

Colchester Local Plan Review

Transport Evidence

14 February 2025

Colchester Local Plan Review

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Executive summary

Introduction

The aim of this study is to assist Colchester City Council (CCC) in developing and assessing preferred site allocations from the perspective of transport for its emerging Local Plan. This has been achieved through reviewing the sustainability of locations for development, consideration of mitigation approaches and using transport modelling to gauge the impact of the preferred allocations.

The study finds that there is a need for a proportion of private car trips to shift to sustainable travel modes of walking, cycling, bus or rail above current Business as Usual (BAU) levels where this is possible. This is considered achievable through continuing to invest in walking, cycling and public transport improvements and consistent with national and local policies. There will still be a need to invest in key highway infrastructure in parallel, including the A12 J19-J25 Widening and other measures, some of which will support access to Park and Ride, access to rail stations and reliability of buses.

Current Position

Current car mode share as a proportion of all trips is high across the whole of the council area resulting in congestion problems on the A12 and A120 strategic routes; but also on local roads within the city area including the A133 Cymbeline Way, A1124 Lexden Road, and A1232 Ipswich Road. Sustainable transport options vary across the council area with bus, cycling and walking alternatives better in the city centre and urban fringe areas when compared with rural parts. The city benefits from three rail stations in the urban area – Colchester, Colchester Town and Hythe stations – and Marks Tey station to the west.

The study has identified committed development in order of 5,300 new homes and 4,200 new jobs, which are excluded from the preferred site allocations. Committed growth includes the Tendring Colchester Borders Garden Community and is being accompanied by transport improvements including the A1331 link road, a new P&R facility to the east, a new bus rapid transit system (RTS) and delivery of walking and cycling schemes.

Supporting Identification of the Preferred Site Allocations

In order to assess the impact of committed growth and the proposed Local Plan preferred site allocations, ECC has enhanced and extended the existing Colchester Transport Model to take account of travel behaviour changes following the pandemic. The new North Essex Model (NEMo) has a base year of 2023. Using data from the transport models to understand existing network pressures and the impact of proposed growth, ECC has supported CCC in their consideration of the potential transport impact of the emerging allocations. This work included considering the quantum of housing able to be allocated around Marks Tey without the proposed A120 Braintree to A12 scheme. It is considered possible that Marks Tey could continue to grow beyond the new plan period of 2041 if the proposed A120 Braintree to A12 scheme went ahead.

CCC has considered the transport evidence alongside evidence from other disciplines in arriving at the preferred site allocations. The preferred allocations were then tested in the new NEMo model and a practicable mitigation strategy developed.

Preferred Site Allocations and Mitigation

The preferred allocations are expected to create a further 11,000 homes and, approximately, 11,000 jobs in addition to the committed development growth. To put this in perspective, committed and preferred allocations would grow homes by 20% above the current amount and employment by 16%.

Forecast reference and assessment case 2041 models were set up in NEMo using car trip rates reflecting current local travel behaviour – business as usual (BAU). The reference case model reflecting committed developments indicates that that level of growth could be accommodated on the transport network if it is accompanied by investment in transport improvements. However, the highway network would not be able to accommodate additional car trips generated by preferred allocations using BAU car trip assumptions.

A practicable mitigation strategy was then developed in line with the National Planning Policy Framework (NPPF) to consider opportunities for sustainable travel and reducing travel need before expanding highway capacity. It was considered impracticable to mitigate impact of growth by solely expanding highway capacity. It is expected that the integrated package of mitigation measures would include:

- Extension of RTS and high quality bus routes
- Extension of walking and cycling programme
- Interchange improvements i.e. mobility hubs, rail station improvements
- Travel planning and travel behaviour changes
- Key strategic highway schemes including the A12 J19-J25 widening
- Local highway improvements

An achievable level of switch to sustainable travel has then been identified to reduce the growth in car trips. The reduced level of car trips was then run through the NEMo transport model, which demonstrated that the impact of growth could be appropriately mitigated using this strategy.

It is expected that the required switch to sustainable travel to facilitate growth would be a combination of reduction from BAU car trips at preferred allocations, committed development and existing settlements. The report provides examples and precedents to support the strategy to accommodate growth partly through a switch to sustainable travel. Examples include evidence from Hull, Brighton and Nottingham in the UK.

Next Steps and Further Testing

The highway authorities ECC and National Highways have been working closely throughout the Local Plan transport assessment process. This has included a review of the new NEMo base year and a review of forecast modelling is commencing.

The ongoing review of modelling with National Highways is expected to include sensitivity tests, one of which will test the preferred allocations without the A12 J19-25 widening scheme for which funding, at the time of writing, is uncertain. These sensitivity tests will improve the levels of certainty on transport modelling findings.

Ongoing work with National Highways will also consider the proposed A120 Braintree to A12 scheme and when it may be required to support further growth at Marks Tey. ECC has previously identified its favoured route for a new and improved A120 between

Braintree and the A12 south of Kelvedon in June 2018. The scheme was one of the Government's Road Investment Strategy 3 (RIS3) 'pipeline projects', however in a Ministerial Statement to Parliament in March 2023, the government announced that work on the future pipeline of schemes earmarked for RIS3 will now be considered for delivery as part of RIS4 (beyond 2030). ECC, and Local Planning Authorities, are continuing to lobby for a committed A120 Braintree to A12 scheme as early as possible. Following the General Election all committed road schemes, not yet under-construction, are subject to the Spending Review. Consequently, it is unclear when any firm commitment will be provided for this scheme.

1 Introduction

1.1 Background

Colchester City Council (CCC) adopted the current Colchester Local Plan Section 1 in February 2021 and Section 2 in July 2022, which has guided growth and development across the council area up to 2033. To ensure plans remain effective, they require reviewing and, potentially, updating at least every five years. CCC's current Local Plan review will consider new national policy and ensure the council's current and future development needs are met.

A Call for Sites process was undertaken from October 2023 to January 2024, in which groups including local residents, landowners, developers and other stakeholders suggested sites that they would like to be considered to inform the review of the Local Plan. The sites submitted during the Call for Sites are shown in the image below.

From this Call for Sites, CCC has devised spatial options for testing, which has also taken into account:

- sites failing assessment criteria (leading to omission from spatial options)
- sites not identified in the Call for Sites but considered worthwhile to include:
 - current allocations
 - current allocations under review
 - council owned land
 - other potential suitable sites

1.2 Objectives

To comply with the updated National Planning Policy Framework (NPPF), development proposals must adhere to the following key principles:

- **Prioritising Sustainable Modes:** The NPPF encourages planning decisions that prioritise walking, cycling, and public transport over car travel.
- **Reducing Reliance on Cars:** Developments should be designed to minimise the need for car travel by locating them close to existing services, amenities, and transport infrastructure.
- **Improving Accessibility:** New developments should be well-connected to public transport networks, cycle lanes, and pedestrian routes.
- **Addressing Travel Demand:** Planning applications should assess the potential transport impacts of the development and propose measures to mitigate any negative effects.

This study will assist CCC in evaluating spatial options through a sustainable transport lens, identifying scenarios for transport modelling to strengthen the planning authority's evidence base.

While prioritising sustainable travel remains paramount, development growth will inevitably exert pressure on the existing highway network. An initial high-level assessment of the potential network impacts will precede any refinements to spatial options for transport modelling.

Recognising that the scale of development at Marks Tey may be constrained without the desired A120 Braintree to A12 upgrade and realignment, an initial assessment of Marks Tey has been conducted to understand the impact of development on the A120 and A12 network, prior to refining spatial options for transport modelling.

To address these issues and support the Local Plan review, the project objectives are to:

- identify transport issues related to different spatial options and scenarios through high level analysis;
- identify opportunities to enhance sustainable travel in spatial options and possible levels of internalisation and sustainable travel;
- advise on whether the A120 Braintree to A12 road scheme is required to unlock development at Marks Tey and at what scale;
- inform selection of spatial options and associated mitigation measures to assess using the updated Colchester multi-modal transport model;
- run and analyse transport models of selected spatial options and associated mitigation measures; and
- provide transport evidence for spatial options.

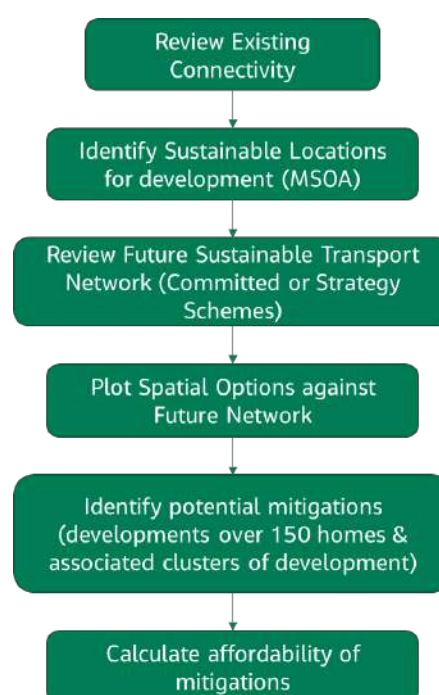


Figure 1.1: Project stages

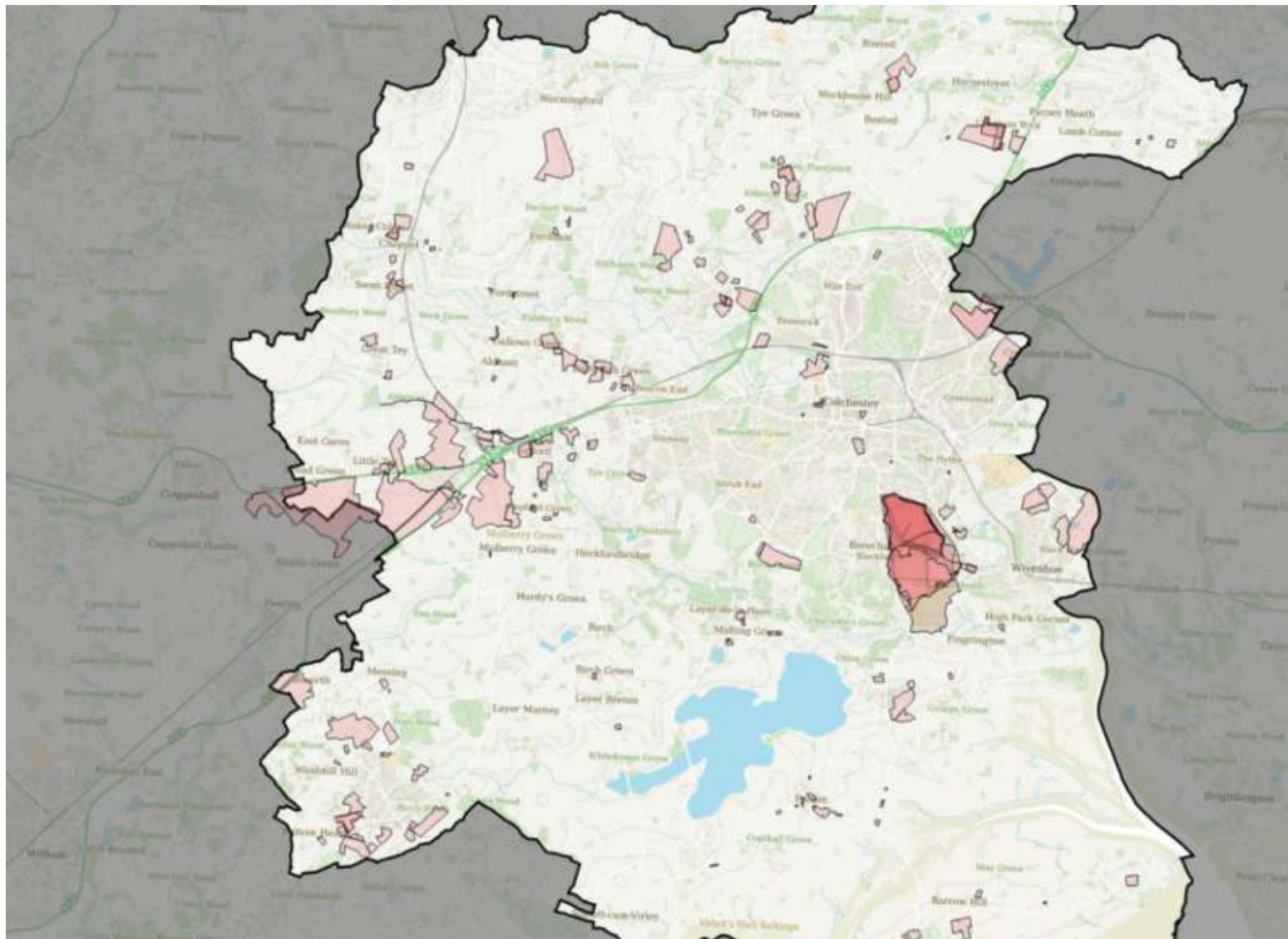


Figure 1.2: Sites submitted during the Call for Sites

1.3 Structure

This report documents the process undertaken to review the long-list of spatial options, considering sustainable transport opportunities and highway impacts. This analysis will inform the refinement of development options in alignment with the updated NPPF and local authority development quantum figures.

The initial phase of work will inform the selection of scenarios for subsequent transport modelling. These scenarios will incorporate appropriate and realistic sustainable transport assumptions, considering the feasibility of implementing such interventions at each development site.

- Chapter 2 – Assessment of Current Conditions
- Chapter 3 – Long-List Spatial Options
- Chapter 4 - Preferred Spatial Options and Transport Modelling Assumptions
- Chapter 5 - BAU Assessment Case Modelling Results
- Chapter 6 - Approach to Mitigating Transport Impacts of Preferred Site Allocations
- Chapter 7 - Conclusion and Next Steps

2 Assessment of Current Conditions

2.1 Existing Connectivity

This chapter assesses existing connectivity within the council area, focusing on the highway network, bus and rail services, cycle routes, and Public Rights of Way (PRoWs). By analysing these networks at the Middle Super Output Area (MSOA) level, this chapter provides a high-level understanding of how mode share, travel times within and outside the council area, and accessibility to key destinations influence travel choices. This analysis helps to evaluate the sustainability of each location for potential development.

Different levels of geographies are used for analysis on the results of the Census 2021. Output Areas (OAs) are the lowest level of geographical area for census statistics and are made up of between 40 and 250 households and had a usually resident population between 100 and 625 persons. Lower layer Super Output Areas (LSOAs) are made up of groups of OAs, usually four or five. They comprise between 400 and 1,200 households and have a usually resident population between 1,000 and 3,000 persons. MSOAs are made up of groups of LSOAs, usually four or five. They comprise between 2,000 and 6,000 households and have a usually resident population between 5,000 and 15,000 persons. MSOAs fit within local authorities.

The following sections summarise the existing connectivity, with a more detailed appraisal and maps shown in Appendix A.

2.1.1 Transport Network

A summary of the transport network in the CCC area is as follows:

- Highway network – Colchester's highway network is primarily radial, with major routes like the A12, A120, A133 and A134 providing critical access
- Bus Network – Bus services are frequent within Colchester city centre and along strategic routes, but less frequent in rural areas, with some areas having no bus coverage.
- Rail Network – The rail network connects key areas like Colchester city centre, Marks Tey, Hythe, Wivenhoe, and Chapel & Wakes Colne. The rural north and south of the council area lack rail connections.
- Cycle Routes – There are two National Cycle Network routes which cross the east and south of the council area, broadly through rural locations. High quality cycle routes are being developed in the city centre, formalising temporary routes from 2020, with future plans to broaden this coverage

2.1.2 Key Attractors

Essex Highways have assessed key attractors as, education, employment areas, retail areas, and healthcare:

- Education – Essex University is located to the east of the city centre, with Colchester Institute higher education centre within the city centre
- Employment Areas – mainly located north of the city centre along the A12 and A120, extending into Tendring and Braintree, and southeast along the A134.
- Retail Areas – concentrated in the city centre, with Tollgate Retail Park to the west, close to the A12.

- Healthcare – Colchester General Hospital is located north of Colchester city centre.

2.1.3 Mode Share

Car mode share is high across the whole of council area, most predominant in the western and southern parts which are more rural in nature. Car share is lowest in the city centre and eastern parts, close to the Tendring border, where there is a greater densification of housing.

Sustainable transport varies across the council area. With bus routes radiating from the city centre, there are greater frequency and route options in the city centre and urban fringe areas. This is consistent for cycling and walking, with more routes provided towards the urban centre, when compared with rural areas of the borough.

2.1.4 Travel Time

For trips between MSOAs, generally the central and eastern parts of the council area, as well as Wivenhoe, attract the most trips due to higher employment, retail and residential density. The northern and southern parts have a more dispersed trip pattern due to their rural geography.

Within the council area, given that the majority of key attractors are within the urban area, journeys to the city centre have the shortest travel times. Journeys to rural destinations have longer travel times.

To access key centres outside of the borough such as Braintree, Chelmsford and Ipswich, the travel times are strongly influenced by the proximity to major roads and the Great Eastern Mainline rail routes.

2.2 Highway issues in Proximity to Long-List Spatial Options

The highway network has been assessed using the Colchester Transport Model (CTM), to understand the current constraints on the network without committed development and without the long-list spatial option trip generation included.

For information, the CTM is highway and public transport model with a 2019 base year and forecast year models in 2026, 2033, 2041 and 2051. Car demand is assigned to the highway network using the VISUM software package and public transport demand assigned to the public transport network using EMME software. An out of model process using the Colchester Parking Model is also carried out which adjusts demand in response to park and ride services and the availability of parking in Colchester. The CTM has been built in line with the guidance set out in DfT Transport Analysis Guidance (TAG).

Maps generated from this assessment are included in Appendix A. A key metric is the Volume over Capacity (V/C) ratio, where anything over 80% indicates capacity issues and potential congestion.

- The A12 experiences congestion west of Colchester near Kelvedon and Marks Tey, as well as north of Colchester.
- In Colchester, local roads such as the A133 Cymbeline Way, A1124 Lexden Road, and A1232 Ipswich Road show a V/C ratio over 80% during both the AM and PM peak times.

Level of Service (LOS) is another key measure to understand the operation of the

highway network. These categories are based on levels of congestion on American roads and are categorised as follows:

- LOS D: Represents conditions where traffic is approaching unstable flow with significant delays.
- LOS E: Indicates unstable flow with significant delays, where the traffic volume is at or near capacity.
- LOS F: Describes conditions where traffic flow is forced meaning extreme delays and congestion.

The below table identifies some of the locations in the AM and PM peak within each category.

Table 2.1: Level of Service Categorisation

	LOS D	LOS E	LOS F
AM Peak	<ul style="list-style-type: none"> • St Johns Street • B1025 Mersea Road • A134 Magdalen Street • A134 Northern Approach Road 	<ul style="list-style-type: none"> • Military Road • Bourne Road • Old Heath Road 	<ul style="list-style-type: none"> • no locations
PM Peak	<ul style="list-style-type: none"> • Butt Road, St Johns Street, B1025 Mersea Road, and A134 Magdalen Street. • A134 Northern Approach Road. 	<ul style="list-style-type: none"> • B1022 Shrub End Road/Boadicea Way/Norman Way • Military Road/Bourne Road/Old Heath Road • A133 Clingoe Hill/Colchester Road 	<ul style="list-style-type: none"> • no locations

The A12 and A120 both have high V/C (link based capacity issues) and assessment of junction capacity problems are being investigated under current work by National Highways.

2.3 Location Sustainability

The connectivity of spatial sites emphasises the potential for sustainable travel by leveraging existing connections. A comprehensive review has been conducted at the Middle Layer Super Output Area (MSOA) level to understand which MSOA's offer the most sustainable locations for new developments.

The below table outlines the categories used to score each of the MSOA's, with the detailed scoring shown in Appendix B.

Based upon a rating where red equals 1, orange equals 2 and green equals 3, each MSOA has been given an overall score. The highest scores represent the most sustainable locations for developments, where there is the greatest opportunity for sustainable transport. These findings by MSOA are shown in Figure 2-2 below – noting the redder the colour the worse the level of sustainability from a transport perspective; and the greener the better.

Despite the rating of the MSOA, spatial options will need to be reviewed on a case by case basis, reflecting their proximity to MSOA borders and future transport network changes. It should be noted that the assessment was only undertaken for the MSOA areas where spatial options have been proposed. These exclusion are shown as white areas in Figure 2.1.

Table 2.2: Criteria for High Level Review

		Red	Orange	Green
Land Use	Health/ Retail/ Key Employment	No attractions in bordering MSOA's	Attractions on the border of the MSOA	Within MSOA
	Key attractor within 2km	No key attractors	One or 2 key attractors	All 3 key attractors
	Key attractor within 5km	No key attractors	One or 2 key attractors	All 3 key attractors
Public Transport	Connection with high frequency bus network	No bus connection	Connection with low/medium frequency	Connection with high frequency / RTS
	Proximity to rail station	More than 1km	Between 500m-1km	Within 500m
	Potential for bus connectivity improvements	No potential	Moderate potential	High potential
Active Travel	Connection with existing/committed cycle routes	No connection	Within 1km of a designated cycle route	Directly connected to a designated cycle route
	Propensity to cycle to the city centre	No propensity to cycle	Moderate propensity to cycle	High propensity to cycle
	PRoW to transport/key attractors	No PRoW	Moderate connectivity	Direct connectivity
	Potential for active travel improvements	No potential	Moderate potential	High potential

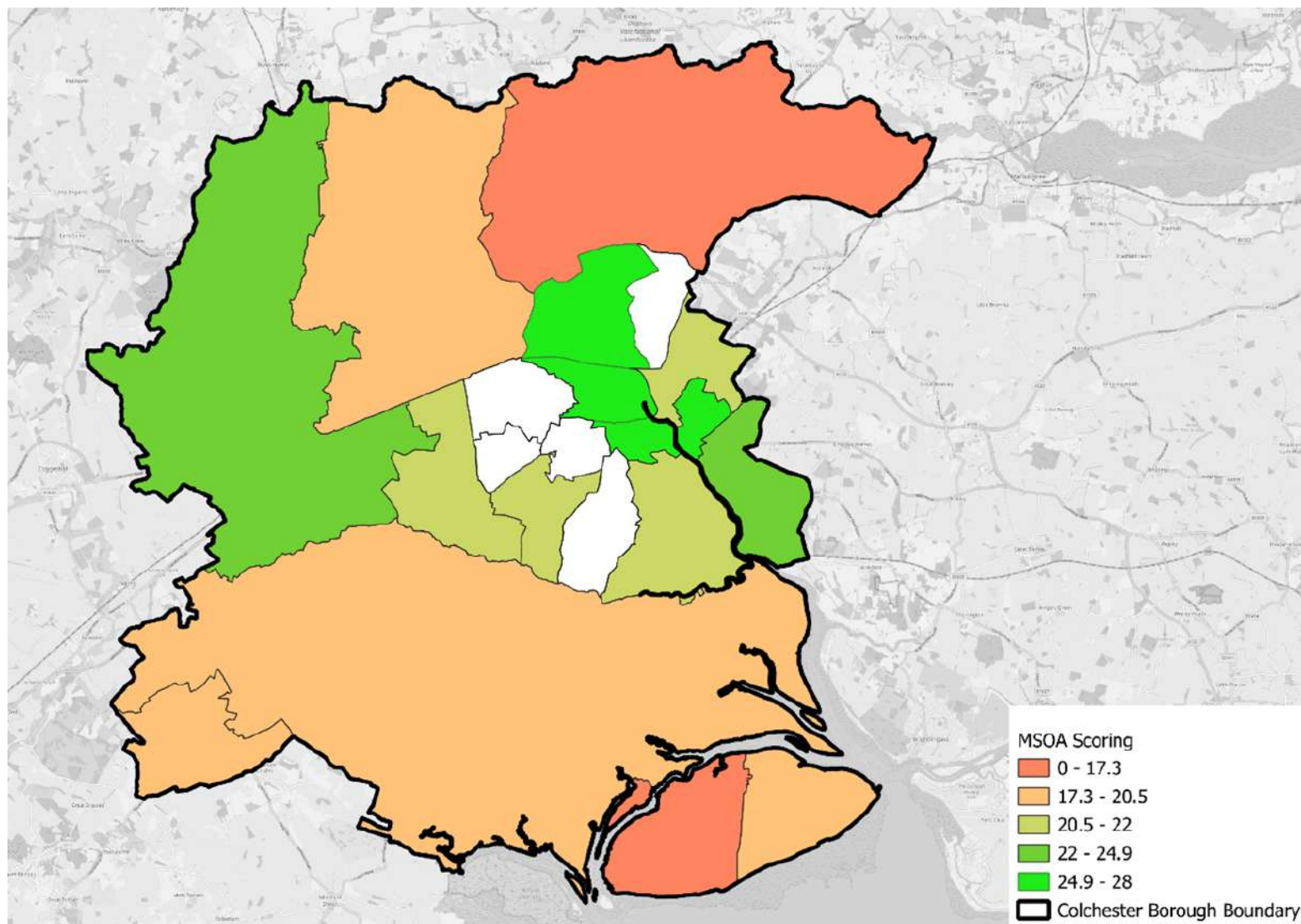


Figure 2.1: Sustainable Locations for Development by MSOA

3 Long-List Spatial Options

3.1 Introduction

Colchester City Council provided Essex Highways with a long-list of potential housing allocations across its council area as outlined in Appendix C noting the sites and quantum of homes. Figure 3.1 shows the location of the spatial options and their proximity to public transport routes.

These options were subsequently refined by CCC following consideration of highway impact, sustainable transport potential and other non-transport criteria as detailed in Chapter 4 – which informed transport modelling scenarios.

3.2 Highway Assessment of Long List Spatial Options

This long-list of spatial options have been aggregated into four categories for their evaluation:

- Potential Emerging Allocations: Sites with one suggested option of the number of homes that could be built.
- Marks Tey: Development around Marks Tey assessed only, to understand further the potential impact on the A12 and A120, and if development is dependent on the A120 Braintree to A12 scheme.
- Further Growth Options: Sites with low and high options for the number of homes that could be built there.
- Committed Development: Developments in the current adopted Local Plan

For a high-level assessment of the impact on existing transport networks, the assessments have been undertaken based upon MSOA boundaries and the subsequent combined impact of development. Appendix D presents the emerging sites by MSOA.

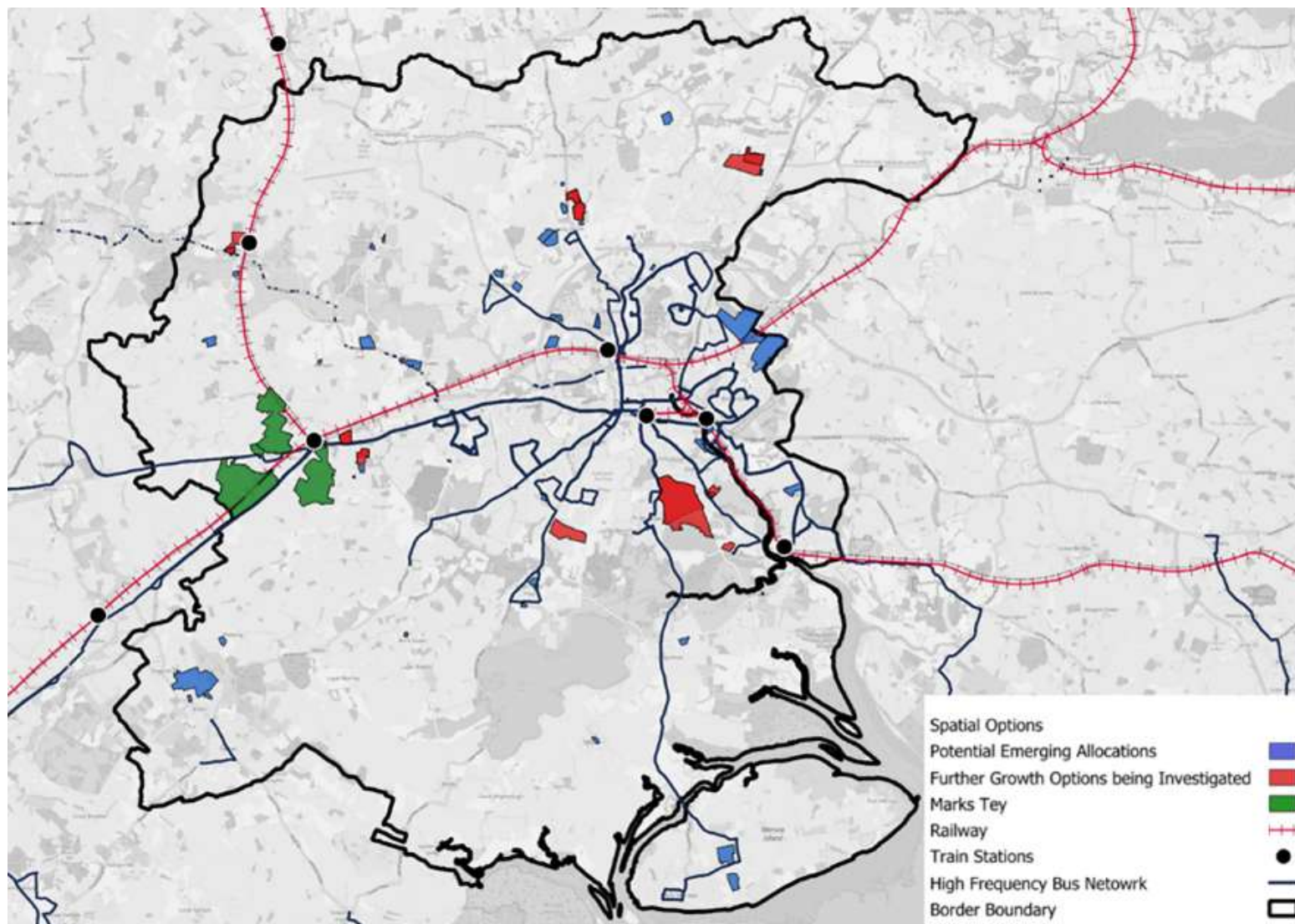


Figure 3.1: Location of Spatial Options

3.3 Trip Generation

For all four categories, the trip generation has been calculated using the same method. Car, public transport, and active travel trips have been estimated for each development using trip rates and then grouped by MSOA.

Trip rates have been extracted from the Trip Rate Information Computer System (TRICS) database. The user classes considered were cars, bus passengers, rail passengers, cyclists, and pedestrians. Time periods were divided into AM peak (07:00-10:00), inter-peak (10:00-16:00), and PM peak (16:00-19:00). To calculate daily trips, 10% of the AM peak was assumed as off-peak. Although NTEM 8 data for Colchester indicates that off-peak traffic across all modes is around 20% of the AM peak, we opted for a more conservative assumption and estimated off-peak traffic at 10% of the AM peak. Only Monday to Friday surveys have been selected, and surveys conducted during the COVID period have been excluded.

Different trip rates have been extracted for comparable locations within the study area, referred to as town centre, edge of town centre, suburban areas, edge of town, and neighbourhood centres in TRICS terminology. (Figure 3.2).

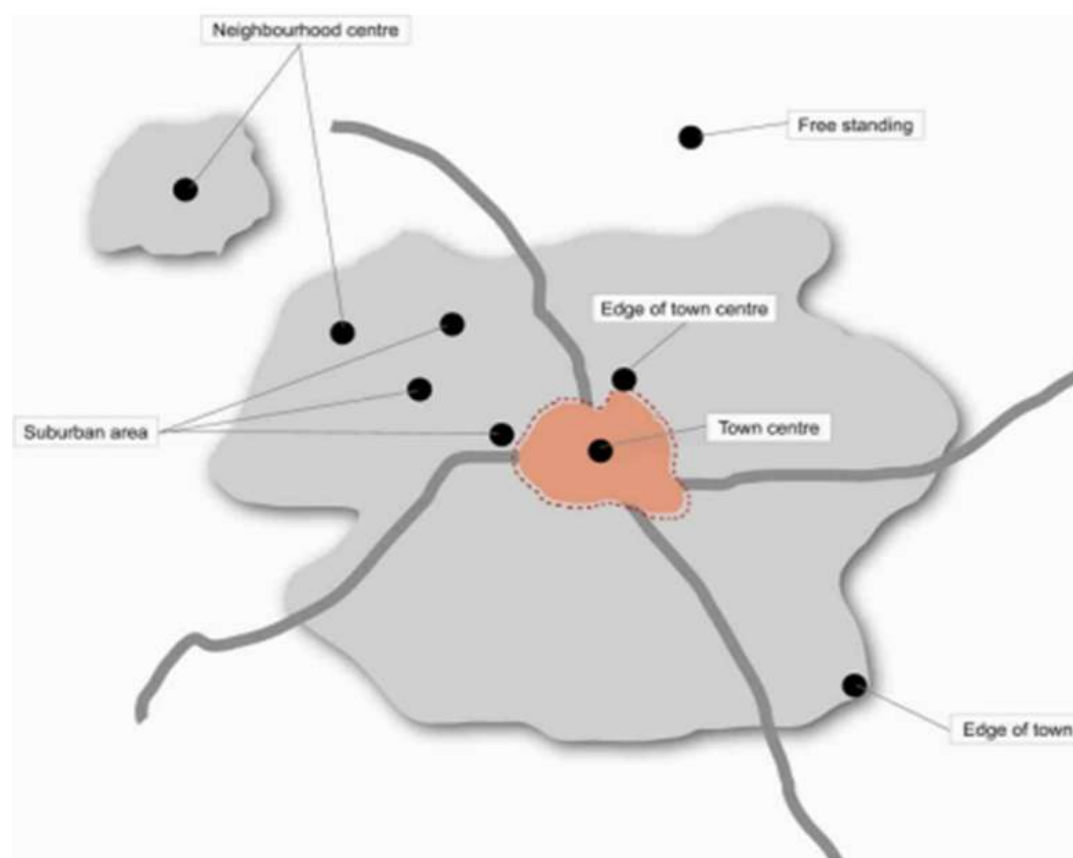


Figure 3.2: TRICS Locations of Developments

3.4 Potential Emerging Allocations

The potential emerging allocations are those on the long-list of spatial options which only have one build out assumption associated with them

Figures 3.3 – 3.5 illustrate the daily car, public transport and active travel trips respectively per MSOA generated by each of the proposed developments.

- **30,000** additional car trips per day could be added to the existing network:
 - Half of these trips are likely to be concentrated around Marks Tey, where both the A120 and A12 are operating close to capacity.
 - Around 9,000 trips are expected to be generated near the city centre, further exacerbating congestion on roads such as the A12, Cymbeline Way, Lexden Road, Ipswich Road, and Mill Road.
- **2,900** additional public transport trips per day could be added to the existing network.
 - The majority of these developments are situated near high-frequency bus services or rail stations, suggesting that investments in sustainable transport options could potentially reduce car trips and alleviate traffic congestion.
- **10,000** active travel trips per day could be added to the network.
 - Colchester's extensive cycling network, including LCWIP routes, provides an opportunity for developments, especially those near the city centre, to encourage cycling as a viable transportation option.

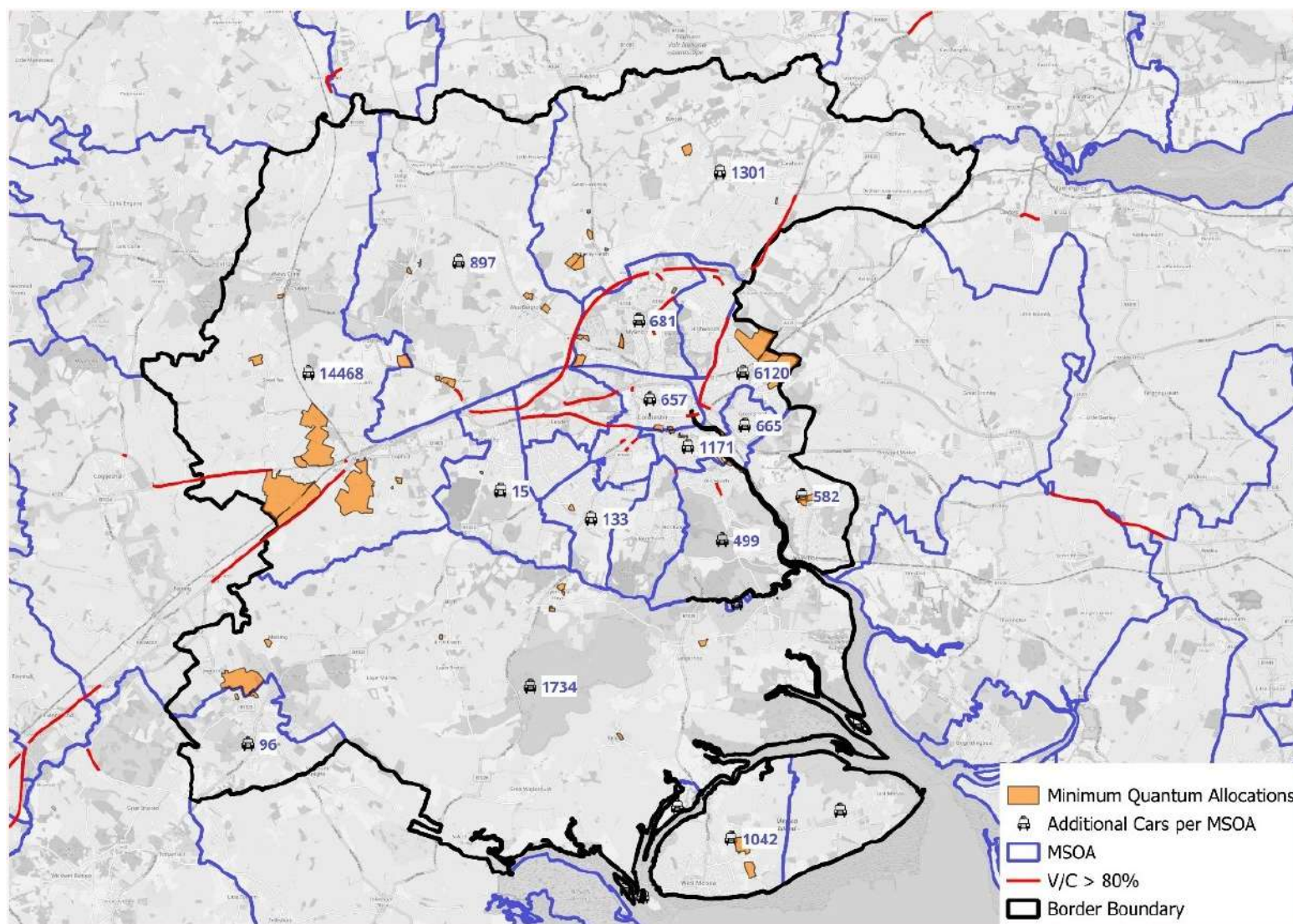


Figure 3.3: Car Daily Trips Generated by the Potential Emerging Allocations

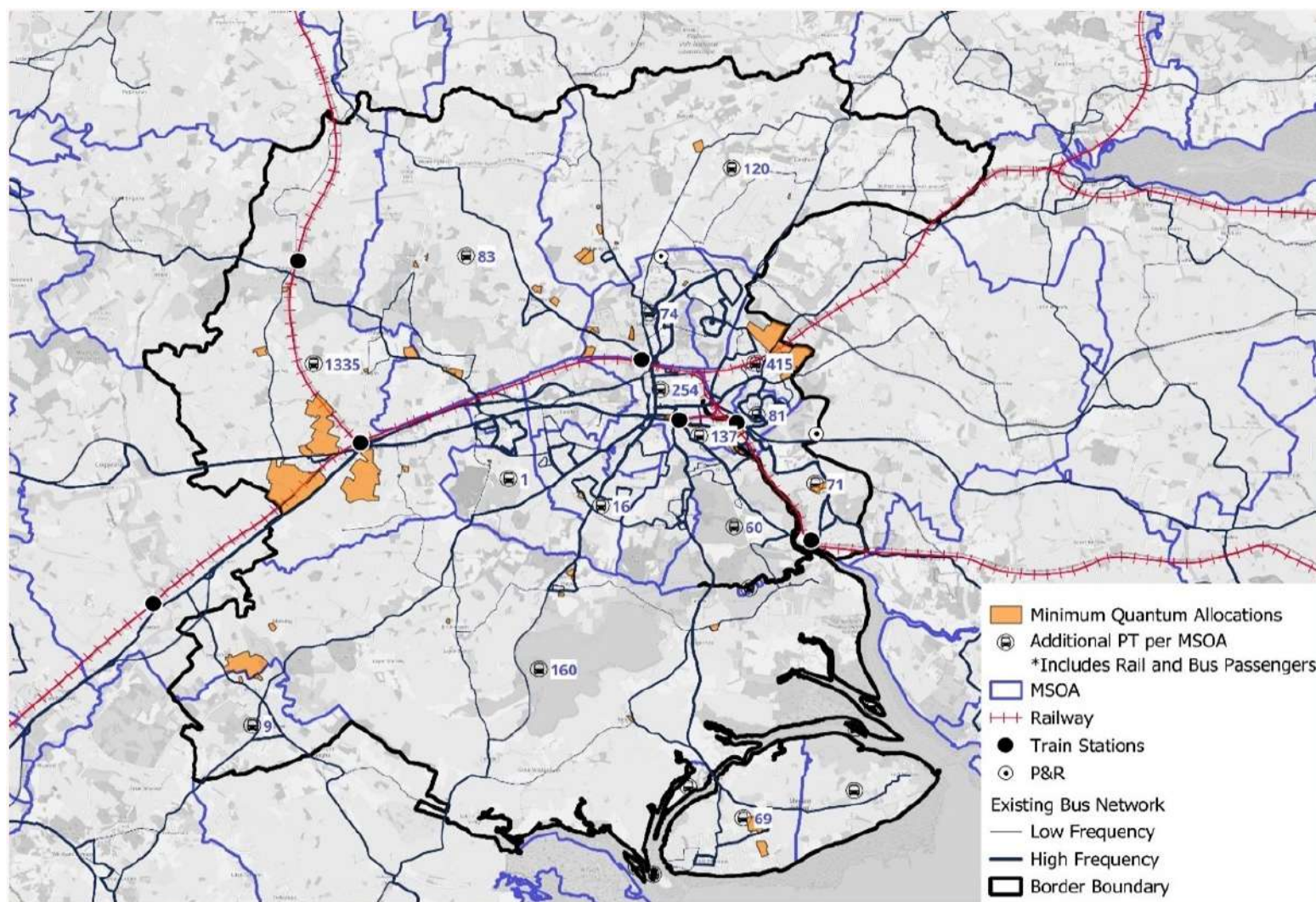


Figure 3.4: Public Transport Daily Trips Generated by the Potential Emerging Allocations

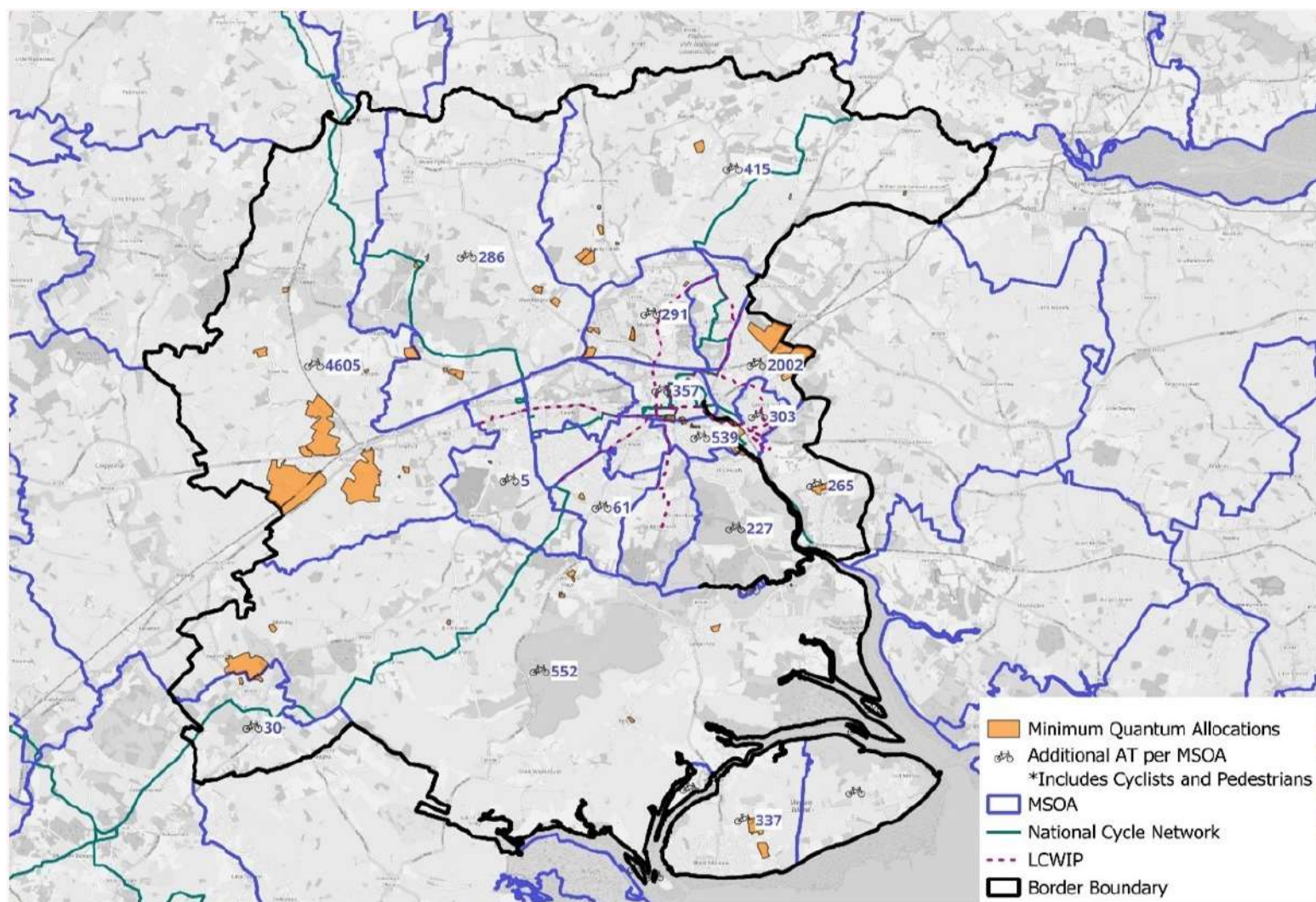


Figure 3.5: Active Travel Daily Trips Generated by the Potential Emerging Allocations

3.5 Marks Tey

Additional assessment was undertaken for the development around Marks Tey, to understand further the potential impact on the A12 and A120, and to understand if development around Marks Tey is dependent on the A120 Braintree to A12 scheme.

The initial trip generation for these developments has been included within the 'Potential Emerging Allocations' evaluation, to inform this enhanced analysis. The initial modelling used the Colchester Transport Model (CTM) with the 2041 forecast year demand since the North Essex Model (NEMo) was under development at the time.

Some alterations were made to the model for its use in this assessment, these are as follows:

- New zone creation for Marks Tey development
- Specific connectors to the A120 and other roads in the vicinity

Scenarios tested to measure the impact of the development are as follows:

Scenario	Year	No. Homes	A120 Braintree to A12 Scheme (Y/N)	A12 Widening Scheme (Y/N)	Analysis
1	2041	1,500	N	Y	Compared with the reference case
2	2041	1,500	Y	Y	Compared with the reference case and assessment without A120 scheme
3	2041	4,000	N	Y	Compared with the reference case
4	2041	4,000	Y	Y	Compared with the reference case and assessment without A120 scheme
5	2041	5,500+	N	Y	Compared with the reference case
6	2041	5,500+	Y	Y	Compared with the reference case and assessment without A120 scheme

Table 3.1: List of Tested Scenarios

The analysis showed that without the A120 Braintree to A12 scheme (Scenario 5), certain sections of the A120 were close to reaching capacity, especially during the AM peak. With the A120 Braintree to A12 scheme (Scenario 6), there was a clear improvement along the existing A120, although there was a slight increase in volume along the A12 between junctions 23 and 25.

Scenario 5 indicated significant increases in journey times along the A120, particularly in the westbound direction into Braintree during the AM peak. Scenario 6 showed significant improvements in journey times along the A120 compared to the reference case, indicating the positive impact of the A120 Braintree to A12 scheme on network performance.

Comparing scenarios with and without the A120 Braintree to A12 scheme demonstrated that the A120 Braintree to A12 scheme is important for accommodating the maximum number of dwellings (5,500+ homes) without causing significant delays and capacity issues on the network.

3.6 Further Growth Options being Investigated

The further growth options are those on the long-list of spatial options which have more than one build out assumption associated with them. The assessment of these options will inform Colchester City Council's decision-making process regarding the inclusion of these developments in the emerging Local Plan and the appropriate level of growth for each site.

Table 3.2 outlines the further growth options being explored, each with two scenarios: low and high.

Table 3.2: Further growth options being investigated

Site	Low	High
South Colchester		
Land south of Berechurch Hall Road	500 homes	800 homes
Place Farm	15 homes	80 homes
Middlewick	600 homes	1000 homes
Chappel and Wakes Colne		
Land north A1124/Land west of Station Road	35 homes	75 homes
Copford		
The Car Boot field/Land North London Road	30 homes	50 homes
Land East of School Road	50 homes	175 homes
Great Horkesley		
Woodlands Farm/Black Brook Farm	158 homes	400 homes
Langham		
Land south School Road/Land north of Park Lane	100 homes	450 homes
Rowhedge		
Rowhedge Business Park	40 homes	100 homes

Figure 3.6 illustrates the car, public transport, and active travel trips generated by the further growth options, considering both low and high scenarios.

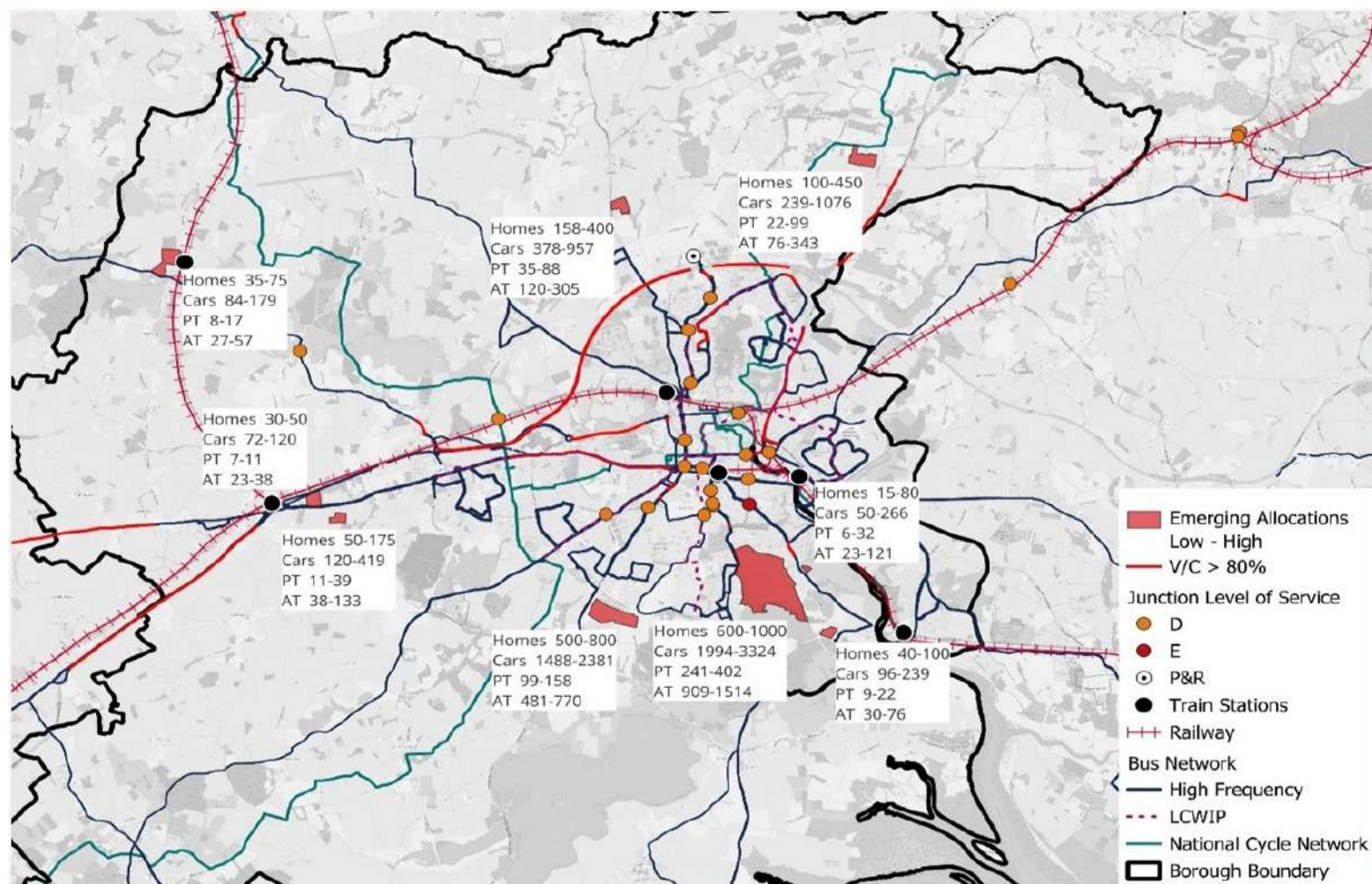


Figure 3.6: Trips Generated by Further Growth Options

An assessment of the trip generated at each of these developments has been undertaken to understand their impact on both the local and wider highway networks.

The following factors have been considered as part of this analysis:

- nearby growth,
- highway network,
- public transport network, and
- active travel network.

Most developments are relatively small-scale, so their impact on the local highway network is likely to be limited, even if they are close to congested roads like the A12. However, the cumulative impact of all developments could lead to increased traffic, particularly in Colchester city centre.

Two large developments in south Colchester, especially the one near Old Heath Road, which is already congested in some sections, will require more attention.

It is suggested that for all of the nine sites, the higher build out quantum is taken forward, but only if robust sustainable transport measures are put in place to mitigate both local and wider highway issues.

3.7 Committed Developments

To fully understand Colchester's growth, we have considered the combined impact of both emerging allocations and committed developments outlined in the adopted Local Plan, since together will drive Colchester's overall growth.

Figures 3.7 - 3.9 illustrate the combined daily car, public transport and active travel trips generated by both the potential emerging allocations, further growth options and committed developments.

- 46,000 daily car trips on the network, with committed developments accounting for an additional 16,000 trips.
 - a significant number of car trips is observed, particularly in areas near congested roads in Colchester (approximately 18,000 daily car trips in or close to city centre).
 - Additional trips exacerbating already congested highway links and reducing the operational efficiency of road junctions
- 4,000 daily public transport trips
 - the proximity of many of these developments to the public transport network suggests that investments in sustainable transport options have the potential to significantly decrease car travel and mitigate traffic congestion.
- 10,000 active travel trips per day to the network.
 - the developments located within or near the city centre, have the potential to capitalise on walking and cycling infrastructure by promoting cycling as a viable transportation option with shorter travel distances to key attractors.

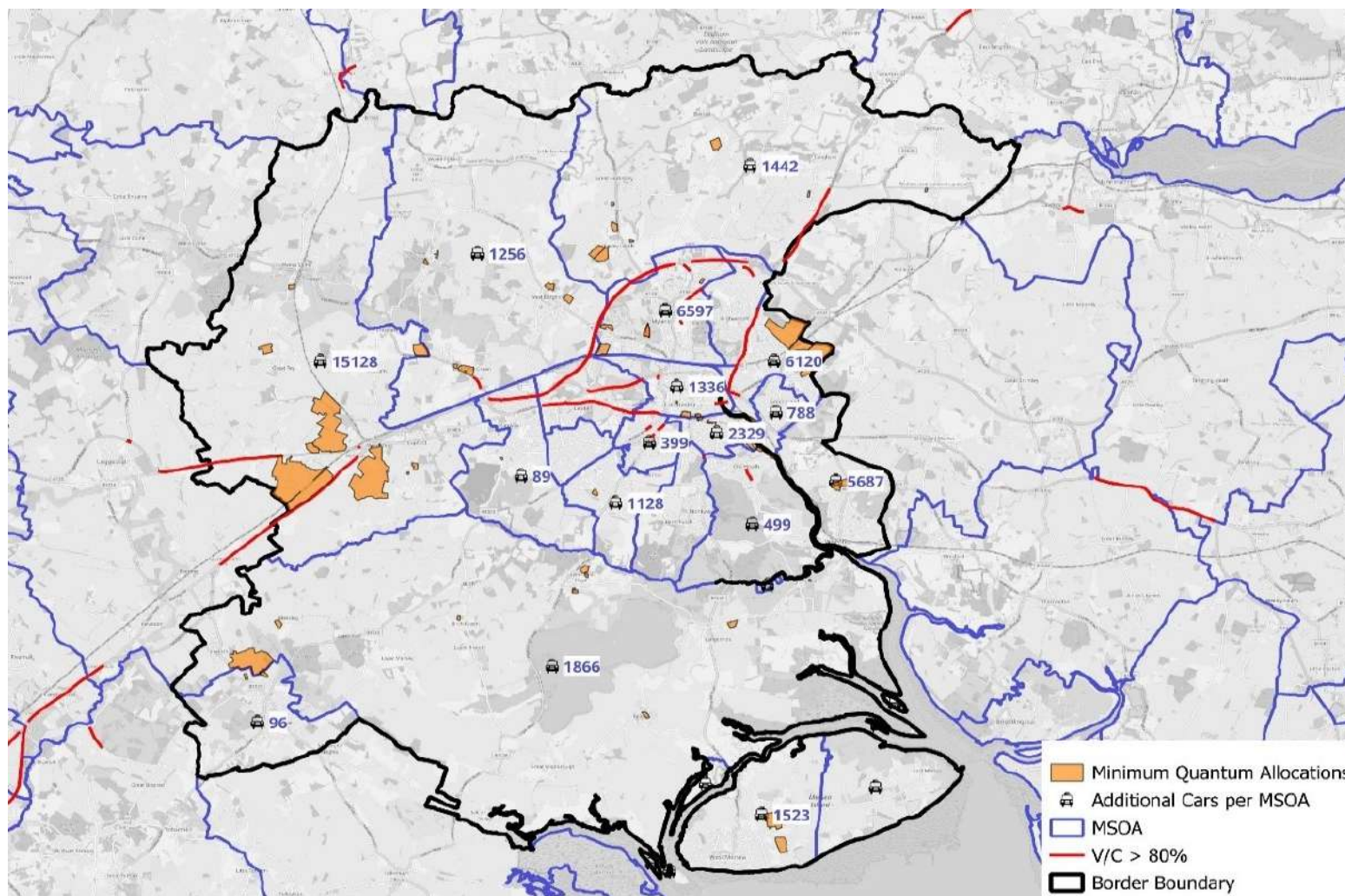


Figure 3.7: Car Daily Trips Generated by the Potential Emerging Allocations and Committed Developments in the Adopted Local Plan

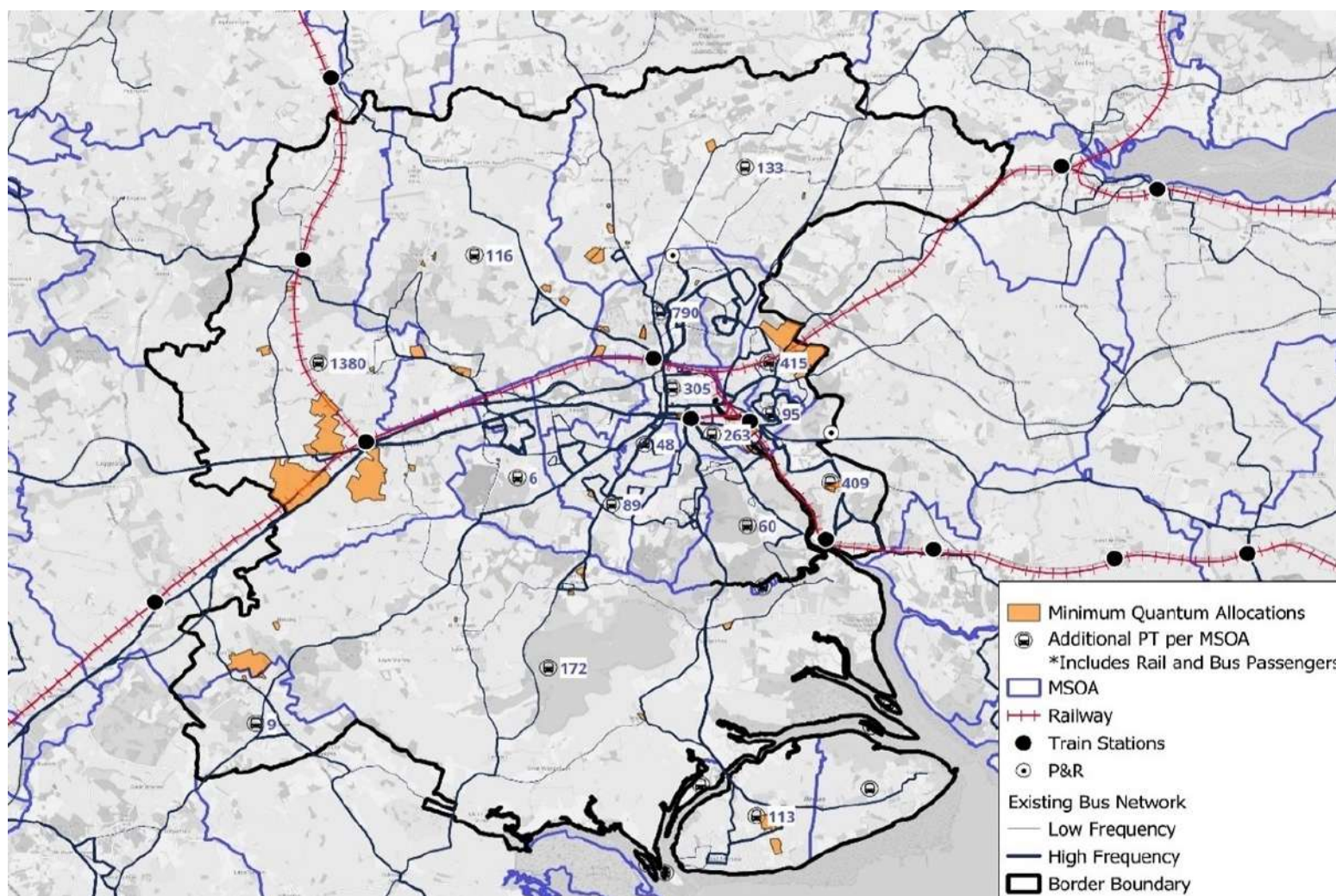


Figure 3.8: Public Transport Daily Trips generated by the Potential Emerging Allocations and Committed Developments in the Adopted Local Plan

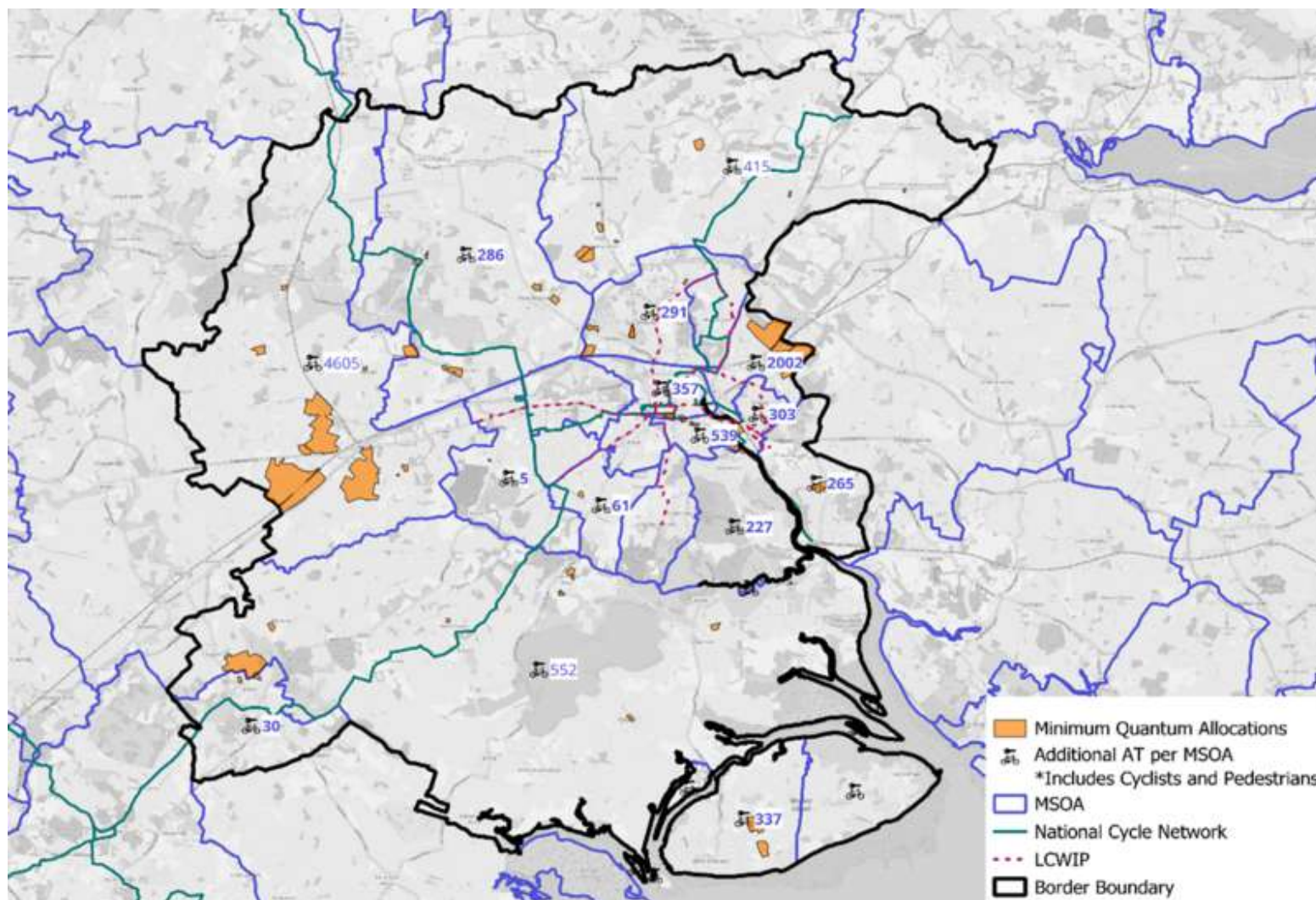


Figure 3.9: Active Travel Daily Trips Generated by the Potential Emerging Allocations and Committed Developments in the Adopted Local Plan

It is suggested to actively review investments in public transport and active travel links alongside both committed and emerging developments, considering the significant potential increase in car trips under business as usual.

3.8 Sustainable Connectivity of Long-List Spatial Options

The assessment of sustainable connectivity has been undertaken in two stages:

- MSOA connectivity assessment: Conducting a high-level assessment of the connectivity of each MSOA for sustainable travel options.
- Detailed site review: Conducting a detailed review of sites with over 150 homes to identify potential for sustainable travel improvements.

The outcome of these assessments will be to understand whether the emerging allocations are situated in the most sustainable location, and secondly to identify any sustainable mitigations which would support increased housing quantum – in line with the Essex Well Designed Neighbourhood concept.

The maps used to inform this analysis are shown in Appendix F.

3.9 Detailed Site Review

Mitigations have been examined in greater detail for sites exceeding 150 homes, grouped with the associated additional developments in proximity to these locations. This thorough analysis ensures that potential impacts are comprehensively addressed, promoting sustainable and well-integrated community growth. The outcome of which will support the identification of potential changes in trip generation.

Table 3.3: Grouping of Sites over 150 Homes with other Nearby Developments

Site	Grouped with
26 Land off Bakers Lane	2 Braiswick 27 Land accessible via Chesterwell
20 Britannia Car Park, 12 Vineyard Street	19 Ford Car Showroom 21 Europit & Magdalen Garage Site 58 Robertson Van Hire 5 146 Magdalen Street
15 Gas Works, 16 Land East of Hawkins Road 18 King Edward Quay Industrial Park	18 King Edward Quay 13 Land West of Hawkins Road 24 Derelict Coal Yard Site
3, 75 & 4 Buildings Farm & Land North of Bromley Road & Welshwood Park	
57 The Causeway, 45 The Causeway, 84 Coach Road	40 Park Lane, 56 Boxted Straight Road
68 Godmans Lane, 80 Land South of Marks Tey, 78 Hall Chase	82 The Car Boot field 77 & 66 Land East of School Road
36, 87 Mersea Road,	37 & 86 Place Farm 25 Rowhedge Business Park
40 Park Lane 56 Boxted Straight Road	64 Land south School Road 54 Land opposite Wick Road
8 Colchester Road	
29 Oak Road	31 Highlands
10 Halstead Road	88 Land North Halstead Road
7 Dawes Lane	
28 Berechurch Hall Road	

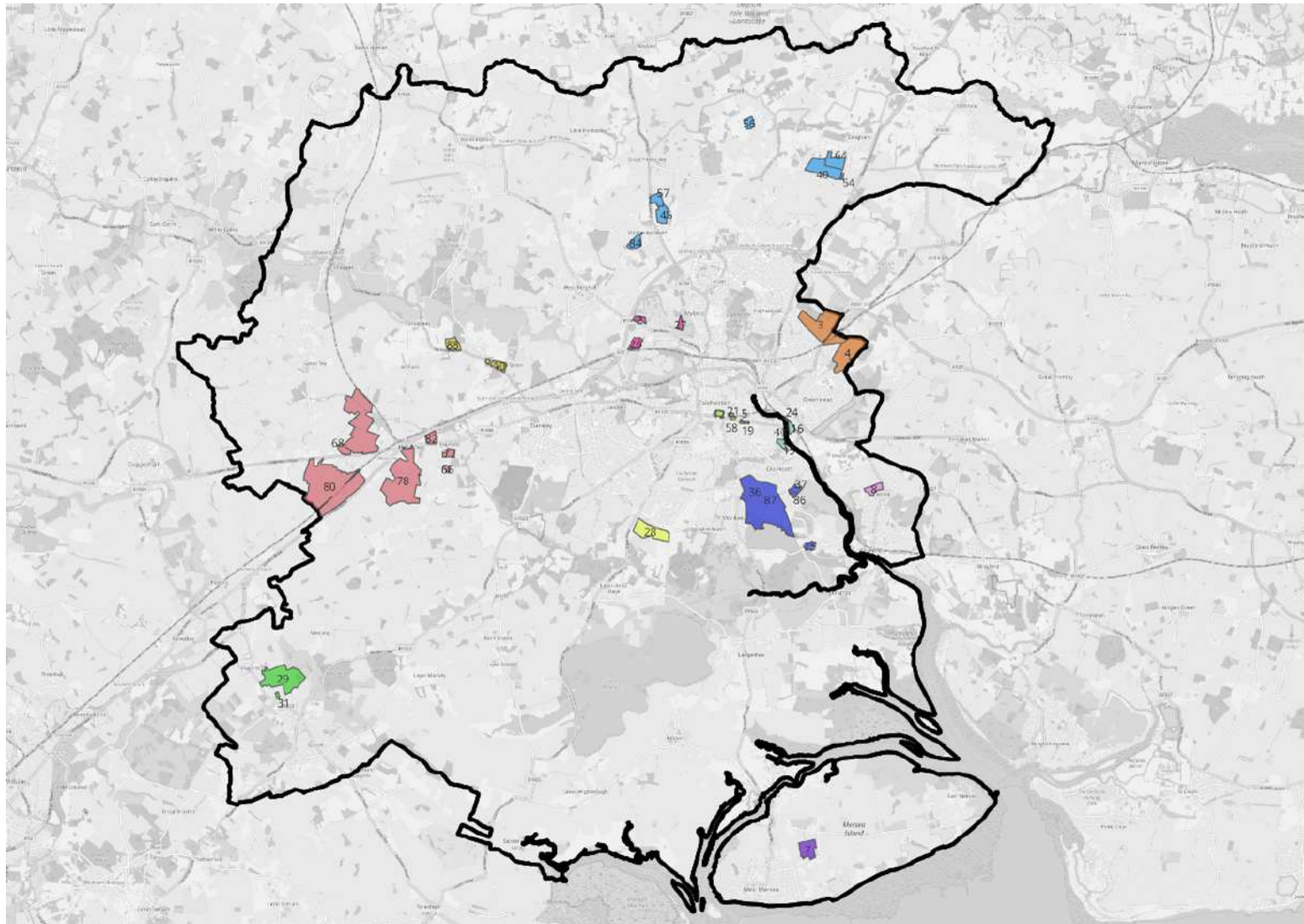


Figure 3.10: Spatial Options

Table 3.4: Identified Mitigation – Public Transport and Active Travel

Sites	PT network	AT network
26 Land off Bakers Lane	<ul style="list-style-type: none"> Need for shelters and bus information at bus stops 	<ul style="list-style-type: none"> Walking access to Bakers Lane bus stop from development - Length 600m Install shared path connecting site to Axial Drive Raised table ped/cycle priority at Three Crows Road Cycle access behind Station Square & access to shared path on SB kerb at North Station
20 Britannia Car Park 12 Vineyard Street	<ul style="list-style-type: none"> Limit or no car parking for residents 	<ul style="list-style-type: none"> Cycle route between St Botolph's and Brook Street
15 Gas Works Site 16 Land East of Hawkins Road		<ul style="list-style-type: none"> Link to NCN & LCWIP & RTS
3 (75 & 4) Buildings Farm & Land North of Bromley Road & Welshwood Park	<ul style="list-style-type: none"> Option 1 - extend exiting routes into development Option 2 - create orbital route connecting either end of the RTS through the site 	<ul style="list-style-type: none"> Walk and cycle LCWIP link to join proposed cycle LCWIPs and develop walking link along this route to connect with amenity centres
57 The Causeway 45 The Causeway 84 Coach Road	<ul style="list-style-type: none"> Extend existing route to circulate around sites 57 and 45 	<ul style="list-style-type: none"> Extension of LCWIP cycle route to connect with development sites
68 Goodmans Lane 80 Land South of Marks Tye 78 Hall Chase		<ul style="list-style-type: none"> Link to LCWIP, Development and School - New footpath and cycle route Extension of LCWIP cycle route to connect with development sites Formalisation of PProW - pinch points, lighting
36 Mersea Road 87 Mersea Road 18 King Edward Quay Industrial Park		<ul style="list-style-type: none"> Formalisation of PProW - pinch points, lighting Extension of LCWIP cycle route to connect with development sites
40 Park Lane 56 Boxted Straight Road 64 Land south School Road 54 Land opposite Wick Road	<ul style="list-style-type: none"> Increase frequency of bus route 	<ul style="list-style-type: none"> Provision of footpaths to both Chapel Road bus stop and School bus stop

Table 3.5: Identified Mitigation – Public Transport and Active Travel

Sites	PT network	AT network
8 Colchester Road	<ul style="list-style-type: none"> Bus stop improvements - inclusive of RTI 	<ul style="list-style-type: none"> Extension of LCWIP cycle route to connect with development sites
29 Oak Road 31 Highlands	<ul style="list-style-type: none"> Bus stop improvements at Windmill Hill (currently only flag and pole, with limited hard standing) Needs purpose built hard standing, shelters, RTI and safe crossing to access stops on both side of road and lighting Needs guard railings and potential speed limit alteration to increase attractiveness of use for pedestrians 	<ul style="list-style-type: none"> Provision of safe cycle routes into Tiptree town centre (consider extension to Kelvedon in time)
10 Halstead Road 88 Land North Halstead Road		<ul style="list-style-type: none"> Potential to branch a new cycle route off the existing planned LCWIP route
7 Dawes Lane	<ul style="list-style-type: none"> New bus routes to connect to Kelvedon mainline station – supporting routes through Tiptree 	
28 Berechurch Hall Road	<ul style="list-style-type: none"> Increased frequency of routes New bus stop serving the site 	<ul style="list-style-type: none"> Connection to the LCWIP route close to the site

3.9.1 Additional Sites Reviewed

Colchester City Council (CCC) identified three additional sites for review outside of the long-list of spatial options, these are as follows:

- Land Off Colchester Road, West Bergholt (100 homes)
 - Reviewed in conjunction with Site **33** Land North of Colchester Road (100 homes) and Site **32** Land between Whitehart Lane and Manor Road (50 homes)
- On a higher frequency bus routes - Bus stops need formalising with shelter and seating. For example, stops need appropriate crossing facilities, footways and lighting (rather than unlit grass verges).
 - LCWIP route 1A extends along Colchester Road, which should be prioritised for delivery in conjunction with development horizons, with high quality links into the developments.
 - A West Bergholt Mobility Hub could be considered.
- Former Telephone Exchange, Station Road, Tiptree (5 homes)
 - No additional sustainable mitigations identified due to size of development
- Land at Colchester Station, Colchester (250 homes)
 - No additional sustainable mitigations proposed, given proximity to RTS, LCWIP corridors and high frequency bus routes. Suggestion for limited parking at this location and car club spaces to support mobility.

In conjunction with this, CCC have altered the potential housing quantum of some sites, which requires detailed review:

- Land North East of Coach Road (85)
 - Initially reviewed in conjunction with sites **57** The Causeway, **45** The Causeway, and **84** Coach Road, which identify the significant mitigations.
 - Additional considerations of further extension of the bus routes, and robust walking and cycling links to connect to extended LCWIP.
- Land at Earls Colne Road (34)
 - 2.5km from Chappel & Wakes Colne Station
 - On a low frequency bus route – 2km from high frequency bus route. Route goes through Marks Tey & with additional demand there could support increased frequency of the existing bus route. Look at timing buses between scheduled rail connections with Marks Tey to support connectivity.
 - Walking and cycling to rail station and high frequency bus route unlikely, due to rural nature of the site – but prioritisation of the secondary cycle route from LCWIP plans could support an increase in cycling between Wakes Colne and Marks Tey
- Land West of Station Road (47)
 - Close proximity to Chappel & Wakes Colne station – on the Gainsborough branch line connecting to Marks Tey

- Ensure high quality walking and cycling to the station and the A1124 (part of the LCWIP Secondary route)
- Close to a high frequency bus corridor
- Consider mobility hub infrastructure at The Street bus stops in conjunction with the General Store
- Land South of Marks Tey Village (78) & Tey Green (80)
 - Initially reviewed in conjunction with sites **68** Goodmans Lane, **82** The Car Boot field, and **77** & **66** Land East of School Road.
 - The housing quantum has reduced from the initial analysis. It is likely that in this plan period, the RTS mitigation would not be viable, given the reduced demand, but the additional bus services would remain beneficial to these communities. The RTS would increase in viability should more housing be built in this location in future plan periods.

Employment sites have also been added to the spatial options for review. There are nine sites across the council area. Table 3.6 lists these sites and the identified public transport and active travel mitigations to support access.

Name of Site	Employment Jobs	Association with housing options	Sustainable Travel Mitigations	
			Public Transport	Active Travel
Bullbanks Farm	678	No nearby housing spatial options		<ul style="list-style-type: none"> • Cycle link connecting along Halstead Rd connecting the LCWIP & to RTS extension
Wakes Hall Business Centre	3057	47, 60, 35	<ul style="list-style-type: none"> • New bus route between Wakes Colne, Great Horkesley and Marks Tey • Provision of bus stops outside the business centre – seating, shelter, lighting and appropriate crossing point 	<ul style="list-style-type: none"> • Cycle route between station/mobility hub and employment site • Provision of a Wakes Colne mobility hub
Knowledge Gateway	1604	No nearby housing spatial options		<ul style="list-style-type: none"> • Walking and cycling routes into the Garden Community - not currently part of LCWIP plans
Maldon Road	1701	No nearby housing spatial options	<ul style="list-style-type: none"> • Provision of bus stops outside the business centre – seating, shelter, lighting and appropriate crossing point 	<ul style="list-style-type: none"> • Extend LCWIP route 2 to the site & prioritise delivery of 2B in conjunction to link with RTS extension to Marks Tey
Colchester Business Park	3057	No nearby housing spatial options	<ul style="list-style-type: none"> • New bus route 	<ul style="list-style-type: none"> • Extend LCWIP 1 to continue along the secondary LCWIP route through the business park • Severalls Mobility Hub
Axial Way	3087	No nearby housing spatial options	<ul style="list-style-type: none"> • New bus route 	<ul style="list-style-type: none"> • On secondary LCWIP route – would need prioritising to connect to RTS & LCWIP route • Cycle route connecting to P&R site
Land South of Factory Hill	1041	No nearby housing spatial options	<ul style="list-style-type: none"> • Bus frequency upgrades & connectivity to Kelvedon station & Colchester 	<ul style="list-style-type: none"> • Cycle route along B1023 into Tiptree and connecting with spatial options on the other side of the town. • Tiptree Mobility Hub
Land South of A12 and north of proposed new route of A12		80	<ul style="list-style-type: none"> • Bus routes accessing within the developments 	<ul style="list-style-type: none"> • Cycle & walk routes from Station, RTS and LCWIP route to access employment area • Employment area Mobility Hub
Land at Patterns Yard			<ul style="list-style-type: none"> • On a high frequency bus route, no viability to route past site on Nayland Road • If accessible from Colchester Road - provide new bus stop - shelter, seating, RTI, lighting and appropriate crossing point 	<ul style="list-style-type: none"> • Extension of cycle route along Nayland Road to join the LCWIP 1A route and bus services • West Bergholt Mobility Hub

Table 3.6: Employment Site Sustainable Transport Mitigations

3.9.2 Sites with Little or No Sustainable Travel Mitigation Options

This section of the report identifies sites with limited or no sustainable travel mitigation options. These sites have been evaluated based on their accessibility to public transportation and proximity to high-quality cycle routes. The analysis highlights the challenges and limitations associated with each site in terms of promoting sustainable travel.

- **71** Land at Kelvedon Road - This site is not on a bus route and is located away from potential high-quality cycle routes, making it difficult to promote sustainable travel options.
- **69** Land off New Road, **50** Land East of Plummers Road, **51** Land at Moat Road, **34** Land at Earls Colne Road, **81** Picketts, and **52** Land South Long Road West - These sites are situated on a low-frequency bus corridor with little opportunity to improve public transportation provision. Additionally, they are located at a considerable distance from key amenities, further limiting the potential for sustainable travel options.
- Former Telephone Exchange, Station Road, Tiptree – this site is small and located in the centre of Tiptree.

Reviewing the trip generation associated with these sites, it is considered that they will have a minimal effect on the wider transport network with cumulative car trips of approximately 185 per day.

- Sites **69**, **34**, **51** & **50** to access key facilities in Colchester would likely use the A1124 where no clear issues are identified using the traffic model for increased vehicles on the network.
- Site **34** could also utilise the A120 where there are greater constraints on the highway network, however up to 75 trips are unlikely to have a significant additional effect on top of those trips added by Marks Tey development
- Site **71** to access facilities are most likely to head to Kelvedon, but if accessing Colchester would have limited impact on the highway network
- Sites **81** & **52** are most likely to access facilities in Colchester, however, the low trip generation will have little effect on the highway network.

3.10 Summary

Following the sustainable travel analysis, it has emerged that overall:

- **10** sites have the potential to internalise trips with appropriate facilities
- **14** sites could benefit from bus frequency improvements
- **8** sites need upgrades to access bus stops or bus stop improvements
- **13** sites are walkable/cyclable to the planned RTS halts
- **22** sites are alongside/close to planned LCWIP routes
- **6** sites would benefit from an LCWIP extension
- **10** sites located too far from amenities to reasonably cycle

- 7 sites identified with little or no sustainable travel mitigation options – *although their impact on the highway network will be limited due to the scale of trips generated*

Other supporting mitigations will need to be considered in conjunction with the walking, cycling and public transport network to ensure the greatest success in modal shift for these new developments. These feed into an overall sustainable transport approach.

Land use

- Proximity to key attractors (schools, employment, retail, healthcare) to support *short trip opportunities*
- Develop Well Designed Neighbourhoods to encourage shared and active travel
- Supporting *parking policies and restrictions* within developments and across Colchester
- Mobility Hubs to support *integrated travel* and lower car ownership

Active Travel

- Extend LCWIP network & *prioritised delivery* of routes, with potential *extensions* to developments
- Upgrades to wider walking network
- Cycle/scooter sharing
- Wayfinding

High Quality Public Transport

- Deliver existing planned Rapid Transit System
- Potential *extensions* of the Rapid Transit System
- Improved connectivity to rail stations and opportunities for increased frequency of services
- Frequency of the bus network & where there are opportunities to increase *frequency* or introduce *new routes*

Other supporting measures

- Car clubs
- Resident journey planning on new developments
- Integrated ticketing options

4 Preferred Spatial Options and Transport Modelling Assumptions

4.1 Introduction

Colchester City Council reviewed the outputs and recommendations of the above analysis described in the previous chapter, and combined with their wider work on the Local Plan, developed a set of preferred site allocations to test in the transport model. These sites are shown in Figure 4.1 below.

These preferred allocations are expected to create, approximately, a further 11,000 homes and 11,000 jobs in addition to the committed development growth. To put this in perspective, committed and preferred allocations would grow homes by 20% above the current amount and employment by 16%.

The chapter describes how this growth has been represented. This involved setting up a reference and assessment case models in 2041. The following chapters compare then them to gauge the impact on the highway network.

4.2 Reference Case 2041

4.2.1 Growth

The reference case model for 2041 involved established expected levels of growth in the Colchester City Council area, neighbouring authorities and external areas in the model. In derived reference case demand, the aim has been to reflect recognised approaches to dealing with uncertainty and collaborating with neighbouring planning authorities in line with the NPPF.

The descriptions below refer to NTEM 8 8, which is the core forecast scenario of the DfT's National Trip End Model. It provides a reasonable basis for predicting growth in homes and jobs if there is a gap in local information. It is accessed using a database called TEMPro.

If local information on growth in homes and jobs differs from NTEM 8, we then need to derive alternative demand in trips. TEMPro has a module that allows alternative planning assumptions to be entered to forecast the impact of development on the generation of trips. This feature has been used to provide an estimate of the number of car trips generated by growth in homes and jobs, where necessary.



Figure 4.1: Refined Spatial Options

The table below presents the percentage increase in dwellings and jobs forecast across the council area and its neighbouring districts compared to the base year (2023).

Table 4.1: Increase in Dwellings and Jobs compared to 2023

District	Dwellings	Jobs
Braintree	7%	5%
Colchester	7%	4%
Tendring	13%	12%

The remainder of this subsection provides further information on growth assumptions in each area.

Colchester

For Colchester, the current 2033 Local Plan with the addition of the Tendring Colchester Borders Garden Community (TCBGC) has been used as the basis for the creation of the 2041 reference model. The number of dwellings in the current uncertainty log has been allocated to each MSOA, based on the location of the developments, and integrated into the 2023 NTEM 8 household figures. It is also assumed that for the reference case purpose only, there is no growth in Colchester between 2033 (current local plan) and 2041 (new local plan) other than at the Colchester part of the garden community.

Given that the current 2033 Local Plan for Colchester provides limited employment data beyond the TCBGC, it is reasonable to assume that employment levels in 2041 will remain consistent with the 2033 figures as projected by NTEM 8.

Alternative planning assumptions have been applied in TEMPro 8 (which is the database used to access NTEM 8) to reflect Colchester's adjusted 2041 forecast year. That is, TEMPro has been used to provide an estimate of the increase in trip ends due to the identified growth in dwelling and jobs.

Neighbouring authorities

Background growth in Braintree and Tendring by 2041 has been set to levels predicted in NTEM 8 and includes certain and near certain development and covers the Tendring part of TCBGC. This approach follows modelling best practice, as defined by DfT's TAG guidance in dealing with uncertainty.

Colchester will continue to collaborate with neighbouring authorities Braintree and Tendring in line with NPPF requirements. As Braintree and Tendring develop their Local Plans to reflect NPPF housing targets, it is expected that their transport modelling will be shared with Colchester. This will provide additional evidence for Colchester which could reflect higher levels of growth than predicted by NTEM 8 in Braintree and Tendring.

This approach provides a logical starting point, which can then be moved forwards in efficient and proportionate stages when further information becomes available and is using the best evidence available at the time (December 2024) in accordance with the updated NPPF.

Tendring

For Tendring, the Adopted Local Plan (committed and near certain developments) has

been used to ensure that growth is allocated to appropriate locations. However, the number of dwellings, from the Local Plan, in each MSOA has been proportionally increased to meet NTEM 8 levels.

For employment, a similar approach to households has been applied. However, unlike households where we have adjusted figures to align with NTEM 8, we have not applied an uplift to NTEM 8 for employment. This is because the Local Plan projects higher employment growth than what is predicted by NTEM 8.

Alternative planning assumptions have then been applied in TEMPro 8 to reflect Tendring's adjusted 2041 forecast year to obtain growth in trip ends.

Braintree

For Braintree, given that recent Local Plan allocation information was not available, the NTEM 8 2041 figures have been used as a basis for both households and employment. No adjustments have been made.

Tending Colchester Borders Garden Community (TCBGC)

The TCBGC has been included in the reference case model. 2041 assumptions about the number of dwellings and jobs within the TCBGC have been incorporated into the process described above for Colchester and Tendring. This has involved adjusting relevant MSOAs in both districts to take into account the growth from the garden community.

Outside of the Fully Modelled Area

Elsewhere, NTEM 8 growth factors have been applied.

4.2.2 Reference Case Committed Schemes 2041

As well as identifying growth in trips ends, the reference model reflects changes in the highway network – that is, highway schemes that are reasonable expected to come forward because funding and decisions are in place.

Table 4.2 sets out the committed schemes have been included in the Reference Case models.

Table 4.2: Committed Schemes included in the Reference Case

Committed schemes	A120/A133 Link Road (full Link Road using DPD modelling)
	Chelmsford North East Bypass
	RTS Section A and C
	A12 J19-25
	M11 J8
	Colne Bank Roundabout Improvements
	Axial Way
	Speed limit of 30 mph on Northern Approach + signals
ATF2	Headgate/Crouch St/St John's St/Head Street junction signals
	Head Street - 1 lane NB from the Crouch Street/St John's Street junction
Other schemes	St Botolph's Circus - Stage 3A
	P&R East - TCBGC
	LCWIP4 (Head Street cycle lane; 1 lane northbound from Crouch Street/St John's Street)

4.3 Business as Usual (BAU) Assessment Case 2041

4.3.1 Growth

The assessment case demand reflects the growth in homes and jobs across the preferred site allocations. As for the reference case, TEMPro's alternative planning assumptions' module has been used to estimate the growth in trips.

Since TEMPro has used the core forecast of NTEM 8 to forecast growth in trip ends at site allocations, this reflects a 'business as usual' approach to travel behaviour – which, for the Colchester area reflects a high proportion of trips being made by car (Since the subsequent chapter introduces sustainable travel assumptions, this assessment case is referred to as the BAU assessment case.).

Table 4.3 shows the percentage increase in households and jobs between the reference and the assessment case.

Table 4.3: Increase in Households and Jobs between Reference Case and Assessment Case

	% increase
Households	13%
Jobs	12%

The remainder of this subsection describes assumptions related to housing and employment.

Housing

Table 4.3 sets out the preferred site allocations that have been included the assessment case models. As described, above, growth in trips has been estimated using TEMPro alternative planning assumptions. The additional growth has then been added on top of the reference case demand.

Table 4.4: Preferred Site Allocations

Site Ref	Site Name	No. Dwellings
40	Land north of Park Lane	900
52	Land south Long Road West	15
54	Land opposite Wick Road	10
56	Land North Boxted Straight Road	150
73	The Old School	13
84	Land North of Coach Road	200
85	Land North East of Coach Road	200
10	Land north of Halstead Road	180
32	Land between White Hart Lane & Manor Road	50
33	Land north of Colchester Road	100
50	Land East of Plummers Road	25
2	Braiswick	30
26	Land off Bakers Lane	100
27	Land accessible via Chesterwell (Colchester Golf Club Site 2)	50
12	Vineyard Street Development	100
20	Britannia Car Park	100
22	St Runwald Car Park	40
13	Land West of Hawkins Road	50
16	Land East of Hawkins Road	150
34	Land at Earls Colne Road	125
35	Swan Grove	35
47	Land west of Station Road	200
65	Land East of School Road	300
69	Land off New Road	15
78	Land South of Marks Tey Village	1500
80	Tey Green	1000
88	Land North Halstead Road	250
5	146 Magdalen Street	15
15	Gas Works Site & Allotment	200

Table 4.4 – continued from previous page

Site Ref	Site Name	No. Dwellings
19	Ford Car Showroom	100
21	Europit & Magdalen Garage Site	40
58	Robertson Van Hire	6
76	Lakelands Crescent	5
28.2	Land south of Berechurch Hall Road	875
18	King Edward Quay Industrial Park	200
25.2	Rowhedge Business Park	50
8	Land North of the Fire Station	175
9	View Park	50
29	Land North Oak Road	600
48	Land west The Folley	60
61	The Furze	10
70	Land at Birch Green	15
71	Land at Kelvedon Road	25
72	Land at St Ives Road	25
81	Picketts	5
30	Land adjacent Bonnie Blue Oak	30
31	Highlands	10
7	Land east Dawes Lane	300
3	Buildings Farm	2000
24	Derelict Coal Yard Site	50

Employment

The following table includes the nine employment sites identified by Colchester.

Table 4.5: Employment Sites

Employment site	GFA (ha)
Bullbanks Farm	N/A
Land at Patterns Yard	N/A
Land South of A12 and north of proposed new route of A12, Marks Tey	N/A
Wakes Hall Business Centre	N/A
Land South of Factory Hill	N/A
Knowledge Gateway	4.5
Maldon Road	0.8
Colchester Business Park	1.1
Axial Way	N/A

These are employment sites that are either new allocations or currently vacant. It has been assumed that this includes any unimplemented employment land designated in the Adopted Local Plan.

At this stage, Colchester has assessed the need, supply, and demand for employment land based on land area rather than specific job numbers. Detailed information on the size of individual developments has been only available for three of the nine sites, as indicated in the table above. The total supply of employment land across these nine sites has been estimated to be 31.1 hectares.

To address the uncertainty surrounding land uses, the following assumptions have been made:

- The Knowledge Gateway site (4.5 ha) has been designated as B1a/b (Office) as in the Adopted Local Plan.
- The Maldon Road site (0.8 ha) has been designated as B2 (Industrial Unit) as in the Adopted Local Plan.
- The remaining 25.8 ha of land, where specific land uses are unknown, has been assumed to be divided equally between B1a/b (Office), B2 (Industrial Unit), and B8 (Warehousing), reflecting the most common employment land uses.

To accurately estimate employment potential, further adjustments have been made. Firstly, a 20% reduction has been applied to the gross internal area to derive the net internal area, as recommended by the Employment Density Guide. Secondly, the employment density matrix from the guide has been used to convert site area into an estimated number of jobs. This matrix provides guidance on typical employment densities for different land use types.

The table below presents the total number of jobs estimated to be generated by developments across the different land uses.

Table 4.6: Number of Jobs Estimated to be Generated by the Employment Sites

Land use	Jobs	Proportion
B1a/b (office)	8,733	42%
B2 (Industrial Unit)	2,000	29%
B8 (Warehousing)	1,029	29%
Total	11,762	100%

To ensure the calculated land use proportions were reasonable, a cross-reference has been conducted with data from the "Employment Land and Floorspace" report within the Adopted Local Plan 2017-2033. To inform economic forecasts for some regions including Colchester, the analysis, presented in the report, incorporated data from two models: the East of England Forecasting Model (EEFM) and the Experian model. The table below presents the land use proportions estimated by the two models for 2033.

Table 4.7: Jobs Split Estimates from the Adopted Local Plan

Land use	EEFM	Experian
B1a/b (office)	39%	35%
B2 (Industrial Unit)	24%	25%
B8 (Warehousing)	37%	40%
Total	100%	100%

Given the data limitations, we have assigned equal proportions to B2 and B8 land uses. However, our overall estimates show closer agreement with the EEFM model. The nine employment sites have been distributed across seven MSOAs. To allocate jobs to each MSOA for the assessment case, the total number of jobs generated by these sites has been proportionally distributed among the respective MSOAs. For all remaining MSOAs in Colchester, it has been assumed that employment levels would remain unchanged between the reference and assessment cases.

This approach has led to a similar number of jobs as new homes, which is an aim of the Local Plan. It also provides a useful check that the transport modelling assumptions that have been made are appropriate.

4.3.2 Network

Specific network changes proposed in the Local Plan, such as access arrangements to connect development sites to the wider highway network, have been incorporated into the forecast network, with assumptions detailed when this information has been lacking.

However, no other highway network changes beyond the committed schemes in the reference case have been included in the BAU assessment case. The A120 Braintree to A12 scheme has not been included since there is no commitment from the DfT at the time of writing. The initial strategic modelling at Marks Tey has identified that the scheme will be required to support development at Marks Tey at some point. Since

these initial model scenarios, the quantum of development allocated to the Marks Tey area by 2041 has been reduced by CCC further avoiding the need to include the A120 Braintree to A12 scheme before 2041.

4.4 Conclusion

Using the growth assumptions described in this chapter, 2041 AM and PM peak hour vehicle trips matrices were developed, which include global assumptions for growth in goods vehicles. These were then run in the transport model to compare the BAU assessment case with the reference case.

5 BAU Assessment Case Modelling Results

5.1 Introduction

A version of the new North Essex Model (NEMo) transport model has been used to test and compare the BAU assessment case and reference case growth described in the previous chapter. NEMo has a 2023 base which has been developed from the 2019 Colchester Transport Model (CTM) to reflect changes due to COVID-19 and revalidated using 2023 traffic count data.

Modelling results have been used to compare the two scenarios to understand the potential impact of the preferred site allocations on the highway network. Flow difference plots and speed plots were extracted from the models. These were exported to analyse changes of traffic patterns and identify potential links or junctions that might show poor performance in the future.

To provide a sense of scale, the preferred housing and employment site allocations are forecast to add approximately 7,000 car trips to each of the AM and PM peak hours using the BAU travel behaviour assumption.

5.2 BAU Assessment Case Findings – AM Peak Hour

5.2.1 Flow Difference – BAU vs Reference Case, AM

Figure 5.1 illustrates the flow differences between the BAU and Reference Case scenarios during the AM peak. While the A12 experiences the most significant increase in traffic (160-440 vehicles per hour) between junctions 25 and A12/A131, Colchester also sees notable changes on roads like A134 Westway and Northern Approach Road. The Reference Case scenario highlights queues at several key junctions, including Spring Lane, Colne Bank, Cowdray Ave/Ipswich Rd, and St. Andrew's Ave/Clingoe Hill roundabouts and the A133.

5.2.2 Speed comparison

Speed – Reference Case, AM

Figure 5.2 illustrates speed performance during the AM peak for the Reference Case scenario, highlighting areas where speeds are significantly reduced compared to free-flow conditions. Notably, the A12 section between junctions 27 and the A12/A133 experiences reduced speeds, particularly between junctions 28 and 29. Within Colchester, east-west routes like A133 Cymbeline Way and A1124 Lexden Road exhibit severe congestion. In the north-south direction, A1232 Ipswich Road experiences delays from the A12 to the city centre. Within the city centre itself, A133 Cowdray Avenue and East Hill exhibit the lowest speed ratios, indicating significant congestion.

Speed – BAU, AM

Figure 5.3 shows the speed performance in the AM for the BAU scenario highlighting increased delays in the same locations as the Reference Case. The increase in flow in the BAU scenario has resulted in higher delays along the A12 and roads within Colchester showing a lower speed.

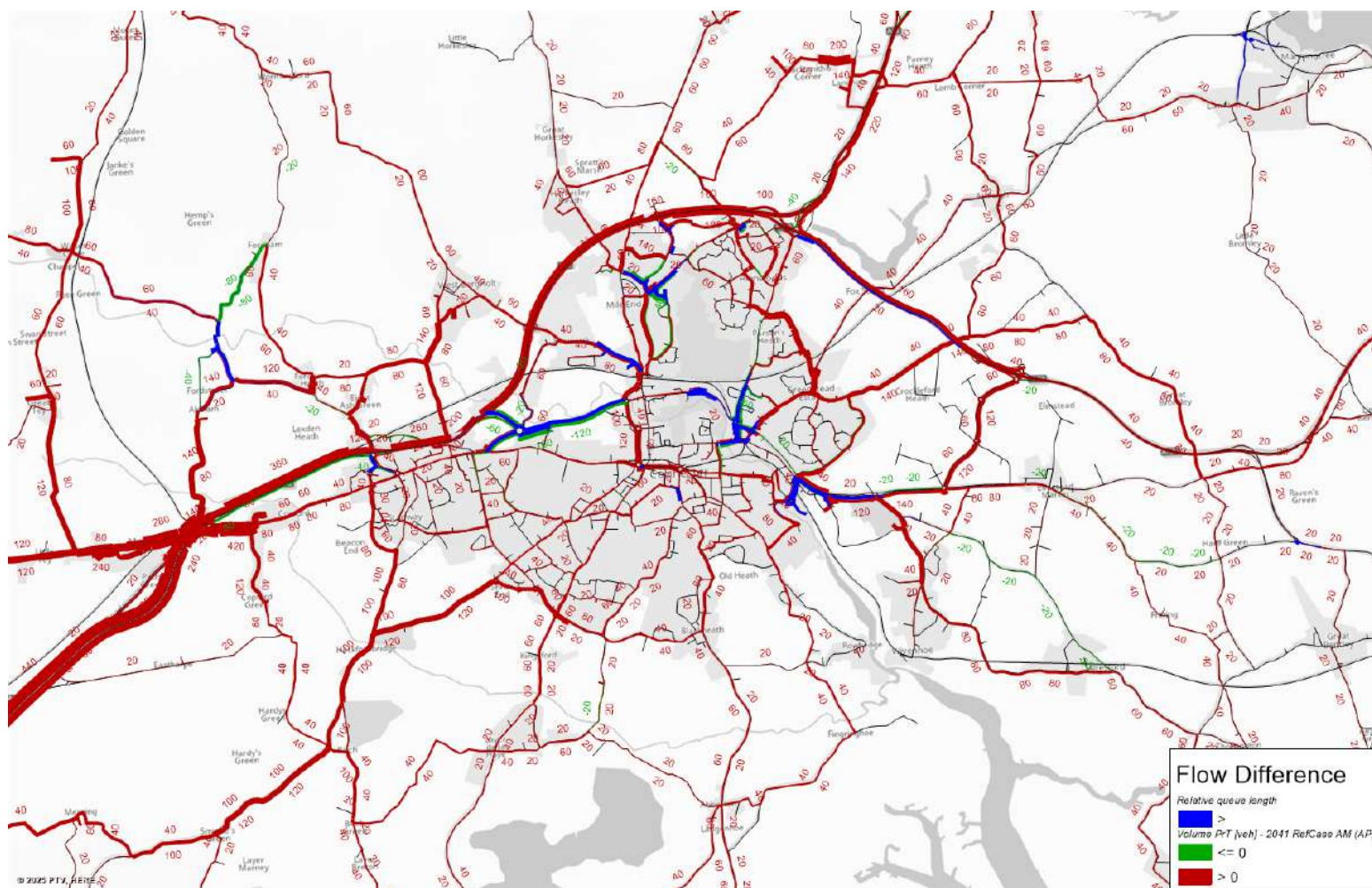


Figure 5.1: Flow Difference BAU vs Reference Case, AM

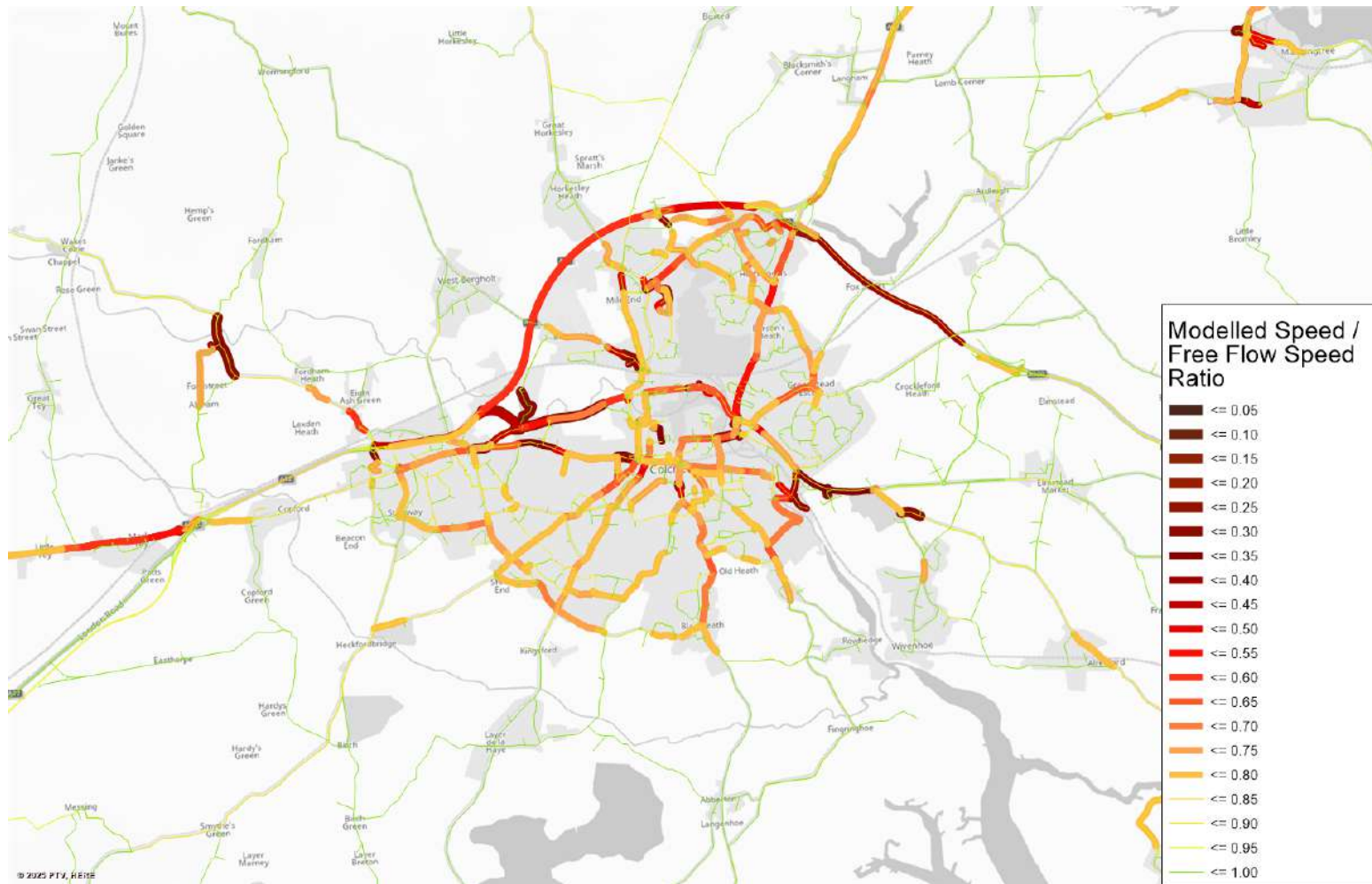


Figure 5.2: Modelled Speed/Free Flow Speed Ratio - Reference Case, AM

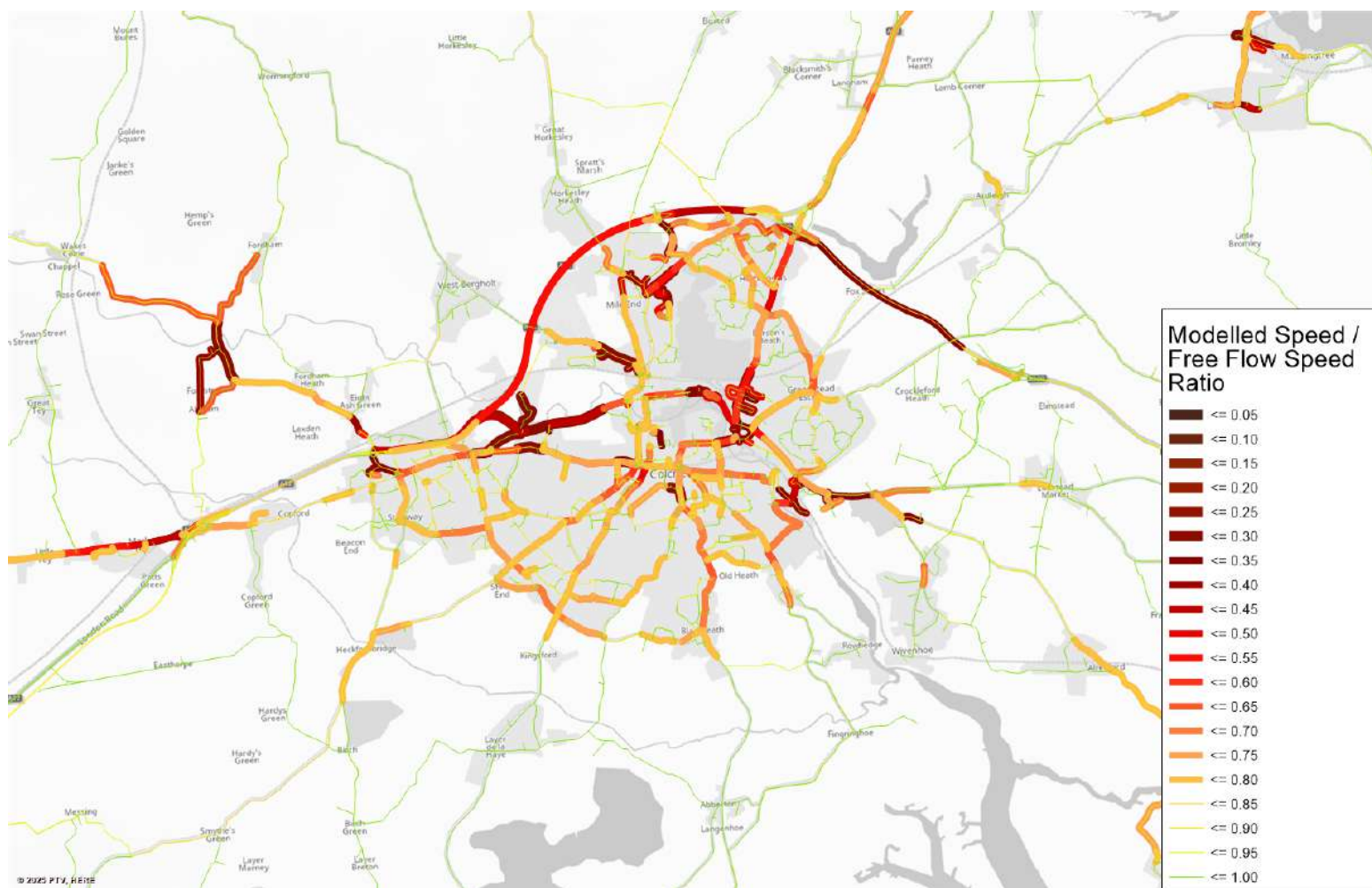


Figure 5.3: Modelled Speed/Free Flow Speed Ratio - BAU, AM

5.2.3 Relative Queue - AM

Relative Queue – Reference Case, AM

Figure 5.4 highlights areas of queuing during the AM peak for the Reference Case scenario. Notable congestion is observed along the A133 Cymbeline Way eastbound, extending from Colne Bank Roundabout to Spring Lane Roundabout. Additionally, delays are evident along the B1058 Bergholt Road southbound approaching N Station Roundabout. Furthermore, congestion is observed along the A133 Clingoe Hill on the approach to Greenstead roundabout.

Relative Queue – BAU, AM

Figure 5.5 highlights that the BAU scenario results in an increase in queue lengths compared to the Reference Case scenario, particularly at the junctions previously identified in the Reference Case: Spring Lane Roundabout, Colne Bank Roundabout, N Station Roundabout (B1508), and Clingoe Hill. Additionally, the BAU scenario introduces a new congestion point along Mill Road, with queues extending from the Mill Rd/A134 Northern Approach junction to the Mill Rd/Turner Rd junction, and further congestion on the A133 St Andrew's Avenue.

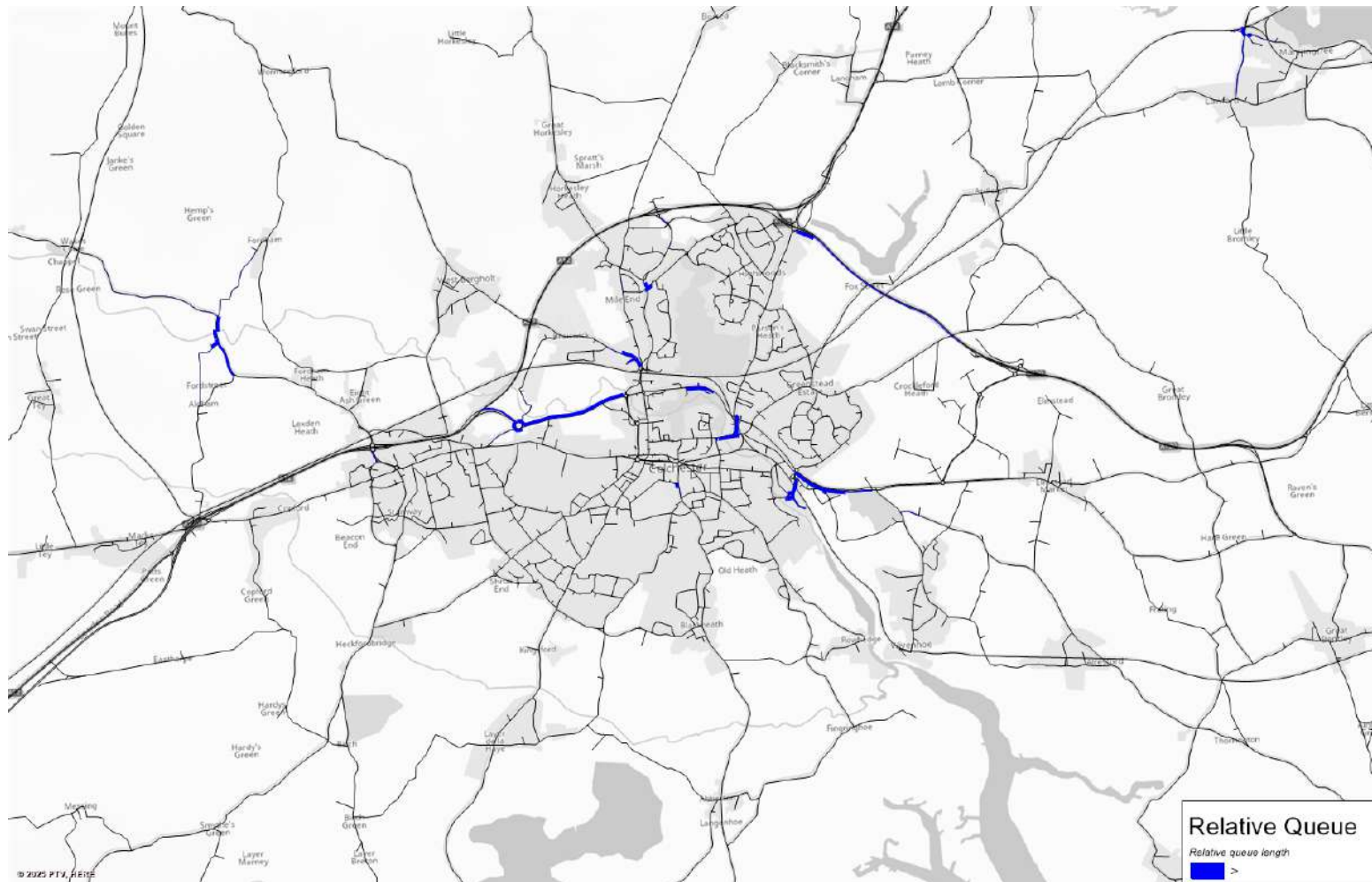


Figure 5.4: Relative Queue, Reference Case, AM

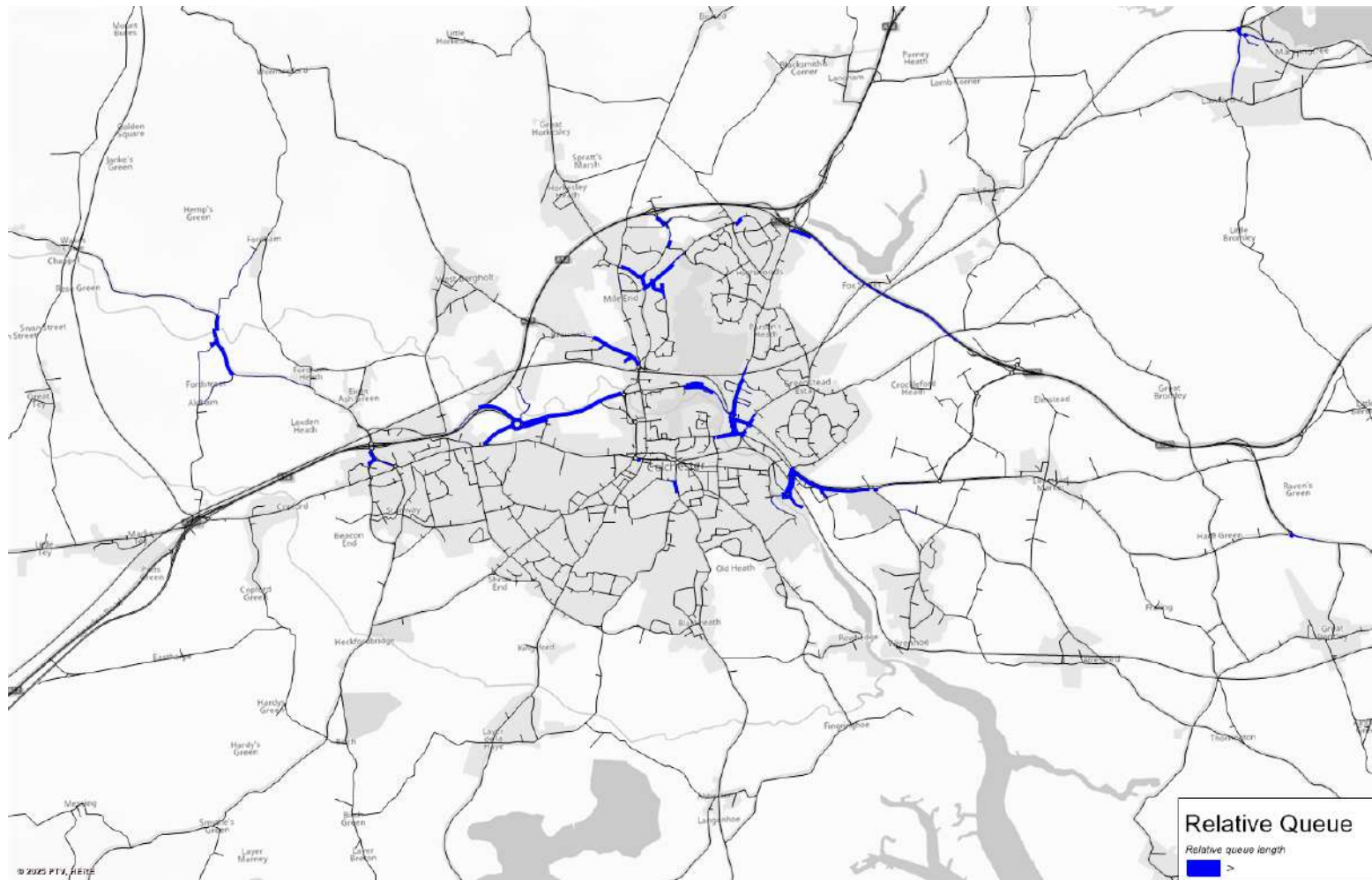


Figure 5.5: Relative Queue, BAU, AM

5.3 BAU Assessment Case Findings – PM Peak Hour

5.3.1 Flow difference – BAU vs Reference Case, PM

Figure 5.6 illustrates the flow differences between the BAU and Reference Case scenarios during the PM peak. While the A12 experiences the most significant increase in traffic (200-440 vehicles per hour) between junctions 25 and A12/A131, Colchester also sees changes, with 40-120 additional vehicles on roads like A134 Westway and Northern Approach Road. The Reference Case scenario highlights queues at several key junctions, including Colne Bank Roundabout, Cowdray Ave/Ipswich Rd Roundabout, and St. Andrew's Ave/Clingoe Hill roundabouts.

5.3.2 Speed Comparison

Speed – Reference Case, PM

Figure 5.7 shows the speed performance in the PM for the Reference Case scenario highlighting faster speeds than the AM. The roads with slower speeds are consistent with the AM including the A12, A133 Cymbeline Way, A133 Cowdray Ave, A1124 Lexden Road, A1232 Ipswich Road, and East Hill.

Speed – BAU, PM

Figure 5.8 shows the speed performance in the PM for the BAU scenario highlighting delays in the same locations as the Reference Case. The increase in flow has caused higher delays along the A12 and roads within Colchester. However, the A12 shows a faster speed during the PM compared to the AM.

5.3.3 Relative Queue Comparison

Relative Queue – Reference Case, PM

Figure 5.9 highlights areas of queuing during the PM peak for the Reference Case scenario. Notable congestion is observed along the A133 Cymbeline Way eastbound and A133 Colne Bank Avenue westbound at Colne Bank Roundabout. Additionally, delays are evident at the East St/Ipswich Rd junction. Furthermore, congestion is observed around Greenstead Roundabout.

Relative Queue – BAU, PM

Figure 5.10 demonstrates that the BAU scenario results in a significant increase in queue lengths compared to the Reference Case scenario. Congestion is observed at all the junctions previously identified in the Reference Case, with increased delays. Additionally, the BAU scenario introduces new congestion hotspots, including Mill Road (extending from the Mill Rd/A134 Northern Approach junction to the Mill Rd/Turner Rd junction) and other key routes such as Via Urbis Romanae, A1232 Ipswich Road, and Severalls Lane. The congestion also worsens around Greenstead Roundabout.

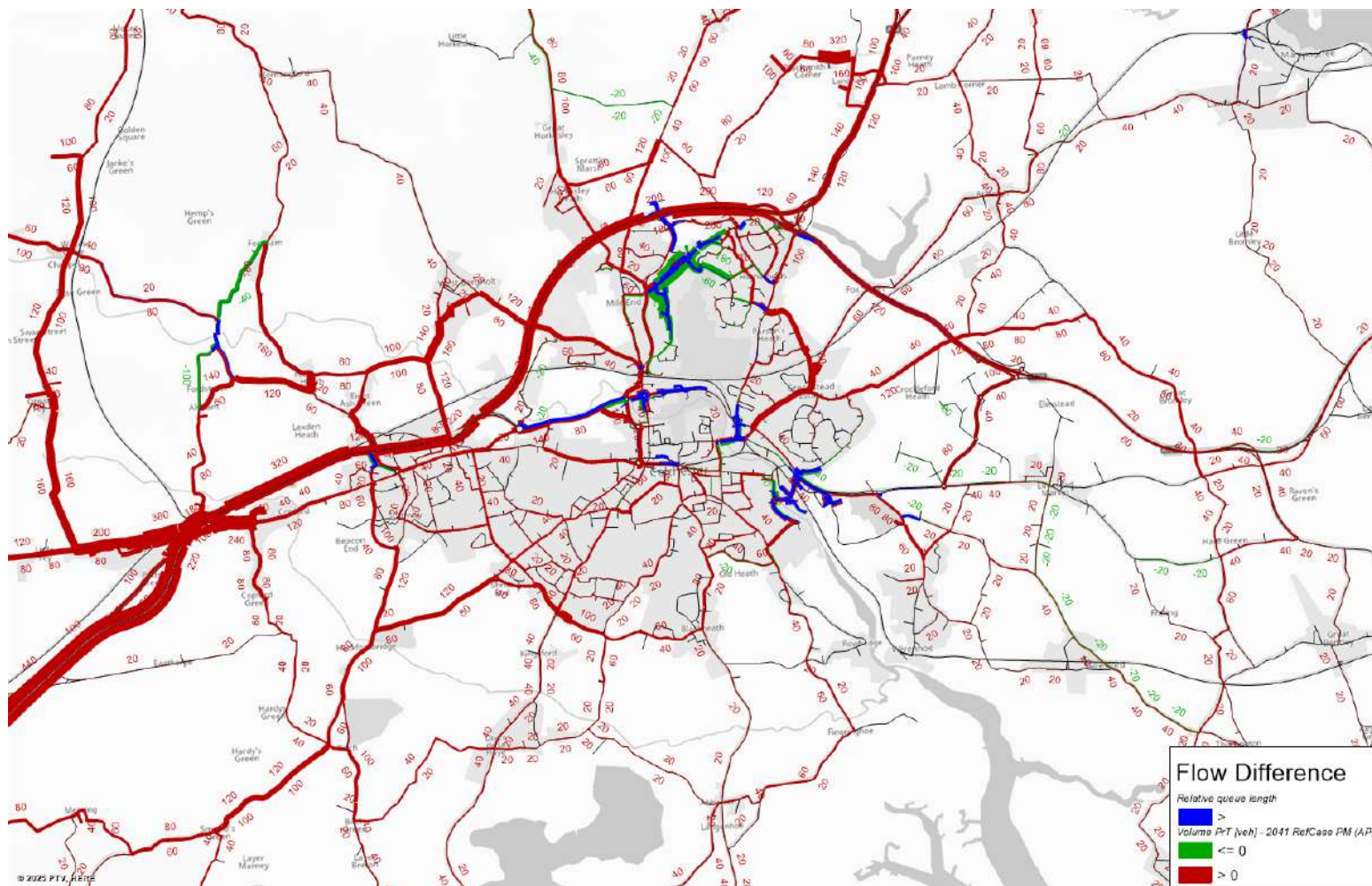


Figure 5.6: Flow Difference BAU vs Reference Case, PM

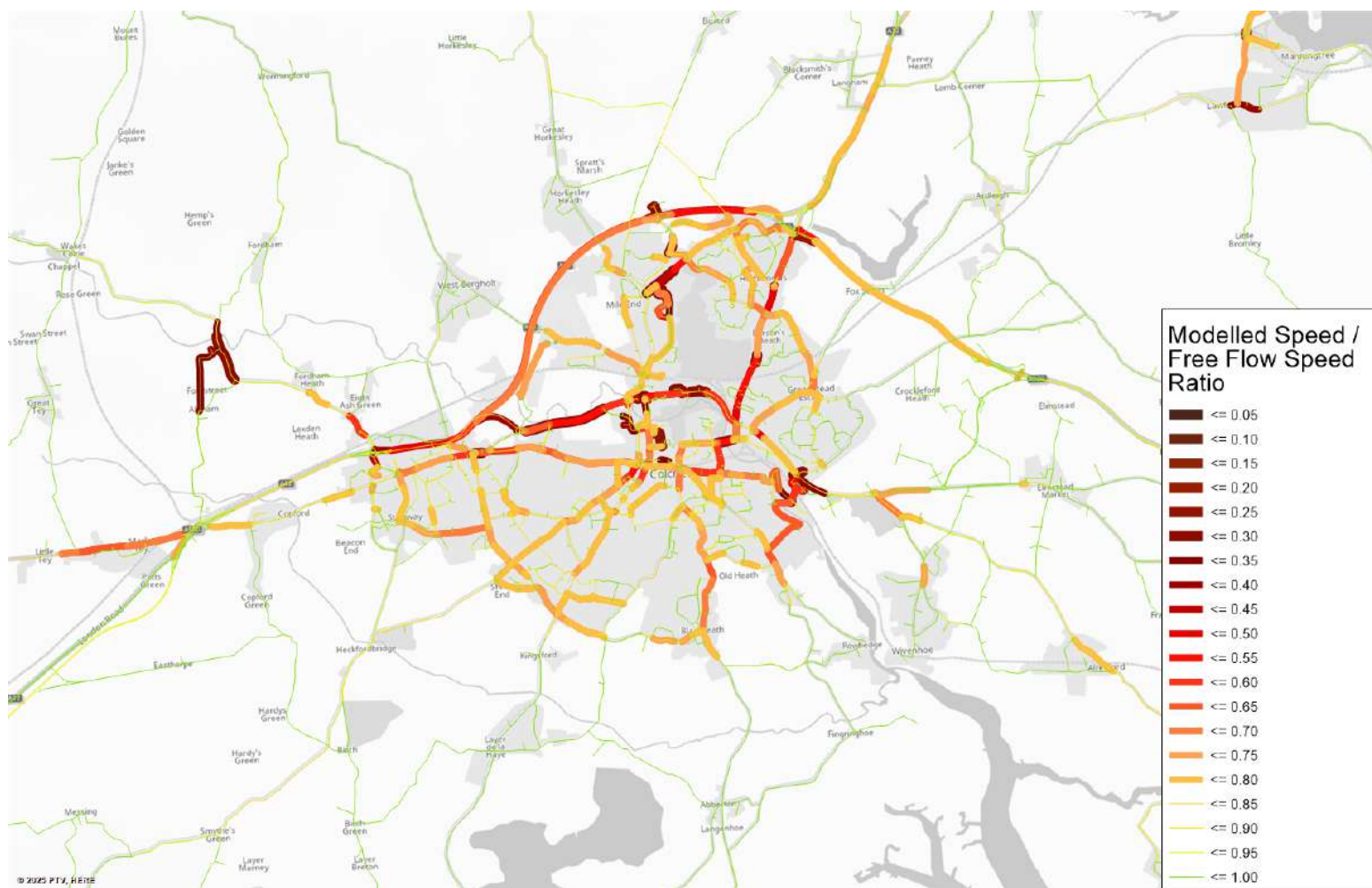


Figure 5.7: Modelled Speed/Free Flow Speed Ratio - Reference Case, PM

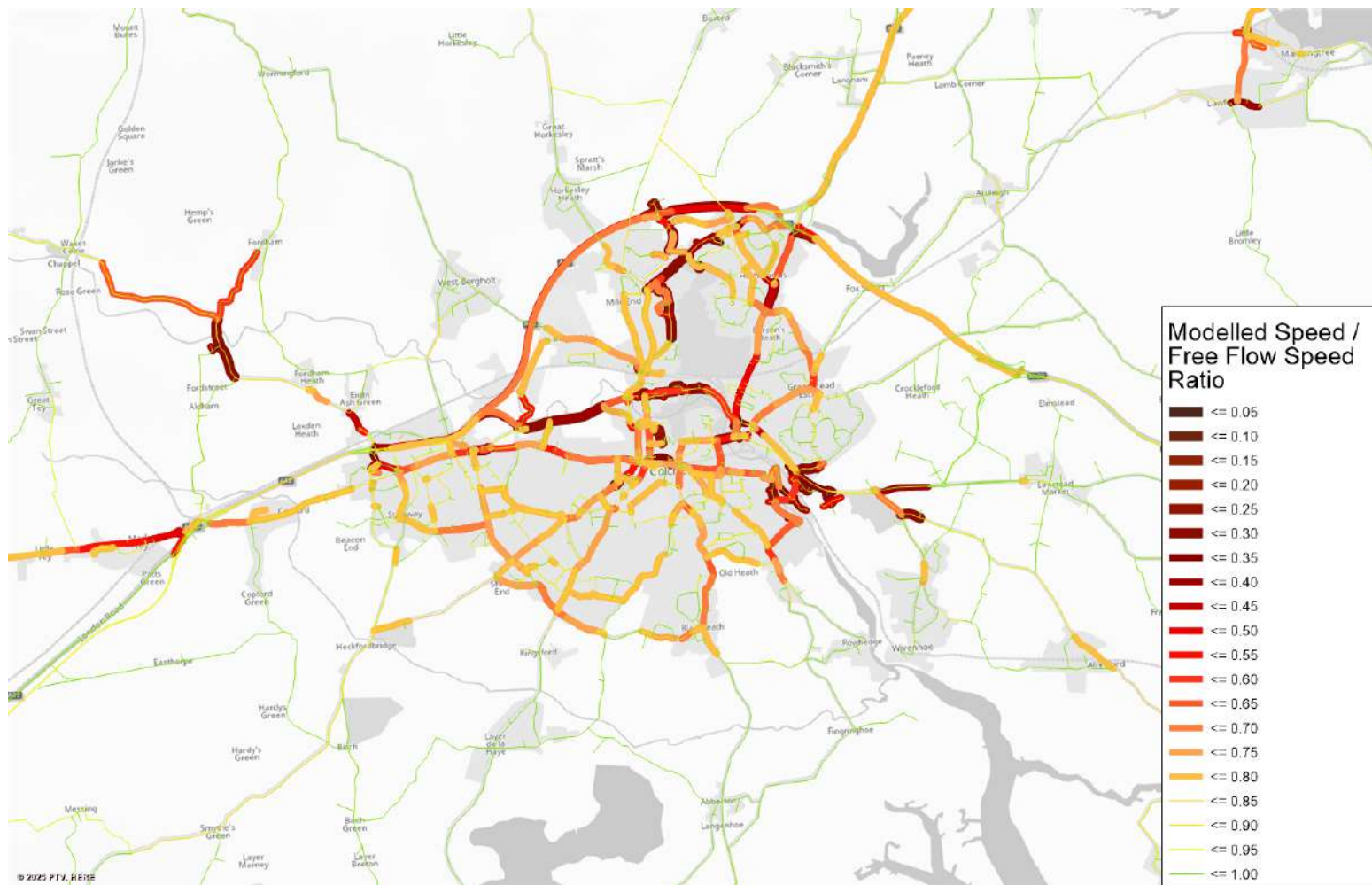


Figure 5.8: Modelled Speed/Free Flow Speed Ratio - BAU, PM

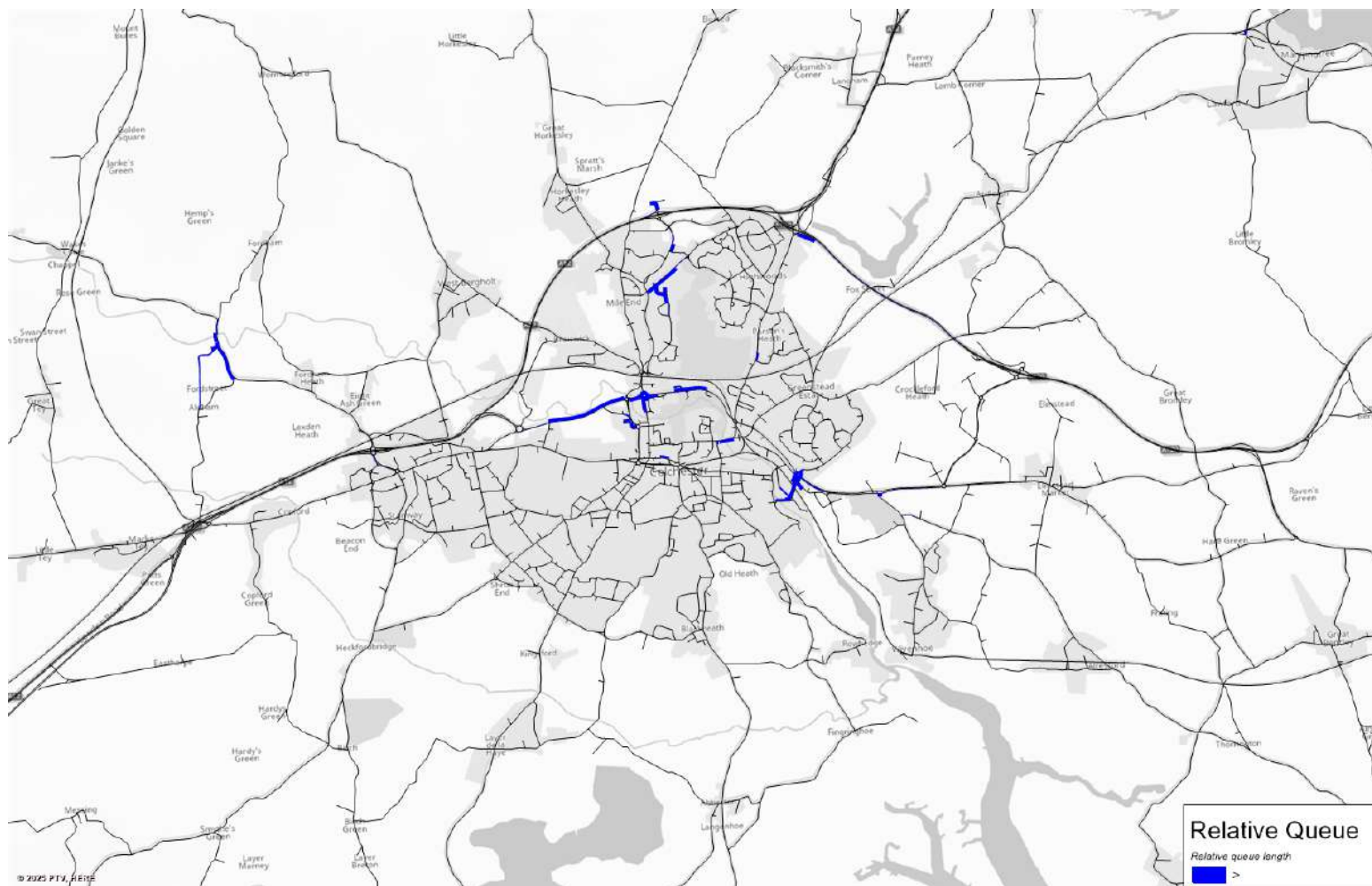


Figure 5.9: Relative Queue, Reference Case, PM

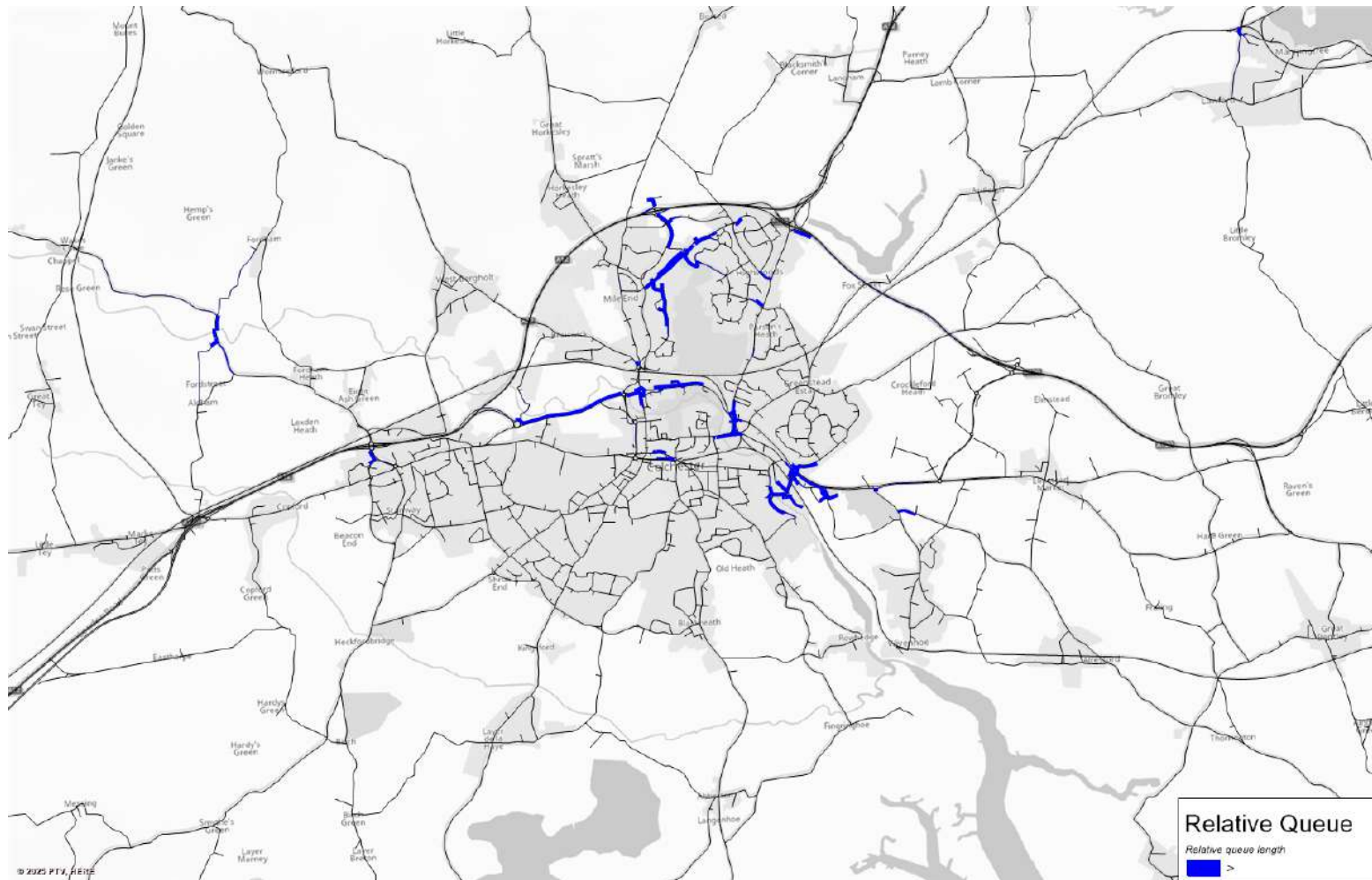


Figure 5.10: Relative Queue, BAU, PM

5.4 Conclusion – BAU Assessment Case v. Reference Case

The Reference Case scenario indicates an acceptable traffic situation, albeit with known congestion hotspots. However, the BAU scenario including the preferred site allocations of around 11,000 homes and 11,000 jobs paints a more concerning picture which would likely be unacceptable from the perspective of highway authorities. Traffic congestion could spread beyond existing hotspots on local and strategic roads; and impact the performance of sustainable transport, such as at East Hill, affecting cycling, bus and RTS alternatives.

Accordingly the next chapter explores an approach to mitigation which explores the contribution of sustainable transport solutions as well as highway capacity enhancements.

6 Approach to Mitigating Transport Impacts of Preferred Site Allocations

6.1 Introduction

The previous chapter concluded that the level of BAU car travel generated from the preferred site allocations would likely lead to an unacceptable impact on the highway network when added on top of reference case demand. This chapter considers whether and how the impact could be mitigated.

In line with NPPF the mitigation approach should consider sustainable transport options ahead of high capacity increases. Hence our first step was to gauge the level of car trip reduction that would be required to reach a level that could, albeit with additional congestion impact, be accommodated on the highway network in the Colchester area.

We identified that the residential and employment site allocations increase car trips to and from the council area by approximately 7,000 trips in both the 2041 AM and PM peaks with BAU travel choices (i.e. 7,000 more car trips in each peak hour above the reference case). Of these trips approximately half are shorter distance trips with a start and finish within the council area; meaning the other half have an origin or destination outside the council area. Furthermore, of all trips about two thirds have a start or finish within the urban area of Colchester.

Given that there are large numbers of local and urban area trips, it was considered reasonable that a number of these trips switch to sustainable modes – noting that there is a greater propensity for cycling and public transport trips for shorter distance trips and those to and or from urban areas. We also recognised that while there are potential further highway improvements, such as the A120 Braintree to A12 scheme that are not yet included in the transport model, these would not be sufficient to mitigate the range of problems across the wider highway network that were identified in the BAU assessment case. Consequently, whilst highway enhancements will make a contribution to mitigation, an integrated approach combined with sustainable travel enhancements would be required.

Given that growth of 7,000 cars trips in each peak hour is considered unacceptable and a sustainable and integrated transport approach is necessary, we identified the level of reduction in car trips that would be required to reach close to an acceptable situation on the highway network. Through an iterative process this was estimated at 3,500 trips – which can be local or longer distance trips (though note that this might reduce if the variable demand model was run which allows drivers to switch destination and mode in a response to congestion.)

Therefore to accommodate the level of growth of homes and employment in the preferred site allocations it is estimated that 3,500 car trips in each peak hour must be provided for through a combination of sustainable travel (reducing car trips) or highway capacity increases (which allows the network to accommodate more cars trips in certain locations so by reducing the amount of car trips needed to switch to sustainable modes.)

The chapter tests whether this level of car trip reduction could be achieved and how it could be approached. It is worth emphasising that both sustainable travel and highway measures have a role in contributing to the suggested 3,500 car trip reduction

6.2 Sustainable Travel Reductions (ST) 2041

To represent the impact of an integrated package of sustainable transport and highway measures, car trips have been reduced by approximately 3,500 trips in each of the AM and PM peak hours.

The sustainable travel matrices to use in NEMo have been built in two stages. In the first stage car trips to and from the preferred allocations have been reduced by approximately 6.5%. This has been achieved using the process outlined in the flowchart below.

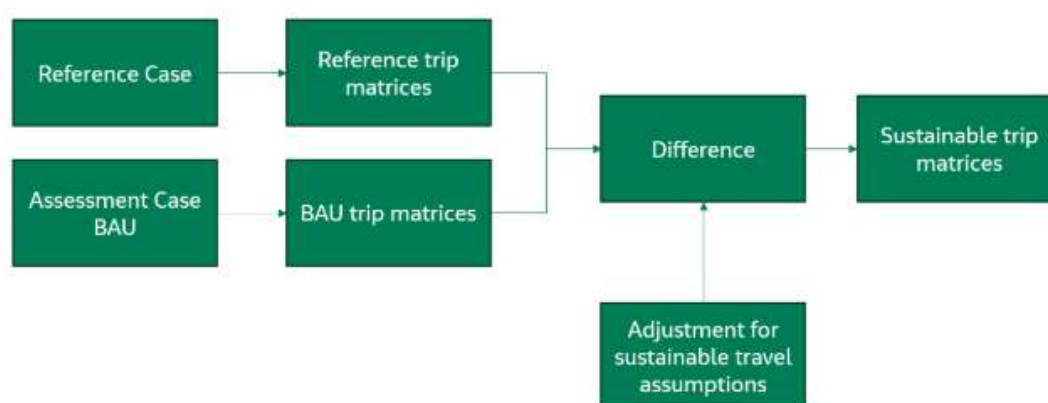


Figure 6.1: Application of Sustainable Travel Assumptions

The adjustments while averaging approximately 6.5% vary depending on the development's potential for sustainable travel and trip internalisation. For example, developments with high potential for walking, cycling, and public transport use have larger car trip reductions. This approach has been informed by an assessment of the sustainability of sites, as described in Chapter 3 of this report. This looked at each spatial option's proximity to existing, committed and proposed transport infrastructure, identifying opportunities to enhance sustainable transport choices and reduce car dependency.

Then further adjustments were applied to the interim sustainable trip matrix by reducing internal trips with a start and finish within Colchester area by 15%. This was considered reasonable on the basis that existing settlements and committed developments would also benefit from sustainable transport improvements and these improvements would be most impactful for local trips. Note that this 15% decrease is further to the 6.5% decrease at preferred site allocations.

Section 6.4 explores the achievability of this level of reduction but first Section 6.3 shows the impact on the highway network of reducing peak hour car trips by about 3,500 – representing the combined impact of sustainable travel and highway measures.

6.3 ST Assessment Case Findings – AM and PM Peak Hours

6.3.1 Flow difference – ST Reduced vs BAU

Figure 6.2 illustrates the flow differences between the ST Reduced and BAU scenarios in the AM peak. Notably, the ST Reduced scenario shows a larger reduction in traffic flow along the A12 and the new A120-A133 link road, ranging from 40 to 100 vehicles per hour. Within Colchester, traffic flow decreases by 20 to 80 vehicles per hour on

key roads such as A134 Westway and Northern Approach Road. However, the ST Reduced scenario also indicates an increase in traffic flow of 140 vehicles westbound on Cymbeline Way, potentially due to traffic rerouting.

Meanwhile Figure 6.3 illustrates the flow differences between the ST Reduced and BAU scenarios in the PM peak. Notably, the ST Reduced scenario shows a reduction in traffic flow along the A12 and the new A120 – A133 link road (A1331), ranging from 20 to 160 vehicles per hour. Within Colchester, traffic flow decreases by 20 to 80 vehicles per hour on key roads such as A134 Westway and Northern Approach Road. However, the ST Reduced scenario also indicates an increase in traffic flow of 20 to 60 vehicles per hour on certain roads, such as A1232 Ipswich Road, Mill Road, St. Andrew's Avenue, and Turner Road, which will be due to traffic rerouting.

6.3.2 Speed – ST Reduced

Figure 6.4 shows that the ST Reduced scenario, while exhibiting delays in the same locations as the BAU scenario, demonstrates a notable reduction in congestion levels. Specifically, traffic flow improvements are observed along the A12 and key Colchester roads such as A134 Westway, A134 Northern Approach Road, and Ipswich Road.

Meanwhile Figure 6.5 reveals that the ST Reduced scenario, while still experiencing delays in the same locations as the BAU scenario during the PM peak, demonstrates a noticeable improvement in speed performance. This improvement is attributed to the reduction in vehicle traffic achieved in the ST Reduced scenario.

6.3.3 Relative Queue – ST Reduced

Figure 6.6 demonstrates that the ST Reduced scenario exhibits a similar level of queueing performance to the Reference Case scenario during the AM peak. While some minor increases in queue lengths are observed at the same junctions and roads identified in the Reference Case, the overall level of congestion remains comparable.

Meanwhile Figure 6.7 demonstrates that the ST Reduced scenario exhibits a similar level of queueing as the Reference Case scenario during the PM peak. While some minor increases in queue lengths are observed at the same junctions and roads identified in the Reference Case, the ST Reduced scenario also introduces a new congestion point at the Boundary Rd/A133 Clingoe Hill junction.

6.3.4 Overall assessment of ST Reduced

Whilst there are still highway network concerns, overall, it is considered that these would be manageable compared to the BAU scenario since the speed and queue patterns are approaching the reference case situation.

It should be noted that this assessment takes into account the fact the local highway mitigations around preferred sites allocations have not been included in the model. Also the test has been carried out without using the variable demand model so the results do not include responses to congestion such as changing destination.

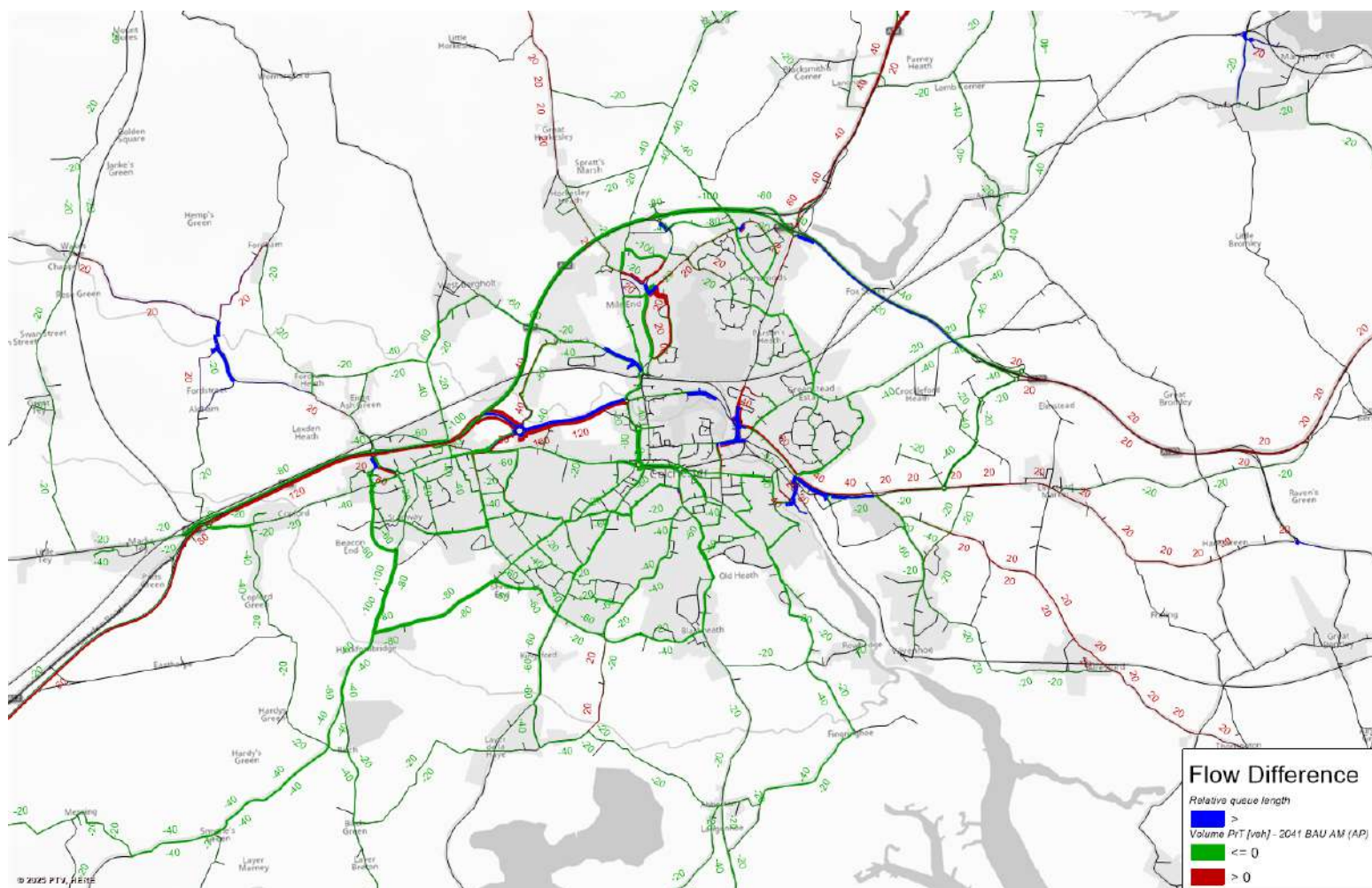


Figure 6.2: Flow Difference - ST Reduced vs BAU, AM

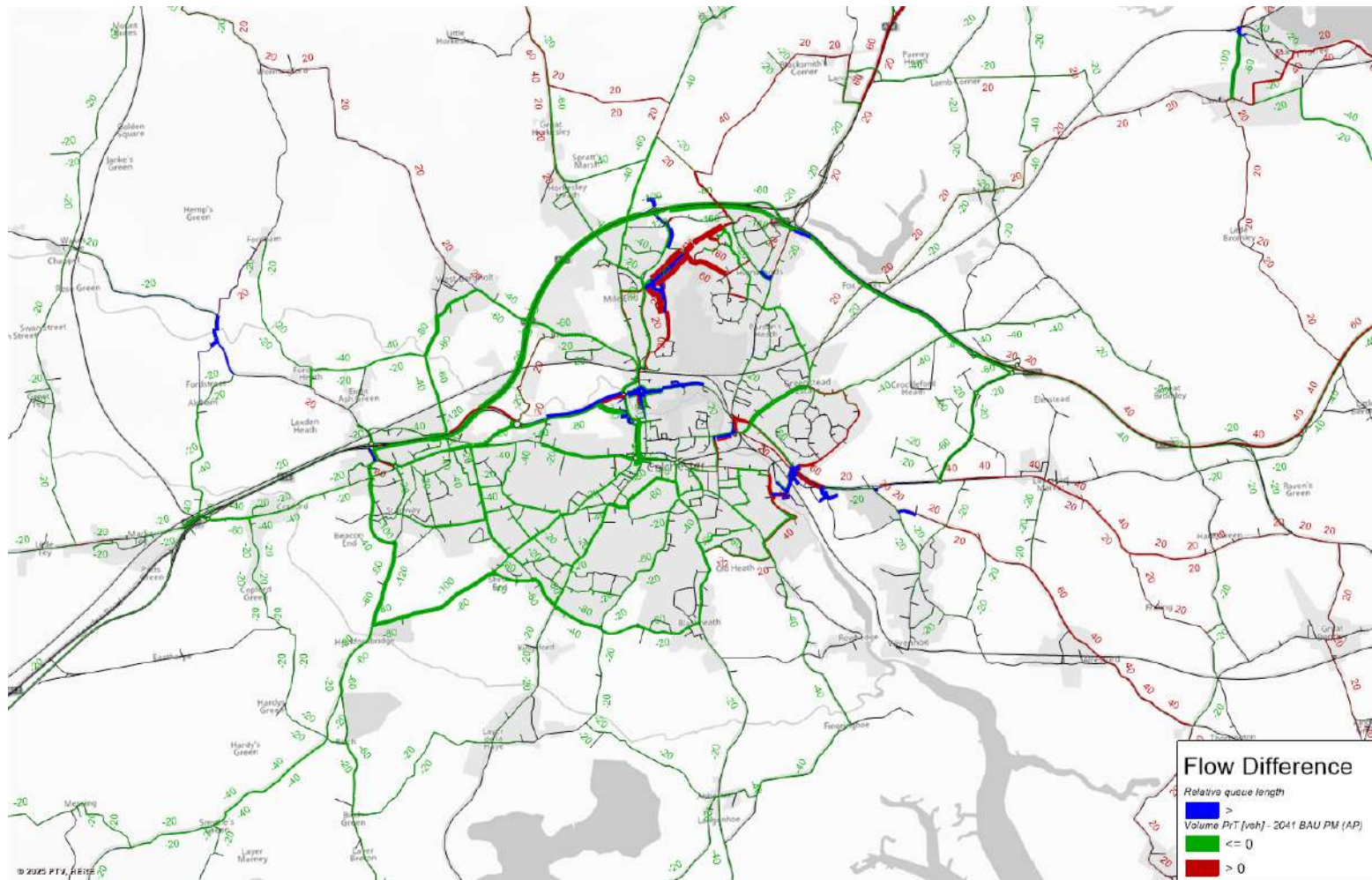


Figure 6.3: Flow Difference - ST Reduced vs BAU, PM

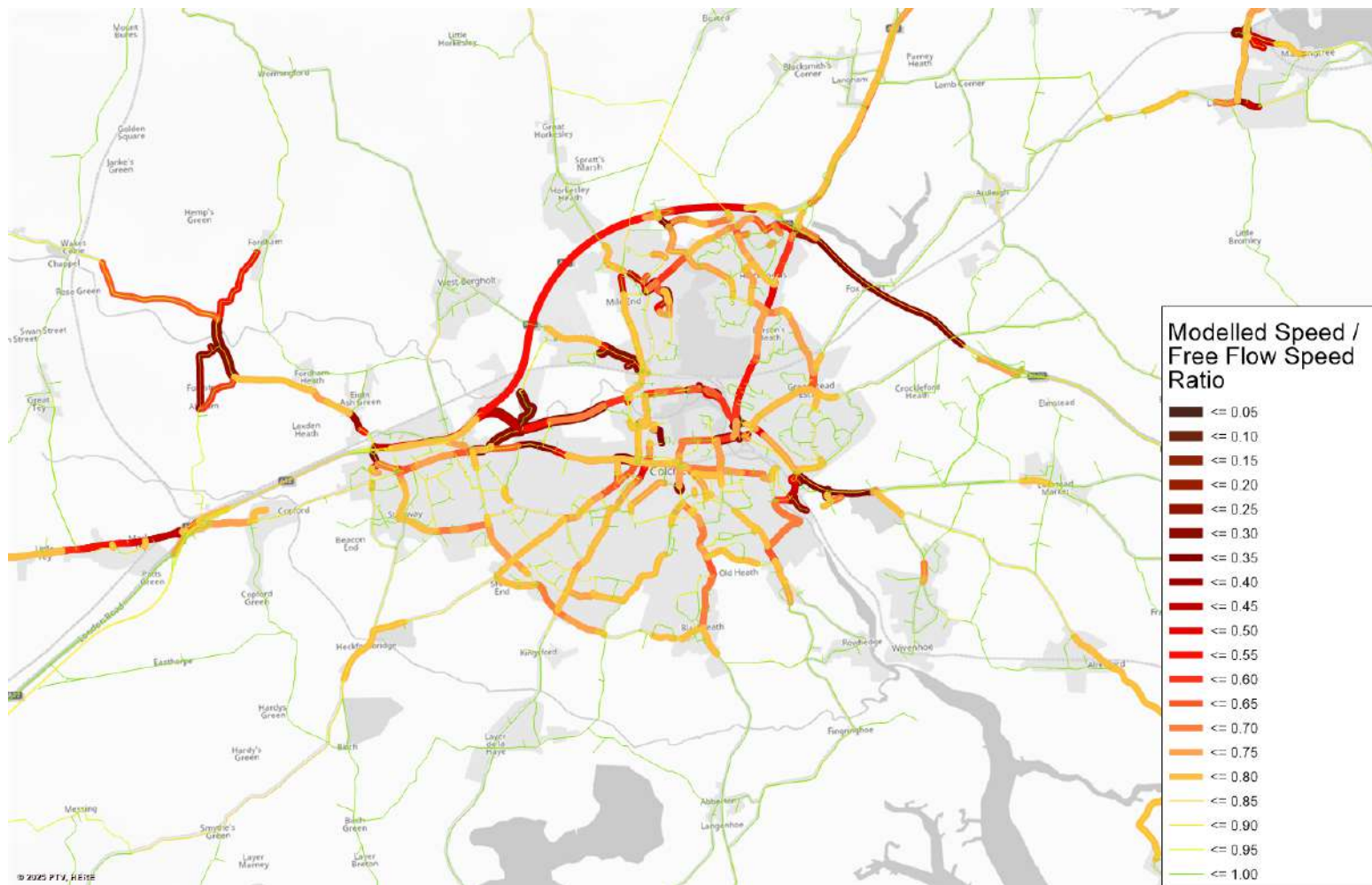


Figure 6.4: Modelled Speed/ Free Flow Speed Ratio - ST Reduced, AM

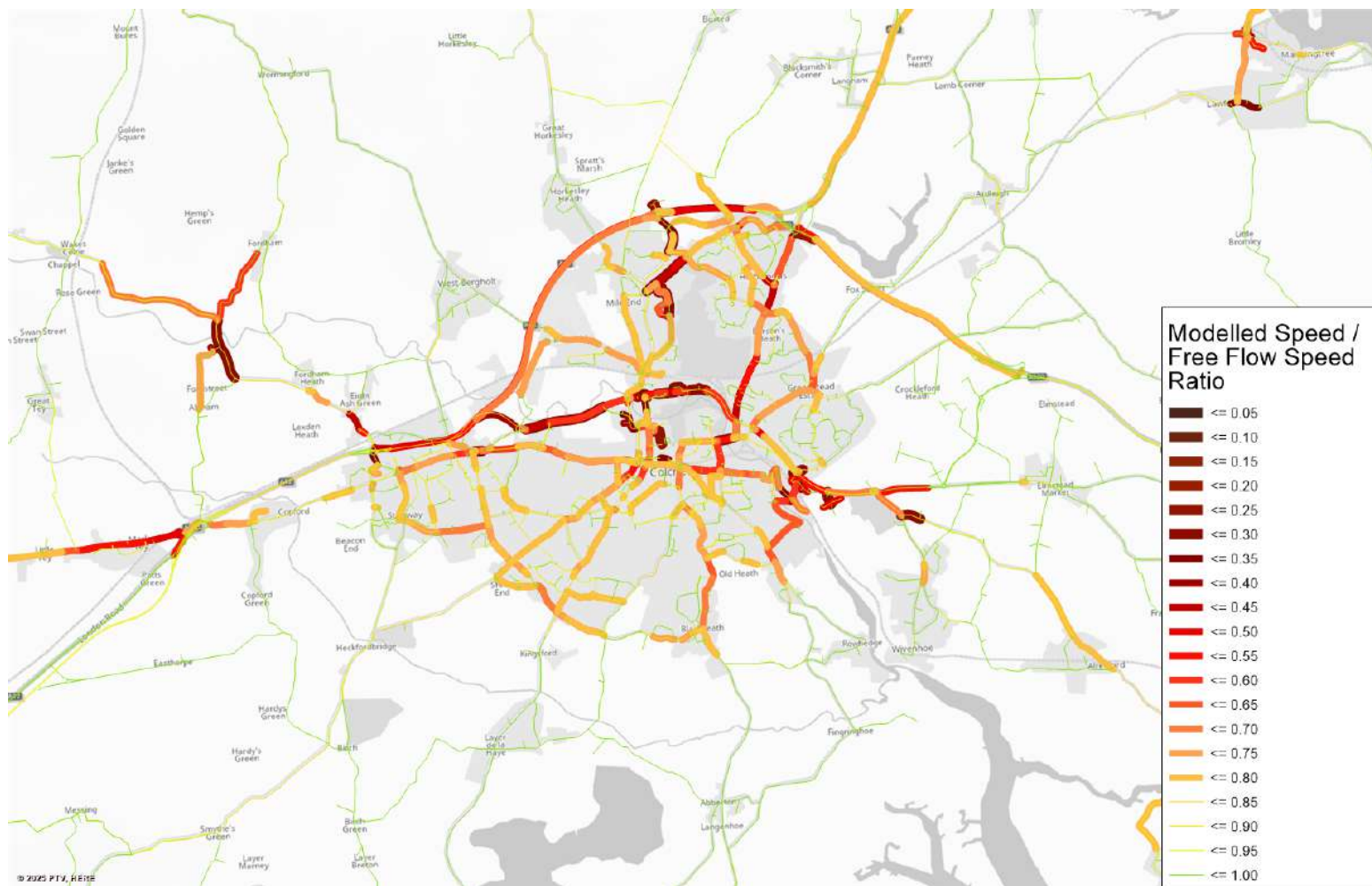


Figure 6.5: Modelled Speed/ Free Flow Speed Ratio - ST Reduced, PM

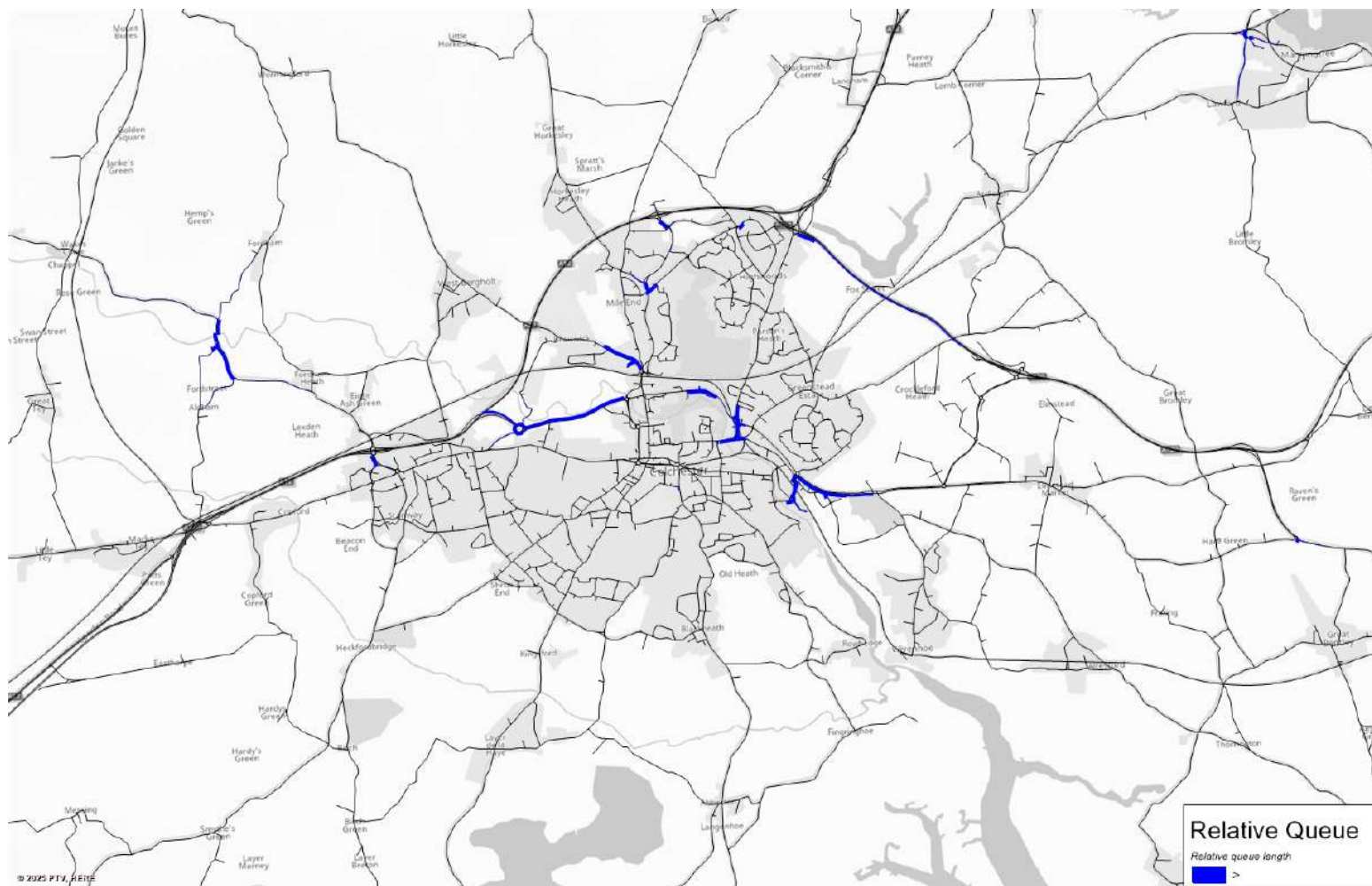


Figure 6.6: Relative Queue, ST Reduced, AM

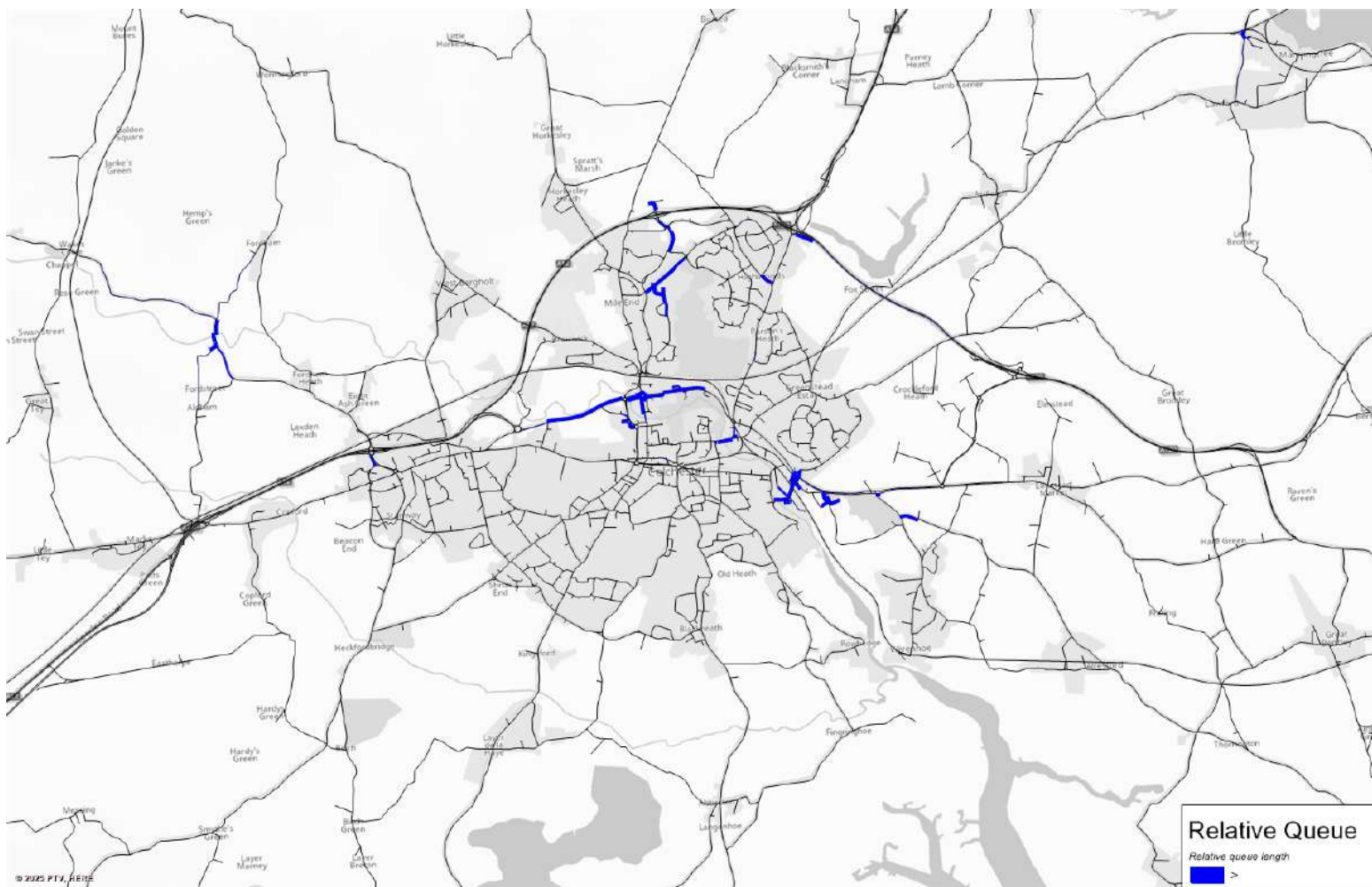


Figure 6.7: Relative Queue, ST Reduced, PM

6.4 How the reduction in trips could be achieved

6.4.1 Putting the level of reduction in perspective

The suggestion to reduce car trips in each peak hour to accommodate preferred site allocations provides a measure to gauge whether Local Plan developments could be acceptable from a transport perspective. As explained, well-targeted highway capacity increases are likely to reduce the required switch to sustainable travel below 3,500. However, this subsection considers what a switch of 3,500 trips away from car would have on car trips rates.

If all the required car trip reduction was only concentrated at preferred site allocations then the car mode share required would need to nearly halve from current high levels, which is equivalent to the mode share aspirations at TCBGC. In this situation people at existing settlement and proposed committed developments would use car on a BAU basis.

However, if the required reduction in car trip rates was shared between both committed developments and Local Plan preferred allocations then the car trip mode share would not need to reduce as much. A 40% reduction is estimated. In this scenario people at the existing settlements in Colchester could carry using cars on a BAU basis.

It is reasonable to expect, though, that people in existing settlements would benefit from sustainable travel improvements and, hence, there would be some peripheral shift to sustainable travel – which is the assumption that has been tested in the sustainable travel model scenario. In this model scenario, the reduction in car mode share at the site allocations would be accompanied by an overall reduction in car mode share of approximately 5% (of all car trips) at committed development sites and in existing settlements.

It is likely that such a reduction at committed sites and in existing settlements would be concentrated across some short distance local trips and trips to and from the urban area of Colchester. Contributing to the reduction could also retiming of car journeys and decisions not to travel.

6.4.2 Possible approaches

Accommodating 3,500 car trips in the peak hours could be achieved through:

1. travelling by public transport including P&R and RTS - believable given that bus and rail services into the urban area can be enhanced and the expansion of P&R; the urban area draws in 66% of demand; plus, policies on designing development to support public transport use.
2. travelling by walking, wheeling or cycling – believable given the growth in cycling and e-cycling; evidence in growth from other urban areas; plus, policies on better integrating transport and land use planning and designing in walking and cycling infrastructure.
3. not travelling – believable given working from home and on-line shopping reducing the need to travel.
4. retiming travel to the inter peak – believable as this a recognised behaviour to congestion.
5. targeted highway capacity increases.

The above options to shift to sustainable travel would also be supported by travel campaigns across the council area and travel planning at new developments.

6.4.3 Mode share level examples

When the level of car mode share in Colchester is compared to other large towns and cities it is considered believable that the shift to sustainable travel (along with other responses including highway improvements) is attainable.

For example Brighton and Nottingham has car mode shares at approximately three quarters the level of Colchester; and Hull at around four fifths.

If Colchester were to grow as set out in the preferred site allocations and sites contributed to step changes in sustainable travel then it is reasonable to surmise that car mode share would drop significantly.

6.5 Conclusion

This section has set out a case that the level of shift to sustainable travel that would be required to facilitate the preferred Local Plan site allocations is achievable and reasonable to propose. Furthermore, the approach is in line with national and local policies.

It is expected that the required switch to sustainable travel to facilitate growth would be a combination of reduction from BAU car trips at preferred allocations, committed development and existing settlements. Therefore it will be important that developments are designed to be accessible by active travel following best practice – to ensure neighbourhoods are walkable and cyclable for the majority of people's daily needs. This report also provides examples to support the suggested approach to accommodate growth partly through a switch to sustainable travel.

7 Conclusion and Next Steps

7.1 Conclusion

The preferred allocations are expected to create approximately a further 11,000 homes and 11,000 jobs in addition to the committed development growth. To put this in perspective, committed and preferred allocations would grow homes by 20% above the current amount and employment by 16%.

Forecast reference and assessment case 2041 models were set up in NEMo using car trip rates reflecting current local travel behaviour – business as usual (BAU). The reference case model reflecting committed developments indicates that that level of growth could be accommodated on the transport network if it is accompanied by investment in transport improvements. However, the highway network would not be able to accommodate additional car trips generated by the preferred allocations using BAU car trip assumptions.

A practicable mitigation strategy was then developed in line with the National Planning Policy Framework (NPPF) to consider opportunities for sustainable travel and reducing travel need before expanding highway capacity. It was considered impracticable to mitigate impact of growth by solely expanding highway capacity. It is expected that the integrated package of mitigation measures would include:

- Extension of RTS and high quality bus routes
- Extension of walking and cycling programme
- Interchange improvements i.e. mobility hubs, rail station improvements
- Travel planning and travel behaviour changes
- Key strategic highway schemes including the A12 J19-J25 widening
- Local highway improvements

An achievable level of switch to sustainable travel has then been identified to reduce the growth in car trips. The reduced level of car trips was then run through the NEMo transport model, which demonstrated that the impact of growth could be appropriately mitigated using this strategy.

The Reference Case scenario indicates an acceptable traffic situation, albeit with known congestion hotspots. However, the BAU scenario paints a more concerning picture, with traffic congestion spreading beyond existing hotspots and impacting key routes such as East Hill, potentially affecting bus reliability. While the sustainable travel scenario aims to address this by reducing car trips from LP developments by around 6.5%, this reduction may not be sufficient to significantly alleviate peak-hour congestion. Therefore, the additional 15% reduction on car trips within Colchester brings this level back closer to Reference Case traffic levels and congestion.

It is expected that the required switch to sustainable travel to facilitate growth would be a combination of reduction from BAU car trips at preferred allocations, committed development and existing settlements. The report provides examples and precedents to support the strategy to accommodate growth partly through a switch to sustainable travel. Examples include evidence from Hull, Brighton and Nottingham in the UK as well as from continental Europe.

It is suggested to actively review investments in public transport and active travel links as committed and preferred site allocations come forward, to assess if car trips are growing sustainably, and to adapt investment accordingly.

7.2 Next Steps

The highway authorities ECC and National Highways have been working closely throughout the Local Plan transport assessment process. This has included a review of the new NEMo base year and a review of forecast modelling is commencing.

The ongoing review of modelling with National Highways is expected to include sensitivity tests, one of which will test the preferred allocations without the A12 J19-25 widening scheme for which funding, at the time of writing, is uncertain. These sensitivity tests will improve the levels of certainty on transport modelling findings.

Glossary

Notation	Description
BAU	Business as Usual
CCC	Colchester City Council
CTM	Colchester Transport Model – a highway and public transport variable demand model
DfT	Department for Transport
ECC	Essex County Council
EMME	Transport modelling software package – used for public transport assignment modelling in NEMo
LCWIP	Local Cycling and Walking Infrastructure Plan
LOS	Level of Service
LSOA	Lower Layer Super Output Areas
MSOA	Middle Super Output Area
NEMo	North Essex Model
NPPF	National Planning Policy Framework
NTEM 8	Core forecast scenario in the DfT National Trip End Model
OA	Output Areas
PRoWs	Public Rights of Way
RIS3	National Highways Road Investment Strategy 3
RIS4	National Highways Road Investment Strategy beyond 2030
RTS	Rapid Transit System – a bus based system under construction in Colchester
ST	Sustainable Travel – a scenario in which car demand has been reduced to reflect a switch to sustainable travel alongside targeted highway capacity increases
TAG	Transport Analysis Guide
TEMPro	Trip End Model Programme (database) used to access NTEM 8
V/C	Volume divided by capacity. This provides a measure of the level of congestion on a link or junction
VISUM	Transport modelling software package – used for highway assignment modelling in NEMo

List of appendices

The following appendices are available in the annex to this report

- Appendix A: Current Conditions
- Appendix B: Sustainable Location Assessment (MSOA)
- Appendix C: Long-List of Spatial options
- Appendix D: Sites by MSOA
- Appendix E: Further Growth Options Detailed Analysis
- Appendix F: Sustainable Transport Maps