7

Hertsmere Borough Council: Local Plan Analysis

Hertfordshire County Council – TIPSF Additional Modelling Support

Final Report

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1.1 Following completion of the COMET v5 2014 Base Year Model enhancement in 2019, HCC commissioned AECOM to develop two 2036 forecast scenarios. The first represented a "do minimum" scenario and is referred to as Scenario 1; the 2036 Reference Case scenario. This included committed (i.e. the most likely) developments and infrastructure across Hertfordshire. NTEM (National Trip End Model) data for 2036 was applied in all external areas. The second represented a "do something" scenario and is referred to as Scenario 2; the 2036 Local Plan Run 5 (LPR5) scenario. This includes the Local Plan aspirations (all employment and dwelling growth, regardless of certainty) of the 10 Hertfordshire districts, as well as the growth aspirations in selected neighbouring areas. Full details of both 2036 scenarios are detailed in separate reports[1] available from HCC[2].

1.2 Scenario 2 includes all infrastructure schemes regardless of certainty and the proposed transport schemes agreed with Hertfordshire districts in autumn 2019. It aligns with the Infrastructure Delivery Plans and Transport Strategies at the time, such as the growth and transport plans and the A414 strategy. In addition to highways and public transport schemes, a range of mode shift schemes were included in Scenario 2 and attempts to reduce areas of notable delay from Scenario 1 were made.

1.3 As part of the Local Plan process, Hertsmere Borough Council (HBC) have identified a number of potential new Local Plan allocations. These were fed into COMET as part of Scenario 2. This document presents detailed analysis of the impacts of Local Plan development in the district of Hertsmere and provides evidence for their ongoing Local Plan process. This document should be used to provide extra narrative about the impacts of Hertsmere's Local Plan developments.

1.4 The caveats should be carefully considered, and the scale of the COMET model and 2036 scenarios undertaken should provide proportionality to the analysis presented. More detailed junction/corridor impacts across Hertsmere should be further assessed using more detailed junction or microsimulation modelling. The analysis provided is an overview to inform future works and identifies areas where further studies should be focussed to complement the Local Plan growth proposed.

1.5 Traffic conditions, routeing summaries and journey times between towns and villages were investigated in both Scenarios 1 and 2 and comparisons between scenarios and the base year were made. Full analysis is contained in this report and should be read in conjunction with the "*Hertsmere Journey Time Routes, Detailed Journey Time Graphs*" issued by AECOM in December 2020.

1.6 This Executive Summary details the Scenario 2 impacts/changes in the key urban areas of Hertsmere. Figures for other time periods can be found in Appendix A, while commentary for other scenarios and comparisons between scenarios are explained in detail in the main body of this report.

[1] "COMET_2036_Reference_Case_Modelling_Assumptions_v1_08-01-2020.pdf" issued to HCC in January 2020 and COMETv5_LP5_Forecasting Report_2036_FINAL.pdf issued to HCC in May 2020

[2] The COMET Local Plan Run 5 forecasting report and LMVR are available upon request via the email address: Tpdata@hertfordshire.gov.uk. Further details on COMET and the modelling process in Hertfordshire can be found via the link: www.hertfordshire.gov.uk/transportmodelling

Borehamwood and Elstree

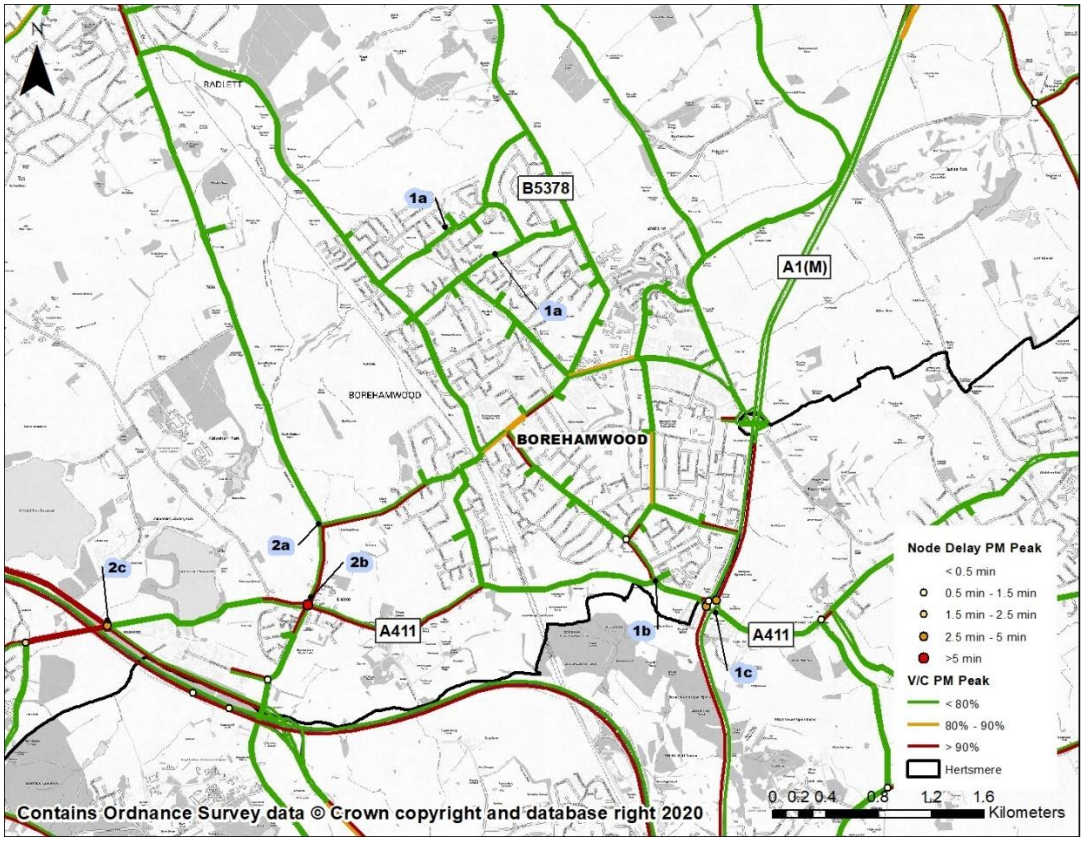

Figure 1-1: Scenario 2 Node Delay and Link Stress in Borehamwood - PM Peak

1.7 The main routes used by traffic travelling to and from Borehamwood are Theobald Street, Shenley Road and more strategic routes such as the A1 and M25. Traffic also links with surrounding local towns in Hertsmere such as Radlett and Elstree and towns such as Hatfield further north in Hertfordshire. Traffic is also observed using north/south routes on local roads to travel between Borehamwood and St Albans.

1.8 Flows travelling to and from Elstree use Roman Road, Barnet Lane, High Street and A41, linking Elstree with Dacorum, Buckinghamshire and Edgware. There is also some interaction with Radlett, Borehamwood and Watford via the A41.

1.9 Theobald Street to B5378 via Aycliffe Road and Gateshead Road operates at capacity in both the AM and PM peaks. In both time periods junction delays are minimal.

1.10 Furzehill Road northbound presents moderate congestion in the AM peak and high congestion in the PM peak near the junction with Barnet Lane. No critical delays are identified at the junction in any time period.

1.11 Long junction delays are suggested in both the AM and the PM peaks at Stirling Corner. These build on the delays which already exist in the Base Year model at this junction. Stirling Corner is a known bottleneck and Scenario 2 indicates that it will experience significant delays in the future carrying local and strategic traffic.

1.12 Moderate to high congestion is suggested southbound on Elstree Hill North southbound and on the A41 Northbound exit in both the AM and PM peaks. Long junction delays are indicated at the Elstree crossroads, building on the delays which exist in the Base Year scenario. This is also a known bottleneck in the area due to the lack of alternative routes. The COMET modelling suggests that further studies should quantify the impacts at the Elstree crossroads and Stirling Corner as these will be critical in determining how traffic routes to/from Watford and North London and the A1/M1 in the future.

1.13 Comparing journey times between scenarios, journeys to/from Borehamwood do increase in Scenario 2 compared to the Base Year although there are marginal changes compared to Scenario 1. The exception to this is journeys to/from Watford as areas of delay and congestion are experienced in Bushey and around Watford town centre. Journeys to and from Elstree are impacted by delays at the Elstree crossroads in Scenario 2. Some of the longer strategic journeys are impacted by congestion on the surrounding A1 and M25 in Scenario 2.

Bushey

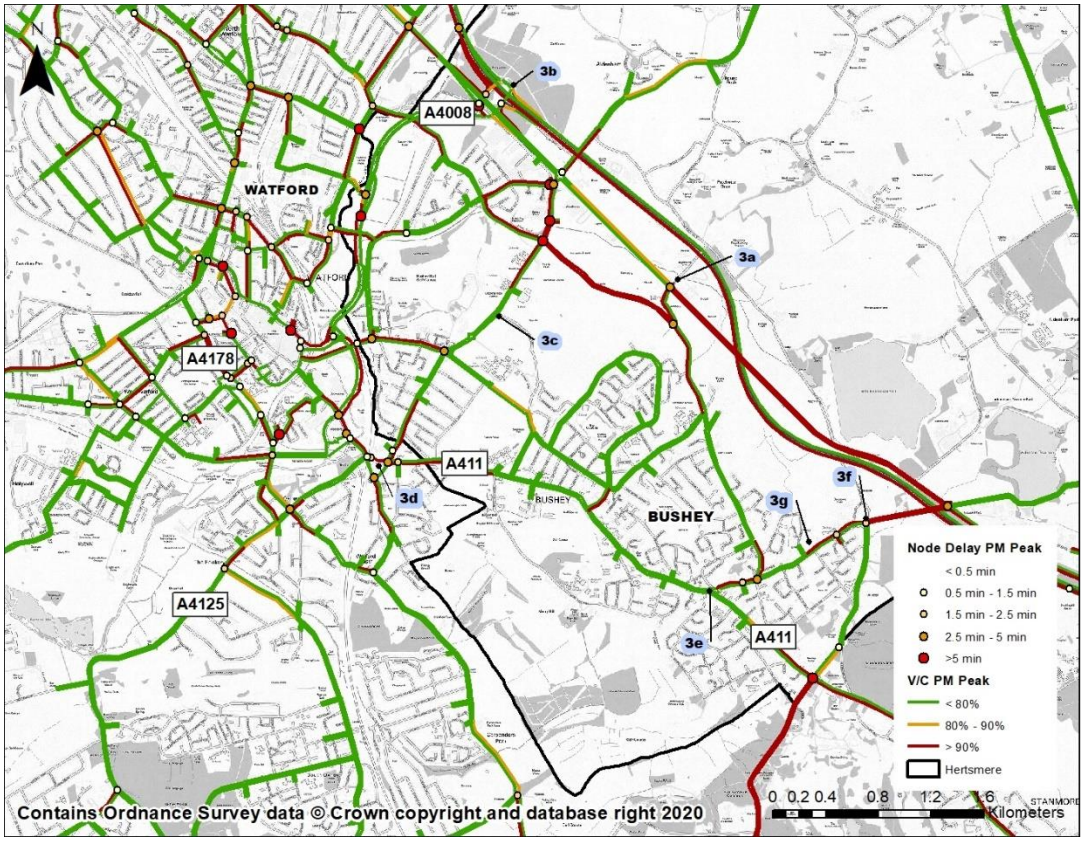

Figure 1-2: Scenario 2 Node Delay and Link Stress in Watford - PM Peak

1.14 Traffic routeing to and from Bushey utilises the A411 and Falconer Road, and the M1 to access areas in Hertfordshire and north London, especially in the PM peak. Traffic volumes to/from Bushey are lower when compared to other towns in Hertsmere and there are linkages to adjacent Watford and Elstree.

1.15 High congestion and junction delays are modelled on Sandy Lane throughout the day in Scenario 2, with congestion on Little Bushey Lane expanding in both directions. Traffic moving in the north/south direction on Little Bushey Lane creates congestion problems at the crossing with Sandy Lane which operates near capacity.

1.16 High congestion is modelled on the B462, especially eastbound, throughout the day. Minor junction delay is observed in both the AM and PM peaks. High congestion is suggested on Aldenham Road near the Little Bushey Lane/ Aldenham Road junction throughout the day, with high junction delays observed in the PM peak. The road is operating below capacity near the Bushey Hall Rd/The Avenue/ Aldenham Road junction in both the AM and PM peaks.

1.17 Whilst local movements around Bushey are not significantly impacted by congestion or delays in Scenario 2, it can be recognised that the surrounding strategic routes (A41, M1) experience high levels of congestion and there are delays at junctions leading to/from these routes. Similarly, there are delays and congestion on routes to/from central Watford. This would suggest that Bushey residents and travellers to and from Bushey will experience congestion and delays in the future.

1.18 Liaison with Highways England would also confirm the predicted pressures on the M1 and especially junction 5 with the A41. These important links between Bushey, Watford, wider Hertsmere and north London should be carefully considered in future studies.

1.19 There are journey time increases for trips to and from Bushey in Scenario 2 compared to the Base Year, however increases are greatest in the PM peak. Some of the largest increases are also experienced for relatively local journeys to and from Watford and changes relative to Scenario 1 would indicate the network is very sensitive in this area and may be approaching capacity.

Potters Bar

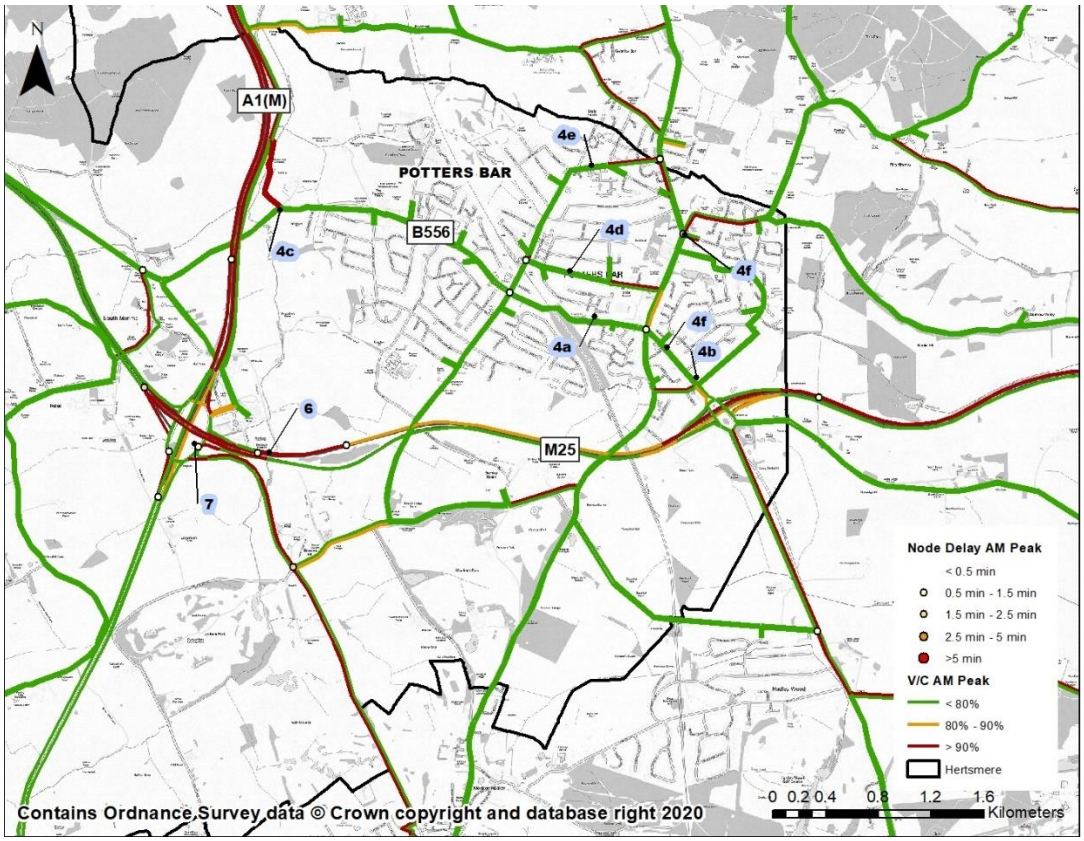

Figure 1-3: Scenario 2 Node Delay and Link Stress in Potters Bar - AM Peak

1.20 Traffic travelling to and from Potters Bar utilises Baker Street, Mutton Lane and the M25 to access other districts within Hertfordshire and London Boroughs south of Hertsmere. Traffic routeing to and from Potters Bar utilises M25 junctions 24 and 22a.

1.21 In Scenario 2, the B556 between Baker Street and High Street A1000 operates well below capacity, with very small delays observed at its junctions. The route from the M25 Junction 24 to B556 Mutton Lane junction with High St A1000 is operating below capacity with small delays at junctions.

1.22 Moderate congestion is observed for the southbound traffic and high congestion is observed for the northbound traffic on Warrengate Lane. Congestion around these junctions in Scenario 2 could possibly be linked to the Bowmans Cross development near M25 junction 22. Traffic from the development may also route to and from Potters Bar Station which should be considered in further assessments. Capacity issues and delays are observed on local roads around M25 junction 23.

1.23 The Walk operates below capacity in Scenario 2, however high congestion is suggested near the Walk/A1000 junction. Small delays are observed at the Darkes Lane/The Walk junction. Darkes Lane operates below capacity, but high congestion is observed at the Church Road/A1000 junction where traffic is subject to small delays.

1.24 Similar to Bushey, it can be observed that whilst local roads around Potters Bar generally operate with limited congestion and some delays, the town is surrounded by the strategic M25 and A1 which experience congestion and delays. Congestion around M25 junction 23 may be generating rat-running to/from Potters Bar as traffic utilises local roads rather than the motorway.

1.25 Journey time increases between Scenario 2 and the Base Year are suggested between Potters Bar and towns to the west of it, especially Watford. This is due to the increased levels of congestion throughout the network in Scenario 2 and the route choices as traffic can utilise the strategic or local road network. There are marginal journey time increases when comparing Scenario 1 and Scenario 2.

Radlett and Shenley

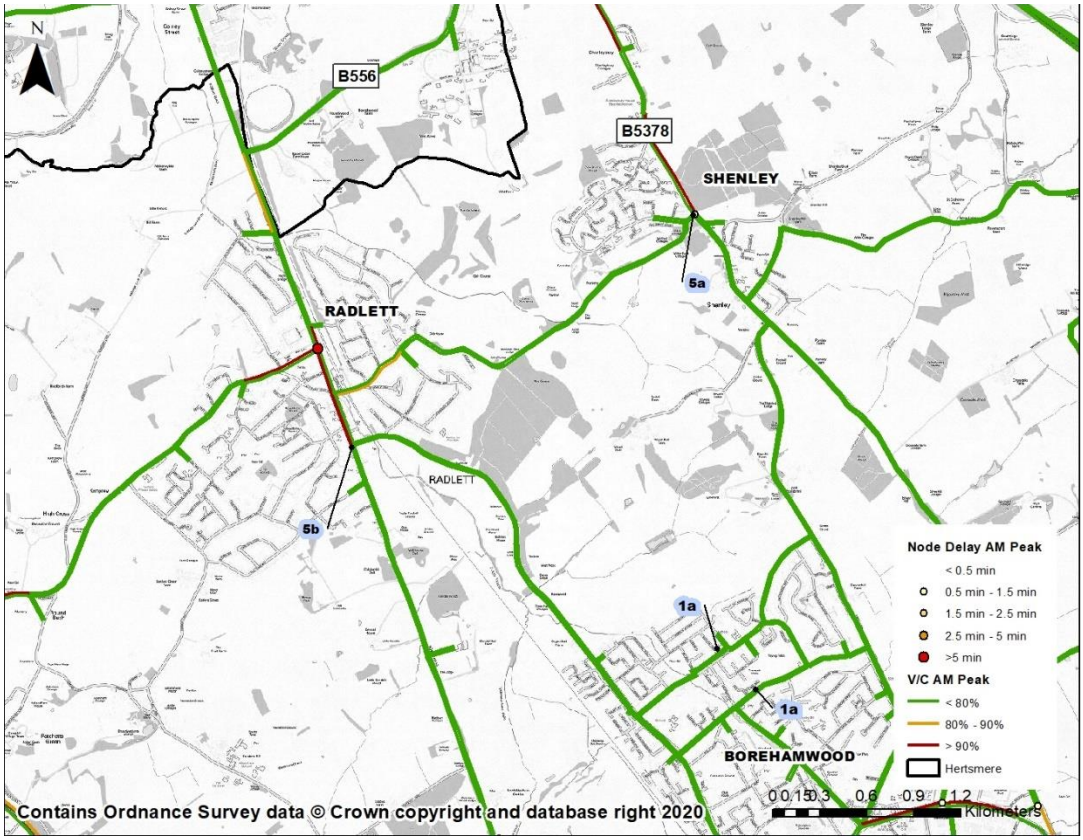

Figure 1-4: Scenario 2 Node Delay and Link Stress in Radlett - AM Peak

1.26 Flows routeing from and to Radlett travel via Watling Street, Theobald Street, Watford Road A414 and the M25 to reach destinations in Hertfordshire, Buckinghamshire and London. The main links to and from Shenley are the Black Lion Hill / London Road and Mimms Lane/ Radlett Lane that provide a shortcut to and from the M25.

1.27 Traffic utilises local roads to reach other towns in Hertsmere or the M25 junction 22 to route via the M25. Traffic also links via local roads to the A414 south of St Albans to join the M1 at junction 8.

1.28 The road network in Shenley generally operates below capacity in Scenario 2, however there is some congestion on the B5378 travelling to/from London Colney and the M25. The network in Radlett is also free flowing, however long delays are shown at the Park Road / Watling Street junction in Scenario 2. These delays will be generating rerouteing on the local road network. This junction is a known bottleneck in the Base Year model.

1.29 Due to the delays at the Park Road / Watling Street junction in Scenario 2 journey times to/from Radlett and Shenley and locations to the south are subject to significant increases. Routeing analysis also indicates traffic from the new development at Bowmans Cross may also contribute to local road traffic around Radlett and Shenley.

Summary

1.30 The results from Scenarios 1 and 2 have confirmed that Hertsmere's Local Plan growth does impact the local network. However, vehicles routeing from Buckinghamshire, London and other districts within Hertfordshire also add to Hertsmere's traffic conditions. Whilst delays increase around the town centres in Hertsmere in Scenario 2, these are also seen in Scenario 1 such as the Elstree crossroads and Park Road junction in Radlett as shown by the plots in Appendix B.

1.31 Graphical journey time analysis has indicated that delays and congestion across Hertsmere follow similar patterns between the Base Year and Scenario 1 and 2. This suggests that few new issues are generated by the Local Plan growth proposed; the growth exerts additional pressure on existing congestion hotspots.

1.32 The town distribution plots have also indicated that there are limited interactions between Hertsmere towns and a lot of journeys interact more with the strategic highway network to travel to and from locations in other areas of Hertfordshire/North London or Buckinghamshire. This is to be expected as Hertsmere is not a large employment area and it is expected most trips would leave the area for work and then return in the evening. Therefore, the impacts of growth on the local road network are not as great as in other areas where significant housing growth is planned alongside significant employment growth.

1.33 The interaction of local and strategic traffic on the surrounding M25, A1, M1 and A41 should be carefully considered in future stages of the Local Plan. Congestion and delays on these roads will impact traffic movements on Hertsmere's road network as users may try to use local roads instead or experience delays travelling to/from junctions with the strategic network bordering Hertsmere.

1.34 It is also observed that the location of the Bowmans Cross (Tyttenhanger) development, the largest in Hertsmere, helps mitigate it's overall impacts. As a lot of traffic uses the adjacent M25 Junction 22 for movements between the development and Potters Bar, Radlett and St Albans, while using the M25 Junction 23 for an easy access on to the A1, these movements mitigate the impact on the local road network. Congestion on adjacent local roads, such as the A1081, and flow increase on Coursers Road and B556 towards Potters Bar, indicate the need for more detailed modelling which would reveal the development's impact to the local network in greater detail.

2. Introduction

Background and Model Versions

2.1 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.

2.2 The COMET Base Year (2014) model has been regularly updated since 2015 and different versions of the COMET model have informed 4 previous local plan forecast scenarios. The latest COMET model (COMET v5) includes significant enhancements and an updated zoning system and transport networks compared to previous versions. The validation[3] of COMET v5 incorporated significantly more traffic data, screenlines[4], cordons[5] and journey time[6] routes. Full v5 Base Year Model performance is detailed in the updated Local Model Validation Report (LMVR)[7].

2.3 Following completion of the COMET v5 2014 Base Year Model enhancement in 2019, HCC commissioned AECOM to develop two 2036 forecast scenarios. The first represented a "do minimum" scenario and is referred to as Scenario 1, the 2036 Reference Case scenario. The second represented a "do something" scenario and is referred to as Scenario 2, the 2036 Local Plan Run 5 (LPR5) scenario. Full details of both 2036 scenarios are detailed in separate reports[8] available from HCC[9]. This report refers to the Base Year scenario and Scenarios 1 and 2.

2.4 Scenario 1 only included committed (i.e. the most likely) developments and infrastructure across Hertfordshire. NTEM (National Trip End Model) data for 2036 was applied in all external areas.

2.5 Scenario 2 includes the Local Plan aspirations (all employment and dwelling growth, regardless of certainty) of the 10 Hertfordshire districts, as well as the growth aspirations in the following neighbouring areas: Central Bedfordshire, Luton, Buckinghamshire (all districts), part of Essex (i.e. Epping Forest, Harlow, and Uttlesford), part of Cambridgeshire (i.e. South Cambridgeshire and Cambridge) and three boroughs of Outer London (Barnet, Enfield and Hillingdon).

2.6 Scenario 2 includes all infrastructure schemes regardless of certainty and the proposed transport schemes agreed with Hertfordshire districts in autumn 2019. It aligns with the Infrastructure Delivery Plans and Transport Strategies at the time, such as the growth and transport plans and the A414 strategy. In addition to highways and public transport schemes, a range of mode shift schemes were included in Scenario 2 and attempts to reduce areas of notable delay from Scenario 1 were made.

2.7 As part of the Local Plan process, Hertsmere Borough Council (HBC) have identified a number of potential new Local Plan allocations. These were fed into COMET as part of Scenario 2. HBC require more detailed analysis of the impacts of Local Plan development in their district in order to provide evidence for their ongoing Local Plan process. Hertsmere have confirmed that comparing Scenarios 1 and 2 will provide the analysis they require to support their Local Plan submission.

[3] Validation is the process of comparing modelled traffic flow/journey time data to observed traffic count/journey time data
[4] A screenline is a line crossing several roads in a model to which modelled traffic volumes are compared to observed traffic count data. Screenlines are used to calibrate a transport model by ensuring flows reflect traffic counts as accurately as possible.
[5] A cordon is an area of a model into which vehicle movements are recorded in order to track performance against observed traffic count data. In COMET cordons were constructed around the major urban settlements so movements into/out of urban areas could be reflected in the modelling as accurately as possible.
[6] Journey time routes in COMET are compared to observed data as part of model validation
[7] "COMET_LMVR_v5.2. pdf" issued by AECOM in March 2020
[8] "COMET_2036_Reference_Case_Modelling_Assumptions_v1_08-01-2020.pdf" issued to HCC in January 2020 and COMETv5_LP5_Forecasting Report_2036_FINAL.pdf issued to HCC in May 2020
[9] The COMET Local Plan Run 5 forecasting report and LMVR are available upon request via the email address: Tpdata@hertfordshire.gov.uk. Further details on COMET and the modelling process in Hertfordshire can be found via the link: www.hertfordshire.gov.uk/transportmodelling

2.8 Table 2-1 presents the number of dwellings and jobs in the Base Year scenario (2014), as well as the growth assumptions considered in Scenarios 1 and 2 in Hertsmere. For reference, the total number of dwellings and jobs and the growth assumed in the county of Hertfordshire are also presented for the Base Year scenario and Scenarios 1 and 2. The percentage growth in dwellings and jobs between 2014 and 2036 is provided for Hertsmere and Hertfordshire for the two applications.

2.9 Comparing growth assumptions between Scenarios 1 and 2, a higher growth for both dwellings and jobs is assumed in Scenario 2, while job growth in Scenario 1 was negative compared to the Base Year.

2.10 Table 2-2 includes the highway and public transport schemes that were considered in the modelling of Scenarios 1 and 2. Five highway schemes and no public transport schemes were considered in Scenario 1, while 13 highway schemes and 1 public transport scheme were considered in Scenario 2. Comparing this to infrastructure improvements considered across Hertfordshire, highway infrastructure assumptions in Hertsmere account for only 6% of the total number of schemes, whereas public transport infrastructure assumptions are less than 3% of the total planned for the county.

2.11 Growth and infrastructure differences between Scenarios 1 and 2 are reflected in the Hertsmere traffic conditions. These are presented and discussed in the following sections. Full details of all 2036 planning and infrastructure assumptions informing the two scenarios can be obtained from the forecasting reports available from HCC[10].

2.12 Hertfordshire's Local Transport Plan (2018) proposes an east west Mass Rapid Transit (MRT) scheme between Hemel Hempstead and Welwyn Garden City, with a potential link to Potters Bar via Bowmans Cross. In relation to that, Hertsmere Borough Council (HBC) are of the view that the proposed Local Plan and associated site allocations can be delivered independently of any transit scheme and options for the routing for that.

[10] The COMET Local Plan Run 5 forecasting report and LMVR are available upon request via the email address: Tpdata@hertfordshire.gov.uk. Further details on COMET and the modelling process in Hertfordshire can be found via the link: www.hertfordshire.gov.uk/transportmodelling

Table 2-1: Growth Assumptions in Hertsmere and district of Hertfordshire (2014-2036)

Area / Comparison	Base Year 2014		Scenario 1		Scenario 2		Growth in Scenario 1 (2014-2036)		Growth in Scenario 2 (2014-2036)	
	Dwellings	Jobs	Dwellings	Jobs	Dwellings	Jobs	Dwellings	Jobs	Dwellings	Jobs
Hertsmere	41,222	50,065	3,519	-5,140	17,633	1,185	9%	-10%	43%	2%
Hertfordshire	469,222	570,277	42,138	-10,983	151,449	61,648	9%	-2%	32%	11%
Hertsmere growth within Hertfordshire	**9%**	**9%**	**8%**	**47%**	**12%**	**2%**	**-**	**-**	**-**	**-**

Table 2-2: Highway and Public Transport Schemes considered for Hertsmere

ID	Location	Road/Junction	Description	Implementation Year	Scheme Type	Scenario 1	Scenario 2
Hmere_1	Potters Bar	Cranborne Road Industrial Estate	Extend current service 298 to Cranbourn Road via Mutton Lane with one-hour frequency (previously modelled as 20 min frequency)	2021	Public Transport	No	Yes
Hmere_2	Potters Bar	Baker Street	New on street cycle lanes within existing road width	2031	Highway	No	Yes
Hmere_3	Potters Bar	B556 / Baker Street / Darkes Lane junction	Rephase signals	2036	Highway	No	Yes
Hmere_4	Potters Bar	Darkes Lane / The Walk junction by station	Junction improvements at Darkes Lane/The Walk to improve conditions for pedestrians and cyclists as well as broader urban realm enhancements along the high street.	2031	Highway	No	Yes
Hmere_5	M25 Junction 18-25	M25 Junctions 18-25	Smart motorway with hard shoulder running	2016	Highway	Yes	Yes
Hmere_6	M25 Junction 23	M25 Junction 23	Capacity Improvements	2020	Highway	No	Yes

ID	Location	Road/Junction	Description	Implementation Year	Scheme Type	Scenario 1	Scenario 2
Hmere_7	Dancers Hill	A1081 / Trotters Bottom / Dancers Hill roundabout	Convert to signalised junction and optimise timings	2036	Highway	No	Yes
Hmere_8	Borehamwood	A1 / A411 Barnet Lane (Stirling Corner) - Borehamwood	Changes to signal staging and timing	2017	Highway	Yes	Yes
Hmere_9	Borehamwood	Borehamwood – Station Road/Theobald St/Allum Lane junction	Upgrade of junction to continental roundabout (DWG files available on AGOL)	2031	Highway	Yes	Yes
Hmere_10	Borehamwood	Elstree Way Corridor	Junction improvement with replacement of the Tesco roundabout with signals	2031	Highway	Yes	Yes
Hmere_11	Radlett	Park Road / Watling Street	Convert to signalised junction & optimise timings	2036	Highway	No	Yes
Hmere_12	Shenley	B556/ B5378 roundabout north of Shenley, south of M25 Junction 22	Convert to signalised junction & optimise timings with potential widening of approaches	2036	Highway	No	Yes
Hmere_13	Bushey	Bushey Hall Road, Bushey Grove Road, Greatham Road	Traffic calming & pedestrian enhancements	2021	Highway	Yes	Yes
Hmere_14	Watford	A4008 /Radlett Road roundabout	Convert to signalised junction & optimise timings	2036	Highway	No	Yes
Hertsmere Total Number of Schemes						**5**	**14**
Hertfordshire Total Number of Schemes						**87**	**242**
Hertsmere infrastructure assumptions within Hertfordshire						**6%**	**6%**

Caveats

2.13 The models in Scenarios 1 and 2 are based on the latest version of COMET (version 5). The COMET version 5 update included increased zoning and network detail alongside an increase in data used to calibrate the model. As a result, there are more screenlines, cordons and journey time routes compared to previous versions of COMET. A high-level review to understand the COMET version 5 base year model performance in the local area of Hertsmere is included in Section 3 of this report, which should be considered when interpreting the results from the COMET model.

2.14 COMET is a strategic modelling tool covering the whole of Hertfordshire. Whilst the COMET version 5 model contains increased zonal and network coverage compared to previous model versions, COMET is not designed to undertake detailed local or junction analysis. The applications COMET is suitable for assessing are detailed in the Model Specification Report (MSR)[11]. All results detailed in this report should be interpreted with the strategic nature of the model in mind. This report should be viewed as a guide to where future transport issues across Hertsmere should be investigated using more localised traffic/junction modelling packages.

2.15 Although all inputs to the scenarios presented in this report were provided by both HCC and HBC, it should be noted that planning data and infrastructure assumptions are firstly confirmed between HCC and each district before being issued to AECOM. Therefore, HCC assumes all responsibility for modelling inputs.

2.16 HBC have requested detailed journey time graphical analysis. AECOM recommends this analysis is treated as purely indicative and results at individual junctions are not treated as representative. All results provided to HBC through this report are heavily caveated and should be interpreted with the strategic nature of the model in mind.

2.17 Growth assumptions in Barnet and Enfield, two London boroughs adjacent to Hertsmere, were included in Scenario 2 and could impact the Hertsmere traffic network, especially compared to Scenario 1. Traffic conditions in and around Hertsmere in this report should be interpreted considering growth in adjacent HCC/other areas.

2.18 Traffic conditions for each scenario are presented in figures in the form of flow difference and junction delays. It should be noted that flows are expressed in passenger car units (PCUs), while junction delays are expressed in minutes. PCUs are a standard modelling output which converts flows into a uniform vehicle format (amalgamating cars, LGVs and HGVs).

2.19 Journey time differences presented in this report are a result of re-routeing between scenarios, developments and infrastructure schemes in the local area.

2.20 Tyttenhanger Estate at Coursers Rd, also known as Bowmans Cross, would be for up to 6,000 dwellings, employment space and associated facilities. As the scenarios studied in this report consider growth up to 2036, Scenario 2 includes only 2,000 dwellings for the Bowmans Cross development which is the anticipated number of units to be completed for that scheme up to 2036 which is the proposed period which the Local Plan will cover. It was not included in Scenario 1.

2.21 COMET utilises generic NTEM trip rates for forecasting applications, which are usually lower than the trip rates proposed by developers and may underestimate traffic conditions. This should be considered when reviewing the analysis of trips to and from the largest developments and especially the Bowmans Cross development in Section 5.

2.22 Results are presented for the AM peak (08:00 – 09:00) and PM peak (17:00 – 18:00) periods. The COMET model also includes an interpeak period (average hour between 10:00 – 16:00) however traffic volumes are lower than in the peaks so impacts are not as critical and not reported.

2.23 It should also be considered that the COMET public transport assumes unlimited capacity on public transport which would not exist in reality. Similarly, COMET assumes that incomes will rise faster than public transport fares when forecasting. This can result in a switch to rail travel as the

[11] "COMET_MSR_v3.pdf" issued via email to HCC 28th November 2019

cost of making a rail journey is deemed more affordable in the future. This is usually at the expense of bus patronage.

Glossary

2.24 Table 2-3 details the glossary of technical terms used in this report.

Table 2-3: Glossary of Technical Terms used in this Report

Term	Description
HBC	Hertsmere Borough Council
HCC	Hertfordshire County Council
COMET	The Countywide Model of Transport – Hertfordshire's strategic transport model consisting of highway, public transport and variable demand models
DfT	Department for Transport
DfT TAG	DfT Transport Analysis Guidance[12] - the guidance on transport modelling all COMET modelling follows
MSR	Model Specification Report – a report outlining the parameters of the COMET model (available from HCC)
LMVR	Local Model Validation Report – a report outlining the construction and performance of the COMET transport model compared to observed data (available from HCC)
Model Calibration	Also indicated as "C" or "Cal", is the process of calibrating the transport model using observed traffic count data. Traffic counts are compared to the modelled flows to define whether the model is representative of traffic conditions. The calibration process allows for the model to make some minor changes to the demand to more accurately match observed data.
Model Validation	Also indicated as "V" and "Val", involves comparing modelled data to observed data. The model is not able to manipulate data to better match observed data and provides a level of verification of model performance.
Journey Times	Defined journey times are recorded using observed data (Google or TrafficMaster) and compared to journey times in the base year model. This is a key measure of model validation.
NTEM	National Trip End Model – the model forecasts the growth in trip origin-destinations (or productions-attractions) up to 2051 for use in transport modelling
PCU	Passenger Car Unit, a standard modelling output which converts flows into a uniform vehicle format (amalgamating cars/LGVs and HGVs)
Cordon	A cordon is an area of a model into which vehicle movements are recorded in order to track performance against observed traffic count data. In COMET cordons were constructed around the major urban settlements so movements into/out of urban areas could be reflected in the modelling as accurately as possible.
Screenline	A screenline is a line crossing several roads in a model to which modelled traffic volumes are compared to observed traffic count data. Screenlines are used to calibrate a transport model by ensuring flows reflect traffic counts as accurately as possible.
Base Year Scenario	The COMET v5 2014 Base Year model
Scenario 1	"Do minimum" scenario, referring to the 2036 Reference Case scenario
Scenario 2	"Do something" scenario, referring to the 2036 Local Plan Run 5 scenario

[12] Full details available at https://www.gov.uk/guidance/transport-analysis-guidance-tag

Term	Description
AM Peak	Represented in the COMET model as 08:00 – 09:00
IP (interpeak)	Represented in the COMET model as an average hour between 10:00 – 16:00
PM Peak	Represented in the COMET model as 17:00 – 18:00
LPR5	Local Plan Run 5 (Scenario 2)
Node delay	Junctions in COMET are represented by nodes. Node delay should be interpreted as junction delay. Node delay is the average delay a vehicle will experience at a junction, regardless of the direction of the approach or movement made. It is averaged across all movements at junctions and weighted by the flows
Link Stress	Congestion on roads is represented in COMET by link stress. Roads operating at link stress below 80% are expected to be relatively free-flowing with minimal delays at junctions. Roads operating between 80% and 90% will begin to show signs of congestion, vehicle speed will reduce, and delays will occur at junctions. At link stress over 90%, roads will be very congested with low average speeds and delays expected at junctions
Zone	An area in the COMET model which trips travel to/from.
SRN	Strategic Road Network – the Highways England arterial network surrounding Hertsmere – i.e. A1, M1 and M25
Select Link Analysis (SLA)	SLA is a tool in COMET used to identify how traffic routes through/to/from areas

Purpose of This Report

2.25 This document presents detailed analysis of the impacts of Local Plan development in the district of Hertsmere and provides evidence for their ongoing Local Plan process. This document should be used to provide extra narrative about the impacts of Hertsmere's Local Plan developments. However, the caveats above should be carefully considered, and the scale of the COMET model and 2036 scenarios undertaken should provide proportionality to the analysis presented. More detailed junction/corridor impacts across Hertsmere should be further assessed using more detailed junction or microsimulation modelling. The analysis provided is an overview to inform future works.

2.26 Following this introduction, the report is organised as follows:

- Section 3 – High-Level Base Model Review
- Section 4 – Settlement Based Distribution Plots
- Section 5 - Bowmans Cross Trip Distribution Analysis
- Section 6 – 2036 Traffic Conditions in Hertsmere
- Section 7 – Journey Time Analysis
- Section 8 – Scheme Assessment
- Section 9 – Public Transport Patronage
- Section 10 – Conclusion, Summary & Discussion

3. High-Level Base Model Review

3.1 This section outlines the performance of the COMET v5 Base Year, which forms the basis for LPR5 modelling. A fundamental difference between COMET v5 and previous versions of the model is the increased spatial resolution of the model in certain areas. This provides a higher level of detail across the transport network within Hertfordshire and its neighbouring areas. A significant extra amount of traffic data was collected to inform the COMET v5 2014 base year enhancement.

3.2 COMET v5 contains a total of 64 two-way screenlines[13] and 21 two-way cordons[14], as shown below. This is a significant enhancement compared to previous versions of the model, however the model does not include validation[15] screenlines in the Hertsmere area, as seen in the highlighted area in Figure 3-1. In total 2 screenlines and 2 cordons around Potters Bar and Elstree informed model performance in Hertsmere in COMET v5. The screenlines and cordons were designed to capture both inter-urban and intra-urban movements across Hertfordshire, as well as traffic to / from the main towns and cities. Performance against observed data was good, however it was noted COMET under-estimated flows into and out of the Potters Bar and Borehamwood cordons. These differences are not deemed significant enough to invalidate any of the results reported.

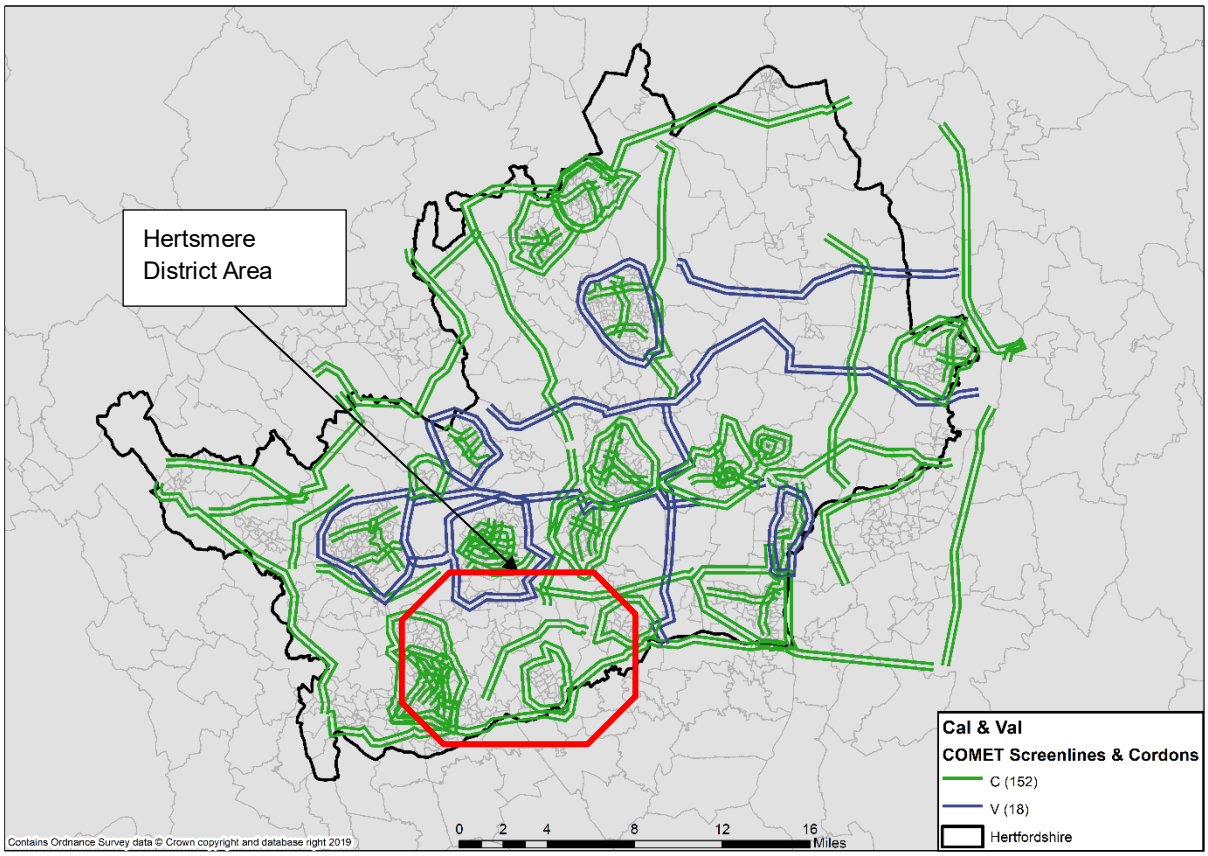

Figure 3-1: COMET v5 Cordons and Screenlines (Hertsmere area highlighted

3.3 As detailed in the COMET v5 LMVR[16] performance of the screenlines in Hertsmere (highlighted in Figure 3-2) compared to observed data was overall positive with only the AM peaks failing to

[13] A screenline is a line crossing several roads in a model to which modelled traffic volumes are compared to observed traffic count data. Screenlines are used to calibrate a transport model by ensuring flows reflect traffic counts as accurately as possible
[14] A cordon is an area of a model into which vehicle movements are recorded in order to track performance against observed traffic count data. In COMET cordons were constructed around the major urban settlements so movements into/out of urban areas could be reflected in the modelling as accurately as possible
[15] Validation involves comparing modelled data to observed data. The model is not able to manipulate data to better match observed data and provides a level of verification of model performance
[16] "COMET_LMVR_v5.2. pdf" issued by AECOM in March 2020

comply with DfT's TAG[17] flow difference criteria for Heavy Goods Vehicles and Light Goods Vehicles. Sensitivity tests applied on flows modelled in COMET v5 against observed data were within 7.5% for the St Albans to Radlett and within 15% for the Potters Bar to Hatfield screenlines in all time periods. Overall, compared to previous COMET versions, movements into/out of and around Hertsmere were more accurately reflected in COMET v5[18].

3.4 The spatial distribution of journey time routes[19] used to validate COMET v5 within Hertfordshire is shown in Figure 3.2. Similar to traffic flows, a considerable extra amount of journey time data was collected to validate COMET v5. More journey times using local roads around Hertsmere were used to validate COMET v5.

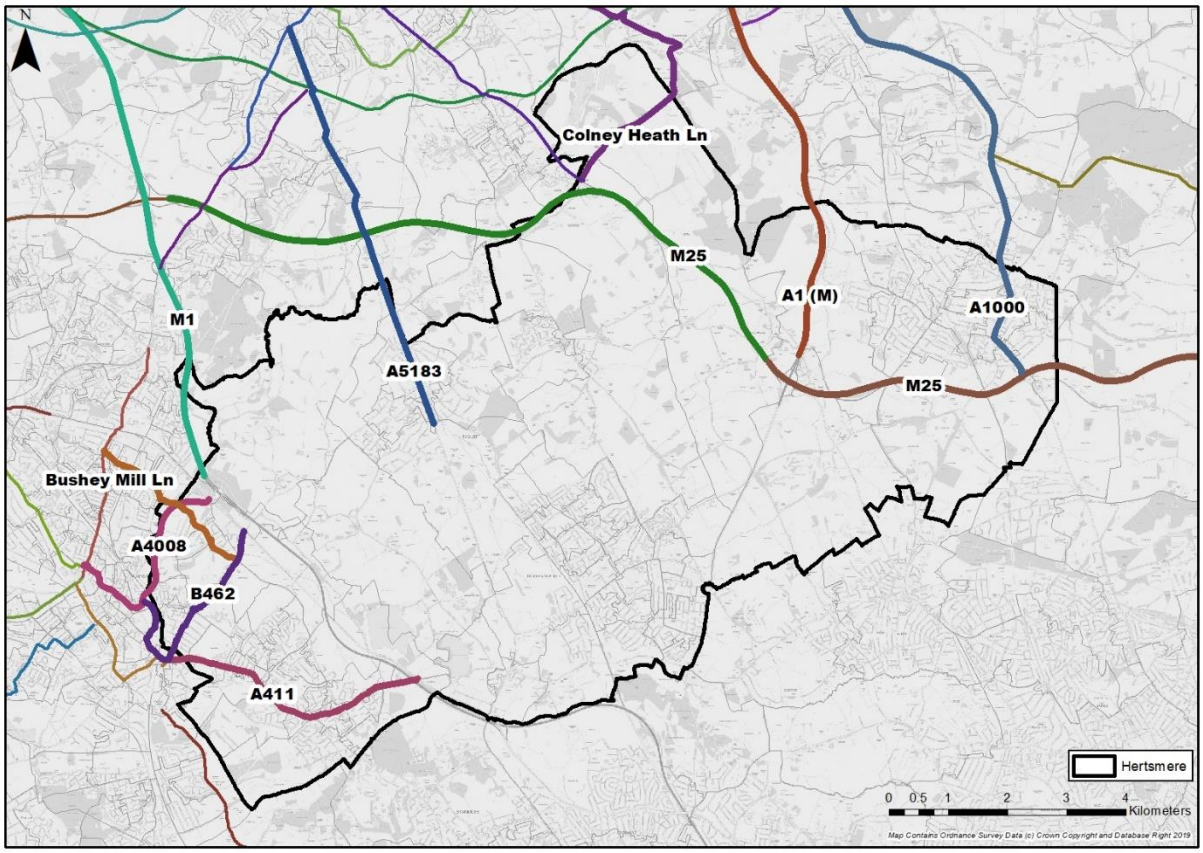

Figure 3-2: COMET v5 Journey Time Routes (Hertsmere area highlighted)

3.5 The performance of the journey time routes around Hertsmere are summarised in Table 3-1 below.

Table 3-1: COMET v5 Flow and Journey Time Validation Summary

Route	Validation Comments
M25	Journey times between junctions 21a to 23 meet all validation criteria. Journey times between junctions 23 and 25 clockwise do not meet validation criteria in the IP and PM peaks and anticlockwise do not meet criteria in the AM peak.
A1(M)	Journey times between junctions 1 and 4 validate well in all time periods.
M1	Journey times between junctions 5 and 7 meet all validation criteria in the northbound direction, while in the southbound direction validation criteria are not met in the AM peak.

[17] The guidance on transport modelling all COMET modelling follows
[18] Full model performance details are available in the appendices of the LMVR available from HCC
[19] Defined journey times are recorded using observed data (Google or TrafficMaster) and compared to journey times in the base year model. This is a key measure of model validation

A1000	Performs well in both directions between Potters Bar to Hatfield except for the AM peak, where observed and modelled flows differ by 15%. Journey times in both directions validate well in all time periods.
A411	Journey times meet all validation criteria in the westbound direction, while in the eastbound direction validation criteria are not met in the PM peak.
A4008	Does not validate in the AM peak for both directions and in the PM peak for the eastbound direction. Validation criteria are met for the IP period in both directions.
A5183	Validates well, except in the AM peak northbound between Radlett and St Albans. Journey times in both directions validate well, except in the northbound direction in the PM peak.
B462	Does not validate well in the PM peak for both directions and in the AM peak westbound. Validation criteria are met for the IP period in both directions.
Bushey Mill Lane	Does not validate well in the PM peak for both directions and in the AM peak eastbound. Validation criteria are met for the IP period in both directions.
Colney Heath Lane	Validation criteria are met only for journey times in the AM and PM peaks southbound and in the IP period northbound.

3.6 Traffic conditions in the 2014 Base Year model illustrate that some of the longest delays are experienced on the SRN surrounding Hertsmere. Up to 5-minute delays are experienced by traffic at the Stirling Corner junction on the A1. There are minor delays at M25 junction 23 with the A1 and up top 3-minute delays on some arms of M1 junction 5 with the A41. Congestion levels are highest on the A1 and A41 with some sections approaching 100% capacity.

3.7 On the local road network around Hertsmere delays are smaller, with the Elstree crossroads experiencing up to 3 minutes of delay and 2-minute delays at several junctions in Bushey on Little Bushey Lane and High Road. There are delays of approximately 2 minutes at the Watford Road/Watling Street junction in Radlett and minor delays (up to 30 seconds) at junctions around Potters Bar town centre. Overall, congestion levels on the local road network do not reach critical levels and traffic is relatively free flowing with delays only experienced at the above locations.

Base Year Review Conclusion

3.8 The review of the COMET v5 2014 base year model has highlighted that COMET v5 provides an accurate tool to undertake strategic assessments of Hertsmere's growth/schemes, however the impacts on specific junctions are indicative as COMET is not suitable to assess impacts at a junction level. More detailed junction modelling packages should be used for more local analysis. This is to be expected as COMET is a strategic model and is not designed for local junction assessments.

3.9 COMET v5 included a significant amount of extra base year validation data in terms of traffic counts and journey time routes. Local movements into and out of Hertsmere are more accurately represented and the overall congestion recorded in urban areas is more accurately validated in COMET v5 compared to previous versions of the model. Journey times on the A1000, B5183 and A1 (M) validate well, while validation of journey times on the M25 varies. The lack of validation journey time routes on local roads through Hertsmere should also highlight that all results are only indicative.

3.10 The above should be considered when viewing the analysis detailed in this report and the recommendations for any future modelling/analysis.

4. Settlement Based Distribution Plots

4.1 To provide a more detailed representation of traffic travelling to and from Hertsmere as part of Scenario 2, several key towns and villages within Hertsmere were selected.

4.2 Inbound and outbound trip distribution plots, for both the AM and PM peak periods, are presented in this section for the following towns and villages in Hertsmere:

- Potters Bar;
- Elstree;
- Borehamwood;
- Bushey (including East Watford);
- Shenley;
- Radlett; and
- South Mimms.

4.3 The Select Link Analysis (SLA) tool in Saturn was used to identify how traffic routes to and from the urban centres in the above urban areas in Hertsmere[20].

4.4 SLA will help quantify what impact Hertsmere's Local Plan will have on the road network of the area. It is important to note that the figures below refer to Scenario 2and that the thickness of the bars shows that the thicker the green bar, the greater the traffic flow.

4.5 It is important to consider the geographical layout of Hertsmere and how it is bounded by the strategic M25, A1, A41 and M1 trunk roads. These are very large strategic roads which cater for significant volumes of traffic. Trips to or from Hertsmere towns have multiple route choices along these strategic routes and are often located near a strategic junction.

[20] Agreed with HBC/HCC in an email exchange on 12 August 2020

Potters Bar

4.6 Figure 4-1 to Figure 4-4 illustrate traffic travelling to and from Potters Bar in the AM and PM peaks. This is mostly using Baker Street, Mutton Lane and the M25 to access other districts within Hertfordshire and London Boroughs south of Hertsmere. Traffic routeing to and from Potters Bar shows a strong correlation with M25 junction 24 and 22a which is to be expected. There is limited interaction with other origins/destinations in Hertsmere apart from Borehamwood.

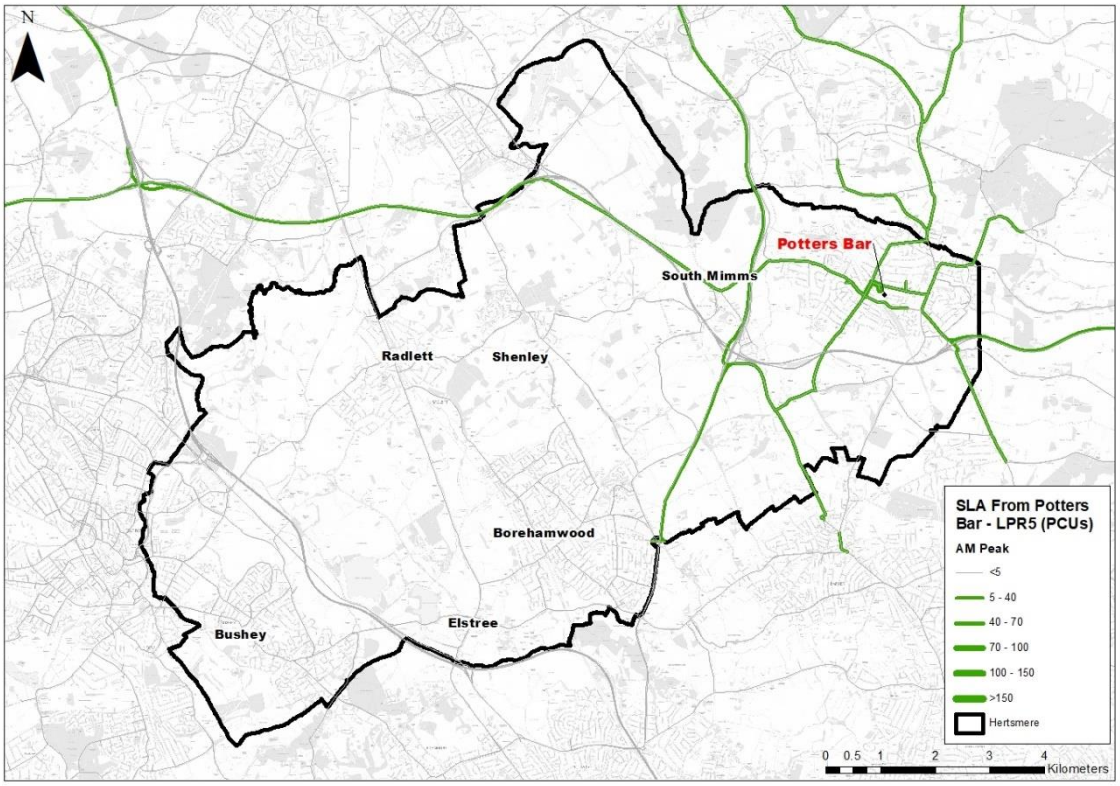

Figure 4-1: Routeing Analysis from Potters Bar (AM peak)

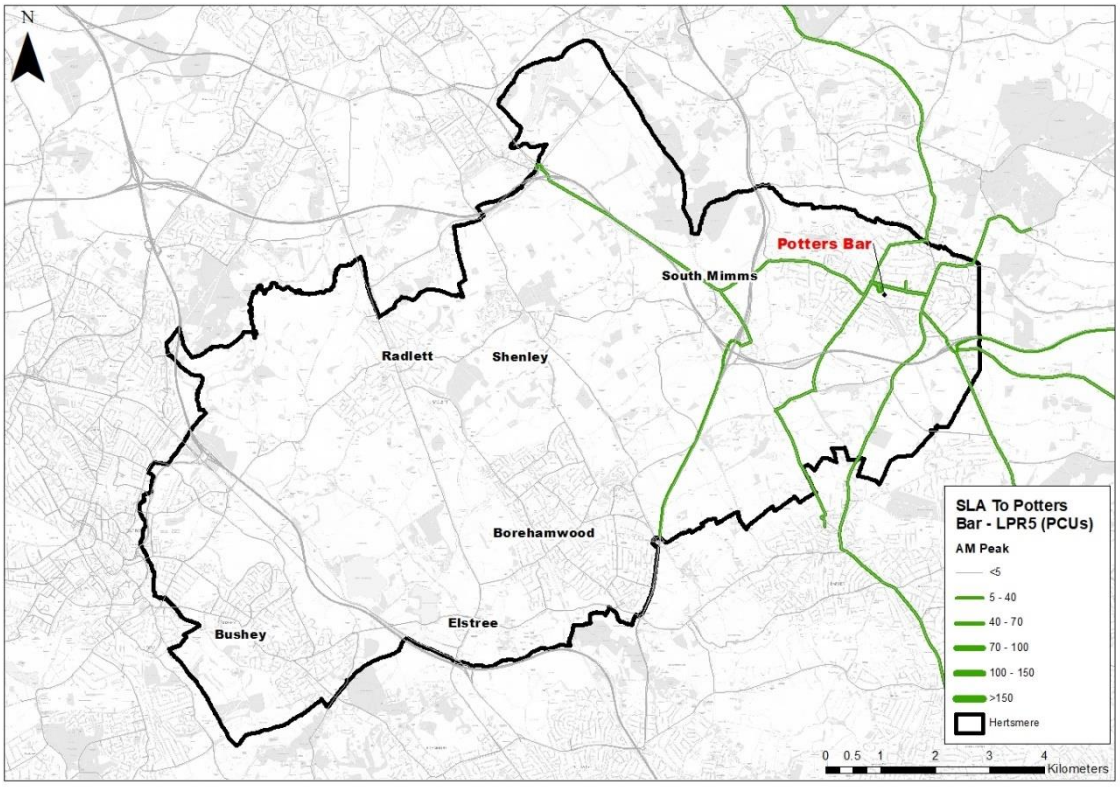

Figure 4-2: Routeing Analysis to Potters Bar (AM peak)

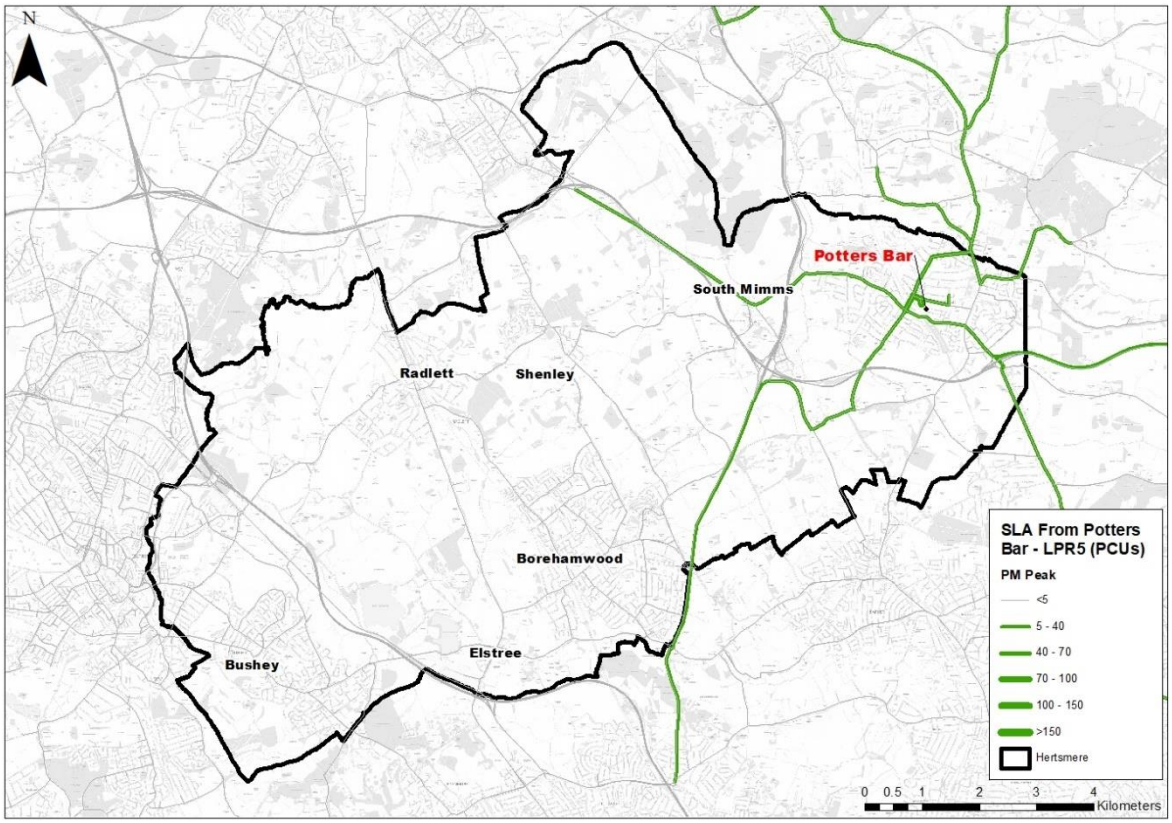

Figure 4-3: Routeing Analysis from Potters Bar (PM peak)

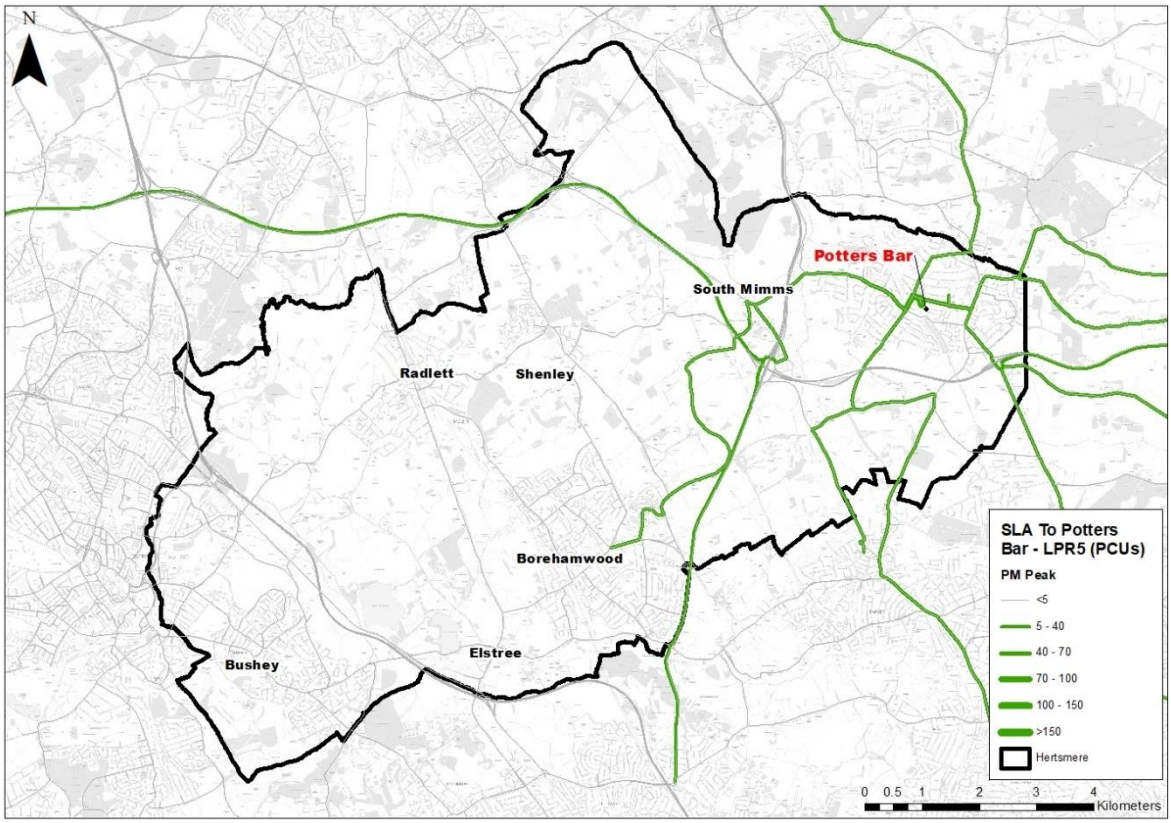

Figure 4-4: Routeing Analysis to Potters Bar (PM peak)

Elstree

4.7 Figure 4-5 to Figure 4-8 show flows travelling to and from Elstree in the AM and PM peaks. Roman Road, Barnet Lane, High Street and A41 are the main routes used to link Elstree with Dacorum, Watford, Buckinghamshire, Edgware and location in north London. There is also some interaction with surrounding towns in Hertsmere such as Radlett, Borehamwood and some interaction with Watford via the A41.

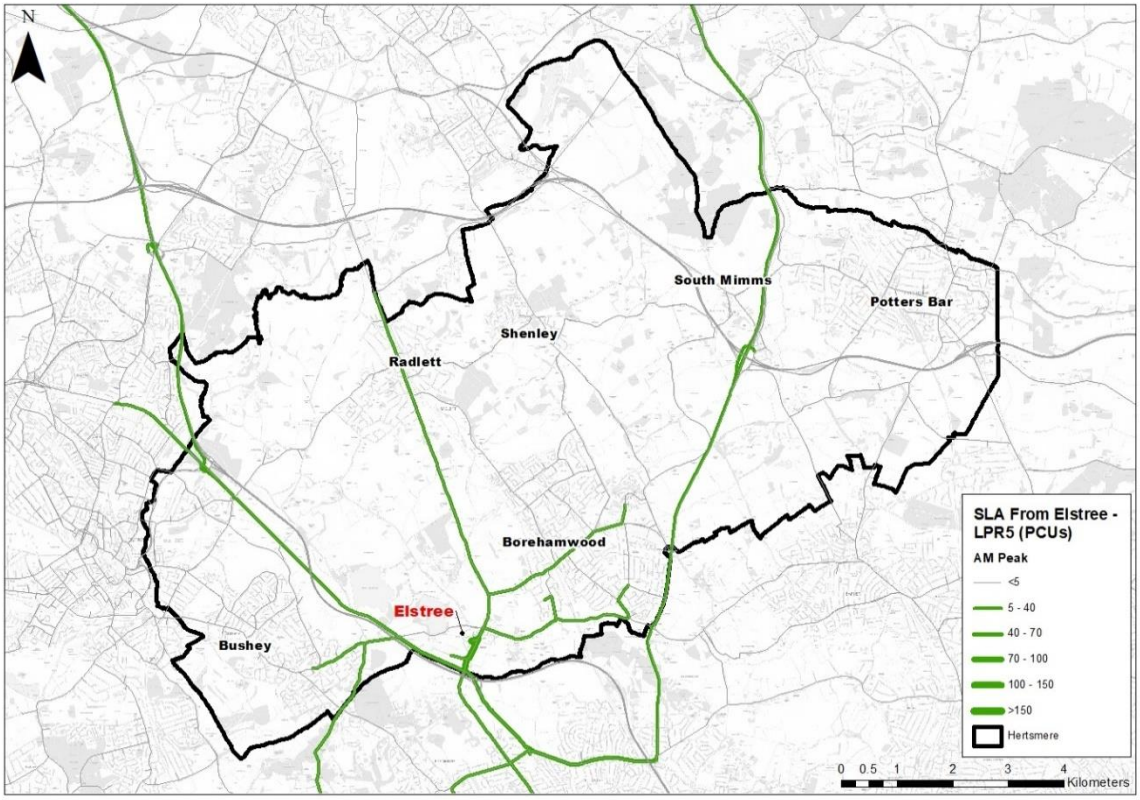

Figure 4-5: Routeing Analysis from Elstree (AM peak)

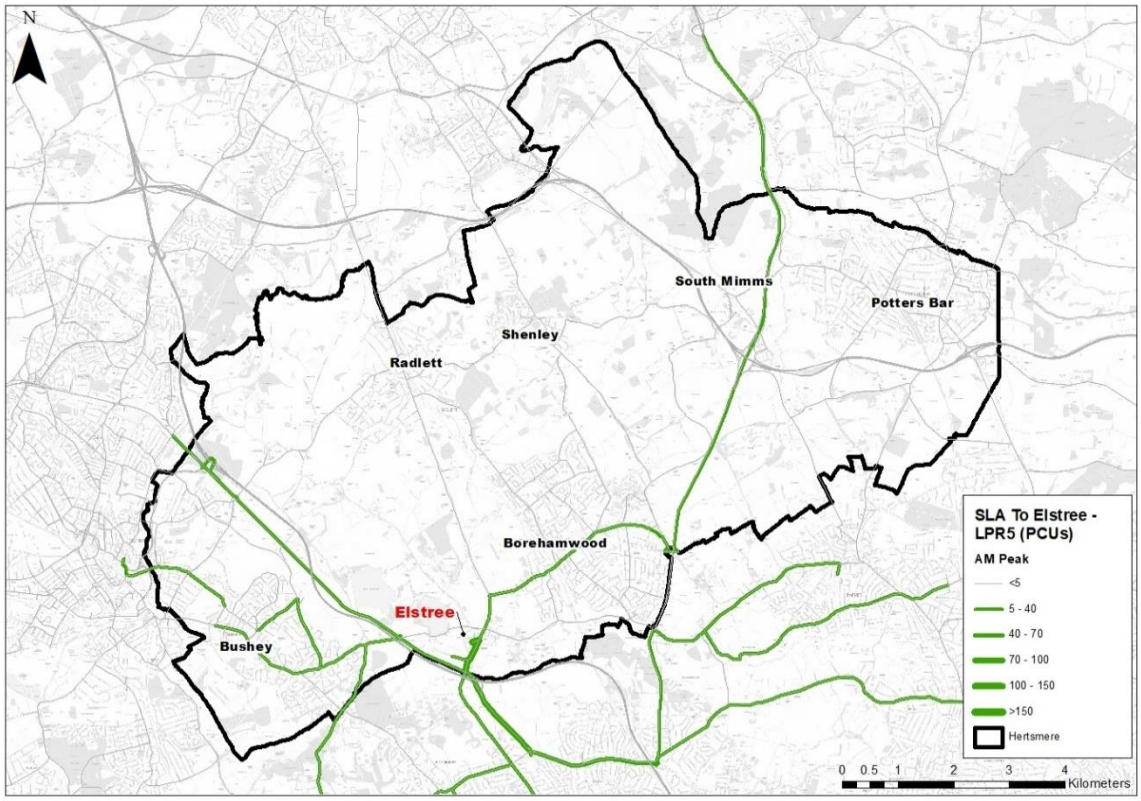

Figure 4-6: Routeing Analysis to Elstree (AM peak)

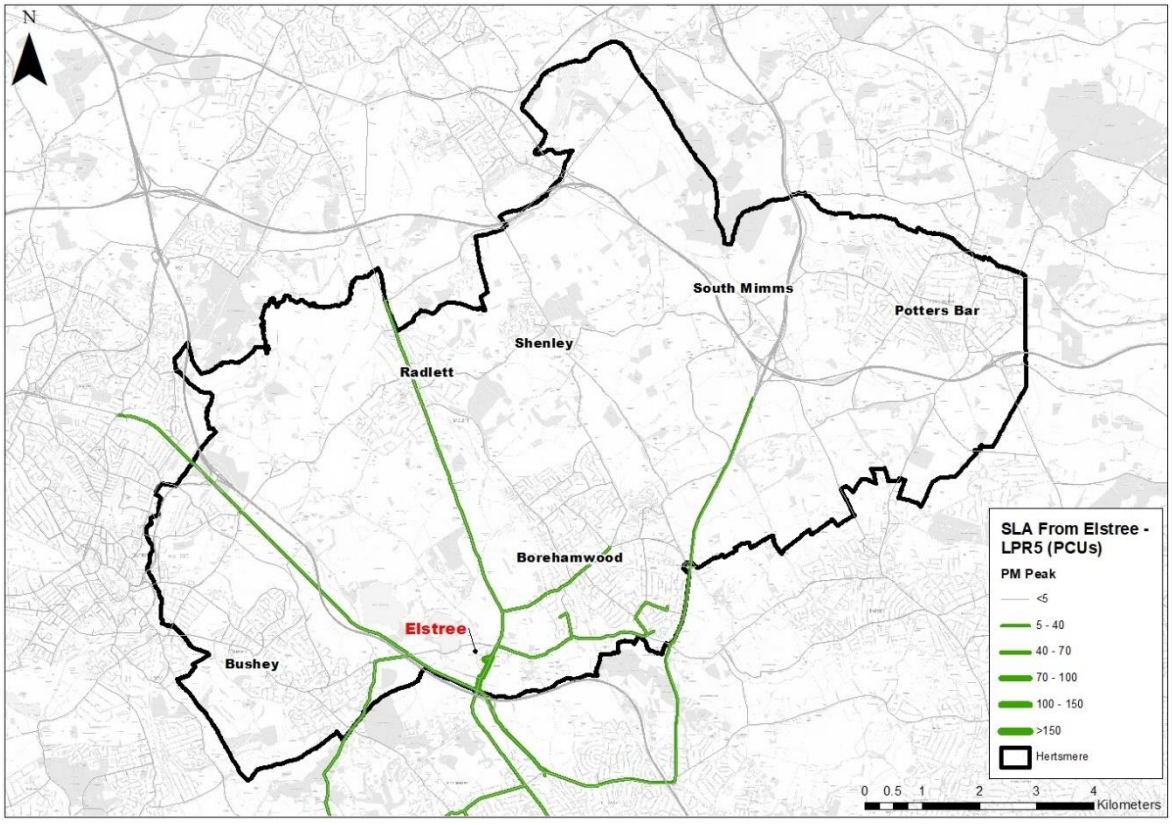

Figure 4-7: Routeing Analysis from Elstree (PM peak)

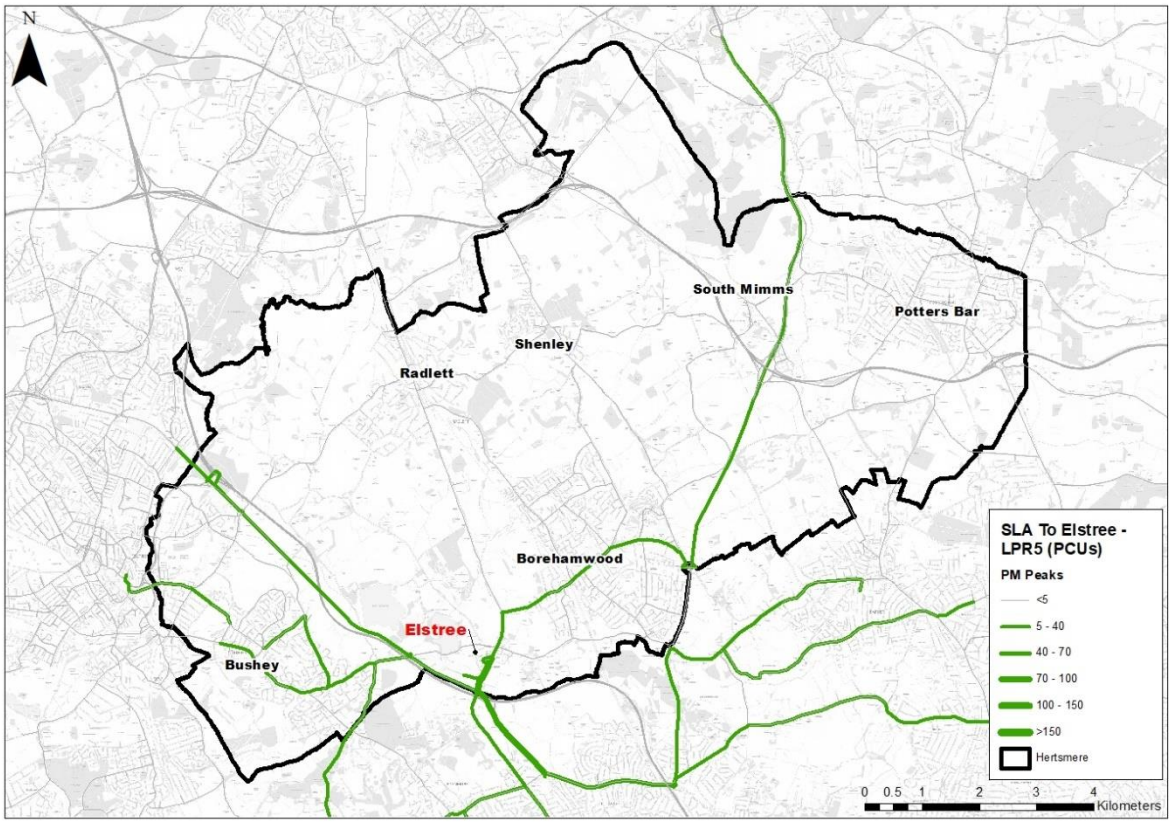

Figure 4-8: Routeing Analysis to Elstree (PM peak)

Borehamwood

4.8 Figure 4-9 to Figure 4-12 show flows travelling to and from Borehamwood in the AM and PM peaks. The main routes used are Theobald Street, Shenley Road and the A1 to link Borehamwood with Hatfield, Dacorum, Buckinghamshire and the rest of Hertsmere. There is a stronger correlation with more strategic routes (A1/M25) for vehicles routeing to and from Borehamwood. Traffic also links with surrounding local towns in Hertsmere such as Radlett and Elstree and towns such as Hatfield further north in Hertfordshire. Traffic is also observed using north/south routes on local roads to travel between Borehamwood and St Albans.

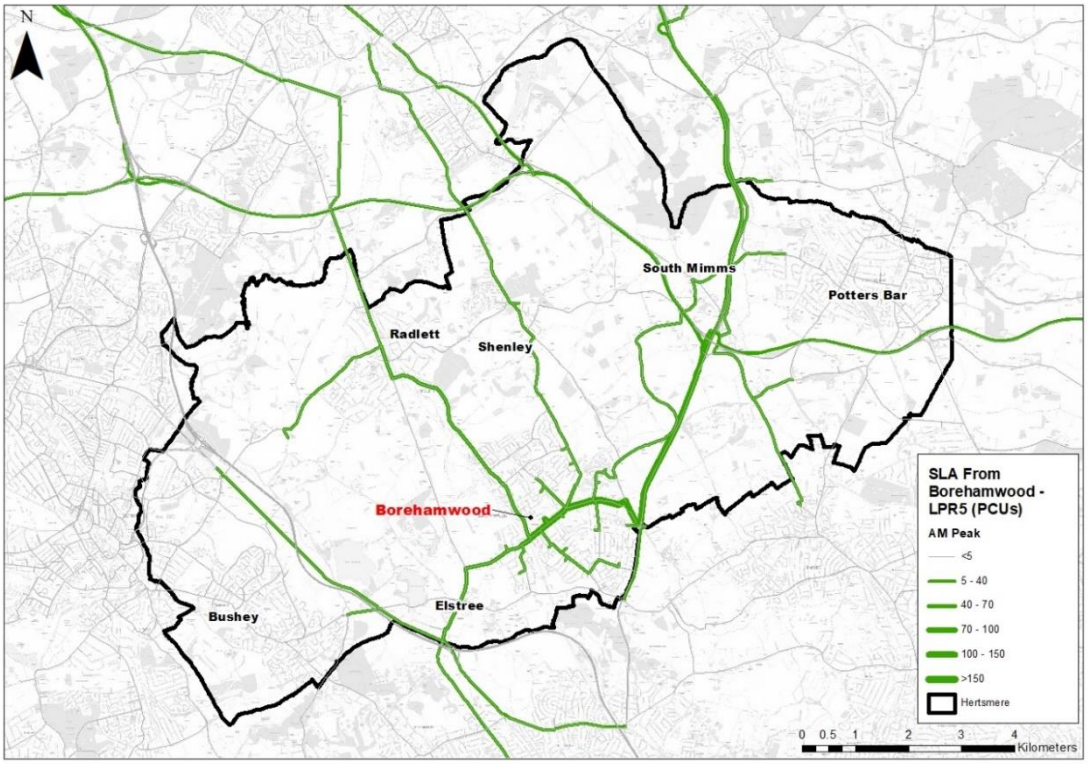

Figure 4-9: Routeing Analysis from Borehamwood (AM peak)

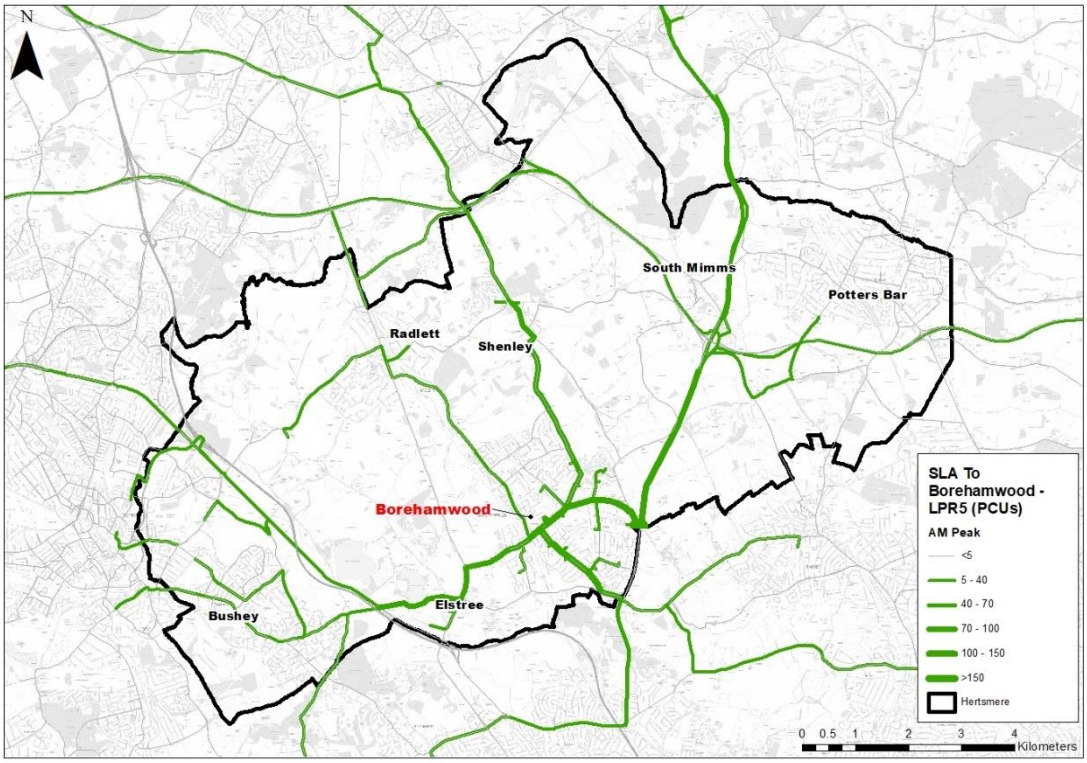

Figure 4-10: Routeing Analysis to Borehamwood (AM peak)

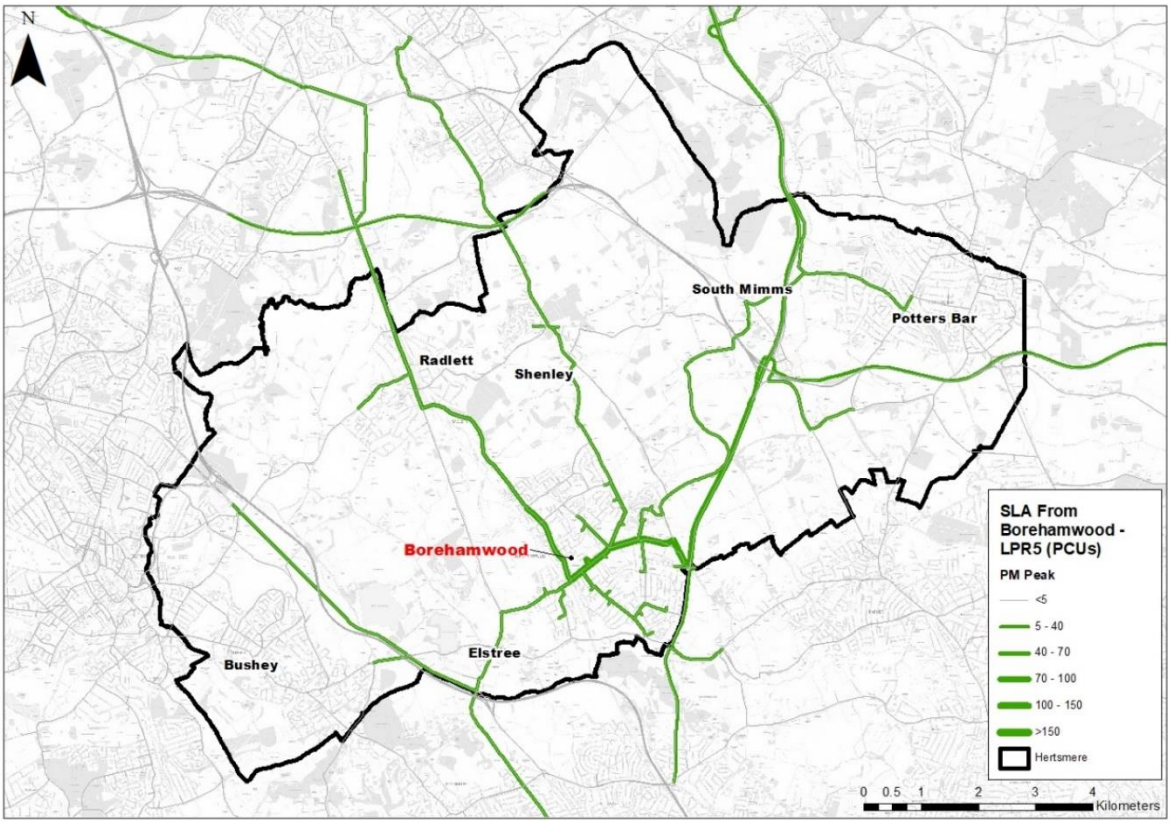

Figure 4-11: Routeing Analysis from Borehamwood (PM peak)

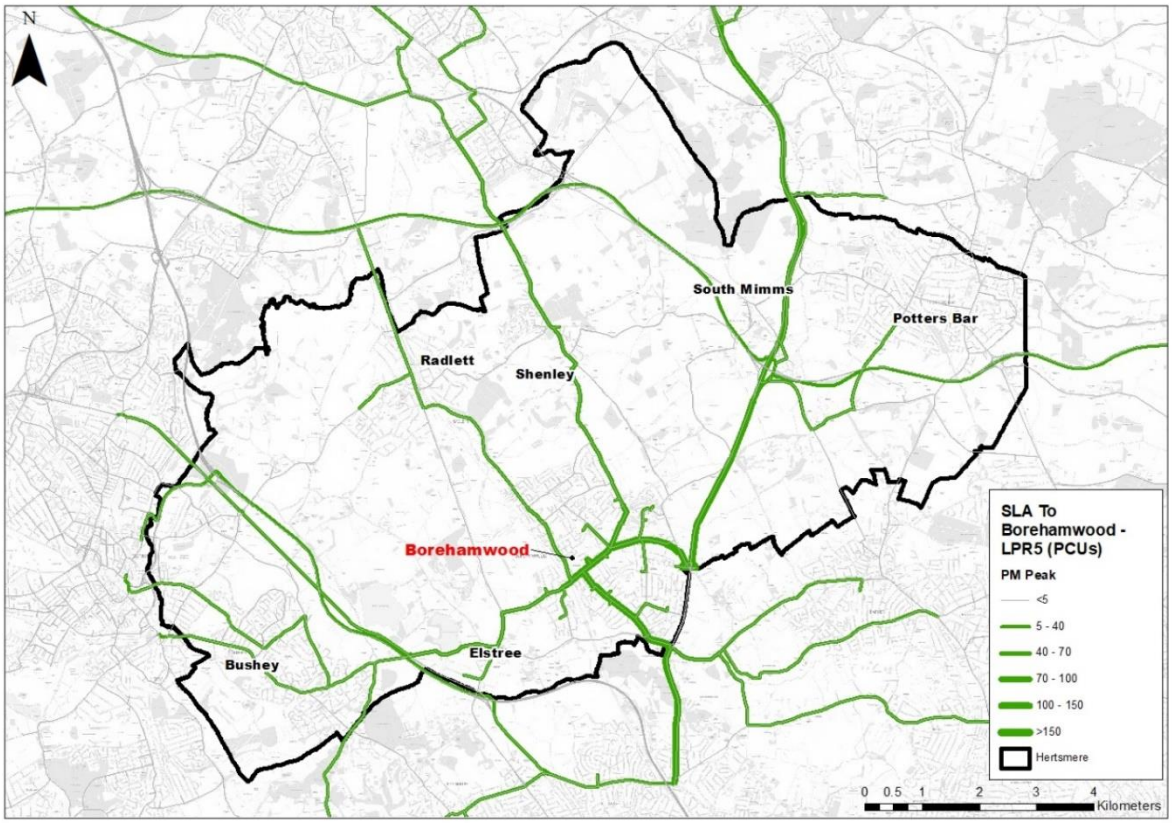

Figure 4-12: Routeing Analysis to Borehamwood (PM peak)

Bushey

4.9 Figure 4-13 to Figure 4-16 show traffic flows routeing to and from Bushey in the AM and PM peaks. Traffic is mainly travelling through the A411 and Falconer Road, and especially in the PM peak, traffic from Bushey is routeing through the M1 to access areas in Watford, Dacorum and north London. Traffic volumes are lower when compared to other towns in Hertsmere and there are also linkages to adjacent Watford. There is very limited interaction with other locations in Hertsmere except for Elstree.

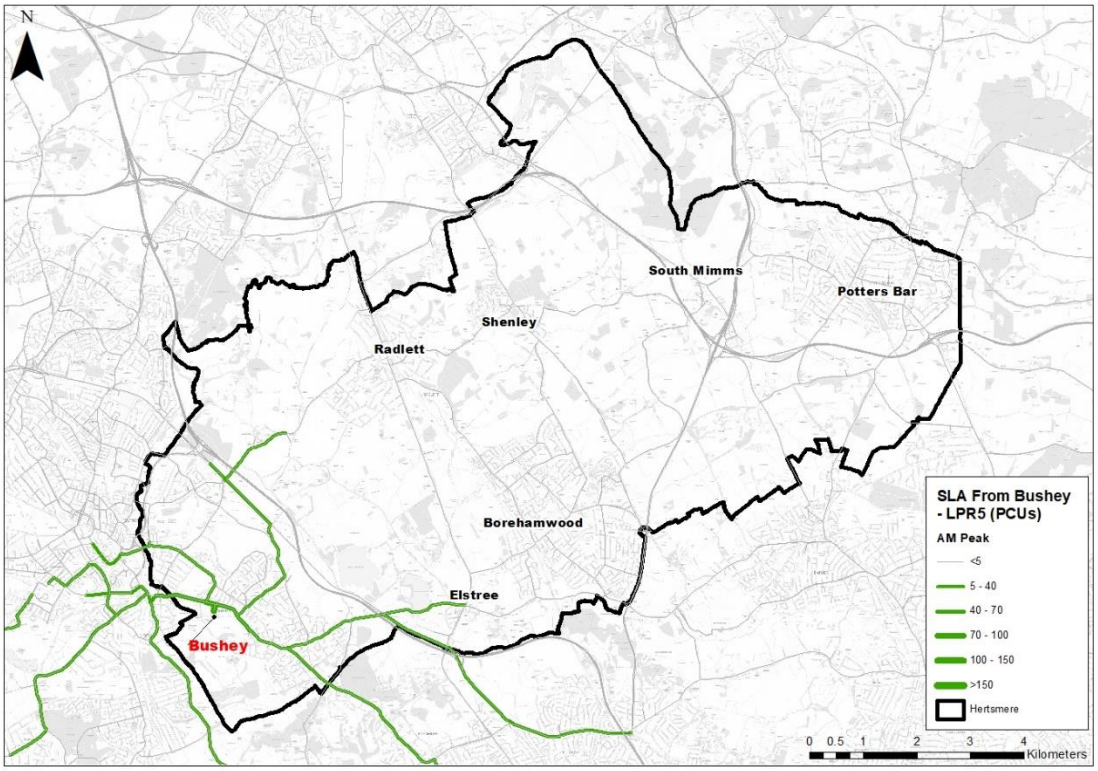

Figure 4-13: Routeing Analysis from Bushey (AM peak)

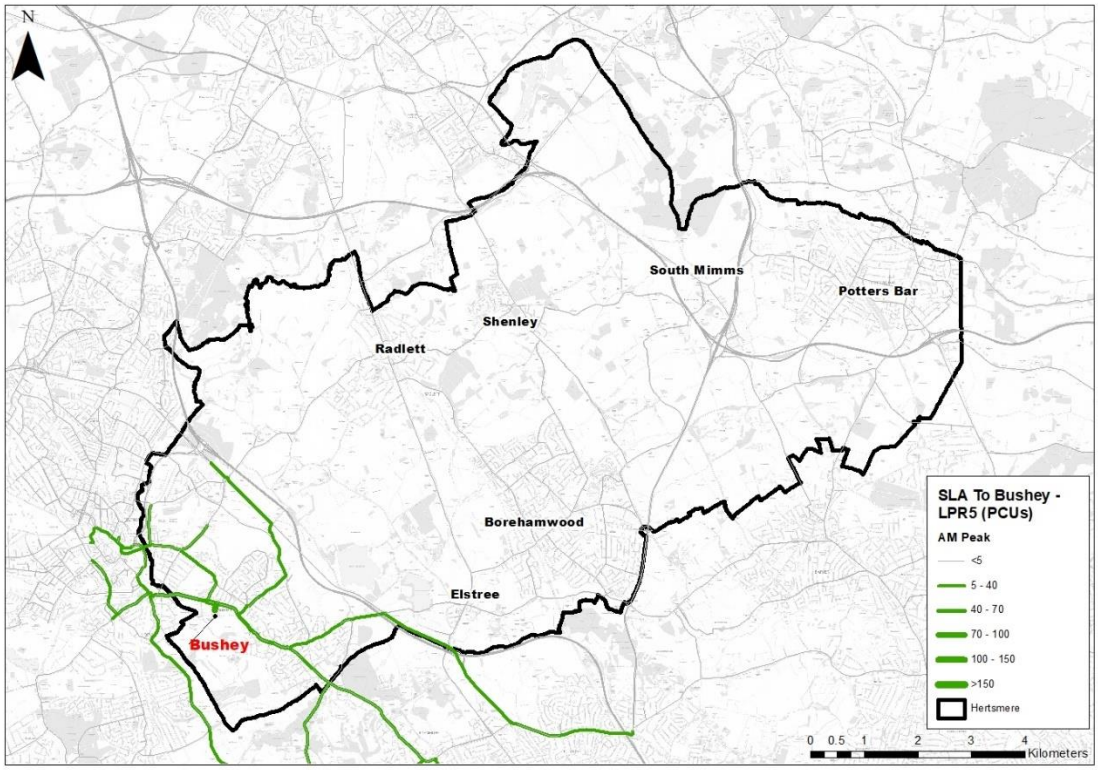

Figure 4-14: Routeing Analysis to Bushey (AM peak)

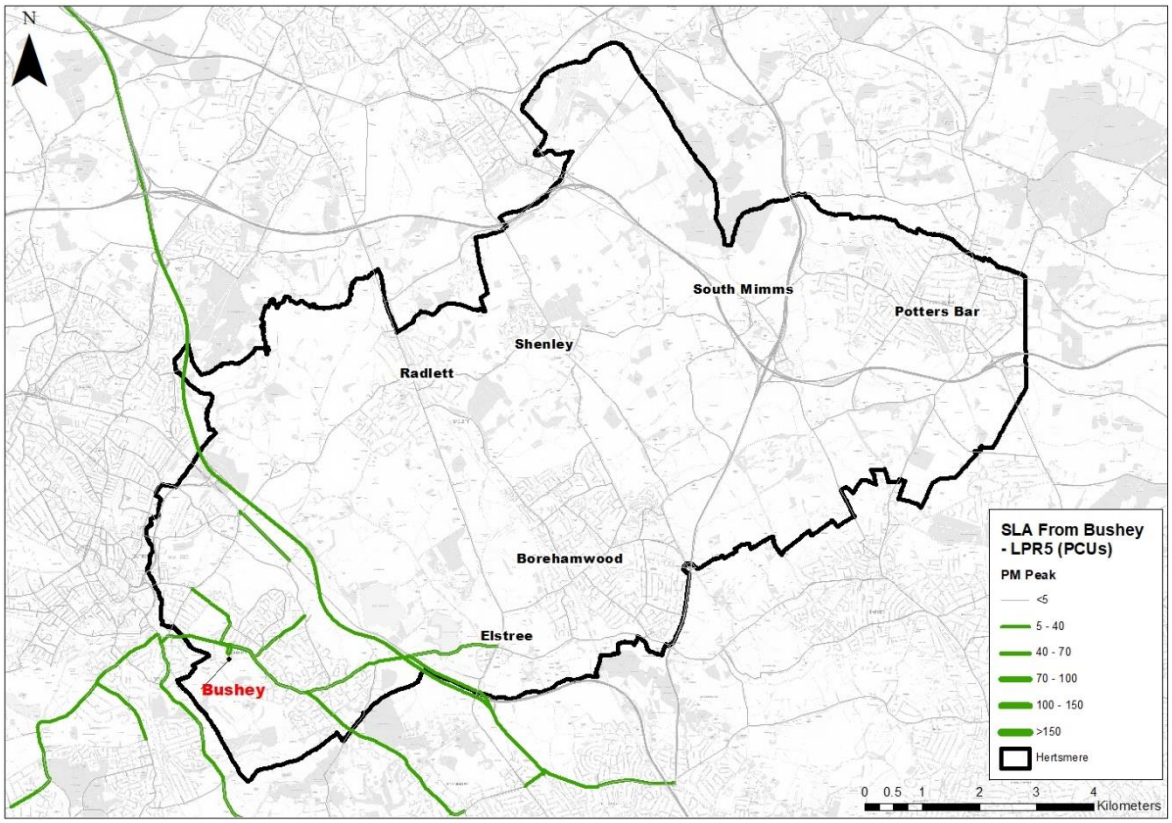

Figure 4-15: Routeing Analysis from Bushey (PM peak)

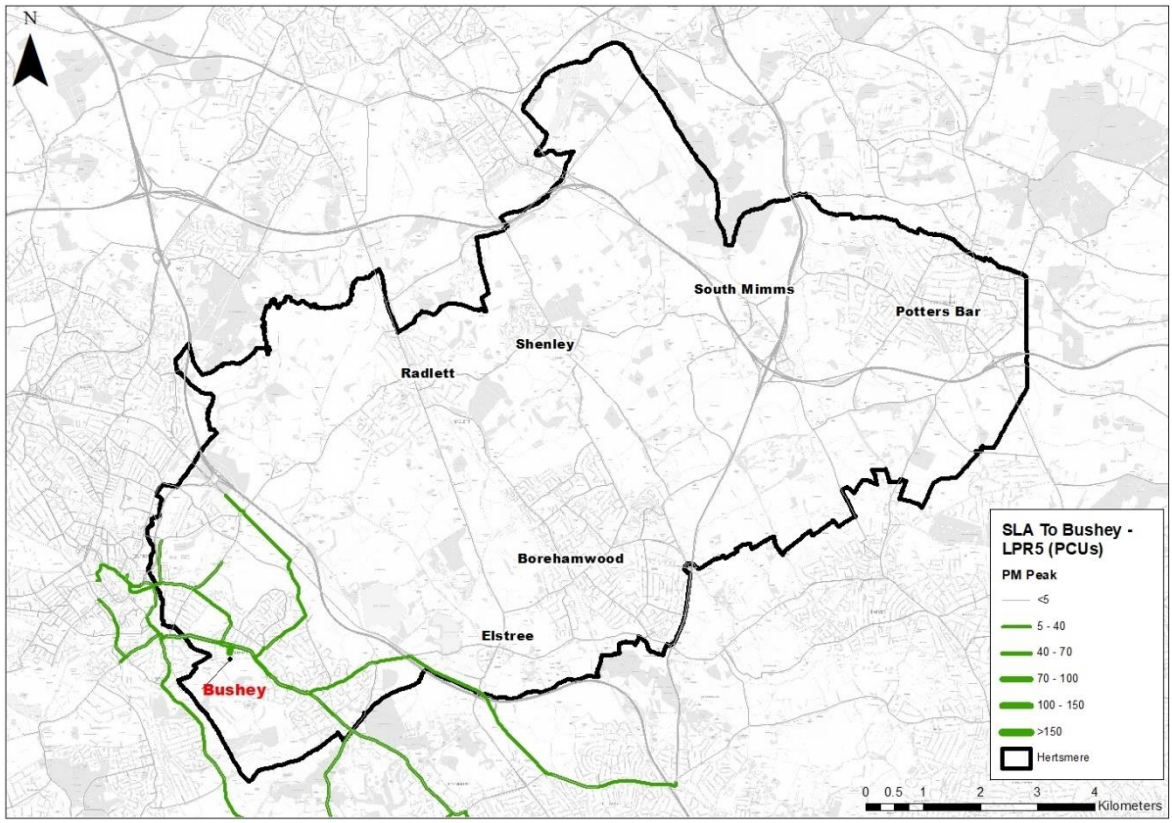

Figure 4-16: Routeing Analysis to Bushey (PM peak)

Shenley

4.10 Figure 4-17 to Figure 4-20 show traffic routeing to and from Shenley in the AM and PM peaks. It is apparent that the main links to and from Shenley are the Black Lion Hill / London Road and Mimms Lane/ Radlett Lane that provide a shortcut to and from the M25. Given the location of Shenley in central Hertsmere, traffic utilises local routes to travel to other towns in Hertsmere or the M25 north of Shenley. It can be observed that traffic routes to junction 22 to travel west on the M25 or junction 23 to travel east.

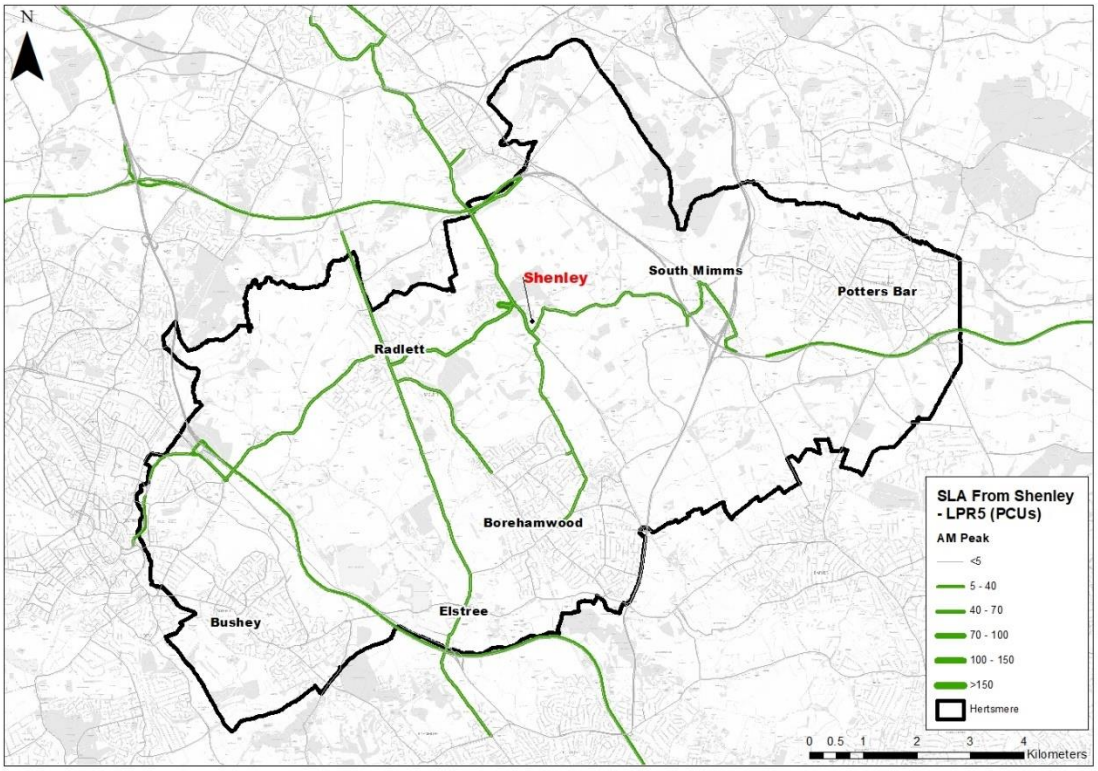

Figure 4-17: Routeing Analysis from Shenley (AM peak)

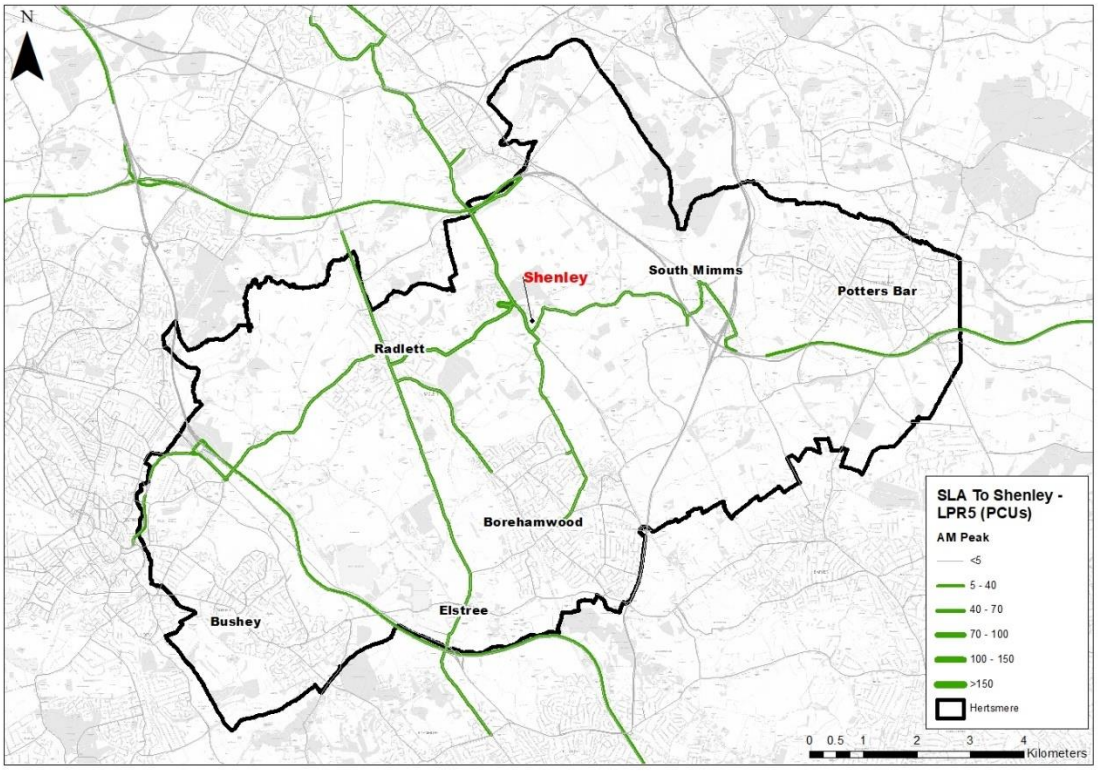

Figure 4-18: Routeing Analysis to Shenley (AM peak)

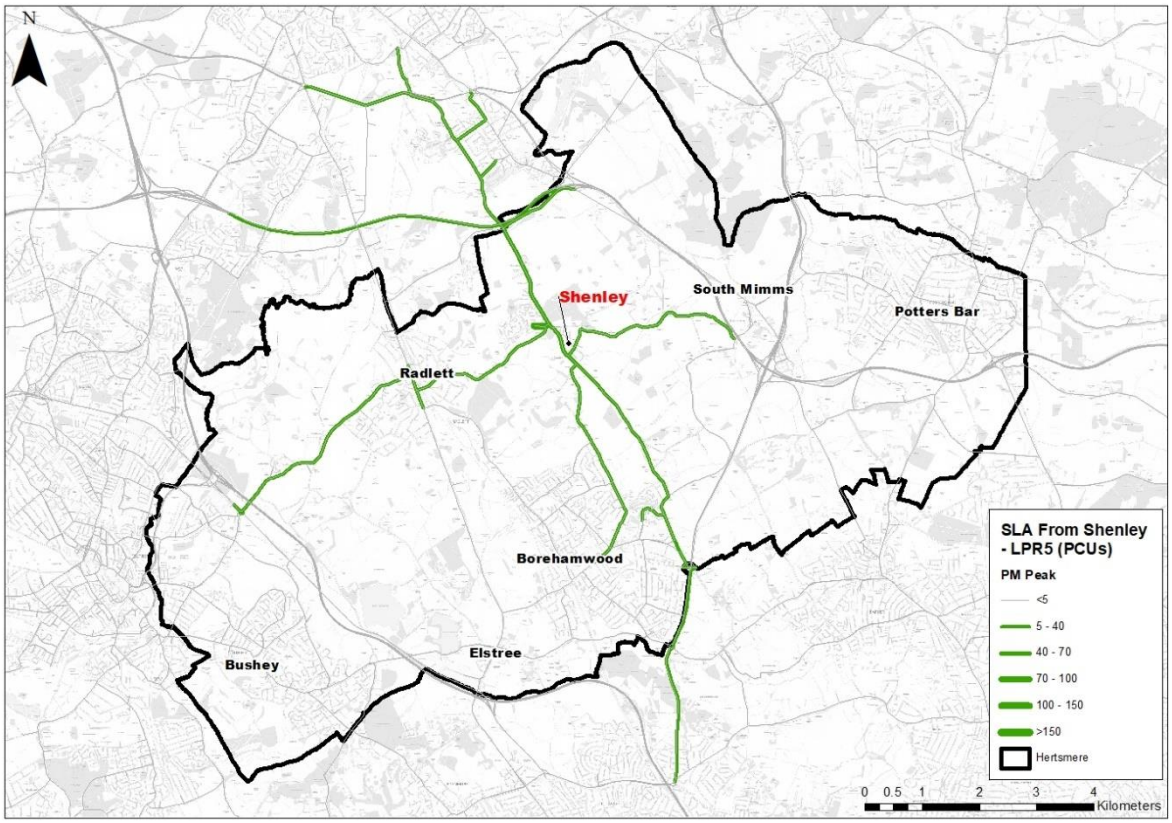

Figure 4-19: Routeing Analysis from Shenley (PM peak)

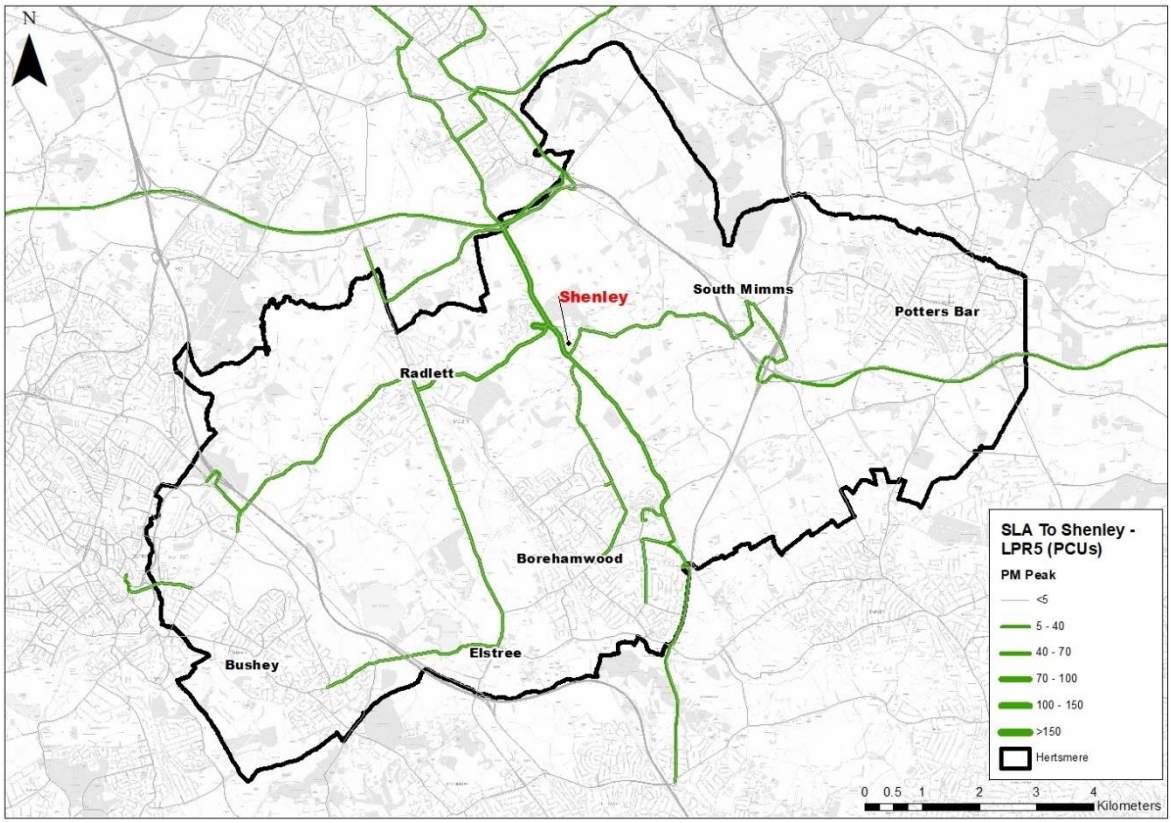

Figure 4-20: Routeing Analysis to Shenley (PM peak)

Radlett

4.11 Figure 4-21 to Figure 4-24 show flows routeing from and to Radlett in the AM and PM peaks. Traffic is traveling via Watling Street, Theobald Street, Watford Road A414 and the M25 to reach destinations in the Hertfordshire county, Buckinghamshire and London. Similar to Shenley, traffic utilises local roads to reach other towns in Hertsmere or M25 junction 22 to route via the M25. Traffic also links via local roads to the A414 south of St Albans to join the M1 at junction 8.

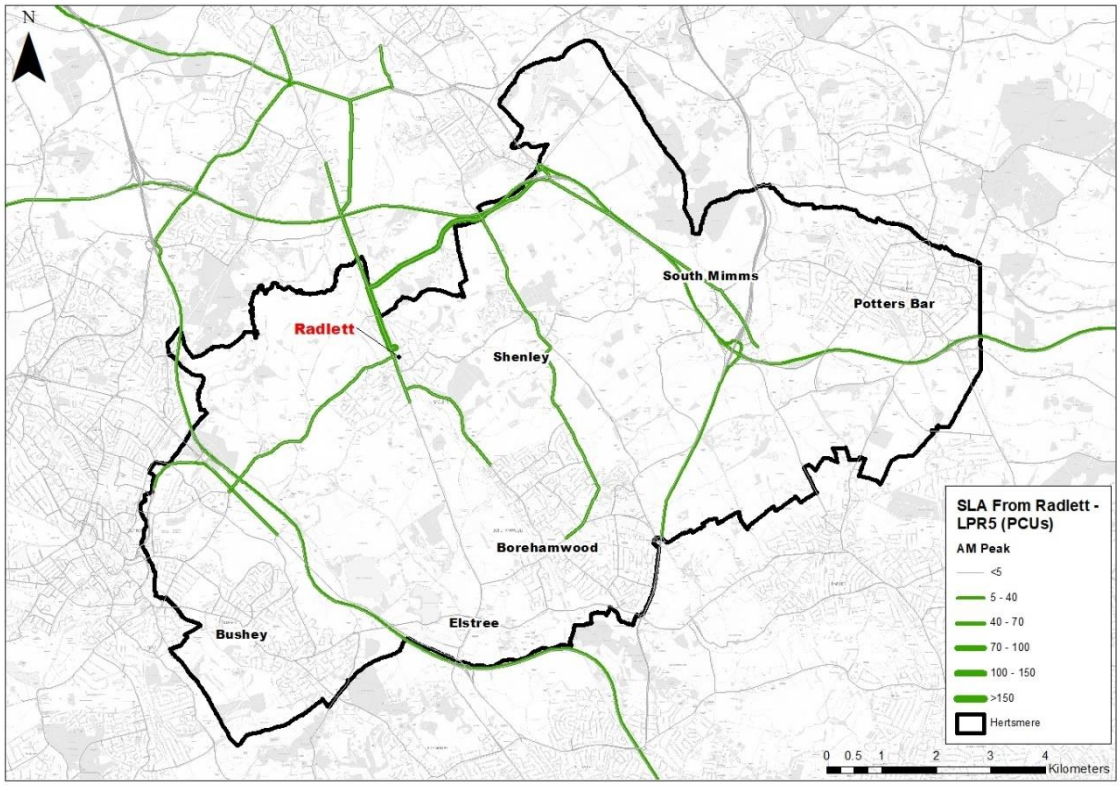

Figure 4-21: Routeing Analysis from Radlett (AM peak)

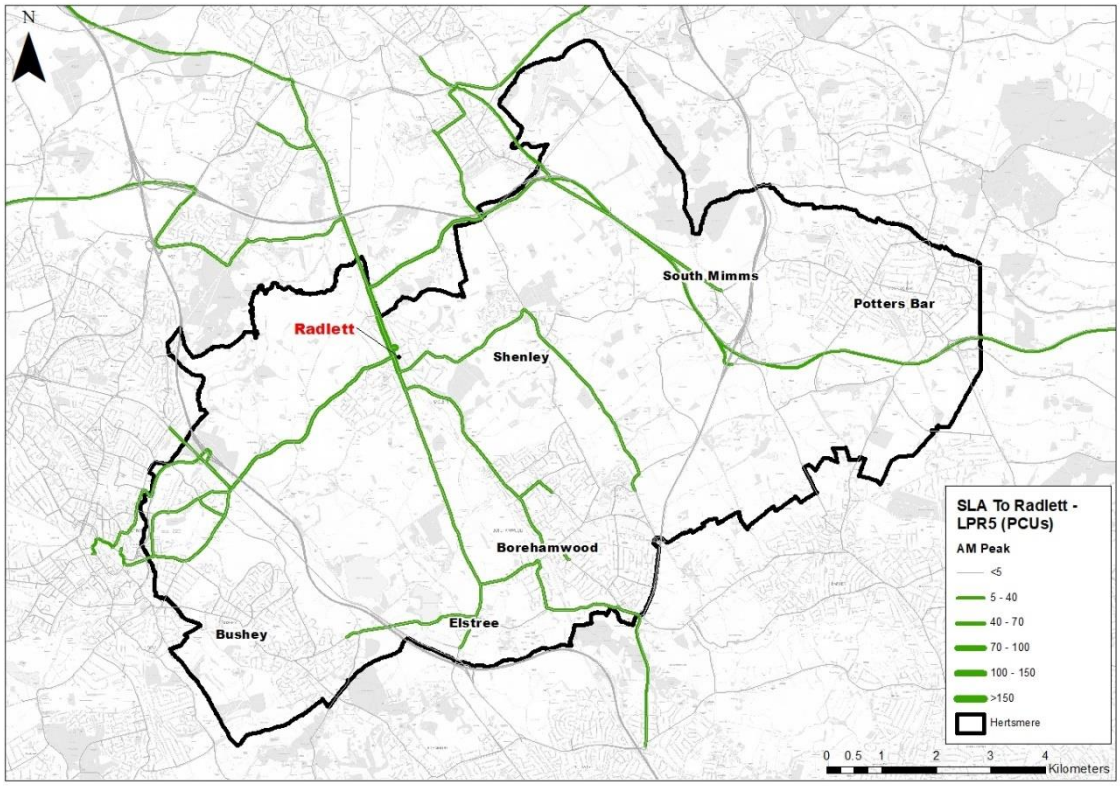

Figure 4-22: Routeing Analysis to Radlett (AM peak)

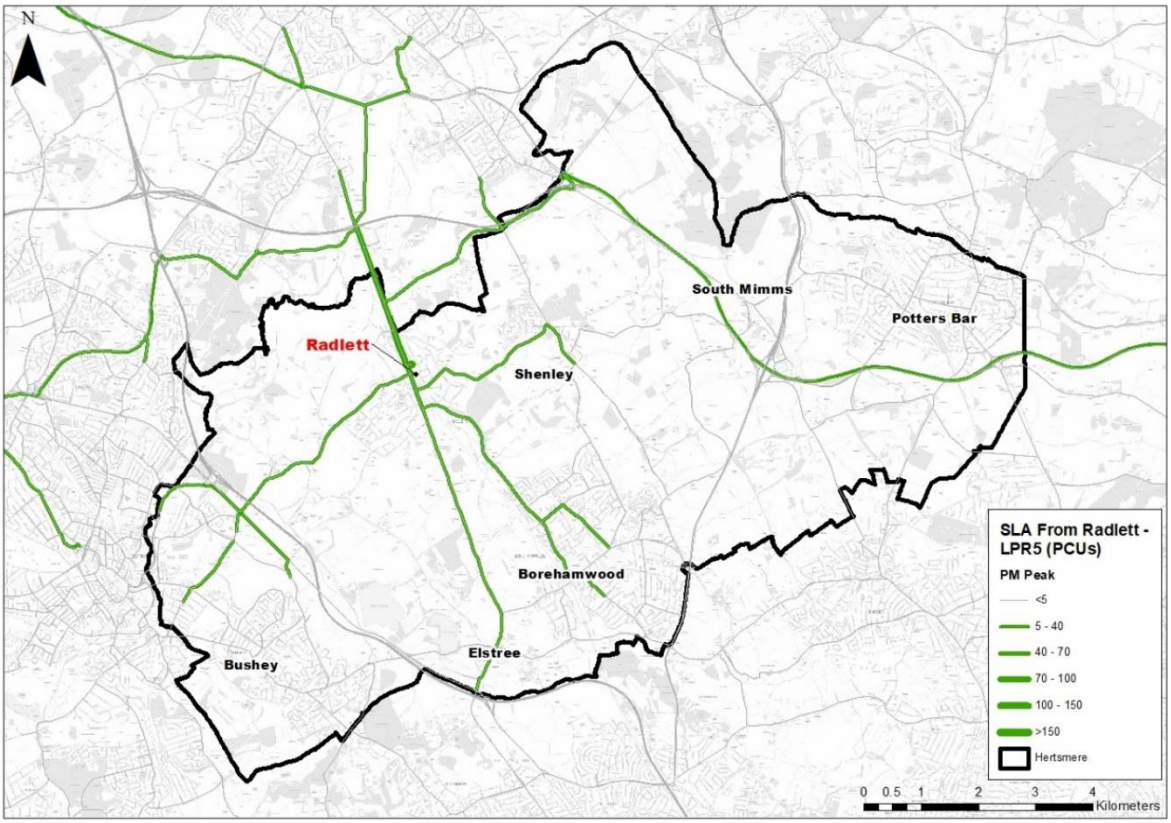

Figure 4-23: Routeing Analysis from Radlett (PM peak)

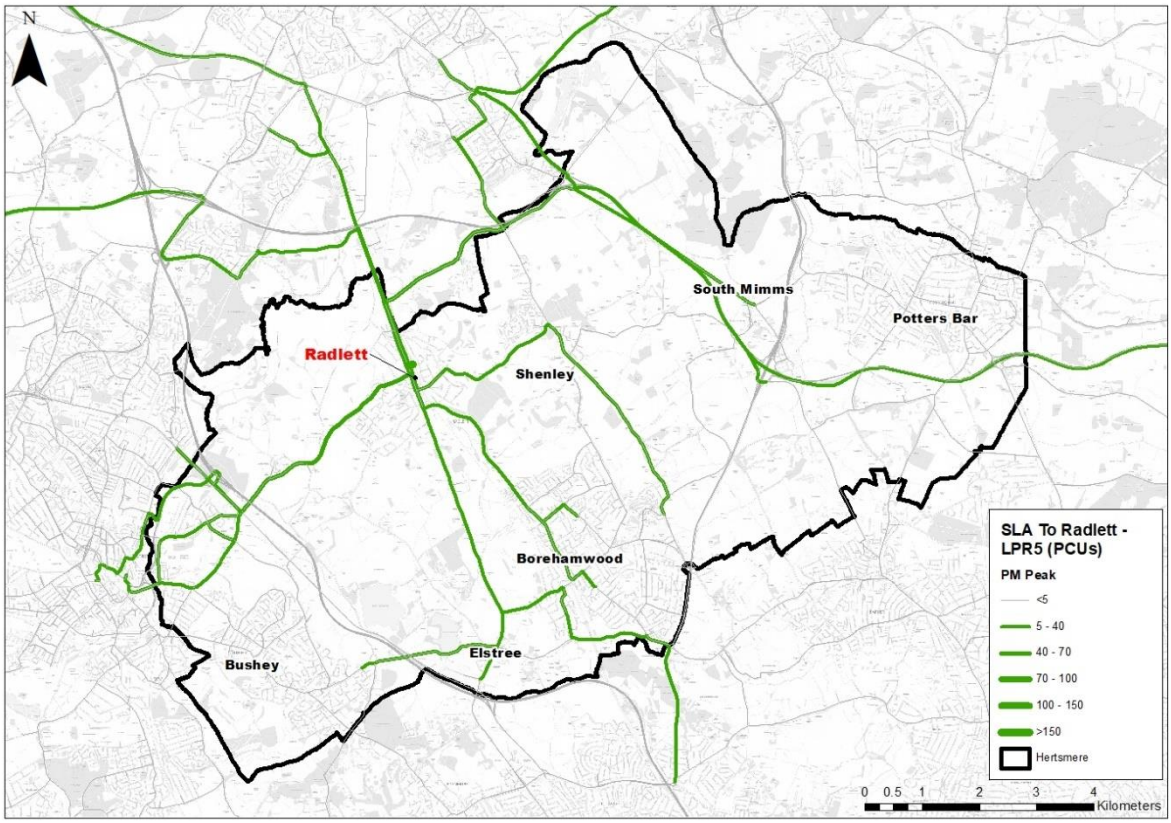

Figure 4-24: Routeing Analysis to Radlett (PM peak)

South Mimms

4.12 Figure 2.25 and Figure 2.26 show flows along the B556 through central South Mimms in the AM and PM peaks. Most traffic is travelling to and from Buckinghamshire, East Hertfordshire and the northernmost boroughs of London via Mimms Lane, the A1 and the A414. The M25 Junction 23 is suggested to be a key junction for flows routeing to and from South Mimms. As the B556 is a through route parallel to the M25 it should be considered that some traffic may be using this route to avoid any delays on the M25 or at nearby junctions 23 and 24.

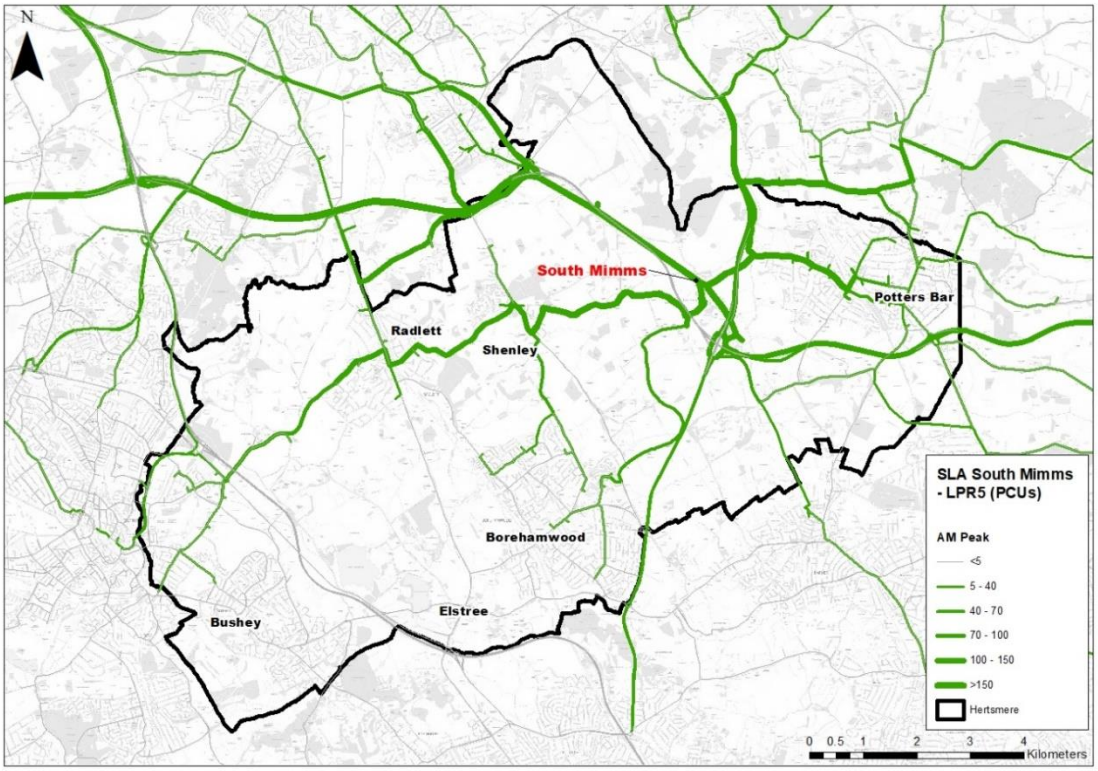

Figure 4-25: Routeing Analysis on the B556 Through South Mimms (AM peak)

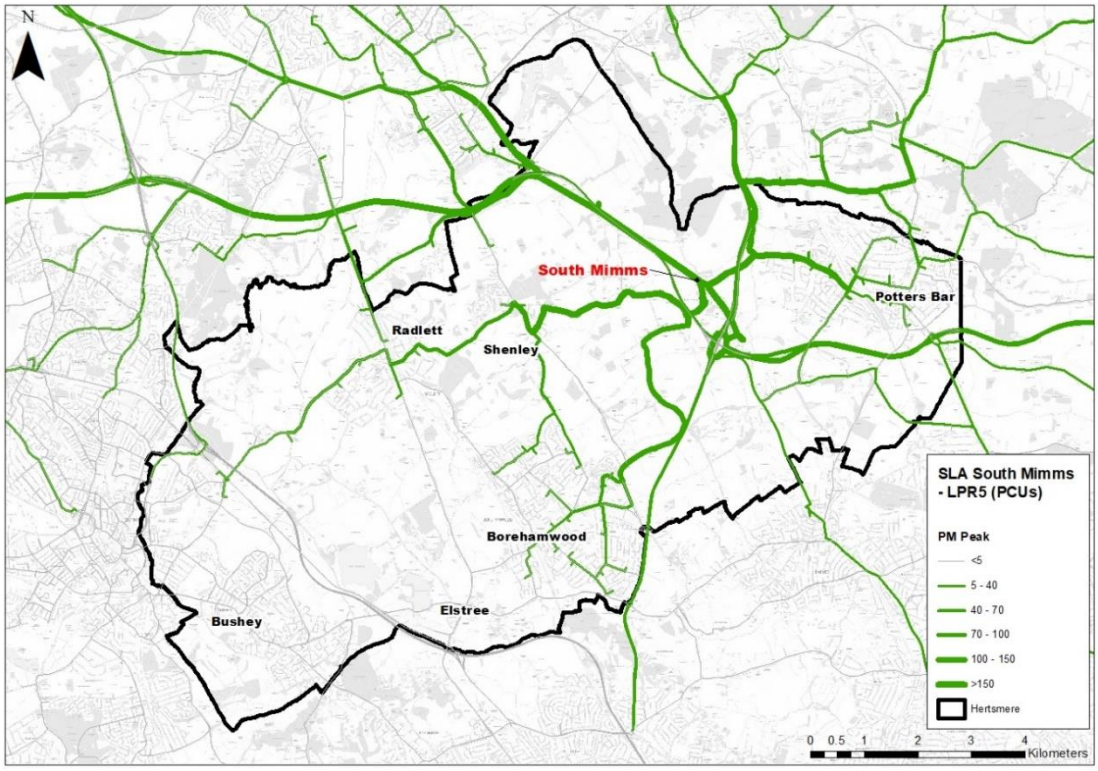

Figure 4-26: Routeing Analysis on the B556 Through South Mimms (PM peak)

Summary

4.13 Table 4-1 provides a summary for key movements to and from each town in Hertsmere.

Table 4-1: Traffic movement from and to towns in Hertsmere

Town	Key routes from/to Town	
	Routes	Areas accessed
Potters Bar	Traffic is mainly travelling through Baker Street, Mutton Lane and the M25, especially junctions 24 and 22a.	Traffic is travelling to other districts within Hertfordshire and London Boroughs south of Hertsmere. Limited interaction is observed with other origins/destinations in Hertsmere apart from Borehamwood.
Elstree	Traffic is mainly travelling through Roman Road, Barnet Lane, High Street and the A41.	Traffic is travelling to Hertfordshire, Buckinghamshire and London. Some interaction with Watford and surrounding towns in Hertsmere, such as Radlett and Borehamwood, is observed.
Borehamwood	Traffic is mainly travelling through Theobald Street, Shenley Road and the A1, as well as more strategic routes such as the A1 and the M25.	Traffic is travelling to Hertfordshire and Buckinghamshire. Traffic also links with surrounding local towns in Hertsmere, such as Radlett and Elstree, and towns such as Hatfield further north in Hertfordshire. Traffic is also observed using north/south routes on local roads to travel between Borehamwood and St Albans.
Bushey	Traffic is mainly travelling through the A411, Falconer Road and the M1. Traffic volumes are lower compared to other towns in Hertsmere.	Traffic is travelling to Hertfordshire, north London and to adjacent Watford. Limited interaction with other locations in Hertsmere, except for Elstree, is observed.
Shenley	Traffic is mainly travelling through the Black Lion Hill / London Road and Mimms Lane/ Radlett Lane that provide a shortcut to and from the M25. Traffic routes to junction 22 to travel west or junction 23 to travel east on the M25.	Traffic is travelling to other towns in Hertsmere or to areas north of Shenley.
Radlett	Traffic is mainly travelling through Watling Street, Theobald Street, Watford Road A414 and junction 22 to route via the M25. Traffic also links via local roads to the A414 south of St Albans to join the M1 at junction 8.	Traffic is travelling to destinations within Hertfordshire county, Buckinghamshire, London and other towns in Hertsmere.
South Mimms	Traffic is mainly travelling through Mimms Lane, the A1 and the A414. The M25 Junction 23 is a key junction and the B556 is considered a through route to avoid any delays at the M25 junctions 23 and 24.	Traffic is travelling to and from Buckinghamshire, Hertfordshire and the northernmost boroughs of London.

5. Bowmans Cross Trip Distribution Analysis

5.1 To understand the impacts of new site allocations, routeing analysis was undertaken to provide supplementary analysis in terms of overall impact of traffic flow to and from selected developments in Hertsmere.

5.2 This analysis can only be undertaken for site allocations assigned to a development zone. Scenario 2 contains fewer development zones within Hertsmere versus previous COMET Local Plan runs. This is due to the size of developments within Hertsmere not meeting the requirements for a development zone in Scenario 2.

5.3 HBC are working with site promoters regarding a potential site allocation in the forthcoming Local Plan for a new development on land which is part of the Tyttenhanger Estate, at Coursers Road. That site is known as Bowmans Cross and would be for up to 6,000 dwellings, employment space and associated facilities. However, it is worth noting that Scenario 2 considers 2,000 dwellings only, as the other 4,000 dwellings will be delivered post 2036.

5.4 Bowmans Cross development fulfils the development zone criteria (growth larger than 2,000 dwelling), hence it is the only one considered in this report. Access to the development was provided by two T-junctions; one accessing Coursers Road and the other accessing the B556. As highlighted in the caveats section, it is important to note the COMET applies generic NTEM trip rates to new developments and the dispersion pattern from neighbouring areas. The trip patterns will probably be much lower than those proposed by developers and the trip dispersion may also differ. These results should only be viewed as indicative. Outbound trip distribution in the AM, and inbound trip distribution in the PM peaks were extracted from Scenario 2 and are shown in Figure 5-1 to Figure 5-4.

5.5 Figure 5-1 and Figure 5-2 show flows routeing from the Bowmans Cross development in both the AM and PM peaks. Traffic generated by the development site have been forecast to route via the:

- A1081 to access St Albans Town Centre;
- M25 Junction 23 and B556 to access Potters Bar Town Centre;
- M25 Junction 22 and Radlett Lane to access Radlett Town Centre;
- M25 Junction 22, Coursers Road, Tollgate Road and High Street to access the A1(M) for North – South movements; and
- M25 Junction 21 and A1081 / North Orbital Road (only for PM Peak Hour) to access the M1 for the North - South movements.

5.6 Figure 5-3 and Figure 5-4 display flows routeing to the development site which are mainly originating from:

- Radlett via Watling Street, B556 and M25 Junction 22;
- Potters Bar via B556 and M25 Junction 23;
- Borehamwood via Rowley Lane / Holmshill Lane / Summerswood Lane, B556 and M25 Junction 23; and
- Outer St Albans via A1081, M25 Junction 22 and High Street / Coursers Road.

5.7 As these plots illustrate, the proximity of the site to the SRN (Strategic Road Network) results in only limited impacts on the local road network.

5.8 As analysis in Section 6 highlights, the new Bowmans Cross development could possibly be linked to the congestion suggested by the model around the M25 Junctions 22 and 23. Congestion is suggested on the A1 and M25 Junction 23 leading to Potters Bar and at the M25

Junction 22 leading to Radlett and St Albans. Minimal delays are observed on access roads around the M25 junctions 22 and 23.

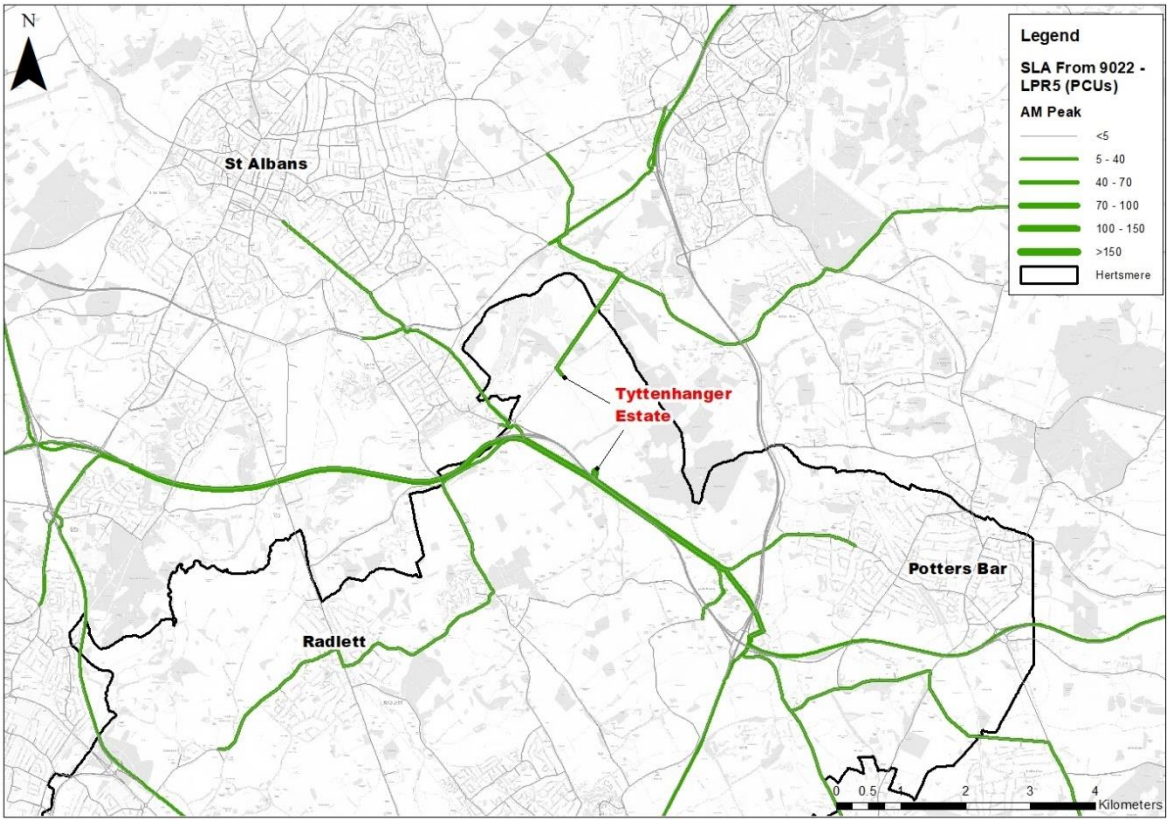

Figure 5-1: Routeing Analysis from Bowmans Cross (AM peak)

Figure 5-2: Routeing Analysis from Bowmans Cross (PM peak)

Figure 5-3: Routeing Analysis to Bowmans Cross (AM peak)

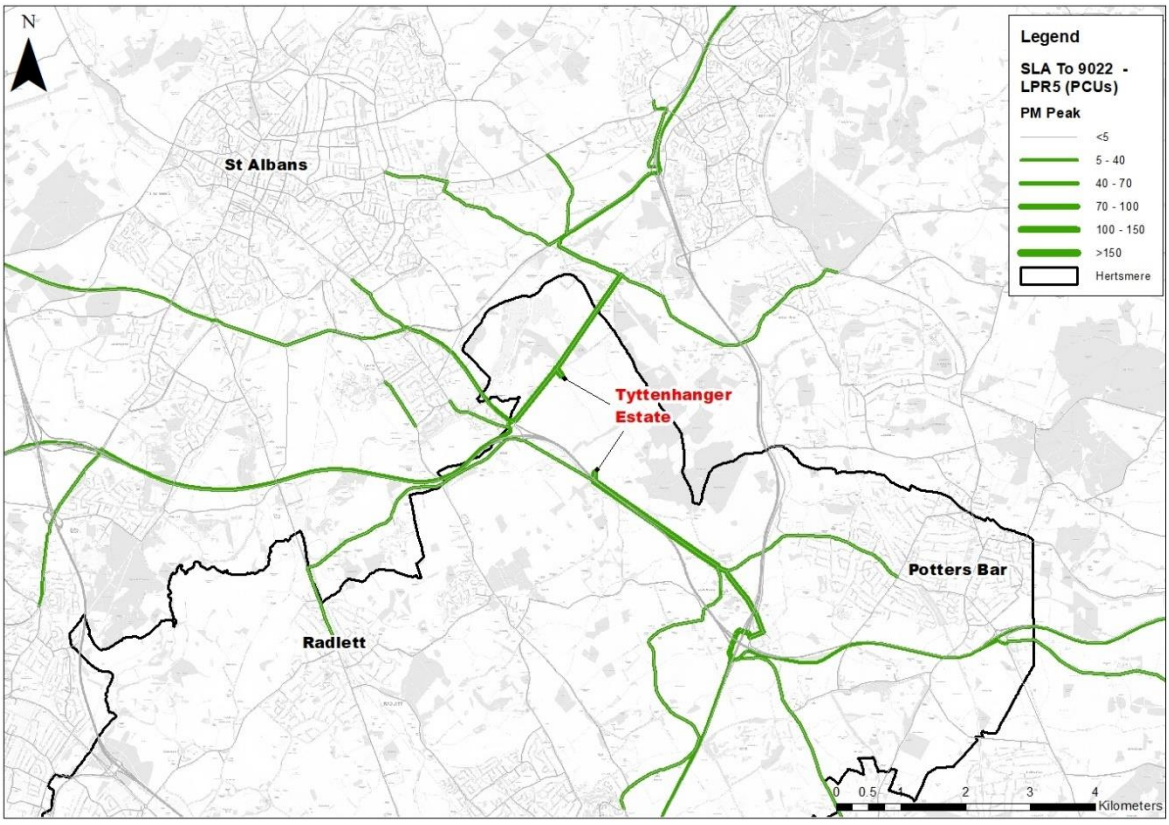

Figure 5-4: Routeing Analysis to Bowmans Cross (PM peak)

6. 2036 Traffic Conditions in Hertsmere

6.1 To understand the 2036 traffic conditions in Scenario 2 for the HBC area, areas of stress / junction delay within Hertsmere were identified and traffic conditions in Scenario 2 are presented in the form of flow and delay difference plots.

6.2 Comparisons between Scenarios 1 and 2, as well as between Scenario 2 and the Base Year are undertaken to quantify the impact of the additional Local Plan growth.

6.3 Link stress and node delay analysis was focused on the 31 routes and junctions shown in Table 6-1 below. Each location is assigned a "Figure Reference" which can be seen in the plots in this section.

6.4 In this section, results for the for AM and PM peaks are presented, while results for Inter-peak hour are included in Appendix A. Where results from the Inter-peak hour vary significantly from those in the AM and PM peak hours, these are reported in this section.

6.5 A summary table is provided at the end of this section and presents traffic conditions in Scenario 2 and comparable scenarios in Table 6-2.

Table 6-1: List of Routes and Junctions in Hertsmere

Area	Description	Figure Reference
Borehamwood	Theobald Street to B5378 via Aycliffe Road and Gateshead Road	1a
Borehamwood	Barnet Lane/ Furzehill Road junction	1b
Borehamwood	Stirling Corner	1c
Elstree	Elstree Hill North/Allum Lane junction	2a
Elstree	Elstree Hill South/A411 junction to Elstree crossroads	2b
Elstree	Watford Road/A41 junction to Elstree crossroads	2c
Bushey	Sandy Lane link between A41 and Little Bushey Lane	3a
Bushey	Hartspring roundabout/A41	3b
Bushey	Aldenham Road from junction with Little Bushey Lane to junction with Bushey Hall Rd/The Avenue	3c
Bushey	Bushey Arches junction	3d
Bushey	Junction of Elstree Road/Sparrows Herne	3e
Bushey	Heathbourne Road/Elstree Road junction	3f
Bushey Heath	A4140 (from junction with A411) via A411 to junction of A411 and A409 (Heathbourne Road)	3g
Potters Bar	B556 Mutton Lane from its junction with Baker Street to its junction with the High Street A1000	4a
Potters Bar	M25 Junction 24 at Potters Bar to B556 Mutton Lane junction with High St A1000	4b
Potters Bar	B556 from its junction with Swanland Road to junction with Baker Street	4c
Potters Bar	Darkes Lane to A1000 via The Walk	4d
Potters Bar	Darkes Lane (from junction with Mutton Lane) to A1000 via Church Road	4e
Potters Bar	A111(from junction with M25 J24) to Junction of A1000 and Church Road	4f
Radlett/Shenley	London Road/Green Street junction	5a
Radlett/Shenley	Watling St/Theobald Street junction	5b
Other Areas	South Mimms village to South Mimms services and J23 via St Albans Road	6
Other Areas	M25 Junction 23	7

Scenario 2 Node Delay and Link Stress

6.6 Figure 6-1 and Figure 6-2 present traffic conditions in the general area of Hertsmere for Scenario 2 in the AM and PM peaks respectively. Individual figures that show localised traffic conditions in more detail for Borehamwood, Watford, Potters Bar and Radlett are included in the Executive Summary and Appendix A (Figure 10-1 to Figure 10-4).

6.7 Traffic conditions for Scenario 2 are presented in the form of node (junction) delay and link (road) stress (also known as V/C, volume over capacity) across the network.

6.8 Node delay is the average delay a vehicle will experience at a junction, regardless of the direction of the approach or movement made. It is averaged across all movements at junctions and weighted by the flows. Larger and darker circles in the figures denote increased junction delays.

6.9 Link stress (or V/C) represents the level of congestion along the road. Roads operating at link stress below 80% are expected to be relatively free-flowing with minimal delays at junctions. Roads operating between 80% and 90% will begin to show signs of congestion, vehicle speed will reduce, and delays will occur at junctions. At link stress over 90%, roads will be very congested with low average speeds and delays expected at junctions.

6.10 High congestion, especially in the AM peak, are suggested along the A1. This is passing through South Mimms, reaching the edge of Borehamwood where congestion is observed on routes and junctions around the A1. Traffic at the Stirling Corner junction is experiencing long delays above 2.5 minutes throughout the day, while local roads at the edge of the town don't present signs of congestion. (1a, 1b, 1c).

6.11 2036 traffic conditions suggest that the network in Elstree is congested throughout the day (2a, 2b, 2c), with delays at junctions experienced.

6.12 High congestion is also suggested along the M1 and along the A41, which affects local roads around Bushey (3a, 3b, 3c, 3d, 3e, 3f, 3g). Localised congestion and junction delays are observed, especially in the PM peak.

6.13 Congestion will also be experienced by traffic moving along the A1000 at Potters Bar. High flow is suggested by the model for parts of this road and adjacent roads, such as Church Lane and The Walk. Congestion expands further to the east and outside of the Hertsmere boundary due to traffic merging with the M25 (4a, 4b, 4c, 4d, 4e, 4f).

6.14 High congestion and long delays are suggested for the A5183 northbound direction and adjacent roads. Traffic passing through the Watford Road/Watling Street junction will experience long delays of more than 5 min. The rest of the network around Radlett appears to operate well below capacity (5a, 5b).

6.15 The high congestion suggested on the M25 and on the A1 throughout the day affects the roundabout south of South Mimms at the M25 Junction 23 and at the A1 Junction 1 (6, 7). Delays of up to 1.5 min are suggested for traffic passing through this junction.

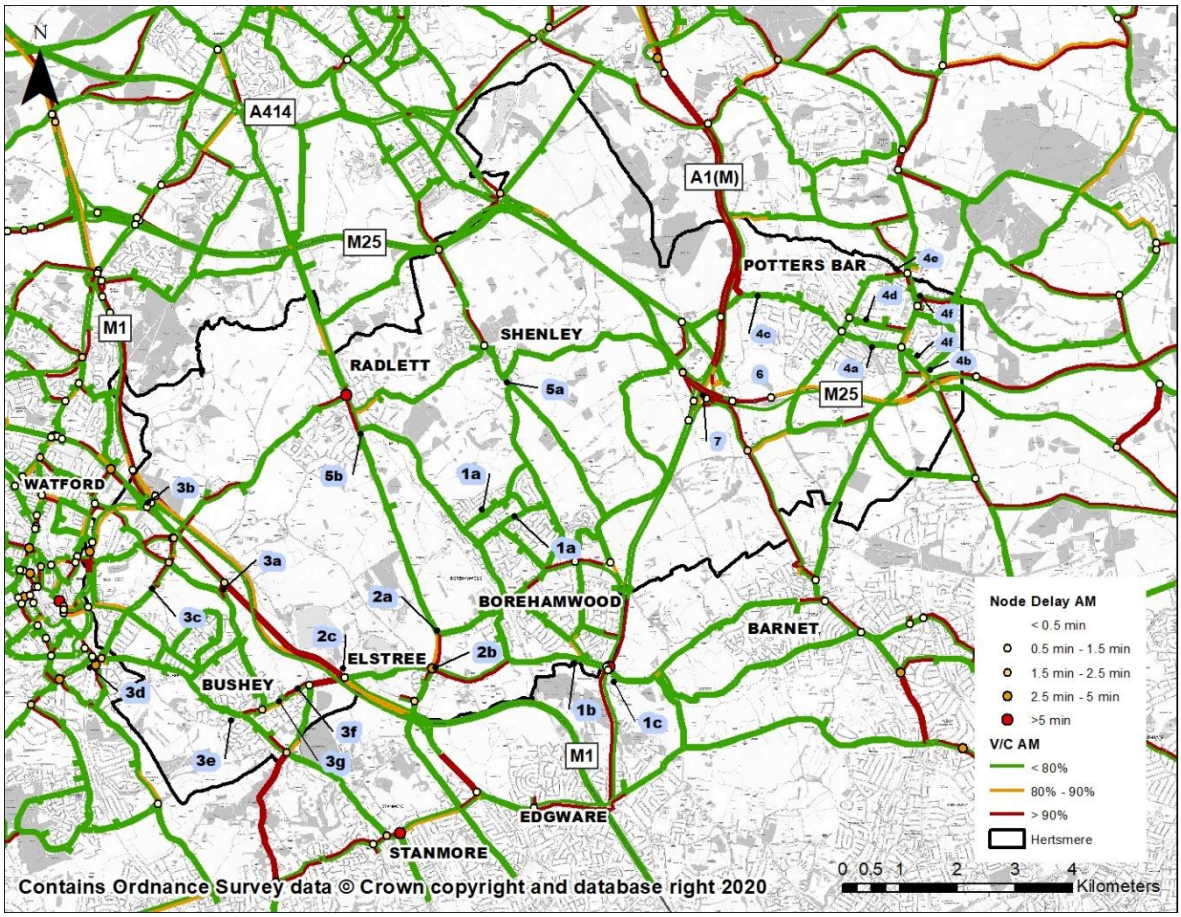

Figure 6-1: Scenario 2 Node Delay and Link Stress in Hertsmere - AM Peak

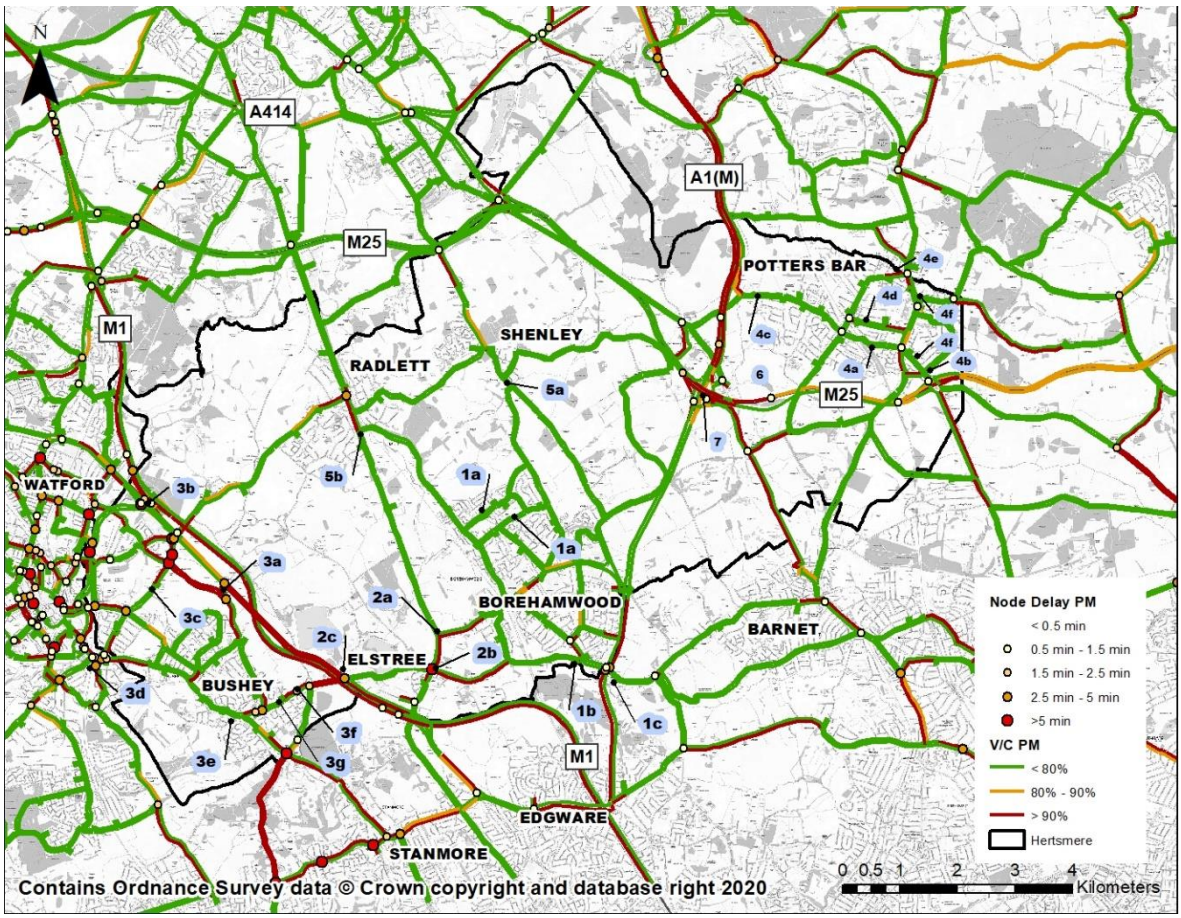

Figure 6-2: Scenario 2 Node Delay and Link Stress in Hertsmere - PM Peak

Scenario 2 and Scenario 1 Comparison

6.17 Figure 6-3 and Figure 6-4 present flow and junction delay differences in the AM and PM peaks respectively between Scenarios 1 and 2 for the traffic network in Hertsmere. Individual figures that show localised traffic condition differences in more detail for Borehamwood, Watford, Potters Bar and Radlett are included in the appendices for all time periods.

6.18 Node delays and flow differences are calculated by subtracting conditions in Scenario 1 from conditions in Scenario 2. Larger and darker circles for delay differences denote increased delays in Scenario 2 compared to Scenario 1, while darker red and darker green represents respectively greatest decrease and greatest increase in flow in Scenario 2.

6.19 Significant flow increase, especially in the AM peak, is suggested along the A1 and at the south edge of Borehamwood. Flow differences on the A411 appear to be low, however moderate delays are suggested in the AM peak due to merging traffic on Stirling Corner. No change in flows is modelled on roads at the northern edge of Borehamwood (1a, 1b, 1c).

6.20 Increased flows on the A41 around Elstree suggest moderate delays increase of up to 2.5 min longer in Scenario 2 for the north-south direction, while flow reduction is modelled for the east-west network around Elstree (2a, 2b, 2c).

6.21 The road network around Bushey appears to suffer from small to moderate increases in junction delays throughout the day. Even though flow differences on the local network between the two 2036 applications are suggested to be small, the high congestion modelled in Scenario 2 affects the capacity of local junctions, especially in the PM peak (3a, 3b, 3c, 3d, 3e, 3f, 3g).

6.22 Flow reduction is suggested on the M1 linked to minimal junction delays in the area as well as to strategic routeing in COMET. For example, it is possible that traffic flips between M1 and M40 for longer strategic journeys between scenarios. It should also be noted that the flow reductions will be low in percentage terms (less than 5%) as the motorway has a high capacity compared to local roads.

6.23 Increased flow on the M25, especially eastbound around Potters Bar, suggests small flow increases on the A1000 and B556 and moderate increase in delays at key junctions in Scenario 2. No flow and delay changes are suggested for road adjacent to the A1000 and B556 in both peaks (4a, 4b, 4c, 4d, 4e, 4f).

6.24 Flow decrease is modelled on the A5183, especially southbound throughout the day, in Scenario 2 compared to Scenario 1. This will be due to the delays experienced at the junctions in Radlett and traffic re-routeing to avoid them. Increased traffic is modelled passing eastbound on Theobald Street and Shenley Hill/Road which affects flows differences on the A5183 north of the Watford Road/Watling Street junction in the AM peak. Flows northbound of London Road suggest being increased in Scenario 2 in the PM peak (5a, 5b).

6.25 Significant flow reduction is suggested by the model at the M25 Junction 23 in Scenario 2 as a result of the reduced flows on St Albans Road south of the junction. Flow increase is modelled north of the M25 Junction 23 as traffic is joining or leaving the A1. Junction delays increase moderately south of the M25 Junction 23 in the AM peak, while moderate delay increases are observed north of the M25 Junction 23 in the PM peak (6, 7).

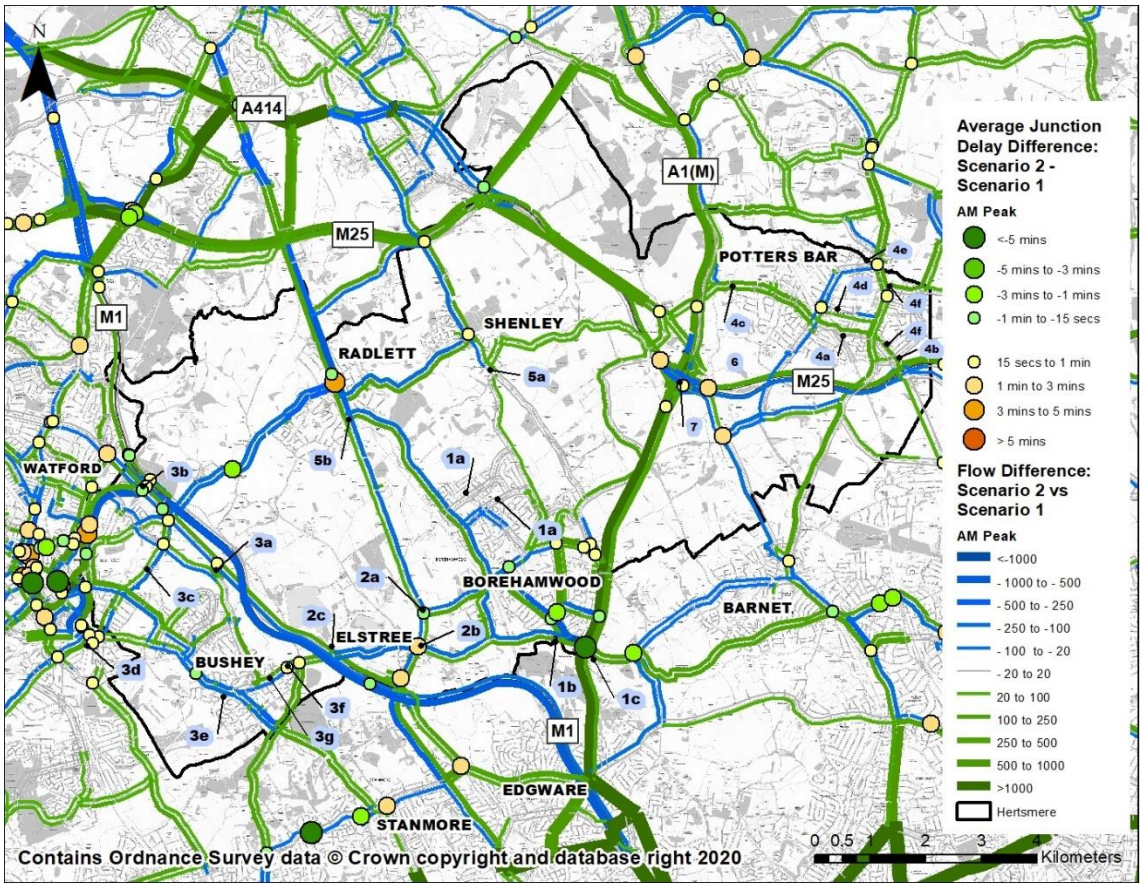

Figure 6-3: Flow and Delay difference between Scenarios 1 and 2 in Hertsmere - AM Peak

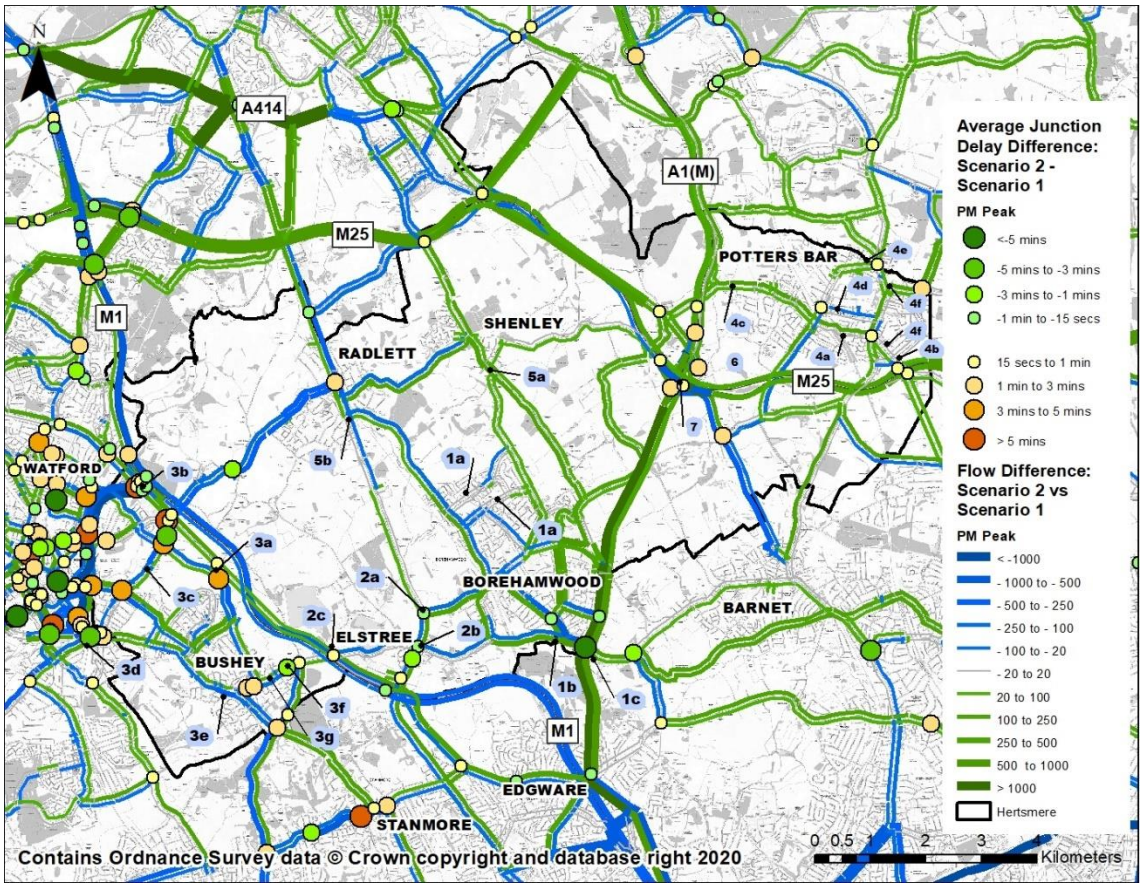

Figure 6-4: Flow and Delay difference between Scenarios 1 and 2 in Hertsmere - PM Peak

Scenario 2 and Base Year Comparison

6.27 Figure 6-5 and Figure 6-6 present flow and junction delay differences in the AM and PM peaks respectively between Scenario 2 and the Base Year scenario for the traffic network of Hertsmere. Individual figures that show localised traffic condition differences in more detail for Borehamwood, Watford, Potters Bar and Radlett are included in the appendices for all time periods.

6.28 Node delays and flow differences are calculated by subtracting the Base Year conditions from the conditions in Scenario 2. Red circles for delay differences denote increased junction delays at, while green circles denote reduced junction delays in Scenario 2 compared to the Base Year scenario. As for flow differences, green indicates increase and blue indicates decrease in flows between Scenario 2 and the Base Year scenario.

6.29 Significant increase in congestion is suggested along the A1 and adjacent roads at the south edge of Borehamwood throughout the day. Reduced congestion on the A411 is modelled in 2036, which results in decreased delays of up to 5 min at Stirling Corner for traffic on Barnet Way merging into the A1 northbound. Delay increases of up to 3 minutes are suggested for southbound traffic on the A1 reaching Stirling Corner. Small flow increases and decreases are modelled on local roads at the north edge of Borehamwood (1a, 1b, 1c).

6.30 Increased flows on the A41, especially in the PM, around Elstree suggest moderate flow increases and delays of up to 3 min longer in Scenario 2 southbound of Elstree Hill Street. Flow reduction is modelled for the east-west network around Elstree (2a, 2b, 2c).

6.31 The road network around Bushey appears to suffer from small to moderate increases in junction delays throughout the day. Increased flows on the M1 and A41 affect the volume of traffic on parallel roads, with Little Bushey Lane accommodating increased traffic in the AM peak compared to the PM peak. (3a, 3b, 3c, 3d, 3e, 3f, 3g).

6.32 Significantly higher flows on the M25 are modelled for Scenario 2 compared to the Base Year, especially in the AM peak. Flow increase is also suggested for the A1000 and B556 roads in Potters Bar, with junction delays in the area increasing up to 3 minutes compared to traffic conditions in 2014 (4a, 4b, 4c, 4d, 4e, 4f).

6.33 Flow reduction (due to re-routeing to avoid delays) is suggested southbound on the A5183, Theobald Street and eastbound on Shenley Street, especially in the AM peak. An increased delay of 5 minutes is expected for traffic passing through Watford Road/Watling Street junction as flow increases are modelled northbound on the A5183. Flow increases are suggested on London Road in the AM and PM peaks (5a, 5b).

6.34 Due to the high flow increase suggested on the M25 around Junction 23 and on the A1, flow increase is also observed on St Albans Road. Delays are suggested to increase by 3 minutes at most for traffic travelling though Junction 23 or joining/leaving the A1 (6, 7).

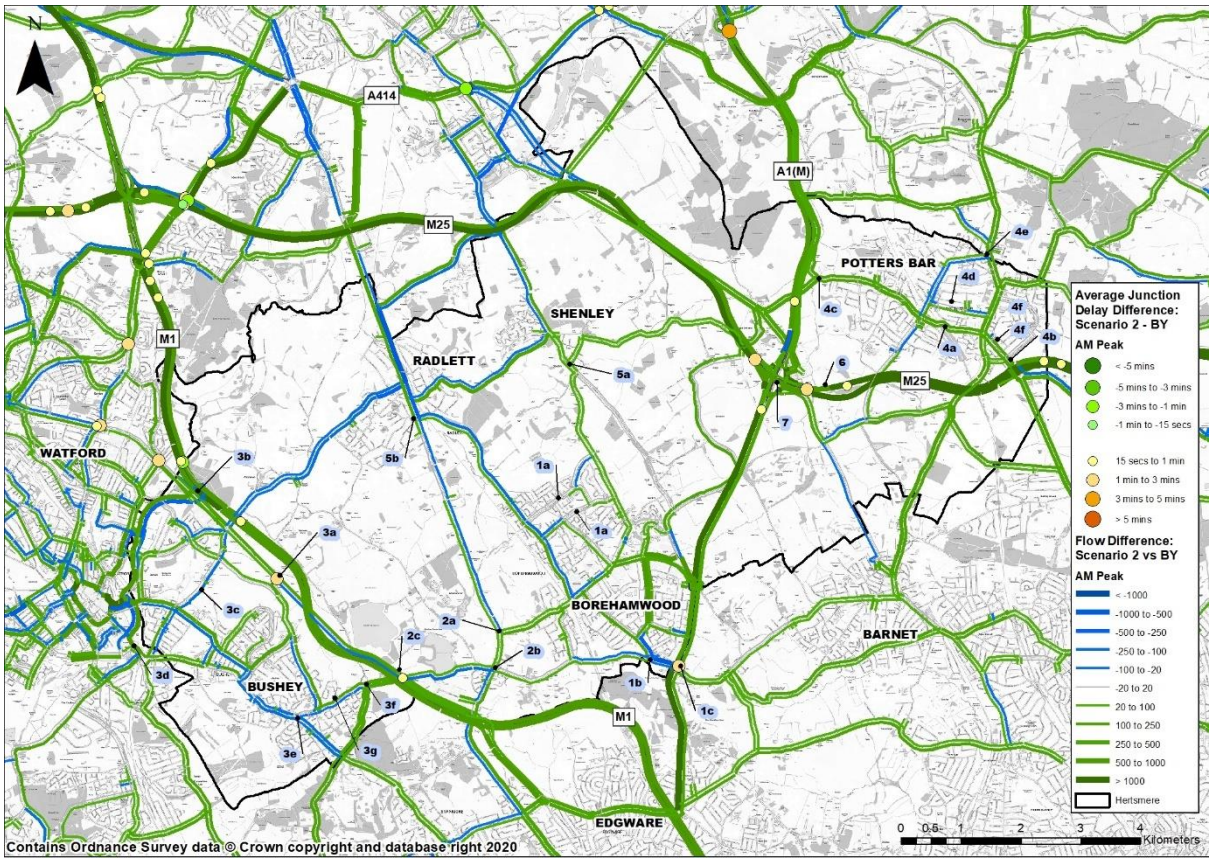

Figure 6-5: Flow and Delay difference between Scenario 2 and Base Year in Hertsmere - AM Peak

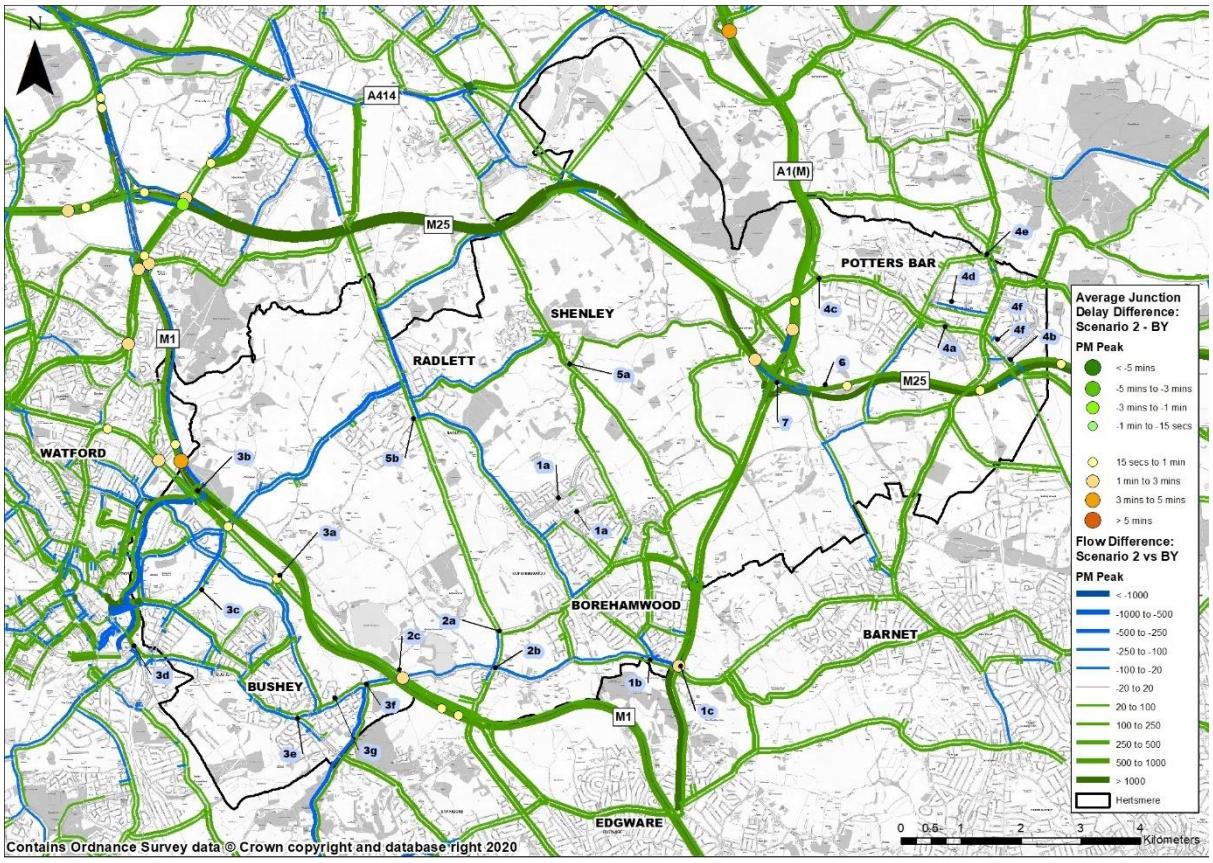

Figure 6-6: Flow and Delay difference between Scenario 2 and Base Year in Hertsmere - PM Peak

Summary

Table 6-2: Summary of Traffic Conditions in Scenario 2 and comparisons with Scenario 1 and 2014 Base Year scenario

ID	Junction Name	Traffic Conditions in Scenario 2	Comparison to Scenario 1	Comparison to 2014 Base Year
1A	Theobald Street to B5378 via Aycliffe Road and Gateshead Road	The route operates at capacity below 80% in both the AM and PM peaks. In both time periods junction delays are minimal.	No significant change in flows or junction delays.	No significant change in flows or junction delays.
1B	Barnet Lane/ Furzehill Road junction	Furzehill Road Northbound presents moderate congestion in the AM peak and high congestion in the PM peak near the junction with Barnet Lane. However, no critical delays are identified at the junction in any time period.	Large flow reduction is modelled for traffic along Furzehill Road approaching the junction and for traffic along the Barnet Lane exiting the junction in the AM and PM peaks. Junction delays are unchanged.	Moderate flow reduction is modelled for traffic along Furzehill Road Southbound and Barnet Lane Southbound. Large flow reductions are modelled for traffic approaching exiting the junction, especially in the AM. Junction delays are unchanged.
1C	Stirling Corner	Congestion on the A1 Southbound and on the A1 Northbound approaching the junction suggest that the Stirling Corner junction is operating below capacity. Long junction delays are also suggested in both the AM and the PM peaks.	Significant flow increase is suggested for the A1 Northbound entering and exiting the junction throughout the day. Significant flow increases on the A1 Southbound approaching the junction in the AM peak. No significant change in junction delay.	Significant flow increases on the A1 throughout the day and in both directions, resulting in long junction delays for the north-south direction. Large decrease in junction delays are suggested for traffic approaching the junction from Barnet Lane.
2A	Elstree Hill North/Allum Lane junction	Moderate to high congestion is suggested southbound on Elstree Hill North Southbound in both the AM and PM peaks. Insignificant junction delays are modelled for traffic travelling through the junction throughout the day.	Small flow increase is modelled on Allum Lane eastbound in both the AM and PM peaks and on Elstree Hill North Northbound in the PM peak. No significant change in junction delay is observed.	Small flow increase is modelled on Elstree Hill North and Allum Lane in the AM peak. Minimal flow reduction is suggested for Elstree Hill North Northbound and Allum Lane eastbound in the PM peak. No significant change in junction delay is observed.
2B	Elstree Hill South/A411 junction to Elstree crossroads	Moderate to high congestion is modelled on the A41 Northbound exit in both the AM and PM peaks. Junction delays do not affect traffic at this crossroad.	The model suggests small flow increase on the A41 and on Elstree Hill South in both the AM and PM peaks and moderate flow decrease on Brockley Hill approaching the junction from the south.	Flow increase is suggested on all roads passing through the junction in both the AM and PM peaks. This affects the junction to the north, where moderate to

ID	Junction Name	Traffic Conditions in Scenario 2	Comparison to Scenario 1	Comparison to 2014 Base Year
			No significant increase in delays are observed at this junction, however moderate delays are modelled at the junction to the north.	long delays are observed, especially in the AM peak.
2C	Watford Road/A41 junction to Elstree crossroads	High congestion is suggested on all arms of the junction throughout the day with traffic experiencing extremely long delays, especially in the PM peak.	Small flow decrease is modelled on the A411 while flows on Elstree Hill South increase. This results in an increase of delays at the junction in the AM peak, whereas no significant change of delays is suggested in the PM peak.	Flow increase is modelled along Elstree Hill, especially Southbound, in both the AM and PM peaks. Flow decrease is modelled westbound on the A411 in the AM peak and in both directions in the PM peak. Moderate increase in junction delays are suggested throughout the day.
3A	Sandy Lane link between A41 and Little Bushey Lane	High congestion is modelled on Sandy Lane throughout the day, with congestion on Little Bushey Lane expanding in both directions in the PM peak. High junction delays are suggested for traffic using the Sandy Lane link. Traffic moving in the north/south direction on Little Bushey Lane creates congestion problems at the junction with Sandy Lane which operates near capacity, especially in the PM peak.	Minimal differences in congestion and junction delays are observed between Scenarios 1 and 2 on Little Bushey Lane. Especially in the PM peak, decreased traffic is modelled on Little Bushey Lane, with the most significant decrease observed for southbound moving traffic on Little Bushey Lane, south of the Little Bushy Lane/ Sandy Lane junction. Small increase in flows is suggested along the Sandy Lane link in both the AM and PM peaks. Moderate junction delays are observed at the Little Bushy Lane/ Sandy Lane junction in the PM peak.	Flow increase is modelled for both the southbound and northbound directions on Little Bushey Lane, in the AM peak. Reduced traffic is suggested in both directions on Little Bushey Lane in the PM peak. As increased traffic is suggested on Sandy Lane link throughout the day, high junction delays are observed at the Little Bushy Lane/ Sandy Lane junction, especially in the PM peak.
3B	Hartspring roundabout/A41	High congestion is modelled on the B462, especially eastbound, throughout the day. Minor junction delay is observed in both the AM and PM peaks.	Small flow reduction is modelled on the B462 in the AM peak, which is further reduced in the PM peak. Flow increases is modelled on the A41 throughout the	Flow decrease is modelled on the B46, especially in the AM peak. High flow increase is modelled on the A41, which results in moderate delay increase at the junction throughout the day. Higher

ID	Junction Name	Traffic Conditions in Scenario 2	Comparison to Scenario 1	Comparison to 2014 Base Year
			day. This results in small delay increase at the junction.	delay increases are expanded south of the junction in question.
3C	Aldenham Road from junction with Little Bushey Lane to junction with Bushey Hall Rd/The Avenue	High congestion is suggested on Aldenham Road near the Little Bushey Lane/ Aldenham Road junction throughout the day, with high junction delays observed at the PM peak. The road is operating below capacity near the Bushey Hall Rd/The Avenue/ Aldenham Road junction in both the AM and PM peaks.	Flow decrease is suggested on Aldenham Road with delay increases observed at Little Bushey Lane/ Aldenham Road junction in both the AM and PM peaks.	Flow decrease is modelled Northbound in the AM peak and Southbound in the PM peak along Aldenham Road. Small delay increase is suggested at the Little Bushey Lane/ Aldenham Road junction throughout the day, while higher delay increase is suggested at the Bushey Hall Rd/The Avenue/ Aldenham Road junction in the PM peak.
3D	Bushey Arches junction	High congestion is suggested on the A4008 throughout the day, while congestion on the A411 eastbound is high in the PM peak. Moderate delays are suggested at the junction throughout the day.	No significant change in flows is suggested in the AM peak, while flow increase is modelled on the A4125 and on the A411 eastbound. Minimal increase in junction delay is also observed.	Insignificant flow change is modelled on the A4008, while flow decrease is suggested on the A4125 and flow increase on the A411, especially in the AM peak. Small delay increase is suggested at the junction.
3E	Junction of Elstree Road/Sparrows Herne	Moderate to high congestion is suggested on Elstree Road, while Sparrows Herne operates well below capacity. No noticeable junction delays are observed in the AM and PM peaks.	Flow reduction is suggested on both Elstree Road and Sparrows Herne in the AM and PM peaks. No significant change for junction delays is observed.	Flow reduction is modelled on Sparrows Herne and Elstree Road westbound, while flow increase is modelled on Elstree Road eastbound. No significant change for junction delays is observed.
3F	Heathbourne Road/Elstree Road junction	Heathbourne Road operates below congestion, while moderate to high congestion is suggested on Elstree Road. Small delays are suggested at Heathbourne Road/Elstree Road junction.	Flow reduction is suggested on Elstree Road, while flow increase is modelled on Heathbourne Road in both the AM and PM peaks. Small delay increase is observed in both the AM and PM peaks.	Flow reduction is modelled on Elstree Road westbound, while flow increase is modelled on Elstree Road eastbound throughout the day. Flow increase is modelled on Heathbourne Road in the AM peak and flow decrease in the PM peak. Larger delay increases are observed in the AM peak, while in the PM peak large delay increases are observed on other junctions along Elstree Road.

ID	Junction Name	Traffic Conditions in Scenario 2	Comparison to Scenario 1	Comparison to 2014 Base Year
3G	A4140 (from junction with A411) via A411 to junction of A411 and A409 (Heathbourne Road)	High congestion is modelled on the A4140, while moderate to high congestion is suggested on the A409, especially in the PM. Small delays are observed at the junction in the Am peak, while traffic suffers long delays in the PM peak.	Flow increase is modelled on Heathbourne Road and along A409. Flow increase on the A4140 is suggested on The Common arm of the junction, while flow decrease is suggested for the High Road arm of the junction. Small delay increase is observed in the PM peak.	Flow increase is modelled on Heathbourne Road (along the A409) in the AM peak and flow decrease in the PM peak. Flow increase on the A4140 is suggested on The Common arm of the junction, while flow decrease is suggested for the High Road arm of the junction in both the AM and PM peaks. Increased junction delays are observed, which become longer in the PM peak.
4A	B556 Mutton Lane from its junction with Baker Street to its junction with the High Street A1000	B556 between Baker Street and High Street A1000 operates well below capacity, with very small delays observed at its junctions in the AM and PM peaks.	Increased flows are modelled for B556 westbound, while no significant change in flows is suggested on the eastbound in both the AM and PM peaks. Small increase in delays is suggested for the B556 Mutton Lane/ High Street A1000 junction in the PM peak.	Increased flows are suggested along the B556 in both the AM and PM peaks with small delay increase at the B556 Mutton Lane/ High Street A1000 junction in the PM peak.
4B	M25 Junction 24 at Potters Bar to B556 Mutton Lane junction with High St A1000	The road is operating below capacity with small delays at junctions on either end of it.	Flow increase is suggested for the Northbound stream of Southgate Road in the AM peak, while no significant flow changes are observed for the Southbound stream in the AM peak and both streams in the PM peak. Small delay increase is observed at the Southgate Road/A1000 junction.	Flow increase is modelled along Southgate Road in the AM and PM peaks. Small delay increase is observed at the Southgate Road/A1000 junction.
4C	B556 from its junction with Swanland Road to junction with Baker Street	B556 at the route of question is operating well below capacity in the AM and PM peaks. Moderate congestion is observed for the Southbound and high congestion is observed for the Northbound stream of Warrengate Lane. No junction delays are suggested. Congestion around these roads could also be linked to the Bowmans Cross development. There are some roads	Flow increase is modelled along the B556 in the AM peak, while only westbound in the PM peak. No increase in junction delays are suggested.	Significant flow increases are suggested on B556 and Warrengate Lane in the AM and PM peaks. No increase in junction delays are suggested.

ID	Junction Name	Traffic Conditions in Scenario 2	Comparison to Scenario 1	Comparison to 2014 Base Year
		approaching capacity and delays are observed on local roads around the Bowmans Cross development. Development traffic will be utilising this route to travel to/from M25 Junction 23 and Potters Bar. (please refer to the journey time graphical analysis for more information)		
4D	Darkes Lane to A1000 via The Walk	The Walk operates below capacity at the most part, however high congesting is suggested near the Walk/A1000 junction. Small delays are observed at the Darkes Lane/The Walk junction.	Insignificant flow changes are suggested along The Walk and small delay increase is observed at Darkes Lane/The Walk junction in both the AM and PM peaks.	Flow decrease is modelled westbound and flow increase on the eastbound stream on The Walk. Small delay increase is observed at Darkes Lane/The Walk junction in both the AM and PM peaks.
4E	Darkes Lane (from junction with Mutton Lane) to A1000 via Church Road	Darkes Lane operates below capacity. High congestion is observed at the Church Road/A1000 junction where traffic is subject to small delays in the AM and PM peaks.	Insignificant flow and delay changes are suggested on Darkes Lane and at the Church Road/A1000 junction in the AM and PM peaks.	Flow decrease is suggested on Darkes Lane in the AM peak, with insignificant flow changes in the PM peak. Flow increase is observed eastbound on Church Road in the AM peak, while flow increases are modelled on Church Road throughout. Small delay increase is suggested at the Church Road/A1000 junction in the AM and PM peaks.
4F	A111(from junction with M25 J24) to Junction of A111 and Church Road	The road along this route operates below capacity in both the AM and PM peaks. Junction delays are observed at the A111/A1000 and A1000/Church Road junctions in both the AM and the PM peaks.	Insignificant flow changes are suggested Southbound, while small flow increases are suggested Northbound on the A111 and A1000 in the AM and PM peaks. Small delay increase is suggested at the A111/A1000 junction in the PM peak.	Flow increase is modelled along the entire route in the Am peak. Minimal flow decrease is suggested eastbound on the A11, while flow increase is suggested on the A1000 in the PM peak. Small delay increases are observed at the A111/Junction24, A111/A1000, A1000/The Walk, A1000/The Causeway and A1000/Church Road junctions in the PM peak.

ID	Junction Name	Traffic Conditions in Scenario 2	Comparison to Scenario 1	Comparison to 2014 Base Year
5A	London Road/Green Street junction	London Road and Green Street are operating below capacity in both the AM and PM peaks with no notable delays at this junction.	No significant flow changes on London Road in the AM peak and on Green Street throughout the day. Increased flows are suggested on London Road Northbound south of the London Road/ Radlett Lane junction and Southbound north of the London Road/ Radlett Lane junction. No significant delay changes are observed.	Flow increase is modelled on London Road and Green Street in both the AM and PM peaks. No significant delay changes are observed.
5B	Watling St/Theobald Street junction	Theobald Street is operating below capacity and Watling St presents high congestion between the Watling St/Theobald Street and Watling St/Park Road junctions. No notable delays are observed at this junction.	Small flow decrease in the AM peak and no significant flow differences in the PM peak are suggested on Watling St approaching the junction. Flow increase is modelled on Theobald Street for the Northbound stream, with small decrease suggested for the Southbound stream throughout the day. No significant delay changes are observed for the junction.	Insignificant or small flow decrease is suggested on Watling St in the AM peak. Flow increase, however, is modelled on Watling St in the PM peak. Flow increase is modelled on Theobald Street for the Northbound stream, and flow decrease is suggested for the Southbound stream throughout the day. No significant delay changes are observed for the junction.
6	South Mimms village to South Mimms services and J23 via St Albans Road	St Albans road operates below capacity, with moderate to high congestion suggested on the access roads to Junction 23 in the AM and PM peaks. Congestion around these roads could possibly be linked to the Bowmans Cross development. Capacity issues and minimal delays are observed on local roads around M25 junction 23. Development traffic will be utilising this route to travel to/from M25 Junction 23 and Potters Bar. (please refer to the journey time graphical analysis for more information) Minimal junction delays are observed on the access roads in the PM peak.	Flow increase is suggested on St Albans Road and on the access roads to Junction 23 in the AM and PM peaks. Small delay increase is suggested for the access roads in the PM peak.	Significant flow increase is suggested on St Albans Road and on the access roads to Junction 23 in the AM and PM peaks. Moderate delay increase is suggested for the access roads in the PM peak.

ID	Junction Name	Traffic Conditions in Scenario 2	Comparison to Scenario 1	Comparison to 2014 Base Year
7	M25 Junction 23	High congestion is suggested on the M25, while moderate congestion is suggested for the A1 at Junction 23 in the AM and PM peaks. Minimal delays are suggested for all access roads to the south of the junction. Congestion on the M25 and at this junction could possibly be linked to the Bowmans Cross development. The trip dispersion analysis indicates traffic travelling to and from the development utilises this development.	Flow differences are suggested on the M25, while significant flow increase is suggested on the A1 at Junction 23 in the AM and PM peaks. Increase in delays are observed for the Northbound stream on the A1, accessing the M25, and for the Southbound stream on the M25, access the A1.	Significant flow increase is suggested at the junction in the AM and PM peaks. Small to moderate delay increases are observed at most junctions between access roads and the A1 and M25 throughout the day.

7. Journey Time Analysis

7.1 Analysis of journey times between key urban areas in Hertsmere District and other urban areas in the wider area was undertaken for Scenario 2 and are detailed in this section. Journey times were averaged across all possible routes that traffic may use to travel between town centres. The analysis focused on the following urban areas[21]:

- Potters Bar;
- Shenley;
- Radlett,
- Borehamwood;
- Elstree;
- Edgware;
- Mill Hill;
- Bushey Heath;
- Stanmore;
- Watford;
- Hatfield;
- High Barnet and
- Bushey.

7.2 It is important to recognise that, as some of these areas are located outside of Hertfordshire, the network and zoning[22] coverage may be more course and hence journey time analysis less accurate. Journey time differences presented in this report are a result of congestion, delays, re-routeing between scenarios, developments and infrastructure schemes in the local area.

7.3 Comparisons between Scenario 2 and the 2014 Base Year (BY) scenario, as well as between Scenarios 1 and 2 for the AM, IP and PM time periods, are presented in Figure 7-1 to Figure 7-6. Where possible, comparisons with flow differences and junction delays between scenarios are mentioned, as discussed in Section 6 of this report.

7.4 Colour formatting is used in each figure to indicate largest and shortest journey times. Therefore, journeys of same duration might be represented by a different colour due to that fact that the highest and lowest values in each table differ.

7.5 Overall, intra-urban average journey times in the AM and PM peaks in Scenario 2 are similar, with local increases in journey times in the PM peak, when compared to the Base Year scenario and Scenario 1.

7.6 Areas in the south of Hertsmere experience the smallest journey time differences, while areas to the north of the district experience some of the largest journey times differences when Scenario 2 is compared to the Base Year scenario (Figure 7-1 to Figure 7-3). This agrees with the increased flows and junction delays observed in Figure 6-5 and Figure 6-6. The exception is Bushey and Watford which experience some of the greatest changes in journey times due to the significant congestion and delays observed in this area in Scenario 2.

7.7 Average journey time increases by 6 minutes in the AM peak, by 2 minutes in the IP period and by 9 minutes in the PM peak when Scenario 2 is compared to the Base Year scenario. This is to be expected as trip patterns tend to vary in the PM peak as people don't always return home in

[21] Confirmed with Hertsmere Borough Council via email August 12th 2020
[22] Zones represent areas in the COMET model from which trips travel to/from

the same way (e.g. stop to do shopping, go to the gym etc). In the morning peak most trips are time constrained as schools/offices/shops open at consistent times.

7.8 The largest average journey time change in the AM peak between 2014 and 2036 is suggested for Radlett due to the high congestion in the network, the increased flows on the M25 and Watling Street and junction delays at Watford Road/Watling Street (discussed in Section 6).

7.9 The largest average journey time change in the PM peak is suggested for Watford, due to the high congestion and junction delays suggested on the M1 and on smaller local roads. Similarly, traffic in the areas of Bushey and Bushey Heath is also experiencing relatively long journey time increases as local routes in these areas are operating at capacity. High junction delays of above 5 minutes are suggested for Stanmore in the PM peak and this is reflected in the journey time increase observed between 2014 and 2036.

7.10 Journey time reductions are suggested for traffic travelling from Stanmore especially to areas south-west of Hertsmere in the IP period. This is due to the moderate junction delays and reduced flows observed in the network around Stanmore.

7.11 Observing journey time changes between Scenarios 1 and 2 (Figure 7-4 to Figure 7-6), average journey time is expected to increase by 1 min in the AM peak and by 2 min in the PM peak, while overall IP period journey times are suggested to be unchanged. This compliments the analysis presented in Section 6.

7.12 The largest journey time increase in the AM peak is suggested for Radlett, which is expected as high congestion and junction delays are modelled especially at the Watford Road/Watling Street and Park Road/ Watling Street junctions. The shortest journey time in the AM peak is suggested for Stanmore, as the routes leading to it generally operate below capacity (Figure 6-3).

7.13 Large increases in journey times are suggested for Watford in the PM peak, as flow increases are modelled on the A41 and on smaller local roads in the area and moderate increases in junction delays are indicated (Figure 6-4). There are also delays around Watford town centre. Journey time reductions are suggested for Bushey Heath which highlights the critical nature of the network in this area. Given the proximity of Watford and Bushey these results highlight the congested nature of the network in this area and suggest further studies in this area would reveal the full local impacts.

7.14 Average journey time changes for Stanmore is reduced, mainly in the AM peak. Journey time reductions are also suggested for other areas south-west of Hertsmere in the PM period due to the significant flow decrease on the M1 and other local roads leading to towns in this area (Figure 6-4). Flow reduction on the M1 may be linked to junction delays further north in Watford and may also link to strategic routeing in COMET, i.e. traffic flipping between M1 and M40 for longer strategic north-south journeys.

7.15 Journey time reductions are modelled for trips to/from Stanmore in the interpeak period, as the road network is operating well below capacity and traffic is not experiencing congestion or delays at junctions.

7.16 To summarise, longer journey times are expected for trips to/from Radlett in the AM peak and to/from Watford in the PM peak, while journey times for routes through Stanmore are suggested to be shorter, especially in the IP period. This is suggested when comparing Scenario 2 to both the Base Year scenario and Scenario 1. The caveats listed in Section 2 and base year performance in Section 3 should be considered when viewing these results.

	2036 LPR5 - BY AM (min) Town	Potters Bar	Shenley	Radlett	Borehamwood	Elstree	Edgware	Mill Hill	Bushey Heath	Stanmore	Watford	Hatfield	High Barnet	Bushey
LPR5 vs BY	Potters Bar	0	1	1	3	8	8	9	9	8	8	5	2	7
	Shenley	4	0	4	0	5	7	8	6	6	11	6	4	6
	Radlett	2	4	0	7	15	16	15	13	15	17	4	3	13
	Borehamwood	6	0	5	0	5	7	8	6	6	11	6	7	6
	Elstree	6	5	9	5	0	2	3	1	1	6	5	4	2
	Edgware	5	2	8	2	0	0	2	2	0	6	4	1	2
	Mill Hill	6	3	6	3	2	3	0	3	2	8	5	3	3
	Bushey Heath	12	6	10	6	4	7	7	0	3	6	11	8	1
	Stanmore	13	8	12	8	7	8	10	5	0	10	12	9	5
	Watford	10	12	10	10	8	6	8	6	6	0	11	7	3
	Hatfield	7	6	7	6	11	10	11	12	10	14	0	7	13
	High Barnet	4	5	4	3	6	4	5	6	4	9	6	0	6
	Bushey	13	9	12	7	5	8	8	2	6	5	12	9	0

Figure 7-1: AM Journey Times Differences between Scenario 2 and the 2014 Base Year scenario

	2036 LPR5 - BY IP (min) Town	Potters Bar	Shenley	Radlett	Borehamwood	Elstree	Edgware	Mill Hill	Bushey Heath	Stanmore	Watford	Hatfield	High Barnet	Bushey
LPR5 vs BY	Potters Bar	0	0	1	2	4	3	5	5	4	3	1	2	4
	Shenley	1	0	0	0	0	1	4	1	1	2	1	1	1
	Radlett	1	2	0	2	2	2	4	3	2	4	1	1	3
	Borehamwood	2	0	0	0	0	1	3	1	1	2	1	1	1
	Elstree	4	3	3	3	0	1	2	1	1	2	4	3	1
	Edgware	5	3	3	3	0	0	2	0	1	2	4	3	1
	Mill Hill	6	4	5	4	2	2	0	2	2	4	6	4	2
	Bushey Heath	6	3	3	3	0	1	2	0	0	2	5	4	0
	Stanmore	1	-1	-1	-1	-4	-4	-2	-4	0	-4	0	-1	-5
	Watford	6	7	7	4	2	1	3	2	1	0	5	4	1
	Hatfield	1	1	3	1	4	3	5	4	4	4	0	1	4
	High Barnet	1	1	1	0	2	1	2	2	1	3	2	0	2
	Bushey	6	6	6	3	1	1	3	0	0	1	5	4	0

Figure 7-2: IP Journey Times Differences between Scenario 2 and the 2014 Base Year scenario

	2036 LPR5 - BY PM (min) Town	Potters Bar	Shenley	Radlett	Borehamwood	Elstree	Edgware	Mill Hill	Bushey Heath	Stanmore	Watford	Hatfield	High Barnet	Bushey
LPR5 vs BY	Potters Bar	0	3	3	5	6	6	8	9	6	10	4	4	8
	Shenley	3	0	1	0	1	3	3	3	1	10	5	3	4
	Radlett	1	4	0	4	5	6	7	8	5	10	3	2	8
	Borehamwood	4	1	1	0	1	3	4	4	1	13	5	5	3
	Elstree	11	7	8	7	0	2	3	3	1	12	9	7	2
	Edgware	10	6	8	6	0	0	2	3	0	14	9	5	2
	Mill Hill	12	7	9	7	2	2	0	5	2	16	11	7	4
	Bushey Heath	23	18	19	18	11	13	14	0	4	16	22	18	2
	Stanmore	19	15	17	15	9	9	11	6	0	11	18	14	6
	Watford	34	36	36	31	26	25	27	21	23	0	31	30	16
	Hatfield	5	5	6	6	7	7	8	9	7	13	0	5	13
	High Barnet	3	4	4	3	2	3	4	5	3	10	6	0	5
	Bushey	25	20	22	20	13	15	16	5	7	14	24	20	0

Figure 7-3: PM Journey Times Differences between the Scenario 2 and the 2014 Base Year scenario

	2036 LPR5 - RC AM (min) Town	Potters Bar	Shenley	Radlett	Borehamwood	Elstree	Edgware	Mill Hill	Bushey Heath	Stanmore	Watford	Hatfield	High Barnet	Bushey
LPR5 vs RC	Potters Bar	0	0	-2	1	5	4	5	5	4	4	4	2	3
	Shenley	3	0	2	-1	4	6	6	4	4	6	5	4	3
	Radlett	1	2	0	5	12	13	11	10	12	13	2	1	9
	Borehamwood	5	0	3	0	4	6	7	4	4	7	5	6	3
	Elstree	-1	-1	1	-2	0	2	2	0	0	3	-2	-5	0
	Edgware	-8	-3	2	-4	0	0	2	0	0	1	-10	-7	-1
	Mill Hill	-7	-8	-1	-9	1	2	0	1	1	3	-10	-6	0
	Bushey Heath	3	2	5	1	3	5	5	0	2	4	2	0	0
	Stanmore	-16	-13	-10	-14	-10	-9	-8	-12	0	-9	-17	-16	-13
	Watford	4	7	5	3	5	4	6	3	4	0	6	2	2
	Hatfield	4	2	0	2	6	3	4	6	4	5	0	3	5
	High Barnet	4	4	2	1	2	1	2	2	1	3	5	0	2
	Bushey	4	2	5	1	3	5	5	1	4	4	2	0	0

Figure 7-4: AM Journey Times Differences between Scenarios 1 and 2

	2036 LPR5 - RC IP (min) Town	Potters Bar	Shenley	Radlett	Borehamwood	Elstree	Edgware	Mill Hill	Bushey Heath	Stanmore	Watford	Hatfield	High Barnet	Bushey
LPR5 vs RC	Potters Bar	0	0	0	2	4	2	4	4	2	2	1	1	4
	Shenley	1	0	0	0	0	1	2	0	0	1	0	0	0
	Radlett	1	1	0	1	2	2	3	2	2	3	1	0	2
	Borehamwood	2	0	0	0	0	1	2	0	0	1	1	2	0
	Elstree	0	-1	-2	-1	0	0	2	0	0	1	-1	-2	0
	Edgware	-5	-1	0	-1	0	0	1	0	0	1	-6	-5	0
	Mill Hill	-6	-4	1	-5	1	1	0	1	1	2	-7	-4	1
	Bushey Heath	1	0	1	0	0	1	2	0	0	1	0	-1	0
	Stanmore	-15	-11	-10	-11	-10	-10	-8	-11	0	-11	-16	-15	-11
	Watford	1	4	4	1	1	0	2	1	0	0	1	-1	0
	Hatfield	1	0	2	1	3	2	3	4	2	1	0	1	3
	High Barnet	1	0	0	1	1	0	1	1	0	2	1	0	1
	Bushey	2	3	3	0	0	1	2	0	0	0	0	-1	0

Figure 7-5: IP Journey Times Differences between Scenarios 1 and 2

	2036 LPR5 - RC PM (min) Town	Potters Bar	Shenley	Radlett	Borehamwood	Elstree	Edgware	Mill Hill	Bushey Heath	Stanmore	Watford	Hatfield	High Barnet	Bushey
LPR5 vs RC	Potters Bar	0	2	1	4	5	2	4	6	1	8	3	4	7
	Shenley	3	0	0	0	1	2	3	2	0	9	4	3	2
	Radlett	1	4	0	3	4	6	6	6	4	10	1	1	6
	Borehamwood	4	0	0	0	1	2	3	2	0	10	3	5	1
	Elstree	2	-1	-1	-1	0	2	2	1	0	9	0	-4	0
	Edgware	-9	-5	-4	-6	-3	0	2	1	0	9	-10	-9	0
	Mill Hill	-7	-9	-4	-10	-2	1	0	2	1	10	-10	-8	1
	Bushey Heath	-11	-12	-12	-13	-15	-10	-10	0	-14	-4	-13	-16	-16
	Stanmore	-12	-9	-7	-9	-7	-4	-2	-7	0	-5	-14	-13	-7
	Watford	23	26	26	20	22	25	27	19	17	0	20	16	12
	Hatfield	1	1	2	2	3	0	2	4	-1	6	0	2	7
	High Barnet	3	3	1	2	0	-1	2	1	-1	8	4	0	1
	Bushey	9	8	10	8	6	10	11	5	7	11	7	4	0

Figure 7-6: PM Journey Times Differences between Scenarios 1 and 2

Bowmans Cross Journey Time Analysis

7.17 Journey time analysis was also undertaken for the Bowmans Cross (Tyttenhanger Estate) development near M25 junction 22. This analysis was produced from Scenario 2 only as this contains the development. Figure 7-8 presents journey times from and to the following locations and Bowmans Cross estate, the location of which is shown in Figure 7-7:

- Potters Bar Station;
- Borehamwood Station;
- Radlett Station; and
- St Albans Station.

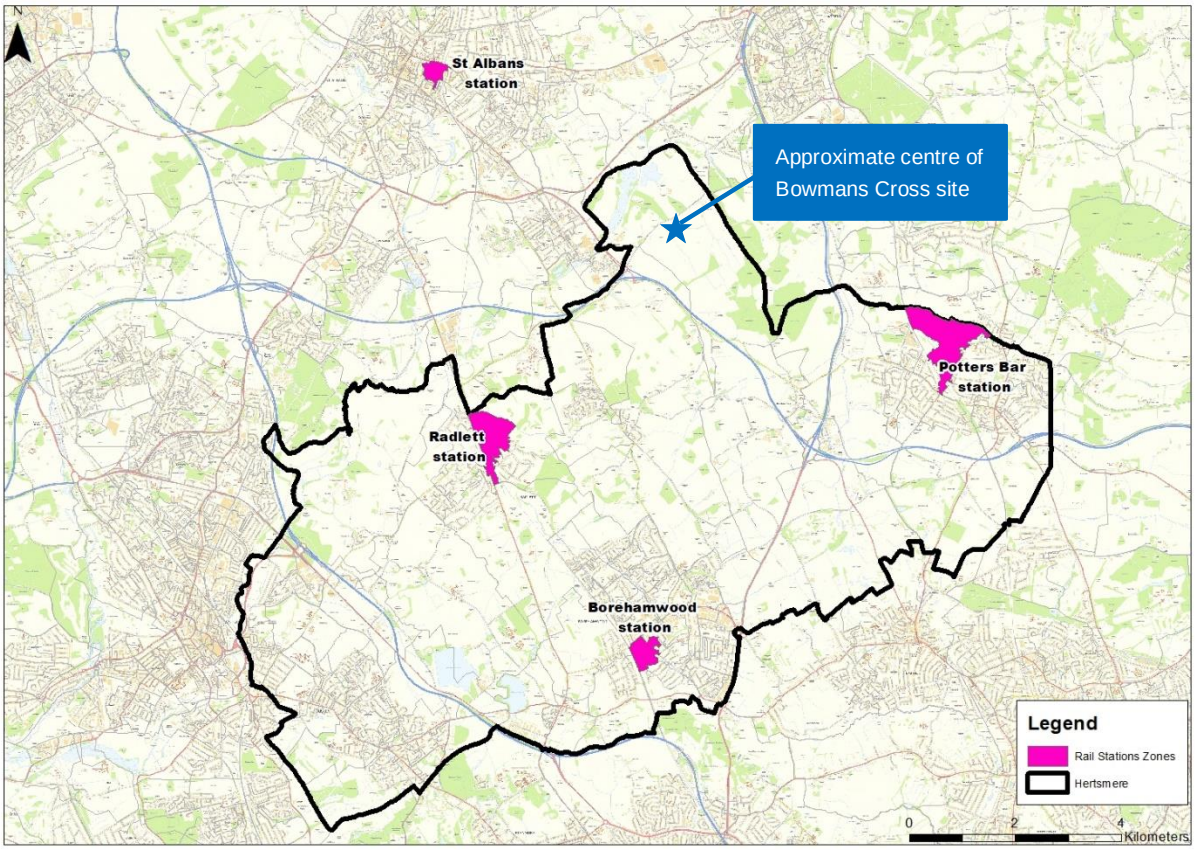

Figure 7-7: Location of Railway stations and Bowmans Cross Estate

7.18 Shorter journey times are suggested for traffic to travel from and to Bowmans Cross and Potters Bar and Radlett stations compared to other stations. Besides these stations being in proximity of the estate, the traffic network around them is suggested to operate below capacity with no delays being modelled at junctions on the local road network.

7.19 Traffic travelling from and to Bowmans Cross and Borehamwood and St Albans stations would be subject to 6 min longer journey times compared to other stations. This is due to the high congestion modelled on the A1 and the delays modelled at junctions 22 and 23 of the M25. It

should also be considered that the urban centres of Borehamwood and St Albans are larger, and therefore suffer from more delays at individual junctions, than Potters Bar or Radlett.

Stations	AM		IP		PM		Average	
	From	To	From	To	From	To	From	To
Potters Bar Station	8	10	8	9	8	9	8	10
Borehamwood Station	14	17	13	14	14	16	13	16
Radlett Station	8	9	7	8	8	9	8	8
St Albans Station	13	16	12	14	13	15	13	15
Total	42	53	41	45	43	49	42	49

Figure 7-8: Journey times from and to Bowmans Cross Estate

8. Scheme Assessment

8.1 A range of sustainable travel initiatives are proposed as part of the Growth and Transport Plans (GTP) and A414 Corridor Strategy workstreams. Some of these schemes were included in Scenario 2, however many of the smaller or mode shift schemes could not be reflected in the COMET model.

8.2 A list of specific schemes was provided by HBC and is included in Table 8-1. Model coding was examined as to whether these schemes were included in Scenario 2 and an interpretation on their impact on the Hertsmere traffic network is provided. In the case specific schemes were not included in the modelling, commentary regarding possible impacts of these sustainable travel initiatives is provided.

8.3 Suggestions for potential further mitigation options are considered in the analysis presented in this section. Suggestions are made around measures to encourage the use of sustainable transport (beyond those already suggested in the A414 and other strategies mentioned above), as well as traditional highway capacity measures (such as whether traffic calming measures and or pedestrian priority or bus priority works would have sufficient impacts in the promotion of more sustainable modes).

8.4 A qualitative assessment of the impact of possible schemes is undertaken and congestion “hotspots” in Hertsmere are identified. Possible solutions are proposed; however, it should be recognised that these are heavily caveated and do not consider budgetary, land-take or programme constraints.

Table 8-1. Scheme List

Scheme	Coded in Scenario 2?	Congestion Hotspot?	Comments based on Scenario 2 traffic conditions
Link road between A1000 and Baker Street within south of Potters Bar development	No	Yes	A1000 and Baker Street are operating below capacity, however localised congestion is observed on adjacent small roads and junction delays do not exceed 1.5 min. A link road south of Potters Bar development would relieve congestion in the area, however further mitigation measures, such as the banning of turns and making the A1000 a one-way road, and sustainability interventions could help reduce congestion along these roads.
New egresses onto Little Bushey Lane from Compass Park	No	No	Little Bushey Lane is operating well below capacity and no junction delays are suggested. A new access from Compass Park is not expected to create any congestion hotspots up to 2036. Further modelling work will need to be carried out to assess the impact of this link on the network in years beyond 2036.
Enhanced capacity at Heathbourne Road/Elstree Road junction	No	Yes	Junction delays are around 1.5min at most, as Elstree Road is operating at capacity between 80-90%. Heathbourne Road is operating at capacity below 80%. Further capacity enhancements in this area would help minimise the observed junction delays and increase vehicle speed. However, more sustainable measures, such as a bus route, would benefit the network even further.
Potential bus, cycle and pedestrian route from Shenley Road Radlett to Theobald Street Radlett (parallel to Newberries Avenue)	No	No	Shenley Road is operating around 80-90% capacity, especially on the westbound direction, Theobald Street is operating well below capacity. No junction delays are observed. Sustainable measures such as the ones described in this scheme could help minimise the observed congestion. A bus network near these roads will not be stuck in congestion and pedestrian routes along these low congested roads could provide a safe path for those that choose active modes of travelling.
Conversion of Coursers Road into a bus-only route between the proposed new settlement (Bowmans Cross) and the Bell roundabout.	No	No	Coursers Road is operating well below capacity, but congestion on the Bell roundabout is moderate. Delays of up to 2.5min are suggested on the A1081 on-slip road and high congestion is suggested on all on-slip arms of the junction. Traffic conditions in this area suggest that a possible bus-only route could help reduce congestion and junction delays. However, if strategies to reduce car access at the roundabout are not put in place, there is the potential of buses being stuck in traffic and taking longer to complete their journey.
Rowley Lane Gyratory, Borehamwood. New signalised	No	No	Rowley Lane Gyratory is, at most part, operating below capacity. However, moderate congestion and delays of up to 2.5 min are suggested at the junction with Elstree Way. These are fed from Elstree Way to the gyratory.

Scheme	Coded in Scenario 2?	Congestion Hotspot?	Comments based on Scenario 2 traffic conditions
junction and series of controlled crossings and cycling facilities			Signalling and sustainable interventions would help manage the delays observed at Elstree Way/ Rowley Lane junction.
Harper Lane bridge - To include a new pedestrian/cycle path that would allow for two-way traffic across the bridge (recent road works have reduced this down to one way with signalling)	No	No	Harper Lane bridge is operating well below capacity with no junction delays at the most part. Delays of up to 2.5 min are observed at the northernmost end of the road where it connects with Shenleybury Road (B5378). (It should be noted Scenarios 1 and 2 exclude this scheme) Width enhancement interventions to allow for walking and cycling would affect the capacity of the road and would create a congestion hotspots up to 2036.

9. Public Transport Patronage

9.1 Public transport statistics were extracted isolating Hertsmere trip origins and Hertsmere trip destinations for both bus and rail and in each modelled time period (i.e. AM, IP and PM). A table has been produced to provide a comparison between Scenario 2 and the Base Year scenario (Table 9-1).

9.2 Table 9-1 suggests that overall public transport demand will increase 156% between 2014 and 2036, with the highest increase suggested in the IP period (181%). It should also be considered that the COMET public transport assumes unlimited capacity on public transport which would not exist in reality. Similarly, COMET assumes that incomes will rise faster than public transport fares when forecasting. This can result in a switch to rail travel as the cost of making a rail journey is deemed more affordable in the future. This is usually at the expense of bus patronage.

9.3 With regards to the individual networks, higher increase in demand is suggested for the rail network (> 180%), which shows that commuters will prefer to travel by rail than bus. Similar demand increase is suggested for the AM and PM peaks for the rail system (around 180%), while more bus commuters will prefer travelling by bus in the PM peak (126% increase in patronage) rather than in the AM peak (108% increase in patronage).

9.4 Public transport demand change will be the highest in the IP period for both networks, with rail commuters increasing by 235% and bus commuters by 141%. This indicates that some commuters may prefer travelling by public transport in the off-peak hours.

9.5 The schemes considered in Scenario 2 may impact mode shift (i.e. walking and cycling). However, these are not directly included in COMET and their impact is more difficult to extract over a smaller Hertsmere area. As a result, no meaningful analysis on modal shift can be provided to feed into the Local Plan analysis with the current model.

Table 9-1: Public Transport Statistics for Trips in Hertsmere

Mode	Model	AM				IP				PM			
		Origin	Destination	Total	Growth (2014 - 2036)	Origin	Destination	Total	Growth (2014 - 2036)	Origin	Destination	Total	Growth (2014 - 2036)
Rail	BY scenario	1,341	490	1,831		356	362	718		506	1,296	1,802	
	Scenario 2	2,510	873	3,382	185%	932	752	1,684	235%	1,137	2,130	3,267	181%
Bus	BY scenario	575	516	1,091		480	484	964		452	509	961	
	Scenario 2	617	558	1,175	108%	694	667	1,361	141%	559	651	1,211	126%
Total	**BY scenario**	**1,916**	**1,006**	**2,921**		**836**	**847**	**1,683**		**958**	**1,805**	**2,763**	
	Scenario 2	**3,126**	**1,431**	**4,557**	**156%**	**1,626**	**1,419**	**3,045**	**181%**	**1,696**	**2,782**	**4,478**	**162%**

10. Conclusion, Summary & Discussion

Summary

10.1 This report confirmed that COMET v5, which informed Scenarios 1 and 2, included a significant amount of extra base year validation data in terms of traffic counts and journey time routes. Local movements into and out of Hertsmere pass the sensitivity checks and comply with Web TAG criteria, while journey times are validated on local roads and motorway junctions. Overall, the congestion recorded in urban areas is accurately validated in COMET v5.

10.2 Traffic movement to and from key towns in Hertsmere occur through major roads, such the A1, M1, A41 and M25 on either side of the district boundary, as well as specific local roads, such as B556, Watling Street and Park Avenue. This enables the connection between towns within the district, towns within Hertfordshire and areas in neighbouring counties, such as Buckinghamshire and London. Movements linked to the Bowmans Cross travel along the M25, A1, B556, St Albans Road and Radlett Road to reach towns within Hertsmere and outer areas of St Albans.

10.3 Traffic conditions based on the assumptions in Scenario 2 indicate that most local roads operate below capacity, with insignificant junction delays. Congestion increases on local roads near the centre of towns and on major roads at the edge of the district, such as the M1, A41, M25, A1, St Albans Road and Watling Street. Highest junction delays are observed in Radlett, Elstree and Watford. This is the case in both the AM and PM peaks.

10.4 Flow and junction delay differences between Scenarios 1 and 2 are generally less pronounced on the local road network. Nonetheless, Scenario 2 assumes lower flows on the M1 (linked to delays and possible strategic traffic routeing), M25 junction 23, Park Avenue, Watling Street, Watford Road and St Albans Road, while larger flows are assumed on the A1 and M25. This indicates that there are key impacts on the strategic network surrounding Hertsmere in Scenario 2 which also need to be considered when examining impacts on the local road network.

10.5 The interaction of local and strategic traffic on the surrounding M25, A1, M1 and A41 should be carefully considered in future stages of the Local Plan. It is clear that congestion and delays on these roads will impact traffic movements on Hertsmere's road network as users may try to use local roads instead or experience delays travelling to/from junctions with the strategic network bordering Hertsmere.

10.6 Compared to the Base Year scenario, Scenario 2 assumptions suggest increased flows and longer junction delays on most of the network. Flow reductions, with equivalent decrease in junction delays, possibly due to re-routeing, are considered for Watford Road, Theobald Street and Radlett Lane in Radlett, on the A411/Barnet Lane and Furzehill Road in Borehamwood, on Heathbourne Road and Watford Road in Elstree and on Little Bushey Lane in Bushey.

10.7 Journey time analysis revealed that longer journey times are expected for trips through Radlett in the AM peak and through Watford in the PM peak, while journey times for routes through Stanmore are suggested to be reduced, especially in the IP period, compared to other towns in the area. This is suggested when comparing Scenario 2 to both the Base Year scenario and Scenario 1. Overall, intra-urban average journey times in the AM and PM peaks in Scenario 2 are similar, with local increases in journey times in the PM peak, when compared to Scenario 1 and the Base Year scenario. Scenario 2 suggests that longer journey times are expected for trips between Borehamwood and St Albans stations and the Tyttenhanger estate.

10.8 Overall, different traffic conditions are observed between the AM and PM peaks. This is due to the fact trip patterns in the AM peak are more considered, as people tend to go to work and drop their children off to school at a specific time, while trip patterns in the PM peak are more varied, as people leave work at different times and can undertake activities on the way home (e.g. shopping, exercising, etc.).

10.9 Specific schemes for sustainable travel initiatives in Hertsmere were not included in Scenario 2. Further analysis showed that most of these schemes are not planned for congested roads but could help relief congestion in future years. A combination of interventions for congestion reduction and sustainable travel is proposed as the most appropriate way to reduce delays and improve air quality in Hertsmere.

10.10 According to the assumptions in Scenario 2, public transport commuters will prefer to travel by rail than bus with most journeys occurring in the IP time period (discussed in Section 9, with increase of rail and bus patronage at each time period shown in percentages in Table 9-1).

Discussion

10.11 The results from Scenarios 1 and 2 have confirmed that Hertsmere's Local Plan growth does impact the local network. However, vehicles routeing from Buckinghamshire, London and other districts within Hertfordshire also add to Hertsmere's traffic conditions. Whilst delays increase around the town centres in Hertsmere in Scenario 2, these are also seen in Scenario 1 such as the Elstree crossroads and Park Road junction in Radlett as shown by the plots in Appendix B.

10.12 Graphical journey time analysis has indicated that delays and congestion across Hertsmere follow similar patterns between the Base Year and Scenario 1 and 2. This suggests that few new issues are generated by the Local Plan growth proposed; the growth exerts additional pressure on existing congestion hotspots.

10.13 The town distribution plots have also indicated that there are limited interactions between Hertsmere towns and a lot of journeys interact more with the strategic highway network to travel to and from locations in other areas of Hertfordshire/North London or Buckinghamshire. This is to be expected as Hertsmere is not a large employment area and it is expected most trips would leave the area for work and then return in the evening. Therefore, the impacts of growth on the local road network are not as great as in other areas where significant housing growth is planned alongside significant employment growth.

10.14 The interaction of local and strategic traffic on the surrounding M25, A1, M1 and A41 should be carefully considered in future stages of the Local Plan. It is clear that congestion and delays on these roads will impact traffic movements on Hertsmere's road network as users may try to use local roads instead or experience delays travelling to/from junctions with the strategic network bordering Hertsmere.

10.15 It is also observed that the location of the Bowmans Cross (Tyttenhanger) development, the largest in Hertsmere, helps mitigate it's impacts. As a lot of traffic uses the adjacent M25 Junction 22 for movements between the development and Potters Bar, Radlett and St Albans, while using the M25 Junction 23 for an easy access on to the A1, these movements mitigate the impact on the local road network. Congestion on adjacent local roads, such as the A1081, and flow increase on Coursers Road and B556 towards Potters Bar, indicate the need for more detailed modelling which would reveal the development's impact to the local network in greater detail.

10.16 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.

10.17 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 scenario 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.

10.18 Given the significant impact of Covid-19 on potential travel patterns and medium-long term economic development, the scale of Local Plan development and infrastructure delivery should also be reconfirmed. The Department for Transport has recently issued its route map[23] for the

[23] https://www.gov.uk/government/publications/appraisal-and-modelling-strategy-a-route-map-for-updating-tag issued on 23 July 2020

future, which acknowledges that many of the forecasting elements currently used in transport modelling are subject to significant review. Further guidance will be released in February 2021.

10.19 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.

Appendix A : Scenario 2 Traffic Conditions

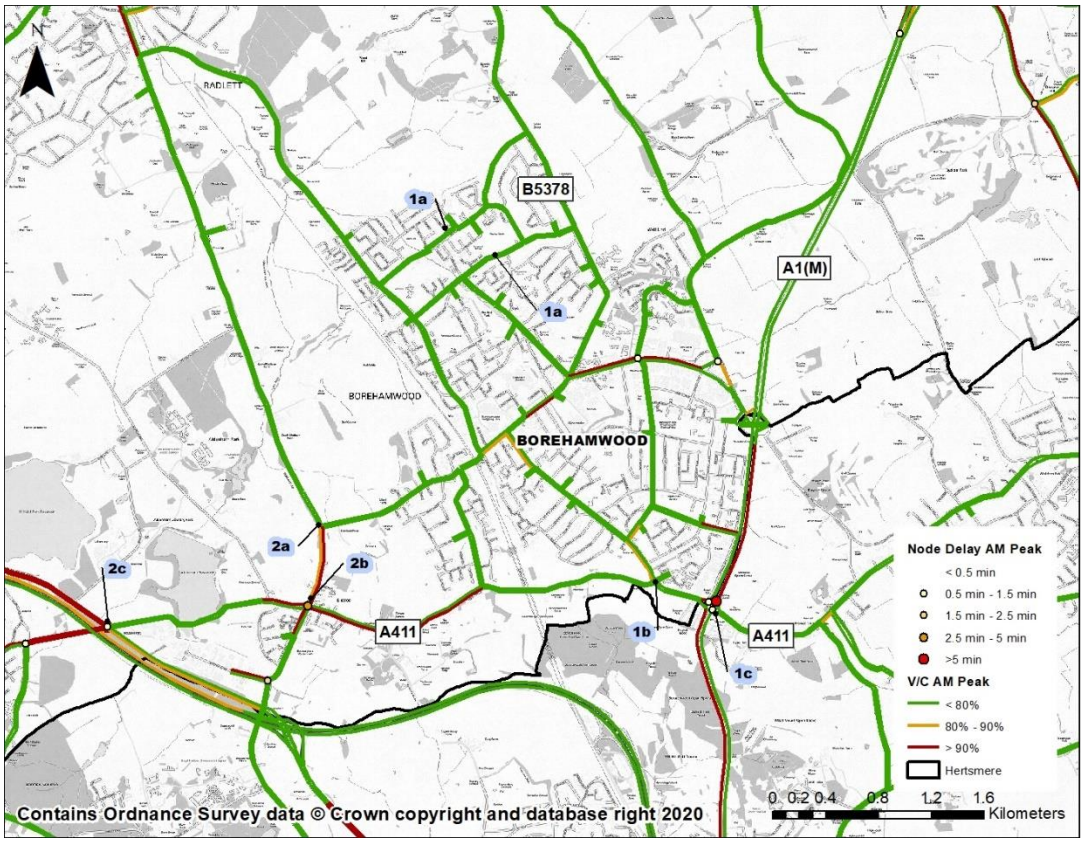

Figure 10-1: Scenario 2Node Delay and Link Stress in Borehamwood - AM Peak

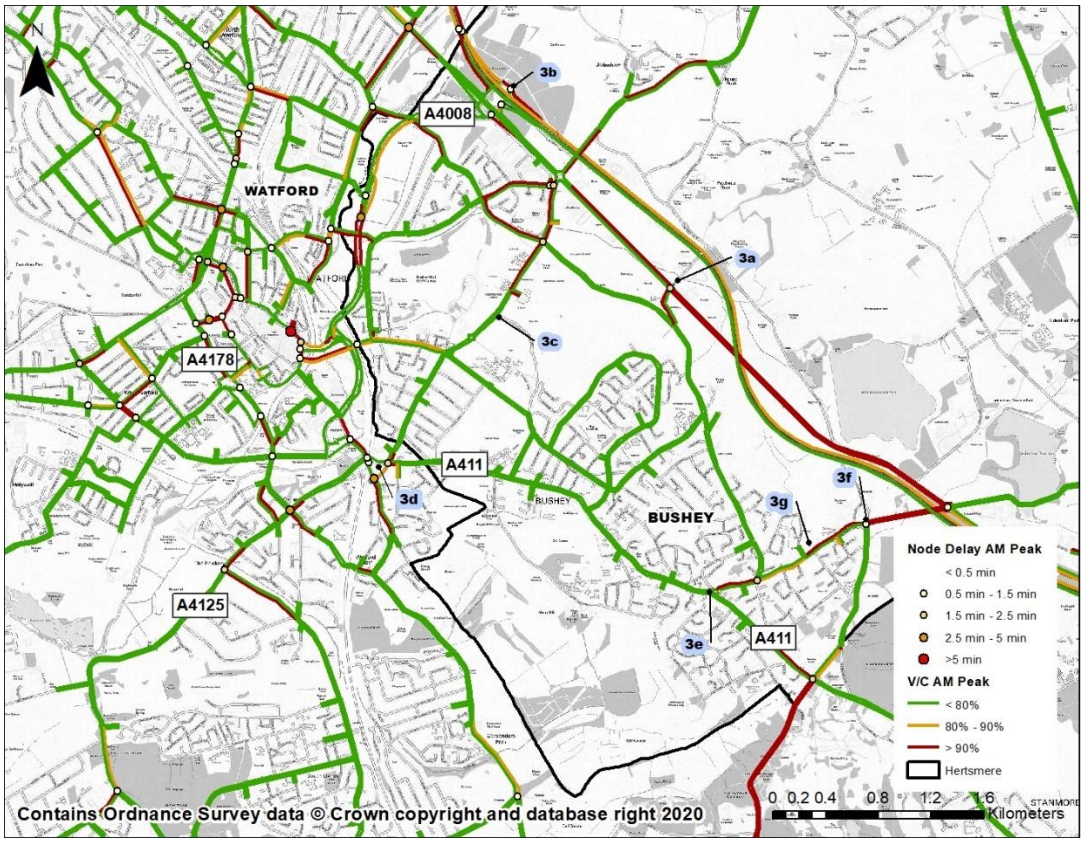

Figure 10-2: Scenario 2 Node Delay and Link Stress in Watford - AM Peak

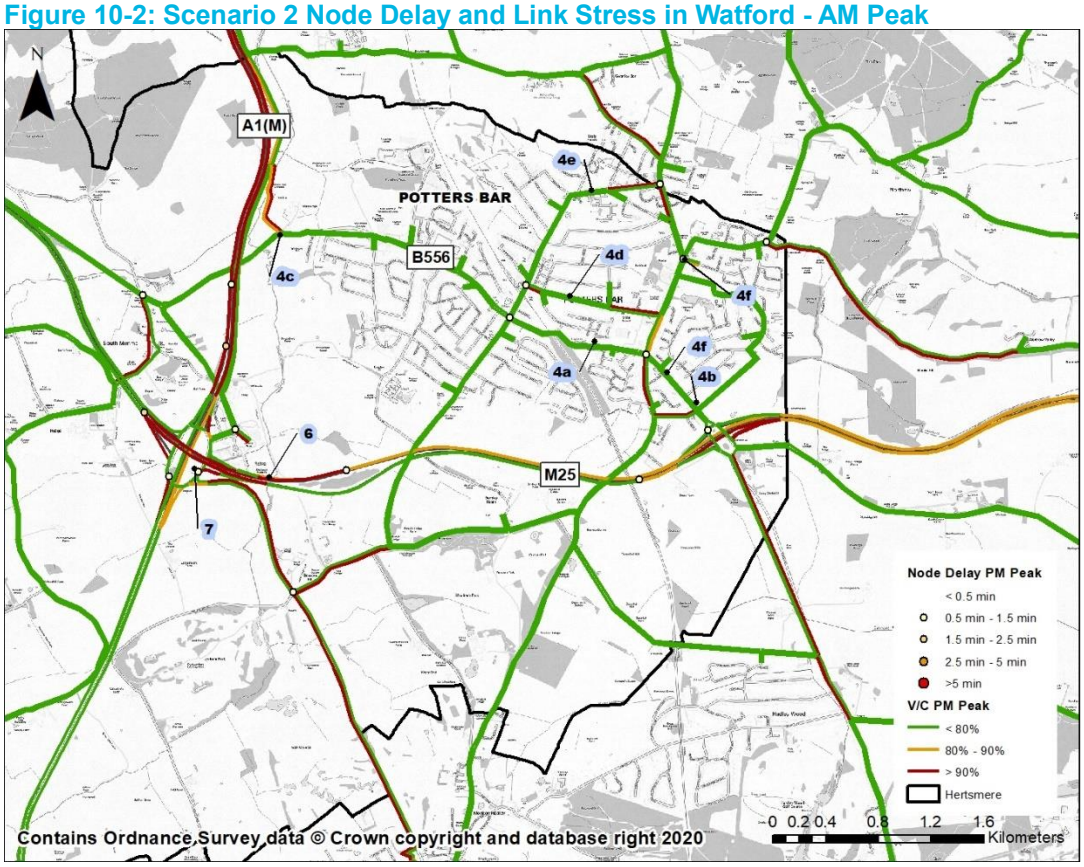

Figure 10-3: Scenario 2 Node Delay and Link Stress in Potters Bar - PM Peak

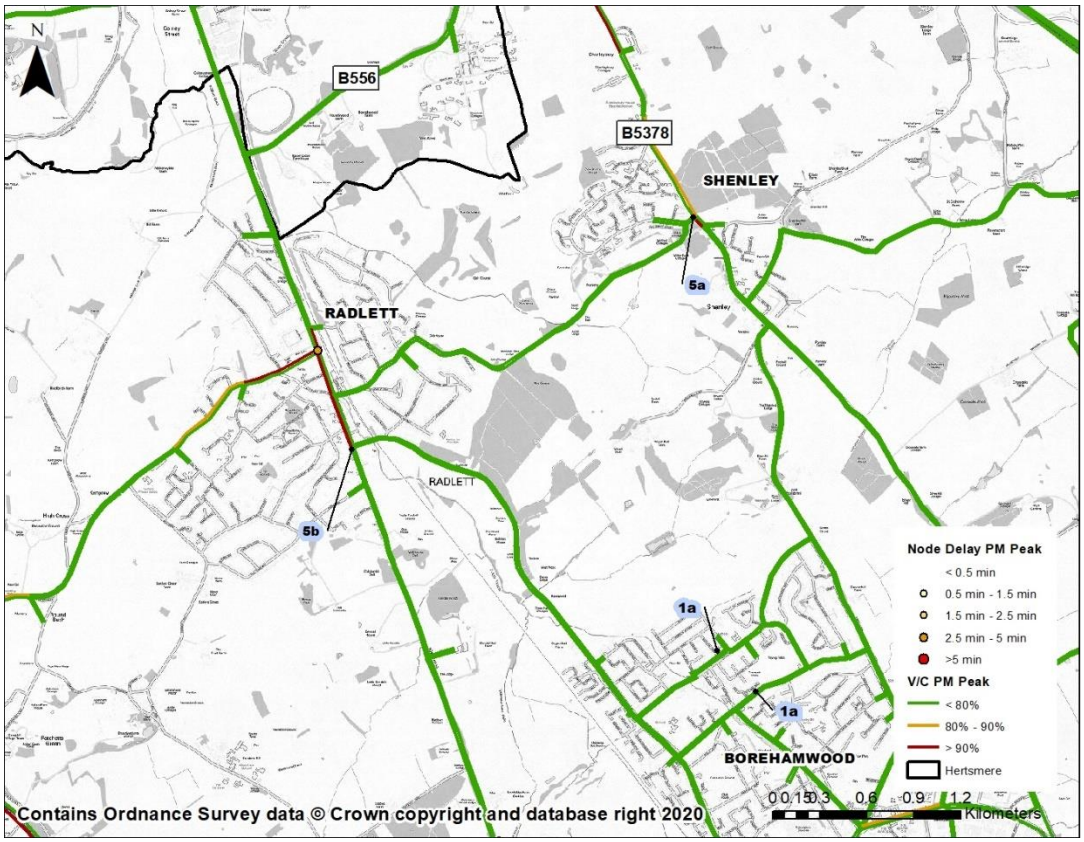

Figure 10-4 Scenario 2 Node Delay and Link Stress in Radlett - PM Peak

Appendix B : Scenario 1 Traffic Conditions

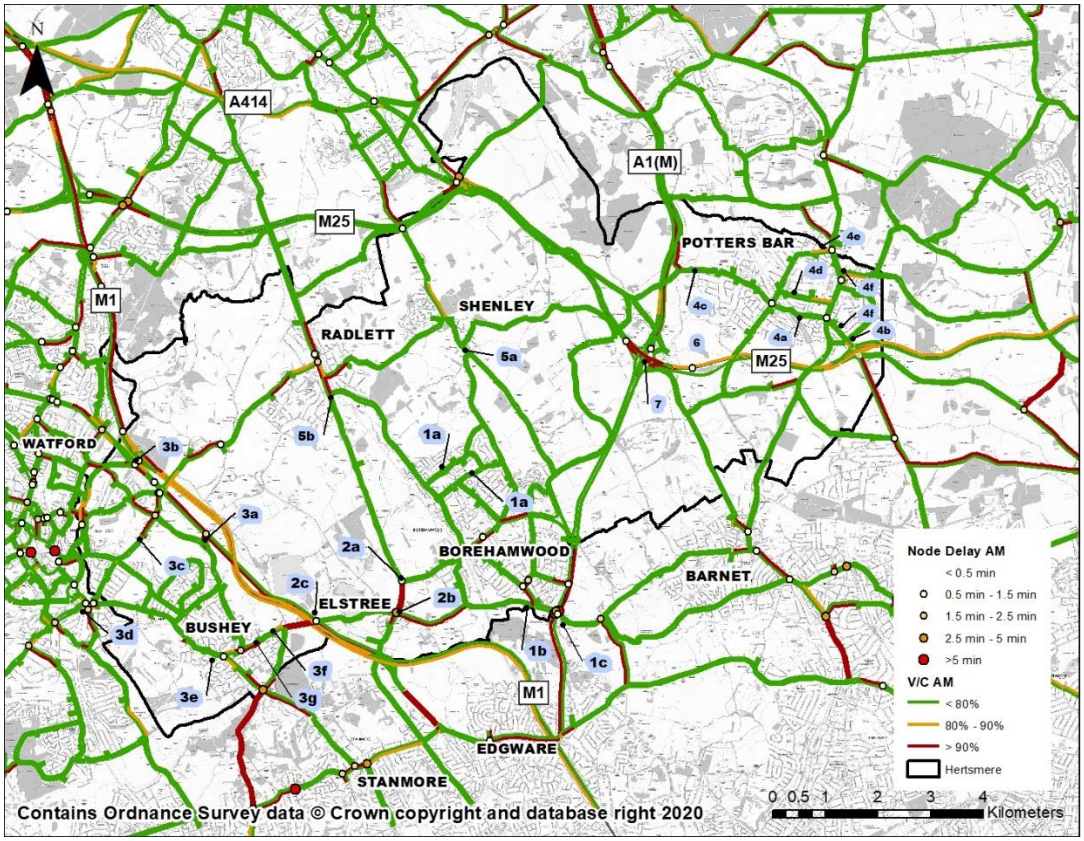

Figure 10-5: Scenario 1 Node Delay and Link Stress in Hertsmere - AM Peak

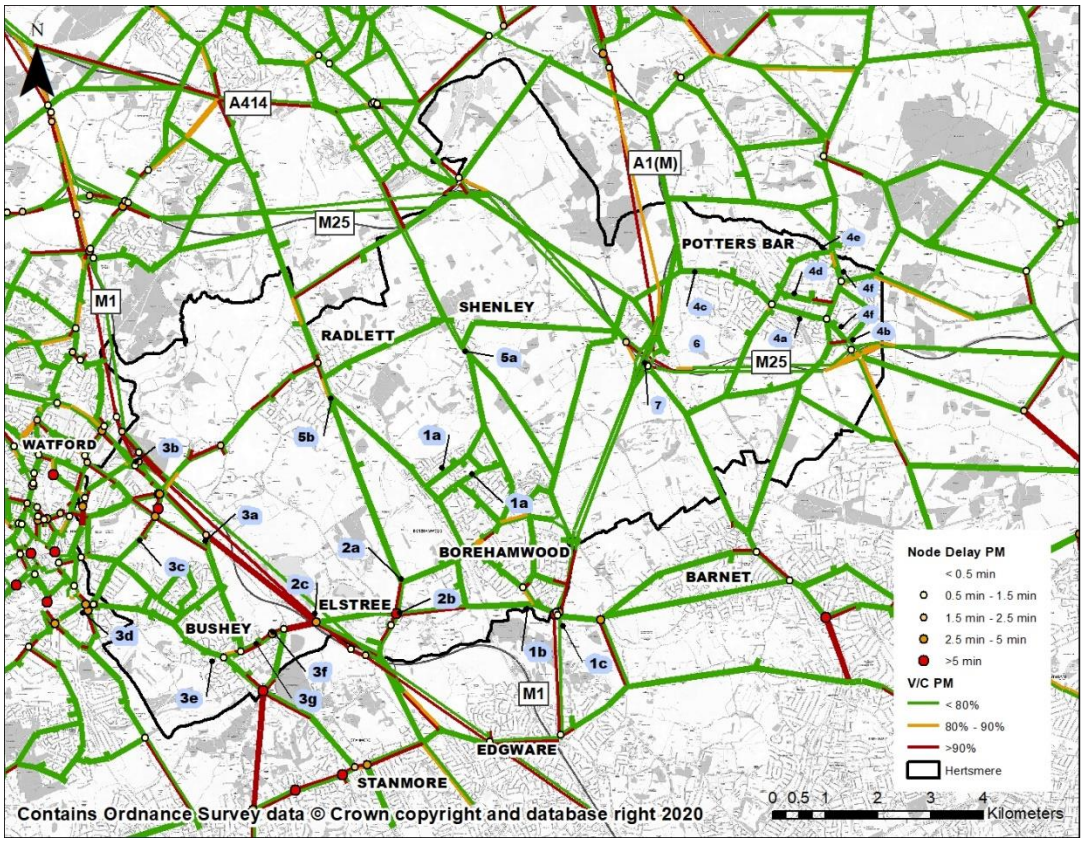

Figure 10-6: Scenario 1 Node Delay and Link Stress in Hertsmere - PM Peak

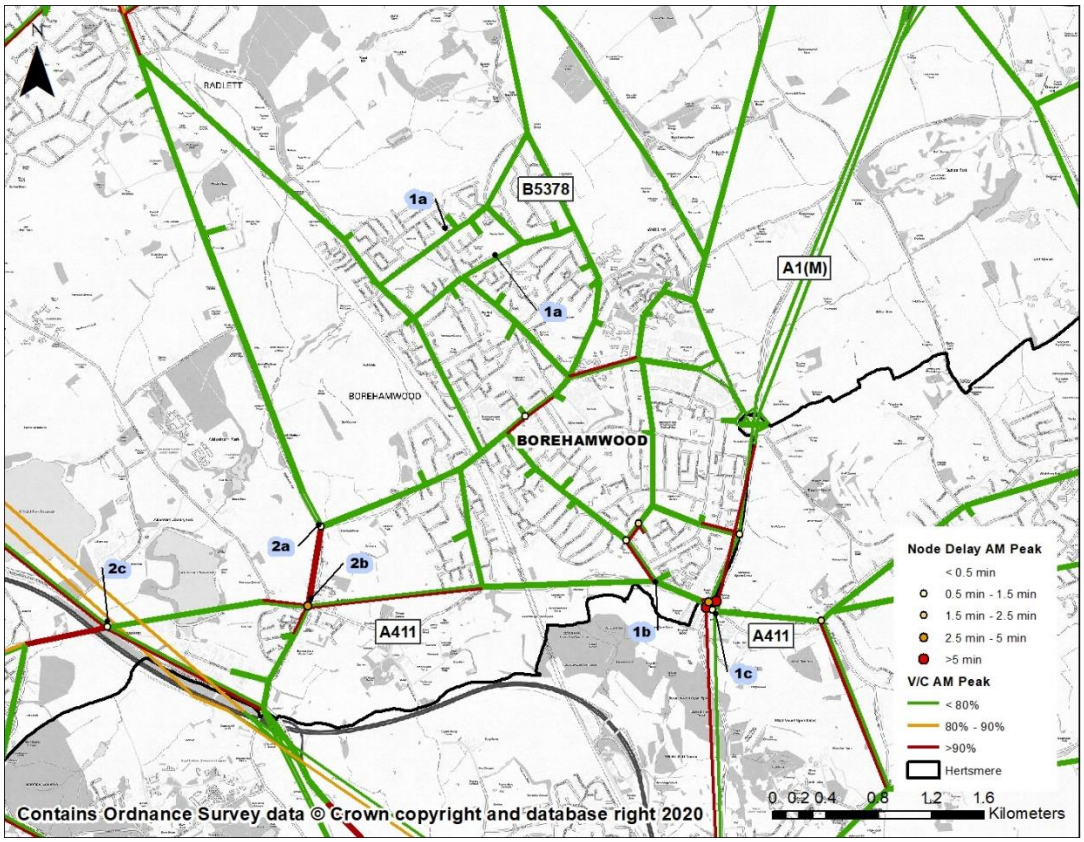

Figure 10-7: Scenario 1 Node Delay and Link Stress in Borehamwood - AM Peak

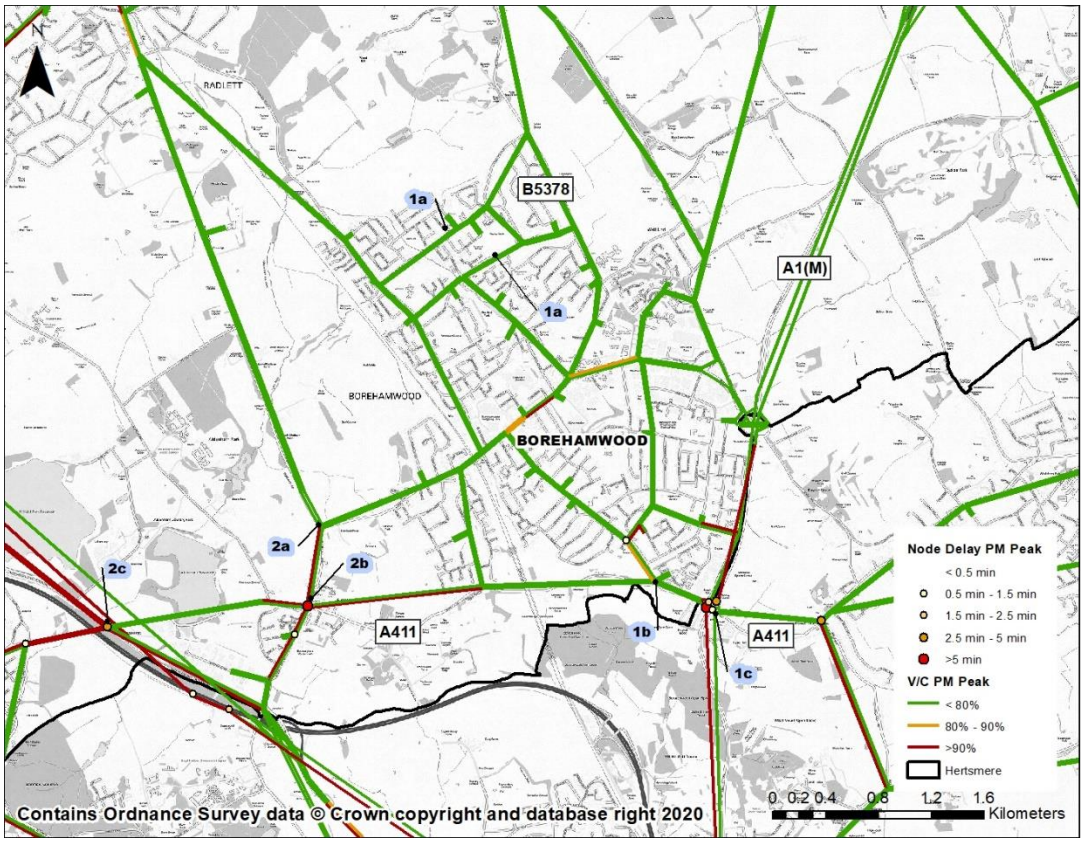

Figure 10-8: Scenario 1 Node Delay and Link Stress in Borehamwood - PM Peak

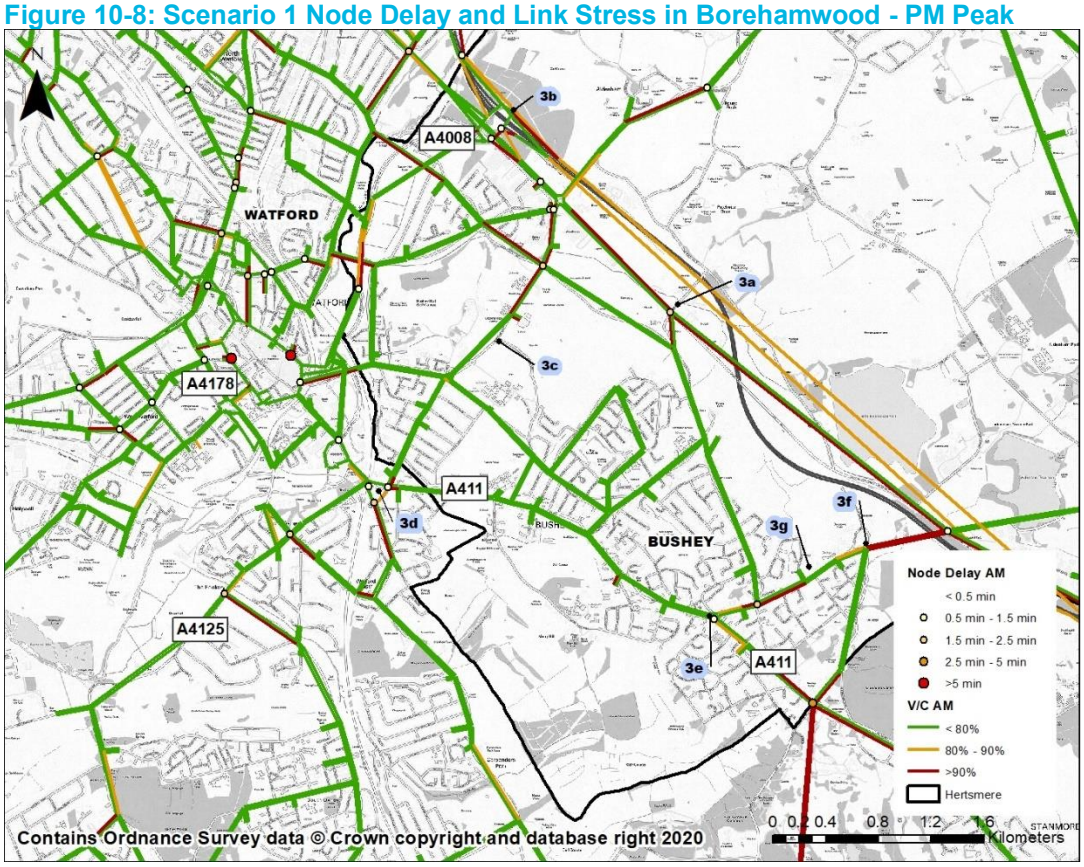

Figure 10-9: Scenario 1 Node Delay and Link Stress in Watford - AM Peak

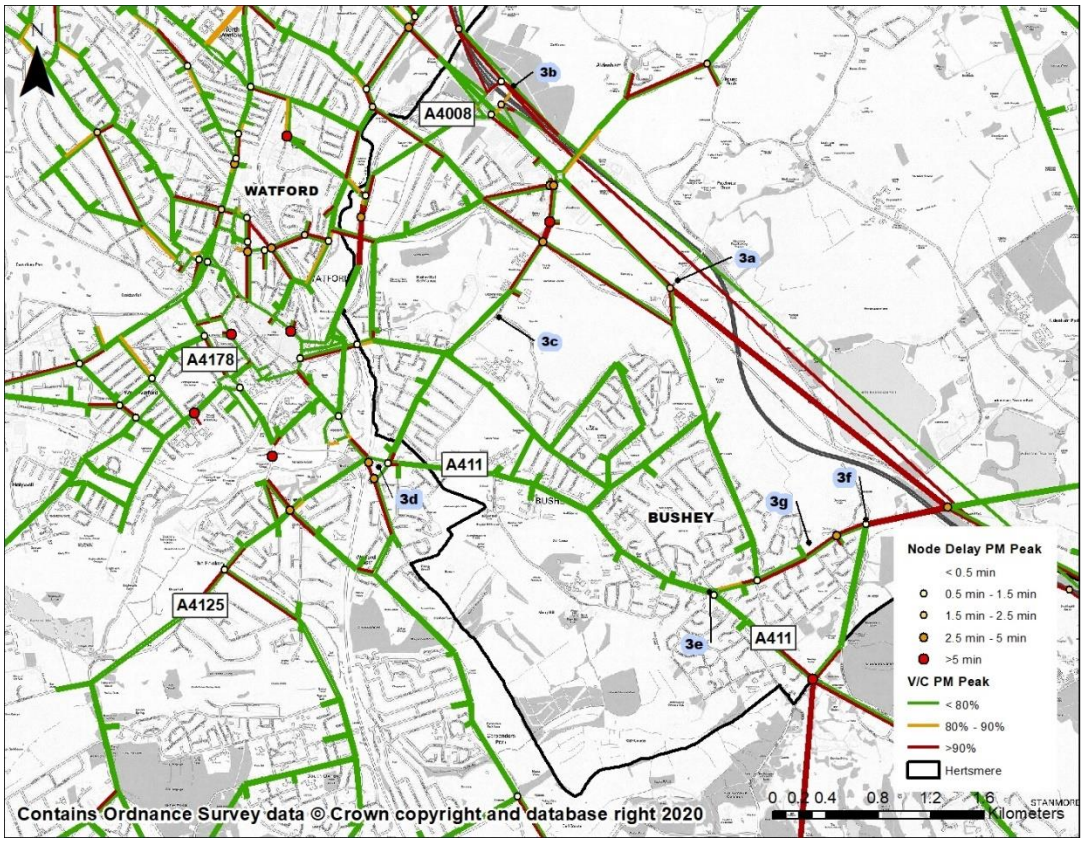

Figure 10-10: Scenario 1 Node Delay and Link Stress in Watford - PM Peak

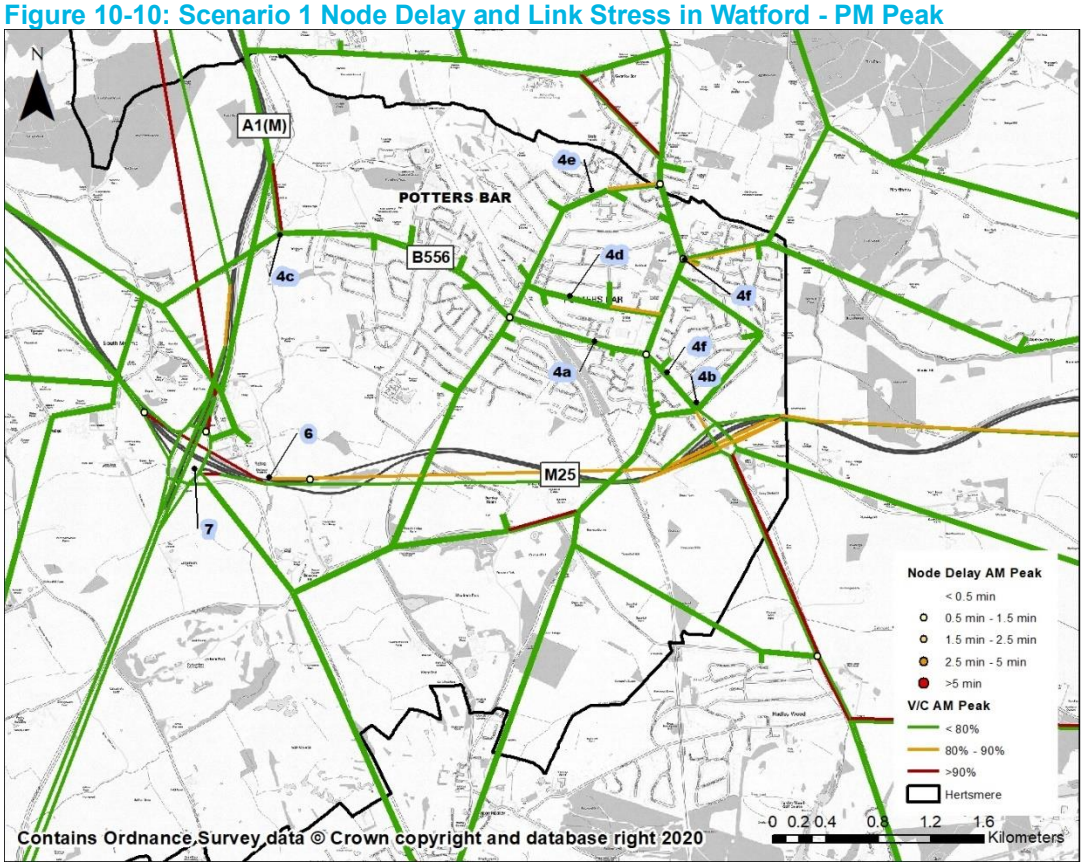

Figure 10-11: Scenario 1 Node Delay and Link Stress in Potters Bar - AM Peak

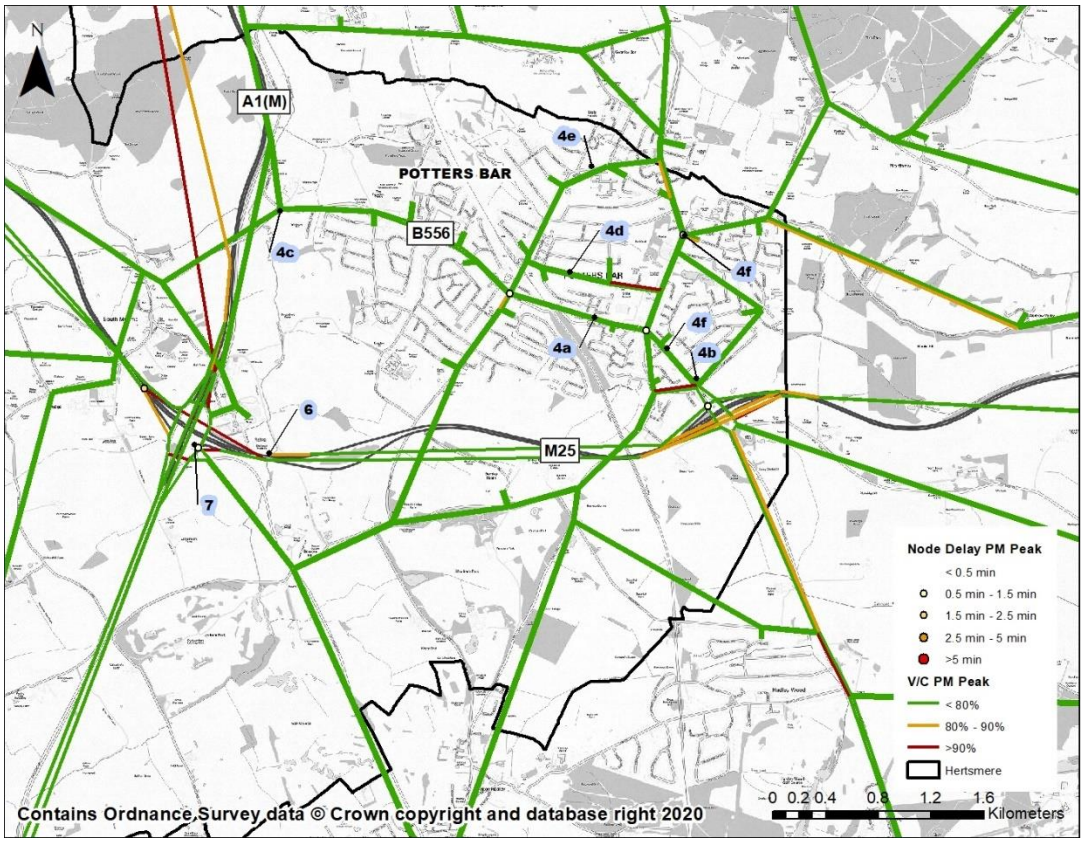

Figure 10-12: Scenario 1 Node Delay and Link Stress in Potters Bar - PM Peak

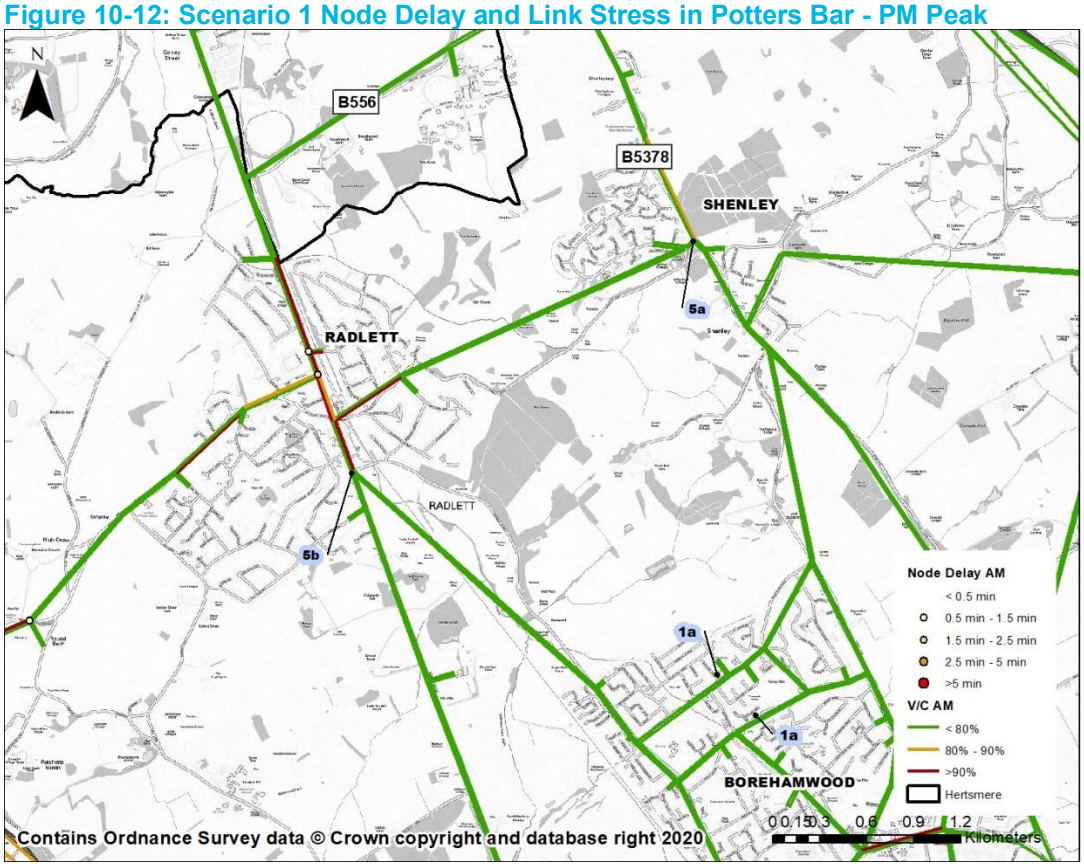

Figure 10-13: Scenario 1 Node Delay and Link Stress in Radlett - AM Peak

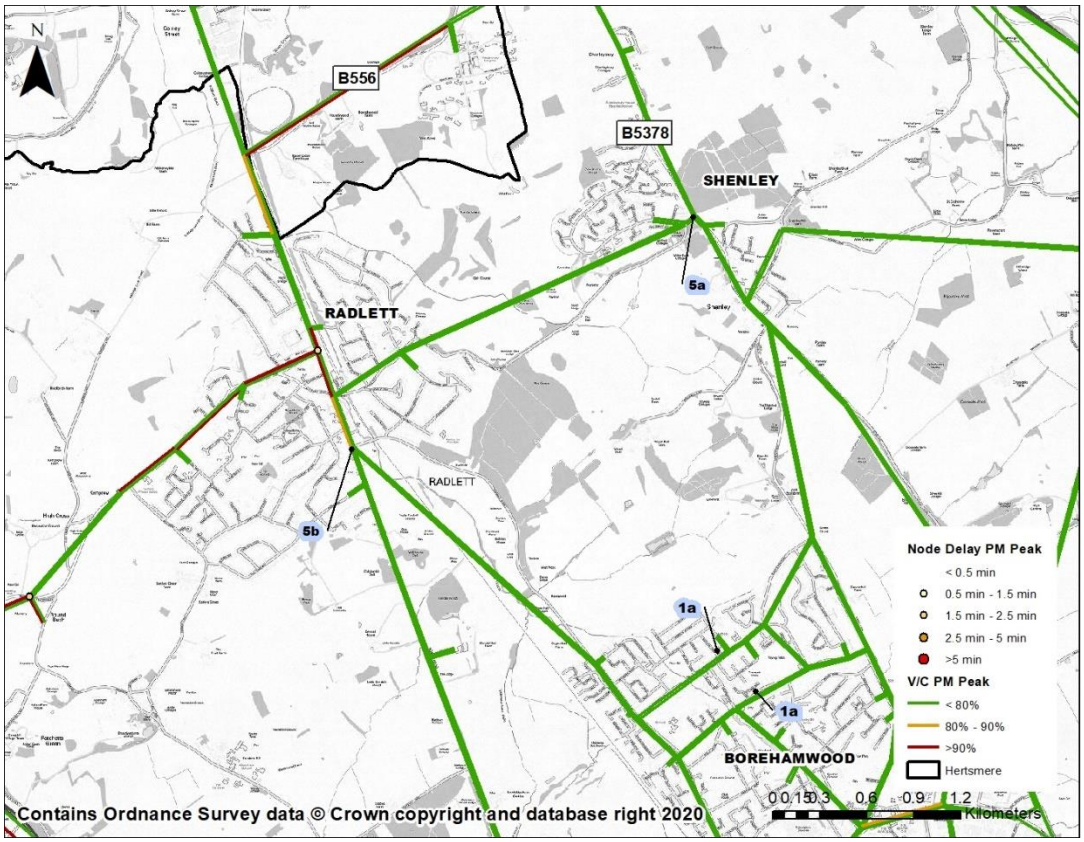

Figure 10-14: Scenario 1 Node Delay and Link Stress in Radlett - PM Peak

Appendix C : Scenario 2 and Scenario 1 Traffic Condition Comparison

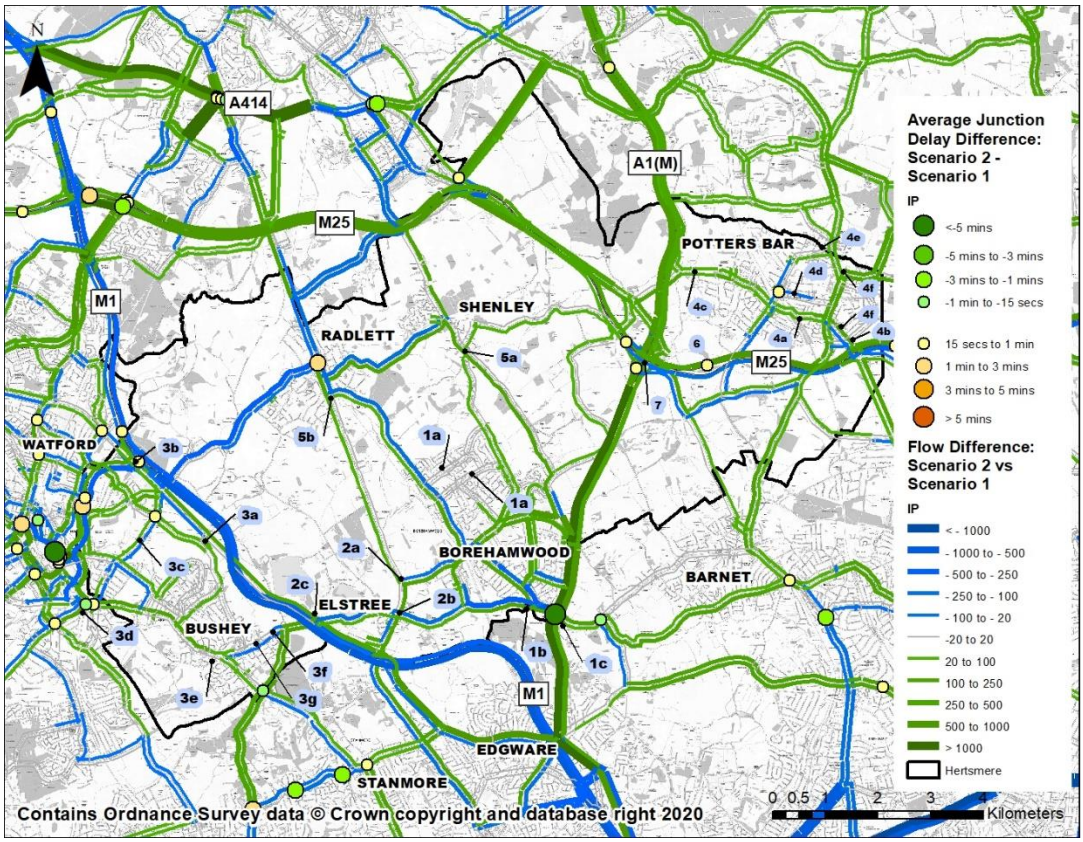

Figure 10-15: Flow and Delay difference between Scenarios 1 and 2 in Hertsmere - IP Peak

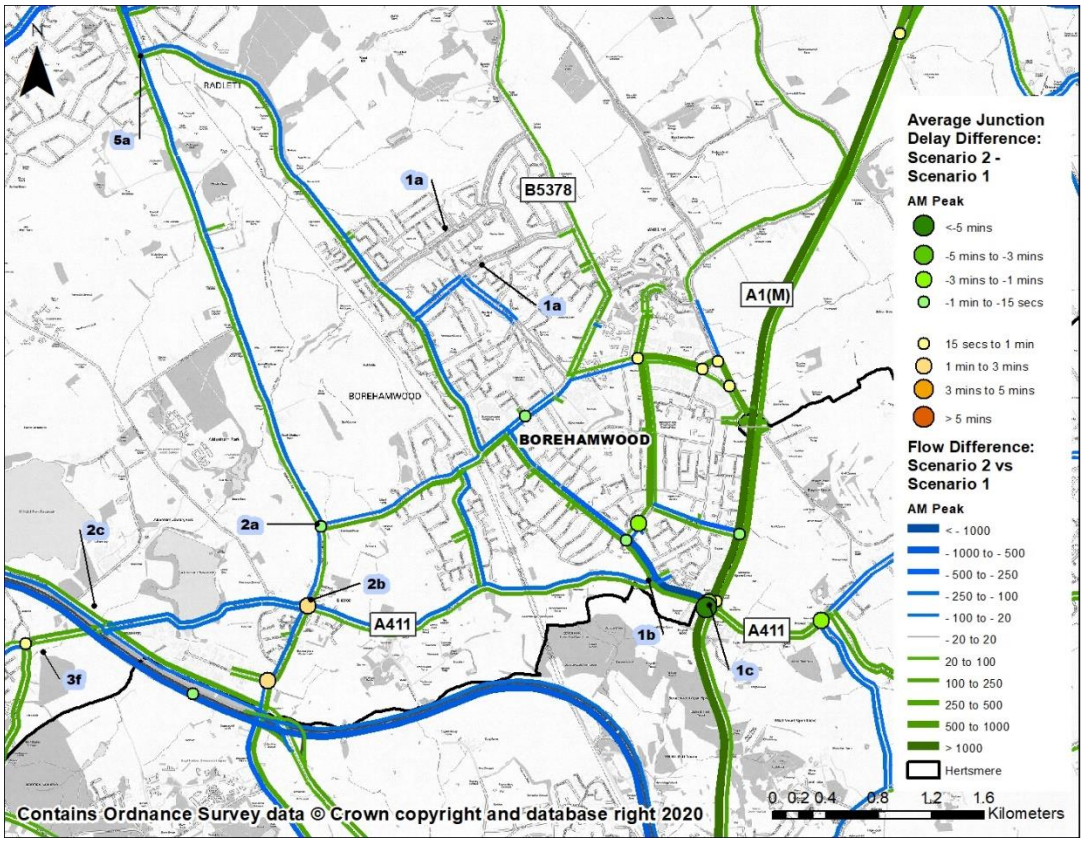

Figure 10-16: Flow and Delay difference between Scenarios 1 and 2 in Borehamwood - AM Peak

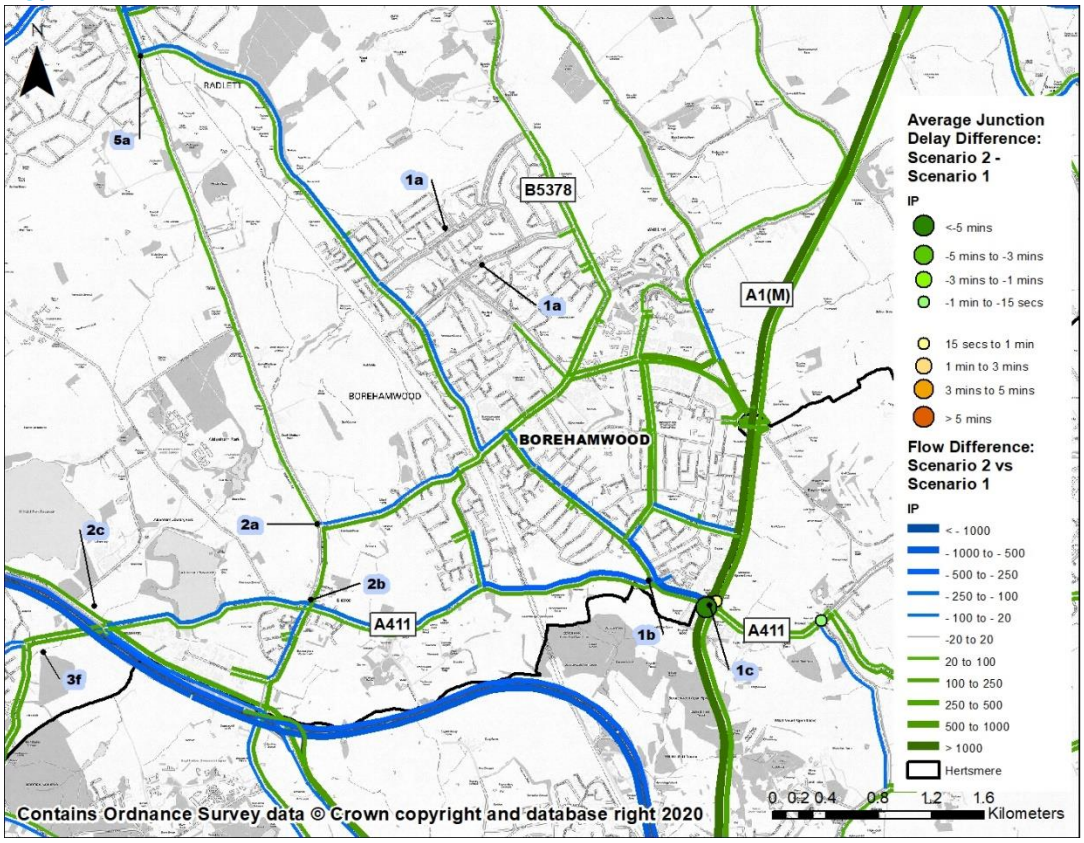

Figure 10-17: Flow and Delay difference between Scenarios 1 and 2 in Borehamwood – IP period

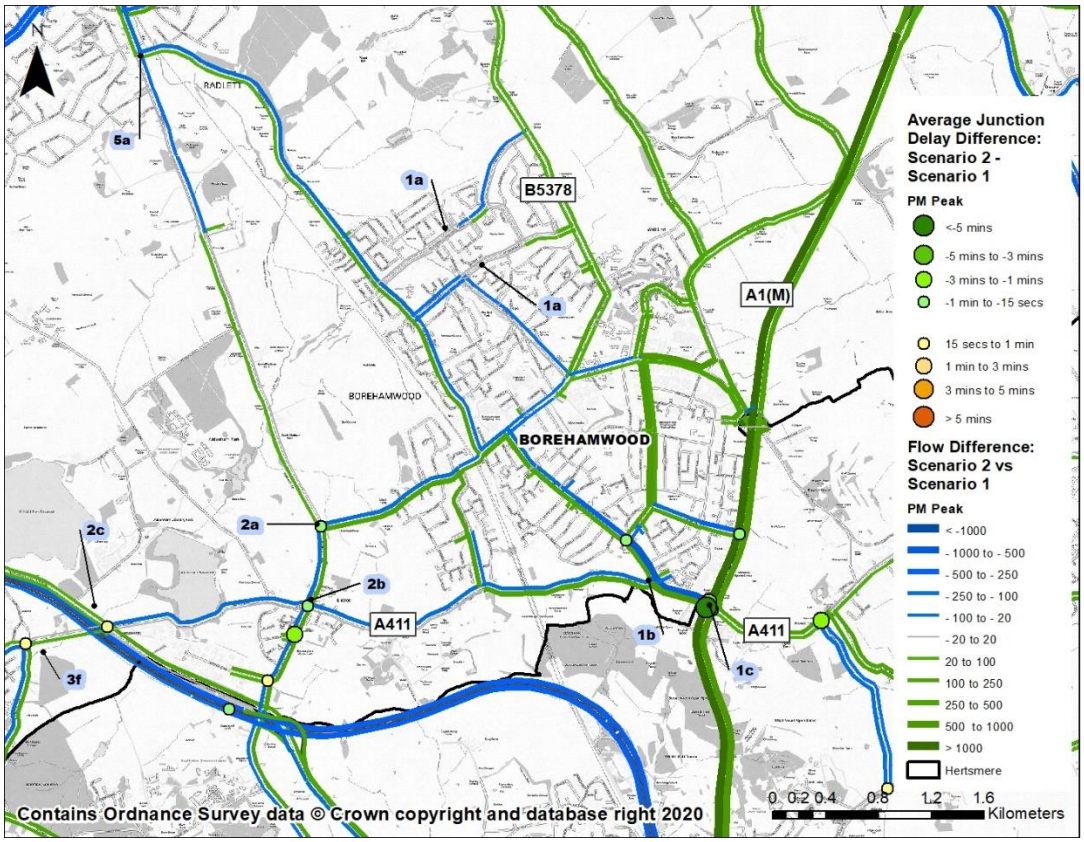

Figure 10-18: Flow and Delay difference between Scenarios 1 and 2 in Borehamwood – PM peak

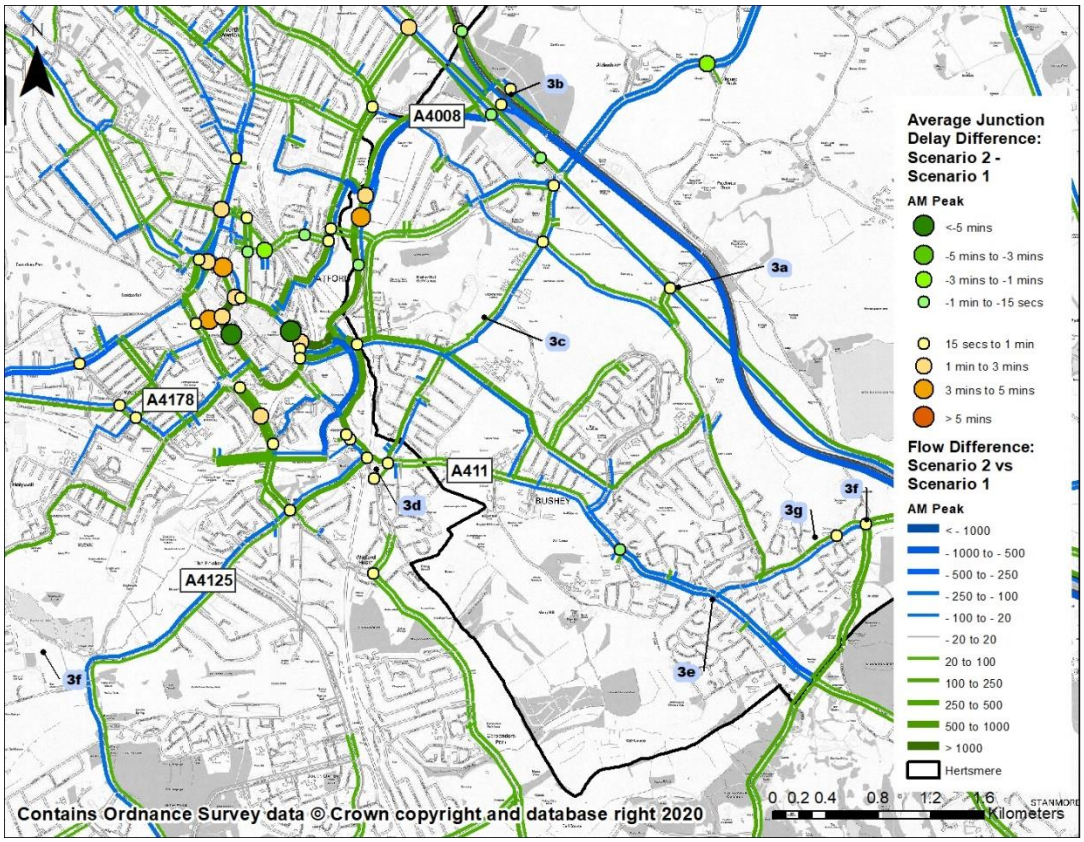

Figure 10-19: Flow and Delay difference between Scenarios 1 and 2 in Watford - AM peak

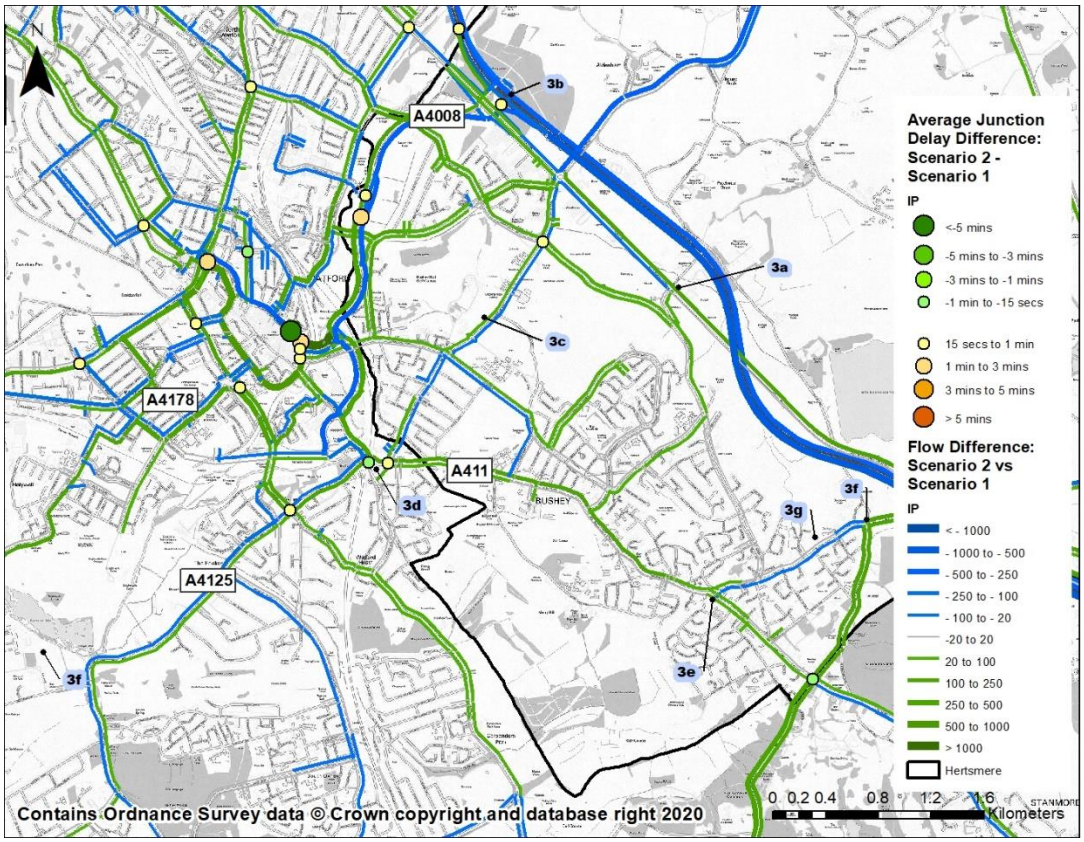

Figure 10-20: Flow and Delay difference between Scenarios 1 and 2 in Watford – IP period

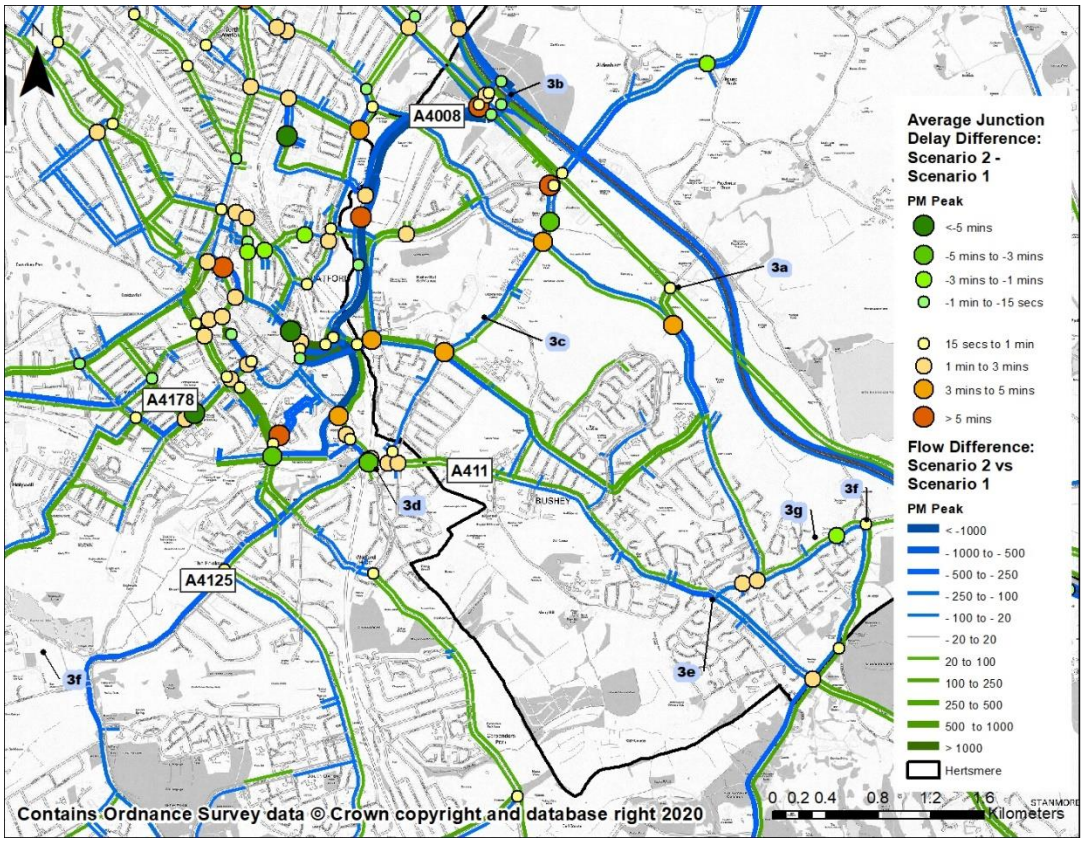

Figure 10-21: Flow and Delay difference between Scenarios 1 and 2 in Watford - PM peak

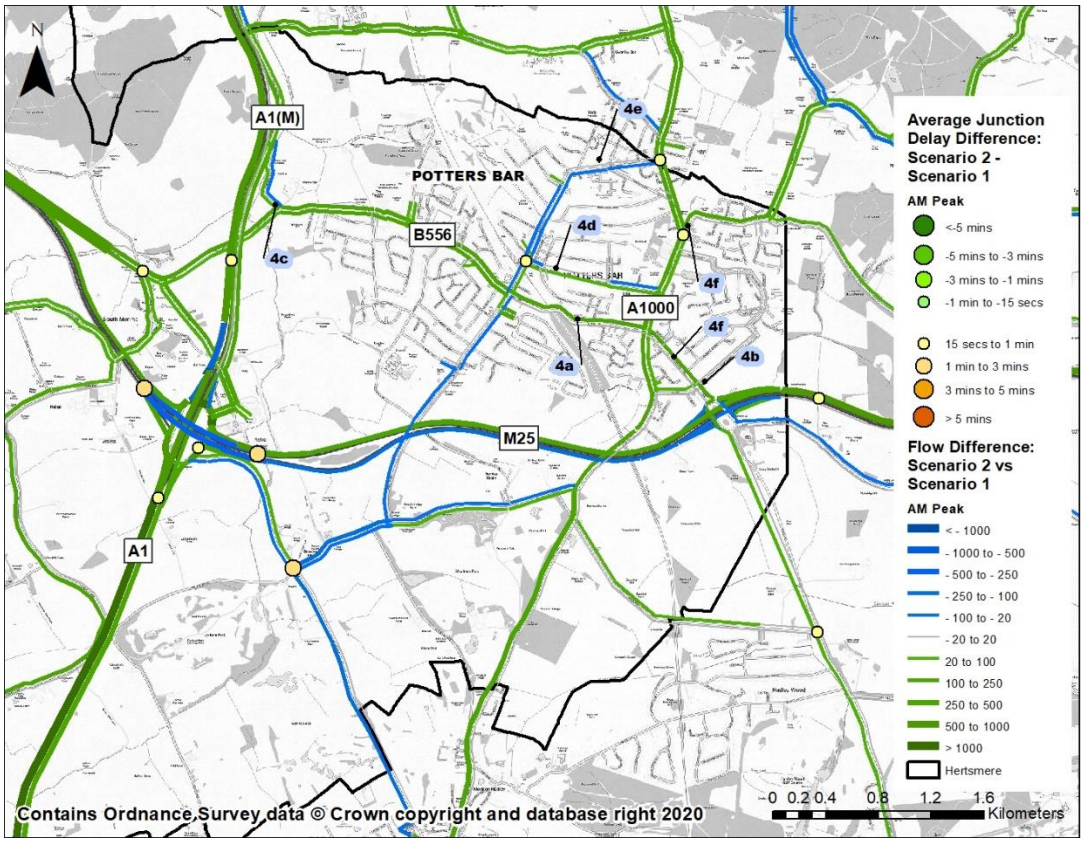

Figure 10-22: Flow and Delay difference between Scenarios 1 and 2 in Potters Bar - AM Peak

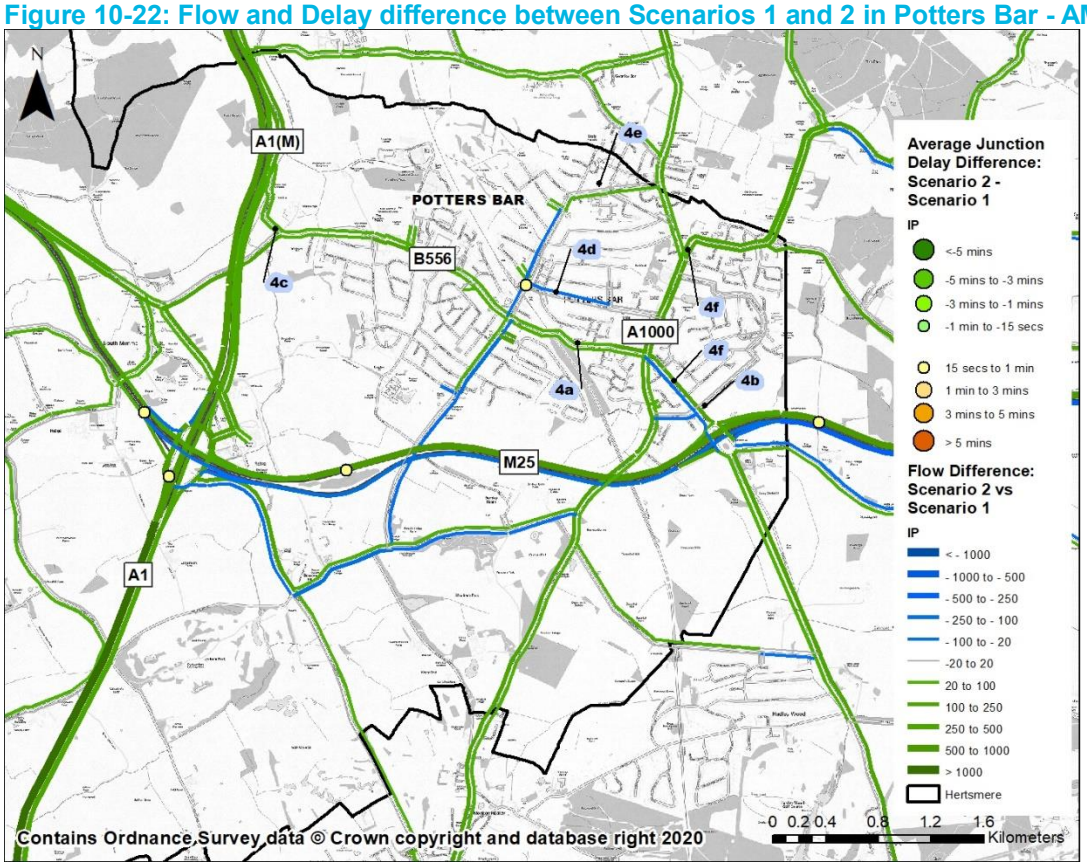

Figure 10-23: Flow and Delay difference between Scenarios 1 and 2 in Potters Bar – IP period

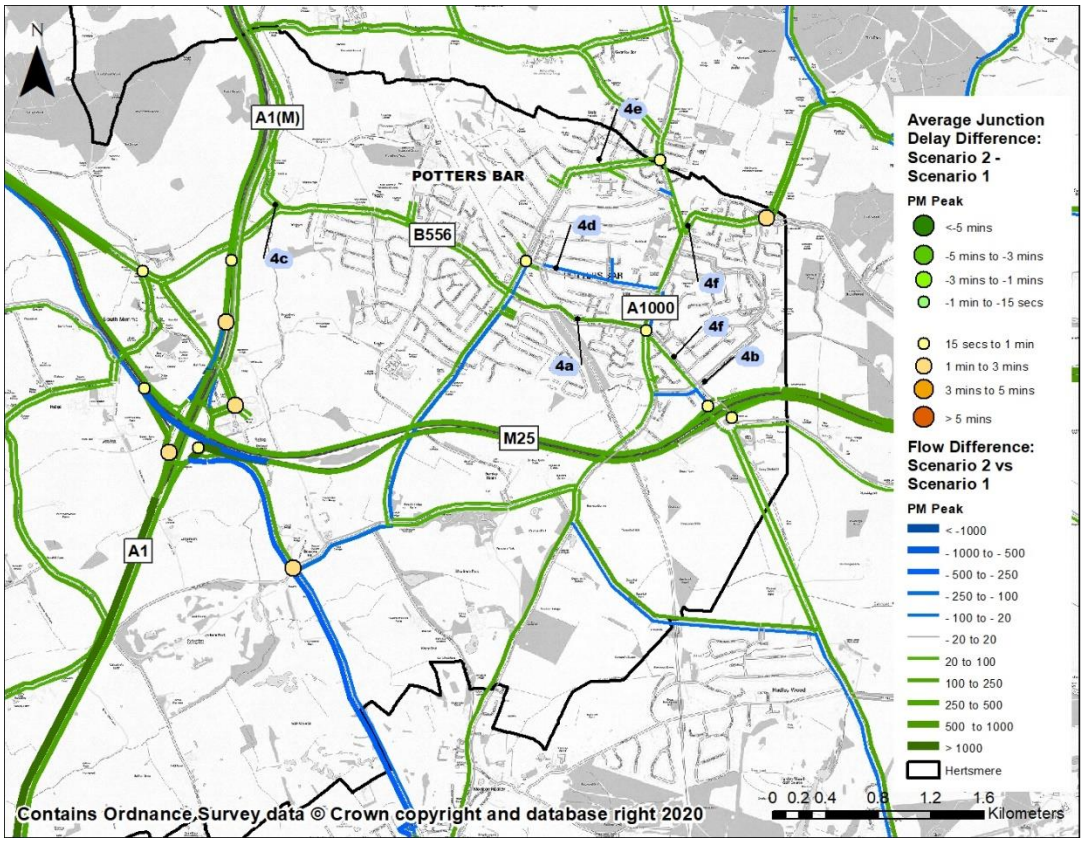

Figure 10-24: Flow and Delay difference between Scenarios 1 and 2 in Potters Bar - PM Peak

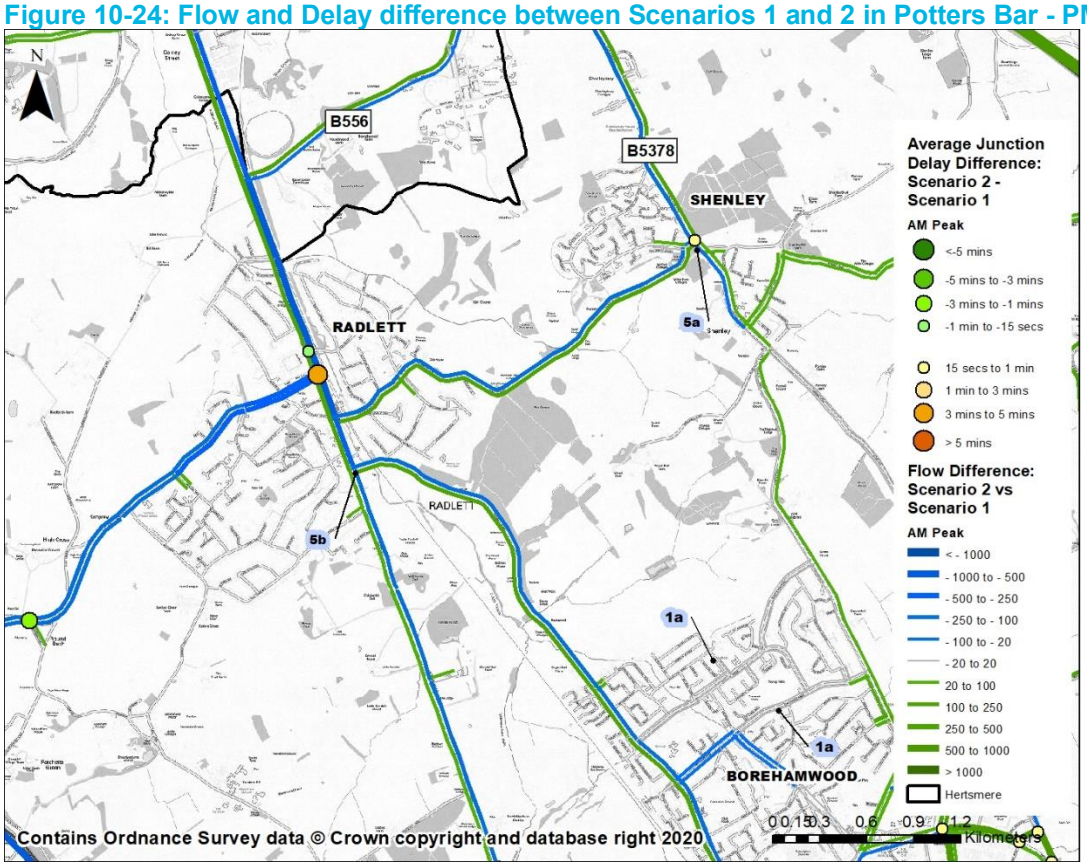

Figure 10-25: Flow and Delay difference between Scenarios 1 and 2 in Radlett - AM Peak

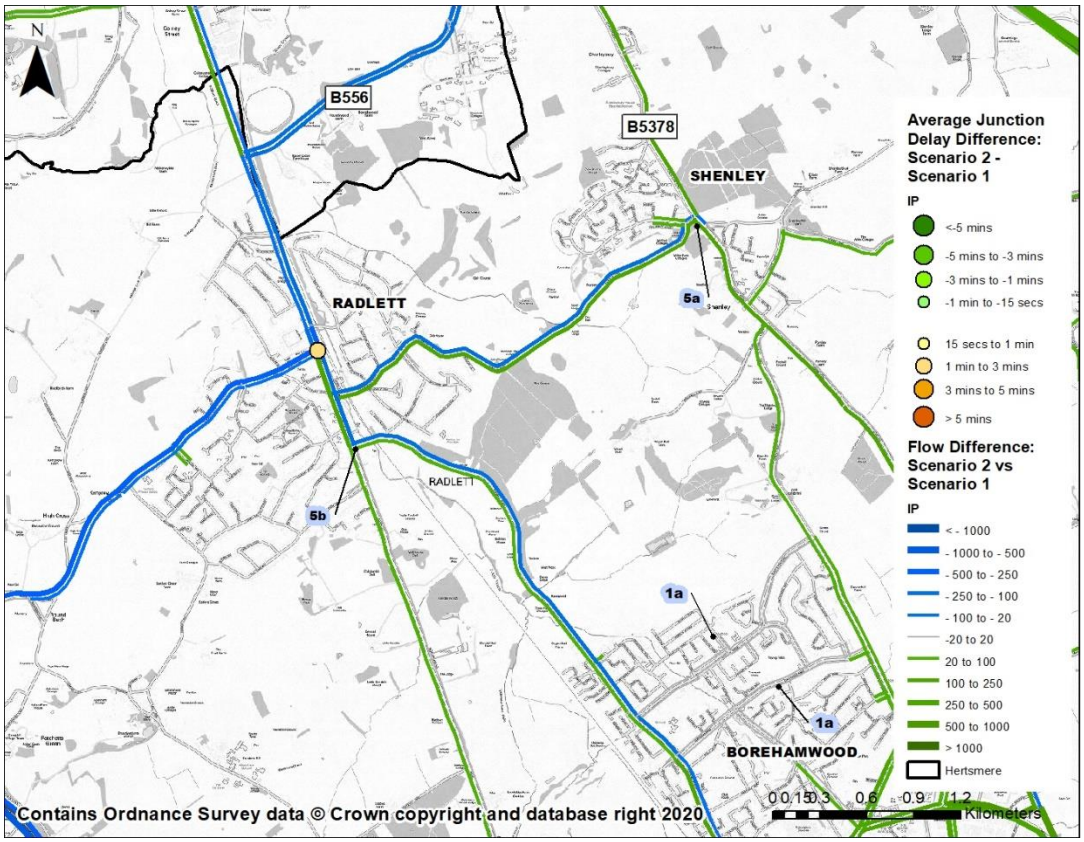

Figure 10-26: Flow and Delay difference between Scenarios 1 and 2 in Radlett – IP period

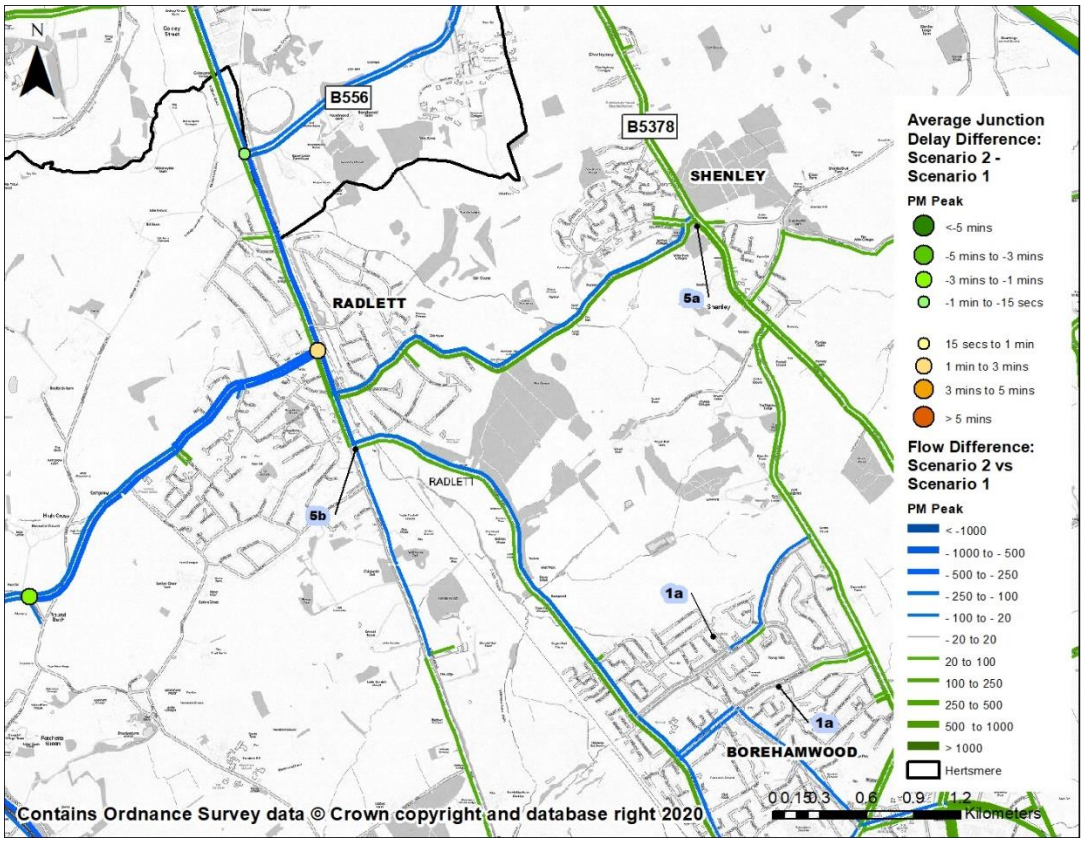

Figure 10-27: Flow and Delay difference between Scenarios 1 and 2 in Radlett - PM Peak

Appendix D : Scenario 2 and Base Year Traffic Condition Comparison

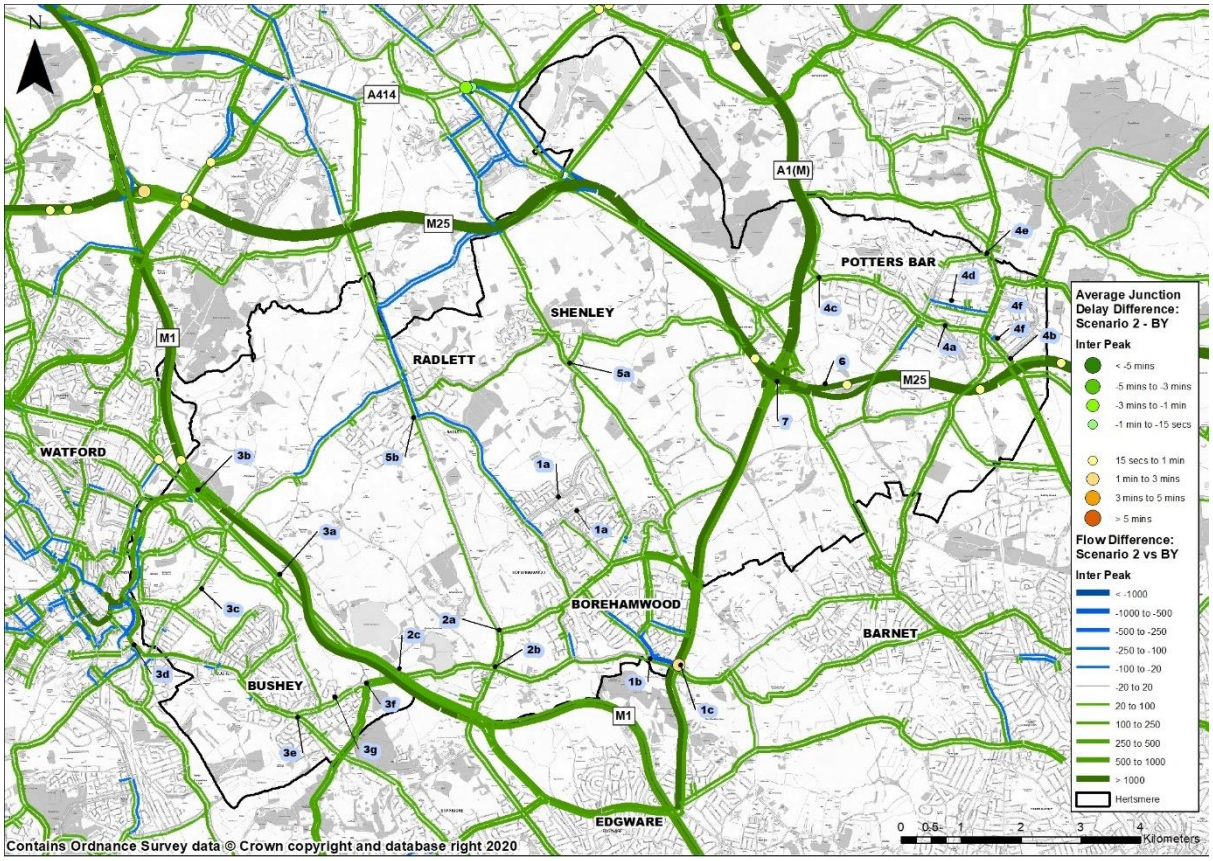

Figure 10-28: Flow and Delay difference between Scenario 2 and Base Year in Hertsmere - IP Peak

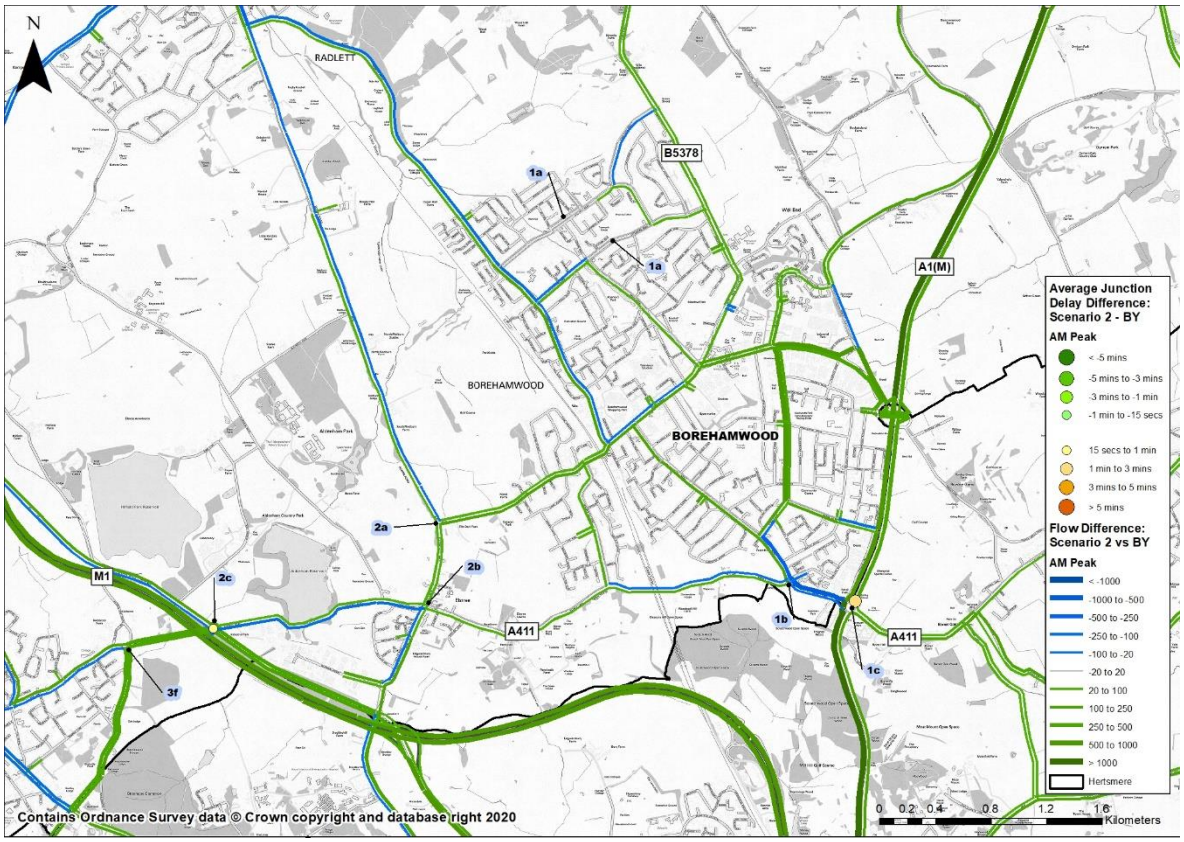

Figure 10-29: Flow and Delay difference between Scenario 2 and Base Year in Borehamwood - AM Peak

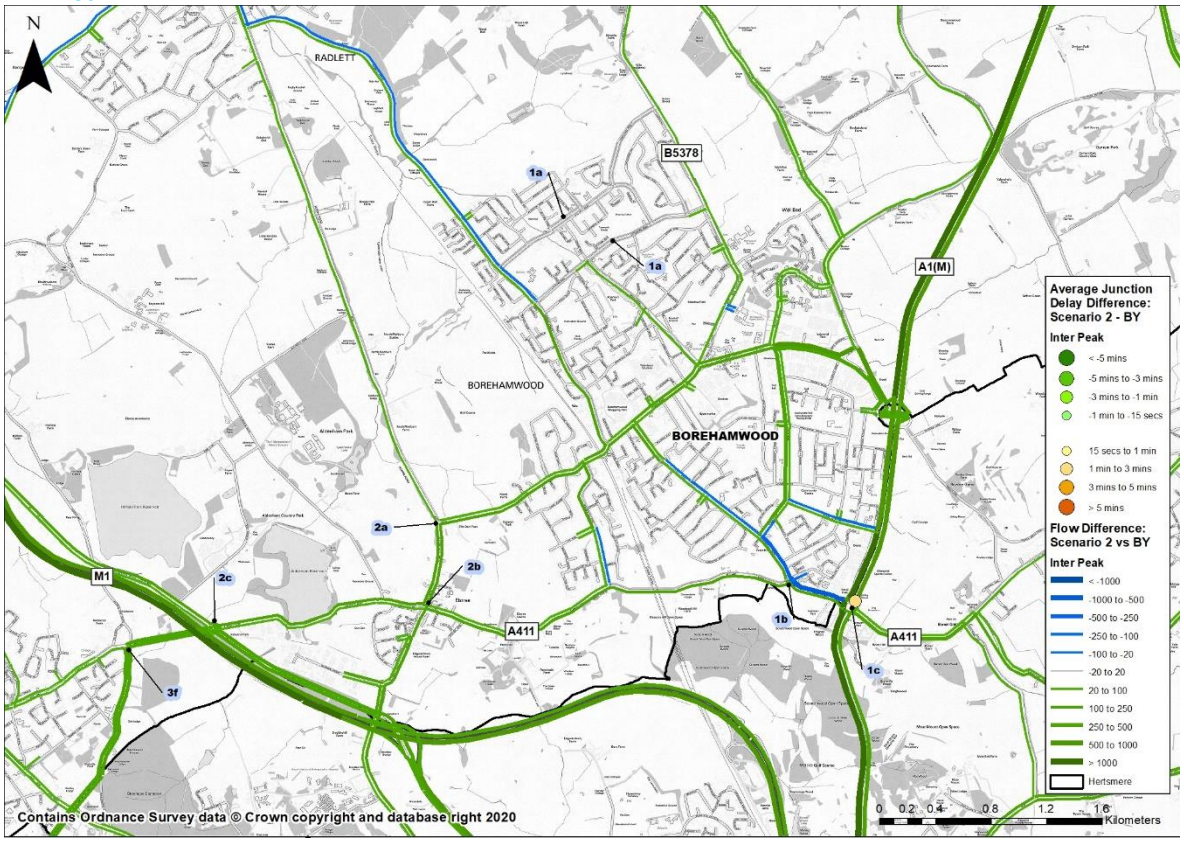

Figure 10-30: Flow and Delay difference between Scenario 2 and Base Year in Borehamwood – IP period

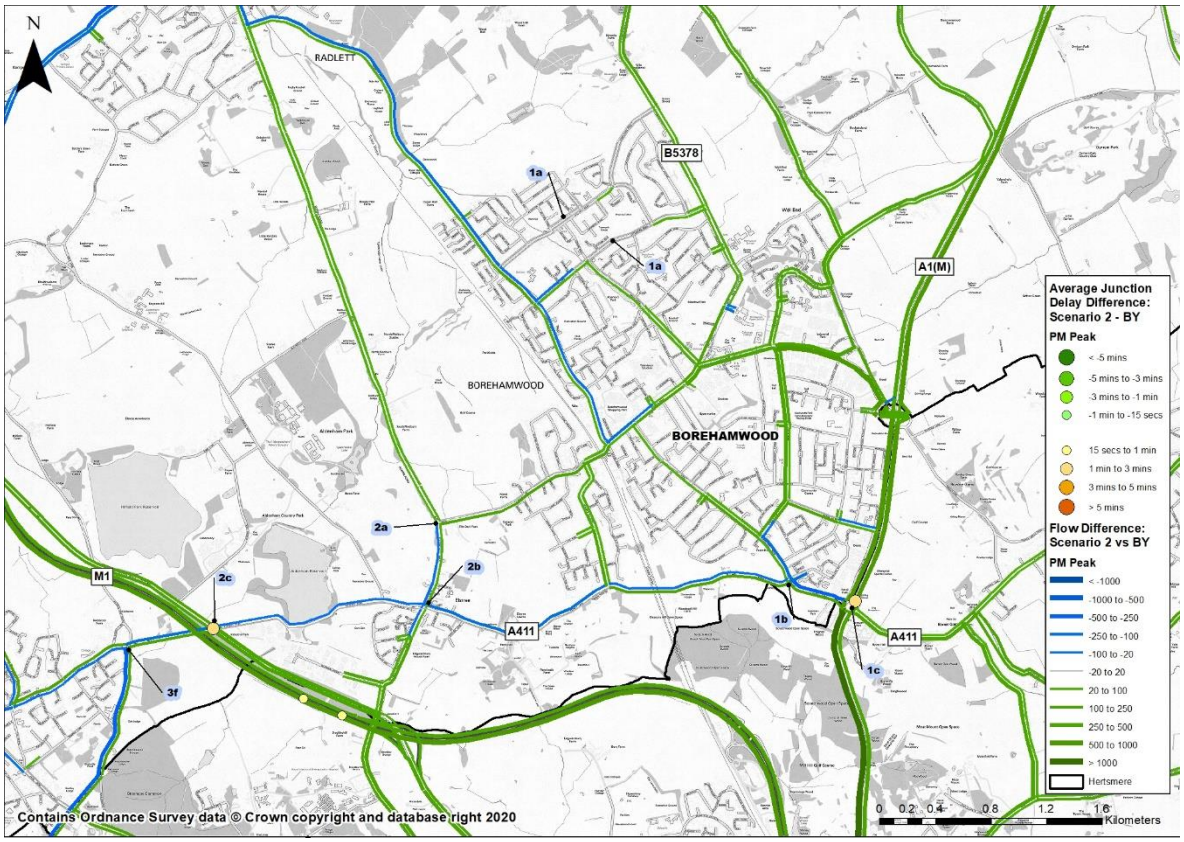

Figure 10-31: Flow and Delay difference between Scenario 2 and Base Year in Borehamwood - PM Peak

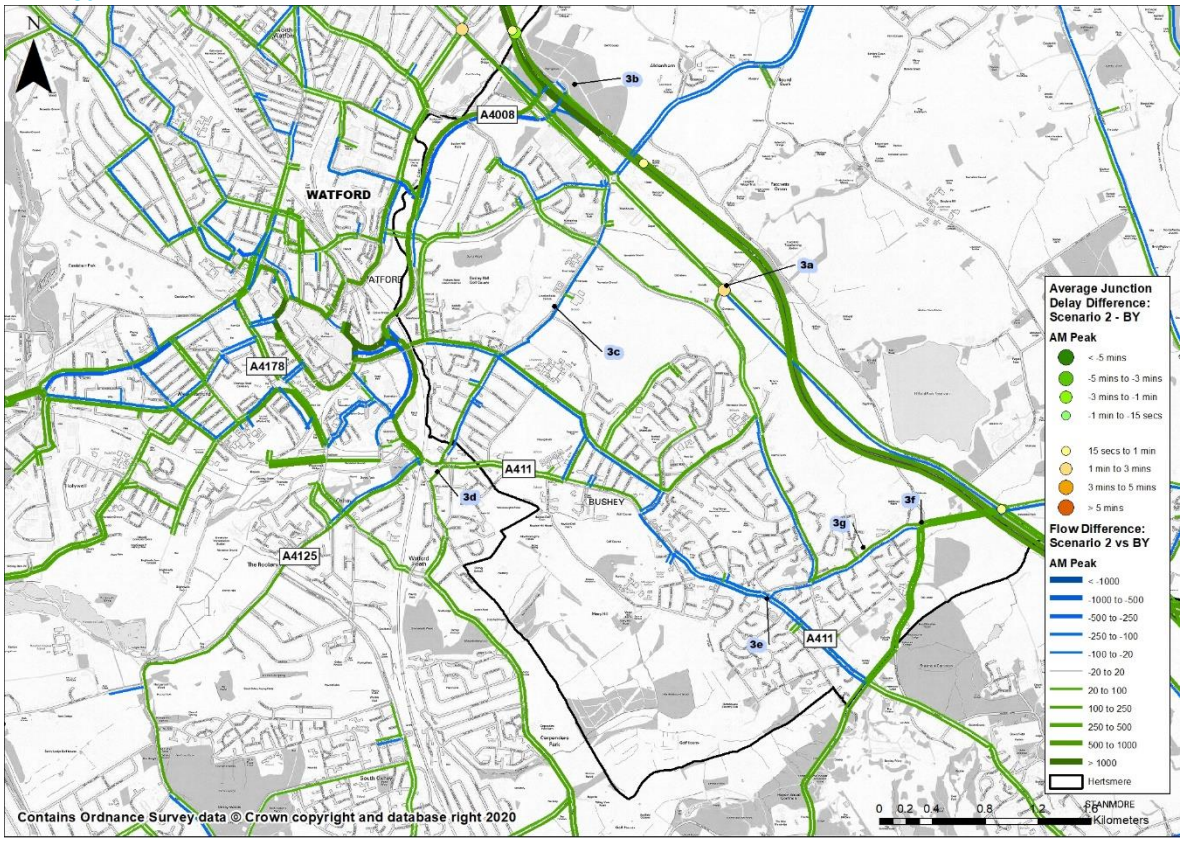

Figure 10-32: Flow and Delay difference between Scenario 2 and Base Year in Watford - AM Peak

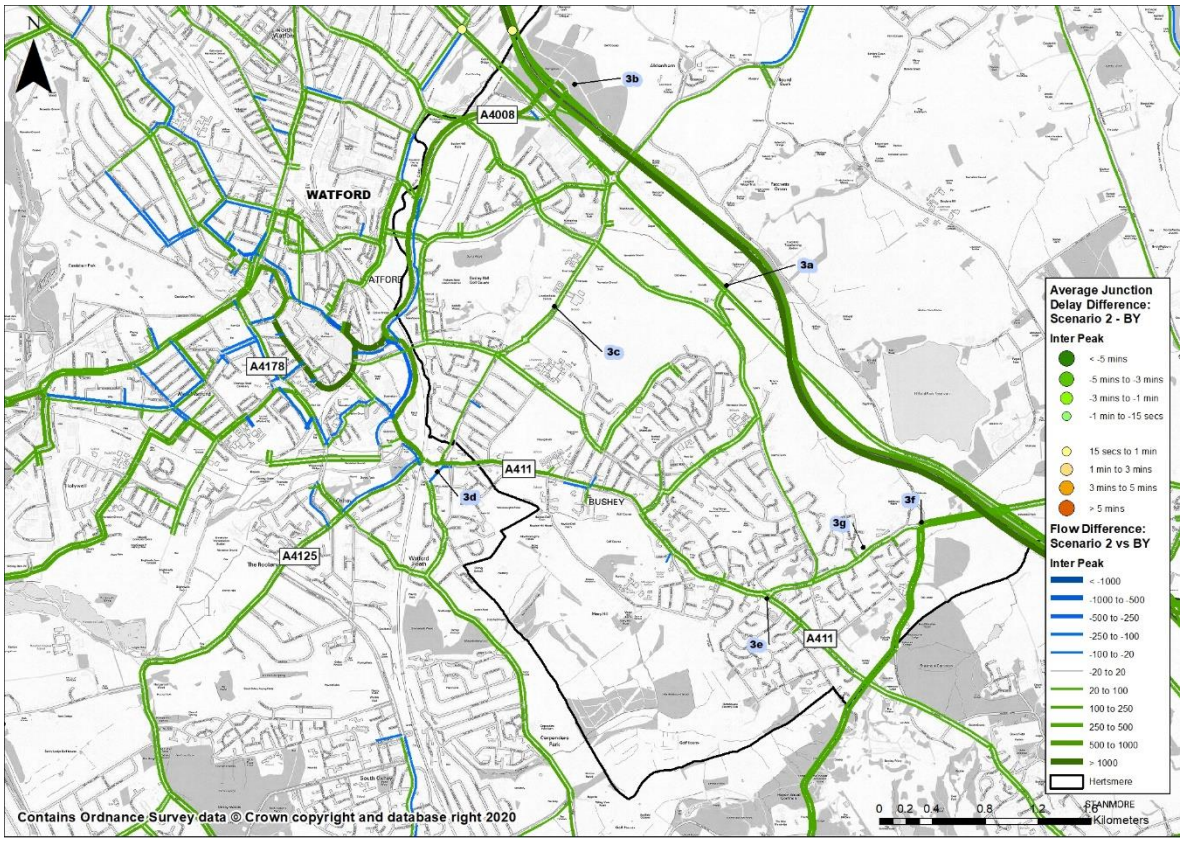

Figure 10-33: Flow and Delay difference between Scenario 2 and Base Year in Watford – IP period

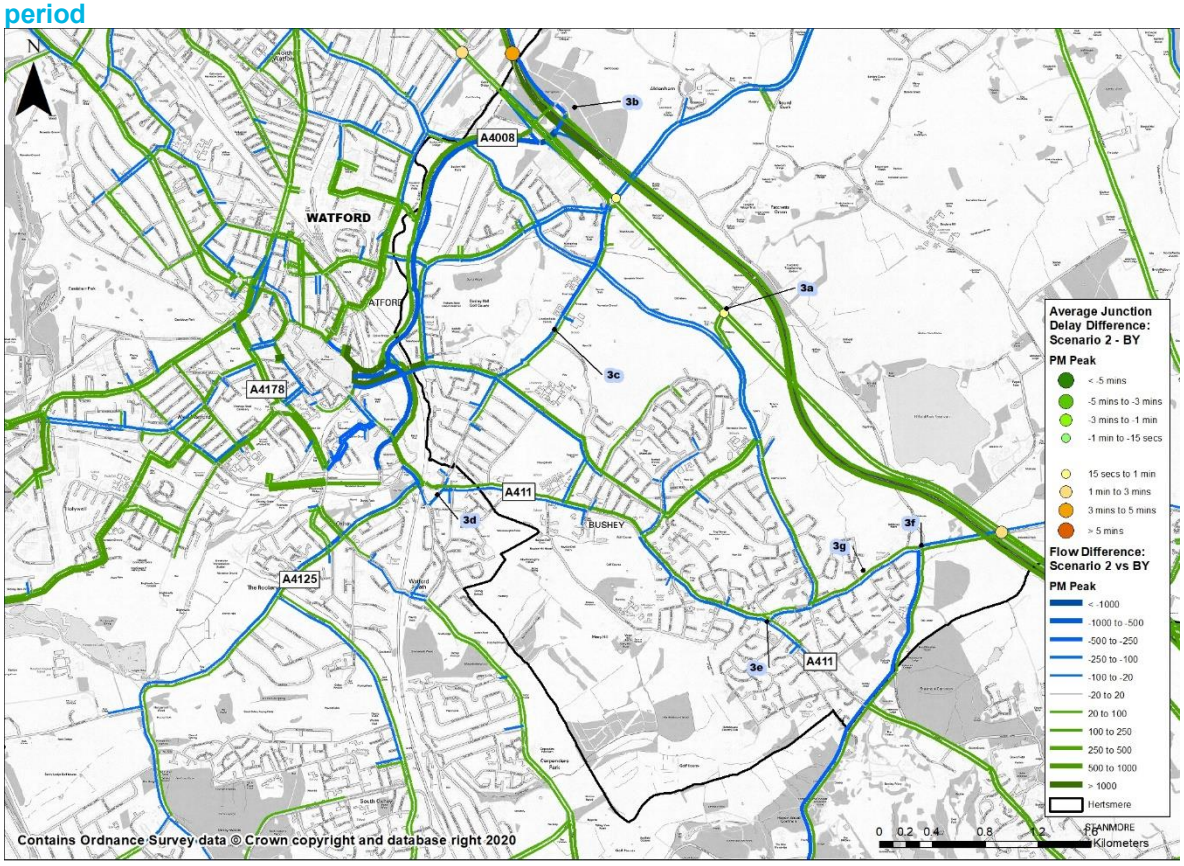

Figure 10-34: Flow and Delay difference between Scenario 2 and Base Year in Watford - PM Peak

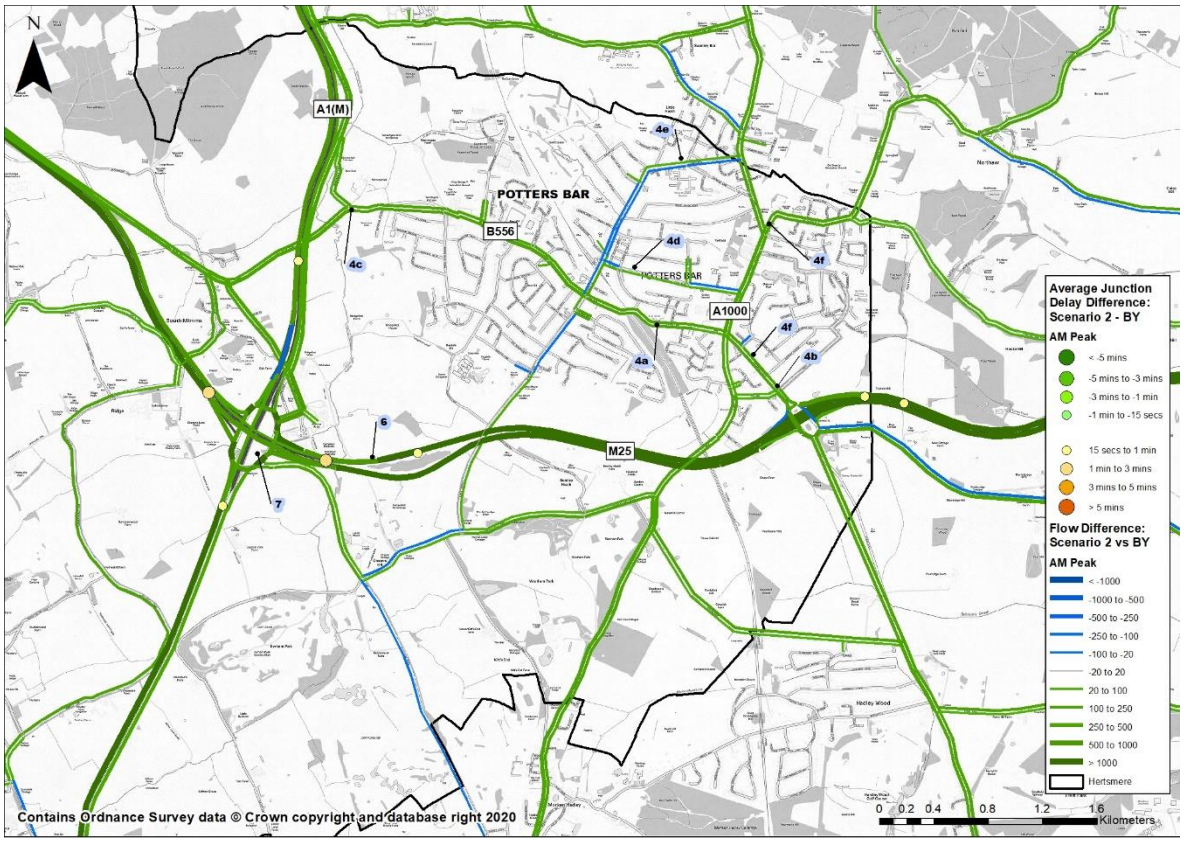

Figure 10-35: Flow and Delay difference between Scenario 2 and Base Year in Potters Bar - AM Peak

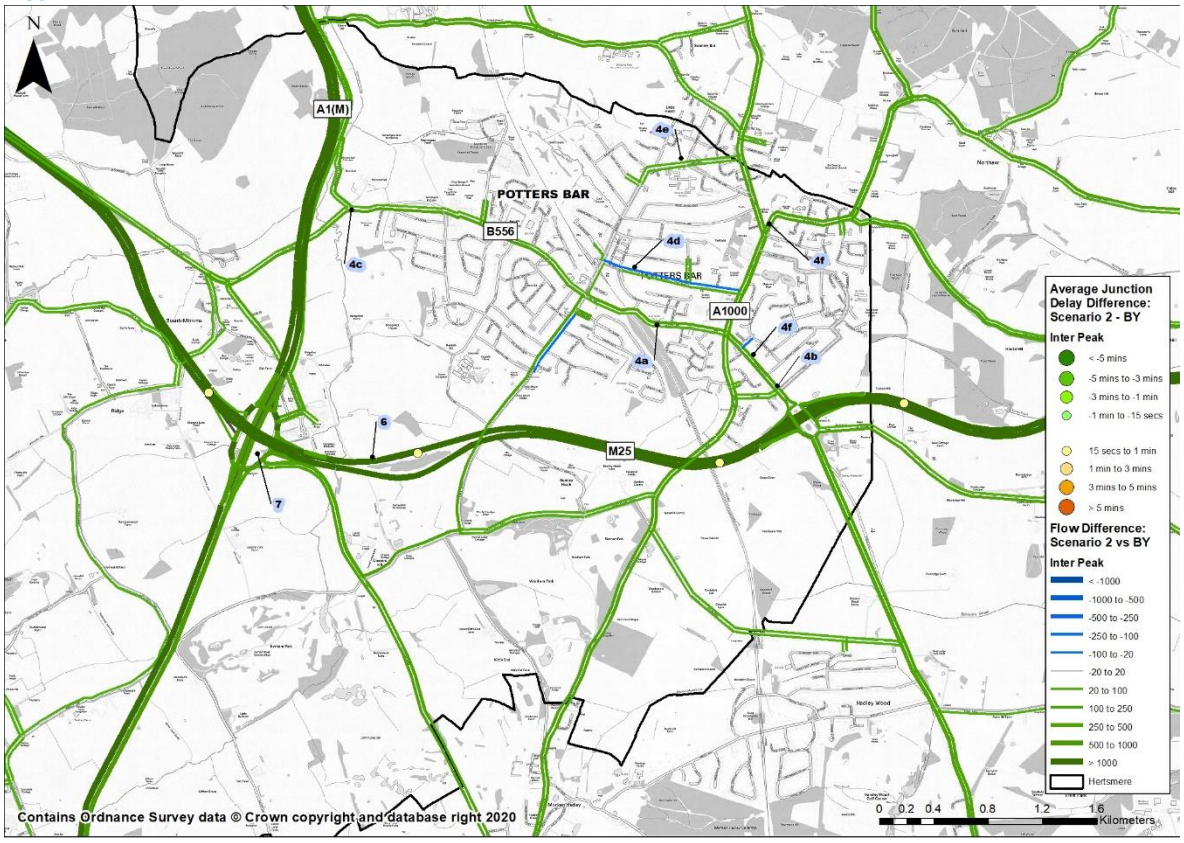

Figure 10-36: Flow and Delay difference between Scenario 2 and Base Year in Potters Bar – IP period

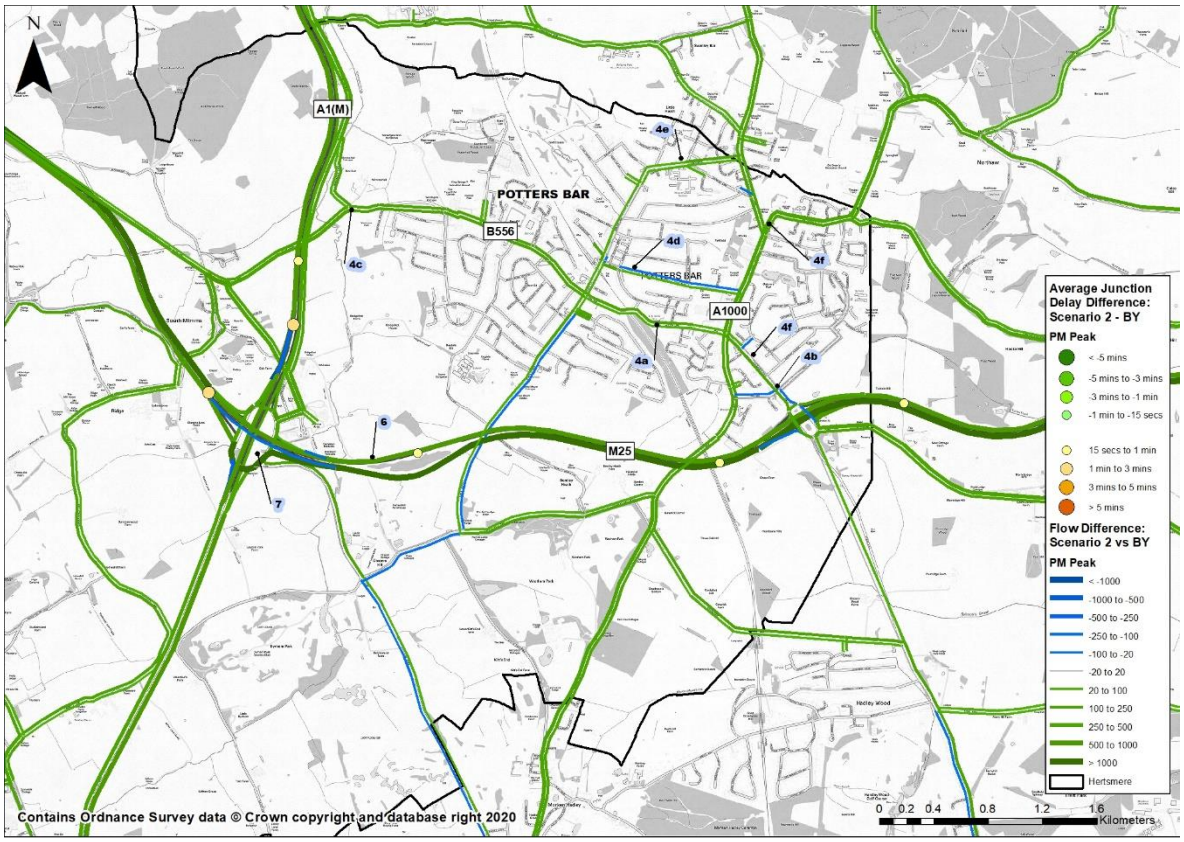

Figure 10-37: Flow and Delay difference between Scenario 2 and Base Year in Potters Bar - PM Peak

Figure 10-38: Flow and Delay difference between Scenario 2 and Base Year in Radlett - AM Peak

Figure 10-39: Flow and Delay difference between Scenario 2 and Base Year in Radlett – IP period

Figure 10-40: Flow and Delay difference between Scenario 2 and Base Year in Radlett - PM Peak