

The top left portion of the cover features a close-up, high-angle photograph of railway tracks receding into the distance. The bottom right portion shows a close-up of a yellow 'BUS STOP' sign painted on asphalt. The bottom half of the cover is a solid blue gradient.

# Dacorum Local Plan Strategic Transport Modelling Report

Final Draft

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# 1. Introduction

## 1.1 Background to COMET

- 1.1.1 The development of the COMET model suite was commissioned by Hertfordshire County Council (HCC) in February 2015 to provide a structured evidence base for assessing transport policies and strategies on a consistent basis across the county. COMET is a multi-modal model with variable demand modelling capability.
- 1.1.2 Following the work to date on developing the COMET Base Year (2014) model, HCC commissioned AECOM to produce a 2036 forecast including the Local Plan aspirations (all employment and dwelling growth, regardless of certainty) of the 10 Hertfordshire districts in addition to the growth aspirations in the following neighbouring areas: Central Bedfordshire, Luton, Buckinghamshire (all districts), part of Essex (i.e. Epping Forest, Harlow, and Uttlesford), and part of Cambridgeshire (i.e. South Cambridgeshire and Cambridge)<sup>1</sup>. This test is known as the COMET 2036 Local Plan Run 4 (LP4).
- 1.1.3 The LP4 forecast was developed to test the impact of the updated Local Plan development information and revised set of transport infrastructure measures across Hertfordshire.

## 1.2 Background to Dacorum Scenarios

- 1.2.1 Dacorum Borough Council (DBC) is in the process of preparing their new Local Plan. This will cover the period to 2036.
- 1.2.2 DBC commissioned AECOM to assess the impact of the additional Local Plan allocations within Dacorum up to 2036 in conjunction with anticipated transport infrastructure in the current version of the COMET transport model. The starting point for this assessment is LP4<sup>2</sup>.
- 1.2.3 The new Local Plan includes a preferred option in terms of the likely scale and distribution of housing across Dacorum. At this stage, the preferred scenario is based on the Objectively Assessed Need (OAN) around 1,025 dwellings a year (18,450 total new dwellings between 2018-2036). This represents an additional 8,894 dwellings in addition to the Local Plan allocation already tested up to 2031.
- 1.2.4 Additional allocations are proposed on the edge of three main settlements as detailed below:
- Hemel Hempstead – around 2,000 units by 2036 on one site, with more in the longer term;
  - Tring – around 2,000 units by 2036 on three sites; and
  - Berkhamsted – around 2,000 units by 2036 on three sites.
- 1.2.5 Large scale transport infrastructure improvements were included alongside the revised development assumptions. These were not defined in detail (and in many cases no layout plans or further details are available) and therefore AECOM made assumptions when coding these schemes which were agreed with DBC. The following schemes in Dacorum would complement the development aspirations:

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<sup>1</sup> For the rest of Great Britain, the growth in employment and population in the COMET forecast is based on National Trip End Model (NTEM) 7.2 projections.

<sup>2</sup> HCC COMET LP4 Forecasting Report issued by AECOM in June 2019

- Key schemes identified to date from the Maylands Growth Corridor and Growth and Transport plan work;
- Potential new link road through north Hemel site connecting Leighton Buzzard Road with Redbourn Road;
- Mode shift to simulate the impact of a multi-modal transport strategy for Hemel Hempstead with a combination of extra road capacity for vehicles but consideration of allocating / re allocating road space for buses, cyclists and pedestrians including the re purposing to the A414 through Hemel to place greater emphasis on non-car models;
- Improvements to railway stations;
- A new link road through the east of Tring site to alleviate pressure on current north south routes through the town;
- A new link road through the South and East of Berkhamsted sites linking the A146/A41 junction with London Road;
- Potential for improved bus links to new developments;
- Potential for new sustainable transport interchanges at Maylands, Bourne End and Kings Langley;
- Improvements to junction 20 of M25;
- Improvements to junction 8 of M1 (as per preferred Maylands Growth Corridor option);
- Improvements to Two Waters Road / London Road / junction;
- Widening of Durrants Hill bridge; and
- New roundabout / access to Hemel station regeneration.

1.2.6 Remaining growth is likely to be dispersed around Dacorum (including some in villages such as Bovingdon).

1.2.7 Four model runs were commissioned to test various elements of the proposed local plan growth. These would aim to answer the following queries and inform DBC's local plan submission:

- What are the impacts of the largest development locations on traffic flows and delays in Dacorum;
- What is the importance of the full North Hemel Link Road; and
- What are the sensitivities of development locations in Berkhamsted.

## 1.3 Purpose of this Document

1.3.1 This document presents the steps taken to produce the forecast scenarios and a summary of results across Dacorum's highway and public transport networks. In addition to this report, AECOM issued 3 presentations<sup>3</sup> to DBC which highlighted key results.

1.3.2 This report should provide the evidence base on strategic transport modelling which DBC can use to inform their final recommendation on the development strategy of the new Local Plan.

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<sup>3</sup> Emails issued by AECOM on 28<sup>th</sup> October 2019, 31<sup>st</sup> January 2020 and 12<sup>th</sup> February 2020.



## 1.4 Caveats

- 1.4.1 Caution should be exercised when comparing the results of Dacorum Local Plan models. COMET is a strategic countywide model and was not developed to represent detailed traffic conditions in urban areas.
- 1.4.2 The main purpose of the COMET model is to simulate inter-urban movements in Hertfordshire, and the calibration/validation process has been conducted accordingly. This has an implication on the level of confidence that can be placed on results in urban areas.
- 1.4.3 The highway assignment component of the COMET model suite is in SATURN. SATURN is a tool that suits the strategic geographical scale of COMET, however, does not enable investigation of detailed sections of the highway network (e.g. detailed junction or corridor assessment).
- 1.4.4 Further evidence may be required to underpin and understand specific network issues as well as specific development impacts as they come forward. At this stage, therefore, the results presented here should be interpreted as high level indications of likely traffic conditions.
- 1.4.5 COMET assumes that any demand for public transport can be met – i.e. no account of capacity on trains or buses is made. Timetable frequencies are adhered to; however, it is assumed that any buses or trains have infinite capacity.
- 1.4.6 Analysis is provided for the AM peak (0800 to 0900), the Inter peak (average hour between 1000 and 1600) and PM peak (1700 to 1800).

## 1.5 Report Structure

- 1.5.1 Following this introduction, this report contains the following sections:
  - Scenarios and Demand
  - Forecast Network Development
  - Forecast Assignments
  - Highway Forecast Results
  - Public Transport Forecast Results
  - AADT Flow Calculations
  - Summary and Discussion
  - Appendices

## 2. Scenarios and Demand

### 2.1 Local Plan Run 4 Model

- 2.1.1 LP4 is the fourth local plan run that has been undertaken. LP4 includes the proposed transport schemes agreed with Hertfordshire districts in autumn 2018 and aligns with the Infrastructure Delivery Plans and Transport Strategies at that time. A full list of all transport schemes included in LP4 is detailed in 9.1 Appendix I and 9.2 Appendix II. Compared to the COMET Base Year model, over 300 schemes are included in LP4. In addition to highways and public transport schemes, a range of mode shift schemes were included in LP4 and attempts to reduce areas of notable delay from the previous LP3 (Local Plan Run 3) were made.
- 2.1.2 LP4 also includes revised light and heavy goods vehicle (LGV/HGV) growth projections detailed in the Department for Transport's Road Traffic Forecast 2018 (RTF 2018). Growth projections of LGV/HGV traffic have significantly dropped in RTF 2018 compared to those used in previous 2031 Local Plan COMET scenarios (from RTF 2015). Similarly, buffer speed changes in RTF 2018 were implemented in LP4. These speed changes simulate changes in speeds on the wider road network outside of Hertfordshire. Sensitivity tests were undertaken to ensure the correct levels of traffic were observed in the simulation area from the buffer using the revised RTF 2018 projections.
- 2.1.3 The LP4 forecast reflected the total cumulative growth within the county rather than a test of any specific (set of) developments and/or schemes.
- 2.1.4 LP4 formed the basis for the Dacorum scenarios assessed. In total, DBC requested AECOM assess 4 different scenarios. This section details the 4 scenarios assessed and the 2036 housing and employment assumptions underpinning the scenarios. The scenarios assessed were:
- Dacorum Baseline;
  - Additional Allocation;
  - Scenario 1; and
  - Scenario 2.
- 2.1.5 In all scenarios planning data projections for other districts in Hertfordshire and immediate bordering authorities remained consistent with LP4 except for Dacorum where revised (October 2019) planning data was used.
- 2.1.6 It should be noted that employment assumptions in all 4 scenarios remained consistent with those used in LP4. This is the result of two considerations; firstly, employment growth is much harder to forecast and secondly, the revised Local Plan assumptions proposed by Dacorum concerned large housing areas. The new developments proposed and tested do not incorporate large employment areas. Any small changes in employment up to 2036 would be negligible.
- 2.1.7 Table 2-1 highlights the key dwellings informing each of the scenarios tested.

### 2.2 Dacorum Baseline

- 2.2.1 The initial scenario was the 2036 Dacorum Baseline scenario. This included background growth in Dacorum up to 2036 but did not contain the large additional allocation developments identified (predominantly on greenfield sites).

- 2.2.2 The total sum of dwelling growth from 2014 to 2036 (including windfall) for Dacorum in the Dacorum Baseline scenario is 15,099 up to 2036. Table 2-1 highlights the key dwellings informing the Baseline scenario.

## 2.3 Additional Allocation

- 2.3.1 The Additional Allocation scenario included the key developments proposed in Dacorum in addition to the Baseline scenario detailed above. Key developments are proposed on the edge of the three main settlements, with the largest developments including:
- Hemel Hempstead – around 2,000 units by 2036 on one site, with more in the longer term;
  - Tring – around 2,000 units by 2036 on three sites; and
  - Berkhamsted – around 2,000 units by 2036 on three sites.
- 2.3.2 The total sum of dwelling growth from 2014 to 2036 (including windfall) for Dacorum in the Additional Allocation scenario is 21,999 up to 2036, an increase of 6,900 compared to the Baseline Scenario. Table 1 highlights the key dwellings informing the Additional Allocation scenario.
- 2.3.3 The Additional Allocation scenario with growth to 2036 and developments is compared to the Baseline Scenario with growth but no developments.

## 2.4 Scenario 1

- 2.4.1 Scenario 1 is a sensitivity test to identify the impact of the North Hemel Link Road (between Leighton Buzzard Road and Redbourn Road) on flows in/through Dacorum following previous model results. The North Hemel Link road is replaced by a smaller link road (between Leighton Buzzard Road and Link Road) for local traffic.
- 2.4.2 All development assumptions and locations remain the same as those in the Additional Allocation scenario i.e. an increase of 21,999 dwellings up to 2036.
- 2.4.3 Scenario 1 is compared to both the Baseline and Additional Allocation Scenarios.

## 2.5 Scenario 2

- 2.5.1 Scenario 2 is a further sensitivity test that investigates the impact of changing the location of the development in Berkhamsted but retaining overall total growth trajectories and the North Hemel Link Road as tested in the Additional Allocation scenario. Development assumptions match those used in the Additional Allocation scenario and Scenario 1 i.e. an increase of 21,999 dwellings up to 2036.
- 2.5.2 Scenario 2 is compared to the Additional Allocation scenario.

## 2.6 Summary of Demand by Scenario

2.6.1 The full list of developments and quantum of growth in each Dacorum scenario are shown in the table below

**Table 2-1: Developments included in each of the Dacorum Local Plan scenarios.**

Log Ref	Scheme Description	Uncertainty Log 1-4	Additional Development Information	Total Dwellings	2036 Baseline Scenario	2036 Local Plan with Additional Allocations	2036 Local Plan – Scenario 1
GL	r/o Green Lane, Bovington (2 linked sites)	4	Greenfield Allocation – South of Bovington	200	x	✓	✓
GF	Grange Farm	4	Greenfield Allocation - Bovington	250	x	✓	✓
MS	Markyate south	4	Greenfield Allocation – Markyate	150	x	✓	✓
NH	North Hemel	4	Greenfield Allocation – Hemel Hempstead	2,000	x	✓	✓
RF	Rectory Farm	4	Greenfield Allocation – Kings Langley	100	x	✓	✓
	Hill Farm	4	Greenfield Allocation – Kings Langley	200	x	✓	✓
SB GUI	Land south of Berkhamsted	4	Greenfield Allocation – Berkhamsted	850	x	✓	✓
SB HF	Land south of Berkhamsted – Haslam Field	4	Greenfield Allocation – Berkhamsted	100	x	✓	✓
	Land south of Berkhamsted – BFI	4	Greenfield Allocation – Berkhamsted	50	x	✓	✓
	Land east of Berkhamsted	4	Greenfield Allocation – Berkhamsted	1,000	x	✓	✓
WT	East of Tring (Including New Mill) (2 linked sites)	4	Greenfield Allocation – Tring	1,600	x	✓	✓
	Dunsley Farm, Tring	4	Greenfield Allocation – Tring	400	x	✓	✓
	Rest of Planning Data up to 2036		Dacorum	15,099	✓	✓	✓

2.6.2 Scenario 2 revised the location and network access of the growth in Berkhamsted. This scenario tested all the developments shown in Table 2-1 but with the reallocation of planned growth in east Berkhamsted spread across the following developments instead:

- Increase of dwellings from 100 to 150 in Haslam Playing Fields and 50 to 100 in BFI
- Blegberry Gardens: New site for 100 dwellings
- Rossway Farm: New site for 400 homes
- East of Darrs Lane: New site for 400 homes

## 3. Forecast Network Development

- 3.1.1 This section details the public transport and highways schemes included in the four 2036 Dacorum scenarios modelled in COMET and reported in this document.
- 3.1.2 It should be noted that in Dacorum and particularly Hemel Hempstead, a high quantum of highways schemes is proposed compared to other districts in Hertfordshire by 2036. Key schemes on the A414 leading to/from M1 junction 8 and linking to Maylands are predicted to provide a wide range of different routeing choices by 2036. This should be considered when viewing results reported later in this report.

### 3.2 Public Transport Network

#### Forecast Public Transport Schemes

- 3.2.1 Public transport schemes included in LP4 derived from the district Local Plan IDPs (Infrastructure Delivery Plans) and transport strategies such as the Growth and Transport plans and the A414 Strategy. Proposed changes to interurban bus services and bus services linked to new developments were also included.
- 3.2.2 For the Dacorum Local Plan scenarios this public transport network (from LP4) was used with one amendment. In LP4 the existing dual carriageway A414 through Hemel Hempstead between the M1 junction 8 and the Magic Roundabout was converted to one lane in each direction with the other converted to a bus lane. For the Dacorum scenarios this was removed and the A414 returned to its existing dual carriageway layout. The public transport schemes and services in Dacorum included in the 2036 forecast networks are shown in Table 3-1.

**Table 3-1: Public transport schemes in Dacorum**

Scheme ref	LPA (District)	Scheme type	Location	Location Details	Description of scheme	Assumptions	Modelled before?	Associated Package / Development	Forecast Year (Full completion)
MG S8 / PR96	Dacorum	Bus service enhancements	Maylands area, Hemel Hempstead	Maylands	Improvement of Maylans bus services	Sc8a4 ML1 linear 2 way route extended to E Hemel North & Spencers Park with increase in frequency to every 20 mins in peak; SC8c Diversion of Centrebus 46 to East Hemel N & Spencers Park; SC8d Diversion of 300 / 320 service through E Hemel South; SC8f Extension of Greenline 759 service through E Hemel N and Spencers Park	LP3		2031
SM10	Dacorum	Bus service enhancements	Luton - Hemel	M1	Dedicated coach Luton to Hemel along M1	Assume diversion of 757 into Maylands area. Assume stops in Maylands MMTI and Luton town centre with half hourly frequency during peak periods	A414 DS		2031
New	Dacorum	New bus service	Hemel Hempstead	A414 corridor	New high frequency bus service running along A414 corridor	Assume 15 min peak hour frequency and 20 min interpeak frequency service running between Hemeel Station and Town Centre and along the A414 sustainable transport lane to Maylands and East Hemel developments	No	SWH GTP / A414 Strategy (tested as a precursor to the MRT)	2031

#### Bus Services

- 3.2.3 It is acknowledged that our ability to predict changes in the bus network over a 10-20-year period is very limited. As bus routes tend to change on a commercial basis, it is generally not possible to make specific forecasts about details of bus routes over the next 10-20 years. Accordingly, the model assumes no changes from the model 2014 Base Year other than the schemes identified in section 9.2 Appendix II for the wider Hertfordshire area and Table 3-1 for Dacorum.

## 3.3 Highway Network

3.3.1 During the creation of the LP4 highway network, Hertfordshire County Council confirmed most schemes included in LP3 would remain in LP4. The LP4 networks therefore informed the four 2036 Dacorum scenarios.

### Forecast Highway Schemes

3.3.2 The full list of highway schemes included in the Local Plan 4 forecast is available in section 9.1 Appendix I. The proposed transport schemes within Hertfordshire were agreed with districts in winter 2018 and align with the IDPs and Transport Strategies at the time.

3.3.3 The forecast highway network schemes included in Dacorum are shown in Table 3-2. These schemes were reconfirmed with DBC in September 2019 and are consistent across all four scenarios.

**Table 3-2: Key Modelled Highway Schemes in Dacorum**

Scheme ref	Location	Description of scheme
3CTL	Hemel Hempstead	Junction Signalisation
39	Hemel Hempstead	Lane reallocation
	Hemel Hempstead	Development site Secondary site access onto The Avenue (extension of existing spur)
	Hemel Hempstead	New roundabout access
	Hemel Hempstead	T Junction onto Fletcher Way, Hemel Hempstead
	A4146 Water End	A4146 HGV ban at Waterend
T/8	Hemel Hempstead	Bedmond Road / Leverstock Junction Upgrade
T/9	Hemel Hempstead	Junction Signalisation
T/17 / Dac_Shooters Way	Berkhamsted	improvements including traffic lights and pedestrian crossings required in association with MU/6: Land at Durrants Lane / Shootersway (Egerton Rothesay School) and Local Allocation LA4: Hanburys.
T/18	Berkhamsted	Extension of 20mph zone and pedestrian crossing facilities
T/21	Tring	New junctions to development with associated highway improvements, including new cycle and pedestrian routes in line with the site master plan. New layout plans available. Assume priority junction at highlighted T junctions, refer to LA5 layout plan
T/23	Bovingdon	New access to LA6 development
D/24	Hemel Hempstead	Part-time signals at the Leighton Buzzard Rd / Queensway roundabout with widening to allow two lanes& intro of yellow box junction. Leighton Buzzard Road / Queensway lane reallocation - 2 lanes SB on LBR
D/25 / PR27 / MG_SC4	Hemel Hempstead	New link between Boundary Way and Wood Lane End (assume single carriageway with 3-way traffic and 30mph. Buncefield Lane north of Boundary Way (between Boundary Way and Cherry Tree Lane and between the A414 and Green Lane will become a Quietway so does not need to be added).

D/26	Hemel Hempstead	
D/27	Hemel Hempstead	T/18 removal of approach flare on eastern arm
D/28	Hemel Hempstead	New mini roundabout
D/29	Hemel Hempstead	Signal optimisation
D/30	Hemel Hempstead	Signalisation with prioritisation of NB flow on Fishery Road
D/31	Hemel Hempstead	Signal optimisation
40 (D/32) / PR10	Hemel Hempstead	Rearrangement of junction & signal optimisation
D/35	Hemel Hempstead	Signal optimisation
MGC S1c/ SM7c	M1 Junction 8, Hemel Hempstead	Junction 8 - Major reconfiguration to provide direct access into Maylands
MG SC1h	Hemel Hempstead	Interim at grade signalisation scheme
MG S2 / SM6b	Maylands Area, Hemel Hempstead	New spine road from B487 Redbourn Road to A414 St Albans Rd - dual carriageway up to new link from M1. Single carriageway north of here.
MG S3 / PR28 / PR97 / PR98 / PR99	Maylands Area, Hemel Hempstead	Closing the existing narrow country lanes within the industrial area of Cherry Trees Lane, Buncefield Lane (north) and Buncefield Lane (south) to through traffic
MG S6	Maylands Area, Hemel Hempstead	New pedestrian / cycle crossings in Maylands area - Maylands Growth Corridor study SC3-6 Options Report 080416
MG SC7	Redbourn	HGV restrictions on B487 and A5183
SM4a	Hemel Hempstead	Bus priority lanes on A414 WB, Station Road and Two Waters Road approaches
SM5a	Hemel Hempstead	Multi-Purpose Street
SM5b	Hemel Hempstead	New link road serving North Hemel development between Redbourn Road and Leighton Buzzard Road
SM32	Hemel Hempstead	Ped / cycle improvement.
PR9	Hemel Hempstead	Model as reduced speed along link to simulate impact of cycle lane and road narrowing
PR14	Hemel Hempstead	Model closure of this link to vehicles and diversion of vehicles to Durrants Hill Road / London Road (scheme assumes diversion of vehicles to Corner Hall, but this isn't in model so assume all vehicles divert to Durrants Hill Road instead and take account of this in any analysis.
PR67	Hemel Hempstead	Model closure of this link to non-bus vehicles. NB: Replaces previous LP3 scheme D/34 (signalisation of London Rd /Fishery Road)
PR35	M1 Junction 10	Capacity Improvement
E TRING	Tring	New access and north south distributor road
S Berko	Berkhamsted	New access and east west link road

## Dacorum Forecast Highway Schemes

3.3.4 For the Additional Allocation scenario and Scenarios 1 and 2, the highway network was amended with several schemes to mitigate the effects of the additional development traffic (6,900 additional dwellings).

3.3.5 The highway schemes specific to the Dacorum Local Plan scenarios are shown in Table 3-3 below.

**Table 3-3: Modelled Highway Schemes in Dacorum for each scenario**

Scheme	2036 Baseline Scenario	2036 Local Plan with Additional Allocations	2036 Local Plan – Scenario 1	2036 Local Plan – Scenario 2
Key schemes identified to date from the Maylands Growth Corridor and Growth and Transport plan work.	✓	✓	✓	✓
Potential new link road through north Hemel site connecting Leighton Buzzard Road with Redbourn Road (shorter version used in Scenario 1).	X	✓	✓ shorter version between Leighton Buzzard Road and Link Road used	✓
Mode shift to simulate the impact of a multi-modal transport strategy for Hemel Hempstead with a combination of extra road capacity for vehicles but consideration of allocating / re-allocating road space for buses, cyclists and pedestrians including the re-purposing to the A414 through Hemel to place greater emphasis on non-car modes.	X	X	X	X
Improvements to railway stations	✓	✓	✓	✓
A new link road through the east of Tring site to alleviate pressure on current north south routes through the town.	X	✓	✓	✓
A new link road through the South and East of Berkhamsted sites linking the A146/A41 junction with London Road.	X	✓	✓	X
Potential for improved bus links to new developments	X	✓	✓	✓
Potential for new sustainable transport interchanges at Maylands, Bourne End and Kings Langley	✓	✓	✓	✓
Improvements to Junction 20 of M25 – no scheme defined, potential need to use previous LP modelling work to help define changes needed.	X	X	X	X
Improvements to junction 8 of M1 (as per preferred Maylands Growth Corridor option)	✓	✓	✓	✓



Scheme	2036 Baseline Scenario	2036 Local Plan with Additional Allocations	2036 Local Plan – Scenario 1	2036 Local Plan – Scenario 2
Improvements to Two Waters Road / London Road / junction	✓	✓	✓	✓
Widening of Durrants Hill bridge	✓	✓	✓	✓
New roundabout / access to Hemel station regeneration.	✓	✓	✓	✓

### 3.4 Road Traffic Forecasts 2018 (RTF 2018)

- 3.4.1 Road Traffic Forecasts 2018 (RTF 2018) present the latest forecast for traffic demand, congestions and emissions in England and Wales up to 2050. These are produced using the Department for Transport's National Transport Model. Data from the Road Traffic Forecasts is used in COMET to forecast LGV (Light Goods Vehicle) growth, HGV (Heavy Goods Vehicle) growth and buffer speed changes. Previous Local Plan forecasts in COMET have used data from RTF 2015, the latest available at the time. It is important to note the changes between RTF 2015 and 2018 are considerable. As RTF 2018 was applied in the Dacorum scenarios key details are highlighted in this section.
- 3.4.2 The RTF 2018 update rebases the model from 2003 to 2015 and considers recent evidence and input data. Since RTF 2015, the National Trip End Model has also been updated. The forecasts consider uncertainty around several key drivers of road traffic, including:
- Population growth;
  - Trip rates;
  - GDP & Income;
  - Costs of driving;
  - Young people's driving patterns and licence holding;
  - Demand for goods: freight; and
  - Technology.
- 3.4.3 RTF 2018 now provides growth rates and speed changes based on the different time periods included in the COMET model. RTF 2015 provided only a single speed regardless of time period.
- 3.4.4 The changes resulting from the new RTF 2018 traffic forecast assumptions are as follows:
- Expected freight growth for LGV and HGVs have been amended and are significantly lower than previous RTF projections; and
  - Buffer speeds reduced relative to the 2014 Base Year to simulate the effect of rising congestion outside the simulation area. This speed reduction is based on Scenario 1 of RTF 2018 and is increased 4-fold to achieve forecast traffic growth in the buffer network. These speeds are marginally lower than those in LP3 which used RTF 2015. This approach was applied separately for each time period across the buffer network.

## 3.5 Modal Shift

3.5.1 In addition to the schemes listed in section 9.1, HCC requested that the LP4 forecast scenario should include an element of modal shift (from highway to other modes). This was applied in selected areas to represent district's proposals to encourage sustainable travel and the impact of emerging Growth and Transport Plan sustainable measures. This parameter was maintained for the Dacorum scenarios. The areas where this modal shift was simulated are as follows and shown in Figure 3-1:

- Hitchin;
- Letchworth Garden City;
- Baldock;
- Royston;
- Stevenage;
- Welwyn Garden City;
- Hatfield;
- Hemel Hempstead; and
- St Albans.

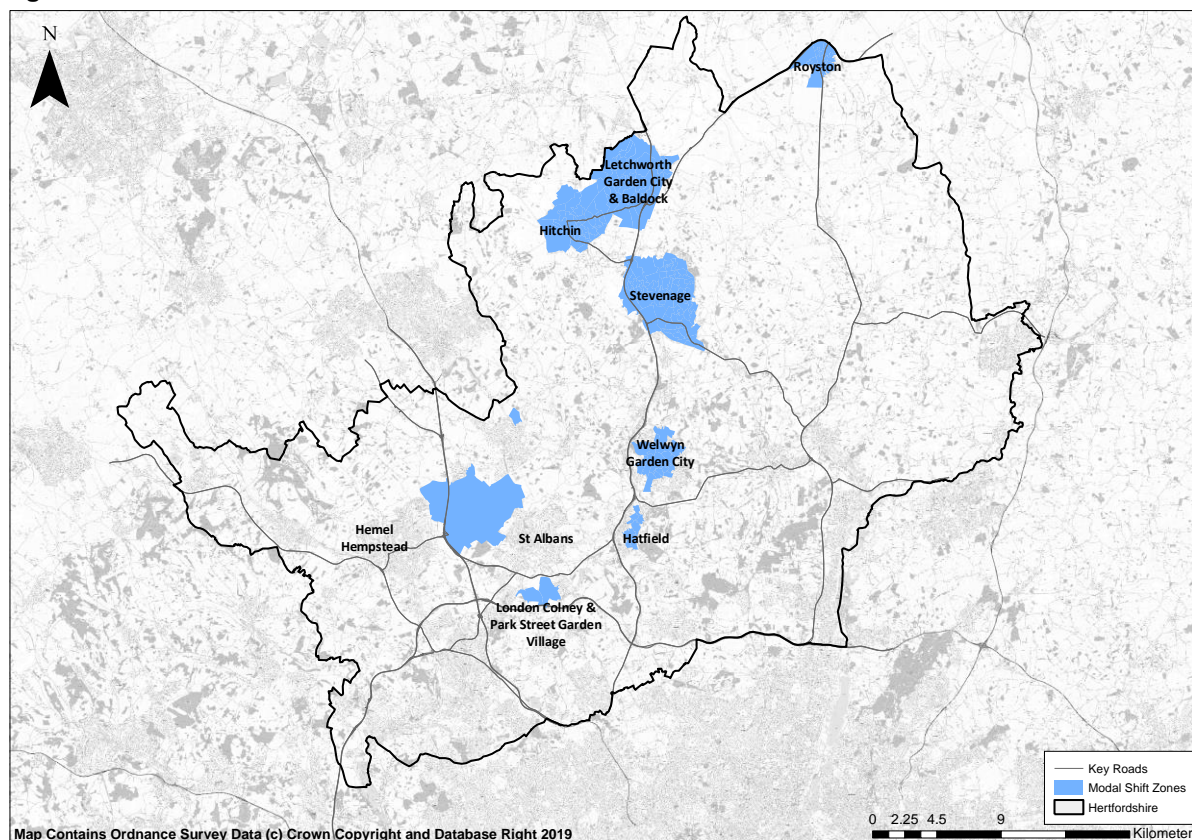
3.5.2 Whilst locations in Dacorum did not have the mode shift parameter applied, bordering locations such as St Albans did. This is highlighted in this section and should be considered when viewing results and linkages with St Albans.

3.5.3 Mode shift in St Albans was applied to reflect the high number of internal trips and to reduce the number of external trips on the network. Reflecting this in a more realistic manner would require changes to the VDM which is currently outside the scope of Local Plan forecasting.

3.5.4 The modal shift in the forecast scenario is achieved by applying a factor (in COMET's Variable Demand Model) to the cost of highway trips originating in the selected zones. By raising the cost of undertaking a journey by car, this factor encourages trips to be made by alternative means (i.e. public transport or sustainable travel). The level of modal shift specified by HCC and achieved for these zones is approximately 5%.

3.5.5 This is not a recommended approach to modelling modal shift in a multi-modal model (such as COMET) as no infrastructure to facilitate such behaviour change has been included in the forecast year network. This modelled modal shift is therefore not a result of COMET's Variable Demand Model representing behavioural change; rather, it is the result of a parameter adjustment that is currently not based on any specific interventions to the transport network. Once more specific scheme assumptions regarding the proposed sustainable travel initiatives are known, these should be coded into COMET as other forecast schemes already are.

**Figure 3-1: Modal Shift Zones**



## 3.6 Signalised Junctions and Network Checking

- 3.6.1 Signalised junctions associated with transport schemes were checked to compare the levels of delay with the Base Year and Local Plan 4 model. Signal timings have been optimised and adjusted in cases where significant delays were forecast.
- 3.6.2 Signal timings and phases were adjusted in the Dacorum area by considering the location of delays or congestion where significant in LP4.
- 3.6.3 Furthermore, a check was made of the forecast highway assignment to ensure that the implementation of the schemes has not led to implausible levels of delay, or any unrealistic re-routing of traffic.
- 3.6.4 It should be noted that, the increased planning assumptions, RTF 2018 changes and additional infrastructure schemes generated significant convergence issues compared to previous Local Plan scenarios. Every effort was made to optimise signals and reduce delays wherever possible, however this had to be considered alongside creating a stable, reliable forecast model scenario which converged in all time periods.

## 4. Forecast Assignments

- 4.1.1 This section provides an overview of the four Dacorum forecast assignments assessed as part of this commission. In simple terms, these are checks to ensure the results reported are robust and consistent as transport modelling forecasting contains many layers of uncertainty.

### 4.2 Highway Assignment

#### Assignment Parameters

- 4.2.1 No changes were made in terms of SATURN assignment options or parameters relative to the base year. For reference, a full list is provided in the COMET Local Plan Run 4 Forecasting report issued by AECOM in June 2019.

#### Assignment Convergence

- 4.2.2 The convergence of the highway assignment has been measured according to standards set out in DfT's TAG guidance, full details can be found in section 9.3 Appendix III

### 4.3 Public Transport Assignment

#### Assignment Parameters

- 4.3.1 With the exception of modelled schemes, the forecast 2036 public transport assignment is identical to the Base Year, except for the previously noted 1% increase per year in public transport fare and an increase in the passenger value of time in line with the demand model. The increases in fare and values of time above inflation are applied for both bus and rail travel.

#### Assignment Convergence

- 4.3.2 The public transport model does not model congestion, and as such there is no convergence to measure.

## 5. Highway Forecast Results

- 5.1.1 This section reports the key results of the COMET highway model for all four Dacorum scenarios. Comparisons between scenarios are made to highlight the impacts of different planning (housing growth) or infrastructure assumptions. Results focus on AM (0800 – 0900), inter peak and PM (1700 – 1800) peak hours as this is where greatest impacts are seen.
- 5.1.2 Results are presented for only the Dacorum District. Sense checks were made on wider results throughout the COMET model area to ensure results in other areas of Hertfordshire remained stable and compared to those previously seen in LP4. These checks did not result in any issues.

### 5.2 Simulation Area Statistics

- 5.2.1 Simulation area statistics concerning the highway assignment were checked for all Dacorum scenarios. These were compared to LP4 and Base Year assignments and were consistent for all scenarios. As there were very little differences between statistics reported in the COMET Local Plan Run 4 Forecasting Report (issued by AECOM in June 2019) results are not reproduced in this document.

### 5.3 Baseline and Additional Allocation Scenario Network Stress and Delays

- 5.3.1 Delays modelled in the highway assignment model are presented in the following sections in terms of link stress (volume over capacity – V/C) and junction (node) delay in minutes.
- 5.3.2 The commentary given in the following sections is not intended as a comprehensive statement of network functionality, rather, it highlights where the main areas of congestion and delay are expected to occur on a corridor/strategic level given the assumptions inherent in these tests.
- 5.3.3 It should be considered that, the reliability of the forecast results is dependent on the performance of the Base Year model, in which there are currently areas identified that do not achieve DfT's TAG validation criteria<sup>4</sup>. This is to be expected in a strategic model such as COMET and results should only be viewed as indicative.
- 5.3.4 The maps presented in this section show the 2036 modelled link stress in terms of volume over capacity (V/C) and the junction delay per vehicle for the three modelled time periods in 2036.
- 5.3.5 Volume over capacity is an indication of how congested a road is. Under 80% (green) is relatively free flowing, 80% - 90% (amber) is a sign that speeds will lower and queuing at junctions will start. Over 90% (red) indicates slow moving traffic and long queues may develop at junctions.
- 5.3.6 The delay shown for each junction is an average (weighted by vehicular flow) of the delays for each possible turn at that junction.
- 5.3.7 The extents of COMET model area and network coverage diminishes outside Hertfordshire.

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<sup>4</sup> The Department for Transport provides Transport Assessment Guidance which outlines the standards that models should achieve to produce reliable and realistic results. Evidence must be provided to show that the model has achieved these criteria for most applications of strategic models. In this case, this is provided in 9.3 Appendix II.

5.3.8 The Baseline Scenario link stress and junction delay plots show that longest delays are seen at M25 junction 20. Roads in Tring and Berkhamsted perform well. In Hemel Hempstead congestion issues are likely at the approach to the Magic roundabout and on the Green Lane/A414 junction approaches.

5.3.9 Additional Allocation results show similar results to the Baseline, with the following differences:

- Increased delays at M25 Junction 20 in all time periods;
- Greater delays in the PM Peak in Hemel Hempstead in the Maylands area including the Green Lane/M1 J8 roundabout caused by re-routeing to access the north link road;
- Greater levels of PM peak congestion in the north of Hemel Hempstead along Redbourn Road as traffic re-routes to use the north Hemel link road;
- Congestion on A4147 towards Hemel Hempstead and the A414/Green Lane junction in PM peak; and
- Greater levels of congestion northbound into Chesham in PM peak, caused by changes to routeing in the buffer network.

Figure 5-1: Dacorum Baseline 2036 AM Peak Link V/C



Figure 5-2: Dacorum Additional Allocation 2036 AM Peak Link V/C



Figure 5-3: Dacorum Baseline 2036 Inter-peak Link V/C

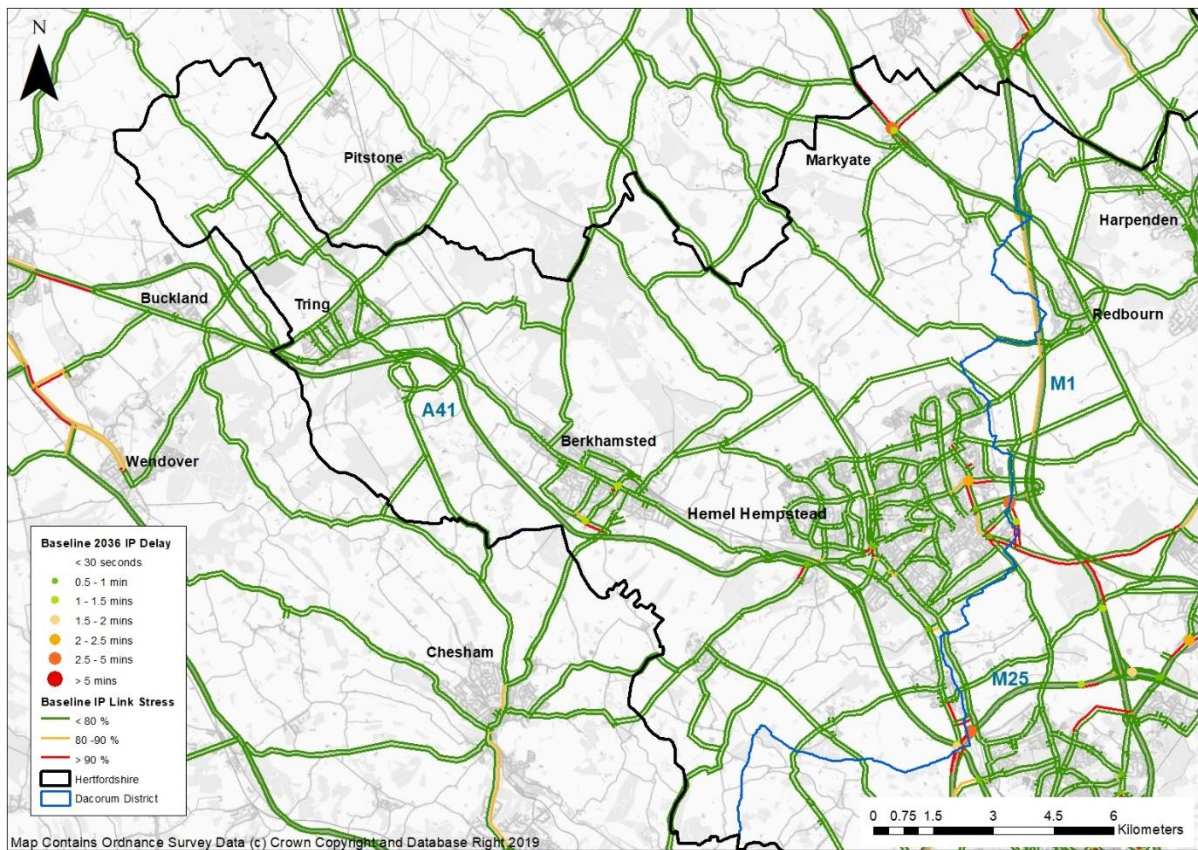


Figure 5-4: Dacorum Additional Allocation 2036 Inter-peak Link V/C

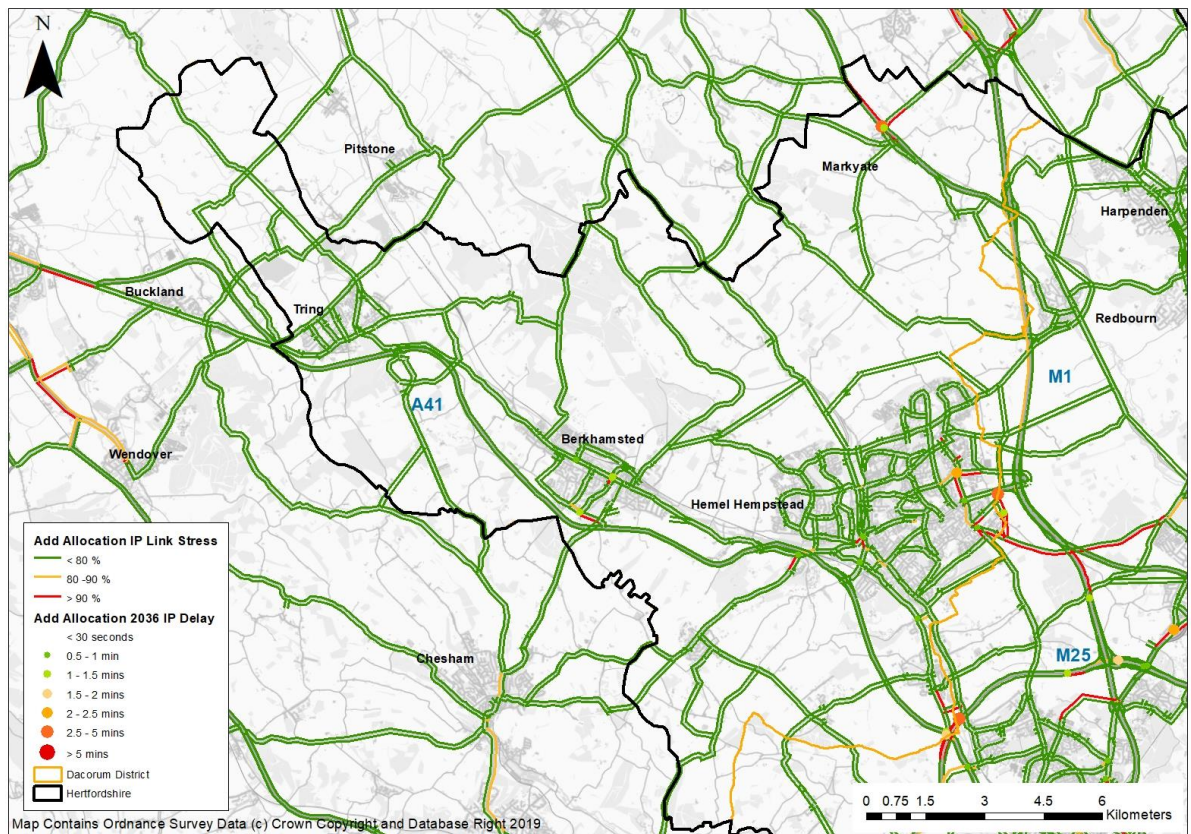




Figure 5-5: Dacorum Baseline 2036 PM Peak Link V/C

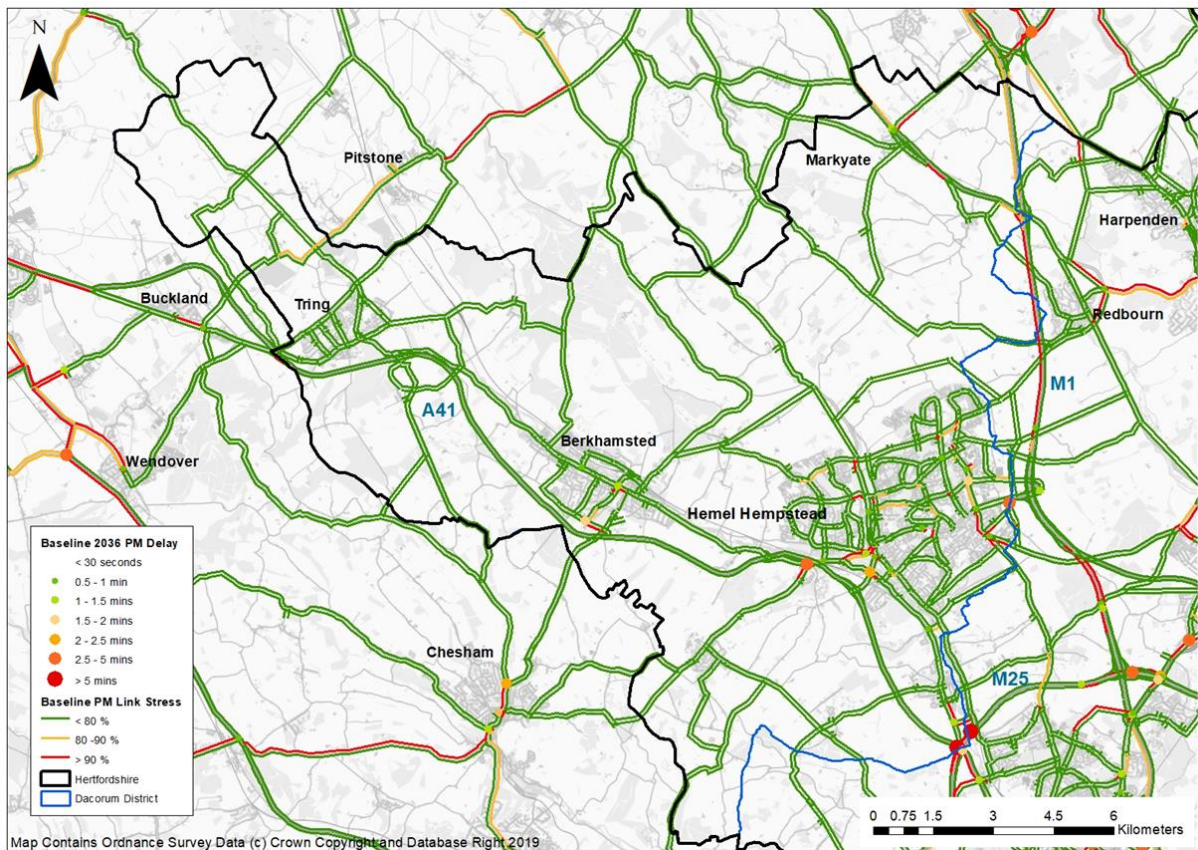
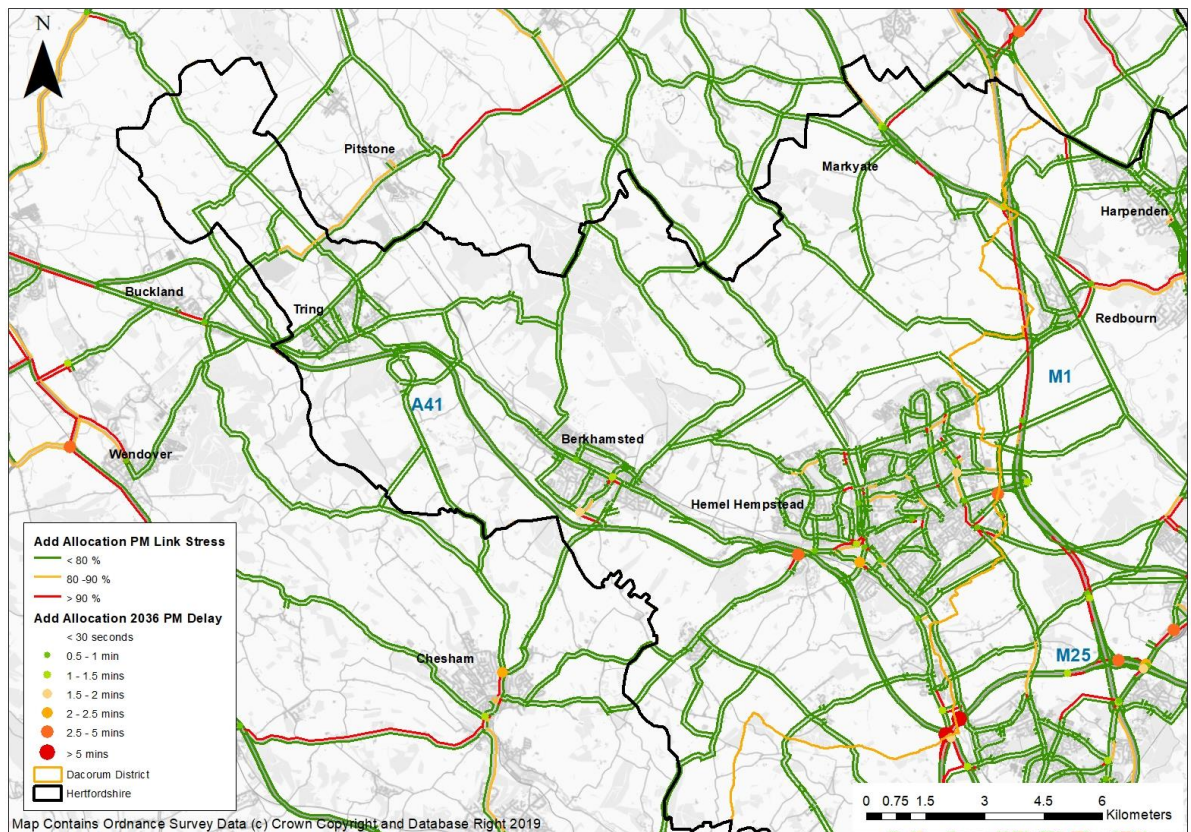


Figure 5-6: Dacorum Additional Allocation 2036 PM Peak Link V/C

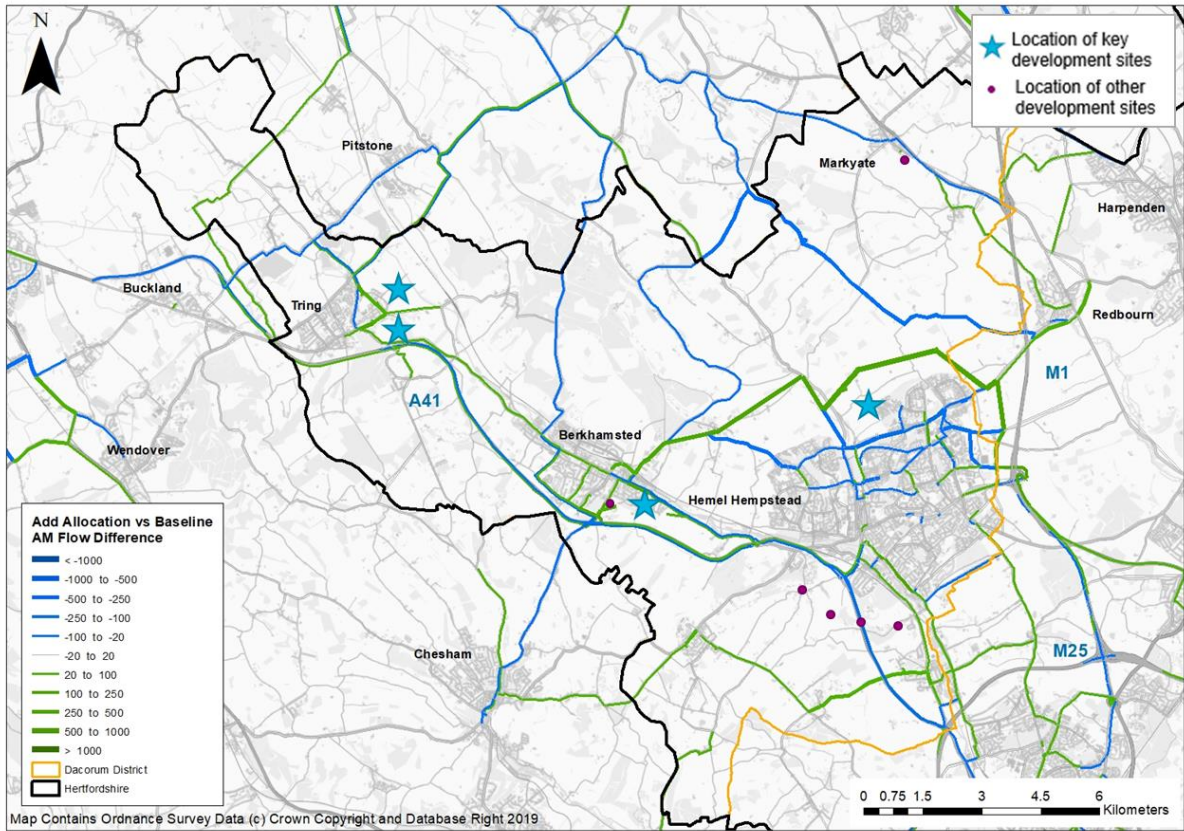


## 5.4 Traffic Flows Additional Allocation vs Baseline Scenario

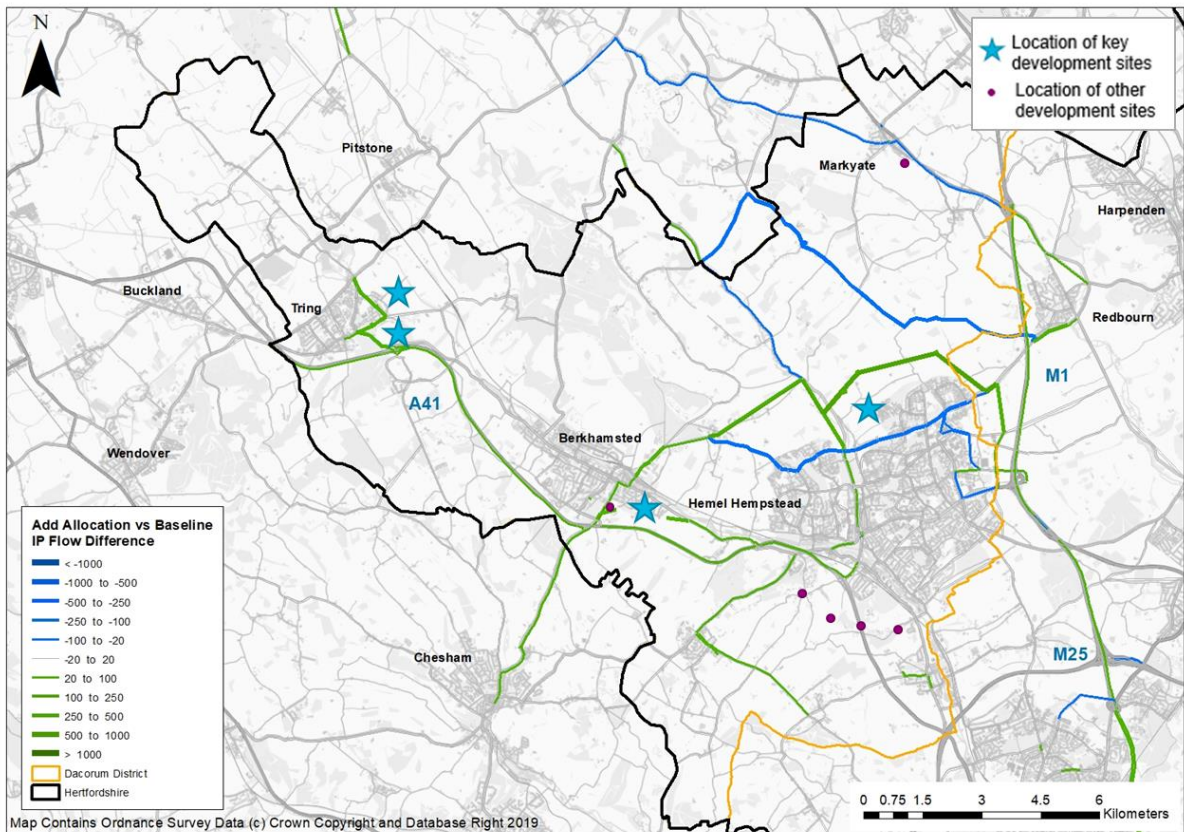
- 5.4.1 The flow difference plots presented in Figure 5-7 to Figure 5-9 display the change in flows (in Passenger Car Units (PCU)) between the 2036 Baseline and Additional Allocation scenarios in Dacorum. A PCU is a unit of flow which averages the impact of differing vehicle types (car, light goods vehicle and heavy goods vehicle).
- 5.4.2 Green bands indicate flow increase in the forecast, whilst blue indicates flow decrease. The thickness of the lines represents the volume of traffic. Any differences of +/- 20 pcus are not presented and are shown in grey. Some re-routing between assignments is common between scenarios.
- 5.4.3 Large developments (for which development flows are provided – see section 5.5) are shown on the map with a star while other, smaller developments are shown with purple circles. Locations shown are indicative of the zones that development is added to, access onto the road network was confirmed with Dacorum Borough Council prior to modelling. These developments indicate the key housing growth area differences between the scenarios.
- 5.4.4 Notable increases in flows are observed:
- to the east of Tring on Station Road and London Road in all time periods where additional developments were introduced;
  - through Berkhamsted and at the A41/A416 junction associated with new developments in all time periods;
  - along Water End Road to access the new link road to the north of Hemel Hempstead and along the east Hemel spine road to access the M1 J8 in all time periods;
  - on east-west movements between Chesham and Kings Langley most likely re-routing to and from the buffer network in the AM and PM peaks;
  - through Berkhamsted along Chesham Road and Gravel Path in the inter peak;
  - southbound along M1 in the inter peak;
  - in PM flows southbound from Junction 10 to the M25 on the M1;
  - on M1 northbound to access Hemel Hempstead from the east via Junction 8 during the PM peak; and
  - westbound in the AM peak and both directions in the inter peak along the A41 south of Tring.
- 5.4.5 Notable decreases in flows are observed:
- to the east of Tring on Station Road and London Road where additional developments were introduced, during the AM peak;
  - north east of Hemel Hempstead as a result of re-routing onto the eastern spine road and the new link road to the north of Hemel Hempstead in both the inter peak and the PM peak;
  - on Galley Hill and Boxted Road in the inter peak as traffic reruns via Potten End Hill;
  - east-west movements between Chesham and Kings Langley most likely re-routing to and from the buffer network in the AM peak;
  - in the AM peak through Berkhamsted associated with new developments;
  - along Water End Road in the AM peak to access the new link road to the north of Hemel Hempstead and along the east Hemel spine road to access the M1 J8;
  - westbound along the A41 south of Tring in the AM peak;

- less rat-running cross-country in the inter peak for east-west movements around Markyate, Great and Little Gaddesden; and
- southbound on the M1 between J10 and the M25 due to re-routeing in the PM peak on a wider scale within the buffer network seen in LP4.

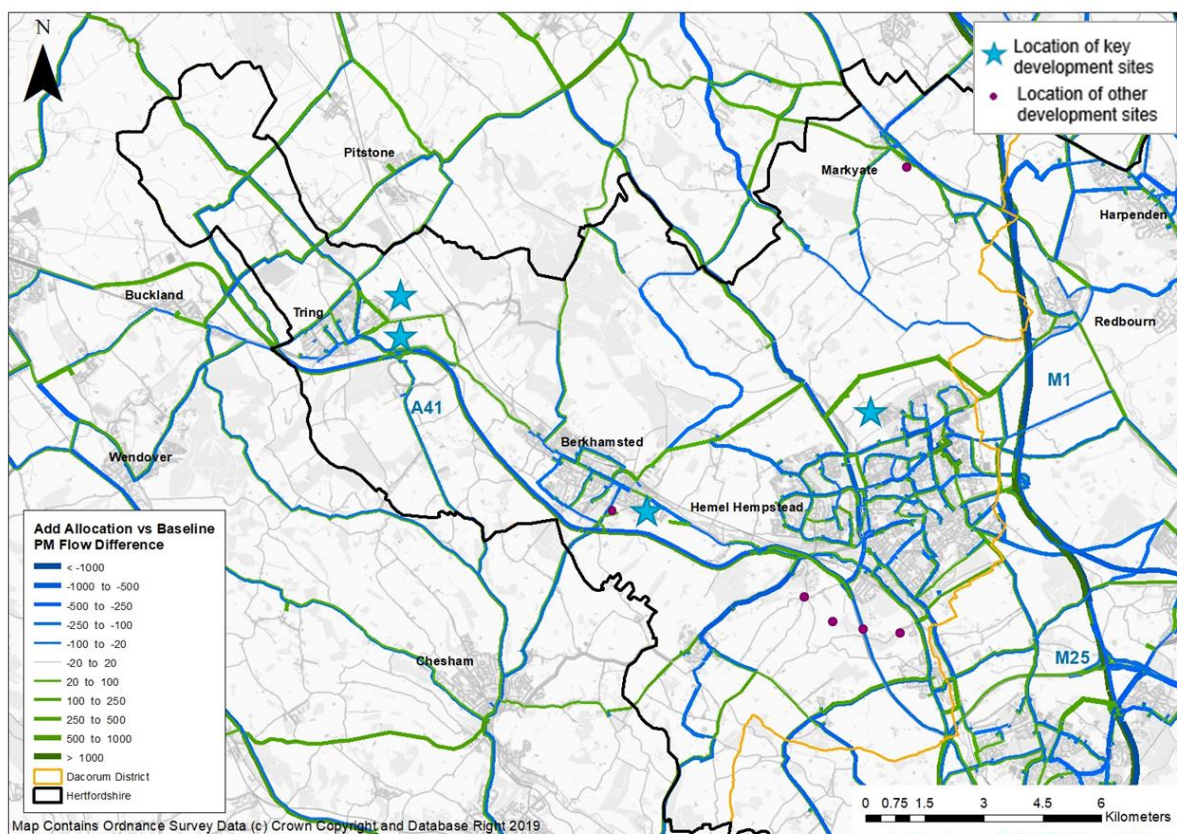
**Figure 5-7: 2036 Additional Allocation AM Peak Flow minus 2036 Baseline AM Peak**



**Figure 5-8: 2036 Additional Allocation Inter Peak Flow minus 2036 Baseline Inter Peak**



**Figure 5-9: 2036 Additional Allocation PM Peak Flow minus 2036 Baseline PM Peak**



## 5.5 Summary of Development Impacts

5.5.1 This section summarises the effects of the 3 largest developments in Hemel Hempstead, Berkhamsted and Tring in the Additional Allocation scenario. Commentary with zoomed in plots with development locations highlighted is provided.

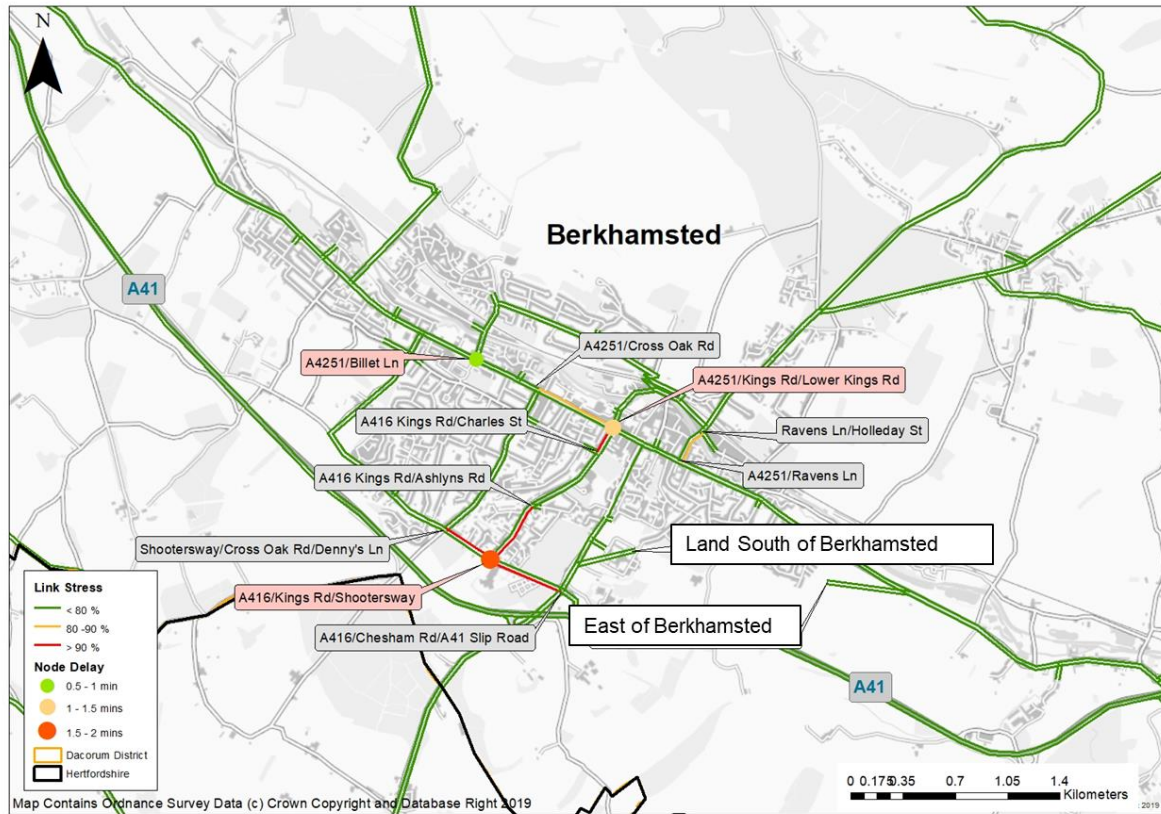
5.5.2 Impacts are compared between the Additional Allocation and Baseline scenarios where relevant.

### Berkhamsted

5.5.3 Key changes observed in Berkhamsted shown in Figure 5-10 are:

- **A4251/Lower Kings Road:**
  - Delays increase from up to 1 minute to up to 1.5 minutes in the peak; and
  - Congestion on eastbound and northbound arms remain similar to the Baseline scenario.
- **A416/Kings Road/Shootersway:**
  - Delays remain at approximately 2 minutes; and
  - Congestion on all approaches to the junction remain high.
- Small delays generated at the A4251/Billet Lane and some increases in link stress between Ravels Lane/Holleday Street and A4251/Ravens Lane junction, but these are also observed in the Baseline scenario.

Figure 5-10: Commentary of development impacts in Berkhamsted



## Tring

5.5.4 Key changes observed in Tring shown in Figure 5-11 are:

- **B4653/London Road/Brook Street:**
  - Some congestion may be expected on westbound arm of the junction however it is not associated with any delays.
- Link stress on all links remains below 80% and therefore are shown as a single line.

**Figure 5-11: Commentary of development impacts in Tring**

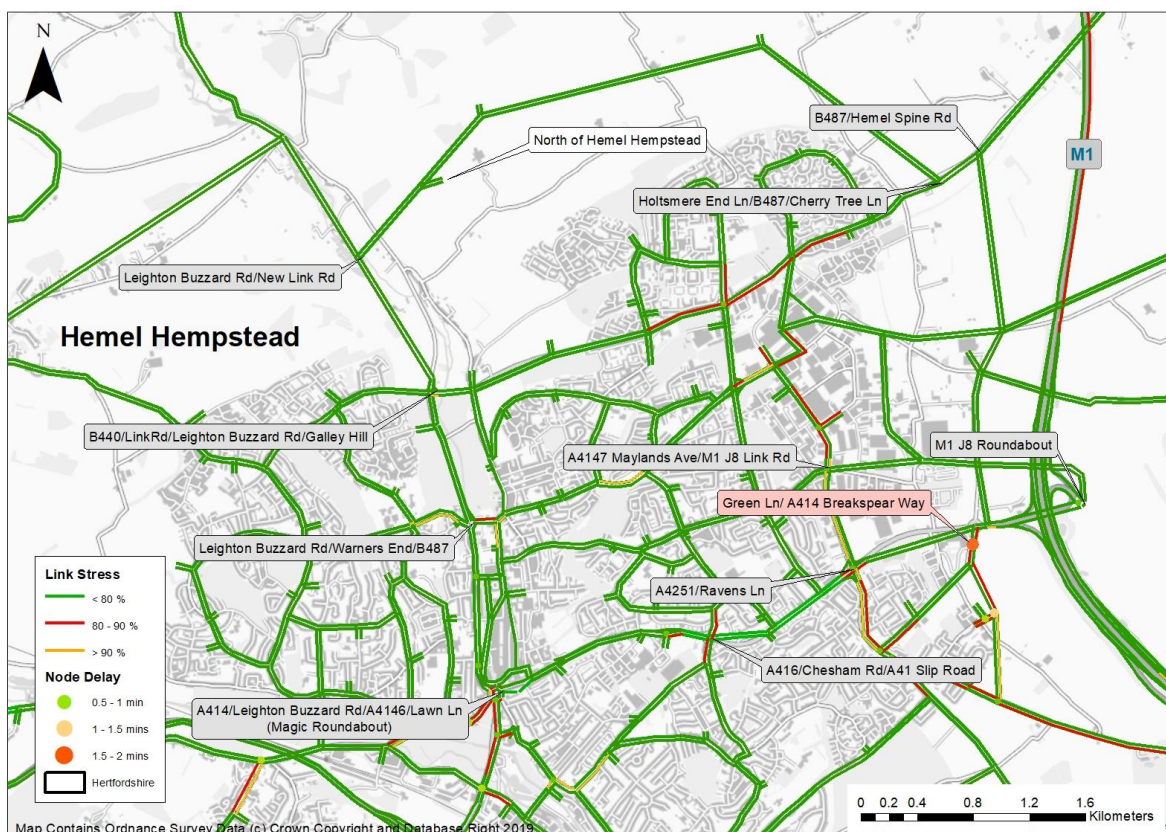


## Hemel Hempstead

5.5.5 Key changes observed in Hemel Hempstead shown in Figure 5-12 are:

- **North Hemel Link Road**
  - Increase in link stress on all Redbourn Road junctions as traffic is attracted to the North Hemel link road and nearby developments. No significant delays are associated with the congestion.
  - Development introduced causes delays on south east Hemel along A4147 at zone loading points.
  - Change in strategic routeing around Hemel caused by link road changes traffic conditions at Green Lane/A414 junction, A4151/Ravens Lane and A4147/Maylands Avenue/M1 Junction 8 link road.

**Figure 5-12: Commentary of development impacts in Hemel Hempstead**



5.5.6 Based on the comparison between the Baseline and Additional Allocation scenarios, the impact of Additional Allocation developments in Dacorum suggest that:

- Additional development traffic is not expected to adversely affect junction delays or congestion in Berkhamsted or Tring. Berkhamsted and Tring have little existing congestion, so the addition of developments is unlikely to generate significant issues.
- The addition of the northern link road at Hemel Hempstead leads to re-routing of traffic from North Hemel developments and the M1 Junction 8 toward the west and causes minor rerouting on rural roads towards Berkhamsted.



## 5.6 Development Flows

- 5.6.1 This section identifies the routing of traffic to/from the four major development sites in Dacorum District. These are:
- Land East of Berkhamsted and Land East of Berkhamsted;
  - North Hemel Hempstead;
  - East of Tring (Including New Mill) (2 linked sites); and
  - Dunsley Farm, Tring.
- 5.6.2 The full Variable Demand Model has been run in these scenarios which may affect the movements out of and into developments due to cost/time/demand changes during model assignment. It should be noted that the trip distribution is based on that from the 2014 Base Year model which were created using a Gravity Model calibrated for different purposes. The distribution therefore relies on known movements and does not account for any significant behavioural change or mode shift. These trip distribution assumptions may vary from those proposed by developers of these sites as they are brought forward for development.
- 5.6.3 Results reported are from the 2036 Dacorum Additional Allocation Local Plan scenario AM and PM peaks. Inter peak flows show similar trends and much lower volumes of traffic and are therefore not provided.
- 5.6.4 Please note that COMET uses generic NTEM trip rates, these will be lower than trip rates provided by developers as part of applications (these results should only be seen as indicative).
- 5.6.5 SATURN outputs are presented in PCUs, standard vehicle units. The results indicate that the developments cater for lots of local movements to nearby areas, but also link to strategic routes such as the A41, A414 and M1 through Dacorum. The impact of the North Hemel link road can also be clearly seen as it provides a new route choice across northern Hemel and alternative route to the M1 via junction 8 and the additional schemes planned in Hemel. Traffic wishing to head north from developments may also use the cross-country routes towards the A505, Dunstable and Luton.

Figure 5-13: Land East of Berkhamsted and Land South of Berkhamsted. AM Peak Out

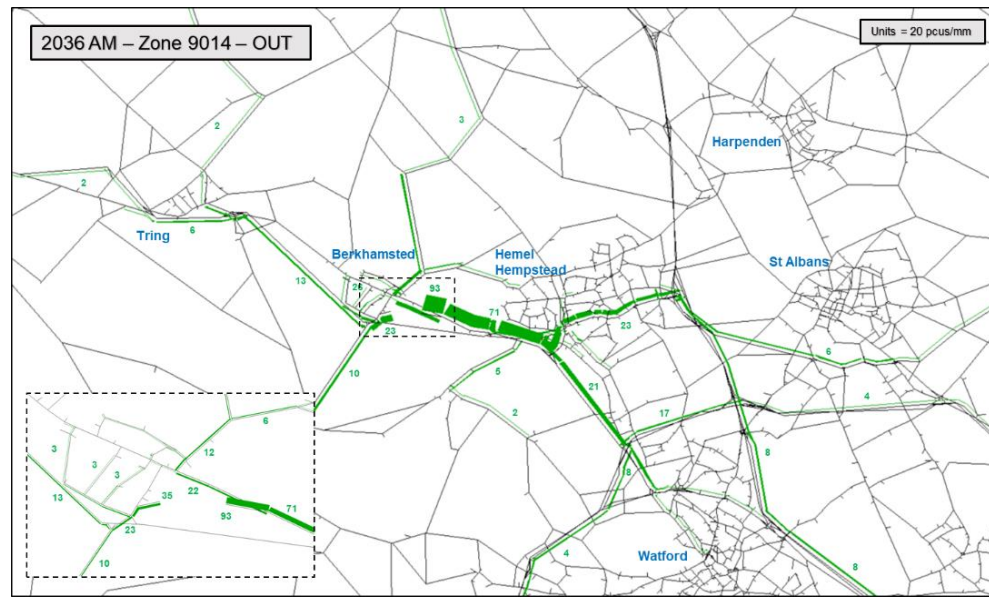


Figure 5-14: Land East of Berkhamsted and Land South of Berkhamsted. AM Peak In

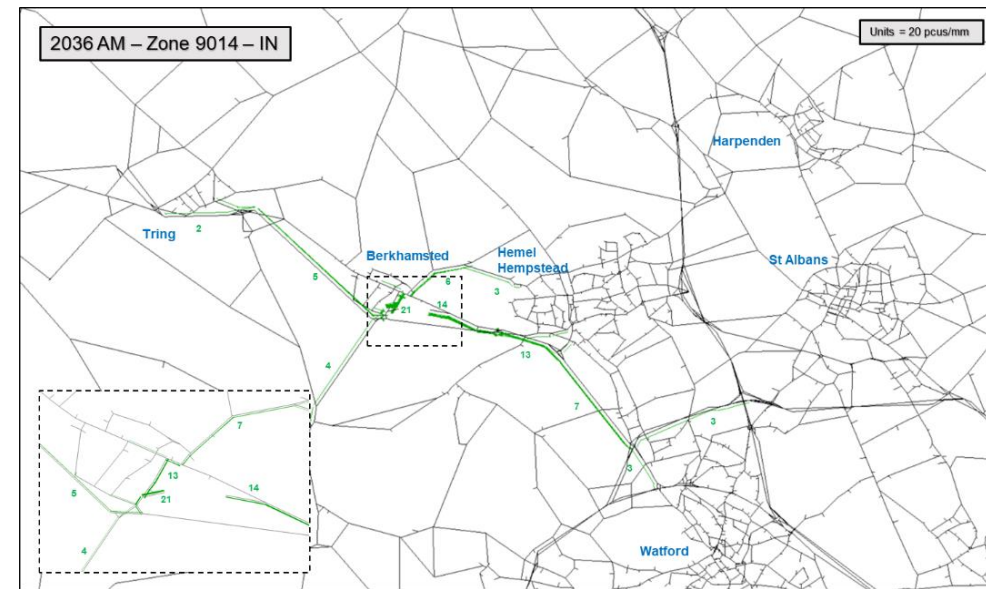


Figure 5-15: Land East of Berkhamsted and Land South of Berkhamsted. PM Peak Out

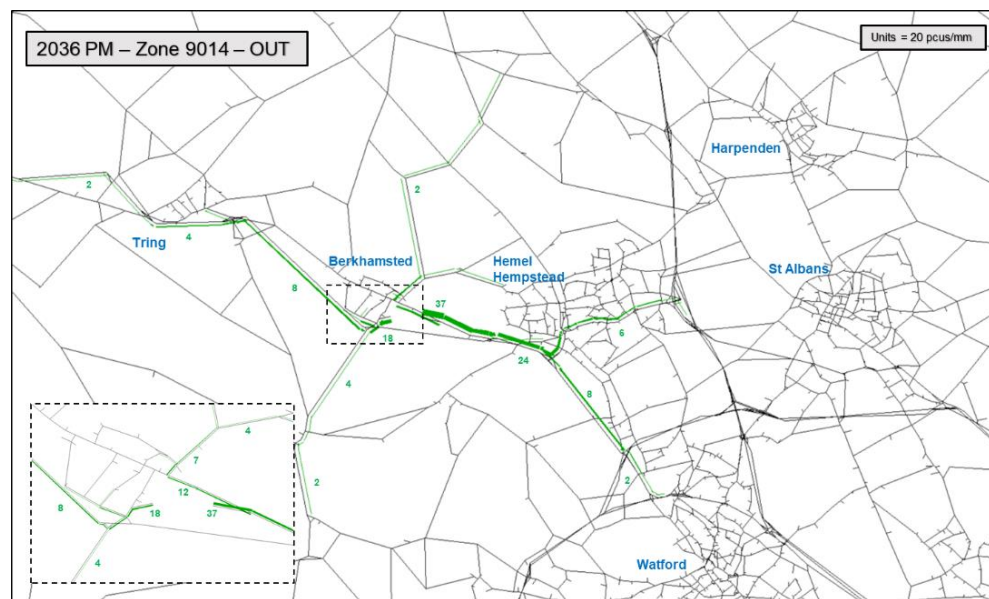


Figure 5-16: Land East of Berkhamsted and Land South of Berkhamsted. PM Peak In

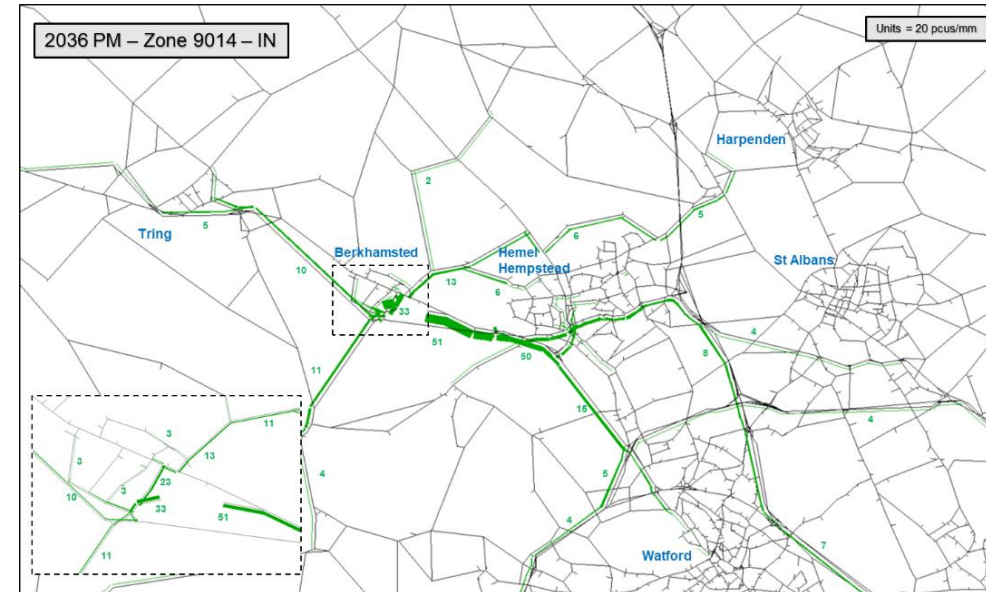


Figure 5-17: East of Tring (Including New Mill, 2 linked sites). AM Peak Out

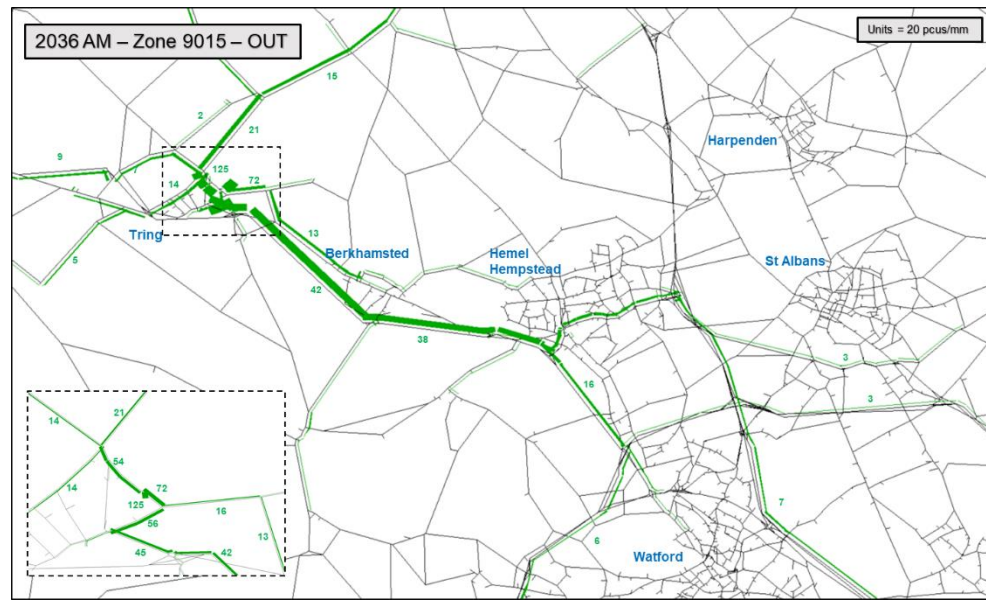


Figure 5-18: East of Tring (Including New Mill, 2 linked sites). AM Peak In

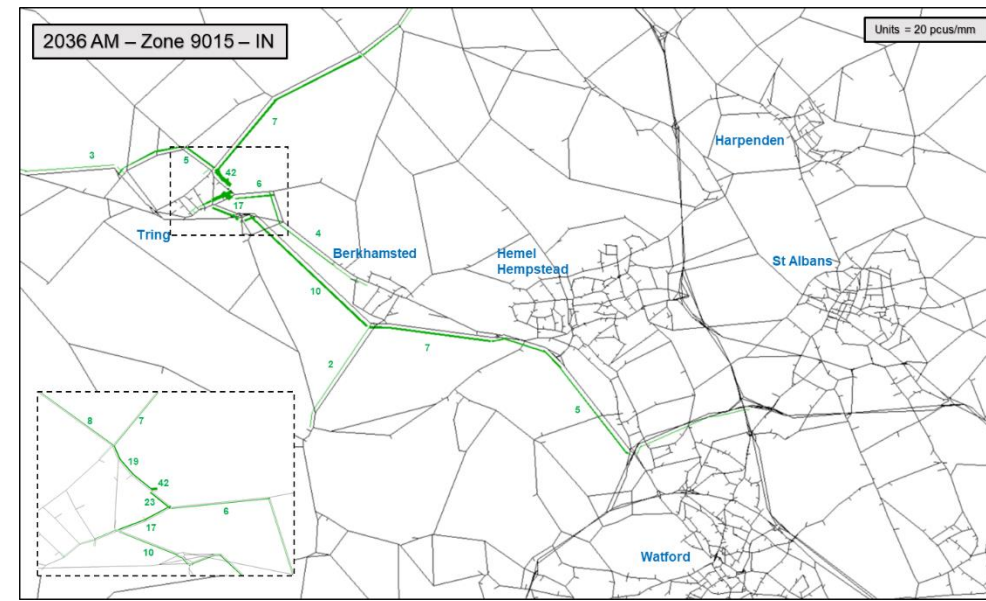


Figure 5-19: East of Tring (Including New Mill, 2 linked sites). PM Peak Out

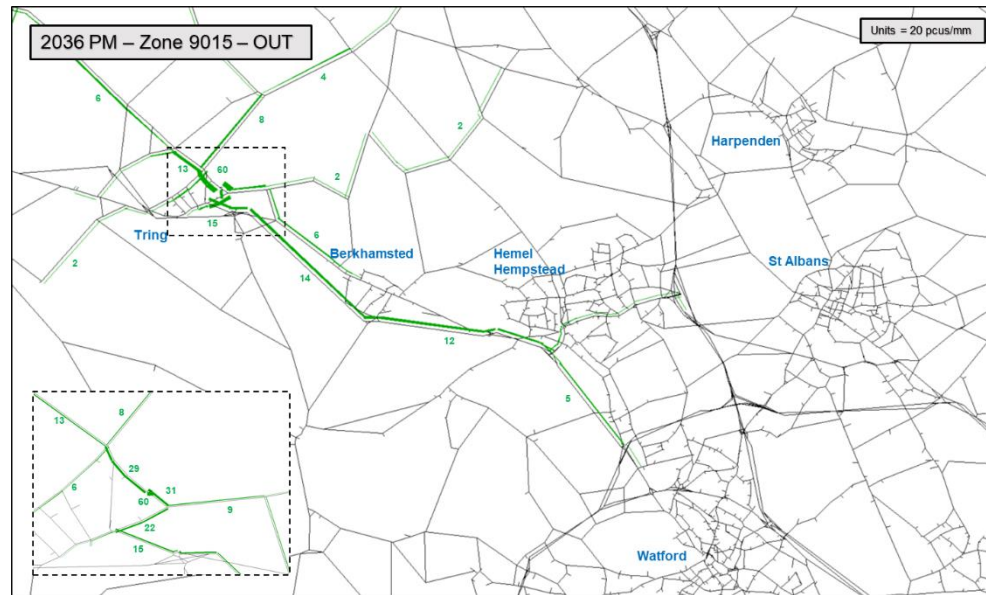


Figure 5-20: East of Tring (Including New Mill, 2 linked sites). PM Peak In

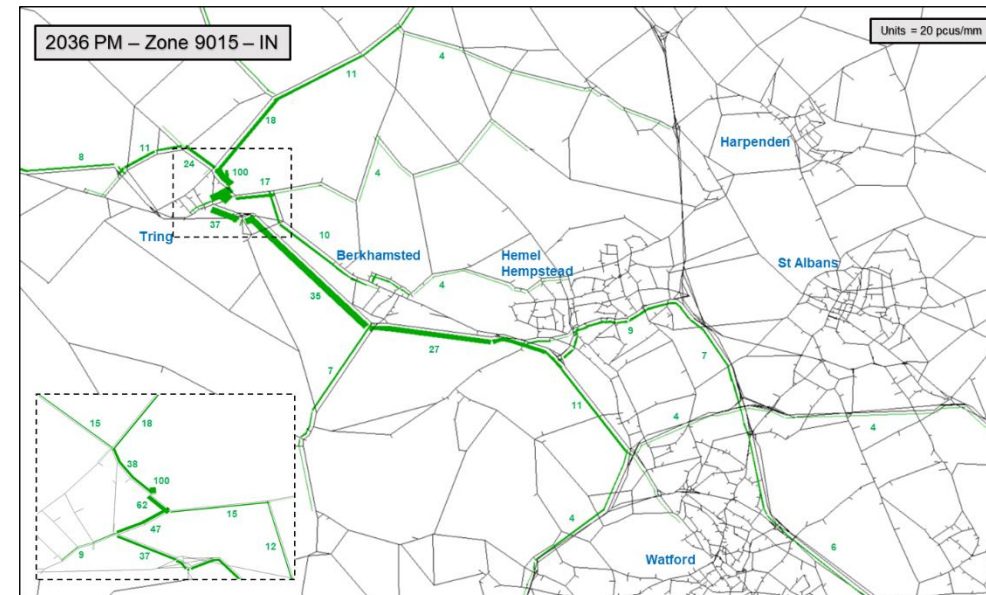


Figure 5-21: Dunsley Farm, Tring. AM Peak Out

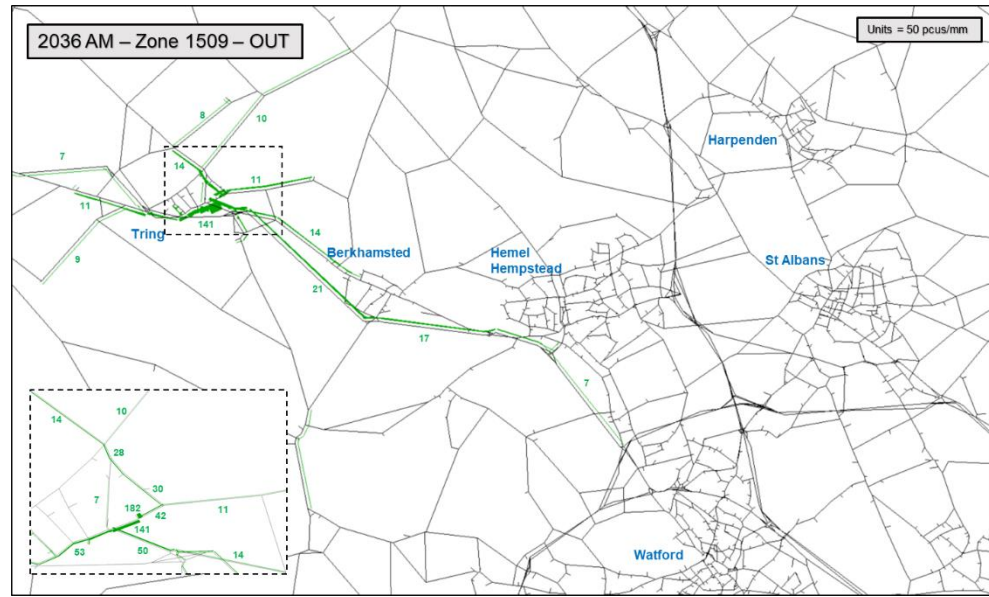


Figure 5-22: Dunsley Farm, Tring. AM Peak In

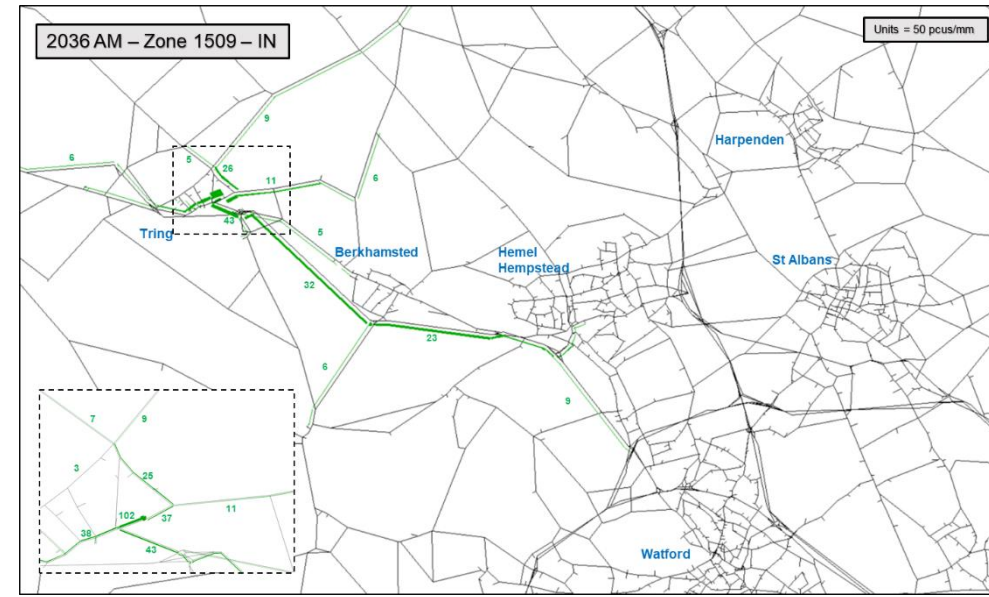


Figure 5-23: Dunsley Farm, Tring. PM Peak Out

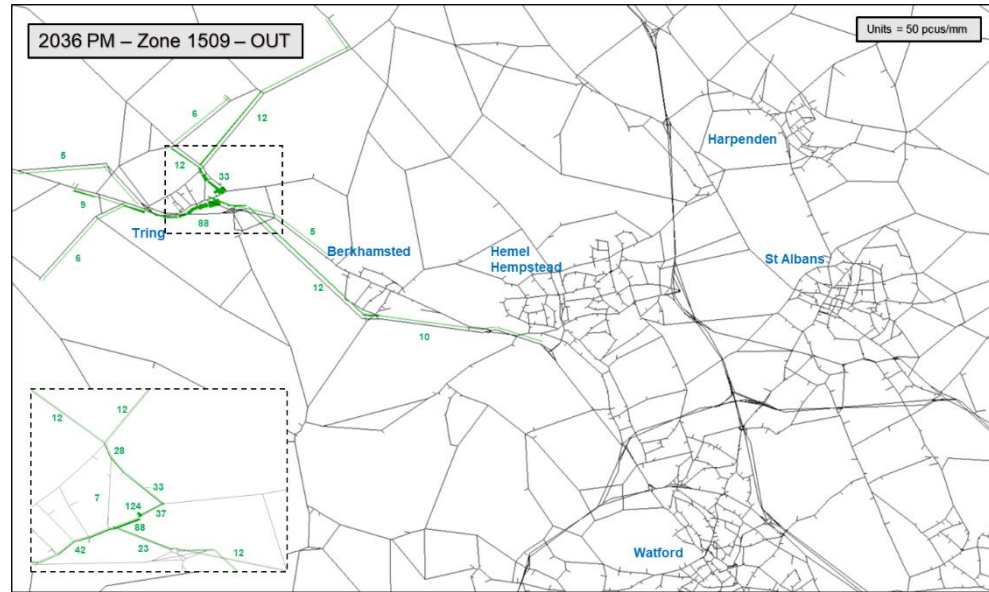


Figure 5-24: Dunsley Farm, Tring. PM Peak In

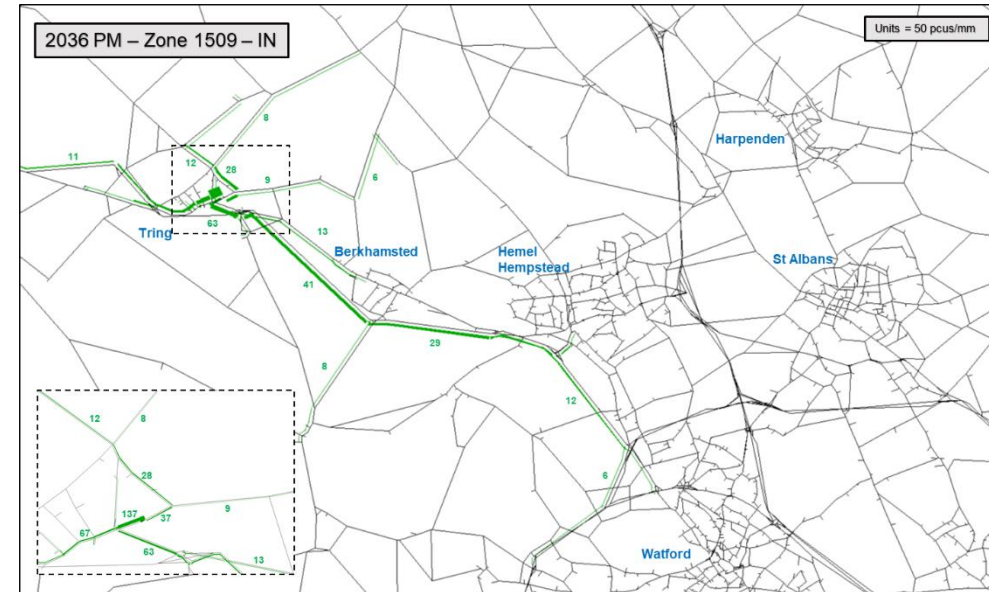


Figure 5-25: North of Hemel Hempstead. AM Peak Out

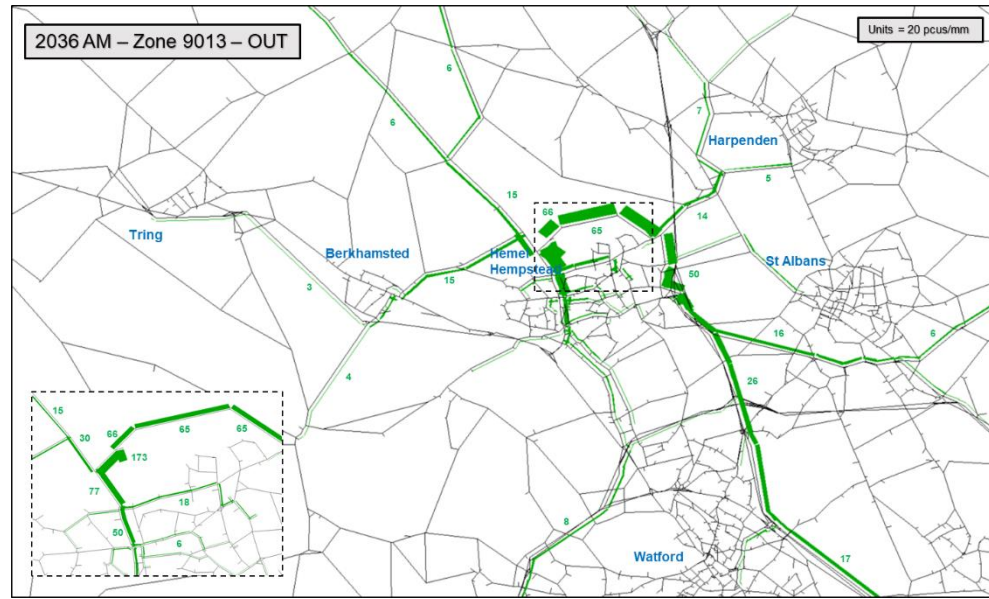


Figure 5-26: North of Hemel Hempstead. AM Peak In

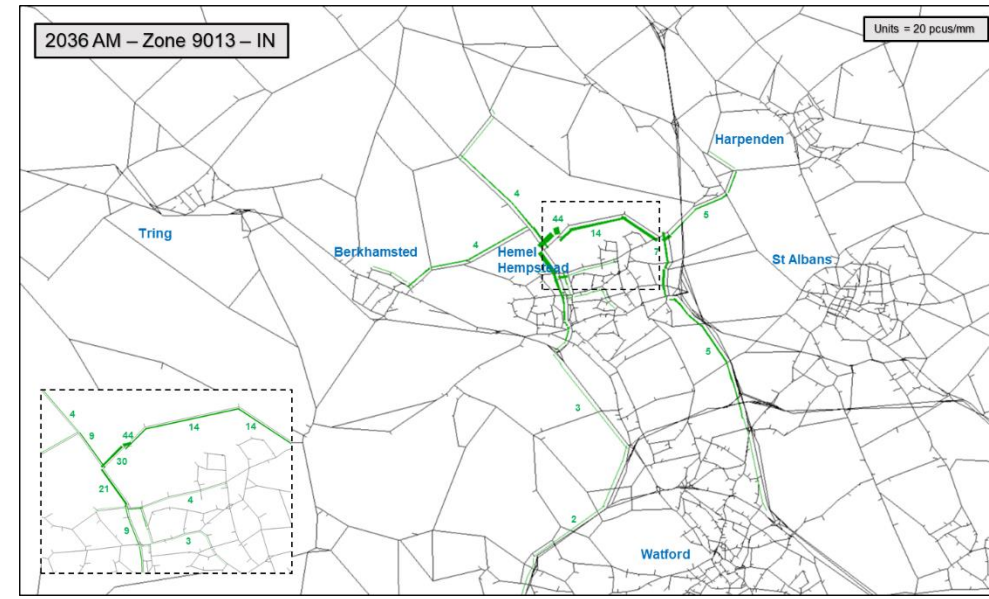


Figure 5-27: North of Hemel Hempstead. PM Peak Out

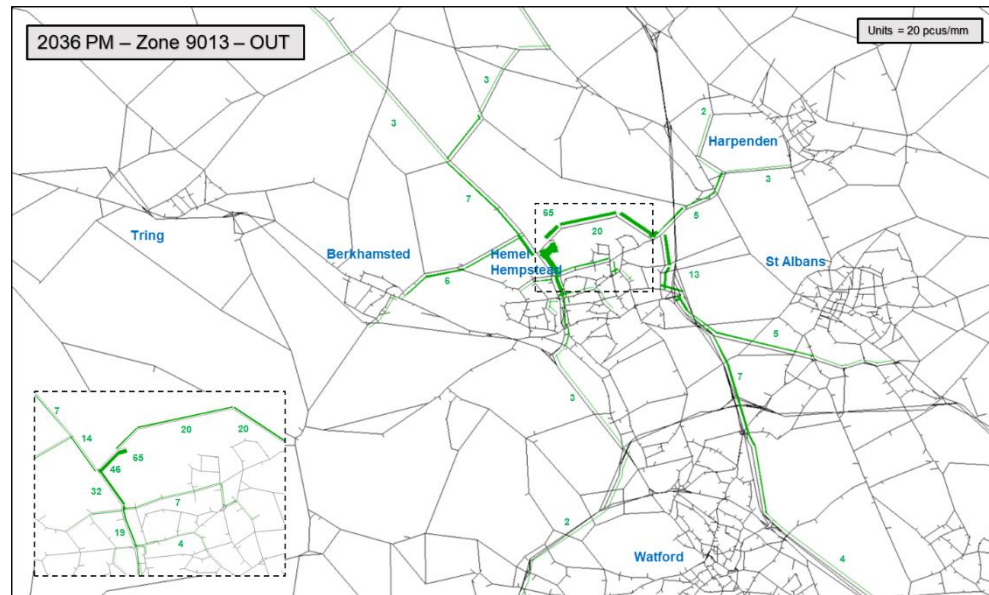
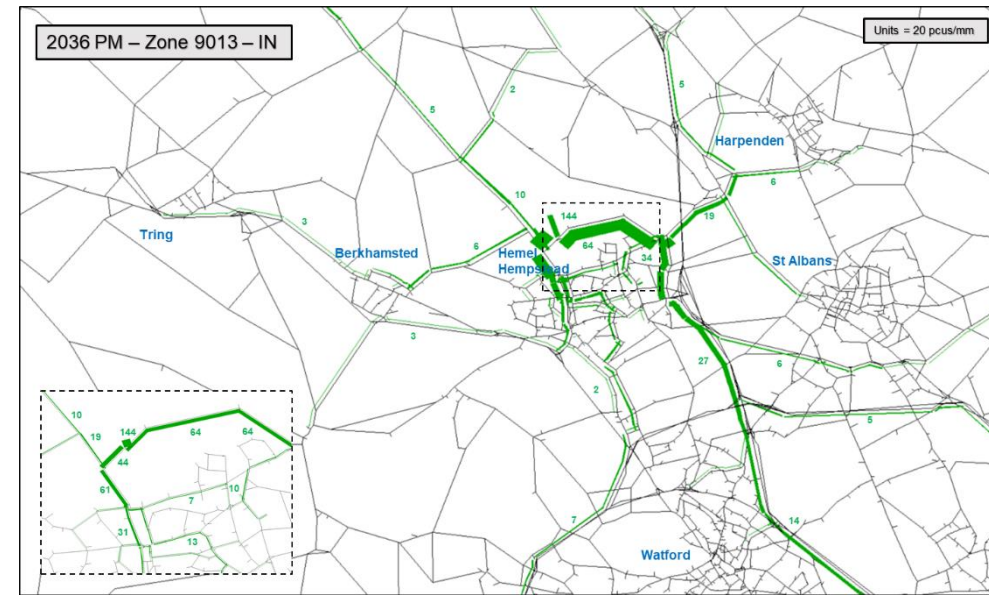


Figure 5-28: North of Hemel Hempstead. PM Peak In



## 5.7 Scenario 1 Traffic Flows

- 5.7.1 Scenario 1 tests the impact of developments without the addition of a large strategic link road across the north of Hemel Hempstead. A much shorter route was provided instead. This indicates whether planned developments could be accommodated without having a significant impact on the local transport network in Hemel Hempstead. Scenario 1 is first compared to the 2036 Dacorum Baseline scenario.
- 5.7.2 Blue indicates a reduction in traffic on a link, while green presents increases in traffic flows along a link. Any differences of +/- 20 pcus are not presented and are shown in grey. Some re-routeing between scenarios is expected.
- 5.7.3 Large developments are shown on the map with a star while other, smaller developments are shown with purple circles.
- 5.7.4 Whilst there are flows along the new link road between Leighton Buzzard and Link Road, there is a negligible reduction on Link/Redbourn Road indicating that the route is not used as a strategic route through Hemel.
- 5.7.5 Notable increases in flows are observed:
- to the east of Tring on Station Road and London Road where additional developments were introduced in all time periods;
  - through Berkhamsted along Chesham Road and Gravel Path associated with new developments in the AM and inter peak;
  - along the A41 between Hemel and Tring during the AM peak; and
  - at the A41/A416 junction associated with new developments during the inter peak.
- 5.7.6 Notable decreases in flows are observed:
- in the AM and inter peak through the north of Hemel Hempstead (along Link Road and Leighton Buzzard road);
  - in flows along the A41 near the M25 J20 likely to be caused by delays at this junction in the AM Peak where traffic entering the detailed model area chooses alternative routes via Chesham and Kings Langley; and
  - at Galley Hill and Boxted road as traffic reruns via Potten End Hill during the AM peak.
- 5.7.7 The PM peak contains greater model noise than the AM and inter peak periods, this is consistent with other COMET Local Plan Scenarios.

Figure 5-29: 2036 Scenario 1 AM Peak Flow minus 2036 Baseline AM Peak

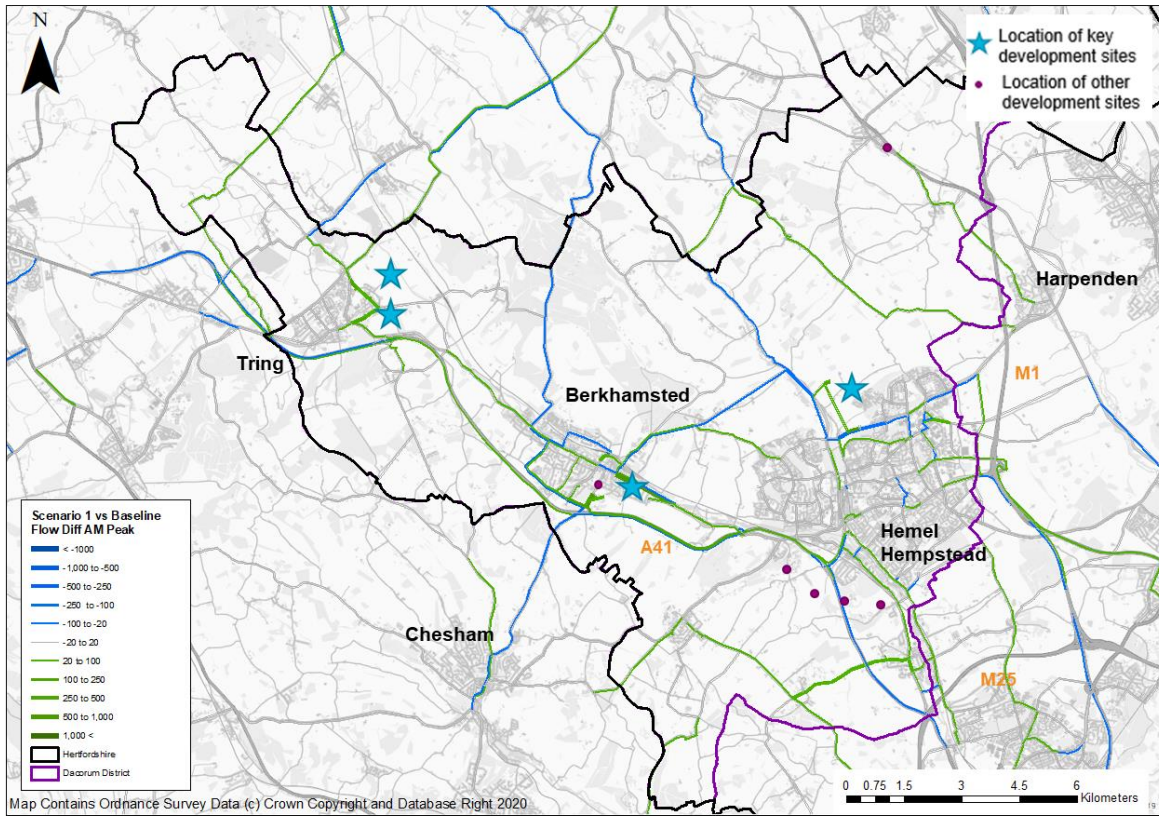
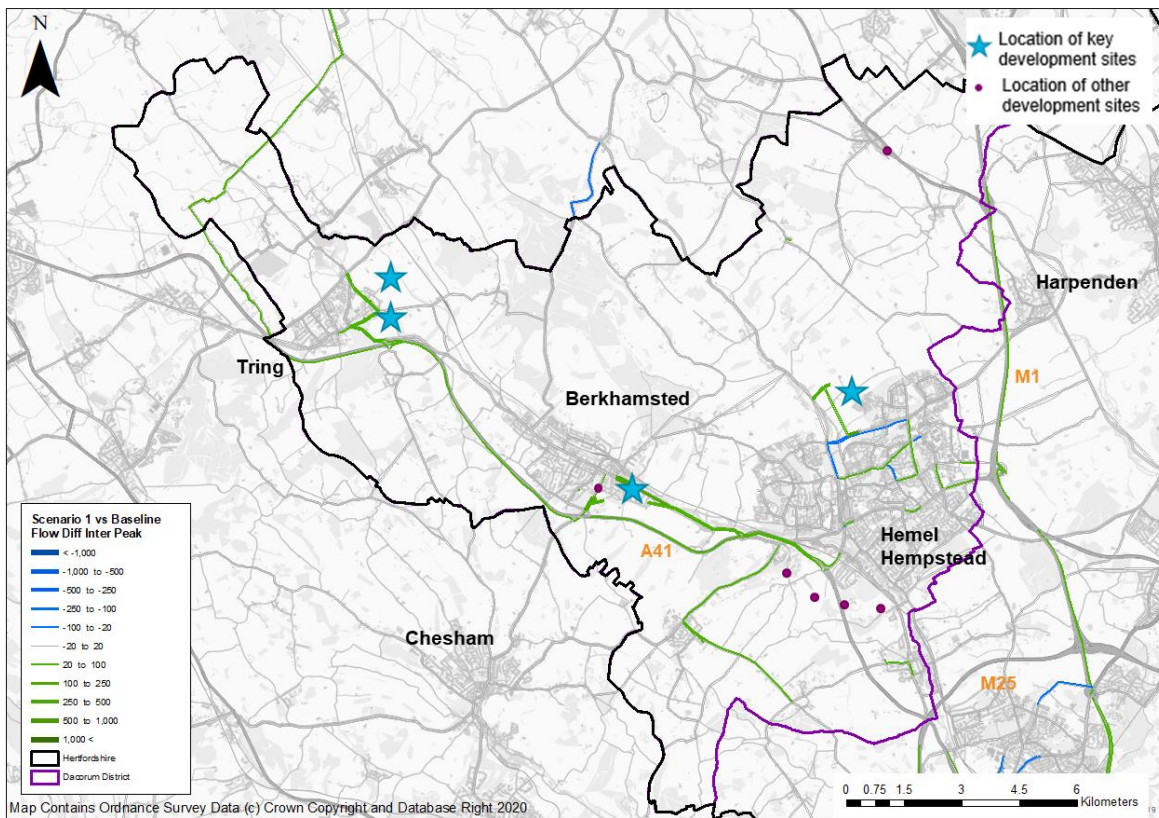
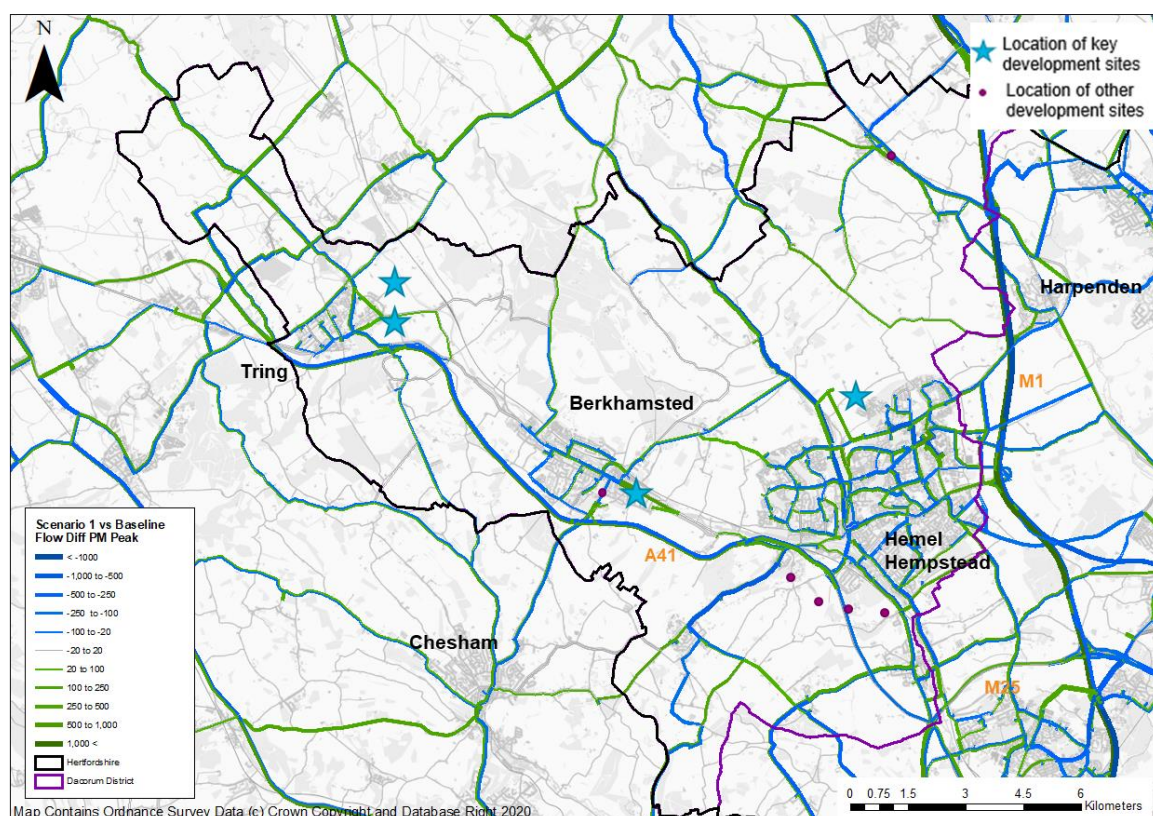


Figure 5-30: 2036 Scenario 1 Inter Peak Flow minus 2036 Baseline Inter Peak



**Figure 5-31: 2036 Scenario 1 PM Peak Flow minus 2036 Baseline PM Peak**

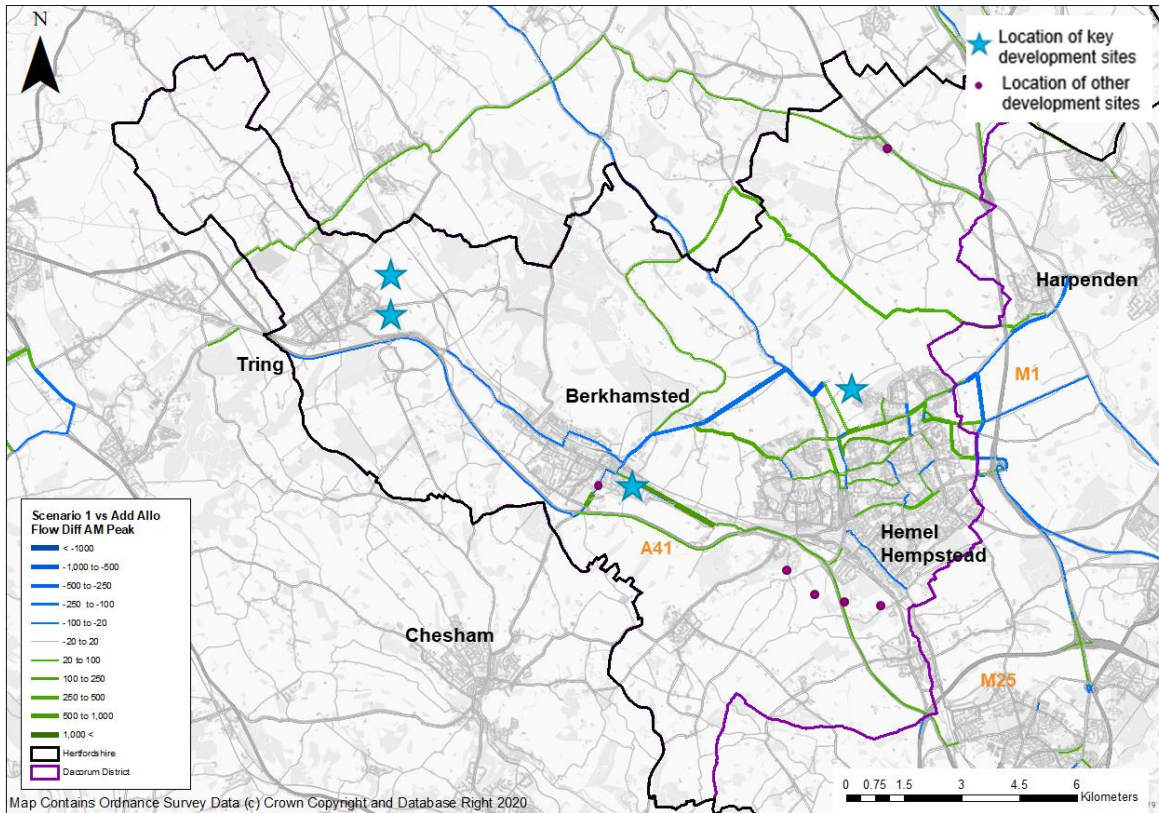


- 5.7.8 A comparison of flow differences between the COMET 2036 Dacorum Local Plan Scenario 1 and the Baseline scenario highlights that the developments included in Scenario 1 generate flow differences in line with those seen during the Additional Allocation scenario reported previously. Demand in Scenario 1 is identical to that tested in the Additional Allocation scenario.
- 5.7.9 The shorter new link road in Scenario 1 does not generate significant flow differences through or around Hemel Hempstead. This would suggest the shorter link road is only used for local movements and does not contribute to a significant new route choice.
- 5.7.10 Flow differences are now compared between the Dacorum 2036 Scenario 1 and the 2036 Additional Allocation scenario.
- 5.7.11 The new shorter link road results in less traffic travelling east-west across north Berkhamsted and into Hemel to route via M1 junction 8. Traffic does route via Berkhamsted Road, Link Road, Swallowdale Lane and Boundary Way to access M1 junction 8 without the North Hemel Link Road. The overall difference in flows at junction 8 and on the M1 between scenarios is negligible.
- 5.7.12 The flow increases in north Hemel indicate that traffic uses existing routes to travel to/from M1 junction 8 instead of the North Hemel Link Road. The removal of the North Hemel Link Road also reduces traffic on the north-south route through Maylands parallel to the M1 (the extension of Green Lane to Redbourn Road). Some traffic also diverts back onto the A41 between Berkhamsted and the M25 or uses east-west county routes north of Berkhamsted towards Harpenden and the M1.

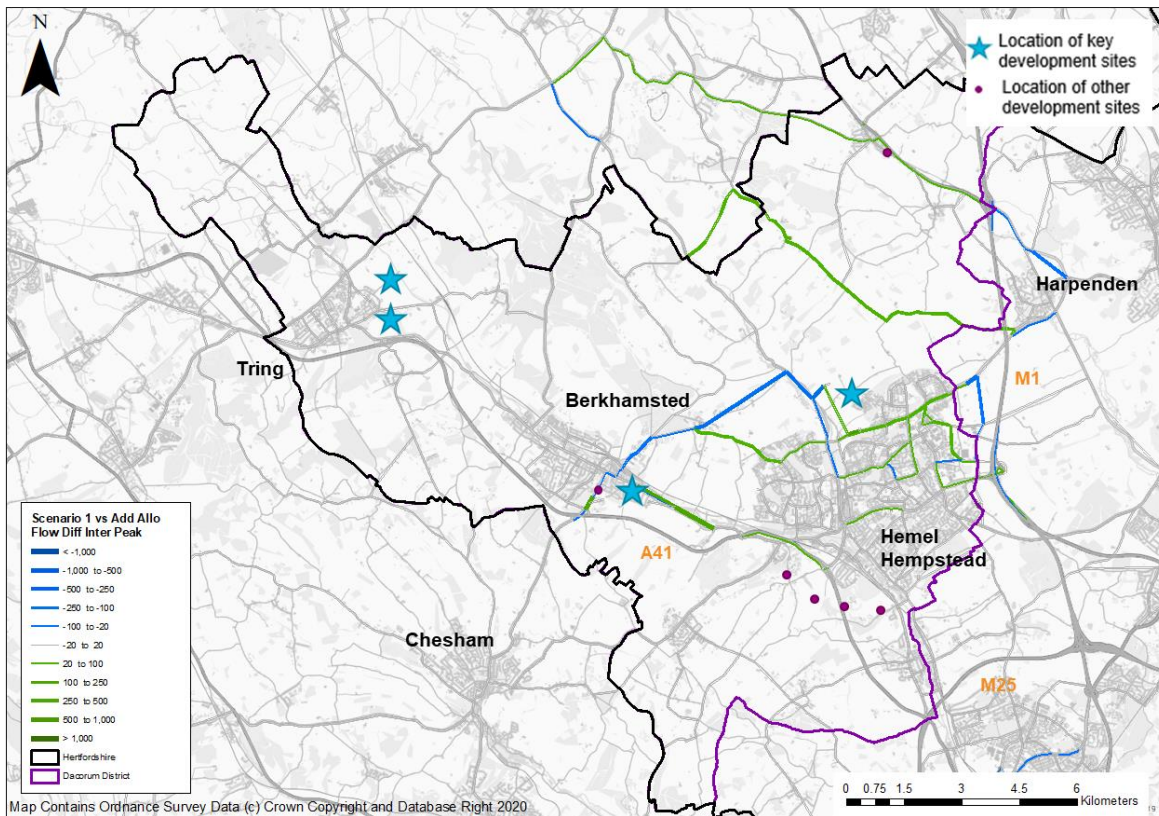


- 5.7.13 The removal of the North Hemel Link Road also reduces traffic on the north-south route through Maylands parallel to the M1 in the PM peak. Some traffic is also using east-west county routes north of Berkhamsted towards Harpenden and the M1.

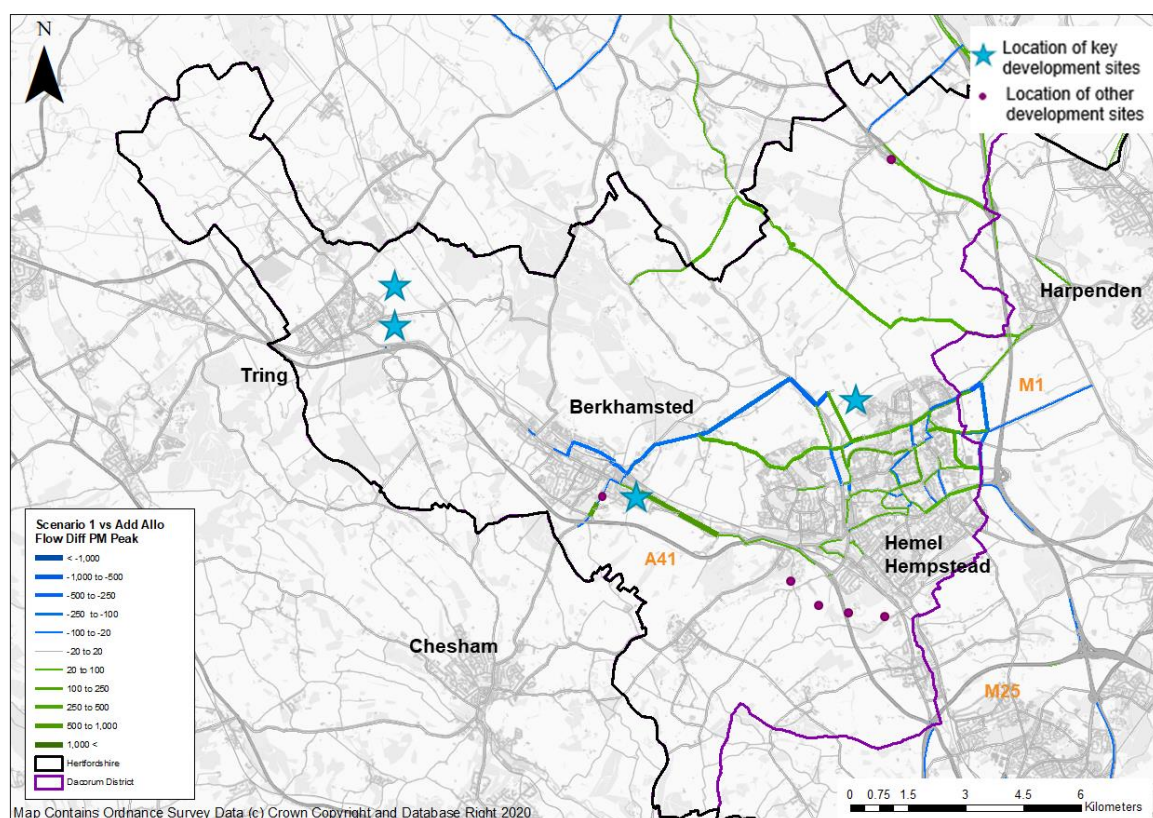
**Figure 5-32: 2036 Scenario 1 AM Peak Flow minus 2036 Additional Allocation AM Peak**



**Figure 5-33: 2036 Scenario 1 Inter Peak Flow minus 2036 Additional Allocation Inter Peak**



**Figure 5-34: 2036 Scenario 1 PM Peak Flow minus 2036 Additional Allocation PM Peak**



- 5.7.14 Comparing flow differences between the COMET 2036 Dacorum Local Plan Scenario 1 and the Additional Allocation scenario highlights that the North Hemel Link Road contributes to a different strategic route choice across/through Hemel between M1 junction 8 and Berkhamsted/Tring.
- 5.7.15 The shorter new link road in Scenario 1 does not replicate the flows seen in the Additional Allocation scenario. This would suggest the shorter link road is only used for local movements and does not contribute to a strategic movement like the North Hemel Link Road.
- 5.7.16 Traffic is reallocated to parallel east-west routes in Hemel Hempstead when the North Hemel Link Road is removed. Some traffic also reroutes via the A41 between the M25 and Berkhamsted.
- 5.7.17 It should also be noted that the A414 through Hemel Hempstead remains as a dual carriageway road in both these scenarios. If it were reduced to one lane only for general traffic this would place additional stress on parallel east-west routes in Hemel Hempstead.

## 5.8 Scenario 1 Network Stress and Delays

- 5.8.1 Delays modelled in the highway assignment model are presented in the following sections in terms of link stress (volume over capacity – V/C) and junction (node) delay in minutes.
- 5.8.2 Link stress (or V/C) represents the level of congestion along a link (road). Below 80% roads are expected to be relatively free flowing with minimal delays. Between 80% and 90% roads will begin to show signs of congestion, speeds will lower, and delays will occur at junctions. Over 90% the road will be very congested with low average speeds and delays expected at junctions.

5.8.3 The commentary given in the following sections is not intended as a comprehensive statement of network functionality, rather, it highlights where the main areas of congestion and delay may be expected at a corridor/strategic level given the assumptions inherent in these tests.

5.8.4 Trends shown in the link stress plots are:

- Roads in Tring and Berkhamsted perform well. In Hemel Hempstead congestion issues are likely at approaches to the Magic roundabout and on the Green Lane/A414 junction approaches;
- Congestion on the M1 southbound between Junction 9 and Junction 8;
- Higher levels of link stress observed on the A4147 westbound potentially resulting from rat running between St Albans and Hemel Hempstead;
- East-west routes through Maylands also show high levels of link stress which will be impacted by traffic routeing to and from M1 junction 8;
- The only junction with delays in Berkhamsted is the A416/Shootersway with delays of 1-2 minutes and some congestion on all arms approaching the junction;
- Small delays of 1-1.5 minutes also observed at the A4251/A416 road junction to the east of Hemel Hempstead;
- Longest delays are seen at M25 Junction 20 in all time periods; and
- Delays occur at the Boxmoor junction and the A4251/A414 junction in the PM peak.

Figure 5-35: Dacorum Scenario 1 2036 AM Peak Link V/C



Figure 5-36: Dacorum Scenario 1 2036 Inter Peak Link V/C



Figure 5-37: Dacorum Scenario 1 2036 PM peak Link V/C



## 5.9 Scenario 1 Routeing Analysis

- 5.9.1 This section illustrates the routeing for traffic using either:
- The North Hemel Link Road (for both directions) in the Additional Allocation scenario; and
  - The shorter Link Road in Scenario 1.
- 5.9.2 The results indicate that strategic east – west traffic uses the North Hemel Link Road whereas the shorter Link Road in Scenario 1 only accommodates local movements.
- 5.9.3 Flows along the longer North Hemel Link Road are much greater and show a clear linkage with the M1 via junction 8, A414 and St Albans/Harpenden. Flows along the shorter Link Road are lower and accommodate local movements in Hemel Hempstead.
- 5.9.4 Only the AM and PM routeing analysis are presented since these show the greatest flows. All flows are in PCU standard vehicle units.
- 5.9.5 The routeing for traffic using the northern link road (for both directions). There are clear routes between the A41, Berkhamsted and Leighton Buzzard road to/from the M1, A414, M25 and Harpenden.

Figure 5-38: North Hemel Full Link Road routing analysis. AM Peak

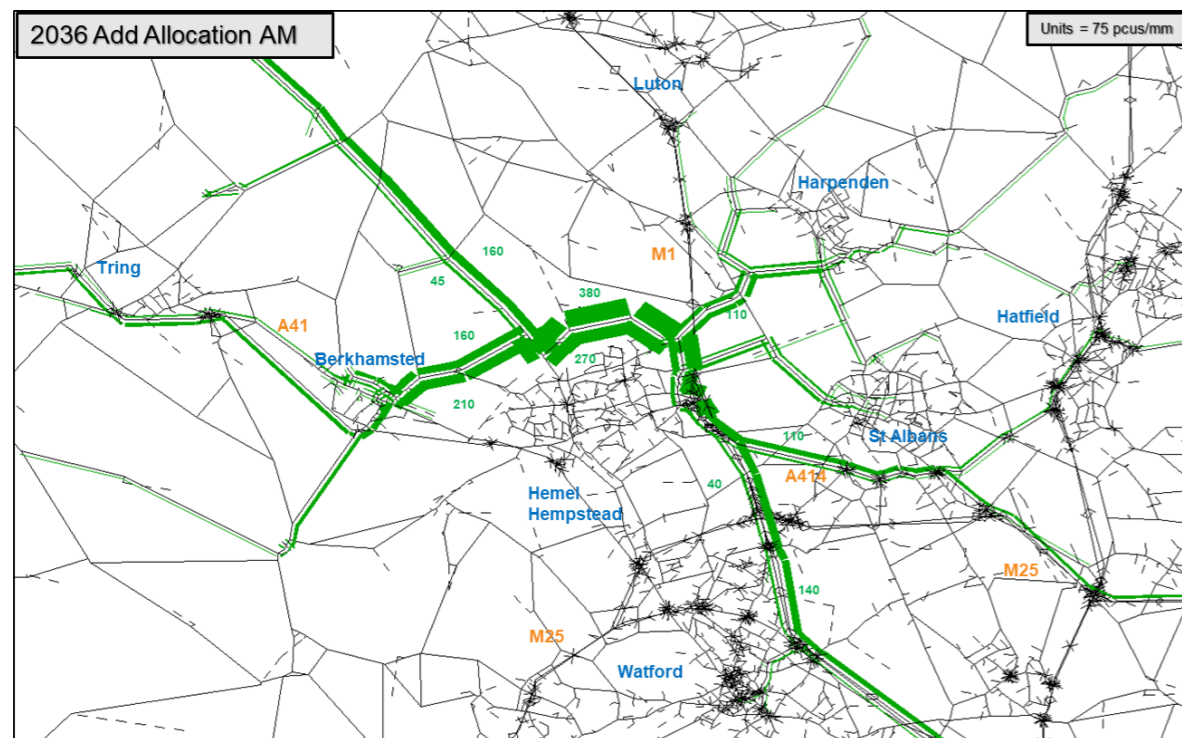


Figure 5-39: North Hemel Full Link Road routing analysis. PM Peak

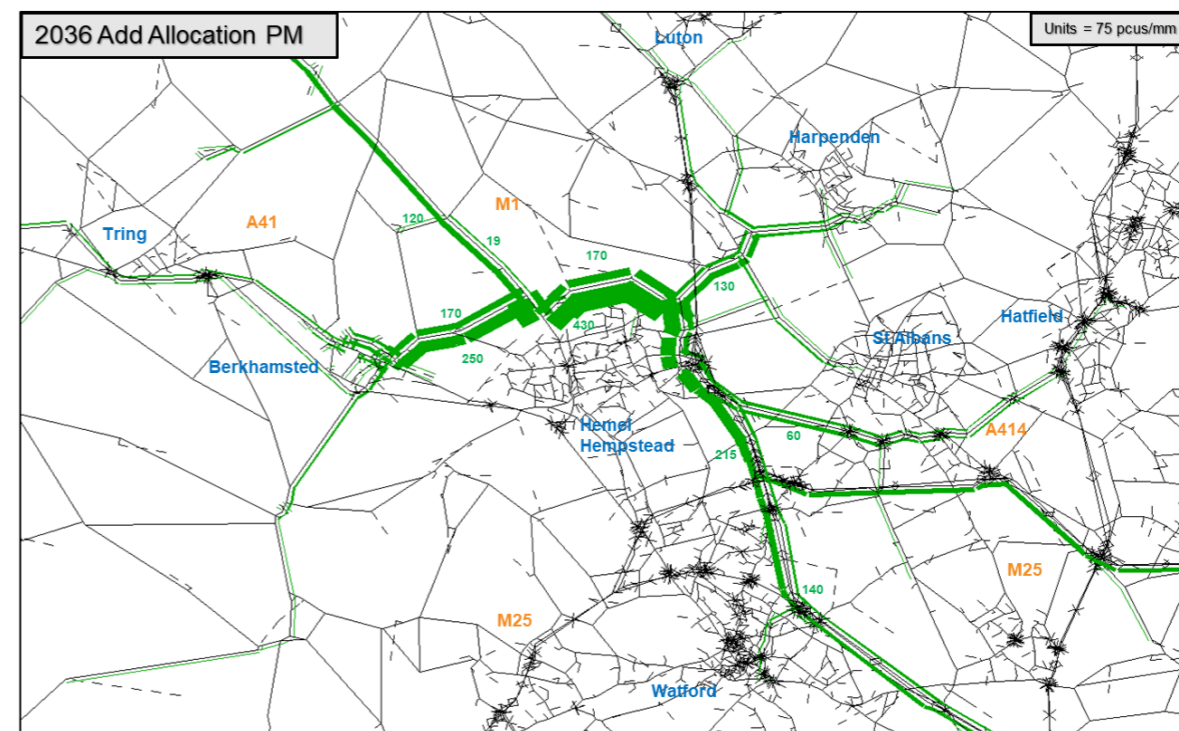


Figure 5-40: North Hemel Smaller Link Road routing analysis. AM Peak

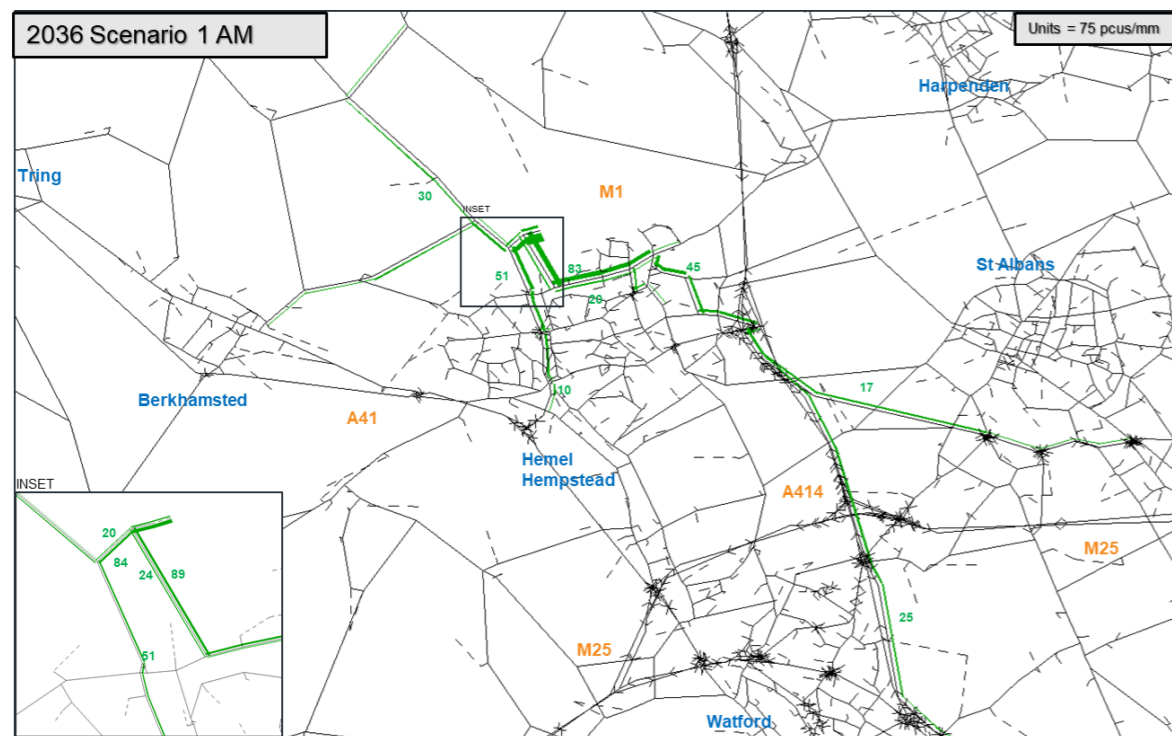
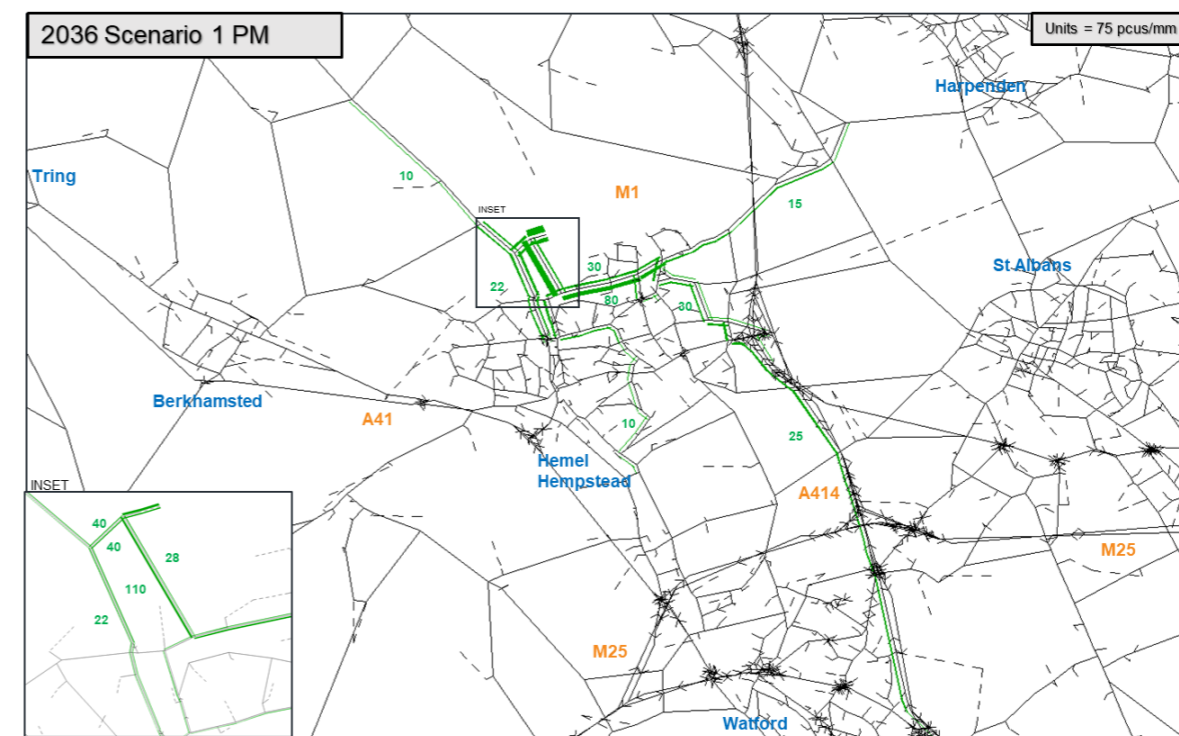


Figure 5-41: North Hemel Smaller Link Road routing analysis. PM Peak



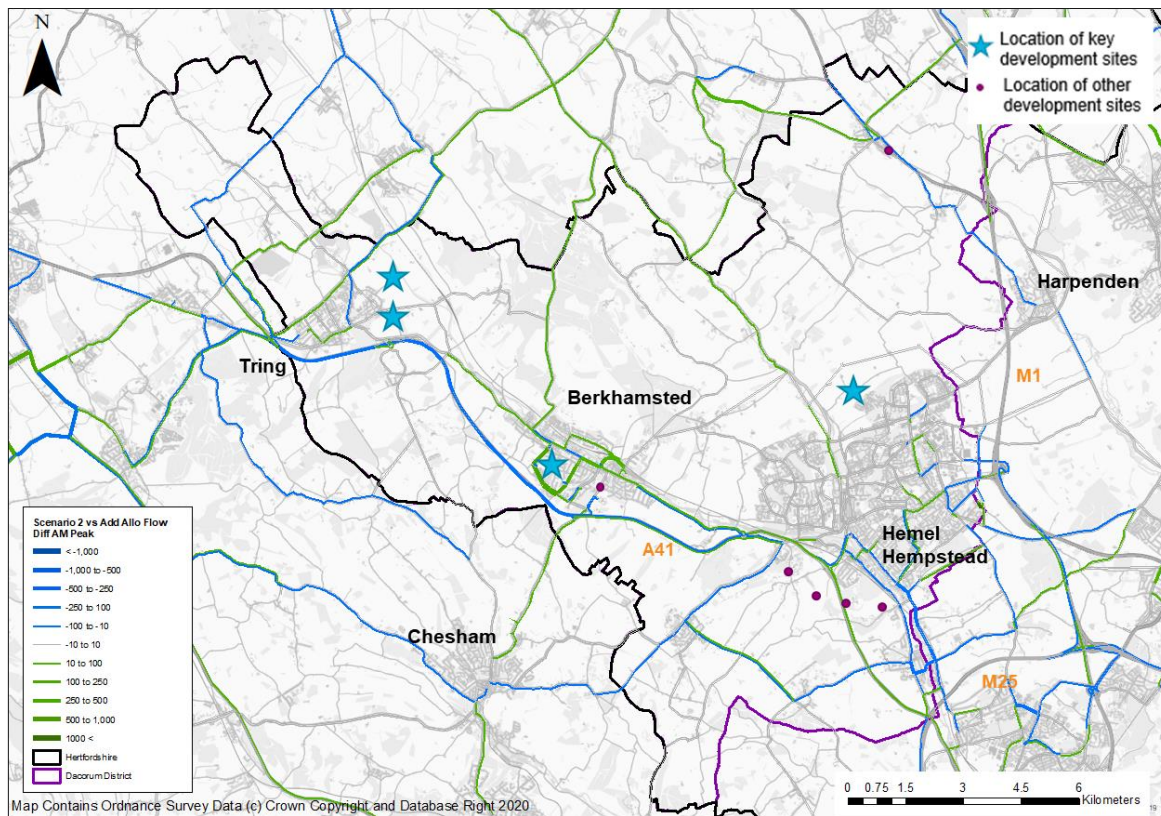
- 5.9.6 Based on the comparisons between Scenario 1 and the Baseline/Additional Allocation scenarios, the North Hemel Link Road contributes to a new strategic route choice across Hemel Hempstead and provides a key route between Berkhamsted, M1 junction 8, the A414 and locations south on the M1.
- 5.9.7 Replacing the link road with a shorter road displaces traffic onto parallel east-west routes across Hemel Hempstead. Some traffic is also displaced onto the A41 and parallel county routes north of Hemel Hempstead towards the M1 and Harpenden.
- 5.9.8 Generally, the volume of traffic using the smaller link road are much lower.

## 5.10 Scenario 2 Traffic Flows

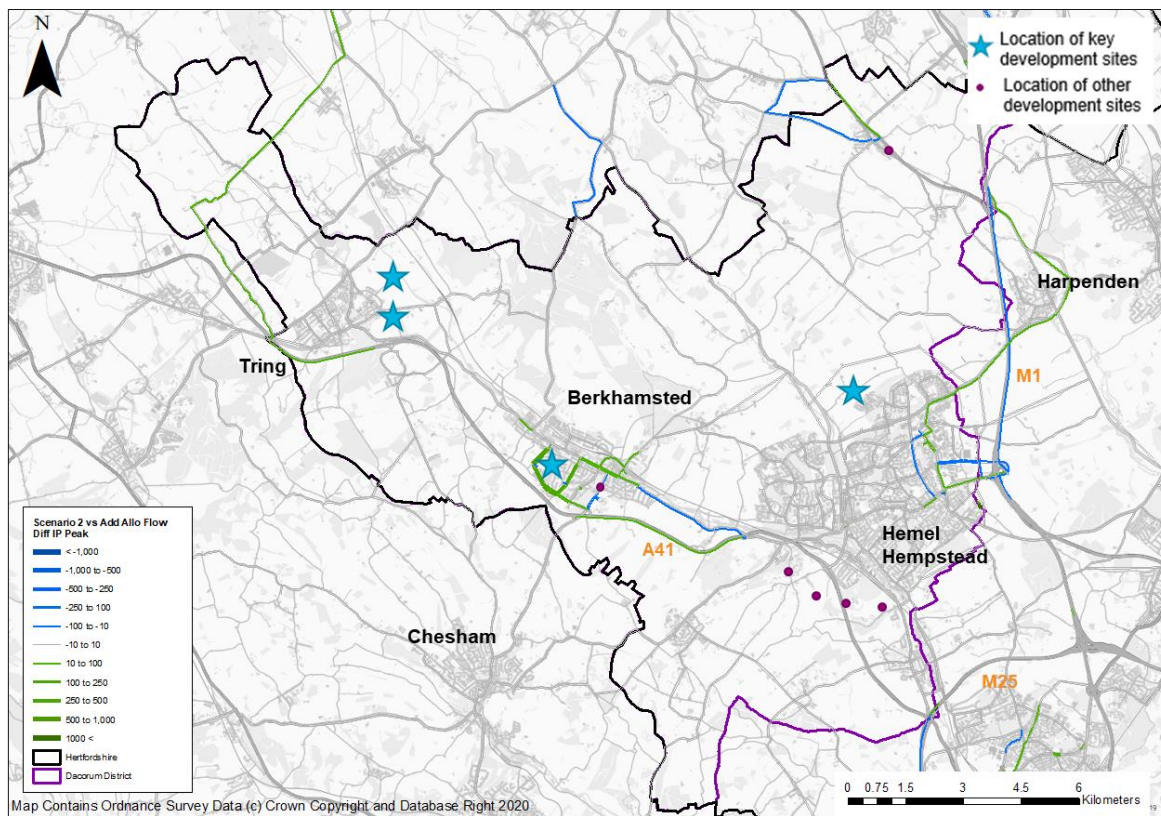
- 5.10.1 Scenario 2 assesses the likely impacts of growth options in Berkhamsted, specifically the impact of moving development previously modelled to the east of Berkhamsted (in the Additional Allocation scenario) to the west of Berkhamsted. Scenario 2 is compared to the 2036 Dacorum Additional Allocation scenario.
- 5.10.2 Blue indicates a reduction in traffic on a link, while green presents increases in traffic flows along a link. Any differences of +/- 20 pcus are not presented and are shown in grey. Some re-routing between scenarios is expected.
- 5.10.3 Large developments are shown on the map with a star while other, smaller developments are shown with purple circles.
- 5.10.4 Notable **increases** in flows are observed:
- through western Berkhamsted associated with new development location (along Shootersway and Durrants Lane) in all time periods;
  - along the A41 between Hemel and Berkhamsted (westbound);
  - along Water End Road and the North Hemel Link Road and along Tring Road as traffic re-routes from the A41 in the PM peak;
  - in the PM peak High Street Green shows increases as traffic moves off East Hemel Spine road; and
  - on the A41 between Hemel and M25 in both directions in the AM peak.
- 5.10.5 Notable **decreases** in flows are observed:
- flows along the A41 from western, external areas to Hemel Hempstead in the AM and PM peaks;
  - flows around development location initially proposed in East Berkhamsted (blue star shows new location in West Berkhamsted) most noticeable in the AM peak;
  - along approach to M1 Junction 8 as a result of slight changes in routing choice through eastern Hemel in all time periods;
  - on London Road and Chesham Road where the development was allocated in the additional allocation scenario in the interpeak; and
  - on both Galley Hill and Boxted road as traffic reruns via Potten End Hill in the AM Peak.



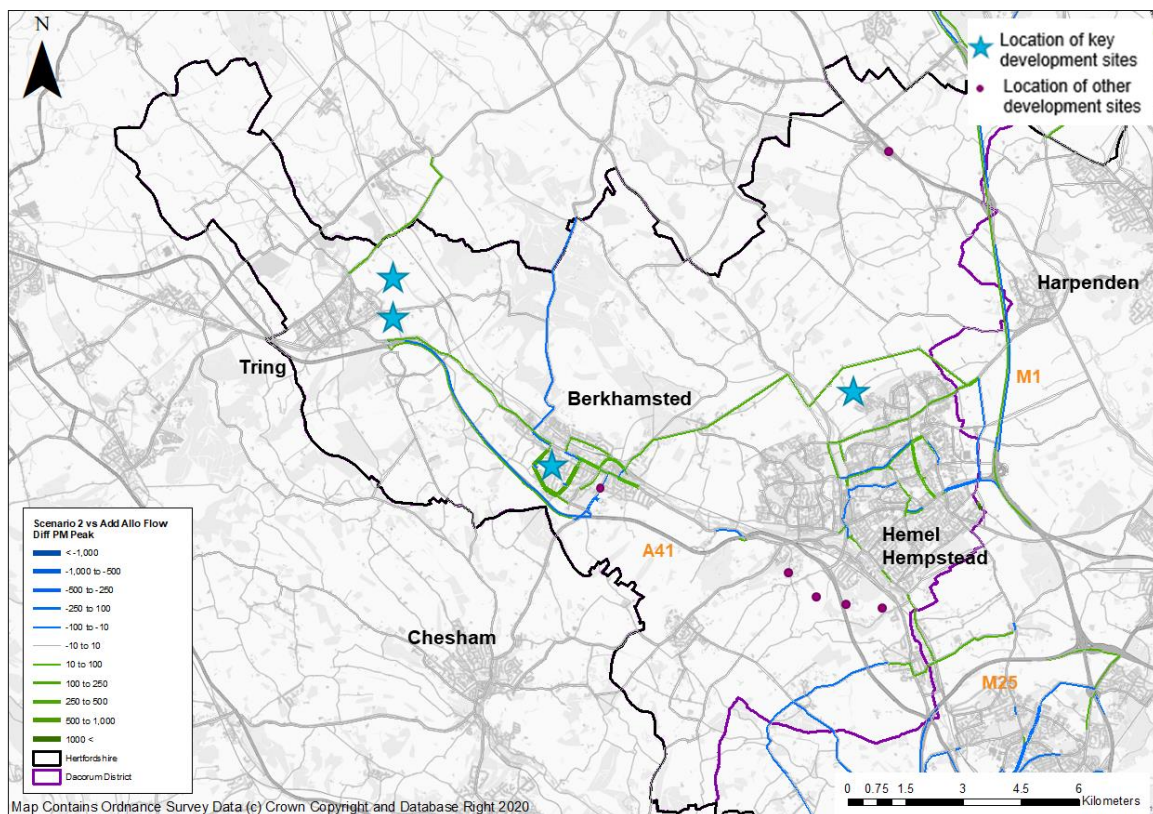
**Figure 5-42: 2036 Scenario 2 AM Peak Flow minus 2036 Additional Allocation AM Peak**



**Figure 5-43: 2036 Scenario 2 Inter Peak Flow minus 2036 Additional Allocation Inter Peak**



**Figure 5-44: 2036 Scenario 2 PM Peak Flow minus 2036 Additional Allocation PM Peak**



- 5.10.6 Comparison of flow differences between the COMET 2036 Dacorum Local Plan Scenario 2 and the Additional Allocation scenario shows that moving the development from East Berkhamsted to West Berkhamsted has little effect in traffic flows in the area.
- 5.10.7 As COMET uses generic trip rates, rather than those identified by a developer, the impacts are as expected, and we would recommend more localised junction modelling is used to fully quantify the impacts in Berkhamsted.
- 5.10.8 Moving the development location has negligible effect on the volume of flows using the North Hemel Link Road in the AM and Inter Peaks, but a small increase in the PM Peak. This reinforces that the road is used as a strategic route to the M1 and eastern Hemel and not only used by local traffic.
- 5.10.9 It should also be noted that the A414 through Hemel Hempstead remains as a dual carriageway road in this scenario. If it were reduced to one lane only for general traffic this would place additional stress on parallel east-west routes in Hemel Hempstead.

## 6. Public Transport Forecast Results

### 6.1 Introduction & Caveats

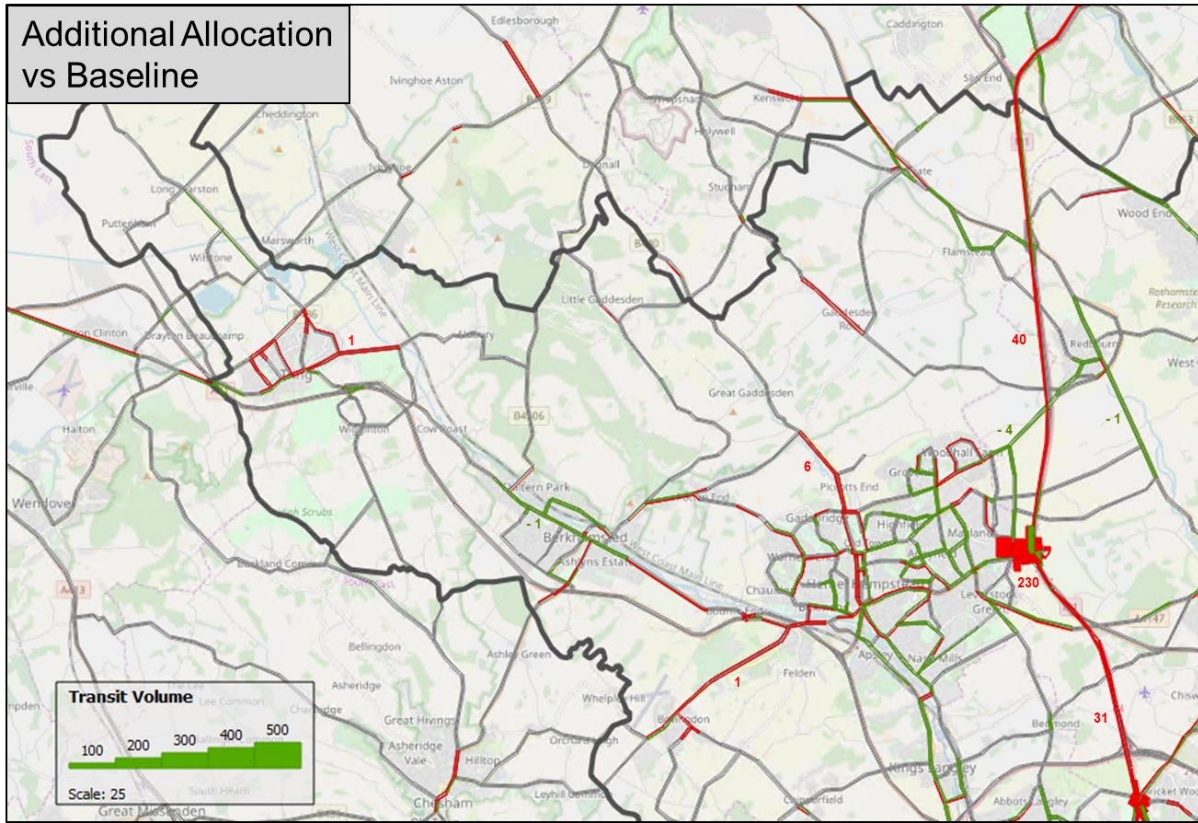
- 6.1.1 This section details the public transport bus and rail flow differences between the 2036 Dacorum Baseline and Dacorum Additional Allocation scenarios. As detailed previously, there were no scheme differences between the scenarios.
- 6.1.2 The thicker the band, the greater the demand. Red indicates an increase in public transport passengers while green indicates a decrease in passengers.
- 6.1.3 It should be considered that COMET forecast models predict a reduction in bus patronage over time as incomes rise faster than bus fares therefore bus travel decreases in attractiveness and travelling by other modes (car, rail, active modes) increases.
- 6.1.4 In addition, the COMET rail model does not consider capacity or passenger crowding and is therefore unconstrained by congestion. While the model forecast is not considered implausibly high as a central assumption, it might require capacity improvements on the rail network to achieve.
- 6.1.5 While the model forecast for rail growth is high relative to other modes, it is quite likely to be lower than the actual growth that will occur. UK rail growth in the past two decades has been close to 4% per year, which if continued, would imply 95% growth from 2014 to 2036. While past trends may not continue, it is likely that the model's rail growth forecast is in fact conservative.
- 6.1.6 Longer distance bus travel decreases as rail becomes a more attractive option, however some local movements by bus increase due to the linkages of new developments to bus routes.

### 6.2 Bus Passenger Flow

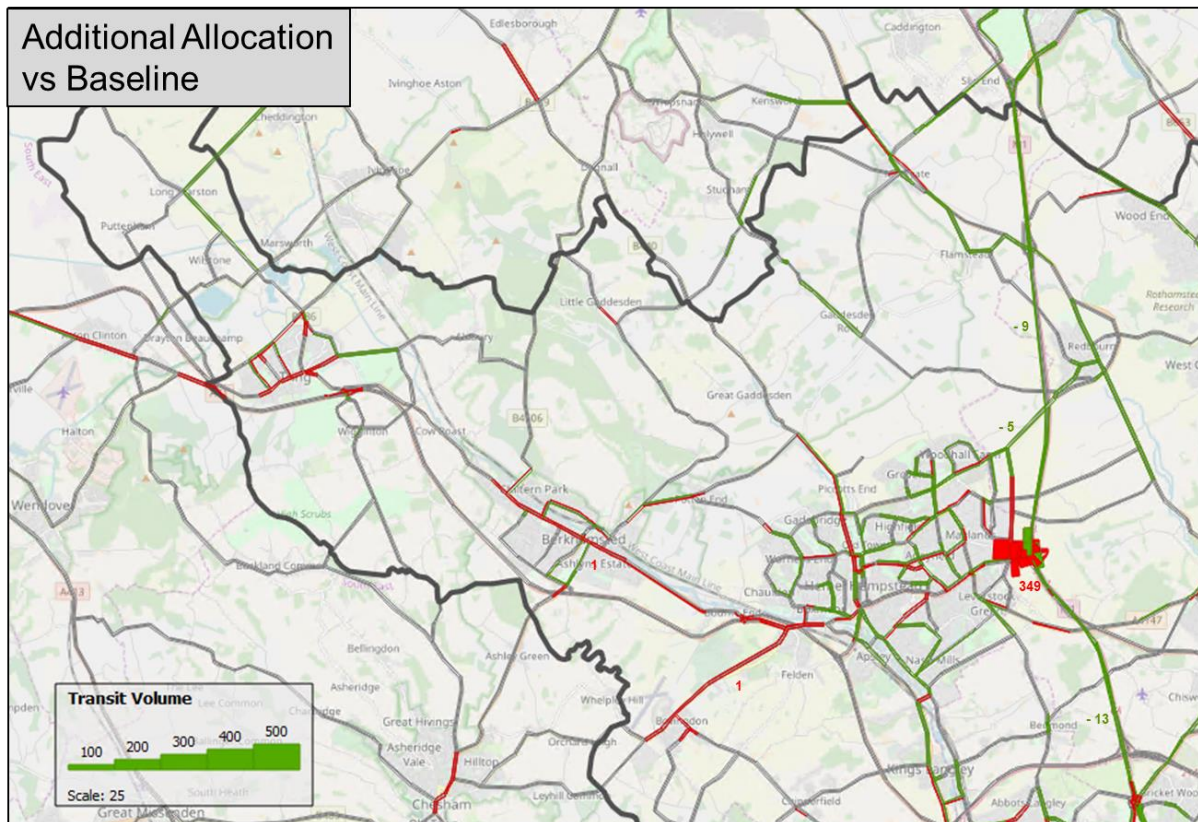
#### Bus Flow Differences between Baseline and Additional Allocation

- 6.2.1 Flow difference plots for bus demand are presented below. These show the differences between 2036 Baseline and Additional Allocation scenario passenger flow.
- 6.2.2 Red bars indicate an increase in flow, while green bars indicate a decrease. The greater the thickness of the line, the greater the flow difference.

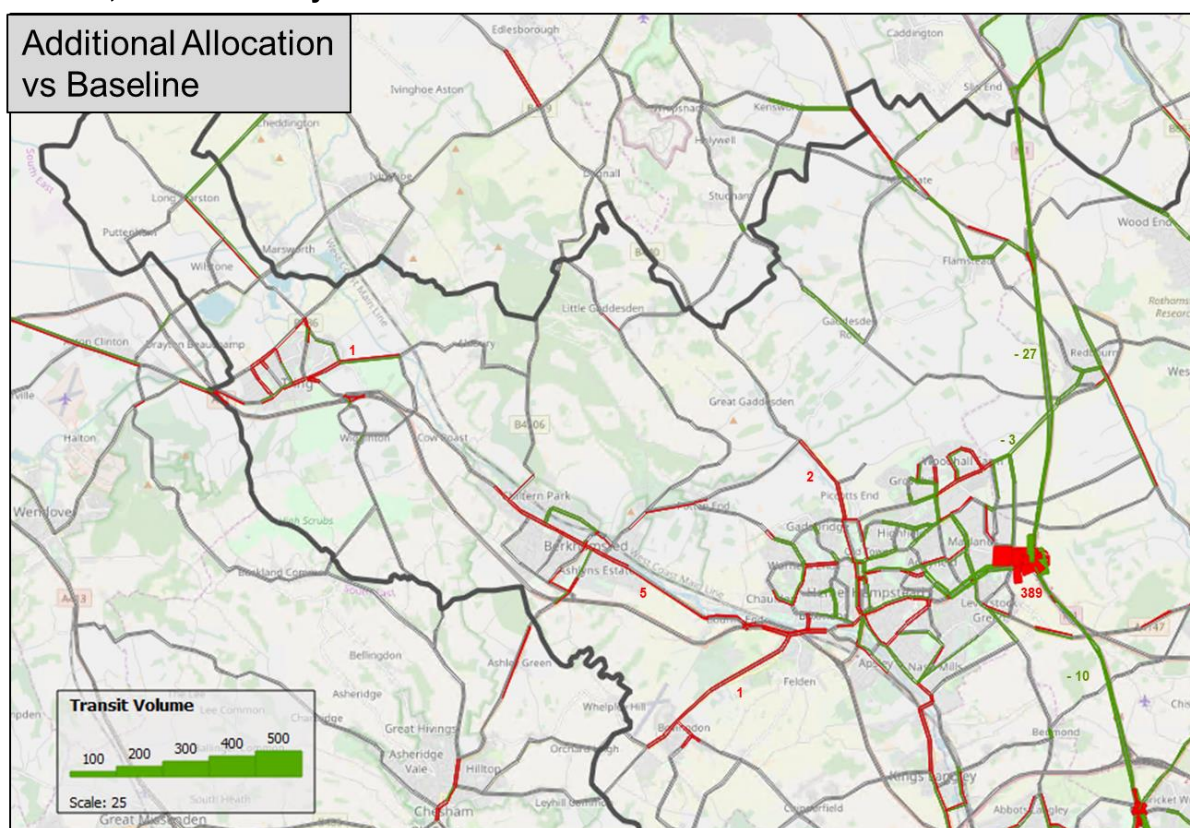
**Figure 6-1: Bus Passenger Flow Change between Baseline and Additional Allocation scenario, AM Peak Hourly Flow**



**Figure 6-2: Bus Passenger Flow Change between Baseline and Additional Allocation scenario, Inter peak Hourly Flow**



**Figure 6-3: : Bus Passenger Flow Change between Baseline and Additional Allocation scenario, PM Peak Hourly Flow**



6.2.3 Small increases are linked to development areas in Tring, Berkhamsted and Hemel Hempstead.

6.2.4 The large increases in bus patronage around M1 Junction 8 and Maylands is linked to the reallocation of trips from private vehicles to public transport.

### Bus Flow Differences between Scenario 1 compared to Baseline and Additional Allocation

6.2.5 Bus flow differences between the 2036 Scenario 1 and 2036 Dacorum Baseline and Dacorum Additional Allocation scenarios are presented in Figure 6-4 to Figure 6-6.

6.2.6 The thicker the band, the greater the demand. Red indicates an increase in public transport passengers while green indicates a decrease in passengers.

6.2.7 Key findings are that in:

- Scenario 1 compared to Baseline:
  - There are large increases in bus patronage around M1 Junction 8 and Maylands. This is linked to the reallocation of trips from private vehicles to public transport.
- Scenario 1 compared to Additional Allocation:
  - Bus patronage in Hemel is mainly reduced in line with generic COMET trends.
  - Some increases are observed for bus usage in Tring and Berkhamsted where new developments have been added.

Figure 6-4: Bus Passenger Flow Change between Scenario 1 and Baseline (left) and Additional Allocation (right) scenarios, AM Peak Hourly Flow

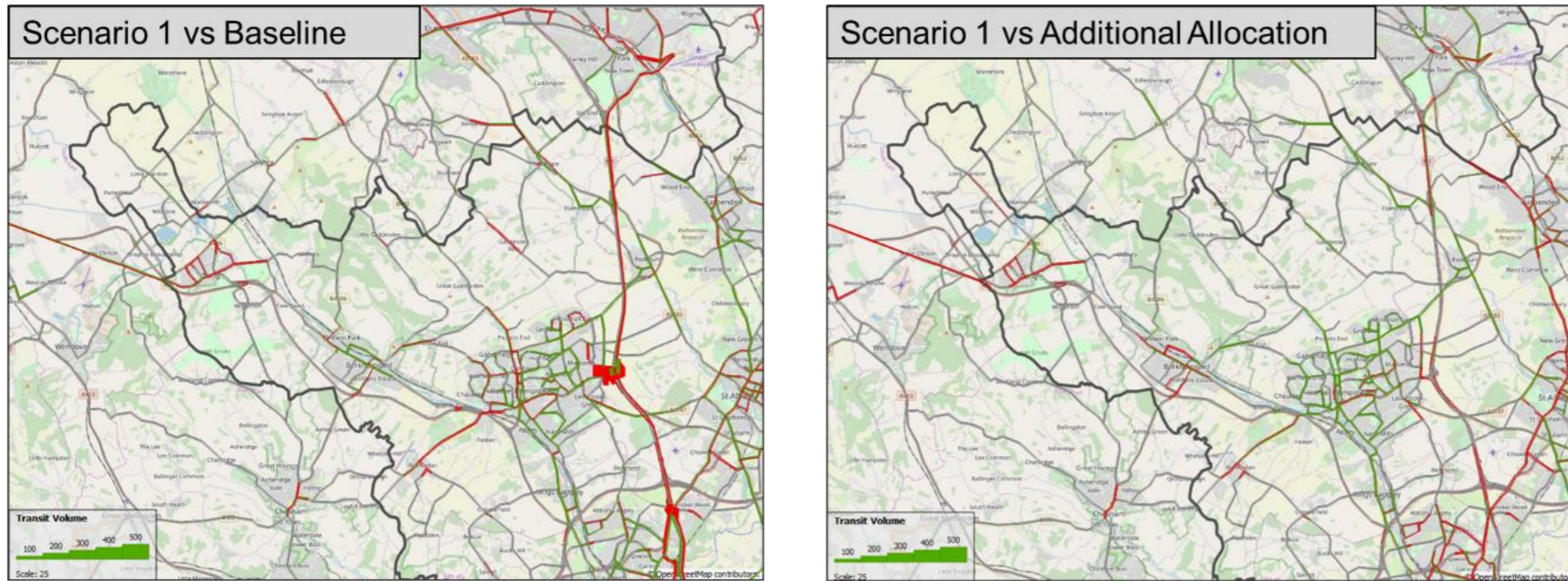


Figure 6-5: Bus Passenger Flow Change between Scenario 1 and Baseline (left) and Additional Allocation (right) scenarios, Inter Peak Hourly Flow

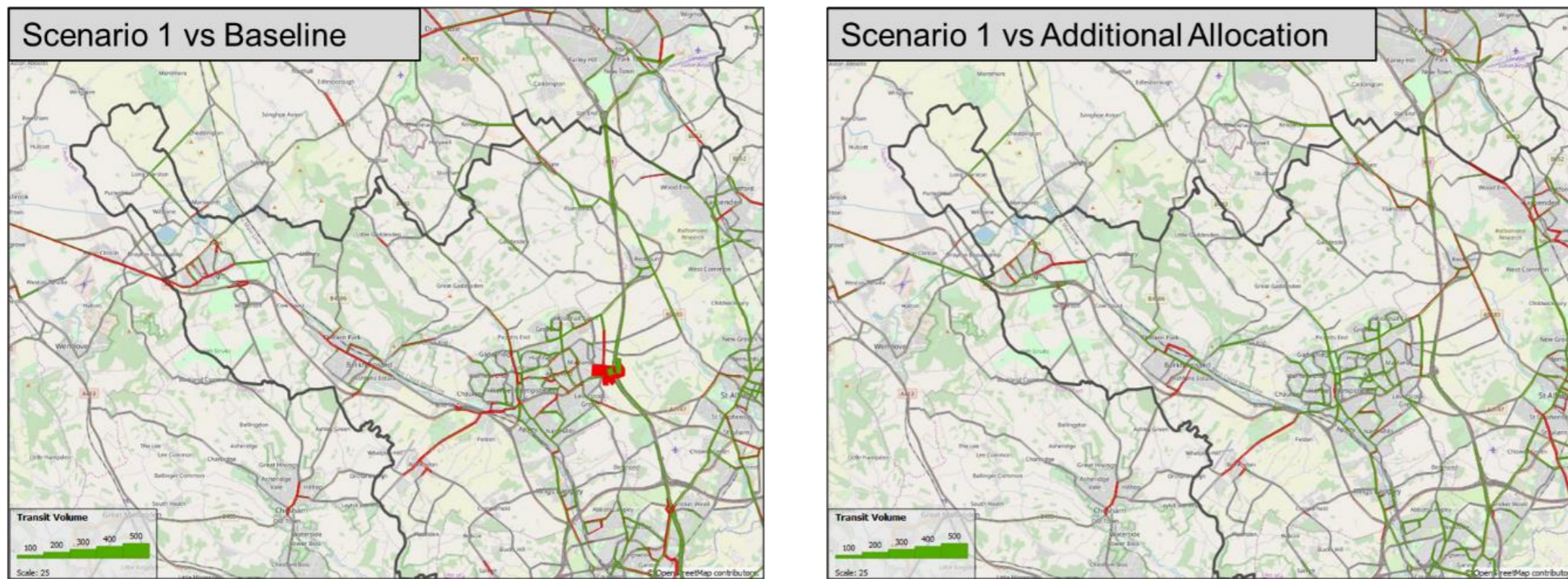
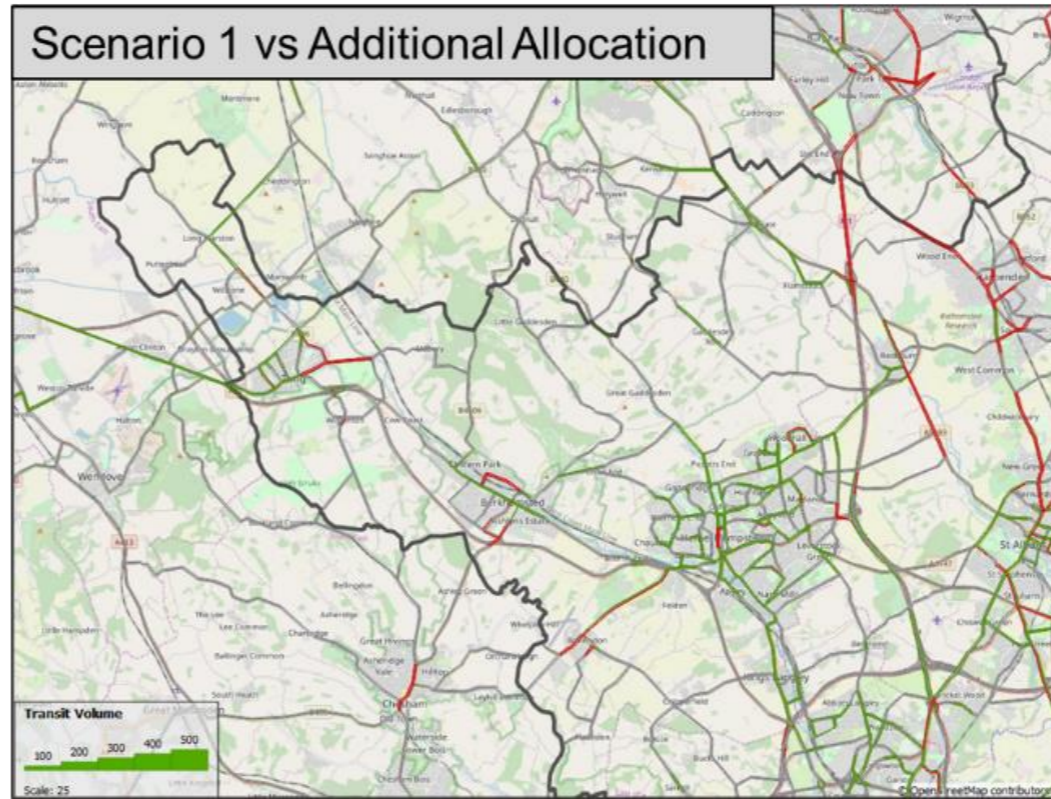
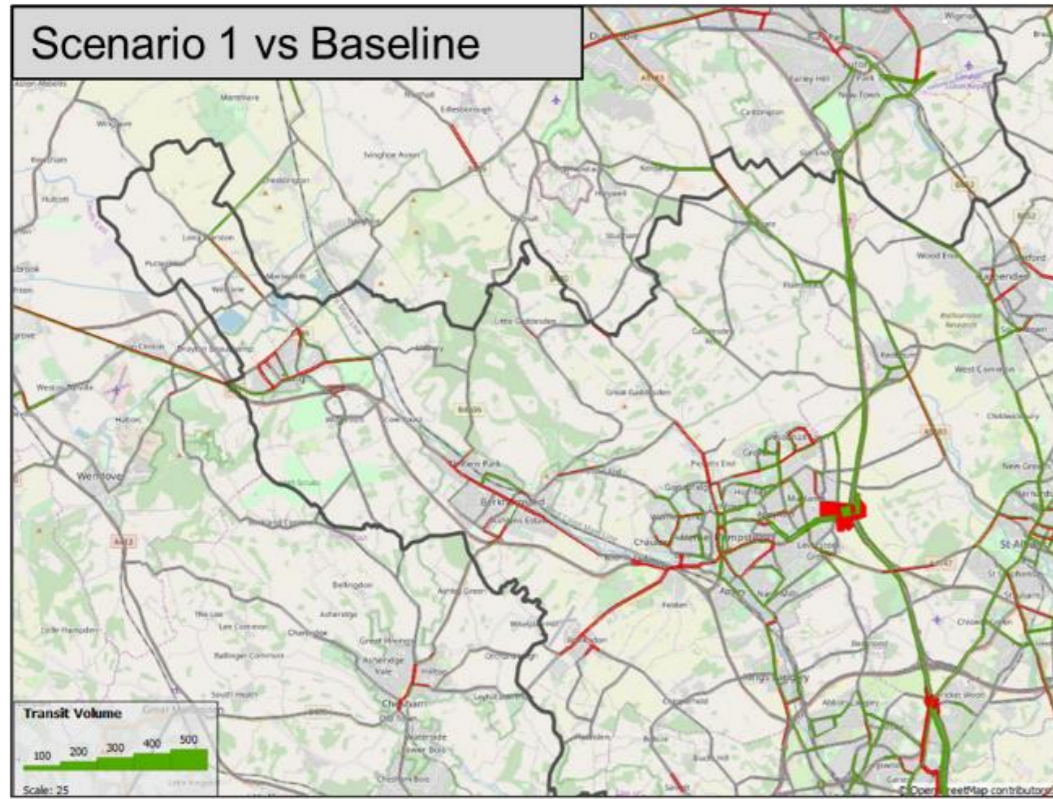


Figure 6-6: Bus Passenger Flow Change between Scenario 1 and Baseline (left) and Additional Allocation (right) scenarios, PM Peak Hourly Flow

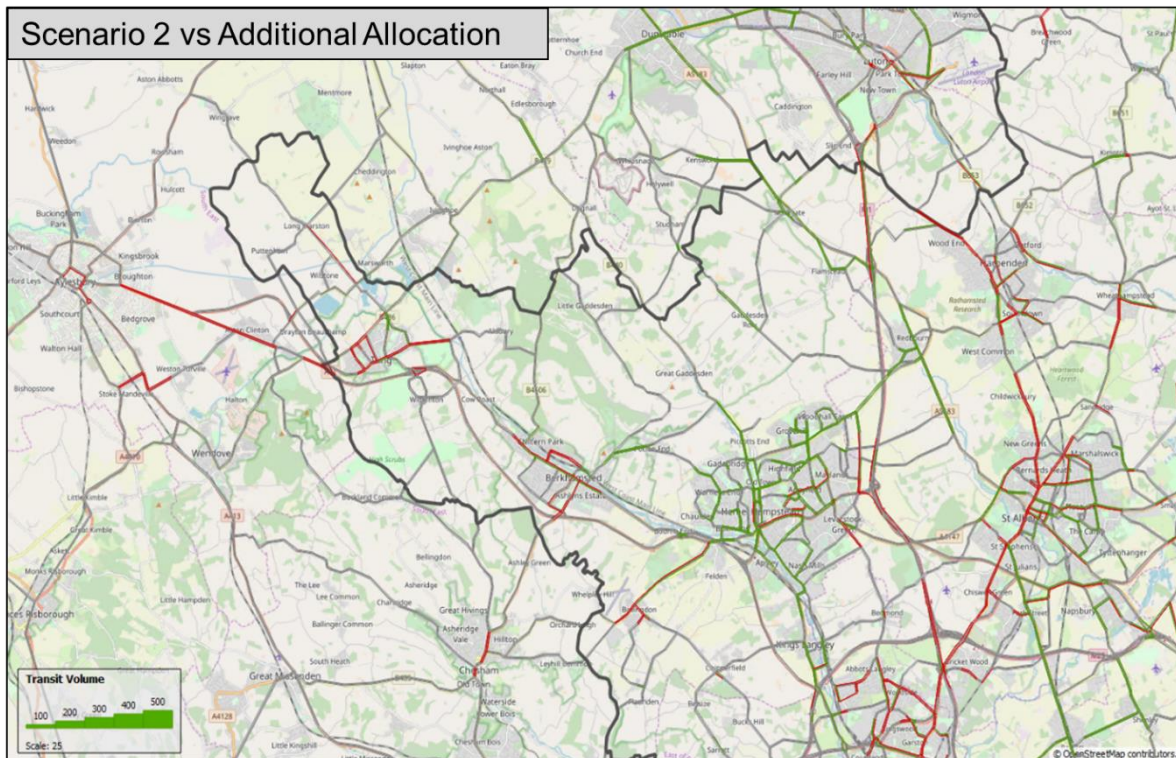


## **Bus Flow Differences between Scenario 2 compared to Additional Allocation**

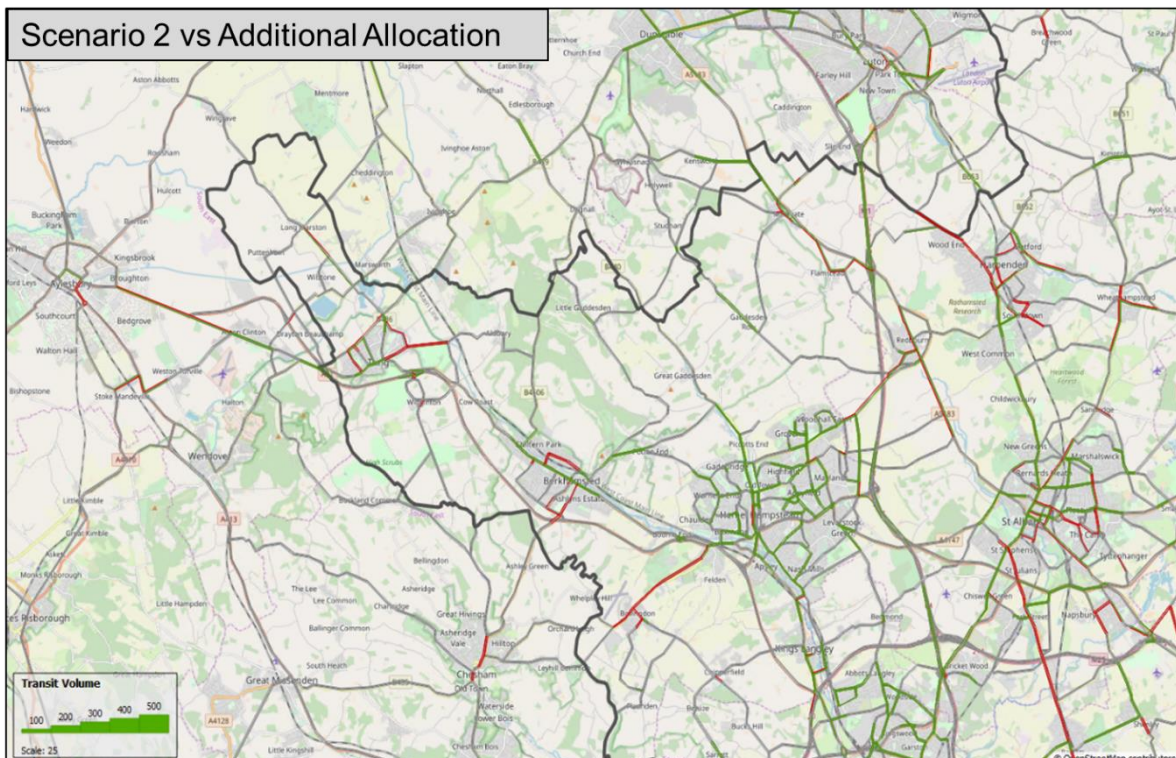
- 6.2.8 Bus flow differences between the 2036 Scenario 2 and 2036 Dacorum Additional Allocation scenarios are presented in Figure 6-7 to Figure 6-9.
- 6.2.9 The thicker the band, the greater the demand. Red indicates an increase in public transport passengers while green indicates a decrease in passengers.
- 6.2.10 Key findings are that the bus passenger differences between Scenario 2 and Additional Allocation are negligible as expected as the growth in both scenarios is identical and there are only minor changes in the development sites.



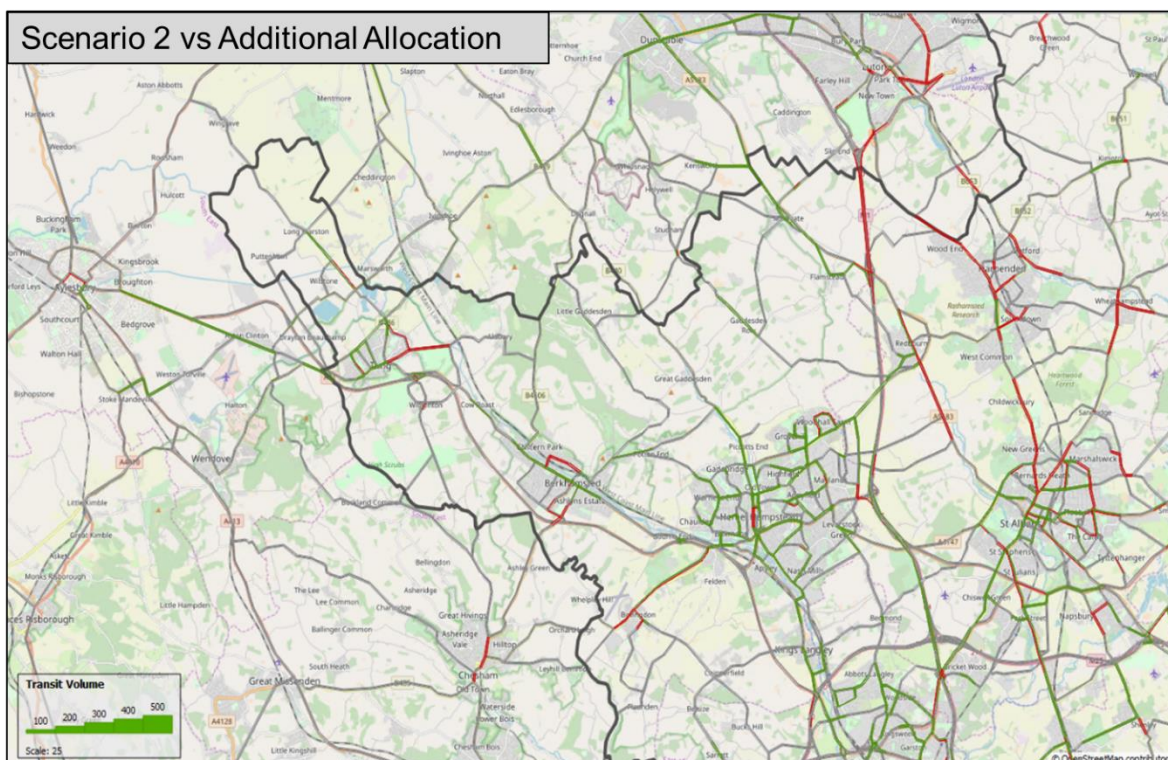
**Figure 6-7: Bus Passenger Flow Change between Scenario 2 and Additional Allocation scenario, AM Peak, Hourly Flow**



**Figure 6-8: Bus Passenger Flow Change between Scenario 2 and Additional Allocation scenario, Inter Peak, Hourly Flow**



**Figure 6-9: Bus Passenger Flow Change between Scenario 2 and Additional Allocation scenario, PM Peak, Hourly Flow**



### 6.3 Rail Passenger Flow

- 6.3.1 Similar plots for rail flow are shown below. Of necessity, a different scale is used for the rail flows, as these are very much larger than bus. Increases are shown in red; reductions are shown in green.
- 6.3.2 It must be acknowledged that as a multi-modal logit model, COMET is not an ideal tool for assessing most strategic rail schemes; this would more usually be done with a rail elasticity model based on the Passenger Demand Forecasting Handbook (PDFH).

## Rail Flow Differences between Baseline and Additional Allocation

Figure 6-10: Rail Passenger Flow Change between Baseline and Additional Allocation scenario, AM Peak, Hourly Flow

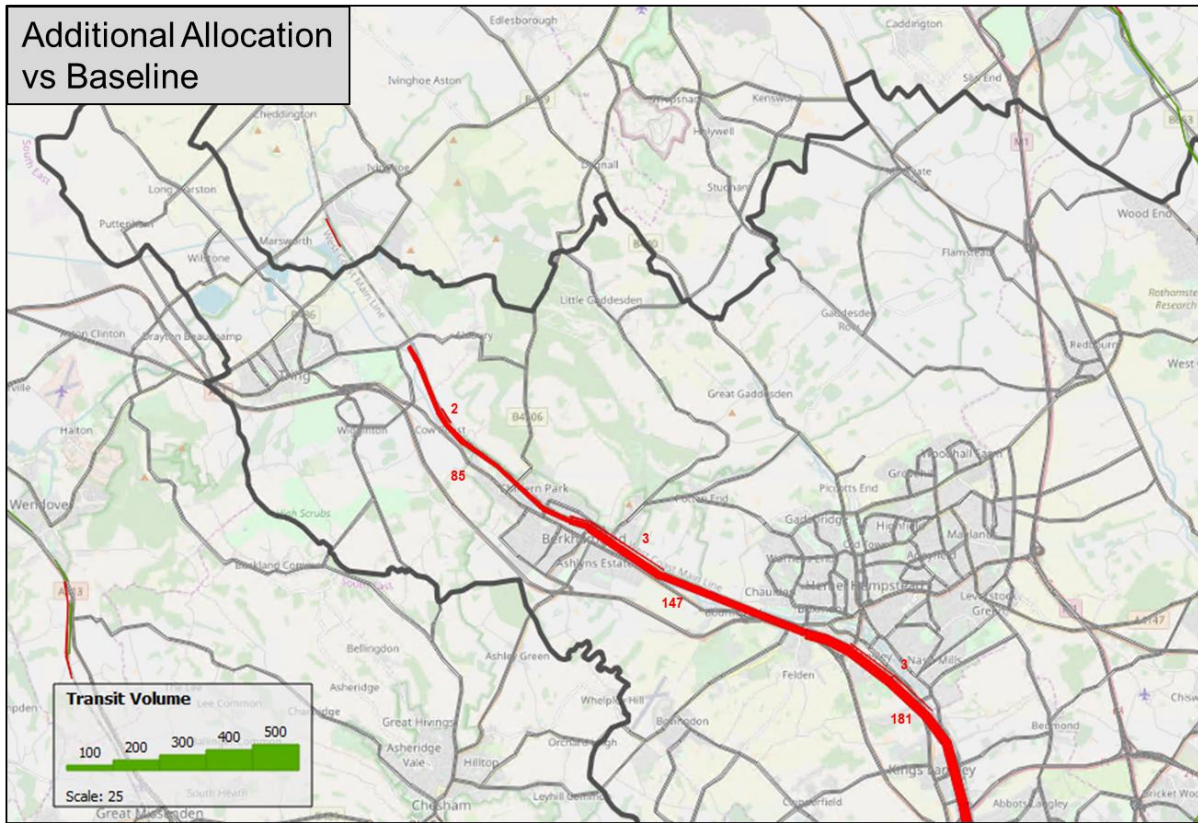
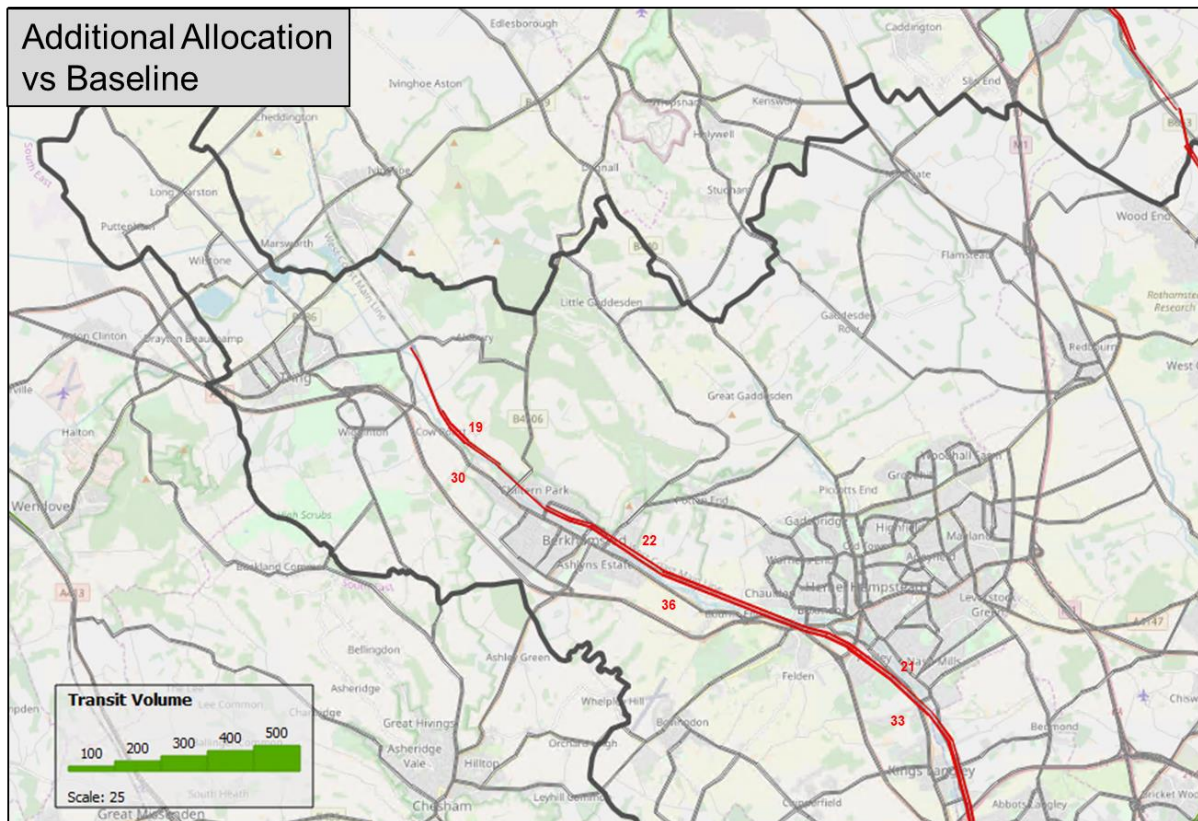
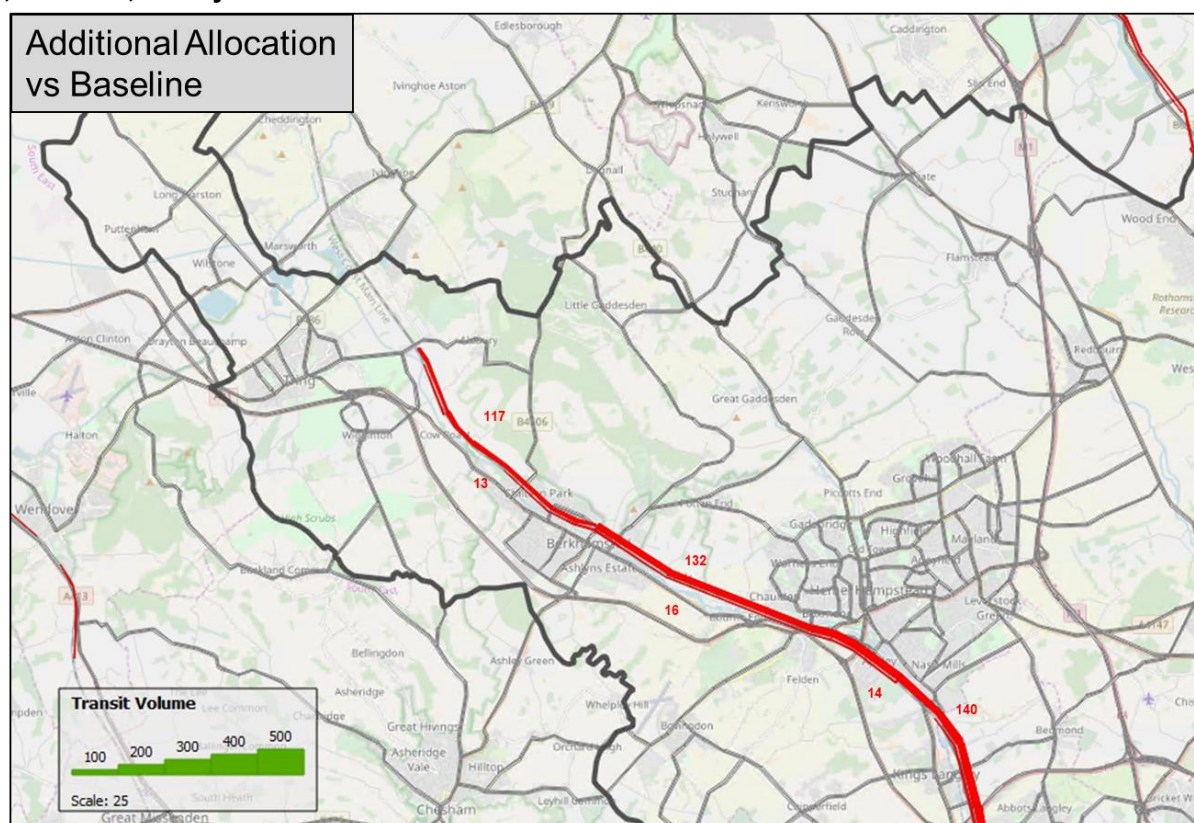


Figure 6-11: Rail Passenger Flow Change between Baseline and Additional Allocation scenario, Inter peak, Hourly Flow



**Figure 6-12: Rail Passenger Flow Change between Baseline and Additional Allocation scenario , PM Peak, Hourly Flow**



6.3.3 Additional passengers seen in the passenger numbers on rail are associated with new developments in Tring, Berkhamsted and Hemel Hempstead as commuters travel to and from London in AM and PM peaks.

### Rail Flow Differences between Scenario 1 compared to Baseline and Additional Allocation

6.3.4 Flow difference plots for rail demand are presented below. These show the differences between 2036 Baseline and Additional Allocation scenario passenger flow.

6.3.5 Red bars indicate an increase in flow, while green bars indicate a decrease. The greater the thickness of the line, the greater the flow difference.

6.3.6 Key findings are that in:

- Scenario 1 compared to Baseline:
  - Increases in passenger numbers using rail due to the greater development in Scenario 1.
- Scenario 1 compared to Additional Allocation:
  - The demand and location of developments is identical between these scenarios, therefore there is no significant difference between rail usage in the two scenarios

Figure 6-13: Rail Passenger Flow Change between Scenario 1 and Baseline (left) and Additional Allocation (right) scenarios, AM Peak Hourly Flow

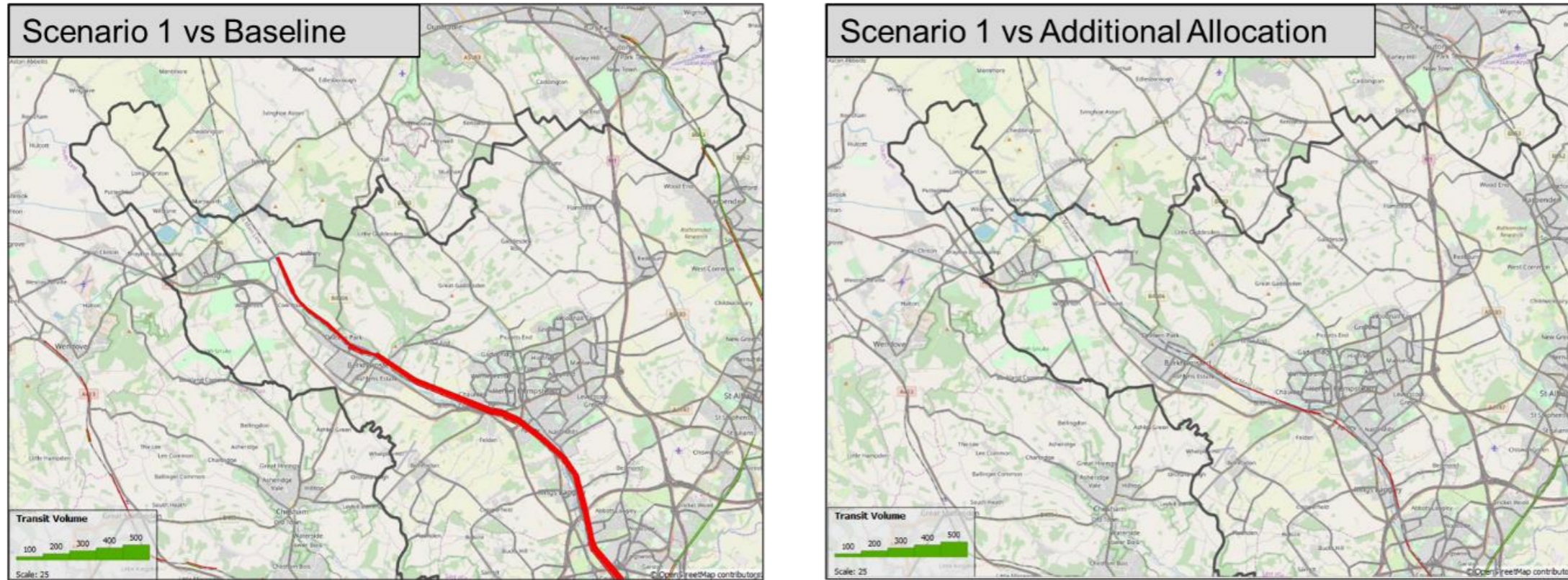


Figure 6-14: Rail Passenger Flow Change between Scenario 1 and Baseline (left) and Additional Allocation (right) scenarios, Inter Peak Hourly Flow

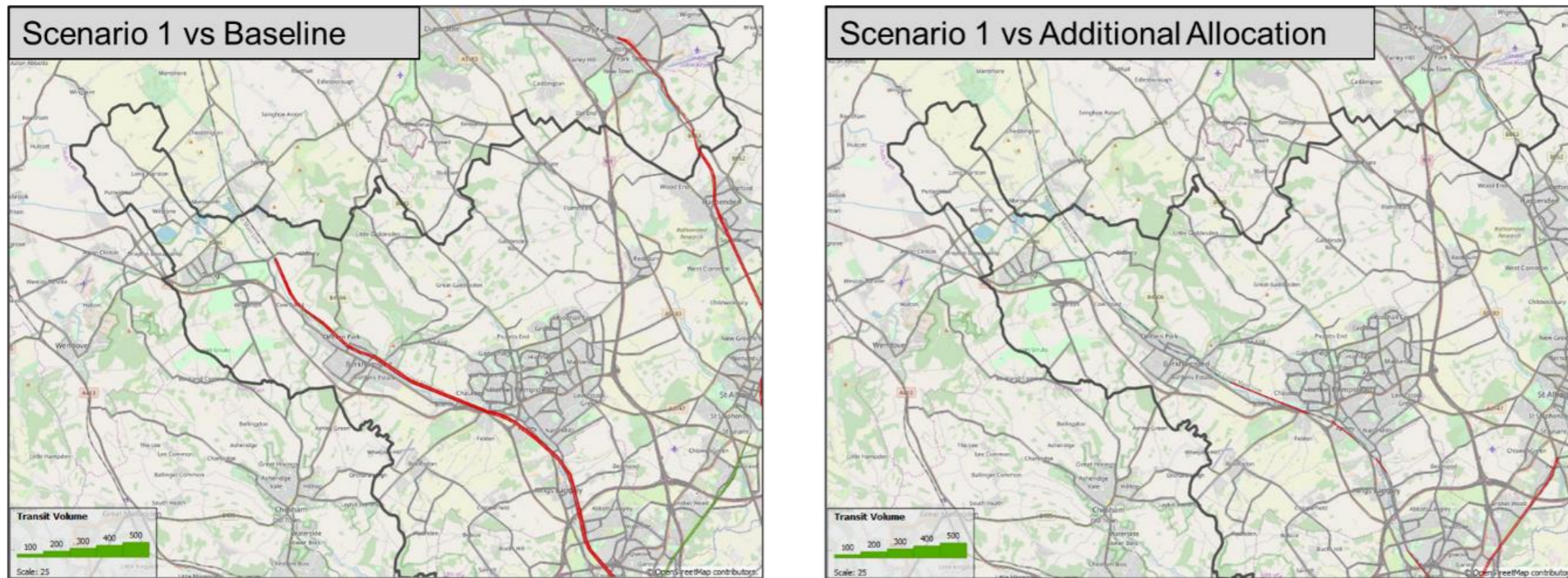
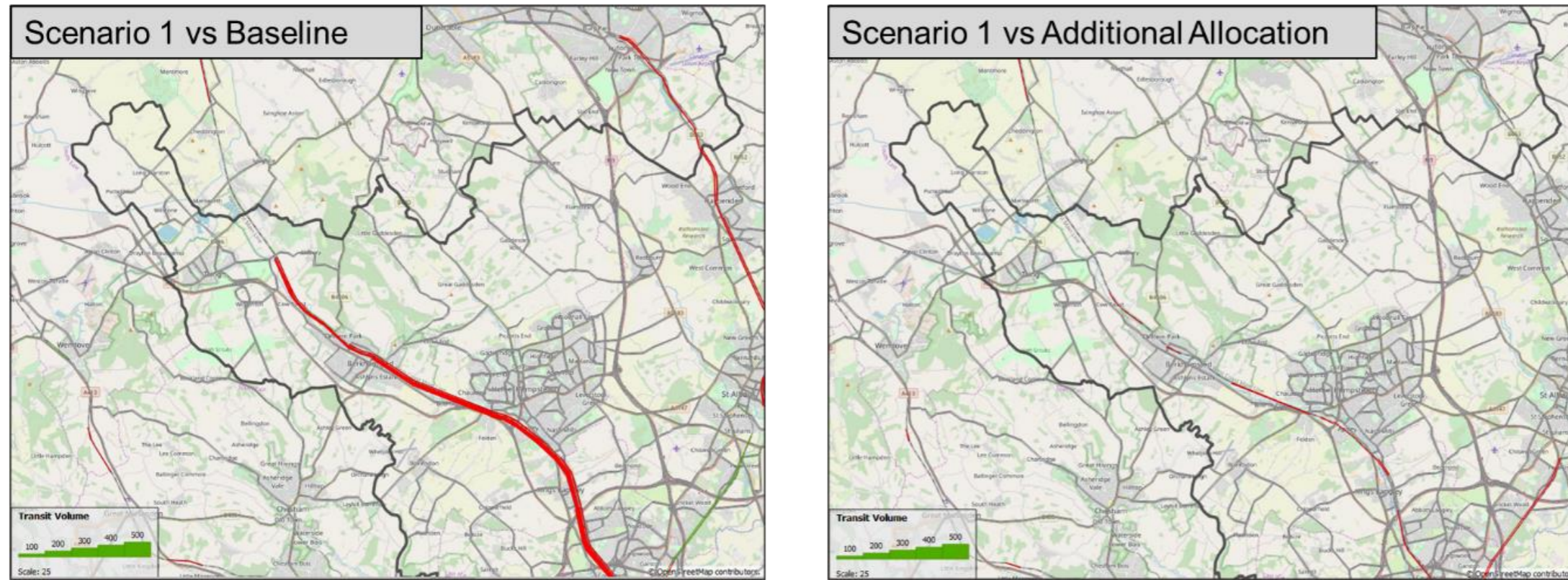


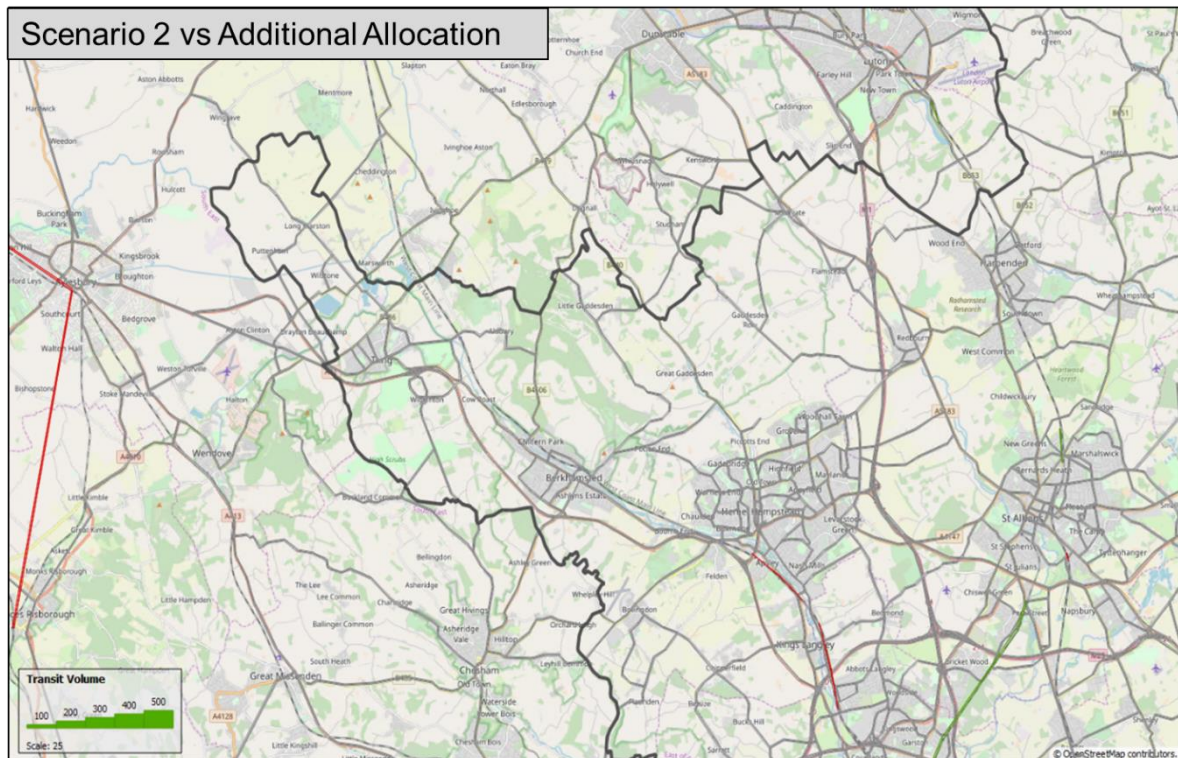
Figure 6-15: Rail Passenger Flow Change between Scenario 1 and Baseline (left) and Additional Allocation (right) scenarios, PM Peak Hourly Flow



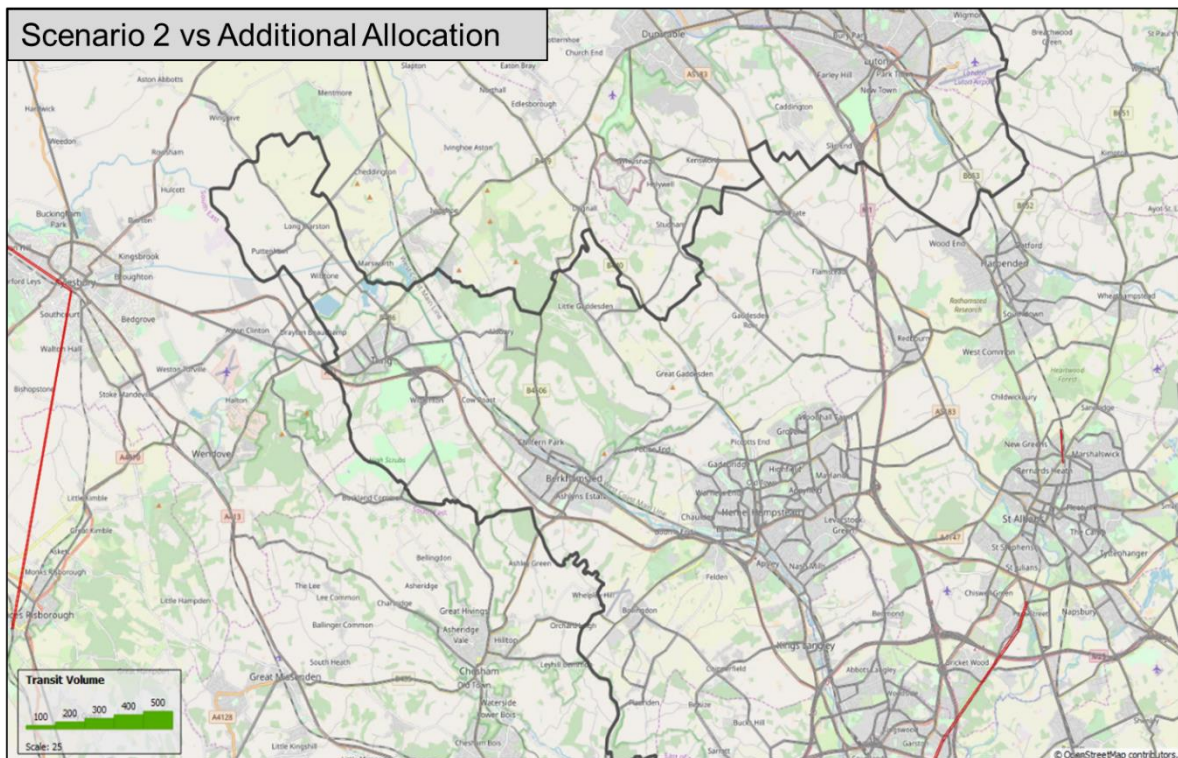
## **Rail Flow Differences between Scenario 2 compared to Additional Allocation**

- 6.3.7 The number of rail passengers remains largely consistent between Scenario 2 and the Additional Allocation scenario in all time periods. This is expected.

**Figure 6-16: Rail Passenger Flow Change between Scenario 2 and Additional Allocation scenario, AM Peak, Hourly Flow**

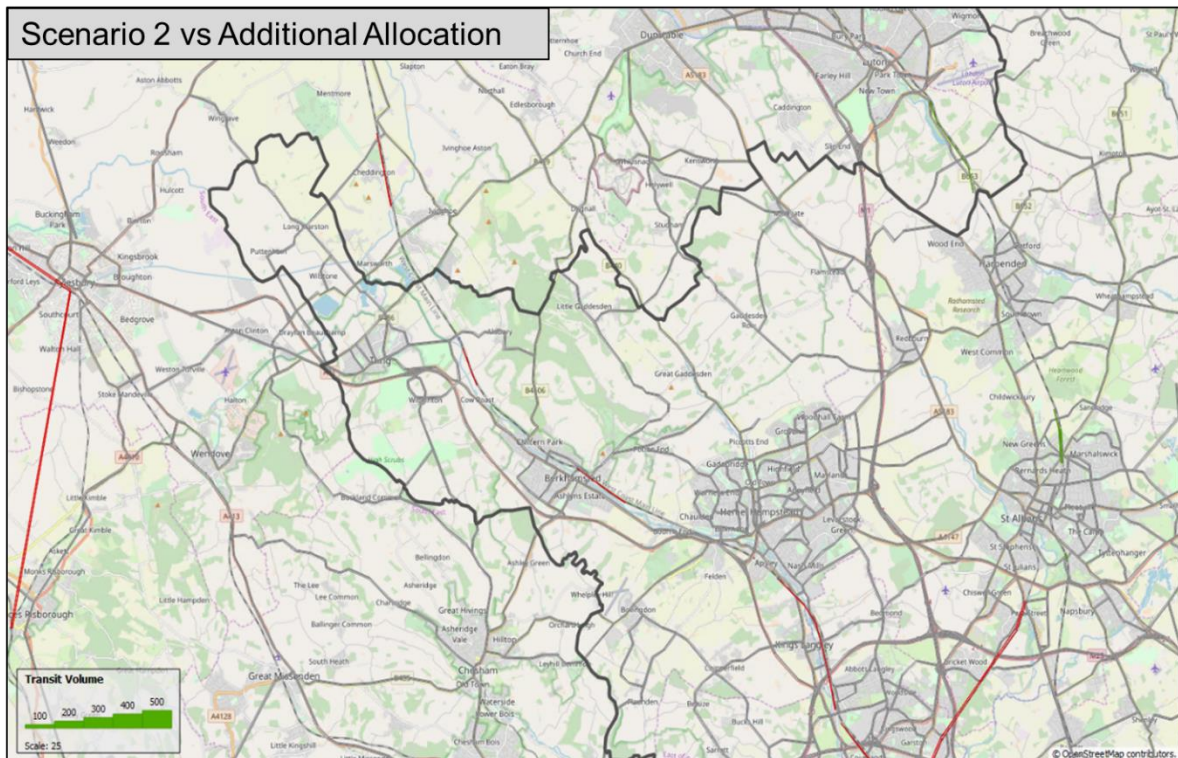


**Figure 6-17: Rail Passenger Flow Change between Scenario 2 and Additional Allocation scenario, Inter Peak, Hourly Flow**





**Figure 6-18: Rail Passenger Flow Change between Scenario 2 and Additional Allocation scenario, PM Peak, Hourly Flow**



# 7. Annual Average Daily Traffic (AADT) Flow Calculations

## 7.1 Background

7.1.1 DBC requested Annual Average Daily Traffic (AADT) flow for five sites across Dacorum. A number of these are in Air Quality Management Area (AQMA) locations.

7.1.2 AADT flows are provided for Baseline and Additional Allocation scenarios only. Scenario 1 and 2 are sensitivity tests and are unlikely to affect AADT flow estimates.

7.1.3 AADT flows are derived by obtaining the traffic flows from each modelled hour and then using factors to convert these into a daily traffic flow. The factors used for the conversion are obtained from traffic count information for roads across Hertfordshire used to construct and validate the COMET model.

7.1.4 AADT flows are provided by direction for the following sites shown in Figure 7-1 and Figure 7-2

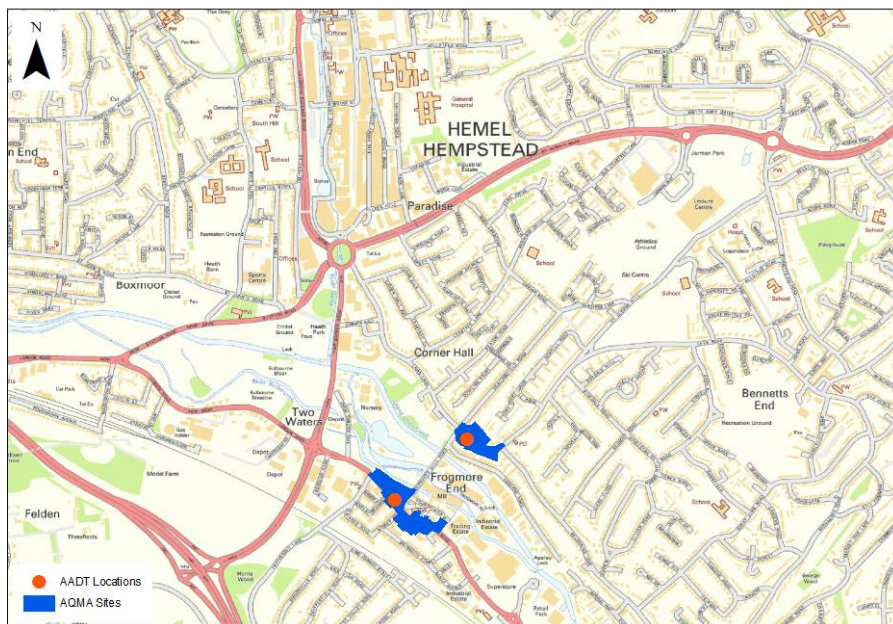
- B4506 north of Berkhamsted including Aldbury;
- A41 between two junctions (Dunsley Farm and B4009);
- Berkhamsted/Northchurch A425/B4506 junction;

**Figure 7-1: Map showing AADT sites in Tring, Northchurch and Aldbury**



- A4251 and Durrants Hill Road in Hemel Hempstead; and
- Lawn Lane Hemel Hempstead between junctions with Belswains Lane and Seatons Road.

**Figure 7-2: Map showing AADT sites in Hemel Hempstead**



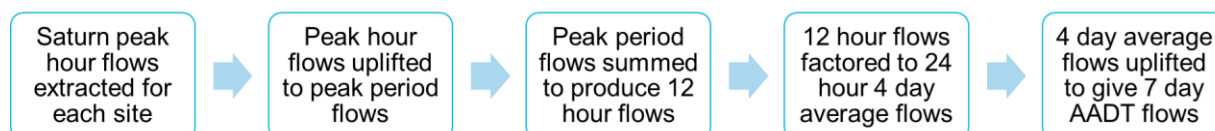
## 7.2 AADT Caveats

- 7.2.1 The AADT figures detailed in this section should not be compared with AADT flows obtained from any alternative sources. There is no supporting LMVR (Local Model Validation Report) for the version of the 2014 COMET base year model which informed the Local Plan Run 4 run (on which the Dacorum scenarios are based).
- 7.2.2 COMET was not designed to inform detailed flow analysis on one road. Movements into/out of Hertfordshire were reflected in the base year model, however there will always be issues when very large areas of growth are planned adjacent to Hertfordshire.
- 7.2.3 Each of the factors listed below will influence the derivation of COMET AADT flows:
- model coverage, granularity and construction;
  - model demand creation and zoning systems;
  - base year model performance;
  - strategic routeing patterns;
  - Variable Demand Model assumptions;
  - forecasting assumptions (infrastructure and planning data assumptions);
  - model forecasting methodology;
  - model forecasting trip rates; and
  - AADT factors used.

## 7.3 Methodology

- 7.3.1 The flows extracted from Saturn were processed as detailed below to provide AADT flows by direction.
- 7.3.2 Factors for each stage were derived from traffic counts across Hertfordshire and are split by road type.
- 7.3.3 AADT flows are reported in PCUs and are rounded to the nearest 10 pcus.

**Figure 7-3: Methodology for calculating AADT flows at each site**

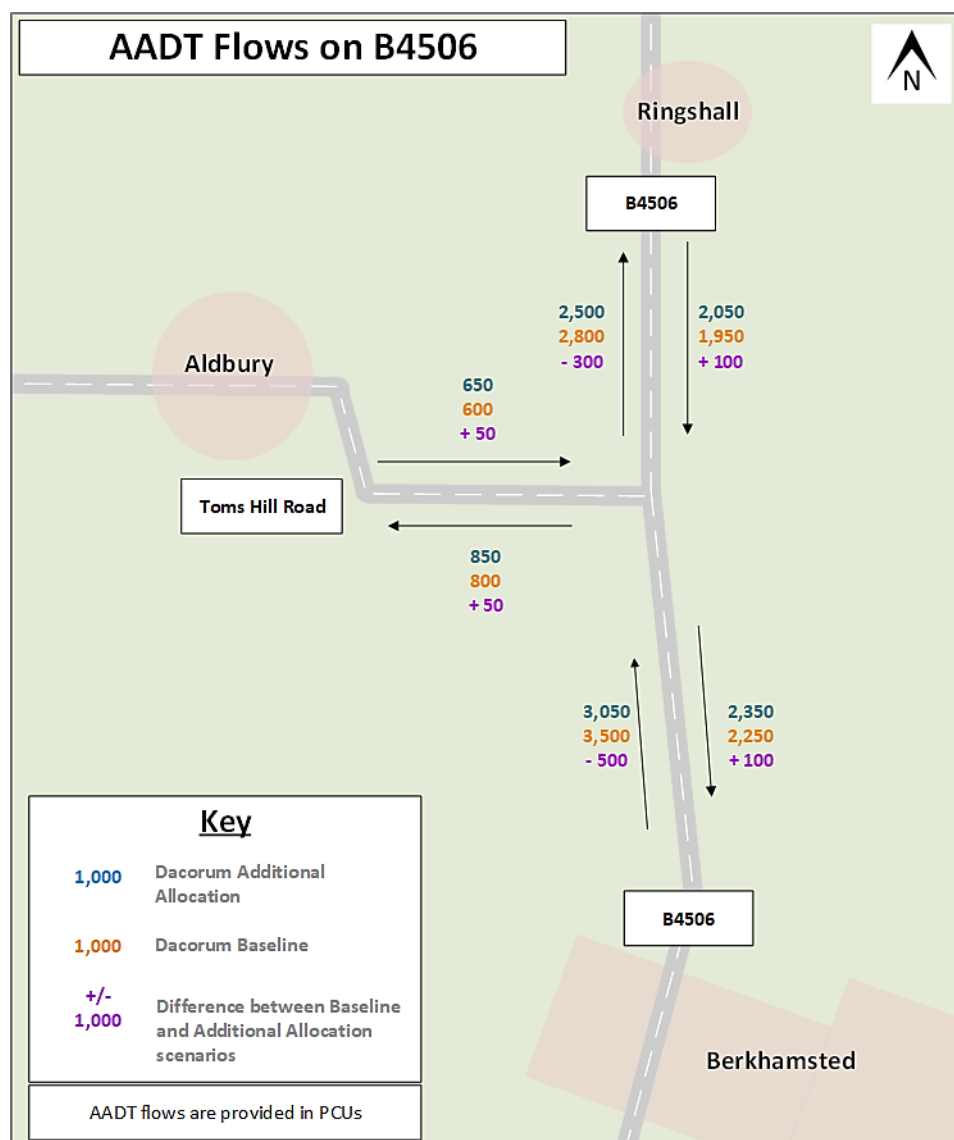


## 7.4 AADT Flows

### B4506 Flows including Aldbury

- 7.4.1 Flows are presented in Figure 7-4 below.
- 7.4.2 Northbound on the B4506 there is a small reduction in flows between the Dacorum Baseline and Additional Allocation scenarios. This is consistent with the flow difference plots presented in section 5.3, with small reductions in the AM and PM peak.
- 7.4.3 Southbound on the B4506 there is a marginal increase in AADT flows, these are too small to be shown on the flow difference plots.
- 7.4.4 Similarly flows on Toms Hill Road increase in both directions between scenarios, however these are too small to be shown on the flow difference plots.

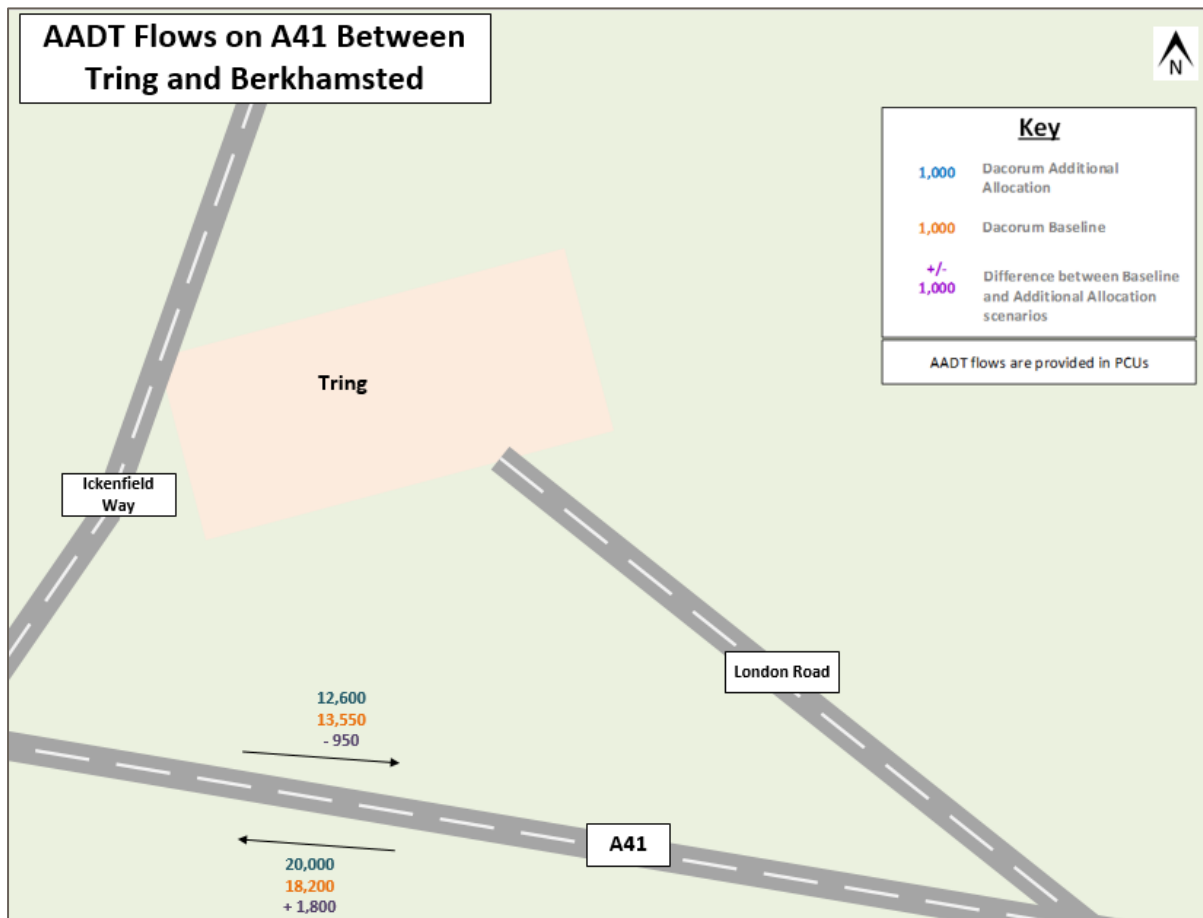
**Figure 7-4: AADT Flows on B4506 in Baseline and Additional Allocation scenarios**



## A41 between two junctions (Dunsley Farm and B4009)

- 7.4.5 Flows are presented in Figure 7-5 below.
- 7.4.6 Eastbound AADT flows on the A41 reduce by almost 1,000 PCUs in the Additional Allocation scenario, this is consistent with flow difference maps presented section 5.3. While the AM and IP show increases in flows through this section of the A41, the PM shows more significant reductions.
- 7.4.7 Westbound on the A41 AADT flows increase. Once again this is consistent with the flow difference plots in section 5.3 where the AM and IP models show increases in flows on the A41, with a reduction in the PM model as traffic avoids the road due to delays on the M25.

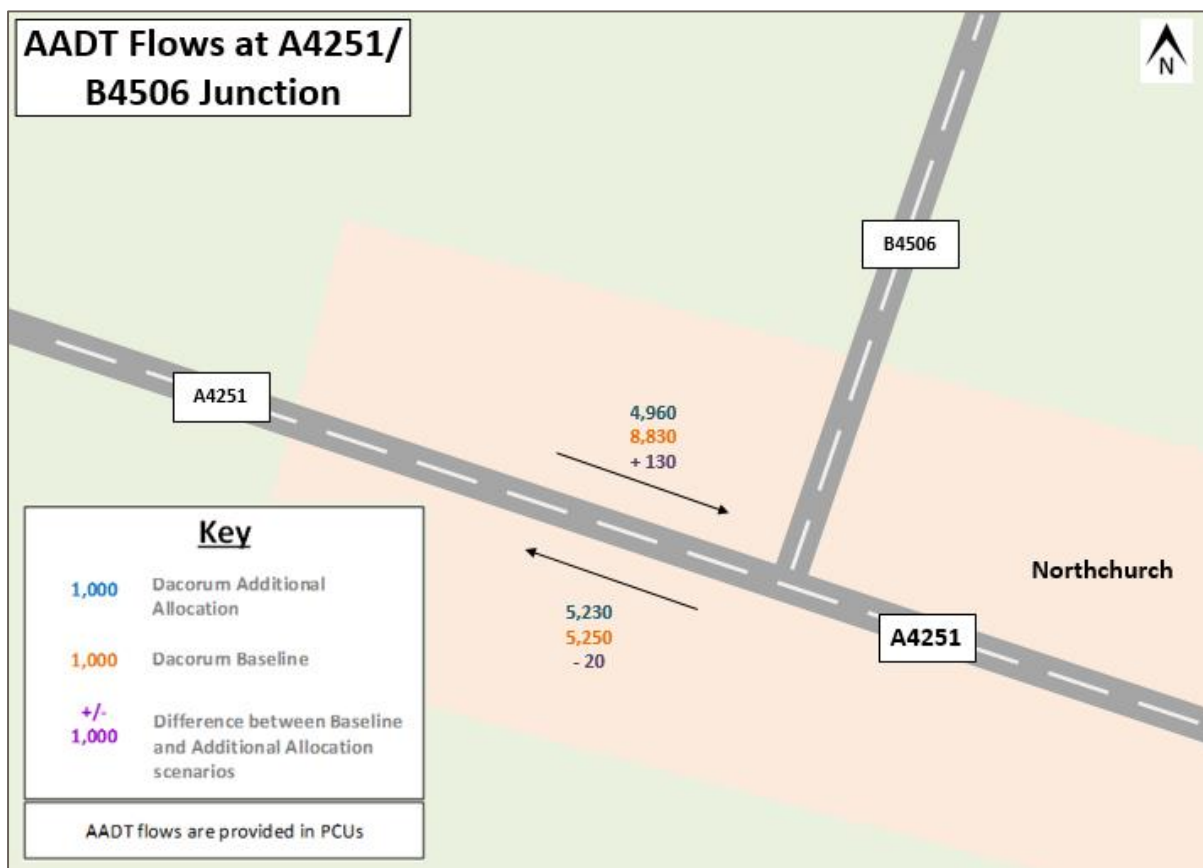
Figure 7-5: AADT Flows on A41 in Baseline and Additional Allocation scenarios



### Berkhamsted/Northchurch A425/B4506 junction

- 7.4.8 Flows are presented in Figure 7-6 below.
- 7.4.9 Flows increase marginally westbound, but changes are too small to be shown in the flow different plots in section 5.3.
- 7.4.10 Eastbound there is a small decrease, once again too small to be shown in the flow difference plots presented in section 5.3.

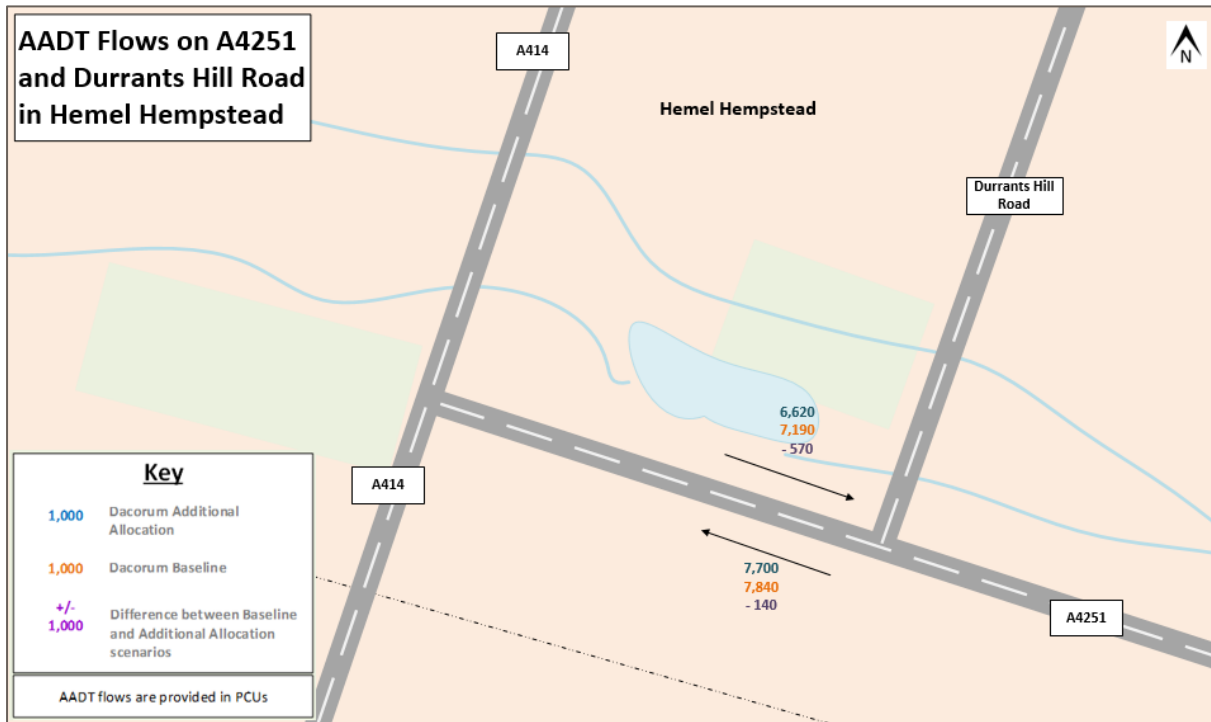
**Figure 7-6: AADT Flows at A4251/B4506 junction in Baseline and Additional Allocation scenarios**



## A4251 and Durrants Hill Road in Hemel Hempstead

- 7.4.11 Flows are presented in Figure 7-7 below
- 7.4.12 There are decreases in flows in both directions on the A4251, these are likely to be influenced by the AM and PM peak flow differences on these roads which are visible in both Figure 5-7 and Figure 5-9 in section 5.3.

Figure 7-7: AADT Flows on A4251/Durrants Hill in Baseline and Additional Allocation scenarios



## Lawn Lane Hemel Hempstead between junctions with Belswains Lane and Seatons Road

7.4.13 Flows are shown in Figure 7-8 below.

7.4.14 There are increases in flows in both directions on Lawn Lane, these are likely to be influenced by the AM and PM peak flow differences on these roads which are visible in both Figure 5-7 and Figure 5-9 in section 5.3.

Figure 7-8: AADT Flows on Lawn Lane in Baseline and Additional Allocation scenarios





## 8. Summary and Discussion

### 8.1 Summary

- 8.1.1 This document outlines the Dacorum Local Plan model results for all scenarios and provides AADT figures for selected sites.
- 8.1.2 Based on the comparison between the Baseline and Additional Allocation scenarios, the impact of developments and growth in Dacorum suggest that:
- Additional development traffic is not expected to adversely affect junction delays or congestion in Berkhamsted or Tring. Berkhamsted and Tring have little existing congestion, so the addition of developments does not generate significant issues.
  - The addition of the northern link road at Hemel Hempstead leads to re-routing of traffic from North Hemel developments and the M1 Junction 8 toward the west and causes minor rerouting on rural roads towards Berkhamsted. These results are highlighted in comparisons between Scenario 1 and the Baseline scenario below.
- 8.1.3 Comparisons between Scenario 1 and the Baseline/Additional Allocation scenario show that:
- This scenario comparison provides further evidence that provided when comparing the scenarios above, that the North Hemel Link Road contributes to a new strategic route choice across Hemel Hempstead and is a key route between Berkhamsted, M1 junction 8, the A414 and locations south on the M1.
  - Replacing the link road with a shorter road displaces traffic onto parallel east-west routes across Hemel Hempstead. Some traffic is also displaced onto the A41 and parallel county routes north of Hemel Hempstead towards the M1 and Harpenden.
  - Overall comparisons between Scenario 1 and Additional allocation show similar overall results in terms of delays, link stress and flow patterns through Dacorum.
- 8.1.4 Based on the comparisons between Scenario 2 and the Additional Allocation scenario:
- The North Hemel Link Road remains a new strategic route choice across Hemel Hempstead and provides a key route between Berkhamsted, M1 junction 8, the A414 and locations south on the M1.
  - This scenario focuses on impacts of development locations in Berkhamsted. It shows that the location of the development in Berkhamsted has a negligible effect on traffic in Dacorum district. Locally there are some small variations in routing through the town, but these do not result in delays or significant changes to link stress. Generally, the modelling suggests that there is capacity in Berkhamsted to accommodate the development.
  - Overall comparisons between Scenario 2 and Additional allocation show similar overall results in terms of delays, link stress and flow patterns through Dacorum.
- 8.1.5 In all scenarios, the revised public transport schemes in the Additional Allocation scenario generate small increases in both bus and rail flows.
- 8.1.6 Longer distance bus travel decreases as rail becomes a more attractive option, however some local movements by bus increase due to the linkages of new developments to bus routes.

## 8.2 Discussion

### Future Uncertainty and COMET Forecasts

- 8.2.1 The COMET forecasting methodology takes into consideration future changes in population, number of jobs and dwellings, as well as rising costs of travel and proposed transport infrastructure schemes.
- 8.2.2 However, there is currently no allowance for factors that may fundamentally alter the nature of travel in Hertfordshire or elsewhere in Great Britain. These factors may include the introduction of new technologies (e.g. autonomous vehicles) or a significant shift in travel patterns relative to the Base Year model as a result of behavioural change. Such behavioural change may be brought about by factors such as changing demographic characteristics / consumer preferences, economic instability, climate change and globalisation.
- 8.2.3 Consequently, COMET forecasts should be viewed as possible representations of the future in Hertfordshire among several potentially different alternatives that require unconventional approaches to planning and investment in the county.

### Sustainable Transport

- 8.2.4 It should be noted that the approach to modelling modal shift in a multi-modal model (such as COMET) should be based on the inclusion/coding of infrastructure to facilitate such behaviour change in the forecast network. Without doing so (as applies to this forecast) the modelled modal shift is not a result of COMET's Variable Demand Model representing behavioural change; rather, it is the result of a parameter adjustments that are currently not based on any specific interventions to the transport network. Once more specific scheme assumptions regarding the proposed sustainable travel initiatives are known, these should be coded into COMET as other forecast schemes already are.

## 9. Appendices

### 9.1 Appendix I: Full List of Highway Schemes

	Location Details	Description of scheme
M25 jct 25-27	Smart Motorway improvements	Widening of motorway to 4 lanes with hard shoulder running
M25 junction 25	M25 junction 25	M25 junction 25 RIS 2 capacity improvements - Option 2
Hoddesdon	A10 Link Hoddesdon	A10 Hoddesdon_Dumbell Roundabout - Dinant Link Road - New roundabout to permit access to High Leigh development
Waltham Cross	A10/Lieutenant Ellis Way / Churchill Way junction	Reconfiguration of the junction into a hamburger with access into (and out of) the Park Plaza West site at the Great Cambridge Road/Great Eastern Road signals.
Waltham Cross	A10 junction with Park Plaza	Modify existing 3 arm signal junction on A10 to provide at grade 4 arm junction for access into Park Plaza North & West
Waltham Cross	Lieutenant Ellis Way / Park Plaza W access	New 4 arm junction on Lieutenant Ellis Way to north of Park Plaza
Cheshunt	A10 /College Road	Implementation of right turn bans between A10 and College Road and free flow LT slip from A10 north to College Road E
Cheshunt	A10 /Church Lane	A10 / Church Lane at grade junction improvements
Turnford / Brookfield	A10 Turnford junction to Halfhide Lane	New 4 lane Link road runs through to Halfhide Lane which then becomes Brookfield Lane W south of the retail park - SB onslip at the Turnford interchange is no longer assumed.
Brookfield Centre	Hells Wood Link Road between The Links and Hells Wood	New link road running between Turnford Link Road and A10 providing revised access into Brookfield and Tescos with closure of existing junction between Halfhide Lane and the Links
Cheshunt	Church Lane / High Street	Reconfiguration of roundabout to provide signalised crossing junction & crossing points for pedestrians
Flamstead End	Church Lane / Flamstead End	Reconfiguration of roundabout to provide signalised crossing junction & crossing points for pedestrians
Turnford	Marriott Roundabout (Halfhide Lane/ A1170) capacity improvements	Provision of additional capacity
Waltham Cross	Fishpools junction (Winston Churchill Way / Monarchs Way) signalisation	Reconfiguration of junction to provide signalised junction & crossing points for pedestrians
Goffs Oak	Goffs Lane / Newgatestreet Road / Cuffley Hill signalisation	Reconfiguration of junction to provide signalised junction & crossing points for pedestrians
Hoddesdon	Dinant Link Road / Amwell Street (Sun Roundabout)	Additional lane on eastern arm of roundabout

	capacity improvements	
Hoddesdon	Hertford Road / Ware Road additional lanes	Roundabout improvements to provide additional eastbound & southbound lanes
Hoddesdon / Broxbourne / Turnford / Cheshunt	Old A10 (A1170 Ware Road / Charlton Way/ High Road/ B176 Cheshunt Wash / High Street / Turners Hill/ Crossbrook Street	Provision of traffic calming
Broxbourne Station	Broxbourne Station access improvements	Replace priority give way junction with signalised junction incorporating pedestrian facilities
Hoddesdon	Essex Road / Pindar Road	Reconfiguration of junction to provide additional capacity
Hoddesdon	Essex Road / Dinant Link Road	New road alignment and bridge and
Cheshunt	Turnford Road / College Road (Old Pond roundabout) & Turnford Road / Windmill Lane	Old Pond junction improvement
Hemel Hempstead	Swallowdale Lane / Three Cherry Trees Lane, Hemel Hempstead	Junction Signalisation
Hemel Hempstead	A414 Breakspear Way / Maylands Lane, Hemel Hempstead	Lane reallocation
Hemel Hempstead	The Avenue, Hemel Hempstead	Development site Secondary site access onto The Avenue (extension of existing spur)
Hemel Hempstead	A4147 Link Road (Location between Piccotts End Road and Aycliffe Drive), Hemel Hempstead	New roundabout access
Hemel Hempstead	Fletcher Way, Hemel Hempstead	T Junction onto Fletcher Way, Hemel Hempstead
A5 Dunstable	M1 - A5	M1 A5 Link Road
A4146 Water End	A4146 Waterend	A4146 HGV ban at Waterend
Hemel Hempstead	Bedmond Road / Leverstock	Bedmond Road / Leverstock Junction Upgrade
Hemel Hempstead	Leighton Buzzard Road / Combe Street, Hemel Hempstead	Junction Signalisation
Berkhamsted	Kingshill / Shootersway, Berkhamsted	Junction Signalisation
Berkhamsted	High Street Corridor	Extension of 20mph zone and pedestrian crossing facilities
Tring	Icknield Way, Tring	New junctions to development (LA5) with associated highway improvements, including new cycle and pedestrian routes.

Bovingdon	Chesham Road / Molyneaux Avenue	New access to LA6 development
Hemel Hempstead	Leighton Buzzard Road / Queensway Roundabout	Junction reconfiguration including part-time signals with widening.
Hemel Hempstead	Between Boundary Way and Wood Lane End	New link between Boundary Way and Wood Lane End.
Hemel Hempstead	Link Road / Redbourn Road roundabout	
Hemel Hempstead	Redbourn Road / Shenley Road, Hemel Hempstead	Reconfiguration of junction
Hemel Hempstead	Station Road / St Johns Road / Heath Lane, Hemel Hempstead	New mini roundabout
Hemel Hempstead	London Road / Nash Mills Road / Red Lion Lane, Hemel Hempstead	Signal optimisation
Hemel Hempstead	Fishery Road / Northridge Way, Hemel Hempstead	Junction signalisation
Hemel Hempstead	Maylands Avenue / Wood Lane End, Hemel Hempstead	Signal optimisation
Hemel Hempstead	Two Waters Road / London Road, Hemel Hempstead	Rearrangement of junction & signal optimisation
Hemel Hempstead	Leighton Buzzard Road north of Plough Roundabout	Signal optimisation
M1 Junction 8, Hemel Hempstead	M1 junction 8	Junction 8 - Major reconfiguration to provide direct access into Maylands
Hemel Hempstead	A414 / Green Lanes	Interim at grade signalisation scheme
Maylands Area, Hemel Hempstead	A414 to B487 Redbourn Road	New spine road from B487 Redbourn Road to A414 St Albans Rd - dual carriageway up to new link from M1. Single carriageway north of here.
Maylands Area, Hemel Hempstead	Cherry Trees Lane and Buncefield Lane quiet ways	Closing the existing narrow country lanes within the industrial area of Cherry Trees Lane, Buncefield Lane (north) and Buncefield Lane (south) to through traffic
Maylands Area, Hemel Hempstead		New pedestrian / cycle crossings in Maylands area -
Redbourn	Redbourn Area	HGV restrictions on B487 and A5183
Hemel Hempstead	Plough Roundabout - plus closure of Lawn Lane arm	Bus priority lanes on A414 WB, Station Road and Two Waters Road approaches
Hemel Hempstead	A414 Hemel Hempstead	Multi-Purpose Street
Hemel Hempstead	North Hemel	New link road between Redbourn Road and Leighton Buzzard Road
Hemel Hempstead	Apsley / Two Waters Road	Ped / cycle improvement.

Hemel Hempstead	A4251 London Road Hemel Hempstead	Model as reduced speed along link to simulate impact of cycle lane and road narrowing
Hemel Hempstead	Lawn Lane arm of Plough Roundabout	No access to roundabout for vehicles
Hemel Hempstead	Fishery Road, Hemel Hempstead	Model closure of this link to non-bus vehicles.
M1 Junction 10	Junction 10 Southbound Onslip	Capacity Improvement
Tring	East Tring	Access road
Berkhamsted	South Berkhamsted	Access road
Bishops Stortford	A120 / Stansted Road junction, Bishops Stortford	Junction capacity improvements associated with Bishops Stortford North development
Bishops Stortford	A120/A1250 W (Tesco's junction) Bishops Stortford	Additional lanes on approach arms
Bishops Stortford	A1250 Hadham Road, Bishops Stortford	New access from Bishops Stortford North development to A1250 Hadham Road
North Bishops Stortford	New spine road through Bishops Stortford North development with new access onto A120	30mph single carriageway road connecting A1250 Hadham Road with A120 and B1004 Rye Street. E
North Bishops Stortford	Rye Street / Michaels Road, Bishops Stortford	New access from Bishops Stortford North (ASR5) development to Rye Street
A602 Ware - Watton at Stone	A10 /A602 junction and A602 / Anchor Lane junction & A602 Anchor Lane to Watton	signalisation and upgrade of A10 / A602 junction, upgrade of Anchor Lane junction, realignment of A602
A602 Stevenage	A602 / Hertford Road	Junction Signalisation
A120 Little Hadham	Little Hadham Bypass	New A120 bypass
Sawbridgeworth	New site access on land north of West Road, Sawbridgeworth.	New priority junction on Cambridge Road
Bishops Stortford	Manor Links, Bishops Stortford	New development access
North and East of Ware	A1170 Wadesmill road / A10 junction, Fanhams Hall Road and B1004 Widbury Hill	1.New arm on A1170 / A10 roundabout and signalisation. 2.Access onto B1004 Widbury Hill East of Ware. 3. Two Accesses are joined by a distributor Road in between which also intersects with Fanhams Hall Road
Stansted Abbots	A1170 NB approach to A414 /A1170 Amwell roundabout	Remove the existing Bus Ln on Ware Rd approach to A10 Amwell Rbt
Buntingford	A10 Buntingford	Dualling of A10 southbound (London Road to existing DC by Westmill)
Buntingford	A10 / London Road, Buntingford	Capacity enhancements to junction

Hertford	St Andrews Street / Old Cross junction, Hertford	Signal optimisation.
Sawbridgeworth	A1184/West Road/Station Rd junction, Sawbridgeworth	Upgrades of A1184/West Road/Station Rd junction
Sawbridgeworth	A1184/High Wych Road junction, Sawbridgeworth	Signalise existing junction
Hertford	A10 /A414 (Rush Green) roundabout, Hertford	Additional capacity on A10 SB off slip
Welwyn Garden City	A414/B195 Birchall Lane/Cole Green Lane	Capacity improvements identified through WHBC junction design study
Harlow	New Link between Eastwick Road and A414 Edinburgh Way	Second River Stort crossing
Hertford	New bypass between A10 and A414 west of Hertford	New dual carriageway bypass
Harlow	Fifth Avenue, Harlow	Central Stort crossing (widening of Fifth Avenue between Eastwick Road and Edinburgh Way (Burnt Mill roundabout), Harlow
Harlow	A414 / Eastwick junction Harlow	Replacement of roundabout with signalised junction and provision of new arm to north providing bus access to Gilston development
Gilston area	A414 west of Eastwick & Eastwick Road	New accesses and internal distributor road for Gilston development
Bishops Stortford	Bishops Stortford between Whittington Way, St James Way and Obrey Way	Revise accesses to include roundabout connecting small portion of northern part of development (125 homes) to Whittington Way. Main access now via roundabout on A1184 St James Way and secondary priority access onto Obrey Way. Although a spine road runs through the site only buses will be able to run straight through.
Bishops Stortford station area	Goods Yard Link	New link road between London Road and Dane Street, Bishops Stortford, for all vehicles.
Harlow	M11 junction 7	M11 junction 7 short term capacity enhancements
Stansted Abbots	A414 /A1170 Amwell roundabout	Capacity upgrade / signalisation
Stevenage	A602 / Gresley Way	Upgrading of the existing Gresley Way/A602 roundabout to signals
Bishops Stortford	A120 / A1250 (Birchanger) junction signalisation	Signalisation of existing junction and provision of rear access from Motorway Service area
M11 junction 8	M11 junction 8 capacity enhancements	Lane marking amendments & new dedicated free flow LT lane from M11 SB off slip
Bishops Stortford	A1250 / London Road (Hockerill junction)	Signal optimisation - signals are being refurbished

Buntingford	London Road, Buntingford	Reduced speed limit from 40 - 30mph
Standon	A120 / Station Road, Standon	Signalisation of junction
Bishops Stortford	South street (between Newton road and Bridge Street)	Road closure during peak hours
Bishops Stortford	A1250 east of Northgate End	Provision of new MSCP with new signalised access and signalisation of A1250 / Northgate End junction
East of Stevenage	Gresley Way, Stevenage	Provision of new signalised accesses from East of Stevenage development (EOS1)
Bishops Stortford	Rye Street, Bishops Stortford	Introduction of traffic calming measures, improvements of pedestrian footpaths and crossing facilities.
Borehamwood	Borehamwood – Station Road/Theobald St/Allum Lane junction	Upgrade of junction to continental roundabout
Borehamwood	Elstree Way Corridor	Junction improvement with replacement of the Tesco roundabout with signals
M25 junction 18-25	M25 j18-25	Smart motorway with hard shoulder running
Borehamwood	A1 / A411 Barnet Lane (Stirling Corner) - Borehamwood	Changes to signal staging and timing
Potters Bar	Darkes Lane / The Walk junction by station	Junction improvements
Potters Bar	Baker Street	New on street cycle lanes within existing road width
Bushey	A409 Common Road / A4140 High Road	Rephasing of signals
Bushey	Sandy Lane / A41 junction	Rephasing of signals
A41 corridor	A41 corridor parallel to M1	Signalisation strategy to link junctions
Watford	A4008 /Radlett Road roundabout	Convert to signalised junction & optimise timings
Elstree	Elstree Crossroads - A411 Watford Rd / A5183 Elstree Hill	New junction layout
Radlett	Park Road / Watling Street	Convert to signalised junction & optimise timings
Shenley	B556/ B5378 roundabout north of Shenley, S of M25 Jct 22	Convert to signalised junction & optimise timings with potential widening of approaches
Dancers Hill	A1081 / Trotters Bottom / Dancers Hill rbt	Convert to signalised junction and optimise timings
Potters Bar	B556 / Baker Street / Darkes Lane	Rephase signals
Borehamwood	A1 / A5135 junction	Rephasing of signals
Bushey	Bushey Hall Road, Bushey Grove	Traffic calming & pedestrian enhancements



	Road, Greatham Road	
A1 (M) jct 6-8	A1 (M) jct 6-8	Widening of motorway to 3 running lanes between junctions 6-8.
Baldock	New link road connecting North Baldock development to North Road and Royston Road	New bridge over railway & tie into A505 Baldock Bypass / Royston Road roundabout. Priority junction at North Road end.
Hitchin	Woolgrove Road/ Cambridge Rd/ Willian Road Hitchin	Signal optimisation
Hitchin	Pirton Road / A505 / Upper Tilehouse St/ Wratten Rd, Hitchin	Junction signalisation
Hitchin	Upper Tilehouse St / A602/ Paynes Park, Hitchin	Junction signalisation
Hitchin	A602 / B656 / Gosmore Rd/ St John's Road, (Hitchin Hill rbt)	Junction signalisation
Hitchin	Bancroft / Hermitage Road, Hitchin	Improve signalised junction and pedestrian phasing
Hitchin	Queen Street / Hermitage Road. Hitchin	Improve signalised junction and pedestrian phasing
A1m junction 9	A1 (M) J9 Letchworth Gate / A505 Letchworth	Signalise all arms of roundabout & optimise existing signal entry (NB offslip)
A1m junction 8	A1(M) J8 / A602 Letchworth junction	Junction improvements
Baldock	Station Road / Royston Rd/Clothall Rd, Baldock	Signal optimisation
Baldock	A507 Clothall Road / Wallington Road / South Road to B656 Royston Road, Baldock	New link road
Letchworth	A505 / Norton Way, Letchworth	Signal optimisation
Stevenage	B197 Gravely Rd / North road, Stevenage	Junction signalisation
Hitchin	Non-strategic roads	Assume 20mph as general assumption in Hitchin on non-strategic routes
Letchworth	Non-strategic roads	Assume 20mph as general assumption in Letchworth on non-strategic routes
Royston	Non-strategic roads	Assume 20mph as general assumption in Royston on non-strategic routes
Hitchin	Station Approach / B556 Hitchin	Hitchin Station access improvements to improve pedestrian, bus and cycle access

Royston	A505 /A10 Roundabout Royston	Widening of roundabout approach arms
Royston	A505/A1198 Roundabout Royston	Widening of roundabout approach arms
Royston	A10/Newmarket Road / Melbourn Street Roundabout, Royston	Widening of junction approach arms
Great Wymondley	Willian Road, Arch Road, Hitchin Road & Graveley Road, Great Wymondley speed reductions.	Reduce speed coded on these roads to 20mph to simulate impact of traffic calming in village
Little Wymondley	Stevenage Road & Priory Lane, Little Wymondley speed reductions	Reduce speed coded on these roads to 20mph to simulate impact of traffic calming in village
Graveley	B197 High Street, Graveley speed reductions	Reduce speed coded on High Street to 20mph to simulate impact of traffic calming in village
Codicote	B656 High Street, Bury Lane, Heath Lane and St Albans Road speed reductions	Reduce speed coded on these roads to 20mph to simulate impact of traffic calming in village
Knebworth	B197 Stevenage Road, London Road, Watton Road, Station Road & Gun Road speed reductions	Reduce speed coded on these roads to 20mph to simulate impact of traffic calming in village
Titmore Green / Symonds Green	Stevenage Road & Fishers Green Road speed reductions	Reduce speed coded on these roads to 20mph to simulate impact of traffic calming in village
Royston	York Way, Royston	New left in left out access from York Way onto A505
A1 (M) Jct 8		Junction improvements
Hitchin	A600 Bedford Road, Hitchin	On-carriageway cycle route
Hitchin	A600 Bedford Road, Hitchin	Bedford Road Pedestrian Crossings
Hitchin	B656 Walsworth Road, Hitchin	Hitchin Rail Station to Town Centre Cycle Route
Letchworth	A505 Hitchin - Letchworth	A505 cycle route and junction treatment for cycle priority
Baldock - Letchworth	Baldock- Letchworth	Baldock to Letchworth Cycle Route via Works Road, Letchworth Rail Station and Broadway
Letchworth - Stevenage		Upgrade existing National Cycle Route between Letchworth and Stevenage
Stevenage to Hitchin		Cycling route between Hitchin and Stevenage via little Wymondley.
Letchworth		Reconfigure B197/A505 junction to remove the need for buses to complete a U-turn.

Royston	Melbourn Greenway to Royston	Pedestrian and cycle improvements
Royston	A505 / Newmarket Road junction	Construction of a new roundabout onto A505, Royston
Hitchin	Stotfold Road & High Dane	New development access
Letchworth	North of Letchworth	New development access
East of Luton	A505 Luton Road	New roundabout on A505
A414 North Orbital Road	A414 North Orbital Road	New access junction onto A414 and new spine road connecting to A5183 Radlett Road (south of Frogmore)
M25 junction 21a	M25 junction 21a	M25 junction 21a capacity improvements (Radlett Railfreight mitigation)
M25 junction 22	M25 junction 22	M25 junction 22 capacity improvements (Radlett Railfreight mitigation)
Park Street	A414 / A405 (Park Street)	A414 / A405 (Park Street) roundabout signalisation
Colney Heath	A414 / Colney Heath Lane / High Street	A414 Colney Heath longabout safety scheme
Chiswell Green	A405 / B4630 Watford Road, Chiswell Green	New Arm to roundabout to serve new hotel development
Harpenden	A1081 Luton Road, Harpenden	Development access
Harpenden	A1081 Luton Rd / Redbourn Lane, Harpenden	A1081 Luton Rd / Redbourn Lane capacity enhancements
Harpenden	A1081 Luton Rd /Station Road, Harpenden	A1081 Luton Rd /Station Road capacity enhancements
Harpenden	A1081 Luton Road / The Common, Harpenden	A1081 Luton Road / The Common capacity enhancements
St Albans	Sandpit Lane, St Albans	Oaklands development new access onto Sandpit Lane
St Albans	Sandpit Lane / House Lane, St Albans	Sandpit Lane / House Lane enlargement of existing roundabout
St Albans	Sandpit Lane / Marshalswick Lane, St Albans	Sandpit Lane / Marshalswick Lane junction improvements
St Albans	Sandpit Lane / Coopers Green Lane, St Albans	Sandpit Lane / Coopers Green Lane junction improvements
St Albans	Sandpit Lane / Barnfield Road, St Albans	Sandpit Lane / Barnfield Road junction improvement
London Colney	A414-A1081-London Colney Roundabout	A414-A1081-London Colney Roundabout junction improvement
St Albans	St Albans Road/Sandridge Road/Marshalswick Lane/Beech Road	St Albans Road/Sandridge Road/Marshalswick Lane/Beech Road - junction improvement
St Albans	A5183 Redbourn Road/A4147 Bluehouse	A5183 Redbourn Road/A4147 Bluehouse Hill/Batchwood Drive Roundabout junction improvement

	Hill/Batchwood Drive Roundabout, St Albans	
Wheathampstead	B653 Cory Wright Way/Marford Road, Wheathampstead	B653 Cory Wright Way/Marford Road, Wheathampstead junction improvement
St Albans	A4147 Hemel Hempstead Road / King Harry Lane St Albans	A4147 Hemel Hempstead Road / King Harry Lane junction improvement
Harpenden	A1081 Luton Road/ Park Hill Junction, Harpenden	A1081 Luton Road/ Park Hill Junction optimisation
St Albans	Hatfield Road/Station Road, Smallford Roundabout	Hatfield Road/Station Road, Smallford Roundabout junction improvement
St. Albans City Centre	Central St Albans	Expanded 20mph zone in St Albans including Victoria Street, Bricket Road and Catherine Street.
St Peters Street	A1081 St Peter's Street Pedestrian Crossing	New pedestrian crossings (various points)
St. Albans City Centre	Peahen Junction	Signal reconfiguration
A414 Park Street rbt- A1(M) J3	A414 Smart Traffic Management	Speed limit changes
London Colney	High Street	Speed limit reduction.
London Colney	Non-strategic roads	A 20mph speed limit introduced on all roads within London Colney
St Peters Street/Victoria Street	St Peter's Street/Victoria Street	Junction Reconfiguration.
Chiswell Green Corridor	A405/B4630 Watford Road	Junction signalisation
Coopers Green Lane	Coopers Green Lane	Speed limit reduction
Chiswell Green Corridor	B4630 Watford Road	Traffic calming measures
London road corridor	London Road/Watsons Walk/Lattimore Road junction alterations	Junction reconfiguration
Harpenden	A1081 Harpenden Town Centre & Station Road	Traffic calming measures
Harpenden	North East Harpenden Access	New access from North East Harpenden development site (site NEH)
Chiswell Green	Chiswell Green Lane	New access from Chiswell Green development (site CG)
Park Street	A5183 Frogmore & A414	New access from Park Street Garden Village
London Colney	Shenley Lane	New access from West of London Colney development
St Albans	A1081 Harpenden Road	New access from North of St Albans development
A1 (M) jct 6-8	A1 (M) jct 6-8	Widening of motorway to 3 running lanes between junctions 6-8.

A1m junction 8	A1(M) J8 / A602 Letchworth junction	Junction reconfiguration
A1m junction 8	A1(M) Junction 8 slip road improvements	Extend width of A1m north of junction 8 to allow a lengthened SB off slip
Stevenage	A602 /Hertford Road Stevenage	Signalisation and capacity improvements at existing junction (A602 phase 1 improvement works)
Stevenage	Stevenage Costco- New Access on Southern and Northern accesses.	Signalised on Northern Access and New Southern Access
A1m junction 7		Lengthening of SB off slip
Stevenage	A602 /Gunnels Wood Road, Stevenage	Upgrade of A602 / Gunnels Wood Road / GSK junction
Bragbury End	A602 Bragbury End	New development access
Stevenage (town centre)	Lytton Way between Swingate and Six Hills Way	Close Lytton Way between Swingate and Six Hills Way to traffic except buses.
Stevenage (south)	Hertford Road, Stevenage	Hertford Road Speed reduction measures & bus gate
North Stevenage	Stevenage road/A602	Signalisation and Bus Priority - Stevenage Road/A602
Bedwell	Letchmore Road area	On-carriageway cycle routes
Stevenage to WGC	B197	Cycle route between Stevenage and Welwyn Garden City, via Knebworth, Woolmer Green, Oaklands and Welwyn.
Letchworth - Stevenage		Upgrade existing National Cycle Route between Letchworth and Stevenage with increased cycle priority and provision of on carriageway route through Graveley and into Stevenage via North Road
Abbots Langley	Woodside Road, Abbots Langley	New roundabout serving development north of Meadowside junction
Rickmansworth	Uxbridge Road, Mile End, Rickmansworth	New access for 4fe secondary school - access proposed via new roundabout junction on Uxbridge Road (at junction with Long Lane)
Rickmansworth	A412 / A402 Rickmansworth	Additional capacity at the A412 / A404 roundabout to the west of Rickmansworth Town Centre
Hunton Bridge	M25 spur, Hunton Bridge	M25 spur approach to Hunton Bridge roundabout - widening approach / circulation or signalisation
Watford	Glen Way and Grove Mill Lane at junctions with Hempstead Road (Watford)	Junction reconfiguration
Watford	Eastbury Road / Deacons Hill, Watford	Junction reconfiguration
M25 junction 20	M25 Junction 20	Capacity improvements
Rickmansworth	A404 Riverside Drive, Church St Roundabout	Partial signalisation
Watford	Thomas Sawyer Way, Watford	New link road from Dalton Way providing access to Watford Health Campus
Watford		Implement 20 mph zone in defined areas

Watford	A411 Hempstead Road / The Avenue (Town Hall) junction, Watford	Modification to roundabout, new exit from central Avenue car park onto A411
Watford	Ascot Road	Additional bus lanes
Watford	Ascot Road, Whippendell Road, Rickmansworth Road	Road Space Consolidation
A414/Holwell Lane roundabout	A414/Holwell Lane roundabout improvements	New development access and minor capacity improvements
A414/B195 Birchall Lane/Cole Green Lane	roundabout improvements	Capacity improvements identified through WHBC junction design study
A1m junction 6	A1m junction 6 ramp metering	Switch on of installed ramp metering as part of final phase of A1m junction 6 improvement works
A1m junction 6 / B656 Codicote Road / Great North Road (Clock roundabout)	A1m junction 6 / Clock roundabout	A1(M) Junction 6 including Clock Roundabout junction capacity improvements
Welwyn Garden City	A1000 Bessemer Road / Waterside / B195 Black Fan Road (Mundells Gyration)	Mundells gyration improvements
Welwyn Garden City	Broadwater Road / Bridge Road	Octabout
A414 Mill Green junction to Jack Oldings roundabout	A414 Mill Green - Jack Oldings roundabout	A414 section between Mill Green & Tesco's reconfiguration
A1(M) Junction 4	A1m Junction 4 /Jack Oldings roundabouts	A1(M) Junction 4 improvements
A1 (m) junction 3	A1 (m) Junction 3 improvements	Signal optimisation and dualling
Hatfield	A1001 Comet Way / A1057 (Comet roundabout), Hatfield	Comet roundabout capacity improvements
Stanborough	A6129 / Coopers Green Lane / B197 Great North Road / Bocket Road, Stanborough	Junction reconfiguration
A414 / A1000, Mill Green	A414 / A1000 junction improvement	Junction reconfiguration
B195 Birchall Lane,	Birchall Lane	Birchall Lane improvements and new development accesses
Hatfield	A1001 Comet Way / Wellfield Road (Airfield) junction, Hatfield	Junction reconfiguration
Coopers Green Lane / Green Lane, near Hatfield	Coopers Green Lane / Green Lane, near Hatfield	Junction reconfiguration

Hatfield	A1057 St Albans Road / Ellenbrook Lane, Hatfield	Junction reconfiguration
A1000 and South Way over-pass, South Hatfield	A1000 and South Way over-pass improvements	Extend SB on-slip to provide extra slip capacity
Welwyn Garden City	A1000 Chequers / Broadwater Road	Junction reconfiguration
Hatfield	A1000 Great North Road / B6426 St Albans Road East (Red Lion junction), Hatfield	Signal optimisation
Brookmans Park	A1000 /Swanley Bar Lane	Junction reconfiguration
Cuffley	Plough Hill / Station Road	Junction reconfiguration
Brookmans Park	A1000 /Hawkshead Road	Junction reconfiguration
A1000 /Shepherds Way, Brookmans Park	A1000 / Shepherds Way junction improvement	Optimisation of existing signals
Welham Green	A1000 /Dixons Hill Road	Junction reconfiguration
Hatfield	Hatfield - College Lane/Cavendish Way Corridor	Replace the existing roundabouts with signalised junctions
A1 (M) J 3	A1M Junction 3	Junction reconfiguration
Hatfield	Hatfield - Cavendish Way/Queensway Corridor	Traffic management measures
Hatfield	Hatfield - Cavendish Way/Queensway Corridor	Cavendish Way bus lane
Hatfield	Hatfield - Cavendish Way/Queensway Corridor	Cavendish Way-Bishops Rise junction reconfiguration
Hatfield	Travellers Lane	Traffic calming measures along length of corridor
Hatfield	Comet Way	Comet Way corridor reconfiguration
Coopers Green Lane	Coopers Green Lane NE of Hatfield Avenue (towards Welwyn Garden City)	Reduced traffic speeds and pedestrian and cycle provision
Lemsford	B653/Lemsford Village/Green Lanes junction	Junction reconfiguration
Mill Green	A414 EB onslip at Mill Green junction	Junction reconfiguration
Welwyn Garden City	Knightsfield / Shire Park (Tesco) entrance	Junction reconfiguration
Welwyn Garden City	Howardsgate / Parkway / Stonehills / Fretherene Road	Urban realm improvements

Welwyn Garden City	Black Fan Road / Hens Lane / Ridgeway	Junction reconfigurations
B197 corridor	B197 corridor (Clock Roundabout Welwyn - Stevenage)	B197 Sustainable Travel Corridor with footway / cycleway improvements, traffic calming & bus priority
Welwyn	Clock Roundabout and Welwyn Bypass	Reduce 2 lane dual carriageway section to single lane in each direction with improved off-road cycling and walking facilities and new crossing facility
Welwyn Garden City	A1m junction 5	Junction closure
Hatfield aerodrome	Coopers Green Lane & Albatross Way	New development accesses
M1 - A5	M1 -A5	New link between M1 and A5 north of Dunstable
Oxford - Cambridge	Oxford - Cambridge	Oxford - Cambridge Expressway
M1 jnc 11a - A6	M1 jnc 11a - A6	New link between M1 and A6 around North Luton
Luton	Town centre ring road	Reallocation of lanes on part of town centre ring road
Luton	Vauxhall Way	Dualling of Vauxhall Way between Stopsley Way / Hitchin Road and Kimpton Road
Luton	Gipsy Lane	Widening of Gipsy Lane

#### Modelled Highway Schemes outside Hertfordshire

Scheme	Area
Oxford / Cambridge Expressway – new road link	Buckinghamshire
A5 – M1 Link & Woodside Link	Central Bedfordshire
M1 – A6 Link road	Central Bedfordshire
Town center ring road – lane relocation	Luton
Vauxhall Way – capacity enhancement	Luton
Gipsy lane – capacity enhancement	Luton



## 9.2 Appendix II: Full List of Public Transport Schemes

### Modelled Public Transport Schemes in Hertfordshire

LPA (District)	Scheme type	Location	Location Details	Description of scheme
Broxbourne	Bus scheme	High Leigh	New bus service High Leigh - Broxbourne Station	New bus service
Broxbourne	Bus scheme	Brookfield Centre	New bus service Waltham Cross station - Hertford Regional College	New bus service
Broxbourne	Bus scheme	Park Plaza	New bus service Park Plaza North - Waltham X bus station	New bus service
Broxbourne	Bus scheme	Brookfield Centre	Brookfield bus interchange improvement	Improved bus stops
Broxbourne	Bus scheme	Old A10	Bus stop improvement programme at stops on old A10 (A1170 / B176)	Real time information and bus stop upgrade
Broxbourne	Bus scheme	Old A10	Selective Vehicle Detection providing priority for buses on old A10 (A1170 /B176) at Station Road / High Road (Broxbourne), A1170 / Vancouver Road, Church Lane / Turners Hill & Old Pond junction (Cheshunt)	Increase in bus speed / reduction in delay
Broxbourne	Capacity enhancement	WA railway line	Crossrail2 improvements	Increase in frequency between Cheshunt and Broxbourne associated with Crossrail2
Broxbourne	Capacity enhancement	WA railway line	New stations at Turnford and Park Plaza	2 trains per hour in off peak with a few additional trains in peak
Dacorum	Bus service enhancements	Maylands area, Hemel Hempstead	Maylands	Improvement of Maylands bus services
Dacorum	Bus service enhancements	Luton - Hemel	M1	Dedicated coach Luton to Hemel along M1
Dacorum	New bus service	Hemel Hempstead	A414 corridor	New high frequency bus service running along A414 corridor
East Herts	Bus Scheme	Hertford A414 Gascoyne Way and Ware Road		Bus priority measures along A119 and A414
East Herts	Frequency change	Bishops Stortford rail	Bishops Stortford - Cambridge 2 additional fast trains per hour off-peak	1 train serving Bishops Stortford and 1 train serving Cambridge (Oct 2016)

East Herts	Frequency change	Bishops Stortford rail	WA line to Bishops Stortford & Harlow	Increased frequency to 9 trains per hour off peak
East Herts	Frequency change	Hertford East	Hertford East line	Increased frequency from Hertford East to / from Liverpool Street / Stratford
East Herts	New service	North and East of Ware	North and East of Ware	New circular bus service
East Herts	Service diversion	East of Stevenage	Gresley Way, Stevenage	Diversion of existing bus service through site
East Herts	Service diversion	Bishops Stortford South	Bishops Stortford South	Diversion of existing bus services through site
North Herts / Stevenage / Welwyn Hatfield / Hertsmere	Rail timetable change	Great Northern rail line	Great Northern rail line	Thameslink timetable changes
Hertsmere	Bus Scheme	Potters Bar	Cranborne Road Industrial Estate	New bus service
Hertsmere	Bus route change	Tyttenhanger		Diversion of existing bus services
North Herts	Bus scheme	Hitchin		Bus frequency improvements Hitchin - Letchworth
North Herts	Bus scheme	Hitchin		Bus frequency improvements Hitchin - Luton
North Herts	Bus scheme	Letchworth		Bus frequency improvements Letchworth - Stevenage
North Herts	Bus scheme	North Letchworth		Bus route extension
North Herts	Bus Scheme	Hitchin-Luton		Bus priority measures
North Herts	Bus Scheme	Baldock		Bus Access to Development - Baldock
St. Albans	Bus Scheme	St Albans	St Albans Abbey station - city station	SC1 Abbey Line Shuttle bus service
St. Albans	Bus scheme	Hatfield road corridor	Hatfield Road	Bus priority measures
St. Albans	Bus Scheme	London Colney-St. Albans		Improved London Colney-St Albans bus services
St. Albans	Bus Scheme	St. Albans-Hatfield		Increased frequencies and

				extended hours of operation.
St. Albans	Park & rail	Park Street	Park Street station	Potential new Park and rail facility south of A414 and east of A405 linked to existing / relocated Park Street station
Stevenage	Bus Scheme	Stevenage (south)	Hertford Road	Hertford Road Speed reduction measures & bus gate
Stevenage	Rail scheme	Stevenage station	Stevenage Station	Provision of fifth platform
Stevenage	Bus Scheme	Stevenage St Nicholas		New services to north Stevenage
East Herts	Bus Scheme	East of Stevenage	Gresley Way, Stevenage	Diversion of existing service into development
Watford / St Albans	Rail Improvements	Watford - St Albans	Abbey Line	Frequency improvements
Watford	Bus service enhancements	Watford	Tolpits Lane to Hampermill Lane	Colne sustainable link (cycle / bus). New link over the River from Tolpits Lane to Hampermill Lane for buses / cycles
Wel Hat	Bus schemes	Hatfield	Business park area - A1057 (Mosquito Way - Albatross Way), Albatross Way / Mosquito Way / Tamblin Way / Jetliner Way / Comet Way	Circular bus network with bus priority, improving facilities an improved interchange facilities
Wel Hat	New bus service	Symondshyde		New bus service
Wel Hat	Bus link	Welwyn Garden City	Shire Park	Bus only link
Wel Hat	Bus frequency	Welwyn Garden city - Luton		Frequency improvements
Wel Hat	Bus frequency	Hatfield - Luton		Frequency improvements
Wel Hat	Bus Improvements	Hatfield - St Albans	A1057 Hatfield Road	Bus priority measures
East Herts	Bus Improvements	724 route Heathrow to Harlow	724 route	Rationalisation of existing 724 route into route 724, & 302 - splitting it into sections with improved frequency over shorter distances

Dacorum	Bus Improvements	Watford	324 route	Rationalisation of existing 324 route, with increased frequency from Hemel to Watford
Dacorum	Bus Improvements	Hemel - Stevenage	300 /301 route	Rationalisation of existing route
Buckingham shire	New rail line	Oxford - Cambridge	Oxford - Cambridge	New rail link connecting Oxford and Cambridge
Luton	New LRT	Luton Airport	Luton Parkway - Airport	New LRT connection between Luton Parkway and Luton Airport

**Modelled Public Transport Schemes outside Hertfordshire**

<b>Scheme</b>	<b>District</b>
East West Rail	Various
Light Rail scheme linking Luton Airport Parkway station to Luton airport	Luton

## 9.3 Appendix III: Highway Network Assignment Convergence

### Assignment Convergence

- 9.3.1 The convergence of the highway assignment has been measured according to standards set out in Table 9-1 (as stated in WebTAG M3.1 section 3.3.5). When a model does not achieve convergence criteria, it may produce large variations between iterations, “noise”, leading to unreliable results.
- 9.3.2 It should be noted that the increased planning assumptions, RTF 2018 changes and additional infrastructure schemes generated significant convergence issues in LP4. Every effort was made to optimise signals and reduce delays wherever possible, however this had to be considered alongside creating a stable, reliable forecast model scenario which converged in all time periods.
- 9.3.3 Checks comparing Dacorum Local Plan scenario convergence to LP4 showed similar levels of convergence in both models. Results are therefore categorised as stable and consistent.
- 9.3.4 In SATURN terms, “percentage of links with flow change (P) <1%” is referred to as %FLOWS.

**Table 9-1: Convergence Measures and Base Model Acceptable Values**

Measure of Convergence	Base Model Acceptable Values
Delta and %GAP <sup>5</sup>	Less than 0.1% or at least stable with convergence fully documented and all other criteria met
Percentage of links with flow change (P) <1% <sup>6</sup> (%FLOWS)	Four consecutive iterations greater than 98% (measured as 97.5% plus in SATURN)

- 9.3.5 For reference, highway assignment convergence values are given in Table 9-2 and show that the model convergence remains stable across the Dacorum scenarios tested. It can be observed that convergence iterations in Scenario 1 and 2 were marginally higher in the AM peak. These were investigated and found to be model noise issues not related to the Dacorum area.

**Table 9-2: Dacorum Convergence Iterations**

Time Period	Base Year 2014	Local Plan Run 4	Baseline	Additional Allocation	Scenario 1	Scenario 2
AM	44	55	49	33	51	66
IP	25	36	34	37	33	39
PM	30	30	32	41	34	33

<sup>5</sup> %GAP is the difference between the costs along the chosen routes and those along the minimum cost routes, summed across the whole network, and expressed as a percentage of the minimum costs. %GAP provides a measure of the proximity to equilibrium of the assignment.

<sup>6</sup> The percentage of links on which flows change by less than 1% between iterations.