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AECOM

Hertfordshire COMET:

TN 07 – Pattern of Travel across Hertfordshire

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HCC COMET
Model Specification Report

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Executive Summary

ES1. This Report

In early 2015 Hertfordshire County Council (HCC) commissioned AECOM to develop a countywide multi-modal transport model: The Hertfordshire **Co**unty **M**ode**l** of **T**ransport (referred to as COMET from here on in this document) with the key principles for model development being set out as part of the "COMET Model Specification Report".

This report is the short-term outcome from the development of COMET. Although the Highway and Public Transport assignment models are still being produced, the various data sources used to inform model development have been reviewed to provide an understanding on the current travel patterns across Hertfordshire.

This executive summary is intended to provide a short overview of the conclusions from the report by drawing together the findings from all the relevant data sources and discuss some potential policy and infrastructure solutions to cater for these travel patterns. In order to understand how we have reached our conclusions it is suggested that the reader takes time to read the entire document which reviews each data source in turn.

ES2. Data Sources

No single data source can provide a complete picture on the travel patterns in Hertfordshire. Therefore this report will draw upon the following data sources:

- 2011 Census Journey to Work data (JTW);

- Hertfordshire 2012 Household Travel Survey;

- LENNON rail ticket sales data;

- Electronic Ticket Machine data from bus operators; and

- Mobile phone origin-destination data.

ES3.   Travel Patterns Across Hertfordshire

Mode Shares

The 2011 Census Journey to Work data has been the main data source for developing an understanding for (home-based work trips) mode share within Hertfordshire. The 2011 Household Travel Survey has also provided some insight. The key findings regarding mode share for travel across the county are as follows:

- Car is the main mode of travel for trips in Hertfordshire;

- The one exception is for trips from Hertfordshire into Central London which is predominantly undertaken by rail;

- Bus use is highest for trips within Stevenage – this is supported by findings from bus ticket sales data;

- The inter-urban trip with the highest mode share for bus is between St. Albans and Hatfield although this is still relatively low at approximately 10%;

- Walk and cycle mode share is highest for internal trips within relatively small / dense urban areas such as Baldock and Hertford; and

- The proportion of Hertfordshire residents who stated that they work from home in the 2011 Census is highest in rural areas.

Key Flows

The rest of this section focuses on the key travel corridors identified in the main report.

A1 Corridor

The A1 corridor represents the major internal flow for trips in Hertfordshire with Welwyn to Hatfield being within the top 10 for all JTW trips with a Hertfordshire origin. Flows are considerable between Baldock – Letchworth – Hitchin and Stevenage in both directions which are likely to be putting pressure on junction 8. In addition there is a significant commuting flow from Stevenage to Welwyn Garden City resulting in congestion issues around the junction 7 area. Reviewing the OD totals for areas to the north and south of the corridor suggests the proportion of strategic through trips on this corridor is quite low.

Despite being relatively well connected by the west coast mainline rail corridor the majority of the JTW trips on this corridor are by car. This can be explained by the fact that journeys by public transport take considerably longer time than if the same journey was done by car. The main issue here is the connectivity of intra-urban public transport to the rail stations in urban areas (e.g. public transport links to Stevenage station). In addition major employment sites are

located on the edge of urban areas away from town centre rail stations in areas more easily accessible by car (e.g. Mundells).

Table 1: A1 Corridor Journey Time Analysis (Departing at 8am)

Route	Direction	Car Journey Time	PT Journey Time
A1(M)	Northbound	26 mins	N/A
A1(M)	Southbound	33 mins	N/A
A602	Hitchin to Stevenage	15 mins	37 mins
A1000 – Chequers	Hatfield to Mundells	13 mins	30 mins
A1(M)	Stevenage to Mundells	18 mins	56 mins

East-West Corridor

The East-west corridor represents the A414, A602 and A120. The flows along this corridor have been found to be strongest between Hemel Hempstead / Watford – St Albans - Welwyn / Hatfield. Flows further east on the corridor are not as strong with Hertford and Ware being found to have stronger relationships with London, Cheshunt and Hoddesdon. Despite this, there is still a reasonable amount of people commuting from Stevenage to Hertford (+500 trips) and from Hertford to Welwyn Garden City (+800 trips). All commuting trips along this corridor are mainly undertaken by car.

Table 2 highlights that there is a significant gap in public transport provision along this corridor with only the journey time between Hertford and Welwyn Garden City being relatively comparable with car. The rest of the journeys reviewed are found to be significantly longer by public transport. It is felt that the level of strategic flows on this East to West corridor through Hertfordshire is quite low.

Table 2: East-West Corridor Journey Time Analysis (Departing at 8am)

Route	Direction	Car Journey Time	PT Journey Time
A414	Hemel Hempstead to Hertford	38 mins	+ 2hours
A414	Hertford to Hemel Hempstead	38 mins	+ 2hours
Sandpit Lane	St Albans to Hatfield	16 mins	30 / 40 mins
B1000	Hertford to Welwyn Garden City	16 mins	20 mins
A602 / A120	Stevenage to Bishop's Stortford	35 mins	1 hour 35 minutes

M1, A41 and M25 Triangle

This triangle contains the towns of St Albans, Watford, Harpenden, Hemel Hempstead and also Luton & Dunstable just to the north of Hertfordshire. Although the main OD pairs from these urban areas are to central London, there is a considerable level of commuting trips within this triangle. Data has revealed over 2,000 people commuting from Hemel Hempstead to Watford and just under a 1,000 people commuting in the opposite direction. Luton & Dunstable is also a major source of commuting to the triangle of which the majority of trips are undertaken by car.

Table 3: M1, A41 and M25 Triangle Journey Time Analysis (Departing at 8am)

Route	Direction	Car Journey Time	PT Journey Time
Luton to Maylands Business Park	Southbound	23 mins	1 hour 5 mins
Hemel Hempstead to St Albans	Adeyfield to St Albans town centre Via Redbourn	20 mins	40 mins
Hemel Hempstead to Watford	Via M1 / Bus and Train	22 minutes	1 hour

A10 – M11 Corridor

Finally the A10 / M11 corridor has been found to be quite isolated from the rest of the county. The major flow from this corridor is to central London (by rail) whilst the major internal flows are between Hertford – Hoddesdon – Harlow and Cheshunt. There is also a significant level of commuting trips into Hertfordshire from Enfield and the external east area. Commuting patterns from Bishop's Stortford are predominantly to central London (by rail) and Stansted Airport (by car). Considering the interaction this corridor has with north London and Essex, it is recommended any proposed Growth and Transport Plan for this area is developed in collaboration with the neighbouring authorities.

Table 4: A10-M11 Corridor Journey Time Analysis (Departing at 8am)

Route	Direction	Car Journey Time	PT Journey Time
A10	Cheshunt to Royston	40 / 55 mins	1 hour 40 mins
Cheshunt to Hoddesdon	Northbound	9 – 12 mins	25 mins
Bishops' Stortford to Stansted Airport	Dunmow Road	12 – 16 mins	35 – 45 mins

Travel and activity synergies between cities/towns

Travel and activity synergies between cities and towns is shown in **Figure 1:**

- **A1 Corridor North:** Baldock – Letchworth – Hitchin to / from Stevenage

- **A1 Corridor South:** Stevenage to Welwyn Garden City, Welwyn Garden City to / from Hatfield

- **East-West:** Ware to Hertford, St Albans to / from Hatfield – WGC, Hertford to WGC

- **"Western Diamond" :** Hemel Hempstead – St Albans – Watford, Trips from Luton & Dunstable

- **Hertfordshire to Central London:** Along main rail corridors,

- **North London Boroughs to / from Hertfordshire:** Harrow – Watford, Borehamwood – Barnet, Cheshunt – Enfield

- **Luton & Dunstable to Hertfordshire:** To Western Diamond, Stevenage and Welwyn Garden City

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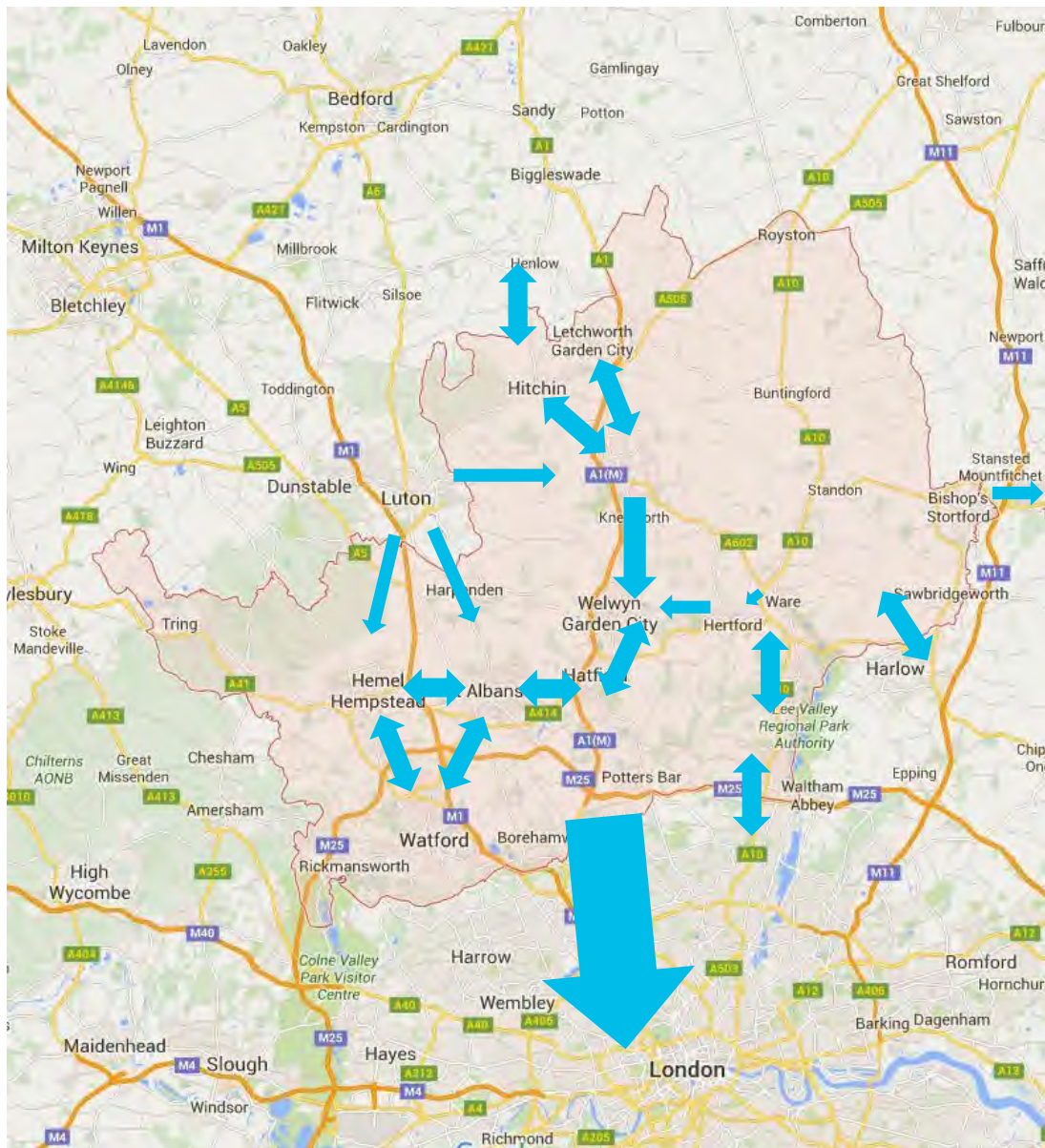
Figure 1: Activity and travel synergies between cities/towns in Hertfordshire

ES4. Key Issues and Focus Area

The findings from this work suggest that the main issues resulting from current travel patterns in Hertfordshire are as follows:

- Car is by far the dominant mode for both inter-urban and intra-urban trips (trips into Central London are the only exception);

- On corridors which are connected relatively well by rail there is still a high mode share for car. This may be due to high rail fares or over-crowding due to the large volumes of people commuting into London but is something that should be investigated further;

- Towns centres on a corridor may be well connected by rail but actual employment sites such as Mundells and Maylands are located in areas which are better accessed by car for inter-urban trips; and

- Some cities/towns with considerable movements between them are poorly connected by public transport thus making it significantly more attractive to travel by car.

It is clear that significant improvements will need to be made to both intra and inter-urban public transport services as well as adopting a land-use planning policy which ensures that development is located / focused around the provision of high quality public transport services. In addition, there appears to be some considerable scope for promoting cycling as an alternative to the car for intra-urban commuting trips. All of this will be vital if Hertfordshire is to reduce its current reliance on the car.

We have also identified that the main flows within Hertfordshire focus along the A1 and East-West corridors and also the A41, M11 and M25 triangle. Therefore, any Growth and Transport Plan developed for these areas should consider the linkages these areas have with each other. A high-level representation of the flows (in the AM peak period) through Hertfordshire is displayed in the following figure:
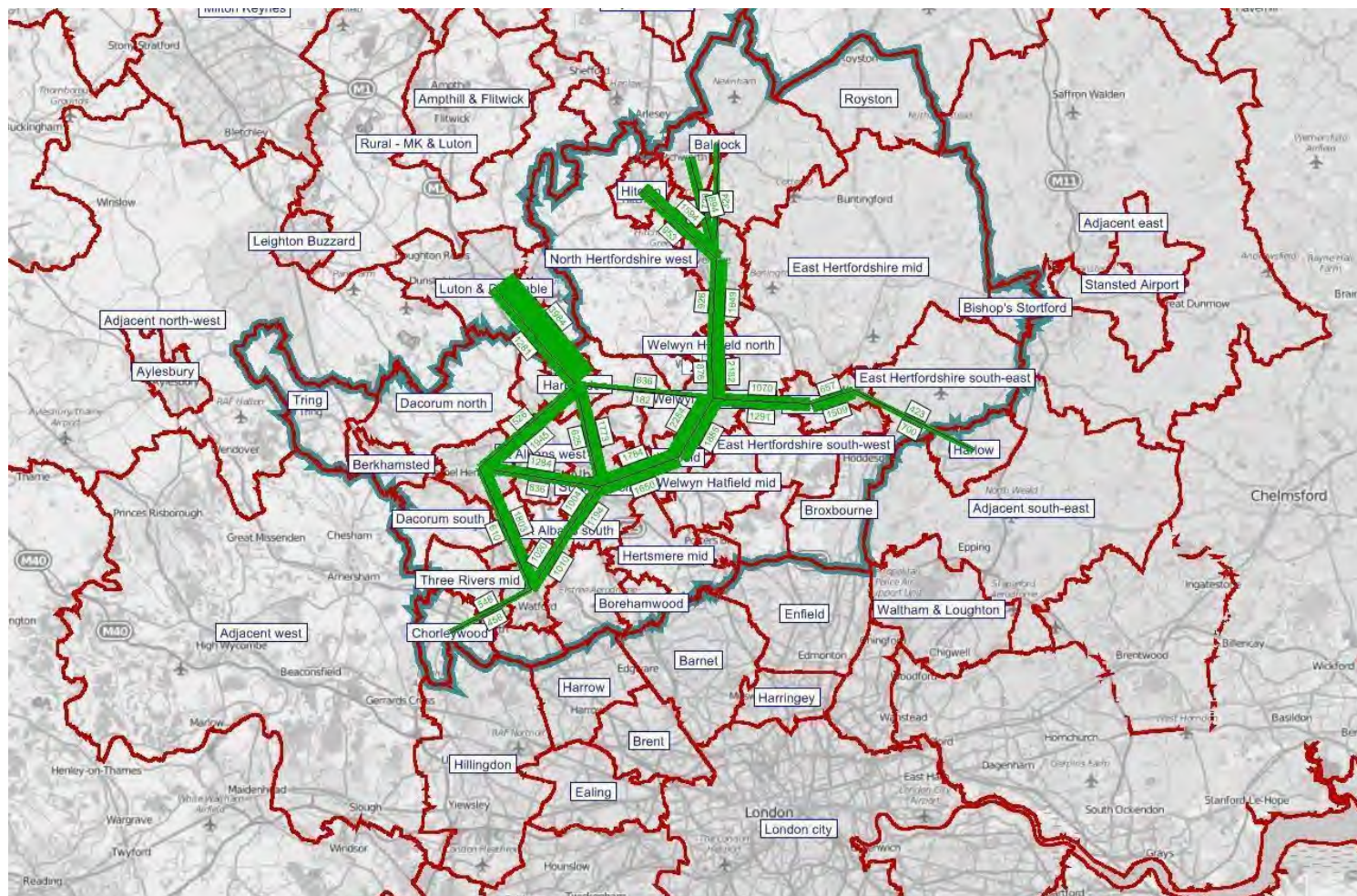
Figure 2: Hertfordshire Curve Corridor Flows – Mobile Phone Data – AM – Home Based Work Outbound[1]

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[1] *Flows provided between MSOA Sectors; actual routeing not provided*

ES5. Policy and Infrastructure Options

The following table summarises the available options for addressing the current issues associated with the patterns of travel in Hertfordshire. This table looks at the possible pros and cons of each option as well providing a high level assessment on whether such options could be implemented within the short, medium or long term.

Table 5: Policy and Infrastructure Options

Option	Pros	Cons	Timescales
Expand junction capacity at congestion hotspots	Reduce congestion and improve journey time reliability	Further reinforce county's reliance on the car – may be unsustainable in future years	Short
Expand highway capacities along key corridors (road widening, by-passes etc.)	Provide additional capacity to reduce congestion	Further reinforce county's reliance on the car Significant new road building may be met with opposition Would require significant land take in town centres	Medium
Investigate joint-working with adjoining authorities where travel interactions are significant (e.g. London)	Collaborative working and joint-funding of schemes which can benefit both authorities	N/A	Medium
Review Land Use Policies	Adopt a strategy that ensures Hertfordshire's growth is planned in a sustainable way by enabling growth which supports the use more sustainable modes	Existing employment sites are well established – will have to improve public transport provision to these	Medium
Work with bus operators to provide enhanced services between key ODs	Provide a 'missing' public transport link between key commuting ODs	Initial work required to demonstrate to operators the commercial potential of running such services	Short
Lobby rail operators to provide cheaper fares for non-London Hertfordshire trips	Potential to provide mutual benefits in increased demand / revenue for operators whilst taking car trips off Hertfordshire's congested road network	Hertfordshire has no control over the rail services within the county Operators may be unwilling to alter fares whilst in the middle franchise contract	Medium
Enhance public transport integration for inter- and intra-urban travel	Improve access to stations to ensure rail becomes a viable mode with competing road corridors	At present HCC has minimal control over public transport services in the county	Medium / Long
Provide greater bus priority on key routes	Improve performance of bus journey times vs. car. Encourage modal shift thus reducing congestion and delays	Bus priority likely to come at a cost to general traffic without extensive infrastructure build	Medium / Long

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Option	Pros	Cons	Timescales
Expand public transport infrastructure (e.g. New rail links, tram, guided bus lanes)	Help provide a genuine alternative to using the car within Hertfordshire	High construction costs	Long
Implement a Work Place Parking Levy[2]	Provide funding for public transport schemes. Incentive for employers to manage and potentially reduce their workplace parking	May meet opposition from business leaders. Would require considerable public consultation	Long

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[2] *For an example see Nottingham Work Place Parking Levy:*
http://www.nottinghamcity.gov.uk/whatisaWPL

ES6. Next Steps

The aim of this report has been to identify the main patterns of travel across the county of Hertfordshire. The findings from this report can help decision makers identify their initial transport priorities and solutions.

HCC are currently in the process of developing and prioritising their Growth and Transport Plans (GTP). The findings from this report should help in informing each GTP and prioritise the order in which these are developed. **Figure 3** provides the recommended geographical location of the potential GTPs. These have been drawn from the findings from this report.

Table 6 provides a list of the GTPs in the order that AECOM believe are a priority for HCC. This table also provides some discussion on the available evidence from this report that the GTPs can make use but also some additional questions the GTPs should seek to address.
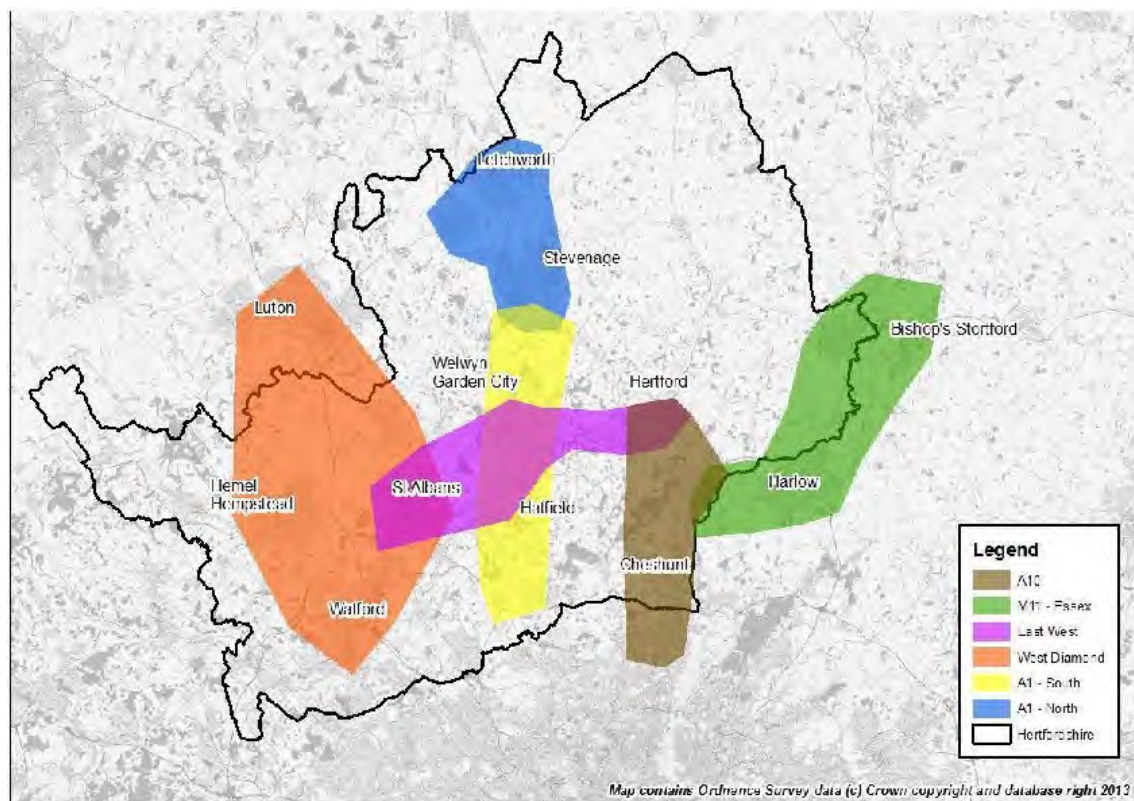
Figure 3: Recommended Location of Growth and Transport Plans

Table 6: Further Studies (Growth and Transport Plans)

Area of Focus	Evidence Available from Report	Questions that need answering
A1 Corridor – Stevenage and North	• Main O/Ds • Mode Shares • Route Journey times	1. What are difference in journey times by mode between the key origin destinations within the Growth and Transport? 2. How accessible are the rail stations within each Growth and Transport? 3. Can additional public transport corridors be provided? 4. What is the level of parking provision at key destinations? 5. Are employment sites adequately served by public transport? 6. Are there any bus priority opportunities? 7. Can cycle provision be improved for short trips?
A1 Corridor – Stevenage and WGC / Hatfield		
Luton – St Albans – Harpenden – Watford Diamond		
East-West Corridor		
A10 Corridor		
M11 & Essex		

Introduction

1 Introduction

1.1 Context

In early 2015 Hertfordshire County Council commissioned AECOM to develop a countywide multi-modal model: The Hertfordshire **Co**unty **M**od**e**l of **T**ransport (referred to as COMET from here on in). The key principles used for developing the model are explained in the "COMET Model Specification Report".

At present an understanding of the wider travel patterns across Hertfordshire cannot be ascertained from the current suite of traffic models, and as such it has been decided to develop a countywide model in order to assess travel patterns across Hertfordshire and allow interaction with public transport modes.

As part of the modelling objectives for COMET (as set out in the MSR), there is no intention to develop a highway / public transport model within the short term. At this stage the aim is to collect and analyse origin-destination data with the view to develop an understanding of travel patterns by mode across the county, in particular inter-urban movements.

This report will draw upon a number of different data sources in order to demonstrate travel patterns. All the data sources used provide an origin-destination pair information; for example this could be a place of residence and place of work from the 2011 Census or an origin and destination from a purchased rail ticket.

These data sources do not provide an indication of the actual routeing between an origin and destination. Therefore, the aim of this report will be to provide an overall idea of the main movements within, to and from the county but not actual routeing. This report is intended to identify the main movements of travel across Hertfordshire and then provide discussion on possible policy and infrastructure options to cater for these travel patterns. In the medium term, it will then be possible to assess these options in COMET once it has been developed.

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1.2   Structure of this report

This report is the result of the short term COMET model development objective. The rest of this report is set out as follows:

- Section 2 reviews the findings from the 2011 Census Journey to Work data;

- Section 3 discusses the travel patterns from Hertfordshire's 2012 Household Travel Survey;

- Section 4 summarises the findings from the public transport ticket sales data for bus and rail;

- Section 5 provides analysis on the mobile phone origin-destination data (which only covers road trips) collected by Telefonica;

- Section 6 brings together the findings from each data source to provide a summary on the Pattern of Travel Across Hertfordshire focussing on key corridors whilst reviewing the current journey times between the main origin-destination pairs; and

- Section 7 provides a high level review of the implications of these findings.

Sections 6 and 7 are the key parts of this report and provide AECOM's main conclusions on the current travel patterns across Hertfordshire. However, it is recommended that all sections of this report should be read to gain a complete understanding of how the conclusions in this report have been reached.

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2011 Census Journey to Work Data

2   2011 Census Journey to Work Data

2.1   Context

The 2011 national Census asked respondents who were in employment to state:

> "How do you usually travel to work? (Tick the box for the longest part, by distance, of your usual journey to work"

The Census also provides 'Area of Residence' and 'Usual place of work" by Middle Super Output Area (MSOA) which essentially provides commuting trip patterns for Hertfordshire. This data has been obtained and analysed for Hertfordshire to understand the travel pattern of daily commuters to and from the county. As **Figure 4** shows, the MSOAs selected for this analysis extends well beyond the area of detailed modelling for COMET.

These MSOAs have then been grouped into a number of sectors to represent the key urban areas within and surrounding Hertfordshire. These are displayed in **Figure 5**.

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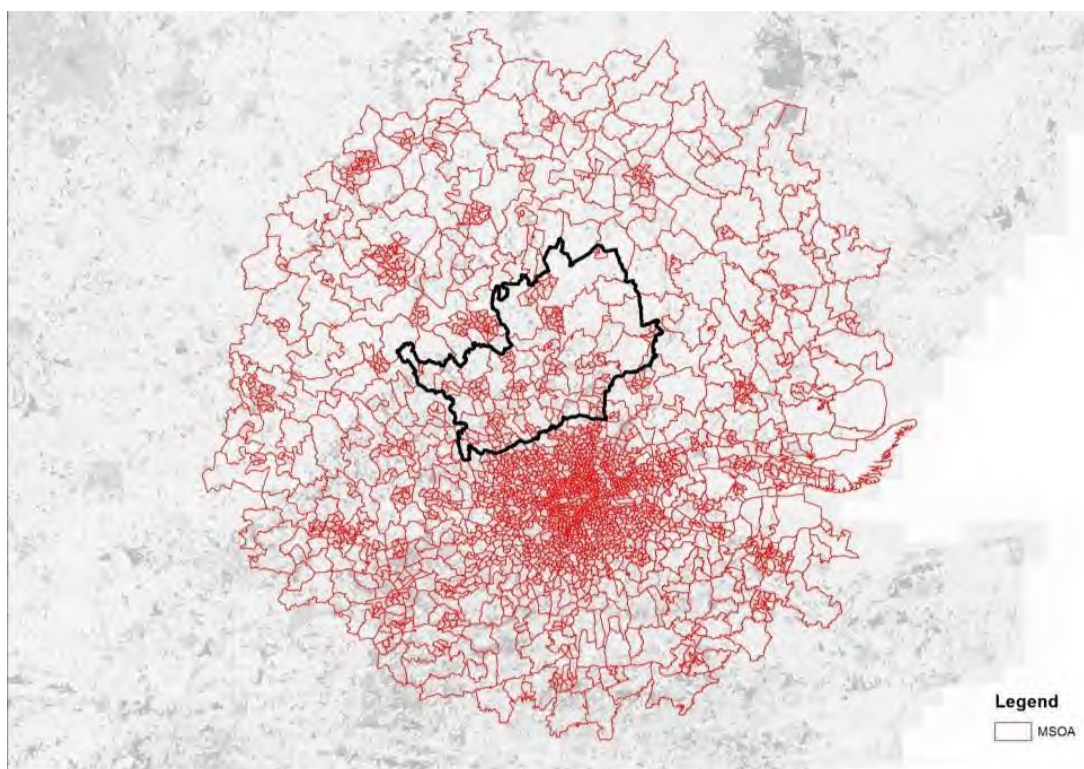
Figure 4: MSOAs Selected for Analysis
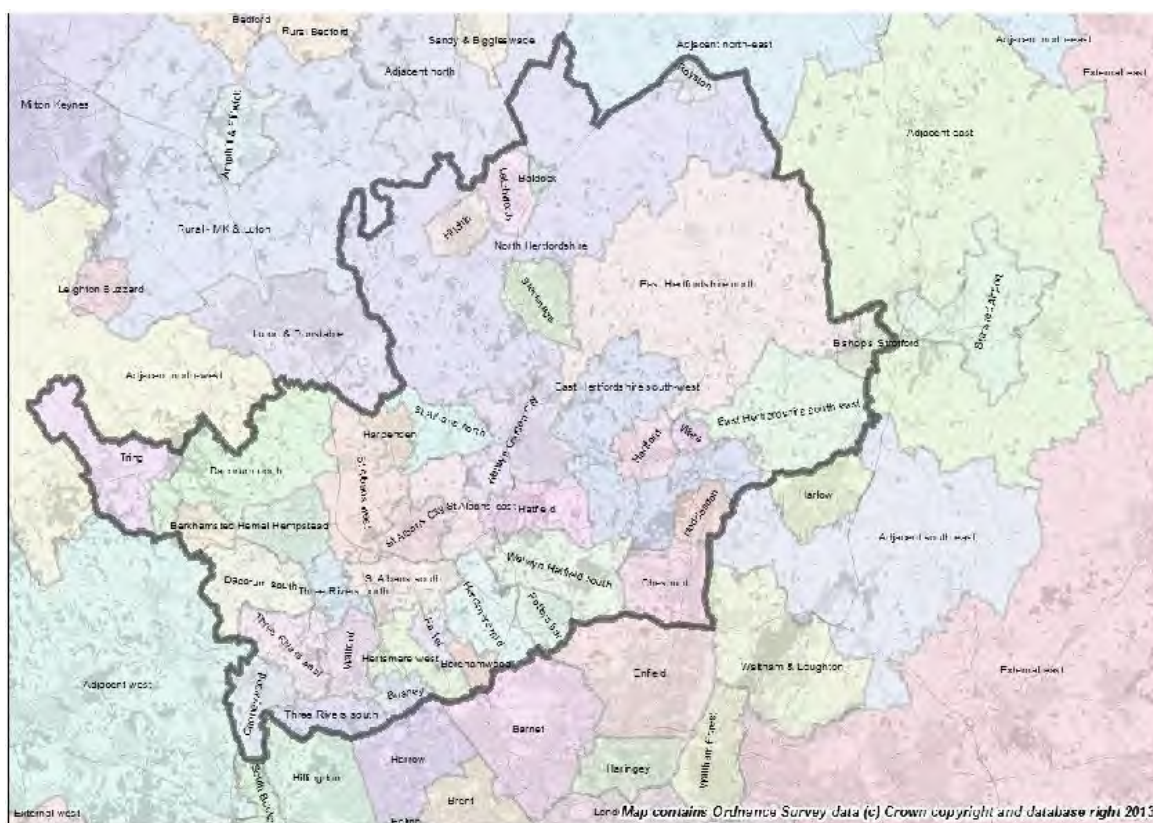
Figure 5: MSOA Sectors – JTW Data

2.2   Mode Share Data

Assessing the mode share for work journeys to / from MSOA sectors provides some useful insight into the travel patterns of the different areas across Hertfordshire. **Table 7** and **Table 8** provide the origin / destination totals for each MSOA sector as well as the relevant mode shares. 'Rail' is a combination of both train and underground from the census data whereas 'Car' is a combination of car driver and passenger.

As expected car is the dominant mode across the whole county. The lowest mode share is for trips originating from Harpenden (49%) whereas the average mode share for all origin trips is 61% and 78% for all destination trips. This difference between origin and destinations is expected due to the fact that a high proportion of commuting trips from Hertford to London would be by rail. The mode shares of specific movements will be assessed in **Section 2.3**.

Mode share for bus is below 10% for all trips across Hertfordshire. When reviewing this in more detail, at MSOA level, it was identified that East Stevenage, Hatfield, Borehamwood and inner Watford were the areas with highest bus mode share in Hertfordshire. Destinations with the highest proportions of bus mode share are: Stevenage Town Centre, Borehamwood, Hemel Hempstead and Watford Town Centre. This is expected as these are all key employment areas which are well served by public transport. Plots for this analysis are provided in **Appendix A**.

Unsurprisingly the areas with highest mode share for train are centred along the main rail corridors in Hertfordshire. Key origins include St. Albans City and Harpenden which also explains the lower mode share for car in these areas. For destinations, Bushey and Borehamwood have the highest mode share for rail but this is low at just 8%.

The mode share for both walking and cycling is highest within urban areas and town centres for both trip destinations and origins. All walking and cycling mode share plots are provided in **Appendix A**. However it should be noted that the mode share for cycling is very low across the whole of Hertfordshire (1-3%). Walk mode share is highest for destinations in relatively small urban areas such as Baldock and Royston as it is likely that any resident who lives and works within these towns will commute on foot due to the relatively short distances involved. It should be noted that Census data may exclude significant number of short cycling trips (e.g. to/from a train station) as respondents are only asked to identify the longest part of their journey.

Areas with the highest proportion of respondents stating that they work from home in the 2011 Census are, on the whole, rural areas including rural parts of East Hertfordshire and Dacorum South where the proportion of respondents working from home is as high as 19%.

Table 7: Mode Share for JTW Journeys to Hertfordshire MSOA Sectors

MSOA Sector	Total Destination	Work from Home	Rail	Bus	Car	Cycle or Walk
Baldock	5,325	11%	11%	1%	65%	11%
Berkhamsted	9,287	15%	20%	1%	51%	12%
Bishop's Stortford	17,397	10%	16%	3%	58%	12%
Borehamwood	16,170	9%	16%	7%	57%	9%
Bushey	9,604	14%	15%	4%	58%	6%
Cheshunt	32,356	8%	15%	3%	64%	8%
Chorleywood	12,800	14%	19%	1%	57%	6%
Dacorum north	5,533	18%	10%	2%	64%	5%
Dacorum south	7,071	19%	10%	1%	61%	7%
East Hertfordshire north	15,171	16%	9%	1%	67%	6%
East Hertfordshire south-east	7,154	15%	13%	2%	63%	6%
East Hertfordshire south-west	8,430	15%	13%	1%	63%	6%
Harpenden	14,090	16%	25%	1%	49%	9%
Hatfield	15,650	8%	9%	7%	55%	19%
Hemel Hempstead	43,799	9%	6%	4%	68%	11%
Hertford	14,341	11%	17%	2%	58%	12%
Hertsmere mid	2,818	17%	13%	3%	61%	4%
Hertsmere west	6,955	16%	15%	3%	56%	8%
Hitchin	17,651	10%	16%	2%	58%	13%
Hoddesdon	14,125	10%	13%	2%	65%	8%
Letchworth	15,712	10%	10%	2%	63%	13%
North Hertfordshire	18,029	17%	10%	2%	65%	5%
Potters bar	10,377	12%	16%	4%	57%	9%
Radlet	4,009	18%	24%	2%	50%	5%
Royston	8,690	9%	10%	1%	64%	15%
St Albans City	32,883	12%	22%	3%	50%	12%
St Albans east	6,755	12%	14%	2%	64%	7%
St Albans north	3,069	15%	12%	2%	63%	5%
St Albans south	11,973	12%	10%	3%	67%	6%
St Albans west	3,048	17%	12%	2%	63%	5%
Stevenage	42,934	8%	7%	6%	67%	11%
Three Rivers north	9,222	11%	9%	3%	70%	6%
Three Rivers south	13,731	11%	18%	3%	60%	7%
Three Rivers west	8,580	13%	15%	2%	61%	7%
Tring	8,231	15%	10%	1%	62%	10%
Ware	10,151	8%	13%	2%	62%	14%
Watford	47,835	9%	15%	5%	55%	15%
Welwyn Garden City	29,972	10%	11%	3%	62%	12%
Welwyn Hatfield south	7,736	15%	15%	2%	60%	6%

Capabilities on project:
Transportation

Table 8: Mode Share for JTW Journeys from Hertfordshire MSOA Sectors

MSOA Sector	Total Origin	Rail	Bus	Car	Cycle or Walk
Baldock	2,367	2%	2%	73%	22%
Berkhamsted	5,753	3%	2%	75%	18%
Bishop's Stortford	10,226	4%	3%	74%	18%
Borehamwood	12,162	7%	8%	72%	12%
Bushey	4,232	4%	8%	77%	9%
Cheshunt	18,413	6%	5%	75%	13%
Chorleywood	8,938	9%	3%	78%	9%
Dacorum north	2,593	2%	3%	84%	9%
Dacorum south	4,679	2%	3%	84%	10%
East Hertfordshire north	5,951	2%	2%	80%	16%
East Hertfordshire south-east	3,712	2%	3%	81%	12%
East Hertfordshire south-west	4,140	5%	2%	80%	12%
Harpenden	7,735	5%	4%	74%	17%
Hatfield	22,070	5%	5%	76%	13%
Hemel Hempstead	33,511	2%	5%	78%	13%
Hertford	12,191	4%	4%	77%	14%
Hertsmere mid	3,087	3%	4%	83%	7%
Hertsmere west	7,342	6%	6%	79%	8%
Hitchin	12,382	4%	4%	72%	19%
Hoddesdon	11,361	4%	2%	82%	10%
Letchworth	13,197	3%	3%	78%	16%
North Hertfordshire	6,297	2%	2%	83%	11%
Potters bar	7,435	6%	6%	75%	11%
Radlet	1,371	7%	2%	81%	9%
Royston	6,044	4%	1%	74%	20%
St Albans City	23,307	6%	6%	71%	17%
St Albans east	5,463	2%	4%	84%	9%
St Albans north	938	2%	3%	81%	13%
St Albans south	8,358	4%	5%	82%	8%
St Albans west	1,483	4%	4%	82%	10%
Stevenage	38,239	4%	7%	75%	13%
Three Rivers north	5,368	6%	3%	79%	11%
Three Rivers south	7,274	8%	3%	72%	15%
Three Rivers west	4,301	6%	5%	77%	10%
Tring	4,284	1%	2%	78%	18%
Ware	7,445	3%	2%	77%	18%
Watford	43,227	8%	7%	67%	17%
Welwyn Garden City	31,577	5%	4%	79%	11%
Welwyn Hatfield south	5,240	5%	2%	84%	8%

Capabilities on project:
Transportation

2.3 Main Travel Patterns

The previous section has provided an overall idea on the level of mode share for work trips to /
from areas in Hertfordshire. This section will now assess what the main travel patterns are for
trips within the county but also to / from Hertfordshire. The mode shares of these JTW routes
will also be reviewed.

2.3.1 *Trips with a Hertfordshire Origin*

The initial task has been to identify the main travel patterns for any JTW Origin-Destination (OD)
pair with an origin within Hertfordshire. **Figure 6** displays the top ten OD movements for a
journey to work trip which originates within Hertfordshire whilst the following table provides the
breakdown of the mode share.

Table 9: Mode Share for Top 10 JTW Journeys from Hertfordshire MSOA Sectors[3]

Origin	Destination	Total	LUL	Train	Bus	Car	Cycle	Walk
St Albans City	London city	6,636	3%	86%	0%	8%	0%	0%
Watford	London city	5,882	24%	56%	1%	16%	0%	1%
Cheshunt	London city	4,576	15%	58%	1%	23%	0%	0%
Cheshunt	Enfield	4,224	0%	5%	8%	82%	2%	2%
Harpenden	London city	3,241	2%	91%	0%	6%	0%	0%
Welwyn Garden City	London city	2,971	6%	77%	1%	15%	0%	1%
Hemel Hempstead	London city	2,796	6%	60%	8%	23%	0%	1%
Welwyn Garden City	Hatfield	2,551	0%	1%	8%	79%	4%	6%
Borehamwood	London city	2,511	17%	58%	2%	20%	0%	0%
Stevenage	London city	2,488	3%	74%	1%	19%	0%	1%

What this clearly highlights is that the major flow of journeys to work from Hertfordshire are
towards central London with 8 out of the top 10 OD pairs being to 'London City', which is
essentially zones 1 and 2 on the London Underground (LUL). These journeys are all
predominantly undertaken by train (91% for trips from Harpenden).

In total, trips to Central London represented 15% of all JTW trips originating from Hertfordshire.
A further 11% of trips were to other London (not central) destinations.

It is noted that for some origins respondents have stated that they have travelled by LUL. As
stated in **Section 2.1** census respondents were asked to state the mode for the longest part, by
distance, of their journey. It is unlikely that a trip from St. Albans to central London would involve
a leg by LUL that is longer than the connecting rail or road journey. For this it is likely that
respondents have either travelled by train into central London before connecting onto the

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[3] *The mode shares will not always equal 100% as 'Other' has not been included in these tables.*

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underground to complete their journey. Alternatively there is also the possibility that respondents drive to their nearest underground station before continuing their journey.

The two OD pairs which do not end in central London are between Cheshunt to the London Borough of Enfield and Welwyn Garden City to Hatfield. For both journeys car is the dominant mode at 79% and 82% respectively.

Figure 6: Top 10 Trips to work with a Hertfordshire origin

2.3.2   *Trips with a Hertfordshire Destination but an External Origin*

Secondly, we assessed the pattern of travel into Hertfordshire. **Table 10** displays the top 10 journey to work OD pairs for trips with an external origin but with a destination within Hertfordshire. These are also displayed visually in **Figure 7**.

Of all JTW trips to a destination in Hertfordshire 32% have come from an external area. Out of these trips from external areas 21% have come from the North London boroughs and 12% from Luton & Dunstable.

The flows are significantly less than those from Hertfordshire to central London with the main origins being a mixture of adjacent urban areas (such as Luton & Dunstable) but also rural areas to the north and east of the county. Unlike journeys from the county to central London these journeys are dominated by car, as high as 91% from Luton & Dunstable to Hemel Hempstead. These are two towns within close proximity of each other (<10miles) and are well connected by road via the M1 but with limited public transport provision.

Some of these mode shares are unsurprising as the connectivity between these large rural areas and towns within Hertfordshire are likely to be fairly limited by public transport (as stated above). However, journeys from Harrow to Watford have a 61% car mode share despite being relatively well connected by both Rail (LUL & National Rail) and bus services.

Table 10: Mode Share for Top 10 JTW Journeys from External to Hertfordshire MSOA Sectors

Origin	Destination	Total	LUL	Train	Bus	Car	Cycle	Walk
Luton & Dunstable	Hemel Hempstead	2,626	0%	1%	5%	91%	0%	1%
Harrow	Watford	2,377	8%	16%	13%	61%	0%	1%
Enfield	Cheshunt	1,757	1%	4%	18%	67%	2%	6%
Luton & Dunstable	Harpenden	1,659	0%	9%	5%	81%	1%	2%
Adjacent east	Bishop's Stortford	1,643	0%	6%	2%	90%	1%	1%
Adjacent north	Stevenage	1,521	0%	5%	0%	93%	0%	0%
Barnet	Borehamwood	1,521	3%	3%	21%	70%	0%	1%
Luton & Dunstable	St Albans City	1,499	0%	15%	4%	78%	0%	2%
External north	Watford	1,432	1%	9%	10%	71%	1%	6%
Adjacent north	Letchworth	1,342	0%	1%	1%	94%	2%	1%
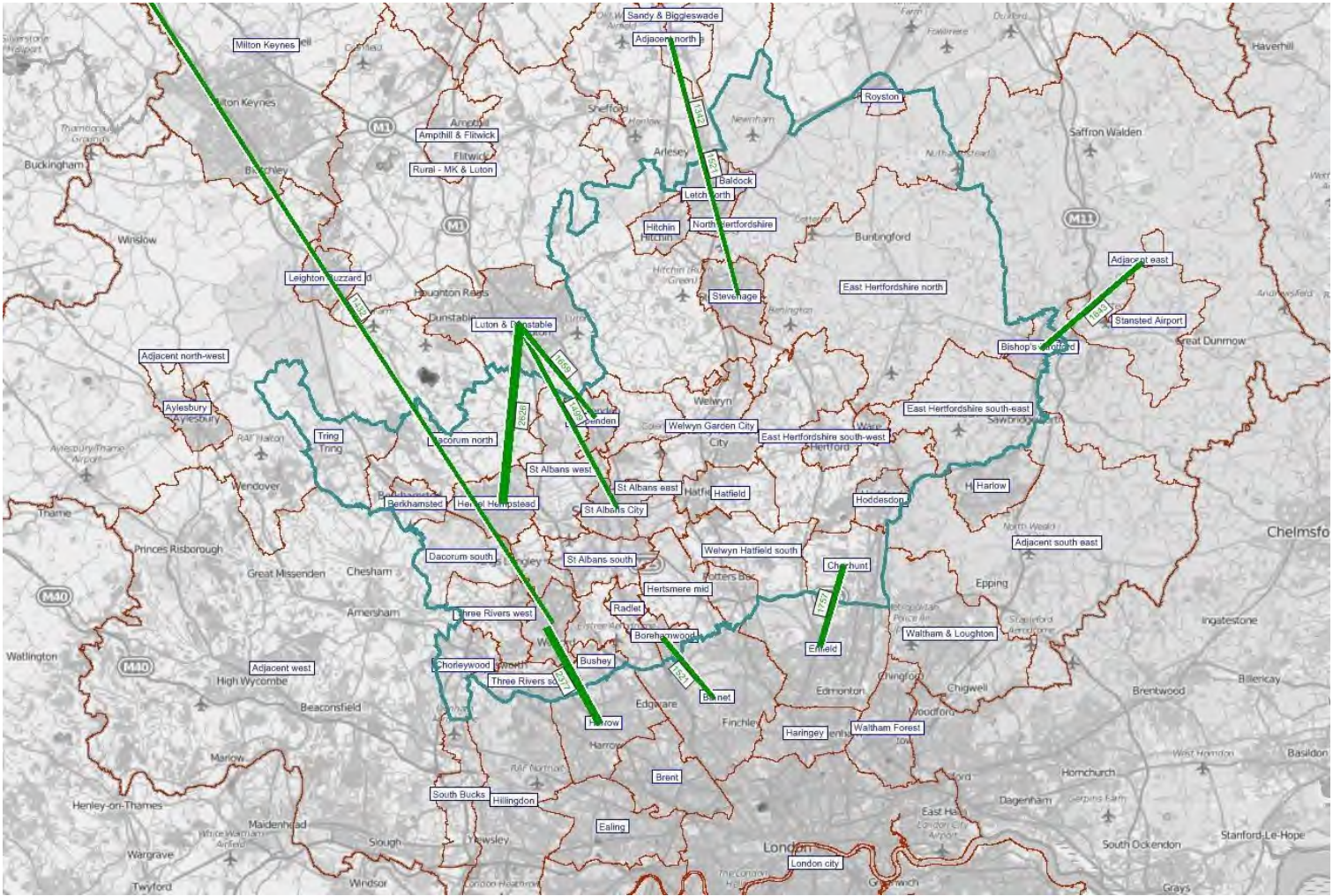
Figure 7: Top 10 Trips to work with an External origin and a Hertfordshire destination

2.3.3   *Trips with a Hertfordshire Origin and Destination*

It is important to understand the pattern of travel within the county itself. For this purpose, only OD pairs with an origin and destination within Hertfordshire were selected and reviewed. These trips accounted for 35% of all JTW OD pairs originating from Hertfordshire.

This analysis reveals a number of interesting findings. Firstly, nearly all the main OD pairs are between adjacent urban areas with relatively short distances between the two. Secondly, it is quite clear that the main corridor of journey to work travel within the county is along the A1 (M). Although, whether the OD pairs would actually use the A1 (M) in their journey is unknown. In addition, there is a strong relationship from Hemel Hempstead to Watford.

For all OD pairs car is the dominant mode and is as high as 90% for journeys between Stevenage and Welwyn Garden City. **Considering the relatively short distance between all of these OD pairs, there is a potential to increase the provision of public transport services between these areas with the aim to reduce the overall mode share for car.**

It is also worth noting that the majority of these main OD pairs are between adjacent urban areas. This reduces the feasibility of introducing park and ride policies as it will be difficult to convince drivers to use park and ride facilities for relatively short journeys.

Table 11: Mode Share for Top 10 Inter-Urban JTW Journeys within Hertfordshire

Origin	Destination	Total	LUL	Train	Bus	Car	Cycle	Walk
Welwyn Garden City	Hatfield	2,551	0%	1%	8%	79%	4%	6%
Stevenage	Welwyn Garden City	2,326	0%	4%	4%	90%	1%	1%
Hemel Hempstead	Watford	2,194	0%	5%	9%	83%	1%	1%
Hitchin	Stevenage	2,040	0%	11%	5%	79%	2%	2%
North Hertfordshire	Stevenage	1,902	0%	2%	5%	86%	3%	2%
Three Rivers south	Watford	1,865	2%	9%	8%	71%	3%	6%
Hatfield	Welwyn Garden City	1,802	0%	5%	10%	72%	5%	6%
Letchworth	Stevenage	1,604	0%	8%	5%	83%	2%	1%
Cheshunt	Hoddesdon	1,594	0%	3%	5%	83%	2%	5%
Three Rivers north	Watford	1,580	0%	2%	9%	82%	2%	4%
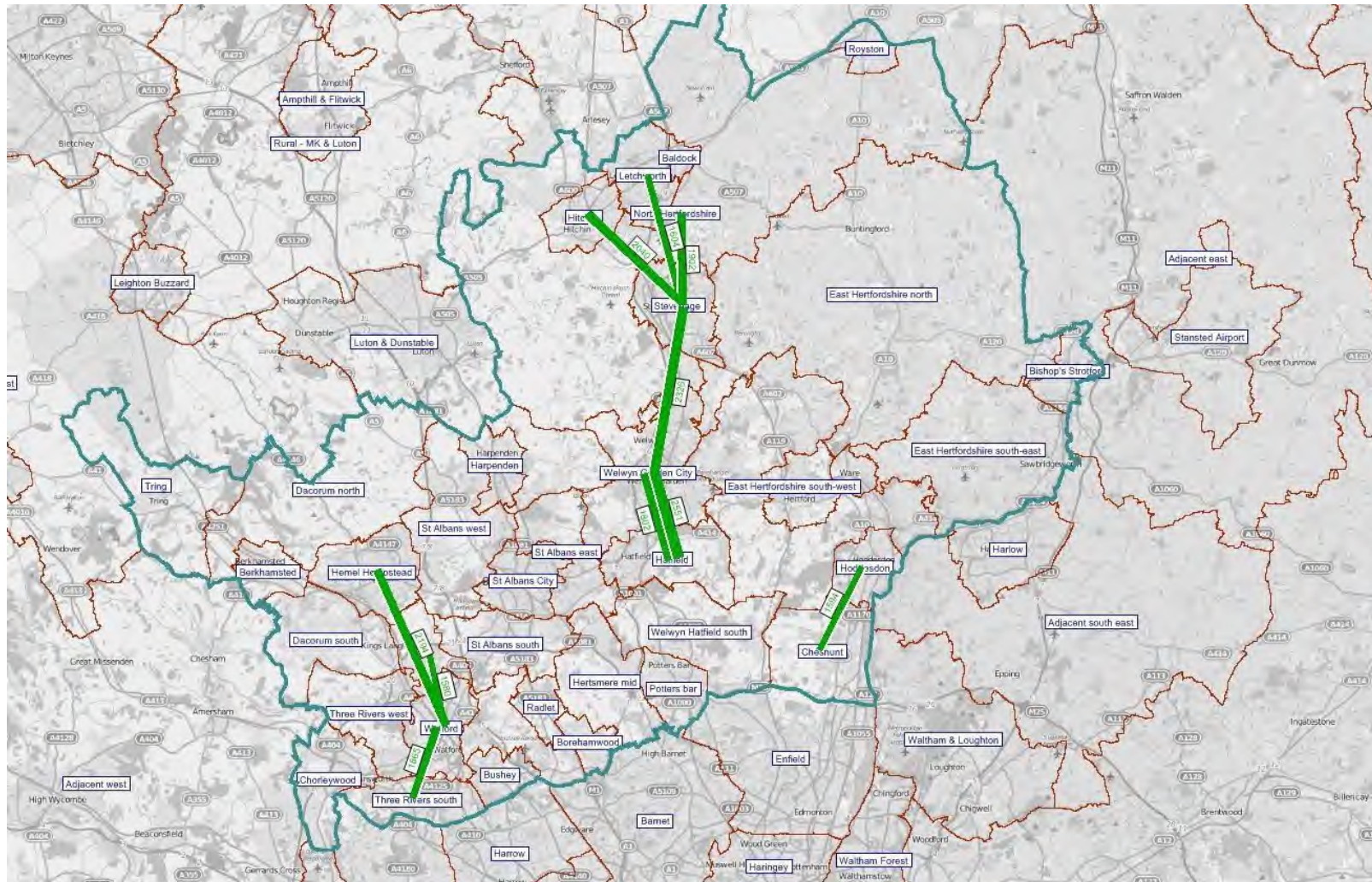
Figure 8: Top Ten Inter-Urban trips within Hertfordshire

2.3.4   *Interaction with Luton & Dunstable?*

As identified in **section 2.3.2** there is a strong interaction between Hertfordshire and Luton & Dunstable to the north west of the county. **Table 12** displays the Top 10 work trips from Luton & Dunstable into Hertfordshire whereas the reverse is shown in **Table 13**. It is clear that the main relationship is for commuting trips from Luton & Dunstable into Hertfordshire whereas the reverse relationship is considerably smaller.

The findings show that there is some scope for reviewing public transport access between Luton & Dunstable and some of Hertfordshire's main urban areas. For example, of the 2,626 people who live in Luton & Dunstable and work in Hemel Hempstead, 91% stated that they use a car as their main mode of transport. This is unsurprising due to the easy connection between the two towns via the M1 but this could also represent an opportunity to improve public transport links.

What is surprising is that the mode share is so high for trips to both Harpenden and St Albans despite being well connected by Thameslink services on the East Midland Mainline. This may be due to high rail fares for the relatively short journeys or potential over-crowding due to the number of people travelling to central London.

Table 12: Top 10 trips from Luton & Dunstable to Hertfordshire including mode share

Destination	Total	Train	Bus	Car	Cycle	Walk
Hemel Hempstead	2,626	1%	5%	91%	0%	1%
Harpenden	1,659	9%	5%	81%	1%	2%
St Albans City	1,499	15%	4%	78%	0%	2%
Hatfield	1,321	2%	4%	91%	0%	1%
Stevenage	1,265	1%	7%	88%	1%	2%
Welwyn Garden City	1,051	2%	4%	92%	0%	1%
Watford	916	2%	5%	89%	0%	1%
St Albans south	655	2%	5%	91%	0%	1%
Hitchin	632	1%	7%	88%	0%	2%
Dacorum north	439	1%	8%	85%	1%	2%

Table 13: Top 10 trips from Hertfordshire to Luton & Dunstable including mode share

Destination	Total	Train	Bus	Car	Cycle	Walk
Harpenden	830	7%	1%	89%	1%	1%
Hitchin	792	1%	4%	92%	1%	1%
Hemel Hempstead	788	1%	2%	95%	1%	1%
St Albans City	786	13%	1%	83%	1%	1%
North Hertfordshire	673	1%	2%	94%	1%	1%
Stevenage	582	1%	4%	91%	1%	2%
Watford	396	2%	4%	88%	1%	3%
Letchworth	311	2%	2%	96%	0%	0%
Dacorum north	301	0%	2%	95%	1%	1%
Welwyn Garden City	264	1%	3%	95%	0%	0%

2.3.5 *Mode Share of Intra-Urban Trips in Hertfordshire*

JTW trips where the census respondent lives and works in the same urban area (i.e. Stevenage) accounts for 29% of all work trips that have a destination in the county.

Table 14 lists the top 10 OD pairs for intra-urban trips within Hertfordshire i.e. trips with the same MSOA sector origin and destination. As expected, the mode share for both walk and cycle is high as a number of trips within these urban areas can be expected to be within a reasonable walk / cycle distance.

Despite this, mode share for car is still the main mode of transport for the majority of OD pairs. For example, St Albans is a relatively dense town with a considerably amount of employment based around the town centre but still has a car mode share of nearly half and a bus share of just 4%.

Table 14: Mode Share for Intra-Urban JTW Journeys within Hertfordshire

Origin	Destination	Total	LUL	Train	Bus	Car	Cycle	Walk
Stevenage	Stevenage	17,491	0%	1%	11%	63%	5%	19%
Hemel Hempstead	Hemel Hempstead	15,130	0%	1%	5%	66%	2%	24%
Watford	Watford	14,428	1%	1%	6%	49%	5%	37%
Welwyn Garden City	Welwyn Garden City	9,292	0%	1%	4%	62%	6%	25%
St Albans City	St Albans City	7,046	0%	2%	4%	49%	5%	39%
Cheshunt	Cheshunt	6,296	0%	2%	4%	63%	3%	27%
Letchworth	Letchworth	4,317	0%	1%	3%	58%	6%	32%
Hatfield	Hatfield	4,241	0%	1%	4%	43%	6%	44%
Hitchin	Hitchin	3,633	0%	1%	2%	47%	4%	44%
Bishop's Stortford	Bishop's Stortford	3,540	0%	1%	2%	53%	3%	40%

Capabilities on project:
Transportation

2.4   Initial Conclusions

The initial conclusions that can be made from the 2011 Census Journey to Work data, in a Hertfordshire context, are as follows:

- The major movement is to central London and is mainly by rail;

- Car is the main mode of transport across the county (even for trips within urban areas);

- Trips into Hertfordshire are dominated by car and the main origins are Luton & Dunstable, the rural north, and parts of North London;

- High level of trips between adjacent urban areas;

- The A1 (M) corridor and Hemel Hempstead to Watford are the main inter-urban movements within the county (again these movements are predominantly by car); and

- There is also a strong East-West movement (which is masked by the large numbers travelling into central London) which should also be considered when developing transport solutions in Hertfordshire.

Capabilities on project:
Transportation

Hertfordshire 2012 Household Travel Survey

3   Hertfordshire 2012 Household Travel Survey

3.1   Context

The Hertfordshire County Travel Survey (HCTS) is a tri-annual household survey undertaken to provide detailed pattern information on journeys by Hertfordshire resident. The last survey was undertaken in October 2012 and published in 2013.

AECOM have made recommendations for 2015 HCTS survey which are discussed in Technical Note 03 – Hertfordshire County Travel Survey: 2015 Data Collection Recommendations.

The part of HCTS 2012 which is of interest to this technical note is the travel diary. The Travel Diary is a detailed description of all the trips made by the respondent the day before taking the survey.

The survey was carried out by means of a postal questionnaire which was sent to 25,300 households across the ten districts of Hertfordshire. From the 7,375 questionnaires returned, 4,546 filled in the Travel Diary. From those, only 2,278 Travel Diaries contain trips with origin and destinations that can reliably be identified, for a total of 5,865 trips sampled (each Travel Diary accounts for several trips).

The rest of this section with assess the main origin and destination movements by mode to infer the travel patterns observed in the sample and provide an explanation of how this data will be used to verify the mobile phone data.

3.2   Trip Patterns

The travel diary provides an idea of trip patterns across Hertfordshire as respondents were asked to log the post code of their origin and destination for each trip made for the specific day that they completed the Travel Survey. These OD pairs have been grouped into a sector system developed from COMET model zones and have been assigned to a spider desire line network. This is a hypothetical point-to-point network between adjacent sectors.

Although the data has no records for Bishop's Stortford (**Section 3.3**) and is under-representing trips into London, it still provides a useful idea on some of the trip patterns within Hertfordshire. For example, the journeys along the A1 corridor correspond with the findings from the JTW data.
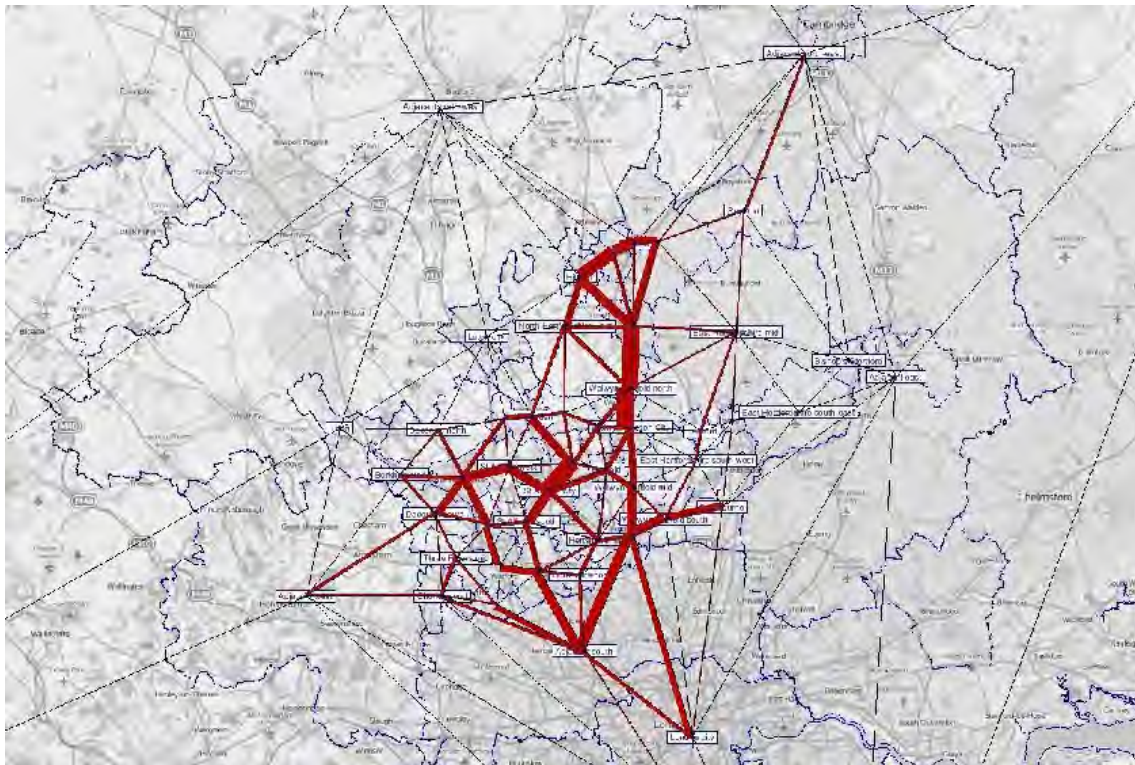
Figure 9: Spider Desire Lines for Travel Diary Trips – HCTS 2012

3.3   Mode Share

In addition to listing the origin and destination of a trip, respondents also logged the modes they used for each trip. This provides an idea of mode share for trips to and from areas in Hertfordshire. It should be noted that no trip in the travel diaries listed 'Train' as the only mode. These always involved another connecting mode such as walk, car etc. Therefore, all train trips have been reported within multi-modal. This also confirms that Census JTW data does not fully capture all modes which may constitute a single journey.

Table 15 displays total trips for sectors with a recorded origin along with the relevant mode share. As can be seen, St Albans City is the main origin followed by Stevenage. As with the JTW data car is by far the most dominant mode. Welwyn Garden City, Letchworth, Hemel Hempstead and Stevenage have the highest mode share for bus which is slightly higher than those recorded for JTW data (**Table 7**). This is unsurprising as the HCTS contains leisure and shopping trips which are known to be a key reason for travelling by bus.

Table 15: Mode Share HCTS Trips for Origins[6]

Sector Origin	Total Trips	Bus	Car	Car Passenger	Multi-modal
Baldock	859	2%	80%	10%	7%
Berkhamsted	1,133	1%	80%	8%	9%
Borehamwood	1,047	9%	76%	6%	7%
Broxbourne	1,583	13%	67%	7%	11%
Chorleywood	1,128	11%	81%	4%	2%
Dacorum north	593	3%	82%	15%	0%
Dacorum south	880	4%	73%	13%	8%
East Hertfordshire mid	822	1%	88%	9%	2%
Harpenden	4,308	3%	78%	15%	4%
Hatfield	44	0%	64%	36%	0%
Hemel Hempstead	3,459	14%	63%	13%	8%
Hertsmere mid	683	4%	78%	9%	9%
Hertsmere west	714	9%	74%	6%	10%
Hitchin	2,421	9%	76%	7%	8%
Letchworth	2,157	15%	67%	13%	4%
North Hertfordshire mid	999	4%	88%	5%	4%
North Hertfordshire west	1,597	2%	73%	16%	8%
Potters Bar	2,417	10%	60%	27%	3%
Redbourn	277	0%	90%	9%	1%
Royston	482	4%	70%	15%	11%
St Albans city	9,358	7%	69%	17%	7%
St Albans east	490	7%	73%	9%	11%
St Albans north	400	6%	88%	3%	4%
St Albans south	322	9%	91%	0%	0%
St Albans west	14	0%	100%	0%	0%
Stevenage	4,185	13%	60%	12%	14%
Three Rivers mid	554	4%	75%	14%	5%
Three Rivers north	1,838	6%	82%	9%	3%
Three Rivers south	365	0%	87%	13%	0%
Welwyn Garden City	2,364	16%	67%	11%	7%
Welwyn Hatfield mid	740	0%	79%	17%	4%
Welwyn Hatfield north	506	13%	73%	12%	0%
Welwyn Hatfield south	132	1%	73%	26%	1%
Welwyn Hatfield west	277	0%	82%	15%	4%

Table 16 provides the total trips to a sector destination with at least one recorded trip. All of these trips originate in Hertfordshire. Once again the dominant mode is car or car passenger except for trips into London which has a multi-modal share of 52%. It is likely that train include a significant proportion of these trips.

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[6] *Mode shares will not equal exactly 100% as this table does not include Motorbike or Taxi*

Capabilities on project:
Transportation

Table 16: Mode Share HCTS Trips for Destinations[7]

Sector Destination	Total Trips	Bus	Car	Car Passenger	Multi-modal
Adjacent east	1	0%	100%	0%	0%
Adjacent north-east	483	2%	71%	11%	16%
Adjacent north-west	2	0%	100%	0%	0%
Adjacent south	1,863	2%	86%	7%	4%
Adjacent west	326	7%	81%	12%	0%
Baldock	511	0%	88%	9%	3%
Berkhamsted	1,151	1%	74%	13%	9%
Borehamwood	1,746	15%	73%	5%	6%
Broxbourne	1,552	16%	66%	8%	7%
Chorleywood	1,252	14%	77%	5%	3%
Dacorum north	483	0%	83%	14%	2%
Dacorum south	702	1%	79%	16%	4%
East Hertfordshire mid	458	3%	80%	15%	2%
External east	3	0%	67%	0%	33%
Greater London south	66	0%	98%	2%	0%
Harpenden	5,637	6%	76%	15%	3%
Hatfield	221	6%	86%	8%	0%
Hemel Hempstead	10,874	18%	64%	12%	5%
Hertsmere mid	560	8%	62%	13%	16%
Hertsmere west	485	2%	80%	7%	9%
Hitchin	5,761	13%	68%	7%	9%
Letchworth	4,399	18%	65%	10%	5%
London city	2,365	15%	27%	6%	52%
North Hertfordshire mid	507	4%	79%	15%	2%
North Hertfordshire west	1,067	1%	81%	13%	5%
Potters Bar	2,022	10%	55%	29%	6%
Redbourn	169	0%	89%	10%	1%
Royston	438	4%	76%	12%	8%
St Albans city	19,778	16%	63%	13%	7%
St Albans east	602	3%	74%	16%	6%
St Albans north	275	4%	90%	7%	0%
St Albans south	260	6%	77%	12%	6%
St Albans west	21	0%	100%	0%	0%
Stevenage	17,979	21%	55%	14%	10%
Three Rivers mid	429	3%	78%	14%	3%
Three Rivers north	1,088	7%	80%	9%	2%
Three Rivers south	161	0%	89%	11%	0%
Tring	1	0%	100%	0%	0%
Welwyn Garden City	8,740	13%	69%	9%	9%
Welwyn Hatfield mid	612	0%	84%	16%	0%
Welwyn Hatfield north	249	9%	67%	18%	4%
Welwyn Hatfield south	362	13%	72%	10%	4%
Welwyn Hatfield west	201	7%	76%	12%	5%

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[7] *Mode shares will not equal exactly 100% as this table does not include Motorbike or Taxi*

3.4 Data Limitations

The trip OD pairs (**Figure 9**) reveal that no OD data has been captured for trips to and from Bishop's Stortford. Although the relationship between Bishop's Stortford and the rest of the county has been found to be relatively weak (see **section 6.6.2**), this shows that the sample is not fully representative of the entire county.

In addition, it has not been possible to differentiate the stages of travel by mode due to the questionnaire's design so trips with more than one travel mode have been grouped as "multimodal". It is envisaged that updates recommended in **Technical Note 03 – HCHTS 2015 Data Collection Recommendations** will address this issue moving forward.

Considering the other data sources available to this task, it is felt that HCHTS 2012 is not probably the most comprehensive and robust data for analysing the travel pattern across Hertfordshire. Although, the key travel patterns identified by this data source are consistent with other data sources used in this study.

Capabilities on project:
Transportation

Public Transport Ticket Sales Data

4   Public Transport Ticket Sales Data

4.1   Context

The LENNON dataset contains data on origin and destination stations and ticket type for every rail ticket (not includingLondon Underground) purchased across the UK. This has been used to develop the base year rail demand matrices (**see the Model Specification Report**) but can also provide an understanding of the main rail movements within and across Hertfordshire.

In addition, Electronic Ticket Machine data (ETM) has been obtained from the four largest bus operators in Hertfordshire. This data is less complete than the corresponding rail data, as destination information is not always available for bus ticket data and it has not been possible to collect data from every operator. However, this ETM data will provide a useful insight into the bus travel patterns across Hertfordshire and can be used to verify the findings from the previous sections.

4.2   LENNON Rail Data

The 2013 LENNON rail data has been used to develop a 24 hour matrix of origin-destination rail journeys to and from Hertfordshire. The findings from this data source correspond with the JTW data thus validating the travel patterns by rail discussed in **Chapter 2**.

Figure 10 displays the main rail journeys from Hertfordshire to an external destination. It is clear that the major flow is into Central London with St Albans being the largest origin with nearly 9,000 trips. These are mainly outbound tours (outbound leg of a return ticket).

Figure 11 provides the OD pairs for rail journeys coming into Hertfordshire from an external destination. As expected the major source of origins is Central London with the majority of trips being return tours.

It is noted that there are a significant number of trips recorded between Bishop's Stortford / Broxbourne and Harringay. It is likely that these are predominantly national rail journeys to either Tottenham or Seven Sisters which then provide an interchange with LUL services into central London.

Figure 12 shows the OD pairs for rail journeys within Hertfordshire. It is apparent that the volume of internal rail trips is vastly smaller than the flows to and from Central London. The largest flows are from Watford and Three Rivers South (likely to be Watford Junction & Bushey journeys), indicating 600 trips over a 24 hour time period. After this the main internal rail journeys are along the northern section of the A1 corridor between Baldock – Letchworth – Hitchin – Stevenage using local services on the East Coast Mainline.

Capabilities on project:
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Origin	Dest	Total
St Albans city	London city	8,974
Watford	London city	6,940
Harpenden	London city	4,043
Borehamwood	London city	3,632
Broxbourne	London city	3,198
Stevenage	London city	2,691
Bishop's Stortford	Harringey	2,513
Welwyn Garden City	London city	2,414
Broxbourne	Harringey	2,086
Hitchin	London city	2,063
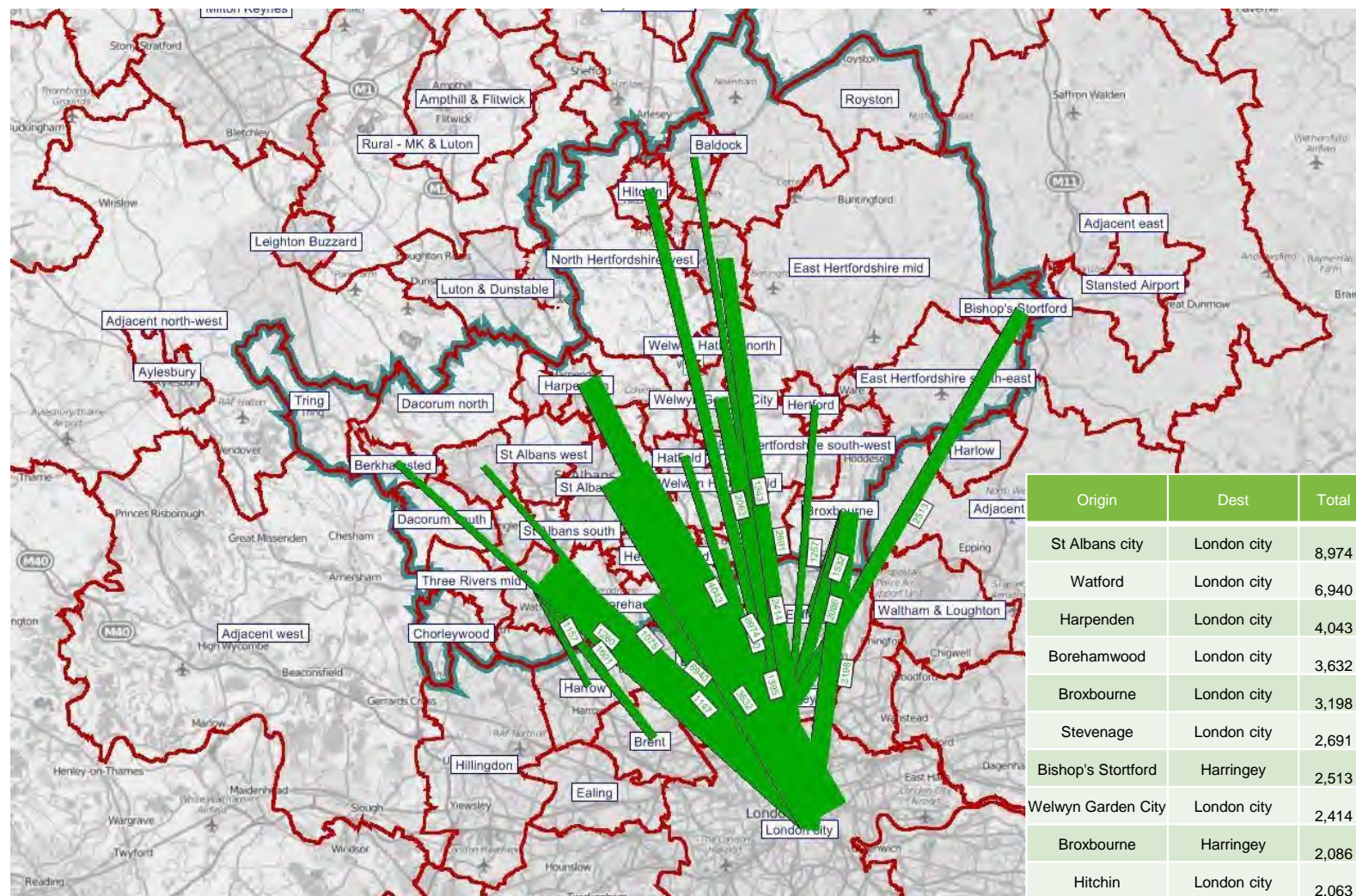
Figure 10: LENNON Rail Journeys from Hertfordshire to External Destinations

Capabilities on project:
Transportation

Origin	Dest	Total
London city	St Albans city	8,776
London city	Watford	6,608
London city	Borehamwood	3,973
London city	Harpenden	3,935
London city	Broxbourne	3,098
London city	Stevenage	2,916
Harringey	Bishop's Stortford	2,489
London city	Welwyn Garden City	2,390
London city	Hitchin	2,181
Harringey	Broxbourne	2,109
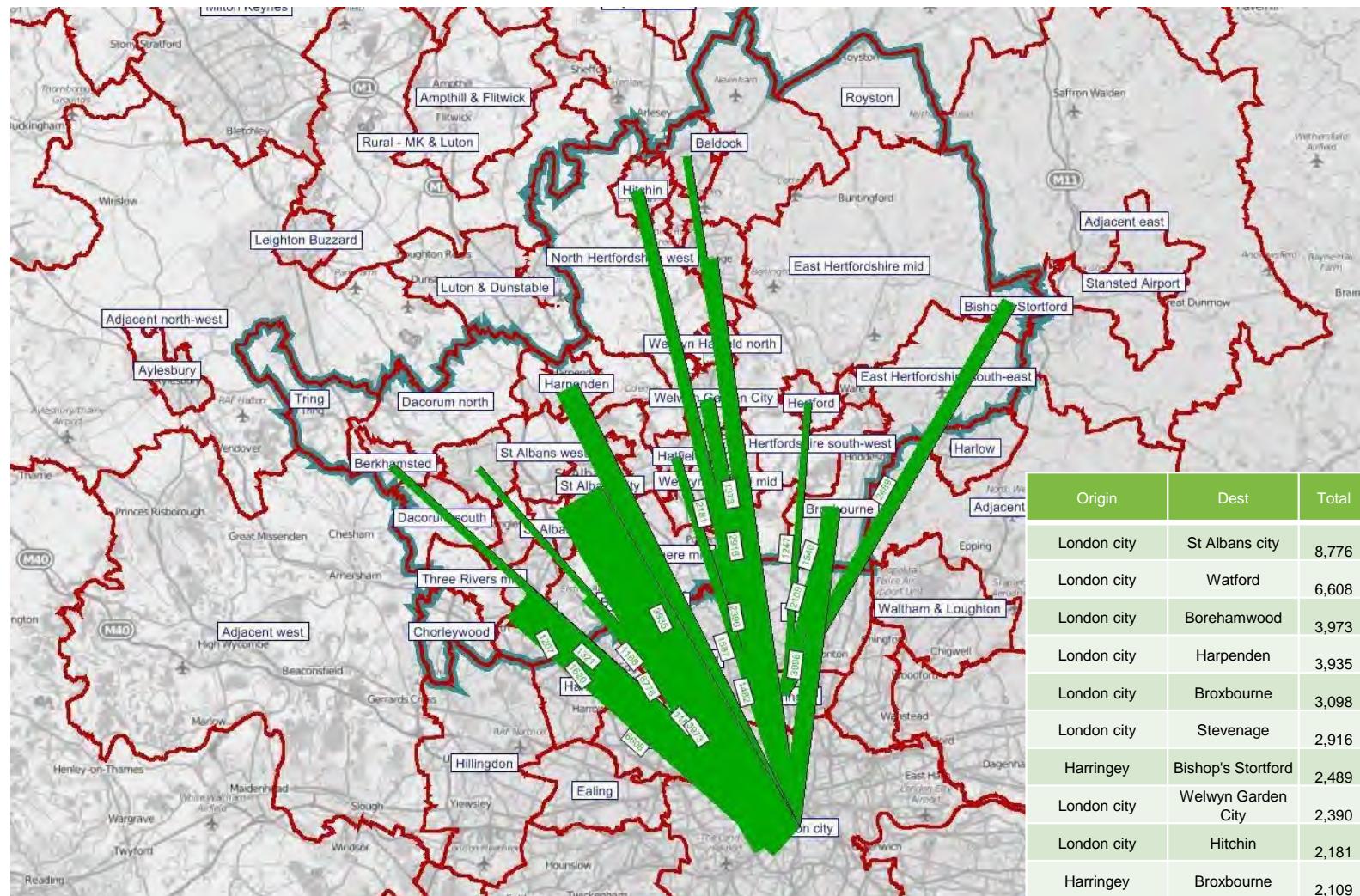
Figure 11: LENNON Rail Journeys From External Destinations to Hertfordshire
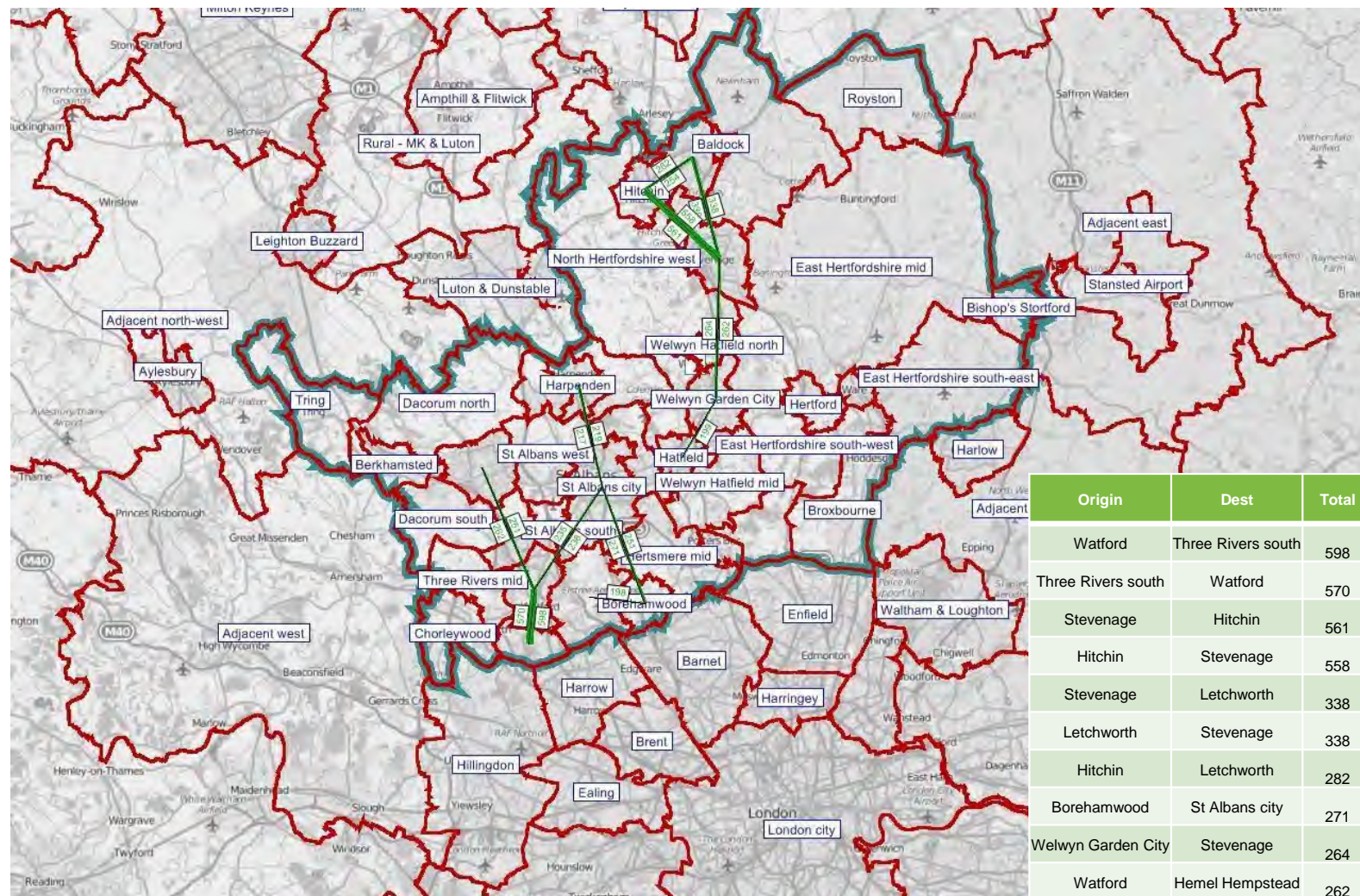
Figure 12: LENNON Internal Rail Journeys within Hertfordshire

Origin	Dest	Total
Watford	Three Rivers south	598
Three Rivers south	Watford	570
Stevenage	Hitchin	561
Hitchin	Stevenage	558
Stevenage	Letchworth	338
Letchworth	Stevenage	338
Hitchin	Letchworth	282
Borehamwood	St Albans city	271
Welwyn Garden City	Stevenage	264
Watford	Hemel Hempstead	262

4.3   Bus Electronic Ticket Machine Data

ETM data has been obtained from the four major providers in Hertfordshire:

- Arriva;

- Uno;

- Centre Bus (including Centre Bus Herts); and

- Metroline

These are estimated to account for 50% of all services (65-70% of passenger-kilometers) in the county covering the main urban areas as well as inter-urban routes. This data will provide an idea on the overall patterns and level of bus use in Hertfordshire.

For the purpose of model development, demand for the remaining services will be synthesised from the available ticket data assuming there is a correlation between service frequency and trips, along with a trip-length distribution. The development of the bus trip matrix will be discussed in more detail in **Technical Note 10 – Public Transport Matrix Build.**

Figure 13 displays the observed trip patterns from ETM data for the AM peak period (0700 to 1000) by COMET model zone. It is apparent that the majority of bus trips are within urban areas. In fact the top 10 OD pairs between COMET zones (see **Table 17)** were found to be within Stevenage. To get an understanding on the level of inter-urban movements we have sectored the EMT data to the same sectors used for the mobile phone data (**section 5**). The following table lists the top 10 inter-urban movements for the AM period identified by the ETM data.

This data corresponds reasonably well with the journey to work data which identified the linkage between Hatfield and St Albans as having the highest mode share for bus. Moreover, this reveals that the overall volume of inter-urban bus movements is relatively low.

Table 17: Top 10 Inter-Urban Bus Movements – AM peak (0700 – 1000)

Origin	Destination	Trips
Welwyn Garden City	Hatfield	231
Hatfield	St Albans city	195
Hatfield	Welwyn Garden City	179
Hemel Hempstead	Watford	168
St Albans city	Hatfield	155
Hertford	Ware	133
North Hertfordshire mid	Stevenage	131
Letchworth	Hitchin	127
Ware	Hertford	115
Three Rivers north	Watford	111

Figure 13: Bus ETM Trips by COMET Zone for the AM period (0700 – 1000)

Capabilities on project:
Transportation

Mobile Phone Origin-Destination Data
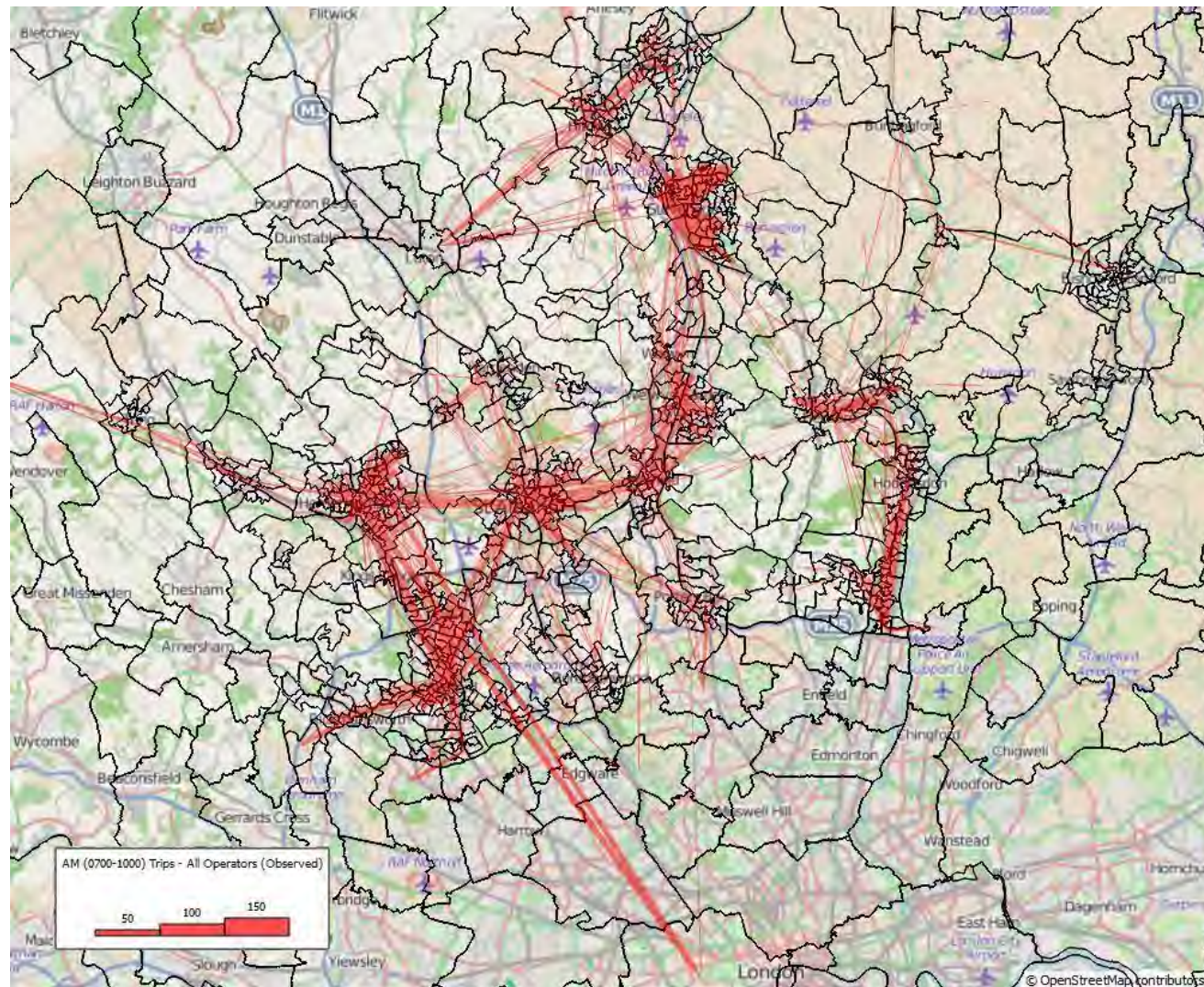
Capabilities on project:
Transportation

5   Mobile Phone Origin-Destination Data

5.1   Context

Mobile phone data from Telefonica has been used to determine origin-destination and production/attraction records across Hertfordshire including trips which pass through the county. This data has been geo-coded to the agreed COMET zoning system to provide an understanding of people movements throughout the county. This has since been sectored to a similar level of aggregation as those used in the JTW analysis.

The data has been provided in two vehicle types: Road (Car, Bus and LGV) and HGVs. In addition these data have been segmented into five trip purposes:

- Home Based Work – Outbound;

- Home Based Work – Return;

- Home Based Other – Outbound;

- Home Based Other – Return; and

- Non-home Based.

5.2   Key Origins and Destinations

To provide a quick sense check on the mobile phone data provided by Telefonica the trip density of each COMET zone has been reviewed[8]. This is to ensure that trips are originating and ending in areas that would be expected i.e. residential and employment areas.

Figure 14 clearly shows that the majority of origins are from the main urban areas across Hertfordshire which is in line with expectations. For destinations, the trip densities are even clearer as employment densities are far higher than average residential densities. In **Figure 15** it is clear that the main employment destinations within Hertfordshire are the town centres of Stevenage, Welwyn, Hatfield, St Albans and Watford. In addition, it is clear that Maylands Business Park is also a key destination.

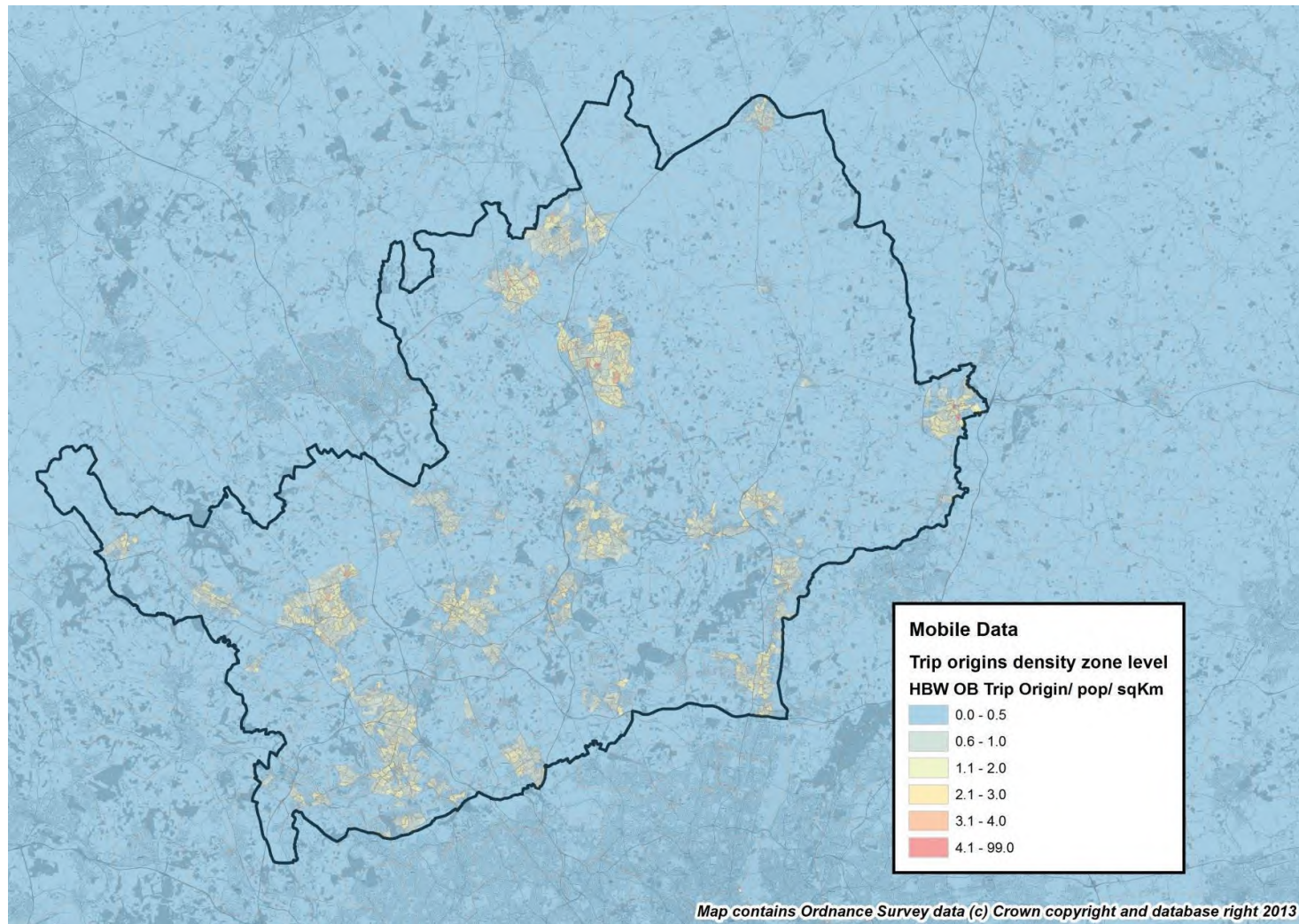[8] *The verification of mobile phone data has been demonstrated elsewhere and discussed with HCC.*

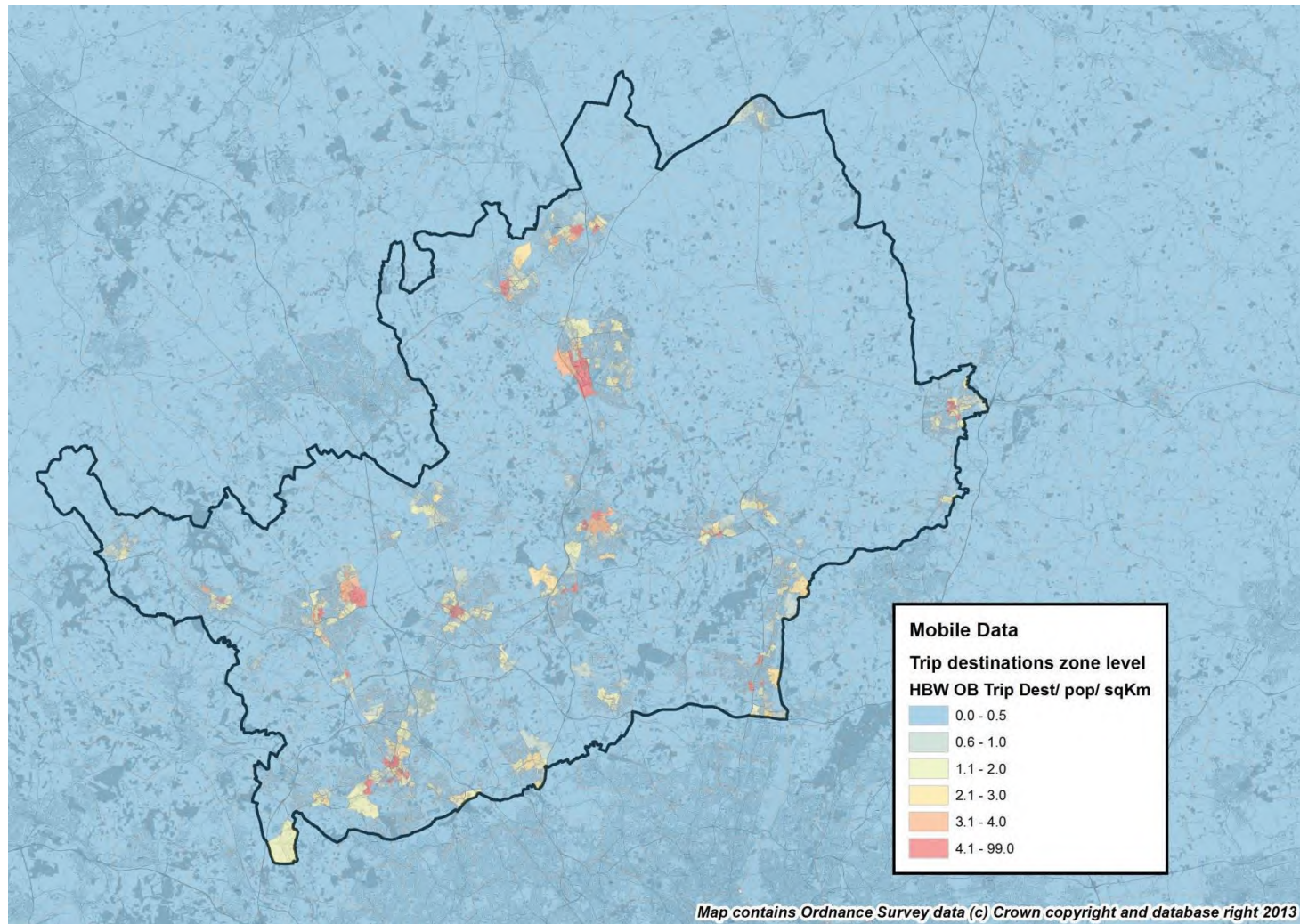**Figure 14: Total Origins by Zone Density. Home Based Work Outbound**

Figure 15: Total Destinations by Zone Density. Home Based Work Outbound

5.3 Travel Patterns

This section will now assess the main travel patterns identified by the mobile origin-destination data. In addition, this will consider whether the AM Home based work outbound data agrees with that of 2011 Census Journey to Work data.

This analysis has focussed on Home 'Based Work Outbound trips' (i.e. trips to work) during the AM Peak Period from the mobile phone data.

5.3.1 *Trips with a Hertfordshire Origin*

Assessing all trips from the mobile phone data which had an origin within the county, it is clear that main pattern of travel is along the A1 corridor, between the Triangle of Hemel Hempstead – Watford – St Albans and along the southern section of the A10 corridor.

Figure 16 displays the main travel movements for trips from within Hertfordshire and also includes a table listing the top ten movements. The biggest OD pair is between Broxbourne and Enfield most likely making use of the A10 corridor. It is noted that a considerable number of people have been observed travelling between Broxbourne and Central London. It is thought that potentially some rail trips are being picked up as road trips in the Telefonica process. This will be investigated further and can be amended in the COMET Matrix Build process.

In addition, there is a significant out commute from Bishop's Stortford to both Harlow and Stansted Airport in Essex.

Unlike the journey to work data this has not picked up the significant flow into Central London as this data set are road trips whereas the majority of journeys to Central London are by rail.

For journeys in the PM Peak Period 'Home Based Work Return' trips (i.e. trips from work to home) have been reviewed. On the whole this follows a reverse of the AM data although this also picks up significant flows of people returning from Work to Luton & Dunstable and some of the North London Boroughs. Plots for all mobile phone data from the PM peak are provided in **Appendix B**.

Origin	Dest	Total
Broxbourne	Enfield	1968
Broxbourne	London city	1382
Stevenage	Welwyn Garden City	1152
Hemel Hempstead	Watford	1138
Letchworth	Hitchin	1086
Borehamwood	Barnet	935
Stevenage	Hitchin	912
Three Rivers north	Watford	832
Hemel Hempstead	St Albans city	777
Stevenage	Letchworth	777
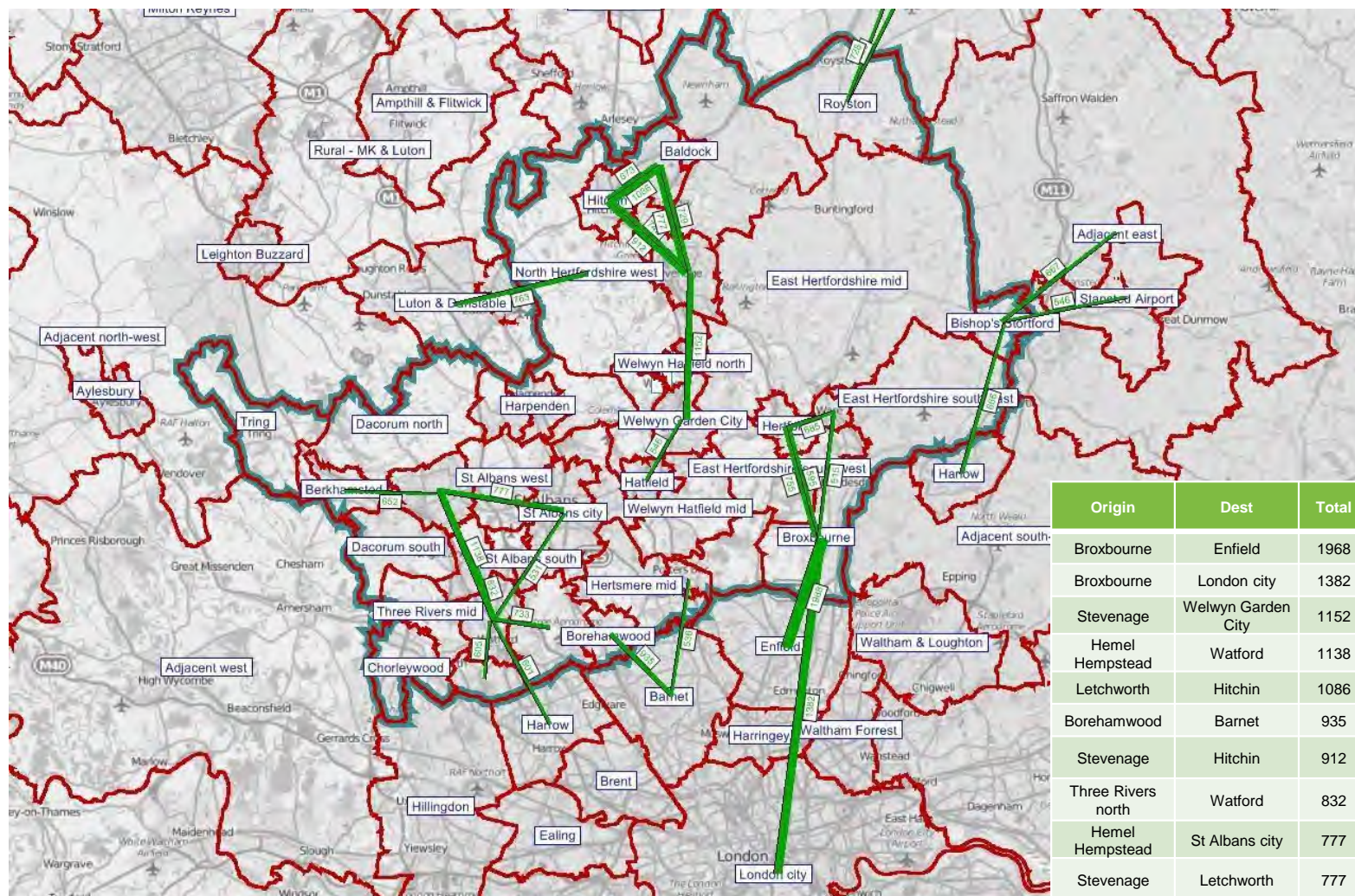
Figure 16: Main Movements from within Hertfordshire – Mobile Phone Data (AM peak period)

Capabilities on project:
Transportation

5.3.2   *Trips with a Hertfordshire Destination but an External Origin*

Looking at journeys into the county **Figure 17** shows that main movements into the county by road are from Luton & Dunstable. In addition there is a strong relationship between the North London boroughs and the southern end of the county such as from Harrow to Watford. Finally, there are a considerable number of trips from the rural Adjacent East area into Bishop's Stortford.

As previously discussed in **Section 2.3.2** these findings follow a similar pattern to the Journey to Work data.

For the PM this analysis reveals the return from work journeys into Hertfordshire. On the whole these are a lot lower the in-commuting trips as the main out commute flow to central London is not picked up by the mobile data as that flow is predominantly by rail.

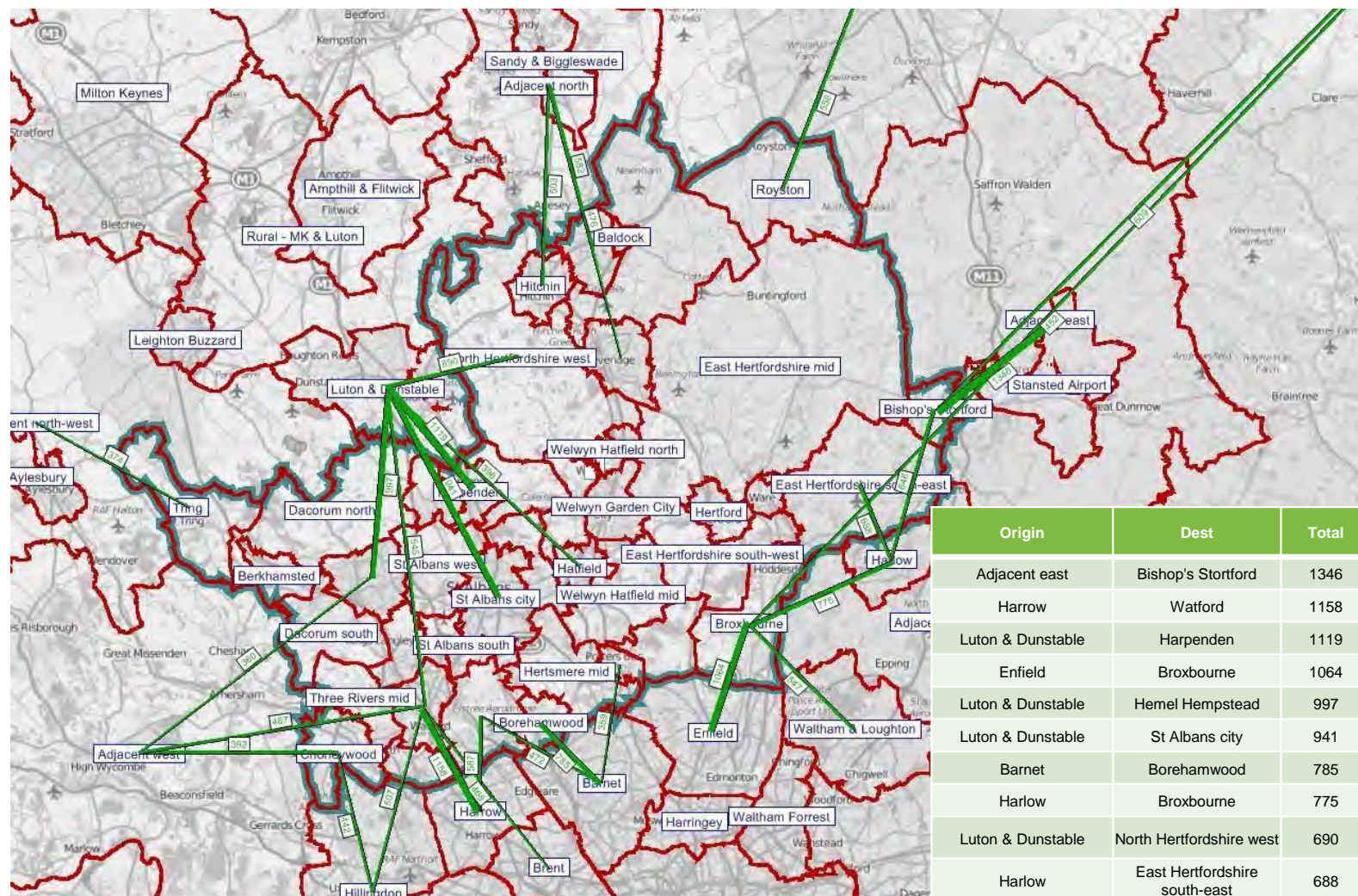| Origin	Dest	Total
Adjacent east	Bishop's Stortford	1346
Harrow	Watford	1158
Luton & Dunstable	Harpenden	1119
Enfield	Broxbourne	1064
Luton & Dunstable	Hemel Hempstead	997
Luton & Dunstable	St Albans city	941
Barnet	Borehamwood	785
Harlow	Broxbourne	775
Luton & Dunstable	North Hertfordshire west	690
Harlow	East Hertfordshire south-east	688

Figure 17: Main Movements into Hertfordshire – Mobile Phone Data (AM peak period)

5.3.3   *Trips with a Hertfordshire Origin and Destination*

Figure 18 displays the main road movements within Hertfordshire and includes a table listing the top ten origin destination pairs.

As can be seen the general pattern travel reflects the findings from the JTW data (**Section 2.3.3**) which also identified the A1 (M) as the main corridor within Hertfordshire but also strong links between the towns of Watford, St Albans and Hemel Hempstead. In addition there is reasonable east-west relationship between St Albans and Hatfield / Welwyn Garden City and between Welwyn Garden City. The east-west flows will be investigated in more detail later in this document (see **section 6.4**). Finally, there is also a strong relationship along the southern section of the A1 between Hertford, Ware and Broxbourne.

In the PM this pattern is very similar to the AM only in reverse. For example in the AM the major flows are from Stevenage to Welwyn Garden City whilst in the PM the predominant flow is now northbound.

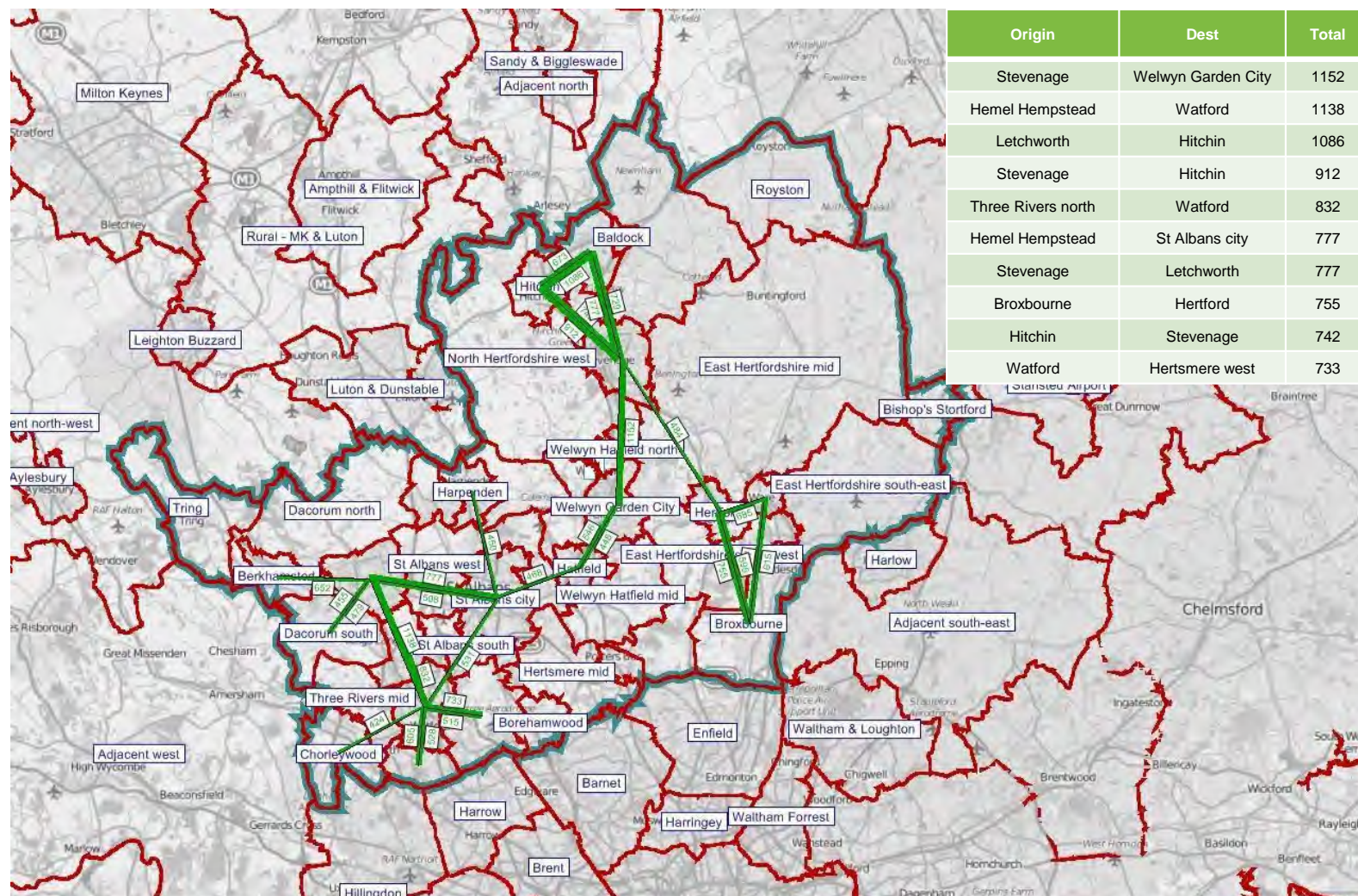| Origin	Dest	Total
Stevenage	Welwyn Garden City	1152
Hemel Hempstead	Watford	1138
Letchworth	Hitchin	1086
Stevenage	Hitchin	912
Three Rivers north	Watford	832
Hemel Hempstead	St Albans city	777
Stevenage	Letchworth	777
Broxbourne	Hertford	755
Hitchin	Stevenage	742
Watford	Hertsmere west	733

Figure 18: Main Movements within Hertfordshire – Mobile Phone Data (AM peak period)

5.4   Initial Conclusions

On the whole the findings from the mobile phone data in the AM peak period (road only) concur with the 2011 Census Journey to Work data. The main findings from this data source are as follows:

- Major internal flow along the A1 Corridor;

- Significant travel interaction between Hemel Hempstead, Watford and St Albans;

- Considerable east-west flows from St Albans to Hatfield and Welwyn Garden City;

- In-commuting trips mainly from Luton & Dunstable, North London Boroughs and from Adjacent east into Bishop's Stortford;

- The major outbound commuting flow is from Broxbourne to Enfield and there is also a strong relationship between Bishops's Stortford and the adjacent areas in Essex.

5.5   Verification of Mobile Phone Data

The 2011 JTW data and other data sources have been used to verify the mobile phone origin-destination matrices and also disaggregate the matrices by mode choice. This will be discussed in more detail in **Technical Note 06 – Matrix Build and Validation of Mobile Phone Data**.

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Hertfordshire Travel Patterns – Corridors of Interest

6   Hertfordshire Travel Patterns – Corridors of Interest

6.1   Context

So far this document has reported the main travel patterns identified by a number of different data sources focussing on origin-destination pairs within, from and to Hertfordshire.

This chapter will aim to incorporate the findings from each data source and provide a summary on the key travel patterns along a number of key corridors within Hertfordshire. These have been identified as corridors for further analysis on reviewing the findings from the previous sections and in discussion with HCC and their Growth and Travel Plans (GTPs).

The key corridors that will be discussed in this chapter are (see **Figure 19**):

- The A1 Corridor;

- East-West A414 / A120 Corridor;

- M1, A41, M25 Triangle; and
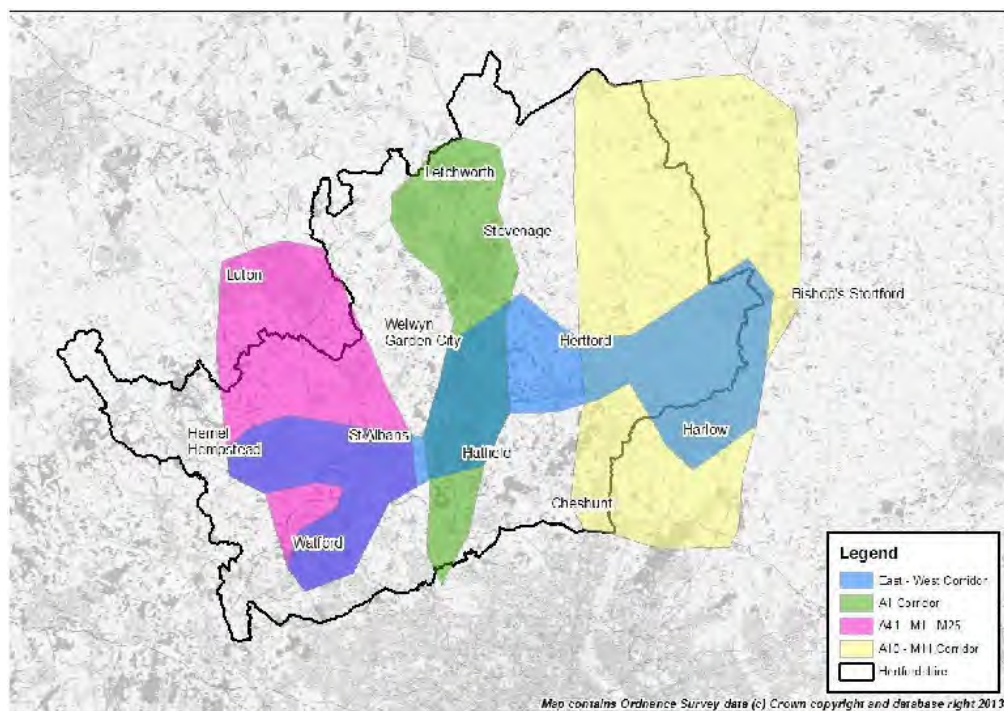
- A10 – M11 Corridor

Figure 19: Corridors Reviewed

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In reviewing these corridors, we also assess the current journey times by road and the overall provision of public transport in order to gain an understanding on what the current issues are and how these can inform future priorities.

This chapter also includes a high level review of potential through trips for each corridor although with no data available on actual routeing of origin-destination pairs this analysis must be treated with caution.

6.2   Additional Data Sources

This chapter will also draw upon two additional data sources:

HCC have access to the Trafficmaster journey time database whose network covers 100% of UK motorways and 95% of trunk roads. Therefore journey time data has been obtained on key routes within each corridor and will be used to identify potential congestion hot-spots and peak flows. This data has been obtained for the AM peak hour (0800 – 0900) with all school and bank holidays excluded.

The journey planning feature from Traveline South East & Anglia[9] has been used to obtain journey times using public transport between particular destinations. This data has been obtained for journeys departing at 08:00 for a week day in September.

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[9] *http://www.travelinesoutheast.org.uk/se/XSLT_TRIP_REQUEST2?language=en&timeOffset=15*

6.3   A1 Corridor

The A1 corridor runs between junction 10 (just north of Baldock) and where the A1 enters London in the borough of Barnet connecting a number of key urban areas within Hertfordshire. The A1 provides the main north-south connection along this corridor although there are routes which should also be considered whilst the East Coast mainline provides a rail connection to and from Central London and the North.

6.3.1   *Main Origin / Destinations*

Both the mobile phone and JTW data suggest that the major flows to and within the A1 corridor are focussed along the corridor itself in two key sections. In the north there are considerable flows between Hitchin, Letchworth and Baldock to Stevenage. The next section is between Stevenage and both the towns of Welwyn Garden City and Hatfield with the predominant flow being southbound: Stevenage to Welwyn Garden City (+2,000 trips) and Welwyn Garden City to Hatfield (+2,500 trips). Mobile phone data from the PM peak supports these findings with the flows, on the whole, being the reverse of the AM. All of these travel patterns are dominated by car, for example between JTW trips from Letchworth to Stevenage is 83% by car.

It is believed that the Growth and Transport Plans (GTP) for this corridor will also be divided into these two sections.

This suggests that the majority of trips along the A1 corridor are predominantly short journeys between key urban areas along the corridor. This is supported by the fact that JTW flows between sectors north or south of Hertfordshire are relatively low except for those to Central London but there are dominated by rail. In addition mobile phone data from the AM peak period found that car trips between these sectors totalled less than 200 trips.

As previously discussed, for the county as a whole, there is a significant level of commuting trips into central London. As expected, rail is the main mode of choice (Welwyn Garden City to Central London – 77% Rail).

6.3.2 *Current Flows*

In order to understand the potential flows within the corridor we have obtained the OD pair totals for all the key MSOA sectors which lie within the corridor. These are:

- Baldock, Letchworth and Hitchin;

- Stevenage;

- Welwyn Garden City;

- Hatfield;

- Potters Bar; and

- Borehamwood

These have been used to provide cumulative flows on hypothetical links between the different MSOA sectors. For example, the flows between Hatfield and Welwyn Garden City include this particular OD pair but also the total number of trips from Borehamwood and Potters Bar to destinations to Welwyn Garden City and further north.

This is a very high level assessment which does not aim to assess actual routeing of trips or take account of more strategic north-south trips. For mobile phone data the AM plots use 'Home Based Work Outbound' whilst for the PM it is 'Home Based Work Return'.

In the AM (**Figure 20**) the main flows are northbound between Hatfield, Welwyn Garden City in Stevenage and also between Stevenage and Hitchin / Letchworth in both directions. In the PM these flows are reversed as people return home from work (**Figure 21**). The journey to work data is very similar to that of the mobile phone data for the AM and also highlights that car is the dominant mode of travel.
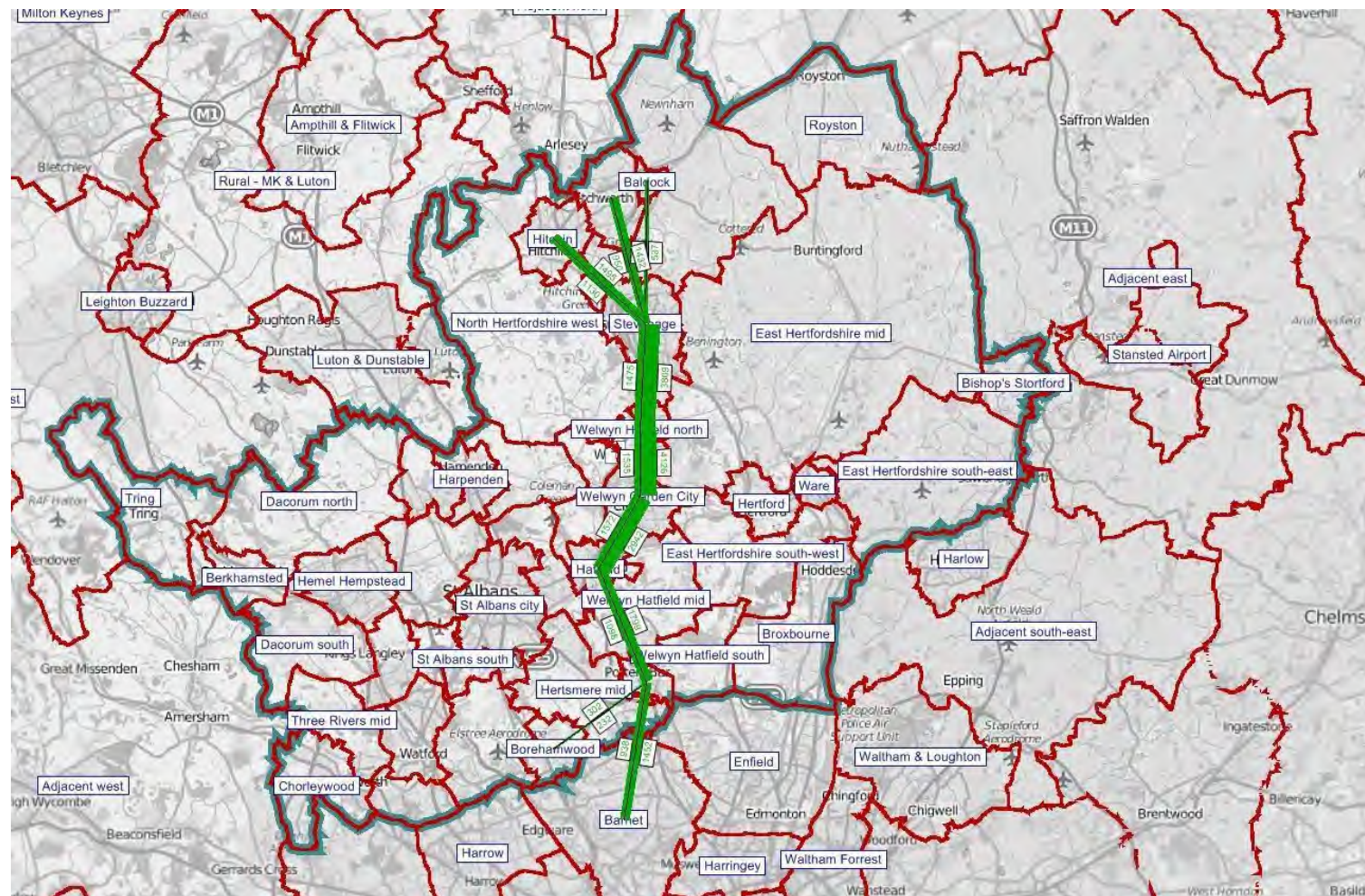
Figure 20: A1 Corridor Flows – Mobile Phone Data – AM – Home Based Work Car Outbound[10]

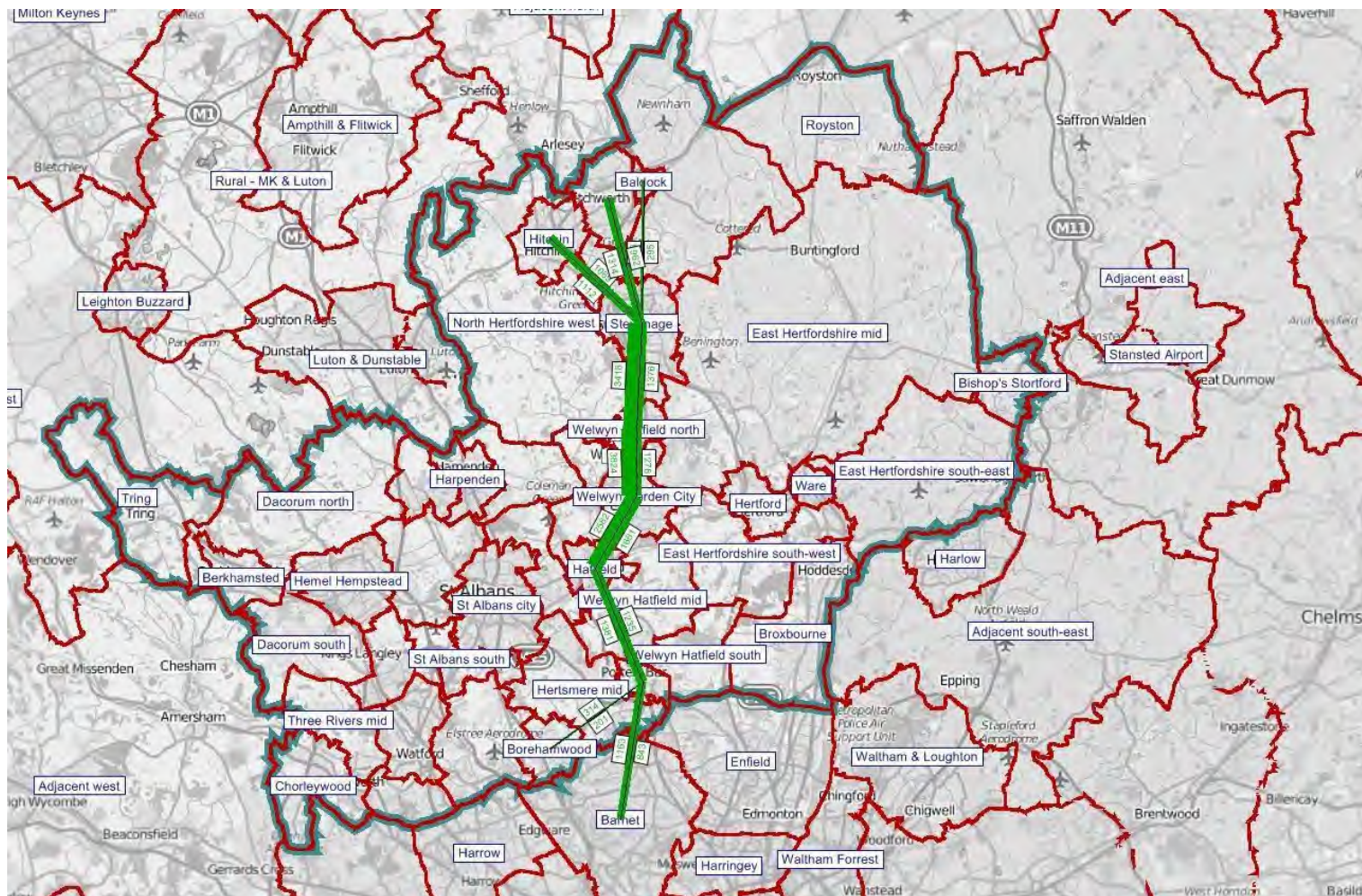[10] *Flows provided between MSOA Sectors; actual routeing not provided*

Figure 21: A1 Corridor Flows – Mobile Phone Data – PM – Home Based Work Car Return

6.3.3   *Journeys By Road*

Journey time data from traffic master has been obtained for the following routes:

- A1 (M) between the Barnet By-pass and junction 10;

- The A602 between Hitchin and Stevenage Town Centre;

- Welwyn Town Centre and Hatfield Town Centre via Chequers; and

- Stevenage to Mundells via the A1 (M)

These routes have been selected as they provide connections between key origin-destination identified in **Sections 2 and 5**. Specific routeing has been chosen using knowledge of the local area and using the Google Maps directions feature[11].

A1 (M)

For the A1 corridor Trafficmaster data suggests that the average journey time along the A1 (M) corridor within Hertfordshire is approximately 26 minutes travelling northbound and 33 minutes southbound. These findings are fairly similar to those provided by Google directions which suggest journey times of 24-40 and 26-50 minutes travelling at 08:00 northbound and southbound respectively.

Figure 22 shows that travelling northbound on the A1 (M) in the AM peak does not seem to be an issue with average speeds remaining fairly stable at around 60-70mph. The only significant reduction in speeds is around Junction 6 where these fall to 50mph. For southbound journeys there is clearly a congestion issue between Junctions 9 to 7 with average speeds falling as low as 30mph in some sections. This issue is widely known already as this section is currently only two lanes although Department for Transport have announced plans to convert the existing hard shoulder to a running lane[12].

A602

Journeys between Hitchin and Stevenage Town Centres are expected to take approximately 15 minutes in either direction according to Trafficmaster data. Google directions data agrees with this suggesting the 6 mile journey will take between 12 and 22 minutes depending on traffic. This journey has been reviewed as it has been identified in both the JTW and Mobile Phone data as a major OD pair in both directions.

Figure 23 reveals that there are a number of congestion spots on the route were vehicle speeds are very low. Travelling southbound it is likely that vehicles have to queue to traverse Junction 8

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[11] *When obtaining route data travel for a Wednesday at 8am was selected*
[12] *https://www.gov.uk/government/news/170-million-road-boost-for-local-economies*

with the A1 (M) with average speeds falling below 10mph. Other hotspots include Hitchin Hill and junctions with A1072, Fairlands Way and St. Georges Way.

A1000 - Chequers

The journey between Welwyn Garden City (Mundells) and Hatfield is expected to take approximately 13 minutes via the A1000 Chequers in both directions. Google directions provide a similar journey on this route but also Comet Way and Stanborough Road. Trafficmaster data suggests that in the AM peak hour this route is quite stop-start with queuing likely at Red Lion Court, A414 Junction, Twentieth Mile Bridge Roundabout, Broadwater Road / Bridge Road and Mundells itself (**Figure 24**).

Stevenage to Mundells

The final route of interest is from a residential part of Stevenage to Mundells. This has been chosen as Journey to Work data has identified a significant number of work trips from Stevenage to Welwyn Garden City and Mundells is one of the main employment areas. On average this journey is expected to take 18 minutes although Google directions suggest that this can vary between 12 – 24 minutes depending on traffic.

Figure 25 shows that, as expected, speeds are lowest travelling through the urban areas of Stevenage and Welwyn Garden City. Average speeds are particularly low around Monks Wood and Gunnels Wood Roundabouts. In addition speeds drop below 20mph on the A1000 immediately after vehicles exit the A1 (M) at Junction 6.

This suggests that the urban centres are quite congested in AM peak hour which is unsurprising as JTW data has found that even commuting trips within an urban area have a high car mode share. **Table 14** from earlier in this report showed that Intra-urban work trips had a car mode share of 63% for Stevenage and 62% for Welwyn Garden City.

Issue 1 – Intra-Urban commute journeys are dominated by car when Public Transport, Walk or Cycle should offer viable alternatives. This is likely to be an issue throughout all the corridors of interest.

The next task will be to compare these journey times by road with available options by public transport.
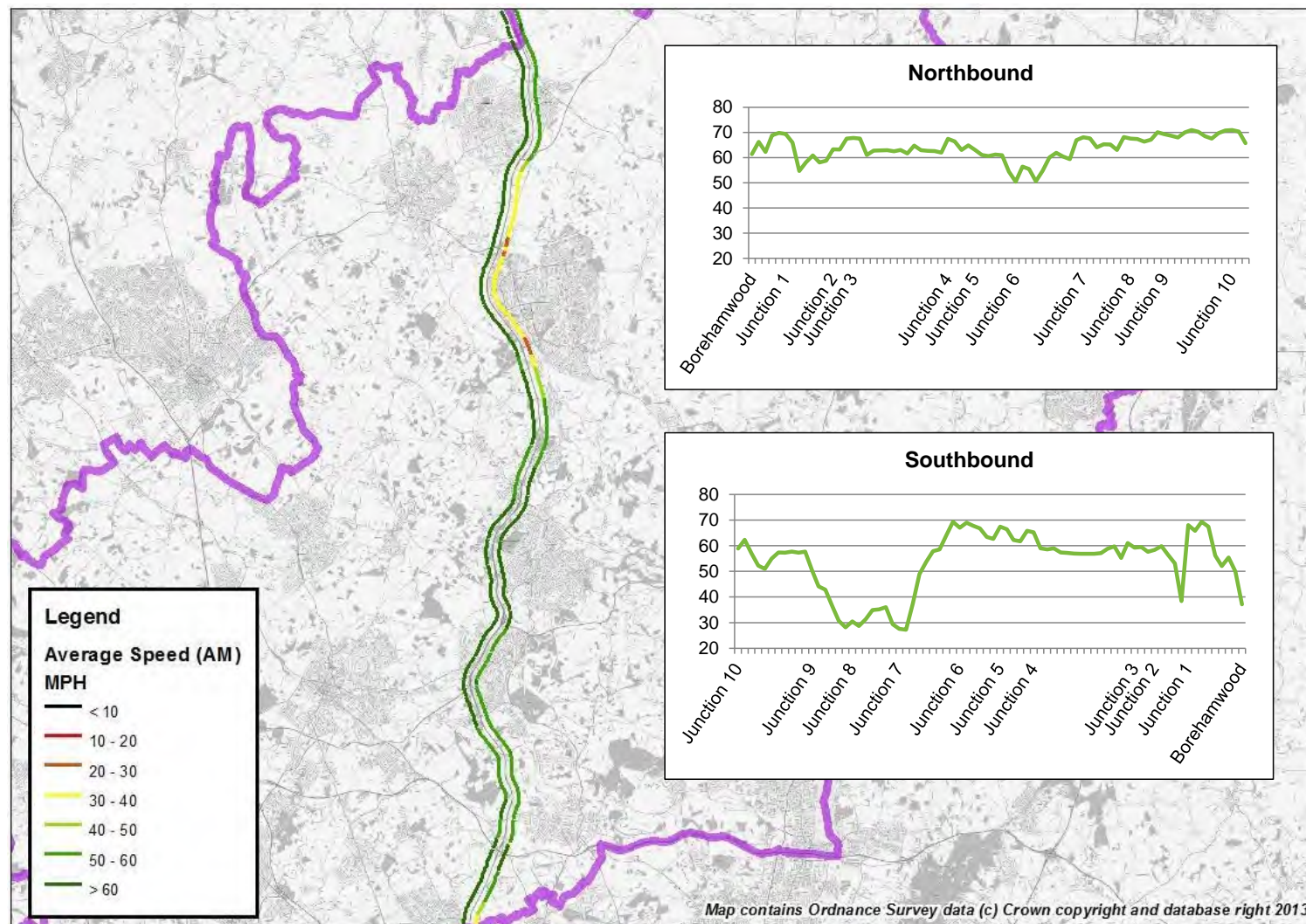
Figure 22: Trafficmaster Data for A1 (M) AM Peak (0800-0900)
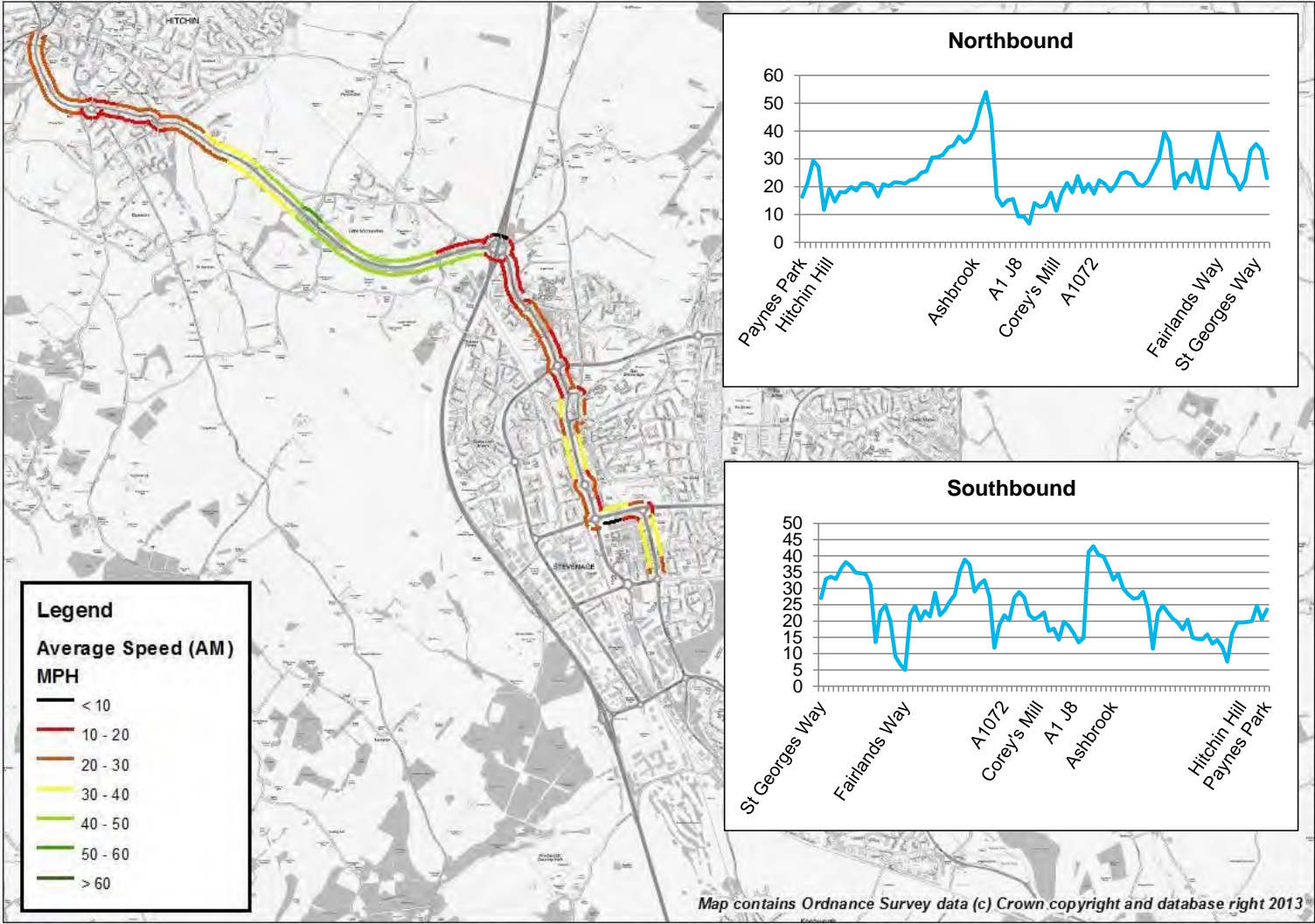
Capabilities on project:
Transportation

Figure 23: Trafficmaster Data for Hitchin-Stevenage via A602 AM Peak (0800-0900)
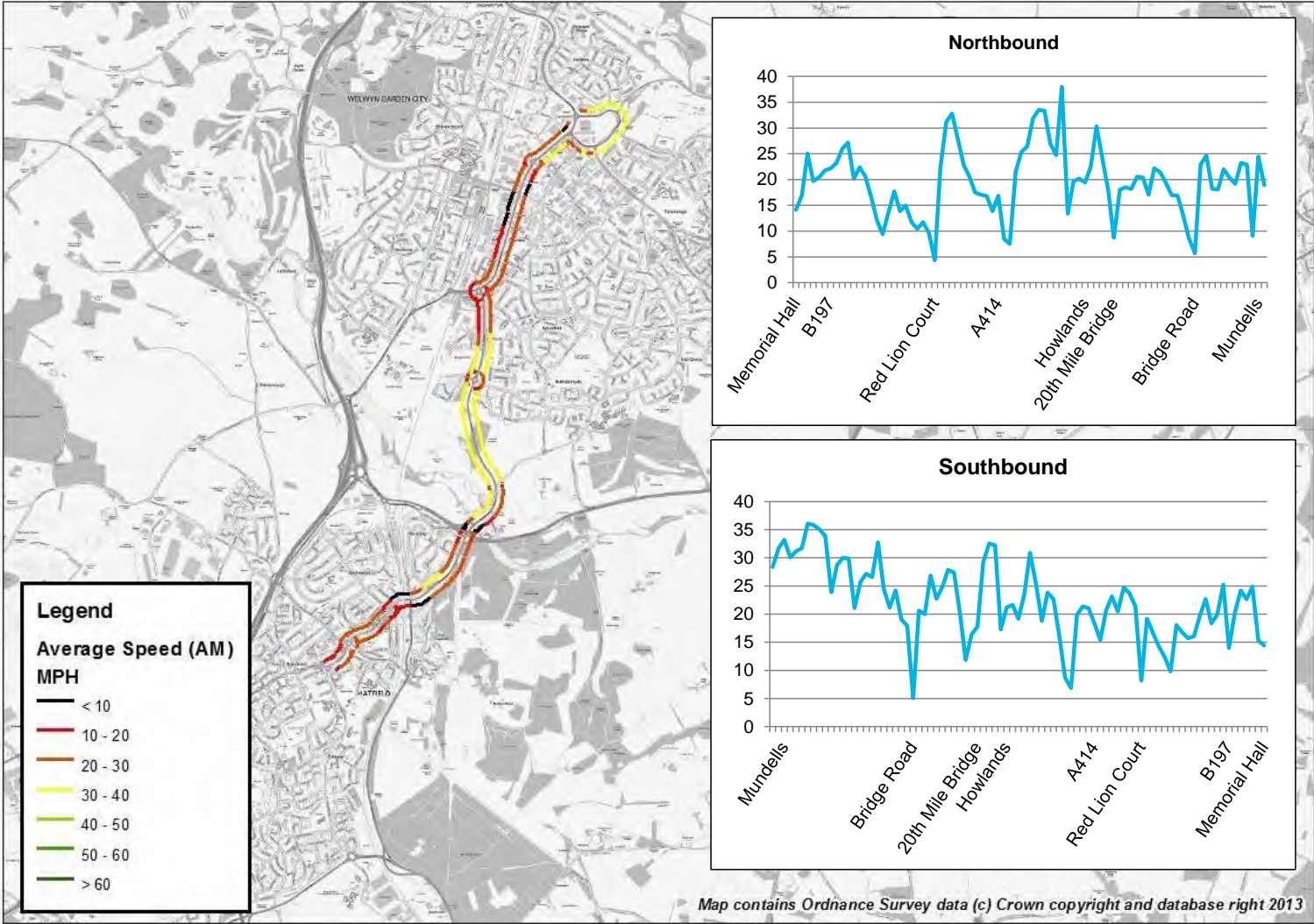
Capabilities on project:
Transportation

Figure 24: Trafficmaster Data for Mundells-Hatfield via Chequers AM Peak (0800-0900)
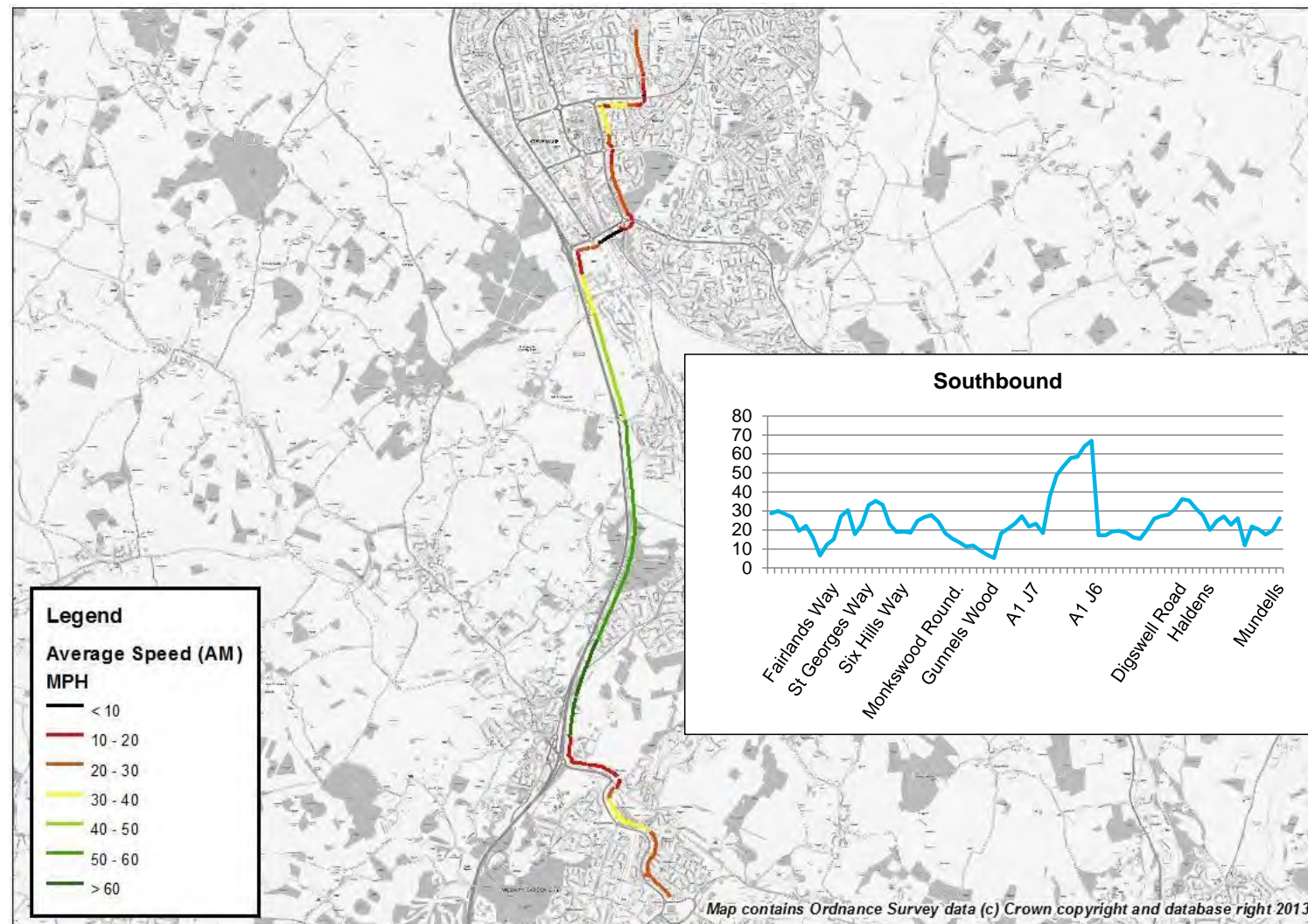
Figure 25: Trafficmaster Data for Stevenage to Mundells (0800-0900)

6.3.4   *Journeys By Public Transport*

The same routes have been reviewed to assess the level of public transport provision and also to compare public transport journey times with that of the car.

Hitchin to Stevenage

Traveline suggest that between Hitchin (Payne's Park) and Stevenage Town Centre will take about 37 minutes using Centrebus South service 700. This runs between Stevenage and Stansted Airport via Letchworth with only one service running in the AM peak hour. This is nearly twice as long as the average journey time by car. In addition, limited bus priority along this route means services are likely to experience delays in the same locations discussed when reviewing this route by car (**section 6.3.3**).

Another option would be to travel to Hitchin station to the east of the Town Centre and taking a train to Stevenage Station. The National Rail Enquires website states that a return ticket would cost £4[13].

Hatfield to Mundells

By car this route was reviewed between Hatfield and Mundells via A1000 Chequers. As Mundells is a key employment area the public transport journey time has been assessed from Hatfield to Mundells only. The fastest AM journey takes 30 minutes by bus by taking Uno service 653 to Broadwater Road and walking up Bessemer Road for 10 minutes until reaching Mundells. It is noted that this bus service does not run directly from Hatfield to Welwyn Garden City along Chequers Road but routes via Howlands and Heronswood Road. An alternative option is travel by train between the two towns although Mundells is an approximately 20 minute walk from Welwyn Garden City Station (overall journey time of 44 minutes).

Either way the journey by public transport is considerably longer than the journey by car which is just 14 minutes. This certainly questions the quality of public transport services between these two to towns versus the attractiveness of the car.

Issue 2 – Journey time by Public Transport are significantly slower than by car

Stevenage to Mundells

This route runs from a residential area of Stevenage (Pin Green) to the key employment area of Mundells in Welwyn Garden City. As previously stated this journey by car should take about 18 minutes. By public transport this journey will take roughly 56 minutes as travellers would be required to take bus SB3 to Stevenage Train Station then change onto a Great Northern service to Welwyn Garden City before taking one more bus (403) from the nearby bus station.

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[13] http://www.nationalrail.co.uk/ , accessed in September 2015

Issue 3 – The Integration between Inter and Intra Urban Public Transport could be improved

The last two examples have highlighted a potential issue in the location of employment sites in areas which are not as easily accessible by public transport as they are by the car. Mundells is located on the northern edge of the town away from the city centre which are traditionally better served by public transport in towns and cities.

Issue 4 – Key Employment sites are located in areas more easily accessible by car

6.4   East-West Corridor

The provision of east-west transport infrastructure is fairly limited in Hertfordshire with the main focus of travel being to and from London. However this is an important corridor linked by the A414 (Watford / Hemel Hempstead to Hertford) and the A602 / A120 connecting Stevenage to Hertford, Ware and Bishop's Stortford. The MSOA sectors considered as part of this corridor are as follows:

- Chorleywood;

- Watford;

- Hemel Hempstead;

- St Albans City;

- Hatfield;

- Welwyn Garden City;

- Hertford;

- Ware; and

- Harlow

6.4.1 *Main Origin Destinations*

The main travel pattern for towns along this corridor is towards London. The journey to work data suggests that this is predominantly undertaken by rail.

Both JTW and Mobile data suggest that the main east-west movements are between Hemel Hempstead / Watford – St Albans – Hatfield – Welwyn Garden City. There is also a significant flow from Ware into Hertford.

Table 18 provides the top 10 trips between urban areas within this corridor. This reveals that all the main movements are between adjacent urban areas, with the only exception being between St Albans City and Welwyn Garden City. For all OD pairs car is the dominant mode although some pairs have bus or rail mode share of above 10%. These are likely to be where rail and bus connections are relatively good between two urban areas and will be investigated in more detail in **section 6.4.5**.

Table 18: Top 10 Origin Destination Pairs within the East-West corridor (JTW)[14]

Origin	Destination	Total	Train	Bus	Car	Cycle	Walk
Welwyn Garden City	Hatfield	2,551	1%	8%	79%	4%	6%
Hemel Hempstead	Watford	2,194	5%	9%	83%	1%	1%
Hatfield	Welwyn Garden City	1,802	5%	10%	72%	5%	6%
Hemel Hempstead	St Albans City	1,152	1%	9%	87%	1%	2%
Ware	Hertford	1,051	6%	7%	76%	5%	4%
Harlow	Hertford	345	1%	4%	91%	1%	0%
Watford	Hemel Hempstead	989	3%	8%	85%	1%	2%
St Albans City	Hatfield	1,095	1%	11%	81%	4%	0%
St Albans City	Welwyn Garden City	1,030	1%	6%	90%	1%	0%
St Albans City	Watford	736	9%	5%	80%	2%	2%

6.4.2 *Current Flows*

Using the same methodology adopted for the A1 Corridor (**section 6.3**), we have reviewed the OD pairs from the mobile phone data to gain a high level understanding of the potential flows along this corridor. In the AM peak period (**Figure 26**), flows of approximately 1,500 trips can be expected along Welwyn Garden City – Hatfield – St Albans City in both directions. Comparing these results with **Figure 27** reveals some tidal flows between Hemel Hempstead and St Albans and also Hertford and Ware. In the AM the main flow is from both Hemel Hempstead and Ware into St Albans and Hertford respectively whilst this is reversed in the PM peak period.

Although the east-west flows are not as high as those along the A1 corridor or those to central London, there are only a limited number of significant east-west connections, especially by public transport. This could be potentially putting pressure on the few east-west routes available

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[14] *Mode shares will not add up to 100% as 'Underground', 'Walk' and 'Other' have not been included*

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which are displayed in **Figure 28**. This explains the dominance of car in the journey to work data.

The potential volume of through trips has been reviewed by looking at the OD pairs for external sectors to the west and east of the county. It should be noted that this is a very high level review and the actual routeing of these trips is unknown. Caution should especially be given to trips between 'External East' and 'External West' as they are two very large sectors and trips between these sectors could make use of a wide range of trips.

On the whole these are fairly low with a number of OD pairs having a total number of trips of less than one hundred with only the external east and west sectors having OD totals of over a 1,000 trips.
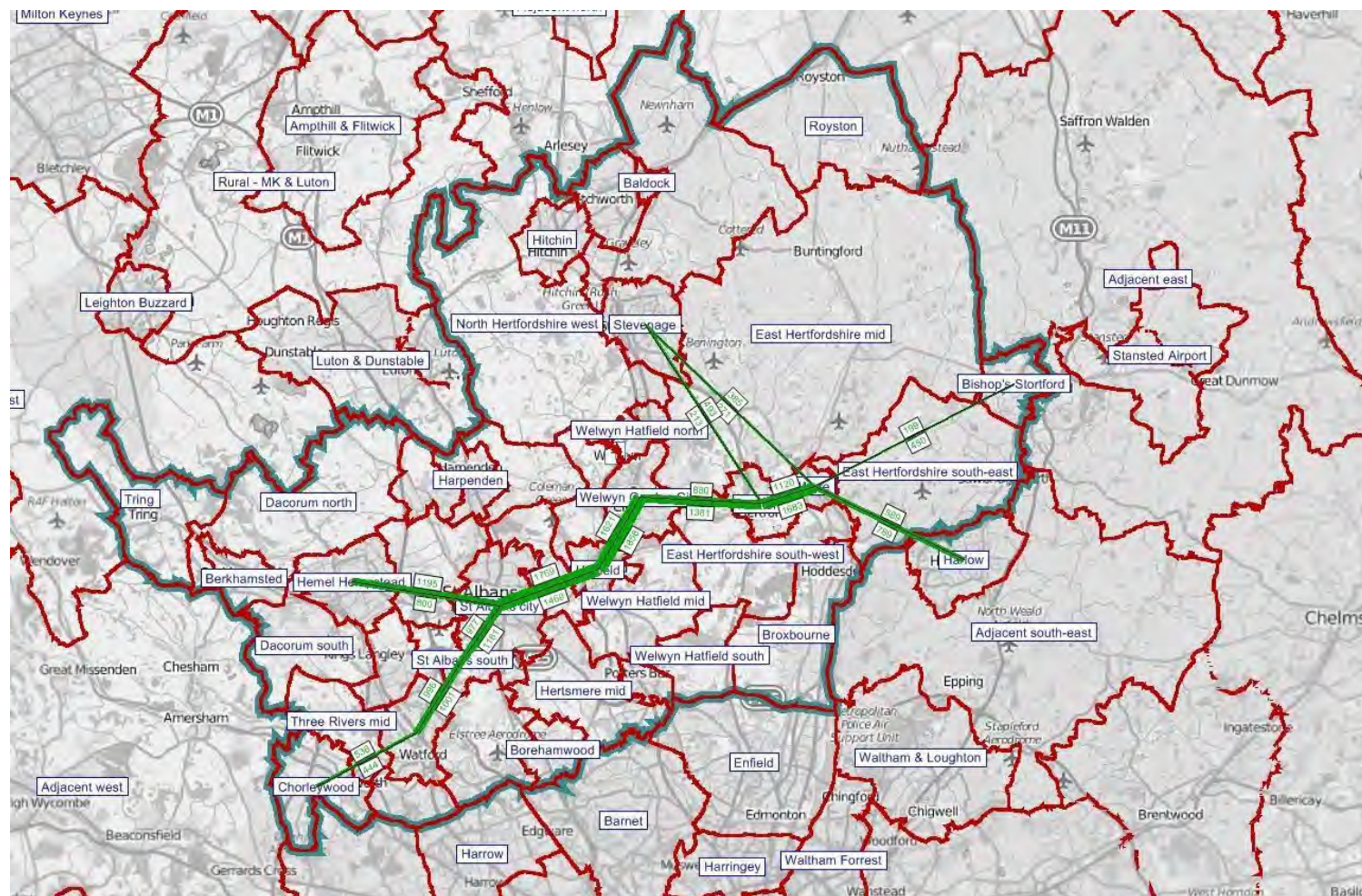
Figure 26: A414 Corridor Flows – Mobile Phone Data – AM – Home Based Work Outbound[15]

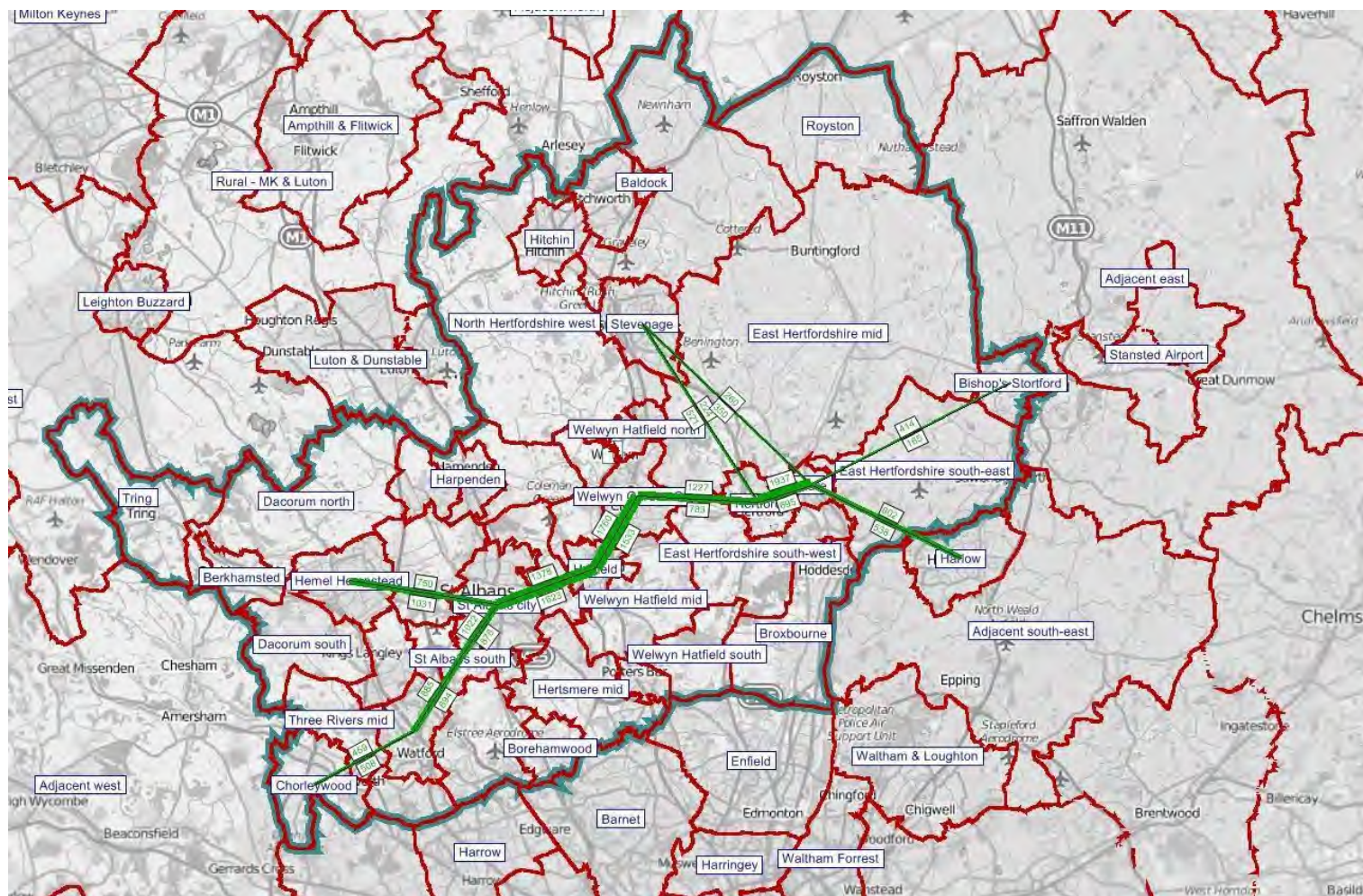[15] *Flows provided between MSOA Sectors; actual routeing not provided*

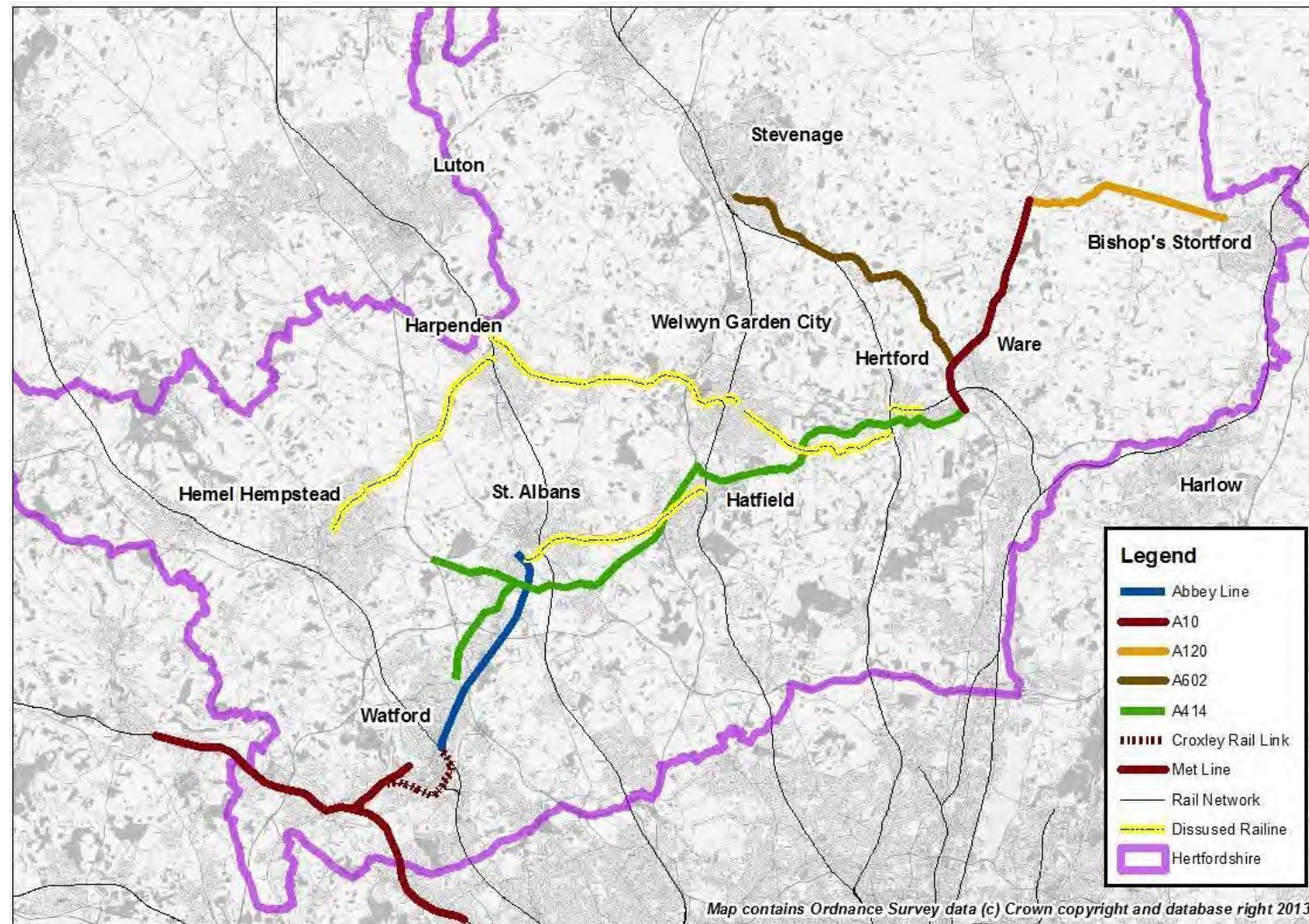**Figure 27: A414 Corridor Flows – Mobile Phone Data – PM – Home Based Work Return**

Figure 28: East-West Transport Infrastructure

6.4.3   *Trips to / from Hertford and Ware*

Figure 27 has shown that east-west flows are weaker in the east of the county. Journey to Work data suggests that work trips from these two towns to destinations within Hertfordshire are limited to Welwyn Garden City and Hatfield. Work trips to these towns are mainly from the adjacent rural areas of East and North Hertfordshire but also Hoddesdon and Cheshunt. However it should be noted that over 500 people are travelling between Stevenage and Hertford for work trips with an 89% car mode share.

As is the case across the whole of Hertfordshire the predominant journey to work flow is to Central London.

Table 19: Top Ten Trips from Hertford / Ware to a Hertfordshire Destination (JTW)

Origin	Destination	Total	Train	Bus	Car
Ware	Hertford	1,051	6%	7%	76%
Hertford	Welwyn Garden City	866	1%	4%	92%
Hertford	Ware	584	2%	4%	77%
Hertford	Hoddesdon	500	3%	3%	89%
Ware	Hoddesdon	480	5%	3%	85%
Hertford	East Hertfordshire south-west	412	2%	2%	85%
Hertford	Cheshunt	405	5%	1%	91%
Ware	Welwyn Garden City	364	1%	4%	91%
Hertford	Hatfield	356	1%	3%	94%
Hertford	Stevenage	343	11%	1%	85%

Table 20: Top Ten Trips to Hertford / Ware to a Hertfordshire Destination (JTW)

Origin	Destination	Total	Train	Bus	Car
Ware	Hertford	1,051	6%	7%	76%
East Hertfordshire south-west	Hertford	824	3%	3%	86%
Hoddesdon	Hertford	745	4%	5%	87%
Cheshunt	Hertford	690	7%	4%	85%
East Hertfordshire north	Hertford	676	1%	3%	91%
Hertford	Ware	584	2%	4%	77%
Stevenage	Hertford	569	5%	2%	89%
East Hertfordshire north	Ware	561	0%	2%	94%
Welwyn Garden City	Hertford	494	1%	3%	91%
Harlow	Ware	432	1%	8%	88%

6.4.4   *Journeys By Road*

Journey time data from traffic master has been obtained for the following routes:

- A414 between Hemel Hempstead and Hertford;

- St Albans Town Centre to Hatfield Town Centre;

- Hertford to Welwyn Garden City; and

- Stevenage Town Centre to Bishop's Stortford.

These routes have been selected as they are connectors between key origin-destination identified in **Sections 2 and 5**. Specific routeing has been chosen using knowledge of the local area and using the Google Maps directions feature[16].

A414

To travel along the A414 between Rush Green in the east and Hemel Hempstead in the west is estimated to take approximately 38 minutes in both directions. Google directions states that travelling eastbound the journey time can vary from between 28 to 50 minutes and 28 to 55 minutes travelling westbound. This suggests that this journey can be highly susceptible to congestion and delays.

Figure 29 reveals that when travelling westbound along this road congestion is likely to be causing low vehicle speeds all the way through Hertford, around Hatfield, London Colney and Park Street junctions. For vehicles travelling east, congestion is apparent at the same locations although it is most severe at London Colney. This could be as this junction is a major access point to the M25 (**Figure 30**).

St. Albans - Hatfield

Google directions suggest that the most appropriate route between St Albans and Hatfield is via Sandpit Lane with a journey time range of between 12-16 minutes eastbound and 14-20 minutes westbound. Additional routes include Coopers Green Lanes, St. Albans / Hatfield Road, and the A414 although these seem more susceptible to delays as they have wider journey time variations. Average AM peak journey times show a journey time of around 15-17 minutes between the two towns.

Figure 31 displays the Trafficmaster data for a journey between St. Albans and Hatfield Town Centres during the AM peak hour (0800-0900). Throughout this route average speeds do not exceed 40mph which is expected considering the nature of the roads. In both directions it is quite clear that average journey is very stop-start with queuing likely at a number of junctions. In

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[16] *When obtaining route data travel for a Wednesday at 8am was selected*

particular average speeds are very low around the Galleria / Mosquito Way and the junctions along Sandpit Lane with Woodstock Road and Beechwood Avenue.

Hertford to Welwyn Garden City (B1000)

Driving from Hertford Town Centre to the Parkway at Welwyn Garden City should take, on average, 16 minutes via the B1000. On Google directions this journey is estimated to take between 12-18 minutes whilst the A414 is also suggested (14-20 minutes).

As expected average vehicle speeds are highest along the rural section of the B1000 (**Figure 32**). It is likely that vehicles are queue whilst leaving Hertford and while approaching Mundells and Broadwater / Bridge Road junctions as average vehicle speeds fall below 10mph.

Stevenage – Bishop's Stortford (A602 & A120)

Trafficmaster data suggests that travelling by car between Stevenage and Bishop's Stortford (Tesco Superstore) is expected to take 35 minutes on average during the AM peak hour. The reverse journey can be expected to take slightly longer; 40 minutes. Google directions data agrees with this by predicting a journey time of 35-40 minutes in both directions.

Figure 33 reveals that the main congestion spot along this route is at Little Hadham with queuing at the junction very likely as average speeds drop below 10mph. Other areas where average vehicle speeds drop to a level that suggests congestion is an issue are: A10 / A602, Watton at Stone by-pass roundabouts, Hertford Roundabout in Stevenage, Broadhall Way and Monkswood Roundabout.
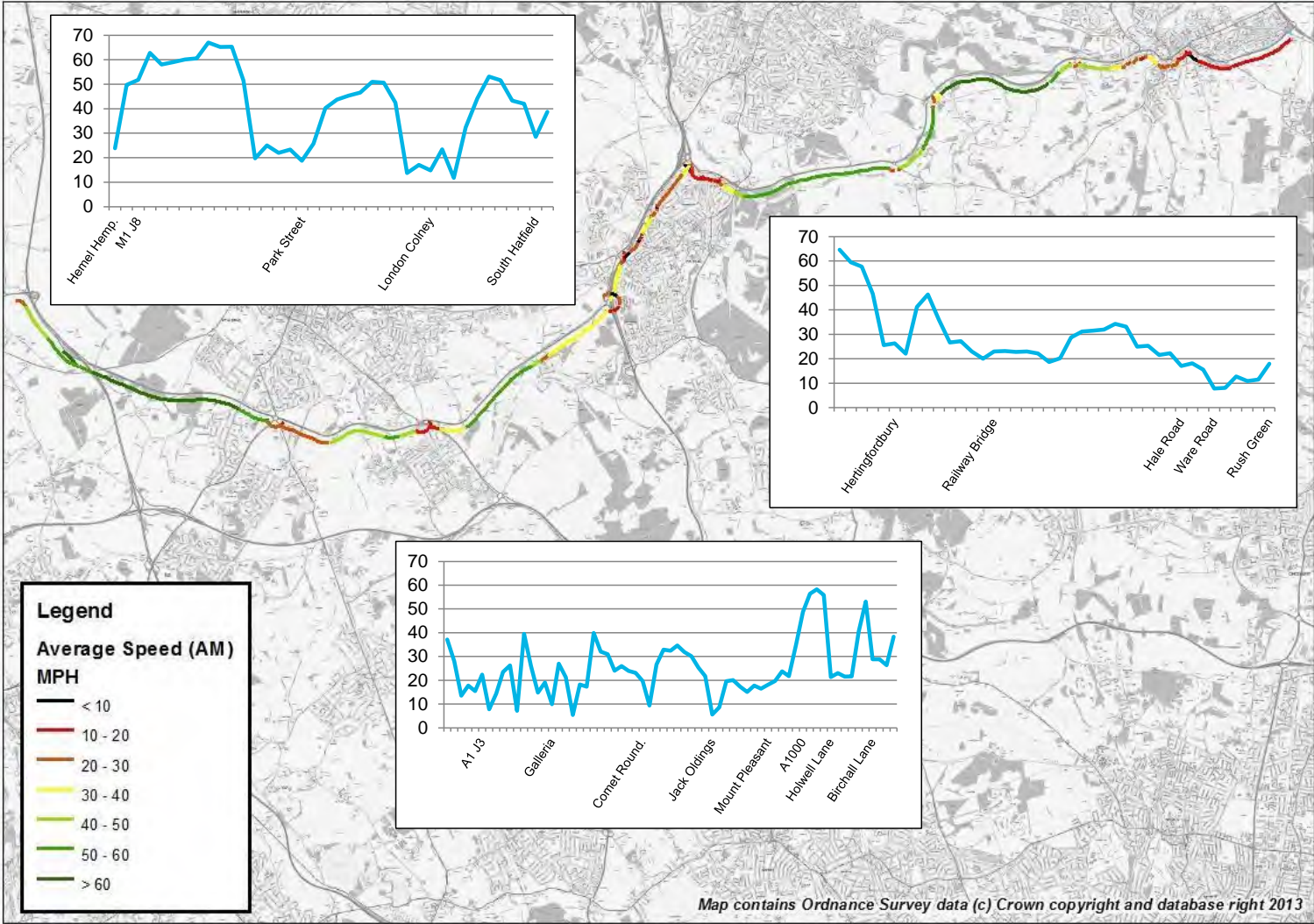
Capabilities on project:
Transportation

Figure 29: Trafficmaster Data for A414 Westbound (0800-0900)

Capabilities on project:
Transportation
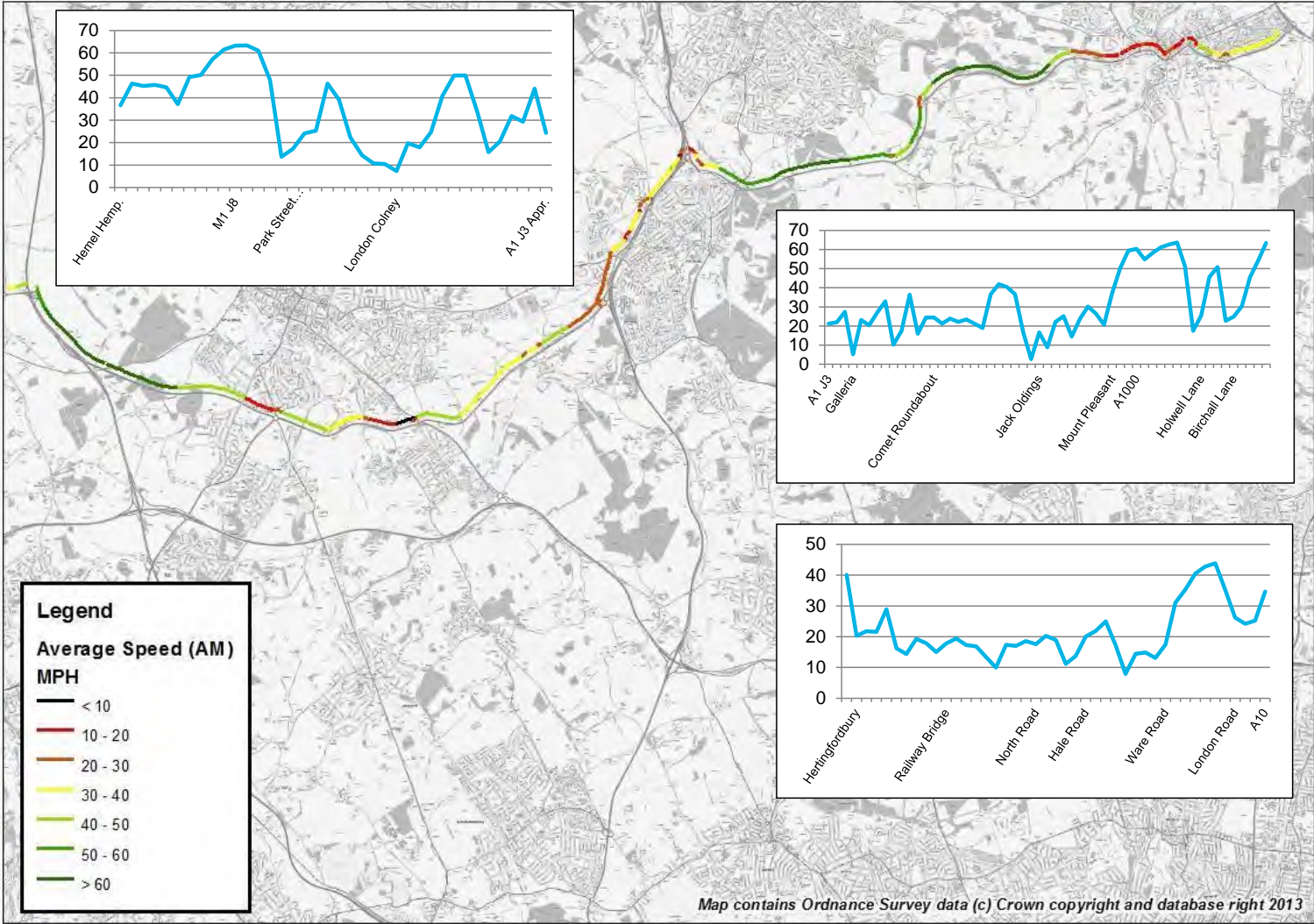
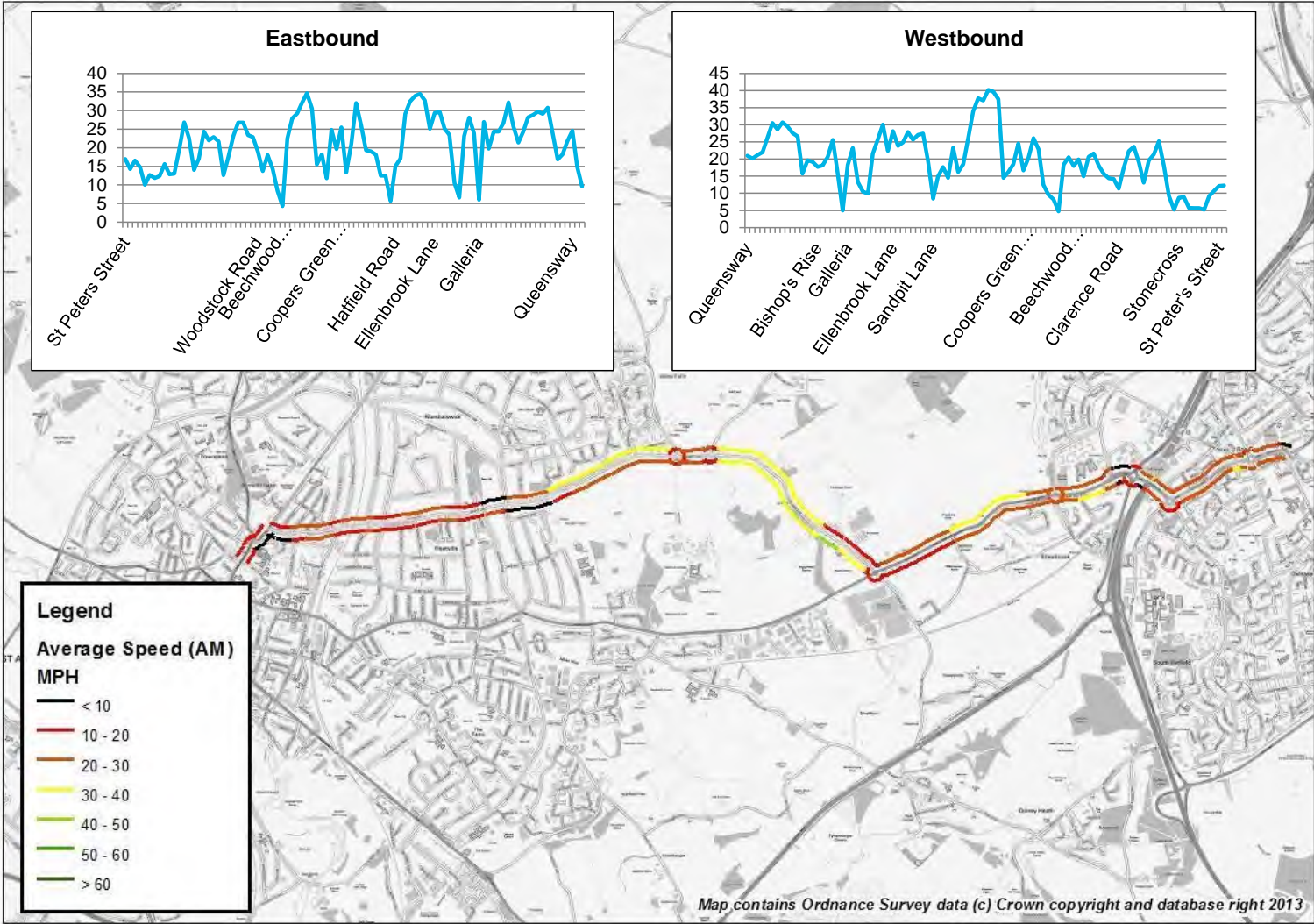**Figure 30: Trafficmaster Data for A414 Eastbound (0800-0900)**

Figure 31: Trafficmaster Data for St Albans – Hatfield via Sandpit Lane (0800-0900)
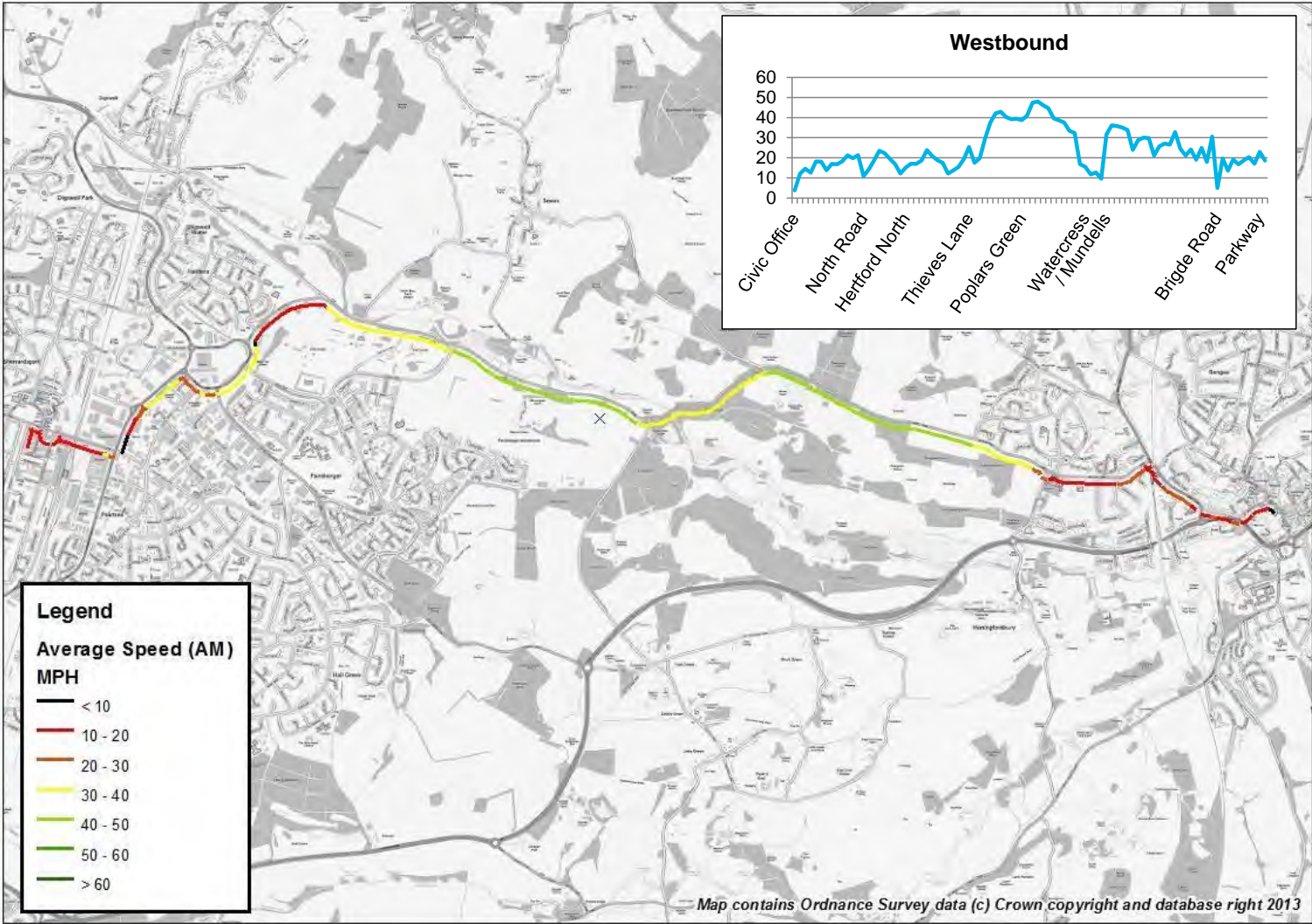
Capabilities on project:
Transportation

Figure 32: Trafficmaster Data for Hertford to Welwyn Garden City via B1000 (0800-0900)
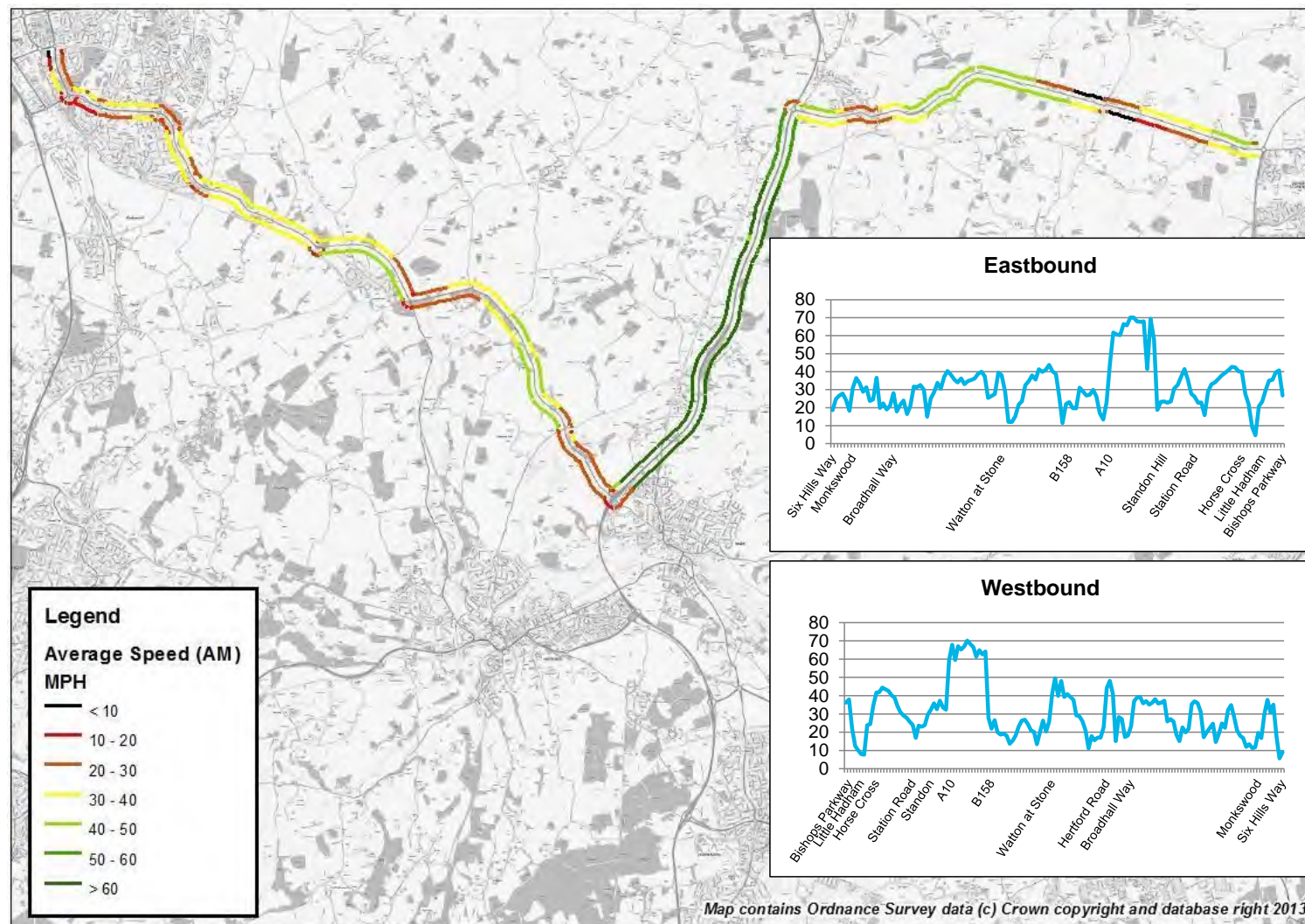
Figure 33: Trafficmaster Data for Stevenage – Bishop's Stortford via A602 and A120 (0800-0900)

6.4.5   *Journeys By Public Transport*

The same routes have been reviewed to assess the level of public transport provision and also to compare public transport journey times with that of the car.

Hemel Hempstead to Hertford

Travelling from Hemel Hempstead to Hertford by public transport is a considerable journey. As previously stated this journey takes approximately 38 minutes by car but if using public transport this can take just over 2 hours with numerous changes required. Intalink recommends trips by rail into central London and travelling back out again to Hertford. Alternatively, it is possible to take Arriva Bus 301 to Welwyn Garden City and then changing to Greenline bus 724 also taking just over 2 hours. One bus service was found to take just 1 hour 40 minutes but it was noted that this did not depart until after 9am so would be unlikely to be viable for a commuting journey. It is noted this is not a particularly common OD pair but has been chosen to highlight the lack of east-west public transport connections.

Issue 5 – Along certain corridors to provision of Public Transport is very limited

St Albans to Hatfield

These two towns are relatively well connected by public transport with buses departing every 5 / 10 minutes with a journey time of between 30 to 40 minutes. However, it should be noted that these services are run by numerous operators which effectively means this is not quite a 'turn up and go' service as tickets will not be multi-operator.

In addition this journey time is still significantly longer than if travelling by car (12-16 minutes) once again highlighting **Issue 2**.

Hertford to Welwyn Garden City

Travelling between Hertford North Railway station to Welwyn Garden City bus station takes approximately 20 minutes when taking Greenline service 724. This route also serves the Mundells employment area but only runs every 30 minutes.

Stevenage to Bishop's Stortford

This route further highlights the limited provision of east-west public transport. By car this journey can take between 35/40 minutes whereas by public transport travellers are required to make a number of interchanges either via central London or by bus and rail via Hertford / Harlow taking 1 hour 35 / 45 minutes respectively - **Issue 5.** However it is noted that this is not a common commuting journey and should therefore not be a priority for public transport provision.

6.5   M1, A41 and M25 Triangle

This area of interest within the M1, A41 and M25 forms a triangle of three key urban areas; Hemel Hempstead, Watford and St Albans within Hertfordshire. As this analysis will show there is also a strong relationship between this triangle with both London and Luton & Dunstable.

6.5.1   *Main Origin Destinations*

As this area of interest is more of a triangle of three urban areas no town-to-town flows have been provided for this section. Instead this section focuses purely on the main trips to / from and within this area from the 2011 Census Journey to Work data.

The largest flows from urban areas within the Triangle are towards Central London (**Figure 34**). For trips into the Triangle, there is a pull towards Watford from adjacent areas such as Three Rivers South and Harrow and from further afield such as Luton & Dunstable and External North which includes big urban conurbations such as Northampton (**Figure 35**).

A common theme of this report is that inter-urban travel within Hertfordshire is dominated by the car. As previously mentioned, it is surprising that the car is also dominant for trips which are well connected by rail. For example, from Luton & Dunstable to Harpenden and St Albans City as these are well connected by Thameslink rail services. The issue here could be to do with fare prices or potentially access to stations within the urban areas. This will be investigated further in **section 6.5.3**.

The findings also reveal the tidal nature of flows within the triangle. All trips from Luton & Dunstable are highest in the AM peak as are trips from Hemel Hempstead to Watford whilst the flows in the PM are reversed.

Capabilities on project:
Transportation

Origin	Dest	Total	Car
St Albans City	London city	6636	8%
Watford	London city	5882	16%
Harpenden	London city	3241	6%
Hemel Hempstead	London city	2796	23%
Hemel Hempstead	Watford	2194	83%
Watford	Harrow	1416	76%
Hemel Hempstead	Dacorum south	1279	84%
Hemel Hempstead	St Albans City	1152	87%
Watford	Hertsmere west	1123	77%
Watford	Hillingdon	1108	86%
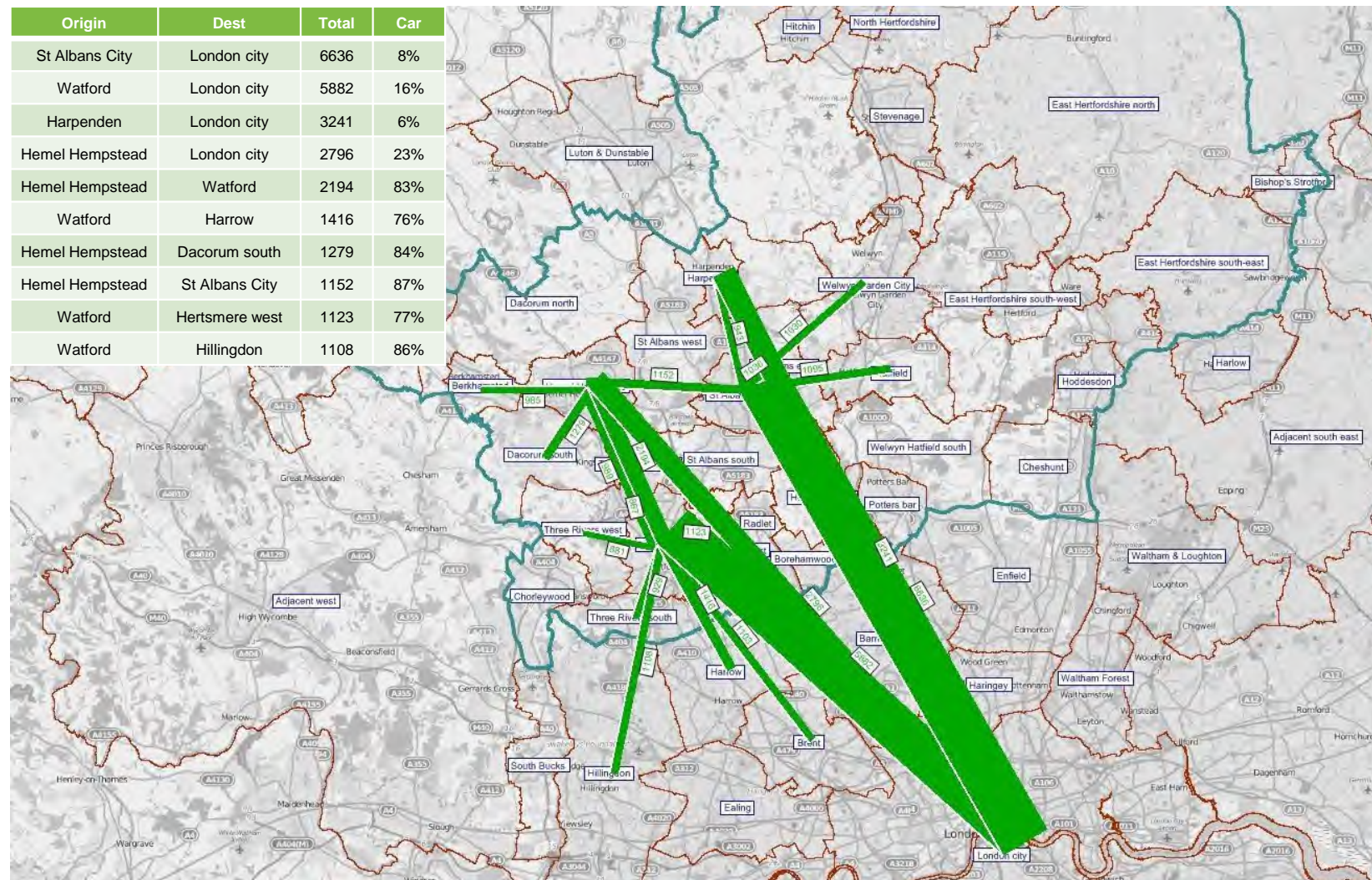
Figure 34: JTW Data – Main Trips from M1-A41-M25 Triangle

Capabilities on project:
Transportation

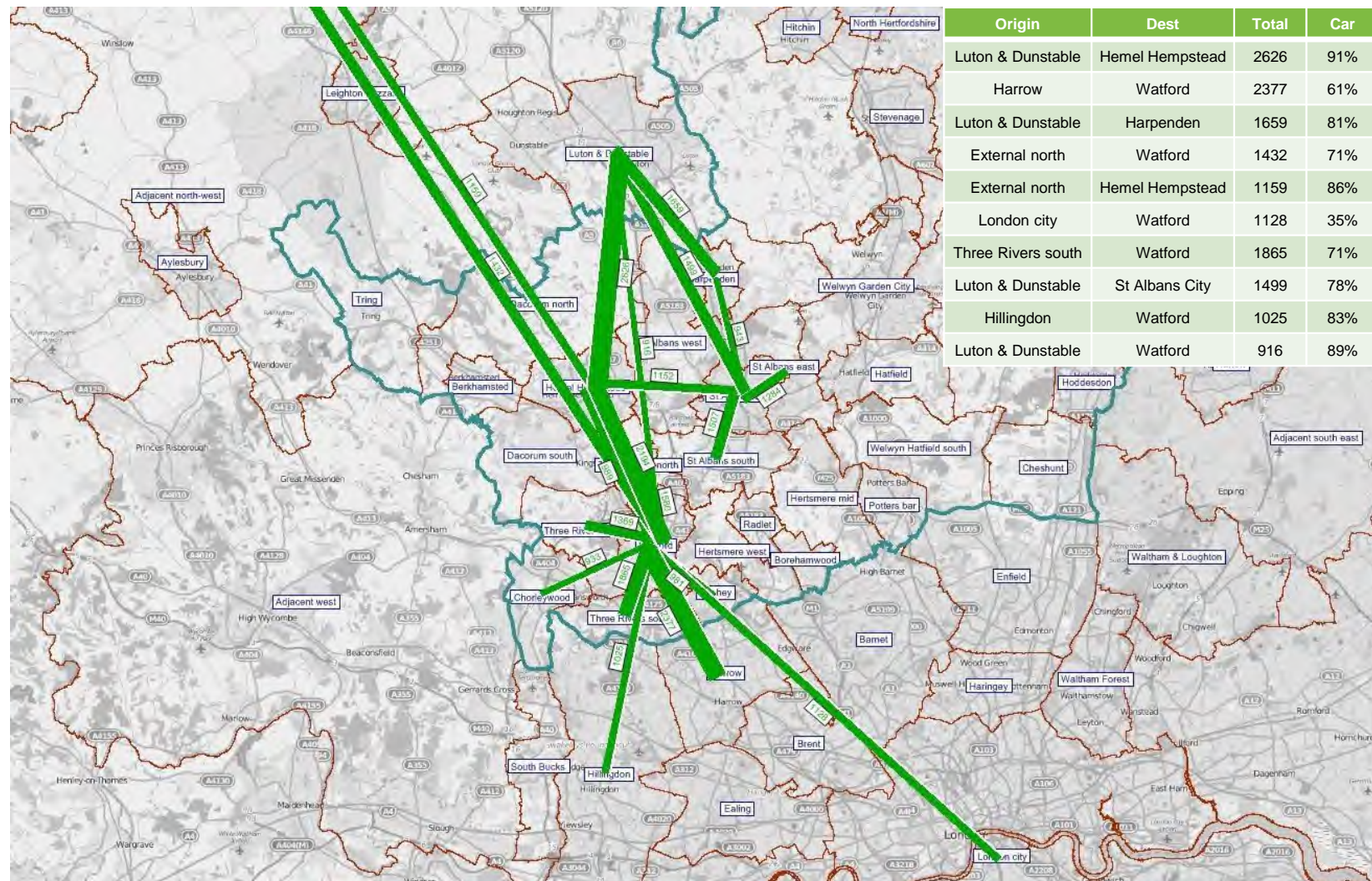| Origin	Dest	Total	Car
Luton & Dunstable	Hemel Hempstead	2626	91%
Harrow	Watford	2377	61%
Luton & Dunstable	Harpenden	1659	81%
External north	Watford	1432	71%
External north	Hemel Hempstead	1159	86%
London city	Watford	1128	35%
Three Rivers south	Watford	1865	71%
Luton & Dunstable	St Albans City	1499	78%
Hillingdon	Watford	1025	83%
Luton & Dunstable	Watford	916	89%

Figure 35: JTW Data – Main Trips to M-A41-M25 Triangle

6.5.2   *Journeys By Road*

Journey time data from Trafficmaster has been obtained for the following routes:

- Luton to Maylands Business Park via the M1;

- Hemel Hempstead to St Albans Town Centre; and

- Hemel Hempstead to Watford Town Centre.

Data has been collected for the AM (0800 – 0900) for these routes as these routes reflect the main commuting trips within the area of interest.

Luton & Dunstable to Maylands Business Park

Luton & Dunstable to Hemel Hempstead has been identified as a significant commute to work flow in both the JTW and Mobile Phone data. Therefore, we have decided to review the journey time data travelling from Luton to Maylands Business Park (major employment site in the area). Google directions indicate three possible routes using: The A5, M1 or B487 which are all expected to take between 20 and 40 minutes in the AM peak hour.

Trafficmaster speed data suggests this journey will take, on average, 23 minutes to drive. **Figure 36** shows that, except when travelling on the M1, average vehicle speeds are relatively slow at between 15-25mph. Low average speeds suggest there is considerable congestion leaving Luton via Airport Way and entering the business park via Maylands Avenue at the beginning and end of the journey.

Hemel Hempstead to St Albans via Redbourn

A residential location next to Keen Fields was chosen as the origin for this journey to reflect the fact that home to work trips are unlikely to be from town centre to centre. Google directions recommends making this journey via Redbourn (16-22 minutes), A4147 (16-24) or A414 (16-35). Trafficmaster data for the average speeds from 0800-0900 state this journey should take approximately 20 minutes.

Speeds outside of the urban areas on the Hemel Hempstead and Rebourn Roads are relatively fast at approximately 40-50mph. Leaving Hemel Hempstead speeds average at about 20mph whereas in St. Albans speeds are lower with queuing likely at the Bluehouse Hill Roundabout and on entering George and Chequer Streets (**Figure 37**).

Hemel Hempstead to Watford via the M1

If driving from Hemel Hempstead (Adeyfield Road) to Watford Town Centre Google directions recommends three possible routes:

- M1 via Junction 5 taking 18-35 minutes;

- A41 / Watford Road taking 22-45 minutes; or

- Via the A41, M25 and then the M1 taking 24-50 minutes.

Trafficmaster average speed data suggests travelling on the M1 via Junction 5 should take around 22 minutes. As expected the main points of congestion for this journey are the sections within the urban areas of Hemel Hempstead and Watford.

With average speeds of under 10mph it is likely that there is considerable congestion and resulting queues along the A414 / Breakspears Way to access the M1 at Junction 7 then also exiting the M1 at Junction 5 and finally along Radley Road travelling into Watford's Town Centre (**Figure 38**).

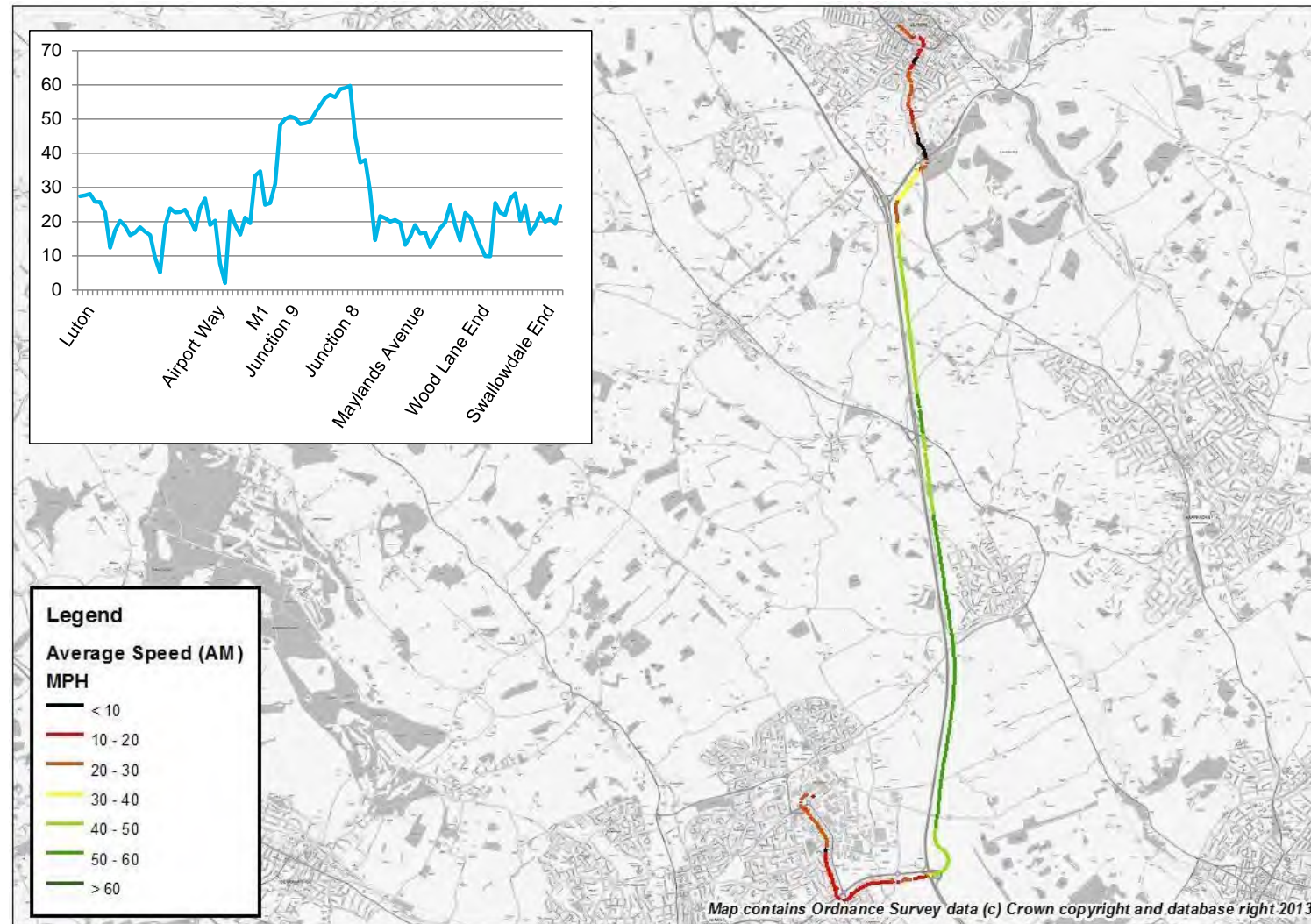**Figure 36: Trafficmaster Data for Luton to Maylands Business Park via M1 (0800-0900)**
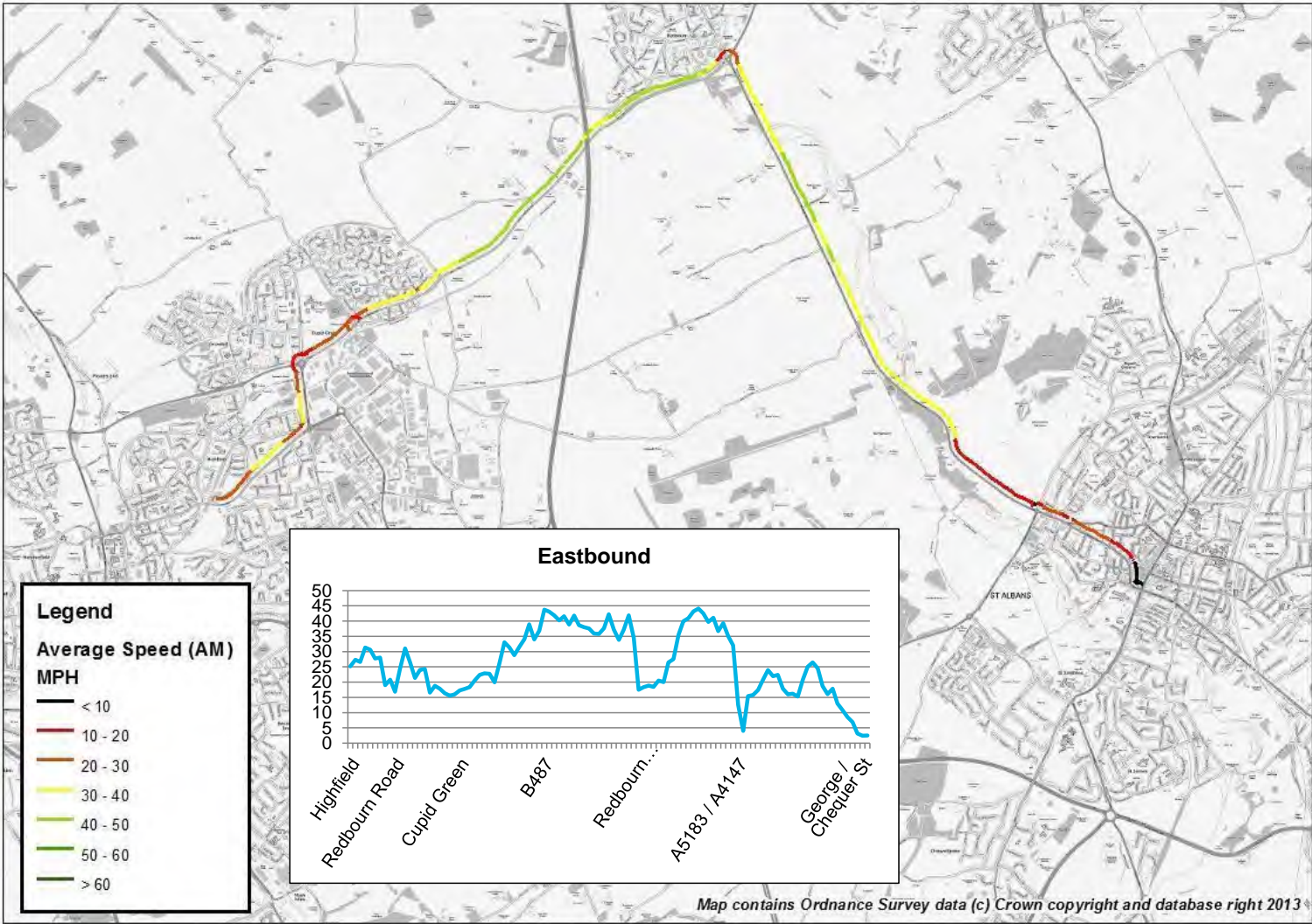
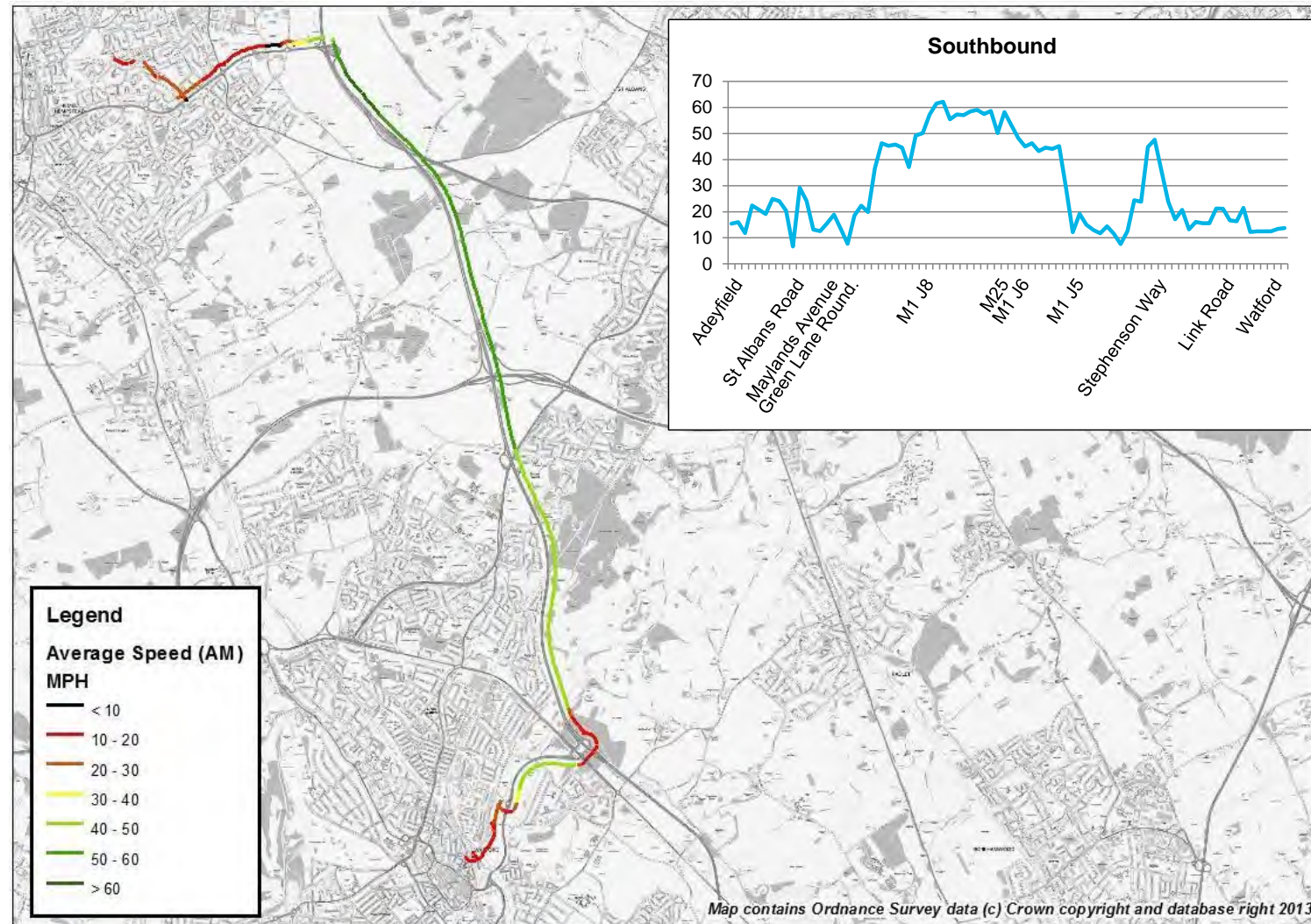**Figure 37: Trafficmaster Data for Hemel Hempstead to St Albans (0800-0900)**

Figure 38: Hemel Hempstead to Watford via M1

6.5.3   *Journeys By Public Transport*

The same routes have been reviewed to assess the level of public transport provision and also to compare public transport journey times with that of the car.

Luton to Maylands Business Park

This particular route highlights an issue where two towns which are relatively close to each other but are very poorly connected by public transport (**Issue 5**). As stated earlier this journey should take roughly 23 minutes. Traveline suggests that this journey at 8am takes just over an hour taking a Thameslink train service to St. Albans and then interchanging onto an Arriva 301 service to the business park.

JTW data revealed that over 2,000 people are travelling from Luton & Dunstable to Hemel Hempstead to work This suggest that there is certainly an opportunity for providing an improved direct bus service between these towns whilst serving the key employment area of Maylands Business Park.

Hemel Hempstead to St Albans Town Centre

This route runs from the residential area of Adeyfield in Hemel Hempstead to St Albans town centre to try and represent a typical commuting trip between these two towns. Using public transport a traveller is required to walk approximately 10 minutes to the nearest bus stop before catching the Arriva 301 service to St. Albans town hall. The total journey time is around 40 minutes and is yet again considerably longer than the journey by car.

Hemel Hempstead to Watford Town Centre

This route again runs from the residential area of Adeyfield in Hemel Hempstead but to Watford Town centre. Traveline suggests the journey will take over an hour by public transport. This includes a 17 minute walk to the nearest bus stop to catch service ML1 to Hemel Hempstead train station taking a total of 40 minutes. This seems unreasonable and suggests that potentially the provision of public transport in Hemel Hempstead is inadequate. (**Issue 3**)

6.6   A10 – M11 Corridor

This corridor runs along the east of Hertfordshire with the A10 connecting Broxbourne, Ware / Hertford and Royston with North East London to the south and Cambridge to the north. In addition, the M11 runs along the eastern border of the county to Bishop's Stortford and also serves Harlow and Stansted Airport just outside of the county.

6.6.1   *Main Origin Destinations*

Reviewing the trips to and from urban areas within this corridor suggests that this corridor is in fact divided up into a number of small sections.

There is a considerable amount of flows along the southern section of the A10 to / from Hertford and Broxbourne and also from Broxbourne to Enfield. In addition to the north, there is a reasonable number of people commuting from Royston to Cambridge and the adjacent north-east area.

Finally, along the M11 corridor the main flows are between Bishop's Stortford and Harlow but also to and from the adjacent areas to the east.

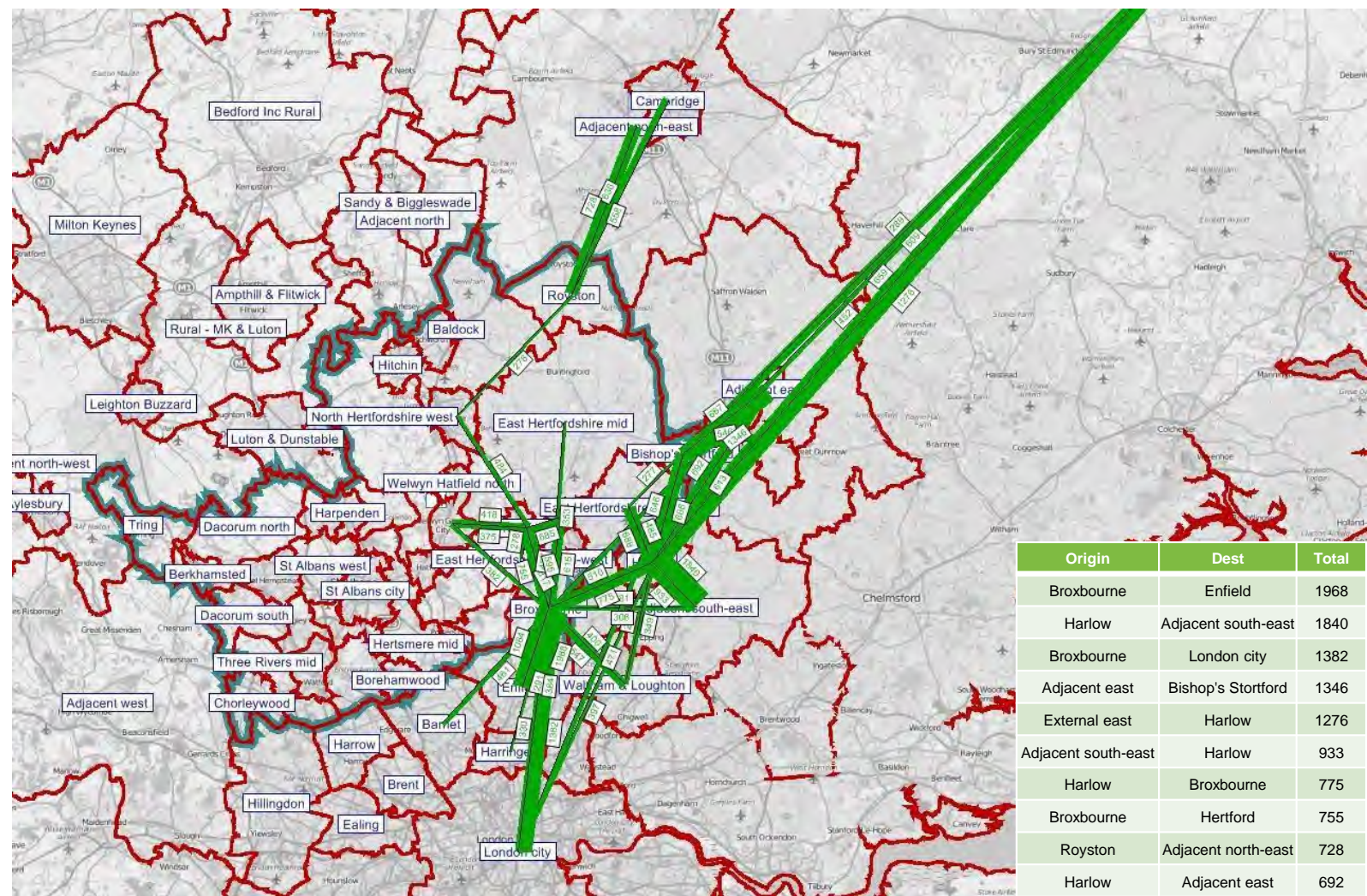| Origin	Dest	Total
Broxbourne	Enfield	1968
Harlow	Adjacent south-east	1840
Broxbourne	London city	1382
Adjacent east	Bishop's Stortford	1346
External east	Harlow	1276
Adjacent south-east	Harlow	933
Harlow	Broxbourne	775
Broxbourne	Hertford	755
Royston	Adjacent north-east	728
Harlow	Adjacent east	692

Figure 39: Main Flows In / Out of M11 / A10 Corridor – Mobile Phone Data (AM peak period)

6.6.2   *Interaction between Bishops Stortford and rest of the County*

Similar analysis from **section 6.4.3** has been undertaken for Bishop's Stortford as both Journey to Work and Mobile Phone data have suggested that there is little interaction between Bishop's Stortford and the rest of the county.

Assessing work trips originating in Bishop's Stortford reveals that the main commuting flows are towards Central London (mainly by rail), Stansted Airport, Harlow and to the East (mainly by car). Trips to Bishop's Stortford are mainly from the East and Harlow with a very high proportion by car.

Table 21: Top Ten Trips from Bishop's Stortford (JTW)

Destination	Total	Train	Bus	Car
London city	2,441	76%	1%	16%
Stansted Airport	1,522	17%	15%	65%
Harlow	1,174	4%	4%	89%
Adjacent east	897	3%	3%	89%
East Hertfordshire north	690	1%	2%	73%
External east	608	4%	0%	95%
East Hertfordshire south-east	551	1%	5%	86%
Hertford	218	3%	1%	89%
Ware	201	3%	0%	93%
Adjacent south east	266	4%	0%	92%

Table 22: Top Ten Trips to Bishop's Stortford (JTW)

Origin	Total	Train	Bus	Car
Adjacent east	1,643	6%	2%	90%
External east	1,040	2%	1%	94%
Harlow	863	6%	9%	82%
East Hertfordshire north	795	1%	2%	77%
East Hertfordshire south-east	409	5%	6%	84%
Stansted Airport	309	4%	4%	89%
Adjacent south east	227	4%	2%	91%
Cheshunt	122	19%	2%	70%
Adjacent north-east	113	9%	0%	91%
Hertford	104	5%	2%	83%

6.6.3   *Journeys By Road*

Journey time data from Trafficmaster has been obtained for the following routes:

•   M11 between M25 and Junction 10; and

•   A10 between M25 and Royston

Data has been collected for the AM (0800 – 0900) for these routes to represent the AM peak hour.

M11

It should be noted that Trafficmaster data is missing for a small section of the M11 just north of Junction 6 with the M25. This is likely to have a small impact on the overall journey time. However these have been compared with Google Directions and have been found to be fairly similar.

Trafficmaster and Google directions data suggest that driving between the M25 to Junction 10 should take approximately 28-35 minutes in both directions. From **Figure 40** it is apparent average speeds are, on the whole, above 60mph along this route as you would expect for a section of rural motorway. Driving northbound average speeds are fairly stable except travelling through Junction 6 which is a busy interchange with the M25. For southbound trips average speeds are slightly lower and more variable. Speeds drop below 60mph at Junction 10 and Junction 7 (Harlow) and fall below 50mph at Junction 6.

A10

Travelling north on the A10 from the M25 to north of Royston can be expected to take between 40 and 55 minutes. For the same journey travelling south the journey time is expected to be slightly longer at 40 minutes to an hour.

Average speeds are quite variable on the A10 (**Figure 41**) as this A road travels through a number of urban areas. Travelling northbound speeds are very slow travelling through Cheshunt traffic appears to be free flowing except at the Standon and Buntingford Junctions. Speeds drop to 20mph as the road runs through the centre of Royston and finally there is likely to be queuing at the junction with the A505 as speeds fall below 10mph on the approach.

The pattern is similar for vehicles travelling southbound although speeds are lower travelling through Royston. Speeds then fall below 20mph for the majority of the final section of the route through Turnford and Cheshunt.
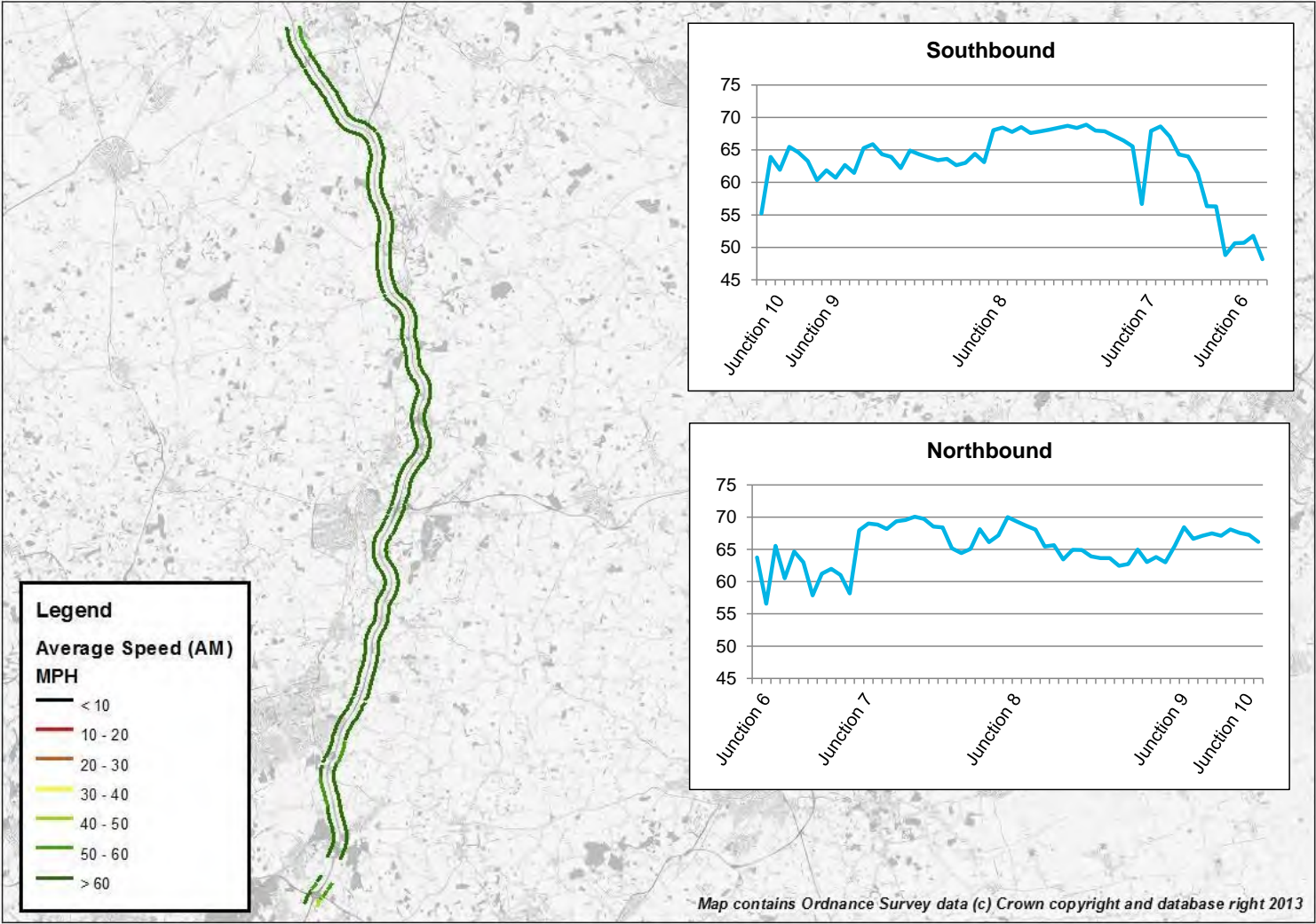
Figure 40: Trafficmaster Data for M11 (0800-0900)
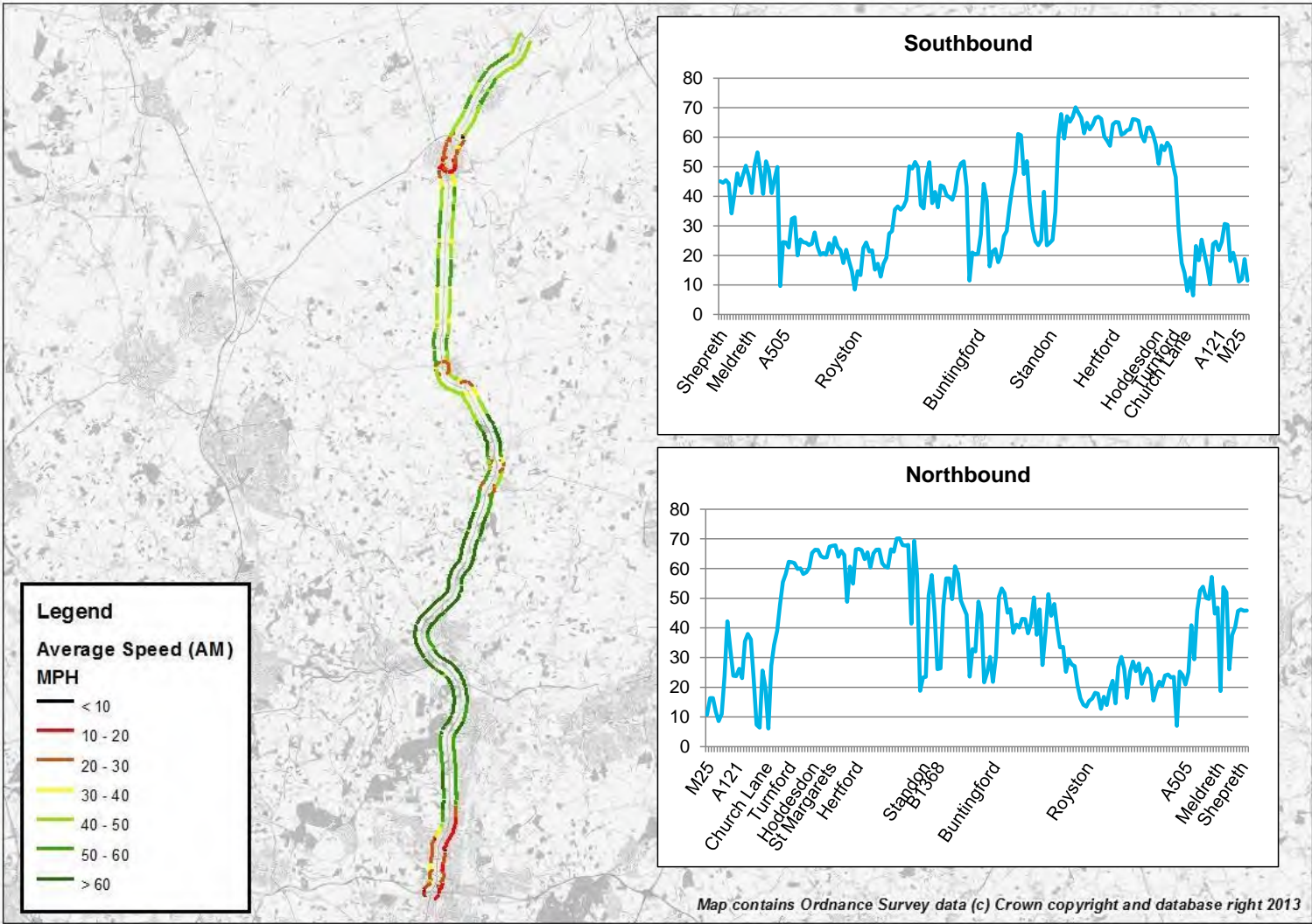
Capabilities on project:
Transportation

Figure 41: Trafficmaster Data for A10 (0800-0900)

6.6.4   *Journeys By Public Transport*

As both the A10 and M11 represent fairly strategic transport routes through traffic travelling through the county the public transport journeys investigated in this corridor are slightly different to those in **section 6.6.3**.

<u>Cheshunt to Hoddesdon</u>

JTW data has revealed that there is a considerable level of commuting (in both directions) between these two urban areas mainly by car (+80%). Therefore, the provision of public transport for this route has been investigated. The rail journey between the Cheshunt and Rye House stations takes just 11 minutes although to avoid walking from the stations to the town centres Traveline recommends taking Arriva bus 310 which runs roughly every 15 minutes. The total journey time by bus is 25 minutes.

Google directions data states that the same journey by car can be expected to take between 9 and 12 minutes in the AM peak hour.

<u>Cheshunt to Royston</u>

Cheshunt to Royston runs along the entire length of the A10 within Hertfordshire. As already discussed, when driving, this journey can take roughly 40 minutes to an hour with a number of congestion hotspots along the route. Traveline has shown that there is no alternative public transport corridor and users will be required to travel via central London making four connections taking 1 hour 40 minutes.

<u>Bishop's Stortford to Stansted Airport</u>

Section 6.6.2 identified that Bishop's Stortford does not have a particularly strong relationship with the rest of Hertfordshire in regards to commuting trips. The two main destinations are to Central London and Stansted Airport. For this route, we have selected an origin from a residential street next to Saint Mary's Catholic School. This was in order to review the transport connectivity to Bishop's Stortford station as rail connections from the town to the airport are quite good.

By public transport the journey should take between 35 and 45 minutes. The majority of options suggest walking into the town centre before catching a bus service or the Stansted Express. The only option which did not require walking into town involved catching an hourly bus service and changing at Hockerill Street. This suggests that public transport connections to the town centre could be improved as this is the likely access point for the two main work place destinations: Central London and Stansted Airport. By car this journey is expected to take just 12 to 16 minutes.

Summary and Discussion

7   Summary and Discussion

7.1   Summary

This report has sought to gather an understanding of the main travel patterns within, to and from Hertfordshire. This has been done by gathering information from a range of data sources to look at aspects of: OD patterns, journey times, public transport provision and mode share.

Finally this report will provide a brief summary of the potential issues Hertfordshire may face with the current patterns of travel along with a discussion on where the focus for improving transport in the county should be placed.

7.2   Travel in Hertfordshire

7.2.1   *Mode Share*

Data from the 2011 Census JTW and the HCTS have identified that car is the main mode of transport for trips in Hertfordshire. The only trips where this is not the case is those trips from Hertfordshire into central London as this is predominantly undertaken by train.

Bus mode share is relatively low for commuting trips, for example Hemel Hempstead to Watford bus mode share is 9%. ETM data has revealed that the majority of bus trips are within urban areas with Stevenage as the main area of bus use in Hertfordshire.

As expected walk mode share is highest for intra-urban trips especially in relatively small / dense urban areas such as Baldock. Cycling however has a relatively low mode share even for intra-urban trips when it should offer a viable alternative to the car.

7.2.2   *Main Travel Patterns*

As expected the most prominent commuting flow is from urban areas within Hertfordshire to Central London – mainly by rail. In addition we have reviewed a number of key corridors within Hertfordshire and have found the main movements in the county are along the A1 corridor, east-west between St Albans and Welwyn Hatfield and finally within the M1, A41, M25 Triangle. In addition there is a considerable amount of commuting trips coming into the county from both the North London Boroughs and also Luton & Dunstable. Interaction of M1, A41, M25 Triangle with Luton & Dunstable can build an area which might requires further consideration for Growth and Transport: "Western Diamond".

7.2.3   *Interaction with London*

From this work it is apparent that Hertfordshire has some considerable interaction with London both into central London but also to and from the North London Boroughs. In order to develop mutually beneficial solutions it will be necessary for there to collaboration between HCC and Transport for London.

As already highlighted, the major flows to work from Hertfordshire are to central London, predominantly by rail. The main origins from this flow are St Albans City, Watford, Cheshunt, Harpenden and Welwyn Garden City. JTW data suggests over 6,500 people are travelling to work from St Albans to central London of nearly 90% have done so by train. There will need to be some consideration on the potential impact future residential growth in Hertfordshire may have on rail services into London and connecting tube services.

The following tables display the top ten trips to and from Hertfordshire and the adjacent North London Boroughs:

Table 23: Top Ten Trips from Hertfordshire into North London Boroughs with Mode Share (JTW Data)

Origin	Destination	Total	LUL	Train	Bus	Car
Cheshunt	Enfield	4,224	0%	5%	8%	82%
Borehamwood	Barnet	1,736	1%	4%	15%	78%
Watford	Harrow	1,416	6%	8%	7%	76%
Watford	Hillingdon	1,108	5%	2%	3%	86%
Watford	Brent	1,103	12%	15%	2%	67%
Potters bar	Barnet	1,083	1%	1%	9%	86%
Three Rivers south	Harrow	964	4%	5%	1%	86%
Chorleywood	Hillingdon	899	2%	2%	1%	93%
Three Rivers south	Hillingdon	855	3%	1%	4%	86%
Watford	Barnet	832	3%	2%	7%	85%

Table 24: Top Ten Trips from North London Boroughs into Hertfordshire with Mode Share (JTW Data)

Origin	Destination	Total	LUL	Train	Bus	Car
Harrow	Watford	2,377	8%	16%	13%	61%
Enfield	Cheshunt	1,757	1%	4%	18%	67%
Barnet	Borehamwood	1,521	3%	3%	21%	70%
Hillingdon	Watford	1,025	8%	3%	4%	83%
Barnet	Watford	885	4%	2%	14%	78%
Brent	Watford	877	14%	18%	8%	58%
Barnet	Potters bar	817	2%	3%	13%	79%
Enfield	Potters bar	776	2%	1%	17%	77%
Hillingdon	Three Rivers south	682	6%	2%	4%	75%
Harrow	Borehamwood	631	3%	2%	15%	78%

Firstly, it is apparent that the volume of work trips into North London is slightly higher than the reverse commute into Hertfordshire. The major flow from Hertfordshire to North London is between Cheshunt and nearby Enfield but also from Watford to the three boroughs of Harrow, Hillingdon and Brent. In the reverse, the major flows into the county are from Harrow to Watford and also Enfield to Cheshunt. Car is the dominant mode for all these OD pairs although the mode share for public transport is, on the whole, greater for trips from North London into Hertfordshire.

Figure 42 shows the key movements along corridors and illustrates activity and travel synergies between cities/towns in Hertfordshire
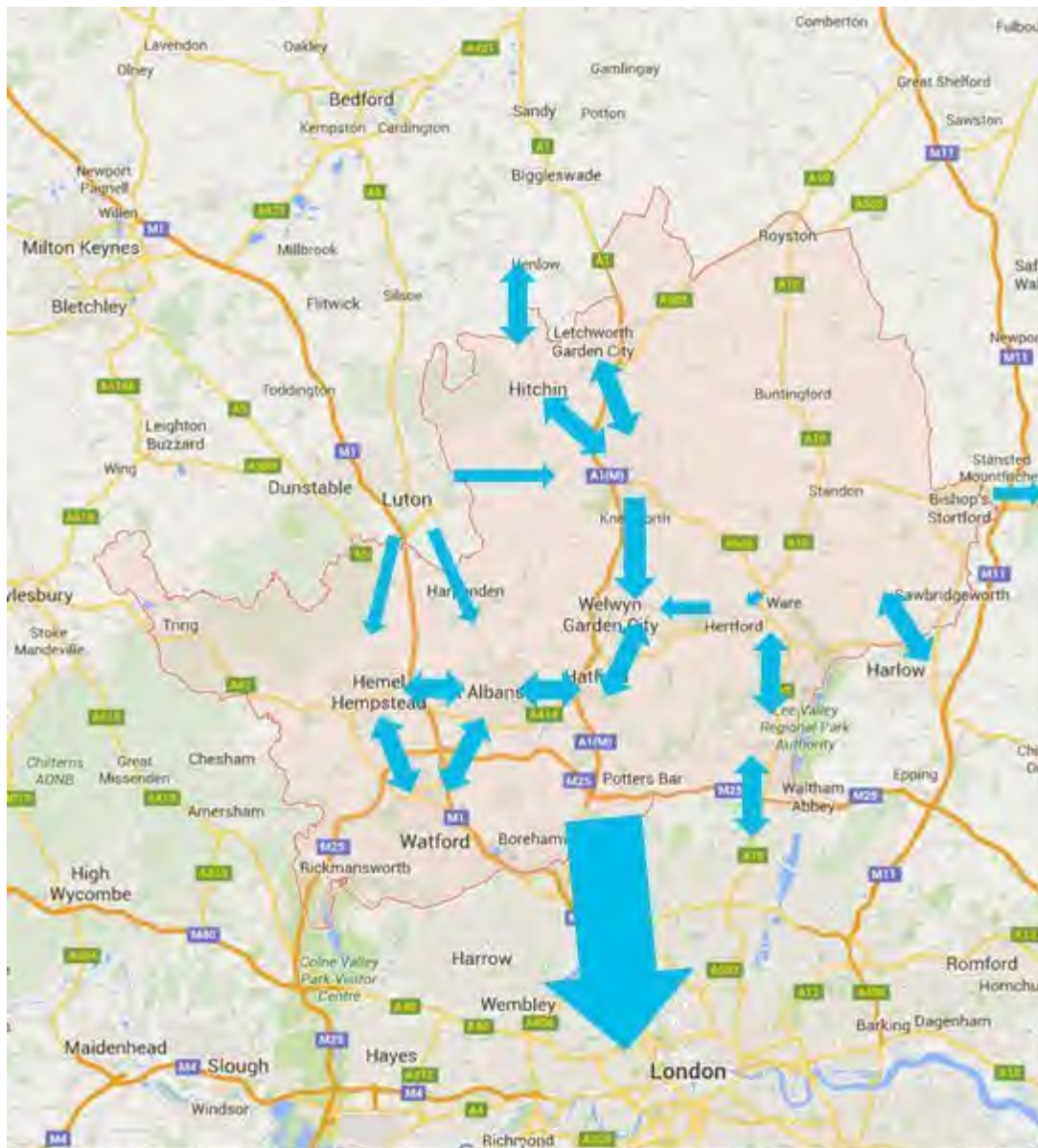
Figure 42: Activity and travel synergies between cities/towns in Hertfordshire

7.3   The Issues in Hertfordshire

When assessing the findings from each data source we have identified four issues that the current travel patterns in Hertfordshire pose for now and in the future. These are as follows:

- Car is by far the dominant mode for both inter-urban and intra-urban trips (trips into Central London are the only exception);

- On corridors which are connected relatively well by rail there is still a high mode share for car. This may be due to excessive rail fares or over-crowding due to the large volumes of people commuting into London but is something that should be investigated further;

- Towns centres on a corridor may well be connected by rail but actual employment sites such as Mundells and Maylands are located in areas which are better accessed by car for inter-urban trips; and

- Some towns with considerable movements between them are poorly connected by public transport thus making it significantly more attractive to travel by car.

Overall it appears that travel by car within Hertfordshire is too attractive and is equally well catered for, a quick scan of Google Maps reveals numerous car parking sites at Stevenage Town Centre and Mundells for example. The fact that the journey time assessment for each corridor has highlighted a number of congestion hotspots where average speeds fall below 10mph suggests this is an issue now. This current travel pattern could become unsustainable in future years as local districts look to encourage more and more growth unless significant highway capacity increases are provided or an effort is made to reduce the county's reliance on the car.

7.4 Improving Transport in Hertfordshire

7.4.1 *Area for Focus – West / North Curve*

In reviewing all the available data on travel patterns across Hertfordshire it is felt that the focus for transport improvement should be based on a curved corridor running east-west from Watford / Hemel Hempstead to Hatfield and then north-south to Hitchin / Letchworth / Baldock along the A1 corridor. In addition the connections between Luton & Dunstable and key urban areas within the county should be reviewed as a considerable level of in-commuting by car is occurring from this town.

Travel throughout this focus area is more attractive by car with journey times being significantly shorter compared to public transport. As a result car is by far the stand out mode of transport for trips.

The same assessment of flows, as undertaken in **chapter 6,** has been done for this focus area to gain a high level understanding of the volume of people travelling between urban areas within this area of focus. Mobile Phone data has been used for this analysis as this provides information for both the AM and PM peak period car trips. In addition JTW data has shown that the main modal choice for commuting trips within Hertfordshire is the car.

The largest flows are expected to be along the A1 corridor with flows being predominantly southbound between Stevenage and Welwyn Garden City in the AM peak and vice a versa in the PM. There are also significant movements between St Albans – Hatfield – Welwyn Garden City (approximately 2,000 vehicles). This is displayed in **Figure 43** and **Figure 44**.

Finally, there is a considerable level of commuting trips from the Luton & Dunstable area into Hertfordshire, especially via the A41, M1 and M25 triangle, including Hemel Hempstead, St. Albans and Watford.
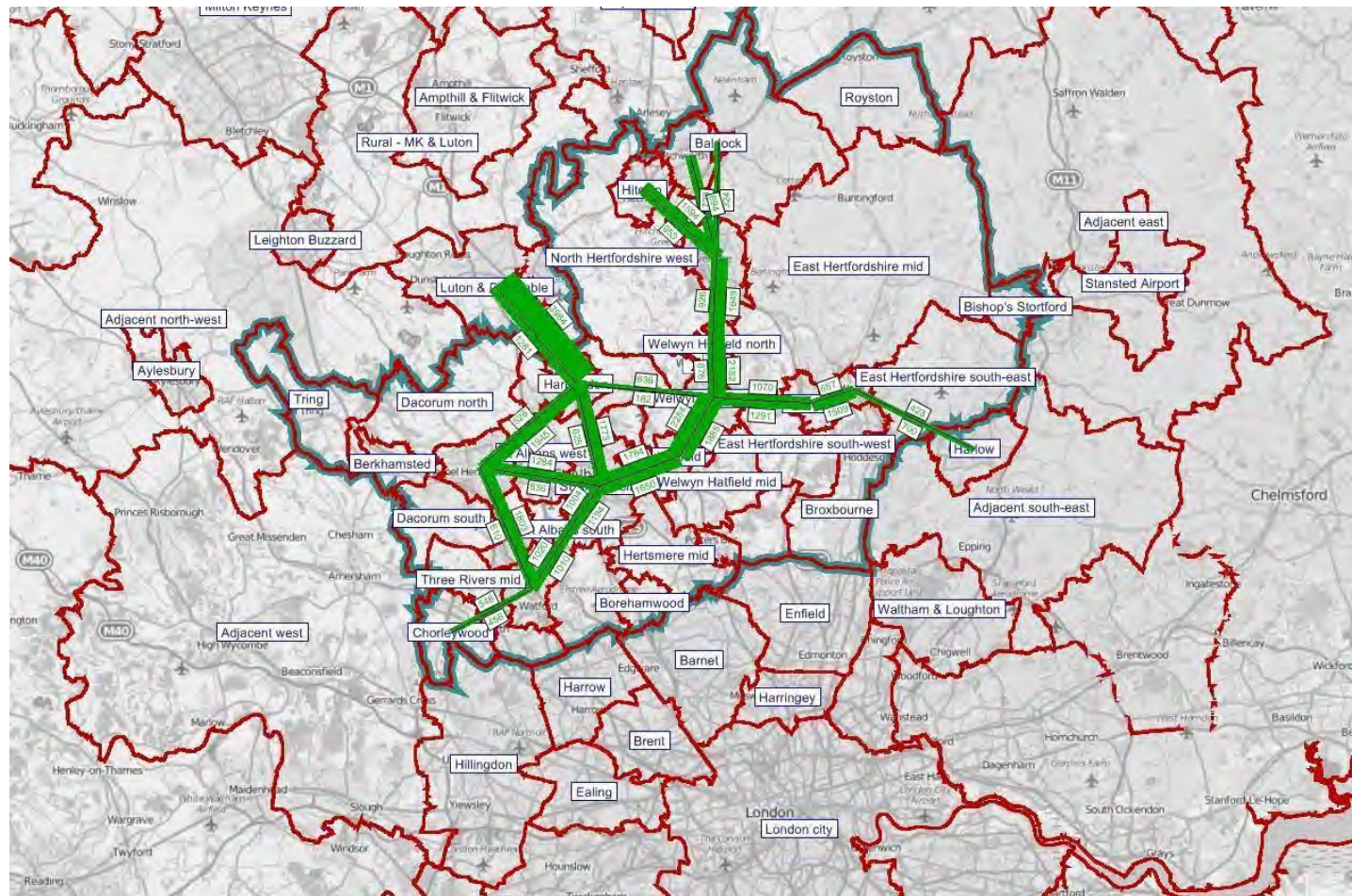
Capabilities on project:
Transportation

Figure 43: Hertfordshire Curve Corridor Flows – Mobile Phone Data – AM – Home Based Work Outbound[17]

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[17] *Flows provided between MSOA Sectors; actual routeing not provided*

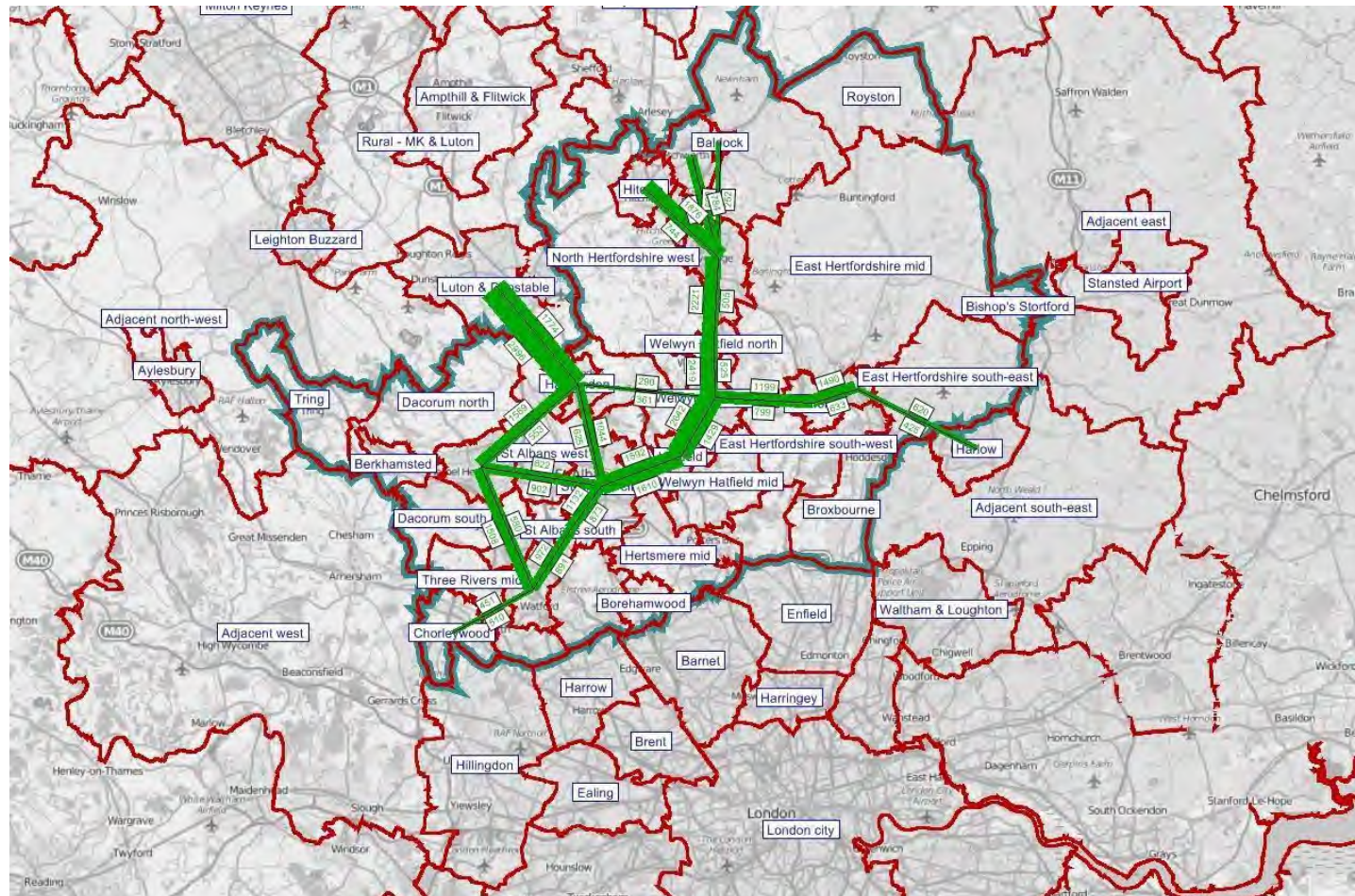Capabilities on project:
Transportation

Figure 44: Hertfordshire Curve Corridor Flows – Mobile Phone Data – PM – Home Based Work Return

7.4.2 *Policy Options*

This work has highlighted some key issues with the current travel patterns in Hertfordshire for which the following polices could be considered:

- The location of both residential and employment sites must consider the level of accessibility by public transport;

- Need to review the availability of parking in town centres and at employment sites. This could include investigating the potential of implementing a workplace parking levy[18];

- Collaborate with neighbouring authorities identified as having significant travel interactions with Hertfordshire to identify mutually beneficial options for accommodating these trips;

- Potential to review whether there is un-tapped demand along Hertfordshire's rail corridors for trips not going into London (e.g. Luton to St Albans). This may be due over-crowding or even high fare prices for non-London trips; and

- Opportunity to implement new bus services where demand is high but current public transport provision is limited (Luton to Hemel Hempstead – especially Maylands Business Park).

7.4.3 *Infrastructure Options*

Reviewing average speed data from Trafficmaster has identified a number of congestion hotspots along the corridors of interest:

- A1 (M) between Junction 8 and 6;

- A1 Junction 8 and A602;

- A1000 / A414 Junction;

- Red Lion Court;

- Broadwater / Bridge Road Junction;

- Monkswood and Gunnels Wood Roundabouts;

- A10 running through Royston;

- A414 London Colney Junction;

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[18] *Nottingham Workplace Parking Levy - http://www.nottinghamcity.gov.uk/doineedawpllicence*

- A10 running through Cheshunt;

- A414 running through Hertford;

- A1 (M) Junction 3;

- A1 (M) Junction 4 and Jack Oldings;

- Mundells;

- Stevenage Town Centre;

- Breakspear Way;

- St Albans Town Centre;

- M1 Junction 5; and

- Radlet Road (Watford).

In addition to these problem areas, it is apparent that the provision / performance of public transport for trips to and within Hertfordshire are inferior compared to the car. It is recommended that options to develop an integrated rapid transit system providing good inter-urban and intra-urban connectivity are investigated. This could include expanding rail corridors or exploring potential tram, train or bus rapid transit options to better serve town centres and employment sites.

Considering the difference in journey times between public transport and car it may be necessary to explore opportunities to provide greater bus priority infrastructure to ensure bus journey times are not affected by congestion on the road network. This will be important both within and between urban areas. For example for trips between Stevenage and Welwyn Garden City it will be necessary to explore the potential of improving connections to the rail corridor or to provide rapid bus service between the two towns serving both key residential and employment sites.

Table 25 summarises the available options for addressing the current issues associated with the travel patterns identified in Hertfordshire

Table 25: Policy and Infrastructure Options

Option	Pros	Cons	Timescales
Expand junction capacity at congestion hotspots	Reduce congestion and improve journey time reliability	Further reinforce county's reliance on the car – may be unsustainable in future years	Short
Expand highway capacities along key corridors (road widening, by-passes etc.)	Provide additional capacity to reduce congestion	Further reinforce county's reliance on the car Significant new road building may be met with opposition Would require significant land take in town centres	Medium
Investigate joint-working with adjoining authorities where travel interactions are significant (e.g. London)	Collaborative working and joint-funding of schemes which can benefit both authorities	N/A	Medium
Review Land Use Policies	Adopt a strategy that ensures Hertfordshire's growth is planned in a sustainable way by enabling growth which supports the use more sustainable modes	Existing employment sites are well established – will have to improve public transport provision to these	Medium
Work with bus operators to provide enhanced services between key ODs	Provide a 'missing' public transport link between key commuting ODs	Initial work required to demonstrate to operators the commercial potential of running such services	Short
Lobby rail operators to provide cheaper fares for non-London Hertfordshire trips	Potential to provide mutual benefits in increased demand / revenue for operators whilst taking car trips off Hertfordshire's congested road network	Hertfordshire has no control over the rail services within the county Operators may be unwilling to alter fares whilst in the middle franchise contract	Medium
Enhance public transport integration for inter and intra urban travel	Improve access to stations to ensure rail becomes a viable mode with competing road corridors	At present HCC has minimal control over public transport services in the county	Medium / Long
Provide greater bus priority on key routes	Improve performance of bus journey times vs. car. Encourage model shift thus reducing congestion and delays	Bus priority likely to come at a cost to general traffic without extensive infrastructure build	Medium / Long
Expand public transport infrastructure (e.g. New rail links, tram, guided bus lanes)	Help provide a genuine alternative to using the car within Hertfordshire	High construction costs	Long

Capabilities on project:
Transportation

Option	Pros	Cons	Timescales
Implement a Work Place Parking Levy[19]	Provide funding for public transport schemes. Incentive for employers to manage and potentially reduce their workplace parking	May meet opposition from business leaders. Would require considerable public consultation	Long

7.5 Next Steps

The aim of this report has been to identify the main patterns of travel across the county of Hertfordshire. The findings from this note should help decision makers identify their initial transport priorities and solutions.

7.5.1 *Growth and Transport Plans (GTPs)*

The findings from this report can now provide input into prioritising the Growth and Transport Plans Hertfordshire County Council are currently in the process of developing. The following table summarises the GTPs that we think represent a priority for the county. This table also provides some discussion on what findings from this report the GTPs can make use but also the additional information they should aim to identify.

Figure 45 provides the geographical location of these recommended areas which have been developed from the findings in **Section 7.2.2**. The table below then sets out the available evidence from this report that each GTP could make use of and also the sort out questions these should aim to answer.

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[19] *For an example see Nottingham Work Place Parking Levy:*
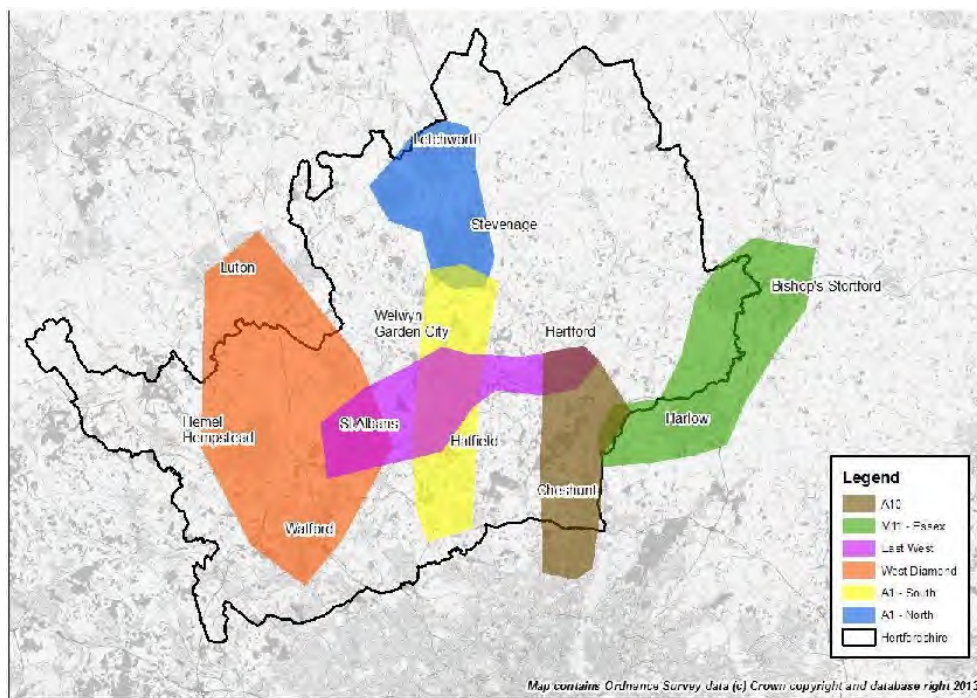*http://www.nottinghamcity.gov.uk/whatisaWPL*

Figure 45: Recommended Location of Growth and Transport Plans

Table 26: Further Studies (Growth and Transport Plans)

Area of Focus	Evidence Available from Report	Questions that need answering
A1 Corridor – Stevenage and North		
A1 Corridor – Stevenage and WGC / Hatfield		1. What is the difference in journey times by mode between the key origin destinations within the GPT?
Luton – St Albans – Harpenden – Watford Diamond	• Main O/Ds • Mode Shares • Route Journey times	2. How accessible are the rail stations within each GTP? 3. Can additional public transport services be provided in the GTP?
East-West Corridor		4. What is the level of parking provision at key destinations? 5. Are employment sites adequately served by public transport?
A10 Corridor		6. Are there any bus priority opportunities? 7. Can cycle provision be improved for short trips?
M11 & Essex		

7.5.2   *Using COMET*

Once a number of transport policies and interventions have been identified / developed, it will be possible to undertake some early sifting of these options using the COMET model once it has been developed over the medium term (by January 2016).This will provide a consistent approach for reviewing all transport policies and options across the entire county.

In the longer term COMET will be enhanced in the necessary areas to ensure it is suitable for developing scheme business cases by meeting the relevant WebTAG guidance. The model will be enhanced in relevant areas only – such as where schemes with high benefits have been identified by COMET in the initial sifting exercises (medium term).

Capabilities on project:
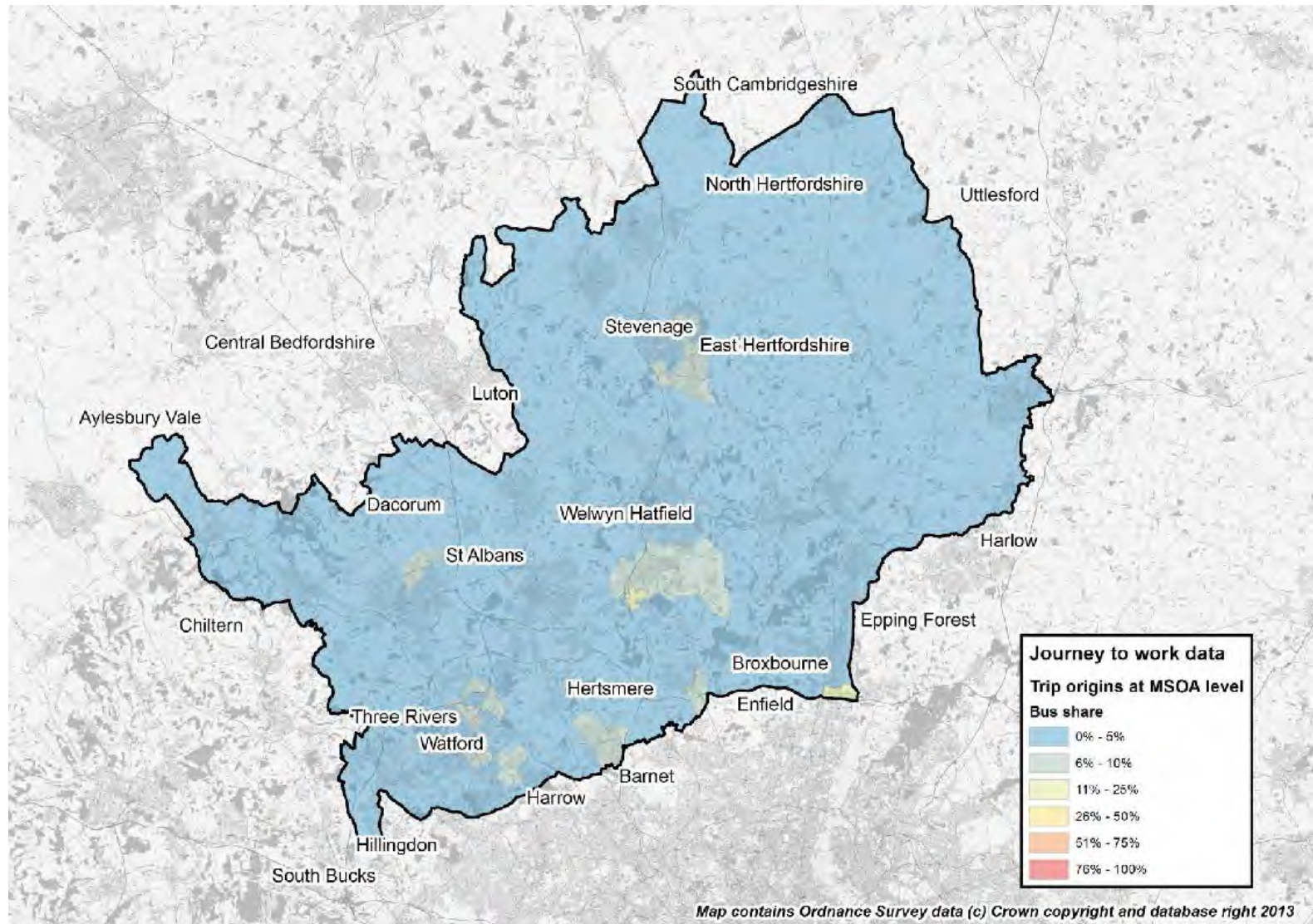Transportation

Hertfordshire COMET:
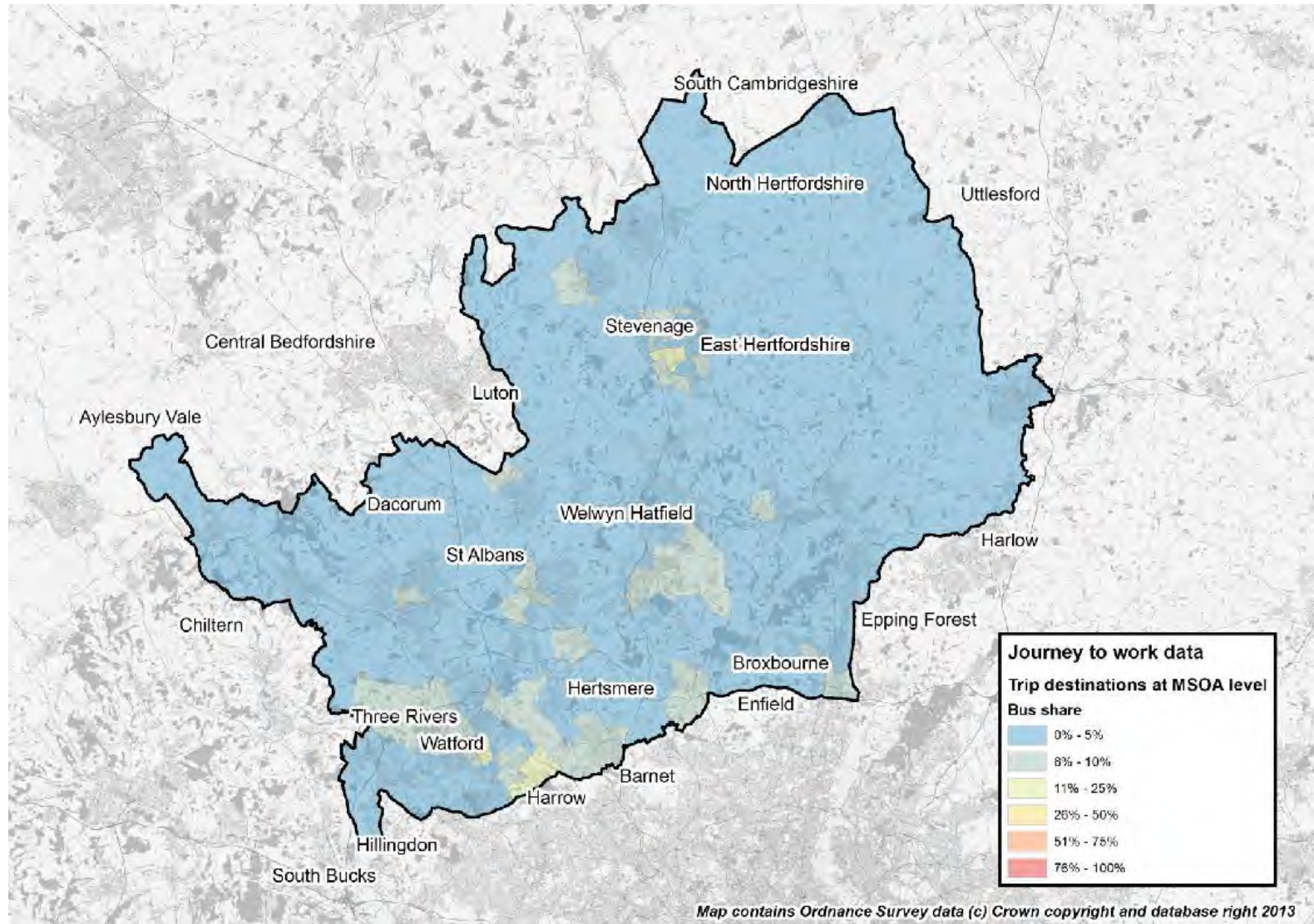TN 07 – Pattern of Travel across Hertfordshire
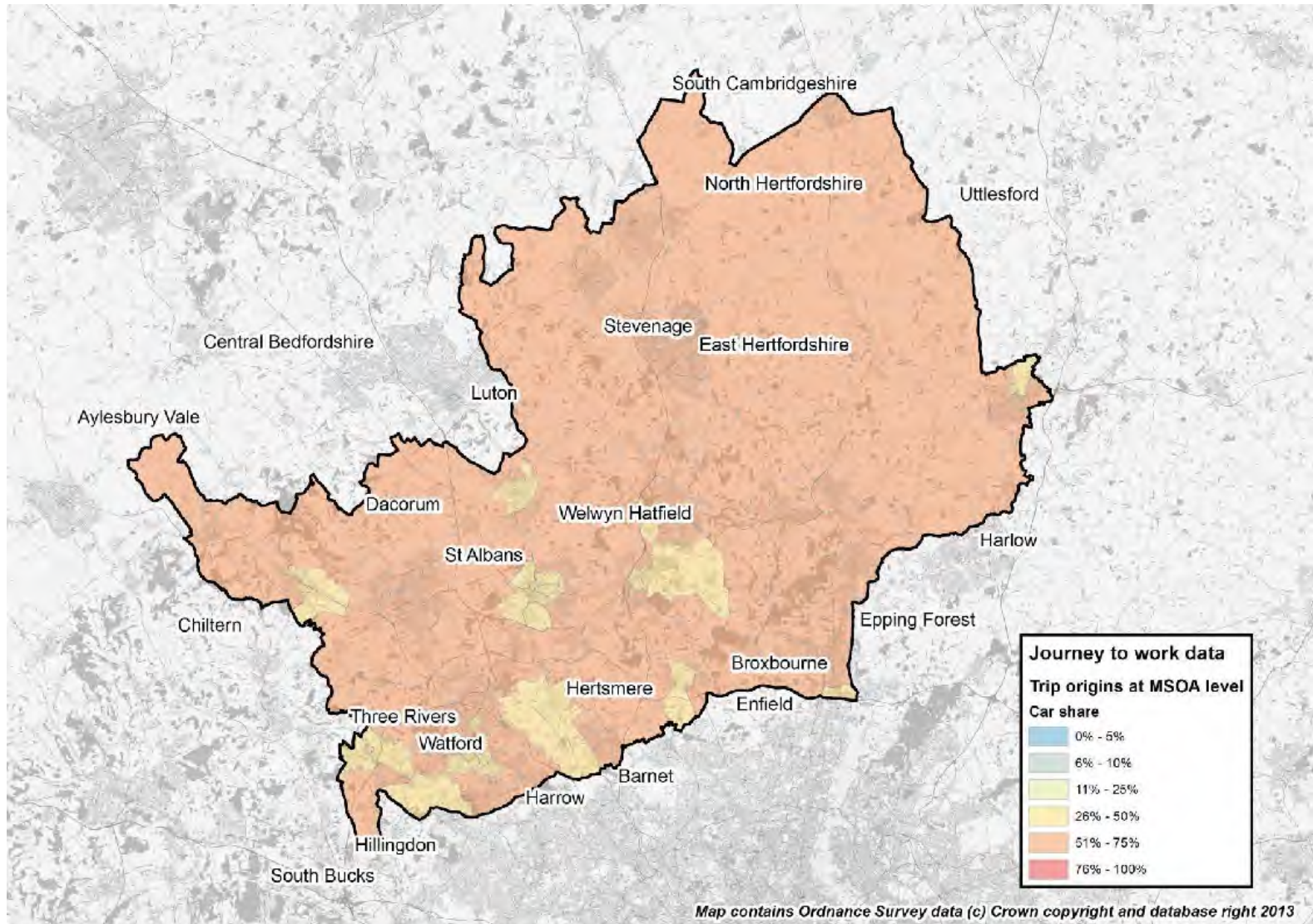*Appendices*

Appendix A – 2011 Census Journey to Work Mode Share Plots
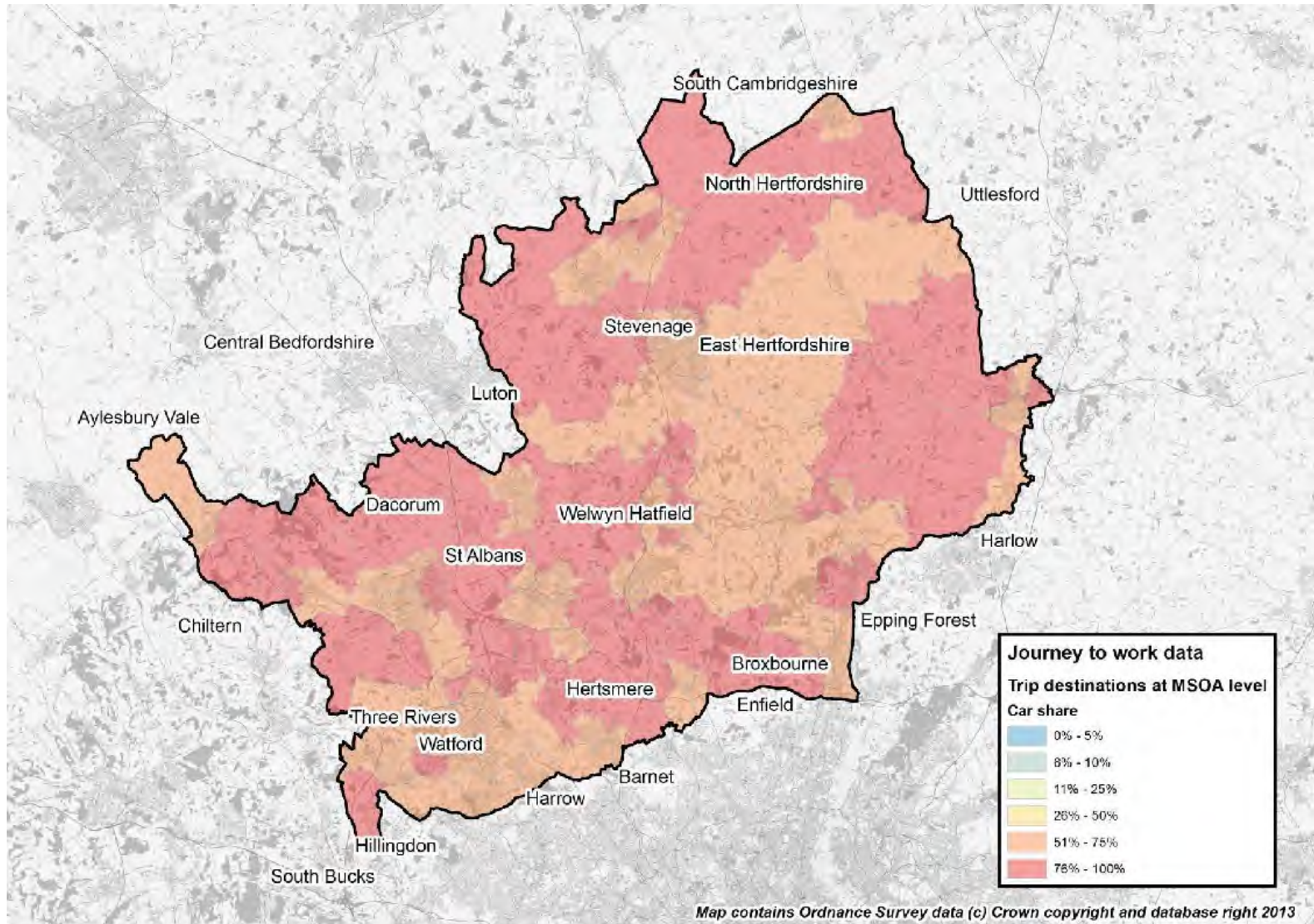
Bus Origins at MSOA Level

Map contains Ordnance Survey data (c) Crown copyright and database right 2013

Bus Destinations at MSOA Level

Map contains Ordnance Survey data (c) Crown copyright and database right 2013

Car Origins at MSOA Level

Map contains Ordnance Survey data (c) Crown copyright and database right 2013

Car Destinations at MSOA Level

Journey to work data
Trip destinations at MSOA level
Car share
0% - 5%
8% - 10%
11% - 25%
26% - 50%
51% - 75%
76% - 100%

Map contains Ordnance Survey data (c) Crown copyright and database right 2013

Train Origins at MSOA Level

Map contains Ordnance Survey data (c) Crown copyright and database right 2013
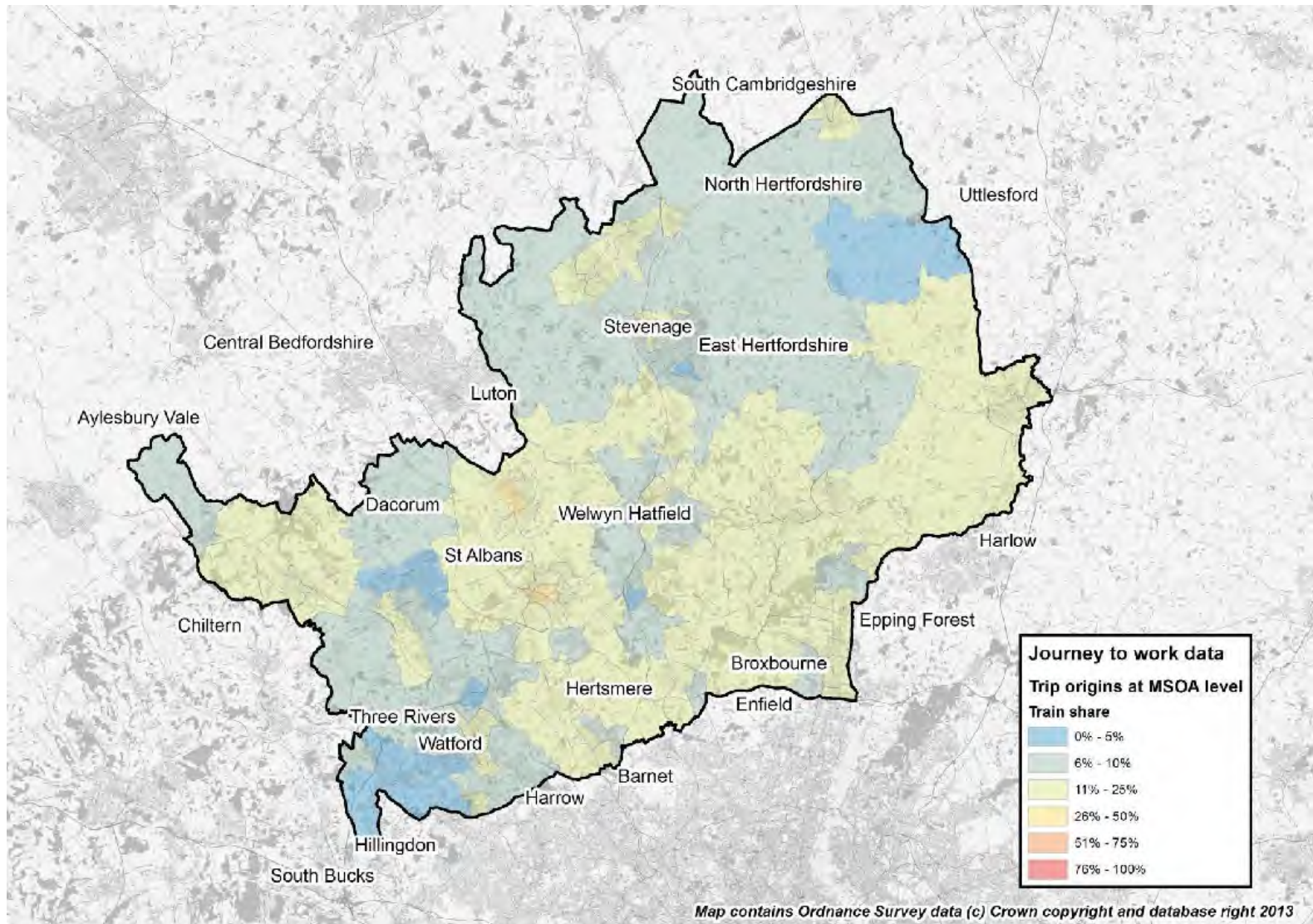
Car Destinations at MSOA Level

Walk Origins at MSOA Level

Journey to work data
Trip origins at MSOA level
Walking share

- 0% - 5%
- 6% - 10%
- 11% - 25%
- 26% - 50%
- 51% - 75%
- 76% - 100%

Map contains Ordnance Survey data (c) Crown copyright and database right 2013

Car Destinations at MSOA Level

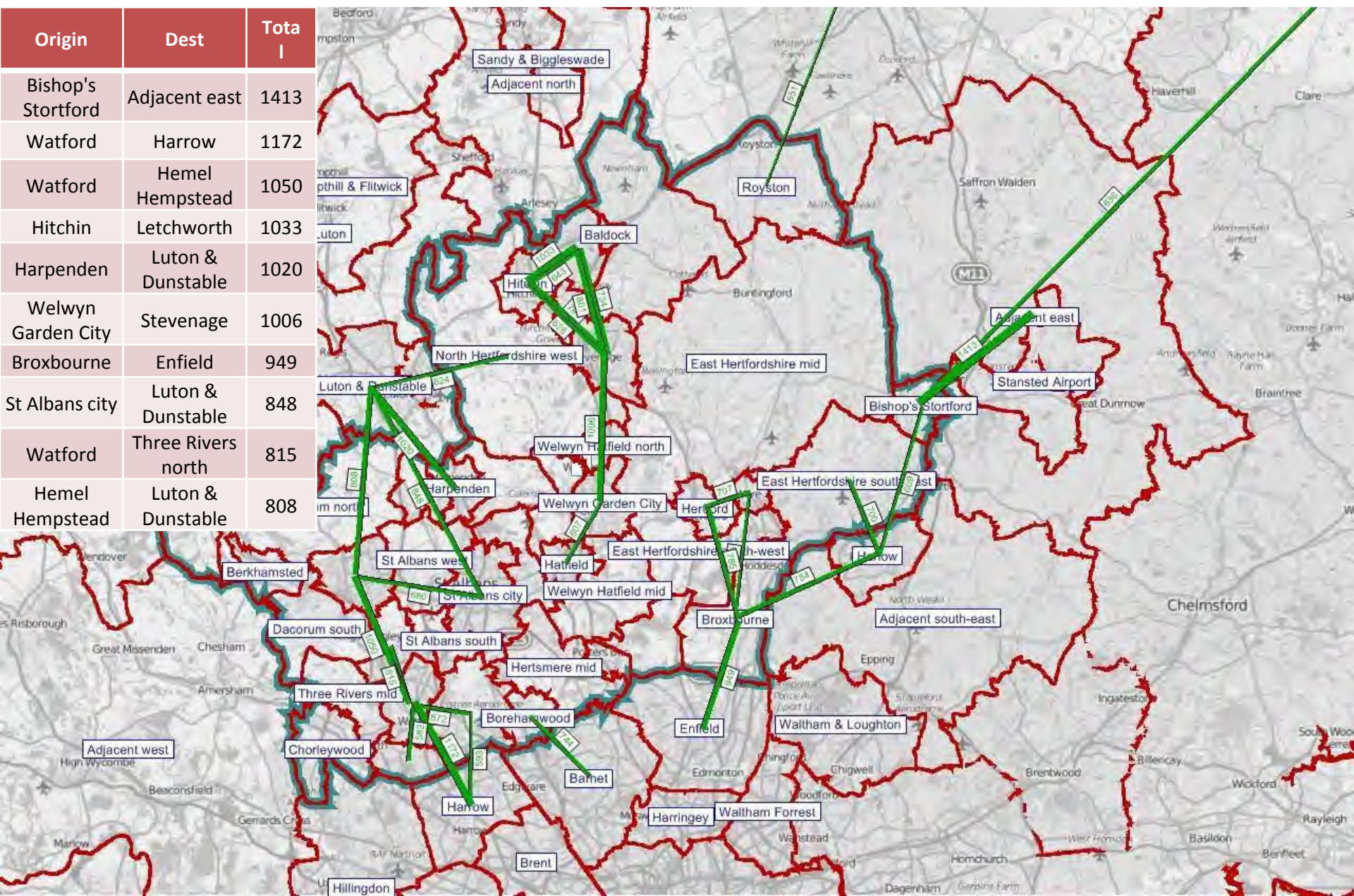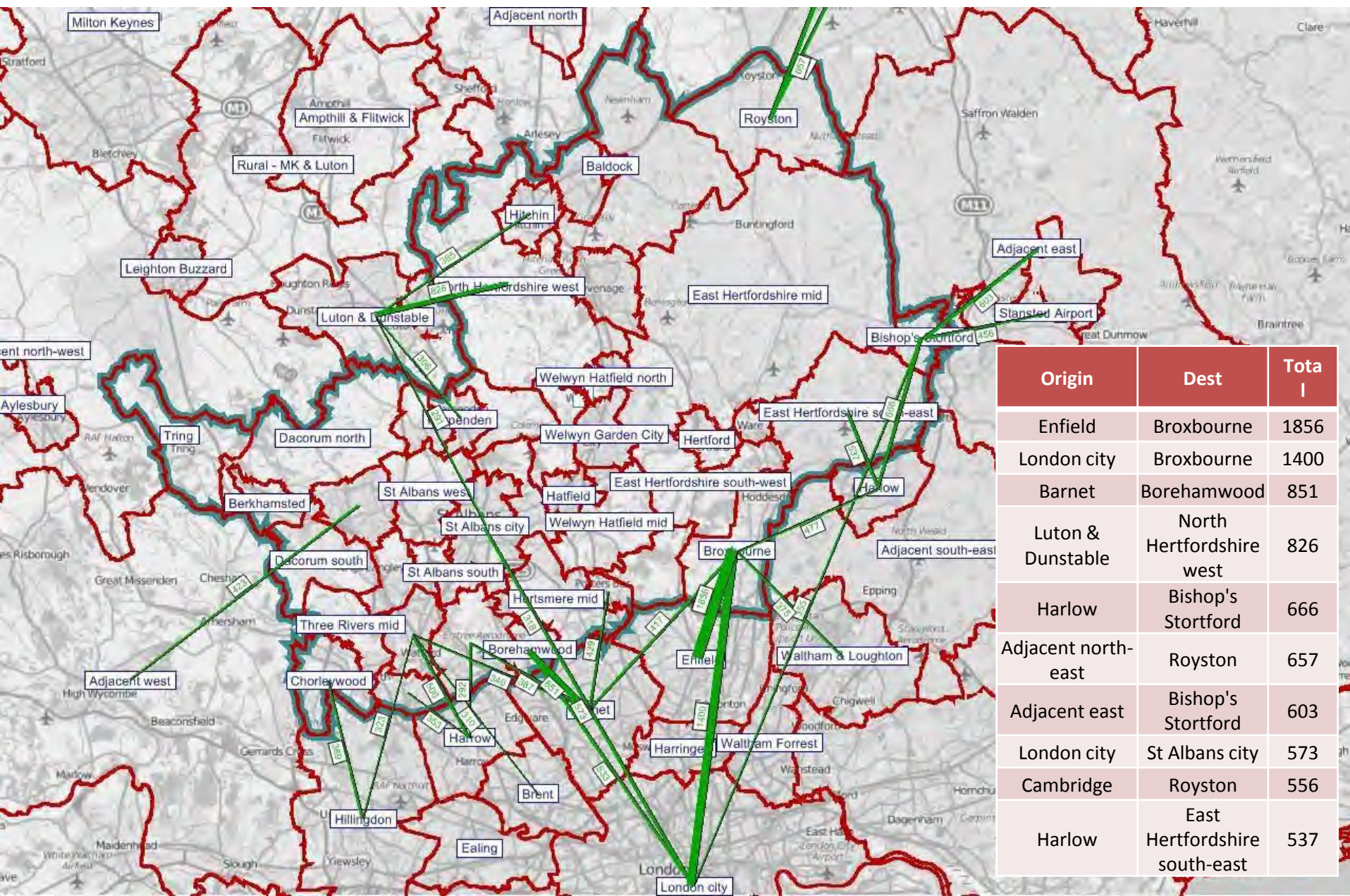Map contains Ordnance Survey data (c) Crown copyright and database right 2013
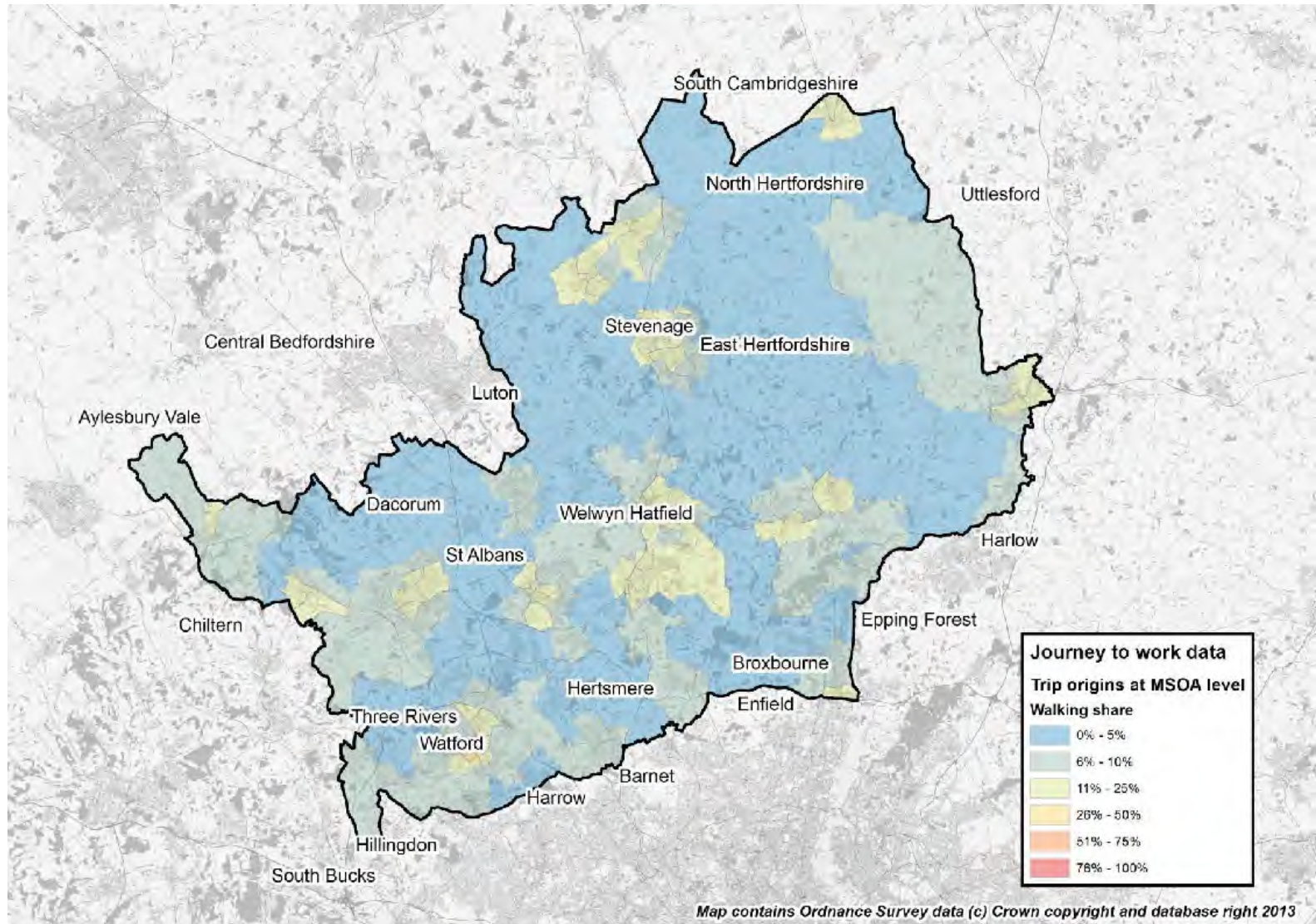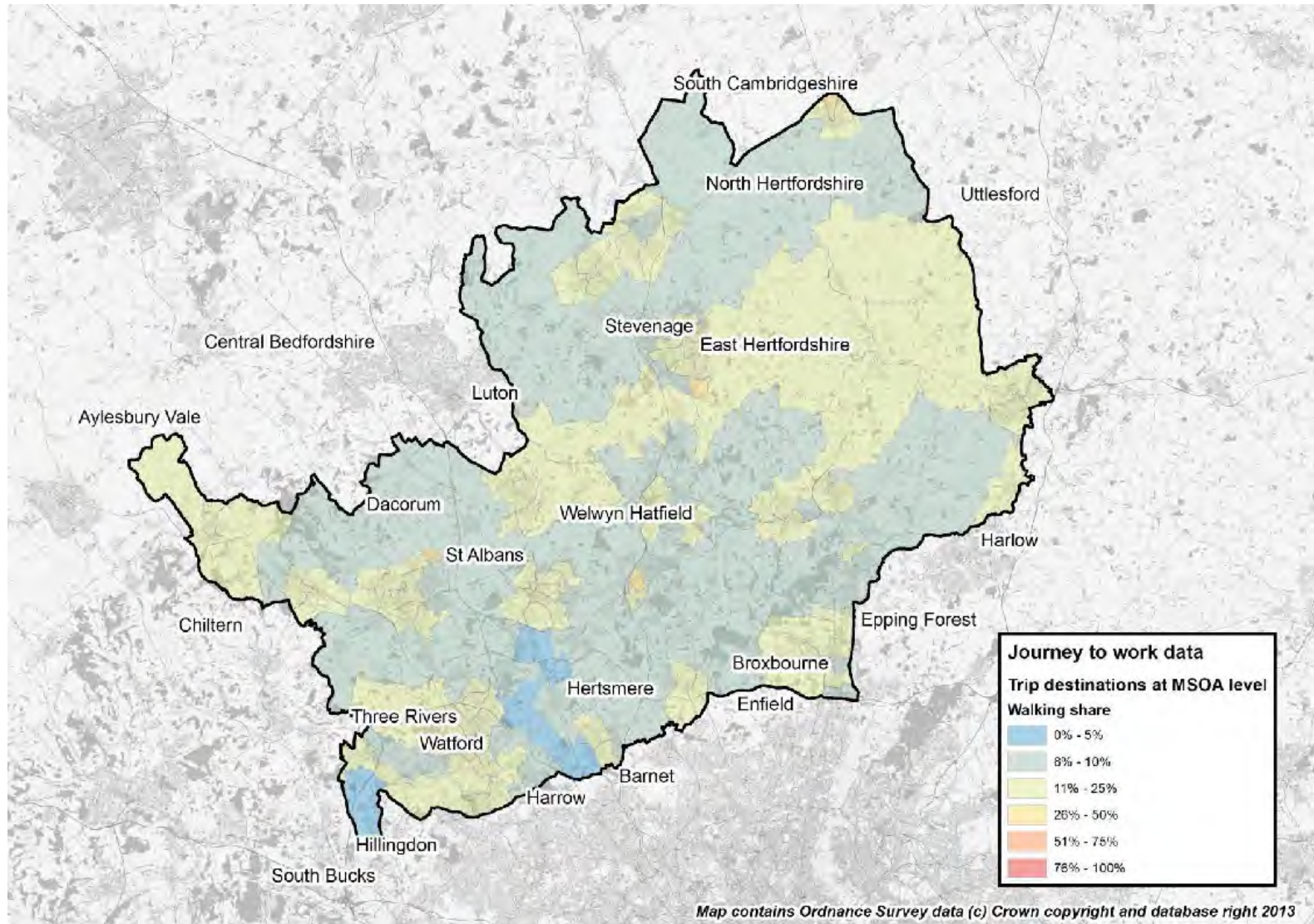
Appendix B – Mobile Phone Origin – Destination Plots

Main ODs (HBW RT) with a Hertfordshire Origin (PM)

Origin	Dest	Total
Bishop's Stortford	Adjacent east	1413
Watford	Harrow	1172
Watford	Hemel Hempstead	1050
Hitchin	Letchworth	1033
Harpenden	Luton & Dunstable	1020
Welwyn Garden City	Stevenage	1006
Broxbourne	Enfield	949
St Albans city	Luton & Dunstable	848
Watford	Three Rivers north	815
Hemel Hempstead	Luton & Dunstable	808

Main ODs (HBW RT) for External Origin to Hertfordshire Destination (PM)

Origin	Dest	Total
Enfield	Broxbourne	1856
London city	Broxbourne	1400
Barnet	Borehamwood	851
Luton & Dunstable	North Hertfordshire west	826
Harlow	Bishop's Stortford	666
Adjacent north-east	Royston	657
Adjacent east	Bishop's Stortford	603
London city	St Albans city	573
Cambridge	Royston	556
Harlow	East Hertfordshire south-east	537

Main ODs (HBW RT) for Internal Hertfordshire trips (PM)
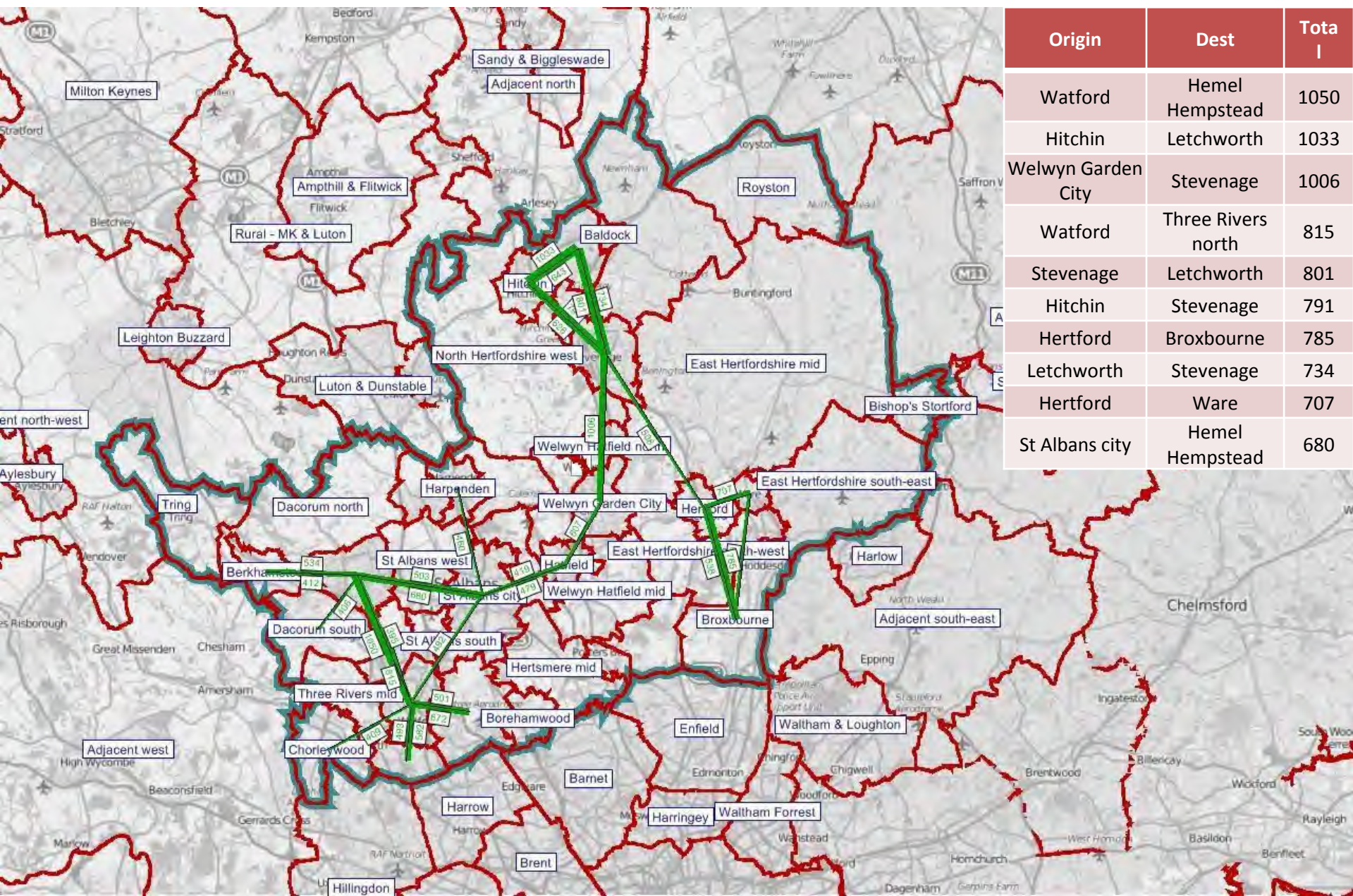
Origin	Dest	Total
Watford	Hemel Hempstead	1050
Hitchin	Letchworth	1033
Welwyn Garden City	Stevenage	1006
Watford	Three Rivers north	815
Stevenage	Letchworth	801
Hitchin	Stevenage	791
Hertford	Broxbourne	785
Letchworth	Stevenage	734
Hertford	Ware	707
St Albans city	Hemel Hempstead	680