NEW LOCAL PLAN ISSUES AND OPTIONS DOCUMENT: HIGHWAYS BASELINE TECHNICAL NOTE 2017

1 PURPOSE OF REPORT

1.1 An assessment of the potential transport implications of any emerging proposals is an important part of the evidence base to support the preparation of Local Plans. This report provides more detail in relation to this requirement, its impact on the development of Local Plans and the purpose of the Topic Paper.

2 SALIENT INFORMATION

2.1 The National Planning Policy Framework (NPPF)[1] requires local planning authorities to effectively plan for infrastructure, including highways, to support any emerging proposals. Paragraph 32 requires both Plans and decisions to take account of opportunities for increasing the take up of sustainable ways to travel, such as bus or train use, or walking and cycling, wherever possible. It also requires improvements to be proposed which mitigate against the "significant" impacts of development. Notably, this paragraph advises that development "should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe".

2.2 The NPPF is supplemented by the Planning Practice Guidance (PPG), which further recognises the importance of assessing the transport implications throughout the plan-making process[2]. Its purpose is not only to ensure that any potential impacts can be suitably mitigated against, but also to encourage a shift to more sustainable transport usage.

2.3 The PPG also notes that these assessments can assist plan-making with:-

- improving the sustainability of transport provision;
- enhancing accessibility;
- creating choice amongst different modes of transport;
- improving health and well-being;
- supporting economic vitality;

[1] www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

[2] www.gov.uk/guidance/transport-evidence-bases-in-plan-making-and-decision-taking

- improving public understanding of the transport implications of development;
- enabling other highway and transport authorities/service providers to support and deliver the transport infrastructure that conforms to the Local Plan; and
- supporting local shops and the high street.

2.4 Whilst transport assessments can be prepared through the plan-making process to support emerging proposals, more detailed assessments are also required at the planning application stage.

2.5 The Council is at an early stage in reviewing its Local Development Plan policies to extend the Plan period beyond 2025. The Issues and Options Document does not include specific proposals to meet future development needs across the district, and so detailed modelling has not been undertaken to support the development of the new Local Plan to date. An assessment of the potential implications for the highway network and options to improve sustainable transport connectivity and choice through a multi-modal modelling approach will be taken forward as work on the review progresses. This will help to inform not only the spatial strategy for the future but also the infrastructure required, which will be set out in an Infrastructure Delivery Plan, and how this could be funded through a flat-rate levy, such as the Community Infrastructure Levy (CIL) or s106 agreements and other funding sources available.

2.6 As a first stage transport assessment to support the Issues and Options Document, Ringway Jacobs, transport consultants, were tasked with preparing a baseline review of the issues and challenges currently facing the highway network across the district. The assessment, therefore, identifies existing bottlenecks and pinch points which cause congestion issues at peak times across the district's network. As the new Local Plan preparation progresses, a detailed multi-modal model will be developed, building on this initial assessment, to explore the potential implications of any emerging proposals on the capacity and movement on the highway network.

2.7 The attached Highways Baseline Technical Note, at Appendix A, identifies key issues affecting the district's highway network, including noted congestion resulting from high rates of car ownership, coupled with the generally rural character of the district and minor roads that make up the principal local road network. In particular, roads such as the A1245, Rawreth Lane, Hullbridge Road, A129, B1013, A1015, Ashingdon Road and Sutton Road are noted as being key congested corridors. The assessment also identifies that whilst train travel is generally a suitable and sustainable alternative to car travel, promoting bus travel is a challenge both in terms of uptake, viability and availability of service.

2.8 The Highways Baseline Technical Note also identifies opportunities including improvement to public transport networks, by seeking contributions from development to establish better transit links. It also suggests there is opportunity for intensification of town centres with delivery of further employment uses and higher density residential uses to promote sustainable travel modes around sustainable transport hubs and minimise the impact on the less accessible parts of the network.

3 RISK IMPLICATIONS

3.1 Transport is considered to be a strategic cross-boundary issue, which means that Rochford District has and will need to actively and constructively engage with its neighbouring authorities on this issue as part of the Duty to Co-operate. If the Council fails to develop evidence and engage with its neighbours this could have implications for a draft Plan at independent examination.

3.2 The NPPF and PPG require that proportional evidence relating to the potential impact of emerging proposals on the highway network is prepared to support the preparation of Local Plans. This includes effective assessment of the potential implications and opportunities for mitigation of the potential effects of further development. Such evidence must be prepared and form part of the evidence base, which will support a draft Plan during independent examination by a Planning Inspector. Failing to have adequate transport evidence in place could risk a draft Plan being found unsound.

4 RESOURCE IMPLICATIONS

4.1 The Highways Baseline Technical Note is a first stage transport assessment which identifies existing issues and challenges within the highway network. It will be used to inform the next stage – more detailed multi-modal modelling – to support the further preparation of the new Local Plan. This could include the commissioning of joint highways evidence with a neighbouring authority to benefit from economies of scale and ensure a comprehensive assessment of the highway network across boundaries.

4.2 The Council is required to discharge its responsibilities under the Duty to Co-operate throughout the plan-making process. Any outputs from the Duty, such as the preparation of joint evidence base documents, will need to be met from investments in the existing budget provision. Future contributions from Essex County Council, as the highway authority for the district, to support future highways evidence is anticipated to be nominal.

5 LEGAL IMPLICATIONS

5.1 The Duty to Co-operate is an important legal test which needs to be demonstrated throughout the plan-making process. Transport is considered to be a strategic cross-boundary issue, which means that we have to actively

and constructively engage with our neighbouring authorities – and be able to demonstrate this – under the Duty. Failure to effectively engage, under the Duty, substantially increases the risk that a draft Plan will be found to be unsound or not legally compliant at the independent examination stage, and therefore not become adopted planning policy for the district to assist with the determination of planning applications.

6 RECOMMENDATION

6.1 It is proposed that the Sub-Committee **RESOLVES**

That the Highways Baseline Technical Note 2017, as attached at Appendix A, be noted as evidence and published on the Council's website.

Matthew Thomas

Assistant Director, Planning and Regeneration Services

Background Papers:-

None.

For further information please contact Natalie Hayward (Planning Policy and Economic Development Team Leader) on:-

Phone: 01702 318101
Email: natalie.hayward@rochford.gov.uk

If you would like this report in large print, Braille or another language please contact 01702 318111.

Document Control Sheet

Document prepared by:

Laura Gardner	Transport Planning	**T**	0845 603 7631
Transport Consultant	Victoria House	**E**	Laura.Gardner@jacobs.com
	Chelmsford	**W**	www.essex.gov.uk/highways
	CM1 1JR		

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Important note about your report:

The sole purpose of this report is to provide a baseline assessment of traffic and transport to inform the development of the Rochford District Council Local Plan.

Where third party information has been used, it is referenced within the report and is presumed to be accurate. The sources of all data used within the report have been referenced and are presumed to be accurate.

The report should be read in full with no excerpts to be representative of the findings.

This report has been prepared exclusively for Jacobs' client and no liability is accepted for any use or reliance on the report by third parties.

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1 Introduction

1.1 Background

Rochford District Council (RDC) is being supported by Essex County Council (ECC) in the development of their Local Plan proposals. The new Local Plan will be part of the Local Development Plan and on its adoption it will supersede a number of policies within the current adopted Local Development Plan.

Essex Highways has carried out a baseline assessment of transportation issues and challenges currently facing the District, which will assist in exploring various future development scenarios based on their impact and demand on the local transport network.

The purpose of this study is to provide an initial assessment across four key areas of focus: a Document Review, Data Review, Transport Network Analysis and Planned Improvements, in order to identify potential suitable development scenarios and possible mitigation measures for further investigation for the Districts new Local Plan.

1.2 Report Structure

This document sets out the methodology and findings of the initial assessment across the four key areas of focus and, following the introduction section above, the remainder of the document is set out as follows:

Section 2 – Document Review – this section undertakes a review of the relevant documentation produced for the area, including the current and historic Local Plan documentation and the Joint Area Action Plan (JAAP) relating to London Southend Airport.

Section 3 – Data Review – this section undertakes a review of the relevant Census data available for the area, for both demographic and transport related datasets, identifying the underlying profile of the area and the travel demands and patterns it generates.

Section 4 – Transport Network Analysis – this section undertakes a comprehensive analysis of the existing transport network for various modes of travel including road, rail, bus, cycle and pedestrian networks within the District.

Section 5 – Planned Improvements – Issues and constraints are identified and where possible, future improvement options are considered.

Section 6 – Summary – this section summarises the findings from the initial assessment work undertaken, and identifies areas for further investigation for the Districts new Local Plan.

2 Document Review

2.1 Documents Considered for Review

The list of documents considered for review are detailed below. Those considered relevant with regards to highways and transport have been reviewed (as identified within Table 2.1 to Table 2.3) and the significant findings have been noted in Section 2.2 below.

2.1.1 Evidence Base for the New Local Plan

The documents comprising the evidence base for the new Local Plan (indicated at https://www.rochford.gov.uk/new-local-plan-evidence-base) are listed in Table 2.1 below.

Table 2.1 New Local Plan Evidence Base Document Review

Category	Document	Relevant to Highway/ Transport Review	Reviewed
Conservation Area Appraisals and Management Plans	Conservation Area Appraisal and Management Plan 2007 for: • Battlesbridge • Canewdon • Canewdon High Street • Foulness • Great Wakering • Paglesham East End • Rayleigh • Rochford • Shopland Churchyard	No	No
Design and Heritage Guidance	Essex Design Guide 2005	No	No
	Local List Supplementary Planning Document 2013	No	No
	Historic Environment Characterisation Project 2006	No	No
	Housing Design Supplementary Planning Document 2007	No	No
		No	No

Category	Document	Relevant to Highway/ Transport Review	Reviewed
	Parking Standards Design and Good Practice Supplementary Planning Document 2010 Urban Place Supplement 2007	No	No
Employment Land Reviews	Employment Land Study Report 2014 Employment Land Study Update Final Report 2009 Employment Land Study 2008	Yes No No	Yes No No
Retail and Leisure Studies	Retail and Leisure Study Update 2014 Retail and Leisure Study 2008	Yes No	Yes No
Growth Strategy	Rochford District Growth Strategy 2014	Yes	Yes
Biodiversity and Habitats Studies	Essex Biodiversity Action Plan 2011 Local Wildlife Site Review 2007	No No	No No
Contaminated Land Strategy	Contaminated Land Strategy 2013	No	No
Environmental Capacity Study	Environmental Capacity Study 2015	No	No
Landscape Assessments	Essex Landscape Character Assessment 2003 Landscape Character Assessment of the Essex Coast 2005	No No	No No
Minerals and Waste Plans	Essex and Southend Minerals Local Plan 2014	No	No

Category	Document	Relevant to Highway/ Transport Review	Reviewed
	Essex and Southend Waste Local Plan 2001	No	No
Strategic Environmental Assessment Baseline Information Profile (SEA)	Strategic Environmental Assessment Baseline Information Profile (SEA)	Yes	Yes
Ageing Population Strategy	Ageing Population Strategy 2014	No	No
Housing Market Assessments	South Essex Strategic Housing Market Assessment 2016 Executive Summary	Yes	Yes
	South Essex Strategic Housing Market Assessment 2016	Yes	Yes
	Addendum to the South Essex Strategic Housing Market Assessment 2017	Yes	Yes
	Thames Gateway South Essex Fundamental Review of Strategic Housing Market Assessment 2013	No	No
	Thames Gateway South Essex Strategic Housing Market Assessment Update 2010	No	No
	Thames Gateway South Essex Strategic Housing Market Assessment 2008	No	No
Land Availability Assessments	Strategic Housing Land Availability Assessment 2012	No	No
		No	No

Category	Document	Relevant to Highway/ Transport Review	Reviewed
	Strategic Housing Land Availability Assessment 2009		
Gypsy, Traveller and Travelling Show People Accommodation Assessments	Essex Gypsy and Traveler and Travelling Showpeople Accommodation Assessment 2014	No	No
	Essex Gypsy and Traveler Accommodation Assessment 2009	No	No
	Looking Back and Moving Forward - Assessing the housing needs of Gypsies and Travelers in Essex 2006	No	No
Parish Plans	Hullbridge Village Plan 2012 - 2014	Yes	Yes
	Great Wakering Parish Plan 2015	Yes	Yes
	Hawkwell Parish Plan 2011	Yes	Yes
	Hockley Parish Plan 2007	Yes	Yes
Cycling and Greenway Studies	Green Grid Strategy 2005	Yes	Yes
	London Southend Airport and Environs Joint Area Action Plan walking and cycling improvements 2014	Yes	Yes
	London Southend Airport and Environs Joint Area Action Plan network report 2015	Yes	Yes
	Walking and Cycling improvements: National Cycle	Yes	Yes

Category	Document	Relevant to Highway/ Transport Review	Reviewed
	Network Route 135, Stock to Southend 2014	No	No
	Parklands Strategy 2010	Yes	Yes
	Essex Cycling Strategy	Yes	Yes
Open Space Studies	Open Space Strategy 2015	No	No
	Open Space Study 2009	No	No
Sports and Recreation Studies	Playing Pitch Strategy Supplementary Planning Document 2012	No	No
	Essex Sports Facilities Strategy 2007 – 2020	No	No
Local Transport Plan	Local Transport Plan 2011	Yes	Yes
Affordable Housing Viability Study	Affordable Housing Viability Study 2010	No	No
Flood Risk Assessments	Essex Flood Risk Management Strategy 2013	No	No
	Preliminary Flood Risk Assessment for Essex 2011	No	No
	Rochford District Council Strategic Flood Risk Assessment 2011 – Level 1 and 2 Report	No	No
	Thames Gateway South Essex Strategic Flood Risk Assessment Review – Scoping Report 2009	No	No
	Thames Gateway South Essex Flood Risk Assessment 2006	No	No

Category	Document	Relevant to Highway/ Transport Review	Reviewed
Coast, River and Estuary Management Plans	Crouch and Roach Estuary Management Plan 2005	No	No
	Essex and South Suffolk Shoreline Management Plan 2010	No	No
	River Basin Management Plan – Anglian River Basin District 2009	No	No
Surface Water Management Plan	Surface Water Management Plan 2012: • Phase 2,3 and 4 • Appendix A1 • Appendix A2 • Appendix A3 • Appendix D • Appendix E3 • Appendix F1 • Appendix F4	No	No
Water Cycle Studies	Essex Thames Gateway Water Cycle Study: • Technical Report 2011 • Scoping Study 2009	No	No

2.1.2 Local Development Plan Adopted Policy Documents

The Council has a number of adopted policy documents which form the current Local Development Plan for the District. The plan covers the period 2010 to 2025.

They comprise:

- Allocations Plan
- Core Strategy
- Development Management Plan
- Hockley Area Action Plan
- London Southend Airport and Environs Joint Area Action Plan

- Rochford Town Centre Area Action Plan
- Rayleigh Centre Area Action Plan

These documents can be accessed via the Council website at https://www.rochford.gov.uk/planning-and-building/planning-policy/adopted-plans.

They have also been reviewed and are summarised below in Table 2.2.

Table 2.2 Local Development Framework Document Review

Document	Relevant	Reviewed
Local Development Framework Allocations Plan Adopted 25 February 2014	Yes	Yes
Local Development Framework Core Strategy December 2011	Yes	Yes
Local Development Framework Development Management Plan Adopted 16 December 2014	Yes	Yes
Local Development Framework Hockley Area Action Plan Adopted 25 February 2014	Yes	Yes
Local Development Framework Rayleigh Centre Area Action Plan Adopted 20 October 2015	Yes	Yes
Local Development Framework Rochford Town Centre Area Action Plan Adopted 21 April 2015	Yes	Yes
London Southend Airport & Environs Joint Area Action Plan December 2014	Yes	Yes

2.1.3 Other Documents

In addition, a number of other documents have been reviewed, as summarised below in Table 2.3.

Table 2.3 Other Documents Review

Document	Relevant	Reviewed
Major Planning Applications	Yes	Yes
Rochford District Council – Housing Land Supply Position Statement June 2016 (including Appendix A – Housing Trajectory)	Yes	Yes
Authority Monitoring Report 2016	Yes	Yes

2.2 Document Review Findings

The significant findings from the documents reviewed have been noted below, and detail issues identified on a strategic, regional and local level.

2.2.1 Strategic Issues

South Essex Strategic Housing Market Assessment

The South Essex Strategic Housing Market Assessment (SHMA) published in May 2016 (http://www.rochford.gov.uk/sites/rochford.gov.uk/files/SE_strategichousing_2016.pdf) has been used to determine the Objectively Assessed Need (OAN) for housing.

The SHMA considers the housing needs of the authorities of Basildon, Castle Point, Rochford, Southend-On-Sea and Thurrock. It was accepted into Rochford's Local Plan evidence base in June 2016. It concludes that the OAN for Rochford District Council is between 312 and 392 dwellings per annum from 2014 (the base date for the study) to 2037. An Addendum was published in June 2017, and using more up-to-date information concludes that the OAN is 331 to 361 dwellings per annum.

The SHMA Addendum 2017 determines a net annual affordable housing need of 296 homes for Rochford District.

Green Grid Strategy 2005

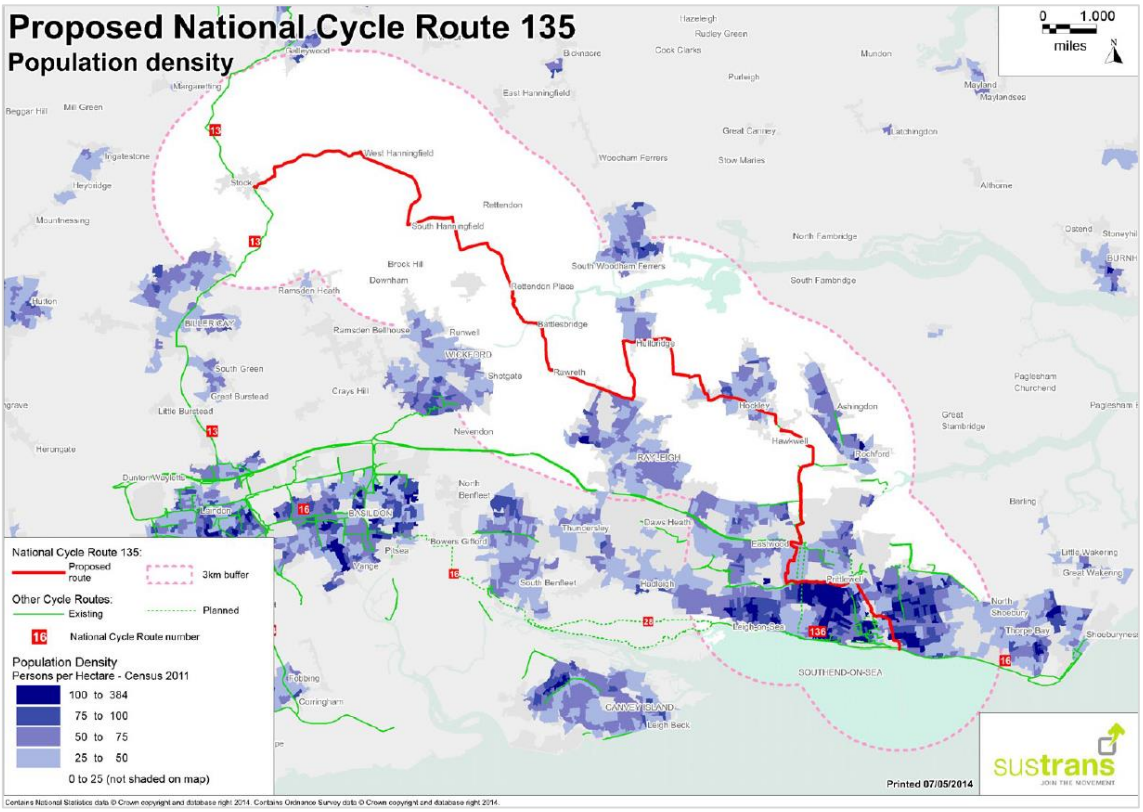
The South Essex Green Grid Strategy is a framework that aims to provide a "holistic and long-term vision" for strategy area. Its purpose is to "define an environmental infrastructure that promotes the establishment and management of appropriate character settings". As part of this area strategy, Rochford District Council proposes the creation of "greenways" (footpaths, cycle paths and bridleways) that run through and connect towns. There is some overlap with proposed cycle networks. The following greenways are the ones identified in the Thames Gateway Green Grid Strategy that are relevant to Rochford:

- Greenway 13: South Benfleet
- Greenway 16: Leigh-Rayleigh
- Greenway 18: Central Southend (to Rochford)
- Greenway 19: Southchurch
- Greenway 20: Shoeburyness
- Greenway 21: City to Sea/Shoreline

Walking and cycling Improvements: National Cycle Network Route 135, Stock to Southend June 2014

The proposed National Cycle Route 135 can be seen in Figure 2.1 and will connect the main population centres of Rayleigh, Hullbridge, Hockley and Rochford and extend all the way to the coast in Southend.

Figure 2.1: Proposed National Cycle Route 135



Source: Walking and Cycling Improvements - National Cycle Network Route 135, Stock to Southend, Sustrans, June 2014

Essex Transport Strategy: The Local Transport Plan for Essex June 2011

The Essex Transport Strategy defines the priorities for the local centres of the Thames Gateway as follows:

- Providing for and promoting access by sustainable modes of transport to new development areas

- Improving public transport links within and between the Thames Gateway towns (including the A13 Passenger Transport Corridor and South Essex Rapid Transit (SERT) schemes)
- Improving the availability of sustainable travel choices and raising public awareness of these through travel planning
- Addressing maintenance, signing and broken links in the cycle network to improve conditions for cyclists and create a safer atmosphere for cycling
- Improving the attractiveness and ease of use of public spaces to support regeneration
- Improving journey time reliability on strategic inter-urban routes including the A127, A129, A130 and the A13
- Improving access to London Gateway port and Southend Airport

2.2.2 Regional Issues

Employment Land Study Report 2014

The Employment Land Study Update 2014 prepared for RDC by GVA Grimley Limited (an independent commercial property agency) concludes that the majority of future employment growth requirements will come from currently undeveloped sites. Such sites have been identified within the Allocations Plan, the Hockley Area Action Plan and the London Southend Airport and Environs Joint Area Action Plan. The largest proportion of this land is located north of London Southend Airport.

Retail and Leisure Study Update 2014

The Retail and Leisure Study Update 2014 identifies the retail floor space capacity projections for Rayleigh, Rochford and Hockley town centres and also Hullbridge, Ashingdon, Great Wakering and Canewdon local centres. It also assesses the current retail provision and the scope, if any, for future retail development.

Rochford District Growth Strategy 2014

The Rochford District Growth Strategy highlights the importance of London Southend Airport to the economy of the area. There is a cluster of Maintenance, Repair and Overhaul (MRO) businesses in the area that are expected to develop alongside the growth of the airport. The Growth Strategy specifies the actions planned by RDC to provide opportunities to residents, visitors and employees.

The Southend Airport and Environs Joint Area Action Plan (JAAP)

The JAAP identifies a number of locations for use as employment land to accommodate future employment needs, detailed in the Table 2.4. The employment created will be high quality, and will likely benefit from the expansion of nearby London Southend Airport, and will help to manage and address current and future employment needs in the District.

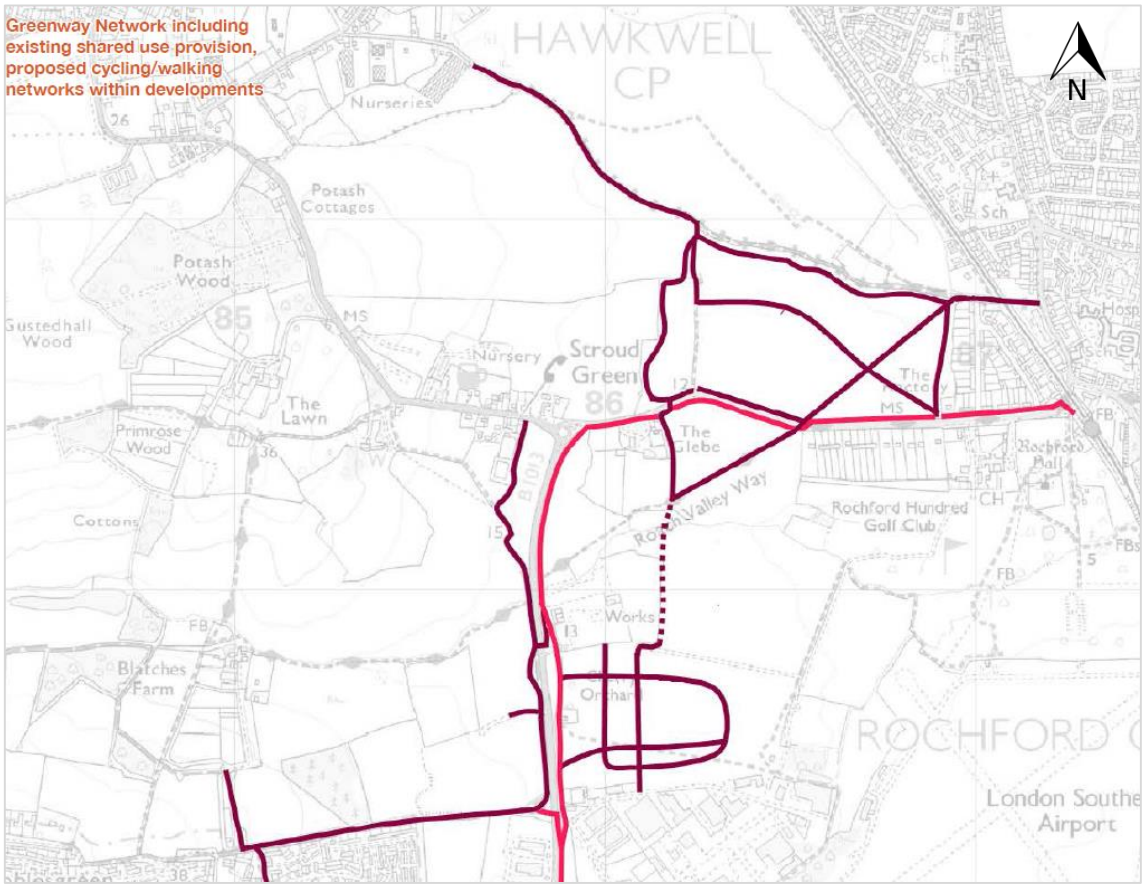
Table 2.4 Locations for Employment Land Identified in The JAAP

Location	Use Class	Proposal and Relevant Employment Policy	Status
Cherry Orchard Brickworks, Cherry Orchard Way, Rochford (Area 1)	Class B1	Proposed option for new access to Saxon Business Park from Cherry Orchard Way Policy E3 and E4 New Access road into business park	No planning application
Land to the north of Aviation Way Industrial Estate, Rochford (Area 2 and Area 3)	Class B1 and B2	Saxon Business Park Policy E3,E5 and E6 New access into Business Park from Cherry Orchard Way	Planning application 15/00781/OUT approved and site under construction
Aviation Way Industrial Estate	Classes B1 and B2	Redevelopment and improvement of existing industrial estate Policy E2	

<u>The Southend Airport and Environs Joint Area Action Plan (JAAP) Walking and Cycling 'Greenway Network'</u>

Plans exist to create a greenway network of cycle paths within the new Hall Road development and the new Airport Business Park in Rochford, and further extension to connect the two to each other and the surrounding areas. One extension will be to the west from the Airport Business Park, connecting with Scotts Park in Southend. Another extension will be parallel of the mixed use path on Cherry Orchard Way, but on the west side of the road with one new crossing. Another extension will connect Airport Business Park with Hall Road via a path through the green space east of the Cherry Orchard Way. Along the north side of the Hall Road development the greenway extends on Ironwell Lane to Rectory Road, Hawkwell in the west and to Ashingdon Road, Rochford in the east. The planned routes can be seen in Figure 2.2.

Figure 2.2: Planned Joint Area Action Plan Greenway



Source: London Southend Airport and Environs Joint Area Action Plan Walking and Cycling 'Greenway Network' - Linking the Community, Sustrans, February 2016

2.2.3 Local Issues

Local Development Framework Core Strategy and Allocations Plan

The East of England Plan required that a minimum of 4600 dwellings be built in Rochford District between 2001 and 2021 to meet the needs of the current and future population. The Core Strategy highlights the issues for the District, namely the high proportion of Green Belt land, the proximity of Flood Zone 3 land and areas of ecological importance. There is a high level of home ownership in the District but there is a gap between house prices and income, meaning that concealed households (ones living in a multi-family household in addition to the primary family, such as a young couple living with parents) are often unable to afford to enter the local housing market. There is also a policy requirement that 35% of new dwellings on schemes greater than 15 or more units, or sites greater than 0.5 hectares, are affordable.

The allocated housing sites are set out by Policies H2 and H3 of the Core Strategy as shown in Table 2.5 below.

Table 2.5 Delivery of Allocated Housing Sites

Area	Dwellings by 2015	Dwellings 2015-2025
North of London Road, Rayleigh		550
West Rochford	450	150
West Hockley	50	
South Hawkwell	175	
East Ashingdon	100	
South West Hullbridge		500
South Canewdon		60
South East Ashingdon		500
West Great Wakering		250
Total Dwellings	**775**	**2010**

Two new employment sites are also identified within Policy ED4 of the Core Strategy, to the west of Rayleigh (Michelins Farm) and south of Great Wakering.

The specific sites identified for residential and employment development are detailed in the Allocations Plan. For a detailed analysis of the allocated residential sites and their status (as of August 2017) see Appendix A.

Local Statutory Development Plans

Rayleigh Centre Area Action Plan

There are no allocated employment sites within the Rayleigh Centre Area Action Plan (AAP). The plan is focused on retail development, new and improved pedestrian and cycle routes and new and improved public realm and environmental improvements. There is one opportunity site identified and that is the brownfield land behind the storefronts on the west side of High Street at the High Street/Eastwood Road roundabout.

The AAP identifies two major intersections in the town centre as having traffic safety and congestion issues, these are:

- Crown Hill/High Street roundabout
- Websters Way/Eastwood Road roundabout

Additionally, transport modelling work has been undertaken to assess the options for improvements to the town centre area. A number of pedestrian crossing upgrade schemes have been identified. The full VISSIM model report is shown Appendix B. On 1 February 2015, however, an Air Quality Management Area (AQMA) was designated around Rayleigh town centre, and an associated Air Quality Management Plan (AQAP) was submitted to DEFRA in June 2017[1].

Rochford Town Centre Area Action Plan

There is one allocated employment site, at Locks Hill, and four buildings in the centre are identified as opportunity sites within the Rochford town centre Area Action Plan. However, the spatial framework identifies increased retail space, improved market square, protection of office based employment at Locks Hill and opportunities for mixed use developments as key policies.

The AAP identifies four major intersections in the town centre as having traffic safety and congestion issues, these are:

- Ashingdon Road/Hall Road/West Street roundabout
- West Street/Bradley Way roundabout
- West/North/East/South Streets intersection
- Bradley Way/South Street/Southend Road roundabout

Hockley Area Action Plan

The Eldon Way Opportunity Area is identified as a site for major redevelopment. The site is envisioned to be mixed use, with an area set aside for employment purposes. Other key areas of improvement identified are pedestrian accessibility, public realm, and parking consolidation. The traffic issues at the Spa Road/Main Road roundabout are described and it is determined that developments will need to contribute to highways improvements, namely “the incorporation of two-lane approaches on the three principle arms (Spa Road, Southend Road and Main Road) of this mini-roundabout”, depending on the engineering feasibility of this design.

<u>Local Non-Statutory Development Plans</u>

Hullbridge Village Plan 2012 - 2014

The Village Plan contains the views of many of the residents obtained via questionnaires. There is concern that the current infrastructure of the village would be negatively affected by further development in terms of congested roads and an impact on the sewage and drainage systems. Overcoming these impacts on the local infrastructure would encourage support for new development.

[1] https://www.rochford.gov.uk/environment/air-quality/air-quality-management-area-aqma

Great Wakering Parish Plan 2015

The Parish Plan has identified a number of Community Objectives, many of which relate to housing development. There is a wish to preserve the village character of Great Wakering and also to preserve the village boundaries to prevent 'coalescence' with Southend.

Hawkwell Parish Plan 2011

The majority of respondents are opposed to further housing developments in Hawkwell. There is concern that the local infrastructure would not be able to accommodate the increased demand and should be improved prior to any development. There is a wish for the Green Belt to be maintained and for local consultation prior to large developments.

Hockley Parish Plan 2007

The Parish Plan describes the wishes of the residents to maintain a clear separation between Hockley and the neighbouring parishes. The need for appropriate infrastructure is expressed with congestion noted as an issue for the area due to Hockley being used as a through route.

Residential Planning Applications

The status of each of the major residential planning applications received as of July 2017 is shown in Appendix C.

The majority of future housing in the District will be delivered on nine allocated sites on the edge of existing residential areas. Three major developments at land north of London Road, Rayleigh (Policy SER1), Hall Road, Rochford (Policy SER2) and south west Hullbridge (Policy SER6) will provide a total of 550, 600 and 500 homes respectively. The development at Hall Road, Rochford has received reserved matters approval and is currently being delivered, whilst the developments at land north of London Road, Rayleigh and south west Hullbridge have secured outline planning permission. Other notable residential developments with final planning permission include 116 dwellings at Star Lane Brickworks, Great Wakering (Policy BFR1), 70 dwellings at Pond Chase Nursery, Hockley (Policy SER3) and 35 dwellings at Three Acres, Canewdon (part of Policy SER7). Allocated sites including 176 dwellings at South Hawkwell (Policy SER4) and 100 dwellings at East Ashingdon (Policy SER5) have already been delivered. The remaining allocated housing sites either have outline planning permission or no planning permission as at August 2017.

The delivery of new housing is identified in Authority Monitoring Report 2016 and is summarised in below.

Other Land Use Planning Applications

There are 2 notable applications for alternative land use development, through light industrial works, offices and leisure. Land east of rugby club on Aviation Way is a major planning application, associated with the JAAP (areas 2 and 3), for the development of a new business park. This is to include a variety of land uses including business, general industry, retail and a hotel. This development of this site is underway.

To accommodate this, the demolition of the existing rugby club is required, and a new rugby club is set to be relocated to land rear of Cherry Orchard Brickworks, as part of a hybrid planning application for the new rugby club and associated works including 10 rugby pitches, a new club house and a car park. The relocation of the rugby club is nearing completion.

Further land use for employment can be found in the allocations plan. This includes an 8.8-hectare site to the west of the A1245, Rayleigh – Policy NEL1, and a 3.2-hectare site South of Great Wakering – Policy NEL2. However, these two employment developments identified in the Allocations Plan have not yet been submitted for planning permission; although there has been commercial interest in bringing forward both sites.

Authority Monitoring Report 2016

This is the most recent Authority Monitoring Report available on the RDC website.

The Authority Monitoring Report 2016 Housing Land Supply Positon Statement chapter sets out the District's position in terms of availability of residential land and number of dwelling completed and under construction.

There were net 169 completions in 2014/15, and net 148 completions in 2015/16 for a total of 315 dwellings built over this period.

Windfall developments are summarised as accounting for 37 and 53 completions and 105 and 119 dwellings outstanding for 2014-15 and 2015-16, respectively. This shows that windfall sites make a significant contribution to housing supply.

Appendix A to the Housing Statistics Land Supply Position Statement chapter provides a housing trajectory between 2015/16 and 2024/25.

Based on the information in the housing trajectory, a comparison can be made of the housing requirement, completions to date and the projected numbers of dwellings arising from extant planning permissions, sites without planning permission and allocated sites approved subject to S106 agreement (as of August 2017), as shown below in Table 2.6.

Table 2.6 Comparison of Housing Requirement, Completions and Forecasted Completions

Number of Dwellings				
	2014-2016	2016-2021	2021-2026	2016-2026
Housing requirement (250 dwellings per year)	500	1250	1250	2500
Actual completions 2014-16	315			
Shortfall	-185			
Extant planning permissions		1,476	858	2,334
Sites under consideration without planning permission		57	208	265
Allocated sites without planning permission		297	300	597
Allocated sites approved subject to S106 agreement		280	40	320
Total Projected Dwellings Developed		2,110	1,406	3,516

Table 2.6 demonstrates that there are sufficient sites available to meet a delivery trajectory of 422 dwellings per year to 2021, 281 dwellings per year for the period 2021 – 2026 and an average 352 dwellings per year for period 2016-2026.

This is around the lower end of OAN range for period 2015-2025 as identified in the 2017 SHMA Addendum. This report does not assess the ability of the housing market to meet this level of OAN.

The anticipated new plan period is up to at least 2036 but this will be finalised as the plan progresses.

2.3 Summary

A wide range of documents from a number of sources were reviewed to provide a comprehensive overview of the housing and development profile of both current situation and future of Rochford District. A review and check was undertaken on large Planning Applications, Local Development Plans, Parish Plans and Transport Strategies. All of the available material was assessed for relevance and then reviewed accordingly.

In Rochford District, the housing trajectory has identified there are sufficient available sites to deliver an average of 330 dwellings per year for ten-year period 2015-2025 (Authority Monitoring Report 2016). This is around the lower end of OAN range of 331

dwellings per year. The major planning applications currently submitted focus mainly on residential developments such as at land north of London Road, Rayleigh and South West Hullbridge. The exception to this is the new business park being built on land east of rugby club on Aviation Way in Rochford, and the associated relocation of the rugby club. Further development opportunities have been identified in the Allocations Plan but have yet to be submitted for planning permission.

A number of specialist reports have been assessed including the Rochford Growth Strategy, Employment Land Study and Retail and Leisure Study. These highlight the importance of London Southend Airport to the area and provide scope for future associated retail floor space. The Employment Land Study report acknowledges there are is a need for further employment land in the future, and that these may be addressed through currently undeveloped sites, including those associated with the JAAP to the north of London Southend Airport.

A review of the JAAP shows the Rochford District Council's commitment to providing further employment to the area. The JAAP aims to address the Districts employment issues, by creating an airport-related employment cluster in close proximity to London Southend Airport. It sets out the proposed plan to deal with the levels of growth and change in the area.

The review of the Council's Town Centre Area Action Plans (AAPs) outlines the priorities in the town centre areas within Rochford District. While there are no major allocations in any town centre, each has policies to promote retail and/or mixed use development. There are opportunity sites in each centre where the local policy supports development. Several transport and accessibility issues are raised in the AAPs, most notably improvements to pedestrian areas and public realm are important in each plan. Particular intersections that are problem areas are also identified. A review of local residential planning applications and other land use development show that the majority of future housing will be provided through major planning schemes up to the year 2025, as set out in the Allocations Plan.

The review of local Parish plans provides an overview of local pressure to deliver local infrastructure and improve local junctions to support any development.

3 Data Review

3.1 Demographic Data Review

Demographic related datasets identifying the underlying profile of the local area were reviewed and are detailed below.

3.1.1 Population

The population of Rochford District according to the 2011 Census was 83,287 people. In 2001 it was recorded as 78,489 and hence there was a 6.1% increase between those dates.

3.1.2 Age Profile

The age profile of Rochford District residents according to the 2011 Census data is shown in the Table 3.1 below. The age profile data suggests a population dominated by the middle aged and elderly. Those aged between 40 and 80 make up 56% of Rochford District's population, compared to a national average of 50%. Similarly, younger generations aged 16 to 40 make up only 26% of the Rochford District profile, compared to a 32% national average. The age profile of Rochford District appears to correlate far closer with that of Essex, with each age band being within a single percentage point. However, Rochford District still has a higher proportion of both 40-60 and 60-80 year olds than Essex.

Table 3.1 Age Profile of Rochford District Residents 2011

Age Profile	Rochford	Essex	England
0-16	18%	17%	19%
16-25	10%	11%	12%
25-40	16%	17%	20%
40-60	29%	28%	27%
60-80	22%	21%	18%
80+	5%	6%	5%

Source: http://www.neighbourhood.statistics.gov.uk/

As has been shown in the age profiles, Rochford District has an ageing population when compared to the rest of England. There has been shift over time from the previous 2001 Census to 2011, towards an older population, accentuating an already aging profile. The population aged over 60 has increased by 4% and consists well over a quarter of the total Rochford District population, with 2% taken from each of the 0-16 and 16-59 categories. This can be seen in Table 3.2 below.

Table 3.2 Change in Age Profile of Rochford Residents from 2001 to 2011

Age Profile	Rochford 2011	Rochford 2001
0-16	18%	20%
16-59	55%	57%
60+	27%	23%

Source: http://www.neighbourhood.statistics.gov.uk

3.1.3 Employment Status

Similarly, employment statistics were extracted from the 2011 Census in order to build a profile of the residents of Rochford District. Rochford is highly economically active area, with a total of 80.3% of those who can work being economically active. This compares favourably with both Essex and England which have 1% and 2% lower activity respectively. Perhaps the most eye catching figure is that of unemployment, which is drastically lower than the average of 5.1% across the rest of England. Rochford's 2.9% of unemployment is also over a percent lower than the rest of Essex. This can be seen in Table 3.3 below.

Table 3.3 Employment Status of Rochford District Residents

Employment Status	Rochford	Essex	England
Economically active	80.3%	79.3%	78.0%
Economically inactive	19.7%	20.7%	22.0%
Unemployed	2.9%	3.8%	5.1%

Source: ONS Annual Population Survey

3.1.4 Dwellings

Dwelling types in Rochford tend to be larger than the average across England as well as Essex. There is a large proportion, almost half of all residences (47%), of semi-detached houses in Rochford District, compared with an average of 31% across both Essex and the rest of England. There are also far fewer flats or maisonettes within the District with them comprising only 10% of the total residences. The average house size and number of bedrooms are larger than the average across the rest of England, largely due to the rural nature of Rochford District. This can be seen in Table 3.4 and Table 3.5 below.

Table 3.4 Type of Dwellings – Proportions (2011 Census)

Dwelling Type	Rochford	Essex	England
Detached house	33%	31%	22%
Semi-detached	47%	31%	31%
Terraced	8%	2%	24%
Flat, maisonette or apartment	10%	16%	21%
Caravan, other mobile or temporary structure	1%	1%	1%
Average number of bedrooms per household	2.9	2.8	2.7

Source: Office for National Statistics 2013 and 2011 Census data

Table 3.5 Type of Dwellings – Numbers (2011 Census)

Dwelling Type	Rochford	Essex	England
Detached house	11,155	177,743	4,949,216
Semi-detached	15,864	182,270	6,889,935
Terraced	2,689	124,508	5,396,459
Flat, maisonette or apartment	3,368	92,314	4,668,839
Caravan, other mobile or temporary structure	488	4,754	158,919
Total	33,564	581,589	22,063,368

Source: Office for National Statistics 2013 and 2011 Census data

3.1.5 Average number of persons per household

The average household size, in terms of number of residents also appears to be higher than that of both Essex and England with an average of 2.48 persons per household

across the District. This implies a higher proportion of families living in houses with 2 + bedrooms in Rochford District than the rest of Essex, which has an average of 1.97 persons per household. This can be seen in Table 3.6 below.

Table 3.6 Average Number of Persons Per Household (2011 Census)

Persons per Household	Rochford	Essex	England
Number of residents	83,287	1,145,489	53,012,456
Number of households	33,564	581,589	22,063,368
Average number of persons per household	2.48	1.97	2.40

Source: Office for National Statistics 2013 and 2011 Census data

3.2 Transport Data Review

Transport related datasets (publicly available from the 2011 Census database) identifying the travel demands and pressures on the network in the Rochford District were reviewed and are detailed below.

Section 3.2.1 presents the data extracted and Section 3.2.2 summarises the key findings.

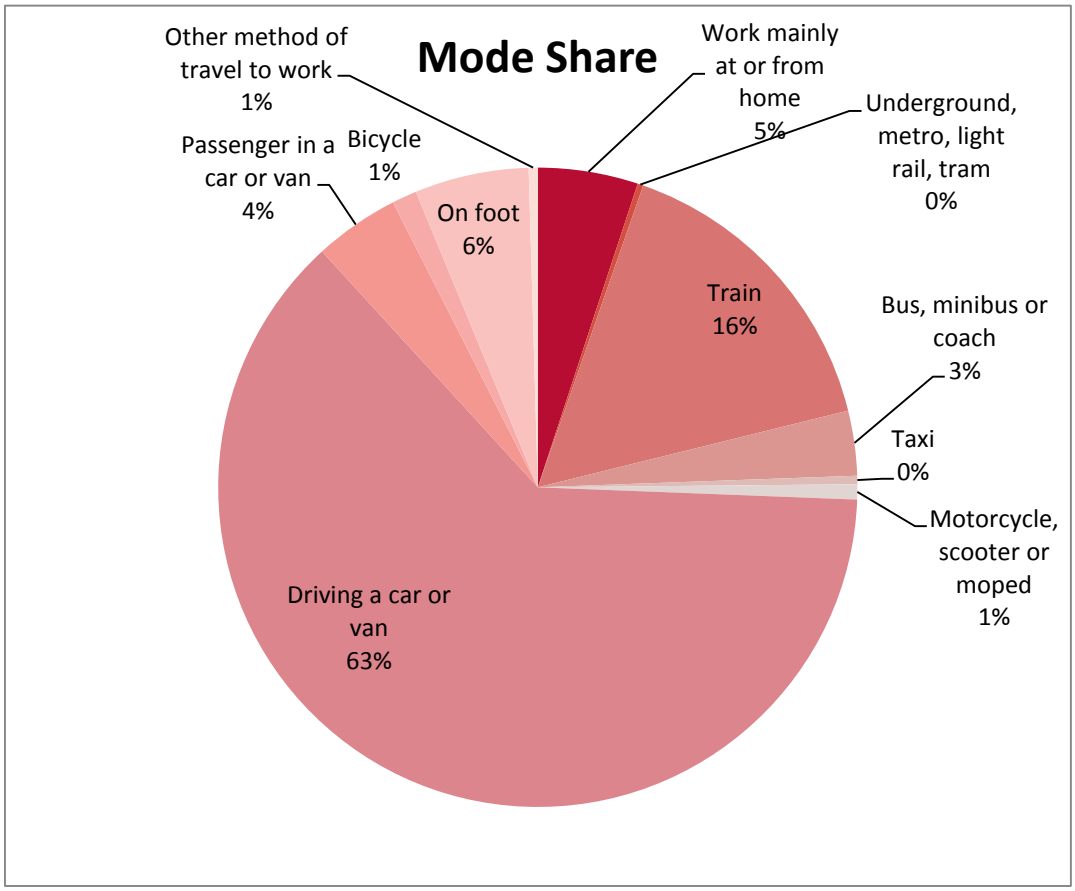
3.2.1 2011 Census Data

Table 3.7: Rochford Residents Mode Share – Work Trips

Mode	Total Trips	Percentage
All categories: Method of travel to work	60,425	
All usual residents aged 16 to 74		
Work mainly at or from home	2,057	5%
Underground, metro, light rail, tram	118	0%
Train	6,423	16%
Bus, minibus or coach	1,333	3%
Taxi	173	0%
Motorcycle, scooter or moped	311	1%
Driving a car or van	25,450	63%
Passenger in a car or van	1,753	4%
Bicycle	511	1%
On foot	2,346	6%
Other method of travel to work	187	0%
	40,662	100%
Not in employment	19,763	

Source: Census 2011

Figure 3.1: Rochford Residents Mode Share – Work Trips



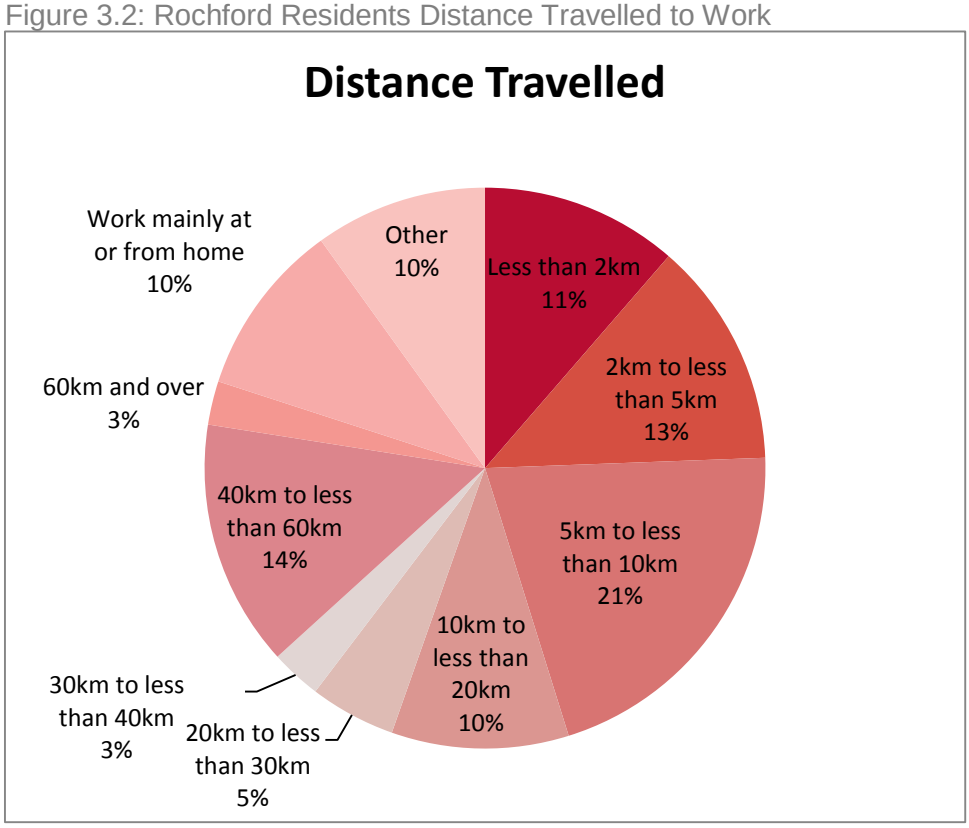
Source: Census 2011

Table 3.8: Rochford Residents Distance Travelled to Work

Distance travelled to work	Total Trips	Percentage
All categories: Distance travelled to work	40,878	
Less than 2km	4,647	11.4%
2km to less than 5km	5,332	13.0%
5km to less than 10km	8,488	20.8%
10km to less than 20km	4,176	10.2%
20km to less than 30km	2,023	4.9%
30km to less than 40km	1,195	2.9%
40km to less than 60km	5,813	14.2%
60km and over	1,029	2.5%
Work mainly at or from home	4,112	10.1%
Other	4,063	9.9%
Total	**40,878**	**100.0%**

Source: Census 2011

Figure 3.2: Rochford Residents Distance Travelled to Work



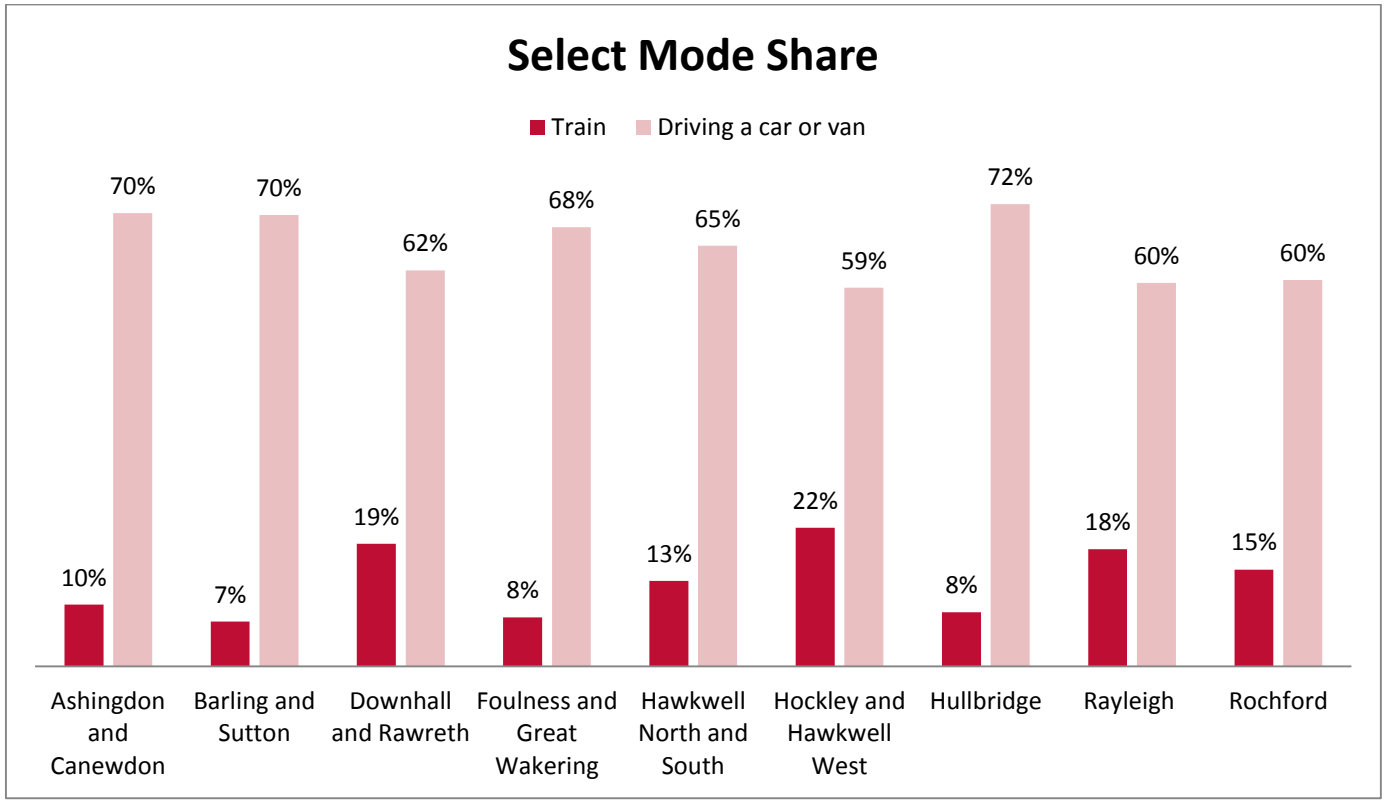
Source: Census 2011

Table 3.9: Mode Share by Rochford Wards

Ward/Region	Work mainly at or from home	Underground, metro, light rail, tram	Train	Bus, minibus or coach	Taxi	Motor-cycle, scooter or moped	Driving a car or van	Passenger in a car or van	Bicycle	On foot	Other method of travel to work	TOTAL
Ashingdon and Canewdon	7%	0%	10%	2%	0%	1%	70%	4%	1%	4%	1%	100%
Barling and Sutton	6%	0%	7%	2%	0%	1%	70%	5%	2%	5%	1%	100%
Downhall and Rawreth	6%	0%	19%	3%	0%	1%	62%	3%	1%	4%	0%	100%
Foulness and Great Wakering	4%	0%	8%	5%	0%	1%	68%	7%	2%	4%	1%	100%
Hawkwell North and South	4%	0%	13%	5%	0%	1%	65%	4%	2%	4%	0%	100%
Hockley and Hawkwell West	6%	0%	22%	2%	1%	1%	59%	4%	1%	5%	0%	100%
Hullbridge	5%	0%	8%	4%	1%	1%	72%	4%	1%	4%	0%	100%
Rayleigh	5%	0%	18%	3%	0%	1%	60%	4%	1%	7%	0%	100%
Rochford	4%	0%	15%	4%	0%	1%	60%	5%	2%	8%	0%	100%
Rochford District council	5%	0%	16%	3%	0%	1%	63%	4%	1%	6%	0%	100%
Essex	5%	2%	11%	3%	1%	1%	61%	5%	2%	9%	1%	100%
England	5%	4%	5%	7%	1%	1%	57%	5%	3%	11%	1%	100%

Source: Census 2011

Figure 3.3: Train and Car Driver Mode Share by Ward for Rochford Residents



Source: Census 2011

Table 3.10: Distance Travelled by Mode Share

	Train, underground, metro, light rail or tram			Bus, minibus or coach			Driving a car or van		
	Rochford	Essex	England	Rochford	Essex	England	Rochford	Essex	England
Less than 2km	2.7%	2.5%	2.8%	11.2%	13.4%	11.8%	9.8%	11.5%	12.1%
2km to less than 5km	1.8%	1.6%	7.9%	23.9%	38.3%	38.5%	16.8%	16.3%	20.0%
5km to less than 10km	7.0%	2.8%	22.0%	46.3%	20.8%	27.1%	27.4%	16.7%	20.7%
10km to less than 20km	2.7%	11.4%	28.6%	9.8%	13.7%	10.6%	14.8%	20.5%	19.5%
20km to less than 30km	2.3%	11.6%	9.7%	1.3%	3.9%	2.1%	7.2%	10.4%	7.8%
30km to less than 40km	1.9%	17.0%	5.0%	0.4%	1.6%	0.8%	4.1%	4.8%	3.4%
40km to less than 60km	70.1%	31.6%	6.6%	1.4%	1.5%	0.8%	4.7%	4.2%	2.8%
60km and over	5.5%	14.2%	7.2%	1.9%	2.0%	2.1%	2.3%	3.1%	3.3%
Other	6.0%	7.5%	10.3%	3.9%	4.8%	6.3%	12.9%	12.5%	10.4%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

	Passenger in a car or van			Bicycle			On foot		
	Rochford	Essex	England	Rochford	Essex	England	Rochford	Essex	England
Less than 2km	13.8%	17.1%	17.4%	31.7%	41.5%	30.1%	72.8%	73.1%	71.4%
2km to less than 5km	23.2%	25.7%	28.0%	30.3%	33.4%	35.3%	9.7%	11.9%	13.4%
5km to less than 10km	27.4%	15.9%	19.8%	21.9%	9.1%	18.2%	5.6%	3.3%	3.9%
10km to less than 20km	10.6%	14.5%	13.5%	6.2%	5.8%	6.9%	2.3%	3.5%	2.8%
20km to less than 30km	3.8%	6.4%	4.8%	1.8%	2.1%	1.4%	1.1%	1.4%	1.2%
30km to less than 40km	2.9%	2.8%	2.0%	0.2%	0.8%	0.6%	0.5%	0.7%	0.6%
40km to less than 60km	4.0%	2.5%	1.7%	1.8%	1.0%	0.5%	1.7%	0.8%	0.6%
60km and over	1.2%	1.9%	2.4%	0.6%	1.8%	1.9%	2.8%	2.0%	2.4%
Other	13.1%	13.2%	10.5%	5.6%	4.5%	5.1%	3.7%	3.4%	3.7%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Census 2011

Table 3.11: Commuter Flows to/from Rochford by Borough/District

	Local Authorities in Essex								
	Southend	Basildon	Chelmsford	Brentwood	Castle Point	Thurrock	Maldon	Westminster and City of London	
To Rochford from	4958	1327	658	145	1554	297	281	4	
From Rochford to	8466	3209	1404	533	1479	769	196	2936	
Net movement	-3508	-1882	-746	-388	75	-472	85	-2932	
	Tower Hamlets	Havering	Barking & Dagenham	Newham	Southwark	Hackney	Islington	Other	Total
To Rochford from	23	208	46	33	5	4	3	988	10416
From Rochford to	951	521	331	266	297	146	330	2803	24441
Net movement	-928	-313	-285	-233	-292	-142	-327	-1815	-14025

Source: Census 2011

Table 3.12: Car Ownership Rates in Rochford District by Ward[2]

Area	No cars or vans in household	1 car or van in household	2 cars or vans in household	3 cars or vans in household	4 or more cars or vans in household	Average number for area
Ashingdon and Canewdon	7.5%	34.0%	39.8%	13.0%	5.6%	1.79
Barling and Sutton	8.1%	36.2%	37.4%	11.9%	6.4%	1.76
Downhall and Rawreth	7.2%	39.2%	39.1%	10.1%	4.3%	1.67
Foulness and Great Wakering	14.5%	39.3%	34.3%	8.8%	3.1%	1.48
Hawkwell North and South	14.1%	39.9%	33.4%	9.4%	3.2%	1.49
Hockley and Hawkwell West	12.7%	40.7%	33.2%	9.3%	4.1%	1.53
Hullbridge	11.5%	40.2%	35.0%	9.7%	3.6%	1.55
Rayleigh	16.0%	42.2%	31.3%	7.2%	3.3%	1.41
Rochford	24.8%	44.4%	23.2%	5.4%	2.3%	1.17
Rochford District	14.5%	40.8%	32.6%	8.5%	3.6%	1.47
Essex	18.0%	42.1%	29.6%	7.4%	3.0%	1.37
England	25.8%	42.2%	24.7%	5.5%	1.9%	1.16

Source: Census 2011

[2] Ward boundaries are as at 2011

Table 3.13: Rochford Pupils Travel to School

Mode of Travel	Percent of Pupils
Car/Taxi	24.37%
Car Share	2.53%
Public Transport	13.99%
Walk	**56.84%**
Cycle	2.10%
Other	0.18%

Source: Travel to School Census 2011, Essex County Council

3.2.2 Key Findings

The transport profile outlined below is derived from the analysis of the 2011 Census data from the tables and figures presented above. For sections that reference wards, it should be noted that ward boundaries were changed in 2015 and this is not reflected in the analysis.

Mode Share

Rochford District's mode share commuter profile in Table 3.7 shows that car/van drivers are the dominant mode at 63% of commutes being made this way. There is a minority of commuters who take the train, at 16% of work trips. Other modes such as walking, cycling, travelling as a car/van passenger, travelling by bus, and no travelling (working from home) make up the remaining trips. Table 3.9 breaks this information down by ward and we can see that the areas with higher penetration of train commuting are those with closer access to the stations: Downhall and Rawreth, Hawkwell and Hockley, Rayleigh and Rochford. There is slight variability between ward in the use of other modes. However, the main trade-off appears to be between train and car.

Flow of Commuters

Table 3.11 breaks down the flow of commuters by borough/District and includes data on individuals who live outside Rochford District and work within the District. This table allows us to compare inflows and outflows and calculate a net flow rate. The Census data indicates that 10,416 people travel to work inside Rochford District from elsewhere. It also shows a movement out of Rochford District for work of 24,441 people. The total net outflow is 14,025 workers.

Car Ownership

Rochford District's residents own on average 1.47 cars or vans per household. This is higher than the national average and slightly higher than the Essex average of 1.37. There is a significant variance between the rural and urban wards. However, Rochford ward is significantly lower at 1.17.

Travel to School

Baseline data taken from the Annual School Census (PLASC) database in January 2011 (as presented in the 'Essex County Council's Sustainable Modes of Travel Strategy'

document) represent figures from over 550 schools, including primary and secondary schools, in Essex. This was the last time a summary of data for Essex was collated.

The data provides an insight into the travel to school mode share in the Rochford District. It shows that walking to school is significantly the highest mode of travel at 56.84%, and although this is in line with the overall trend shown across the county, it is amongst one of the highest mode shares of walking across all Districts in Essex.

Sustainable modes of travel to schools can be further encouraged through the use of a School Travel Plan (STP) which is defined in the 'Essex County Council's Sustainable Modes of Travel Strategy' document as an "active document produced by the whole school community to identify and implement measures to enable all relevant parties to travel by their most suitable and sustainable modes, with associated benefits for the wider community". This is being promoted by ECC through providing school travel planning initiatives and additional support through a new School Travel Plan Accreditation Scheme.

3.3 Summary

The demographic related data review has revealed Rochford District as an ageing population, with a decrease in young people, most notably between the ages of 16 to 25. This can be linked to the fact that the dwelling size is generally larger than the rest of England and Essex, with a higher average occupancy, suggesting a larger number of family homes. There are also very few flats which are generally more affordable for a young population.

The transport related data review captures the general profile of commuters, identifying a heavy dependency on cars to form part or all of a commuter's journey to/from Rochford. This is likely to be derived from the lack of local employment, and the Districts dependency on the economic pull of London and other surrounding areas. There is also a relative lack of public transport connecting the District with its surrounding areas which may encourage people towards car usage.

Although currently 6 years out of date, the 2011 Census data has clearly demonstrated that Rochford District experiences a net outflow of workers, which implies heavier flows in one direction during the peak commuter periods on the transportation network.

4 Transport Network Analysis

An analysis of the existing transport network for various modes of travel including road, rail, bus, cycle and pedestrian networks within the District has been undertaken and detailed below.

4.1 Study Area

The study area for this section covers the Rochford District, as shown below in Figure 4.1.

Figure 4.1: Transport Network Analysis Study Area

Source: Background mapping contains OS data © Crown copyright and database rights (2017)

4.2 Road

Google Maps provides a detailed overview of the local road network. Satellite and Street View provide viewing at a local level of detail for analysing roads or junctions.

4.2.1 Strategic Highway Network

The strategic highway network is linked to Rochford District via two key links, the A130 and A127. This section of the work will summarise the issues and options identified from the document and data review undertaken in Section 2 and Section 3 respectively.

A130

The A130 runs north-south and connects Chelmsford in the north to Canvey Island in the south. It is a dual carriageway with 2 lanes in each direction from Chelmsford until the A127 Junction, with a 6-lane (3 lanes in each direction) carriageway being developed

on this northern part. Between the A127 Junction and the A13 Junction it is a dual carriageway with 3 lanes in each direction. South of the A13 junction it becomes a single carriageway until the B1014 junction. South of the B1014 Junction it is a dual carriageway with 2 lanes in each direction until it terminates.

The section of the A130 that lies within the Rochford District is to the west of Rayleigh. The A130 does not link to the road network within the District. To the north, the A130 connects Rochford District with Chelmsford City. The A130 southbound connects to the A13, which is a connector to Basildon and London. The A130 connects to A1245 north of Battlesbridge and to A1245 at the Rayleigh spur, south of Fairglen junction on A127, both fall outside of the District.

There are proposed improvements to the A127/A130 Fairglen interchange which are detailed on Essex highways website: (http://www.essexhighways.org/Transport-and-Roads/Highway-Schemes-and-Developments/major-schemes/a127-a130-fairglen-interchange.aspx) These new improvements have been funded by ECC, the Department for Transport (DfT) and the South East Local Enterprise Partnership (SELEP).

A127

The A127 runs east-west from Gallows Corner in the west (where it merges with the A12) to the A13 junction in central Southend-on-Sea, near Southend Victoria Train Station. It is a dual carriageway with 2 lanes in each direction for nearly all of its length, with a small section of single carriageway in Southend.

The section within the District lies to the south of Rayleigh and marks the periphery of the District. The A127 does not link any key centres within the District but serves as a connector to Southend-on-Sea in the east to the wider network. To the west, the A127 connects the A13, with London via the M25, and the A12. The A127 is accessible from the District via the A1245 and the A129 in the south-west of the District or via the B1013, in the central southern area of the District.

The key proposals for the corridor upgrade will need to be funded. ECC is looking for contributions via Section 106 agreements and Community Infrastructure Levy (CIL) contributions from adjacent developments in Castle Point Borough, Basildon Borough and Rochford District that have direct and indirect impacts on A127. In addition, the County Council will seek funding through bid opportunities as they arise.

A1245

The A1245 runs north-south from Battlesbridge in the north (at the Hawk Hill roundabout, connecting with the A130/A132/A1245/Hawk Hill) to Rayleigh in the south, where it meets at the junction with the A127 and the A130 Fairglen Interchange. To the north of Rawreth Lane it is a single carriageway with one lane and to the south of Rawreth Lane it is a dual carriageway, with two lanes.

The section within the District lies to the west of the boundary. The A1245 travels through the centre of Rawreth and serves as a connector to Battlesbridge and Rayleigh. To the

south, the A1245 connects the A127 and the A130 (which turns into the A13), which both connect to London via the M25.

ECC has plans for improvements on the A1245 at the junction with A127 Fairglen Interchange. There is a development site at London Road which has a planning condition requiring the installation of a left turn lane at the Carpenters Arms roundabout on the A1245.

4.2.2 Key Regional Links

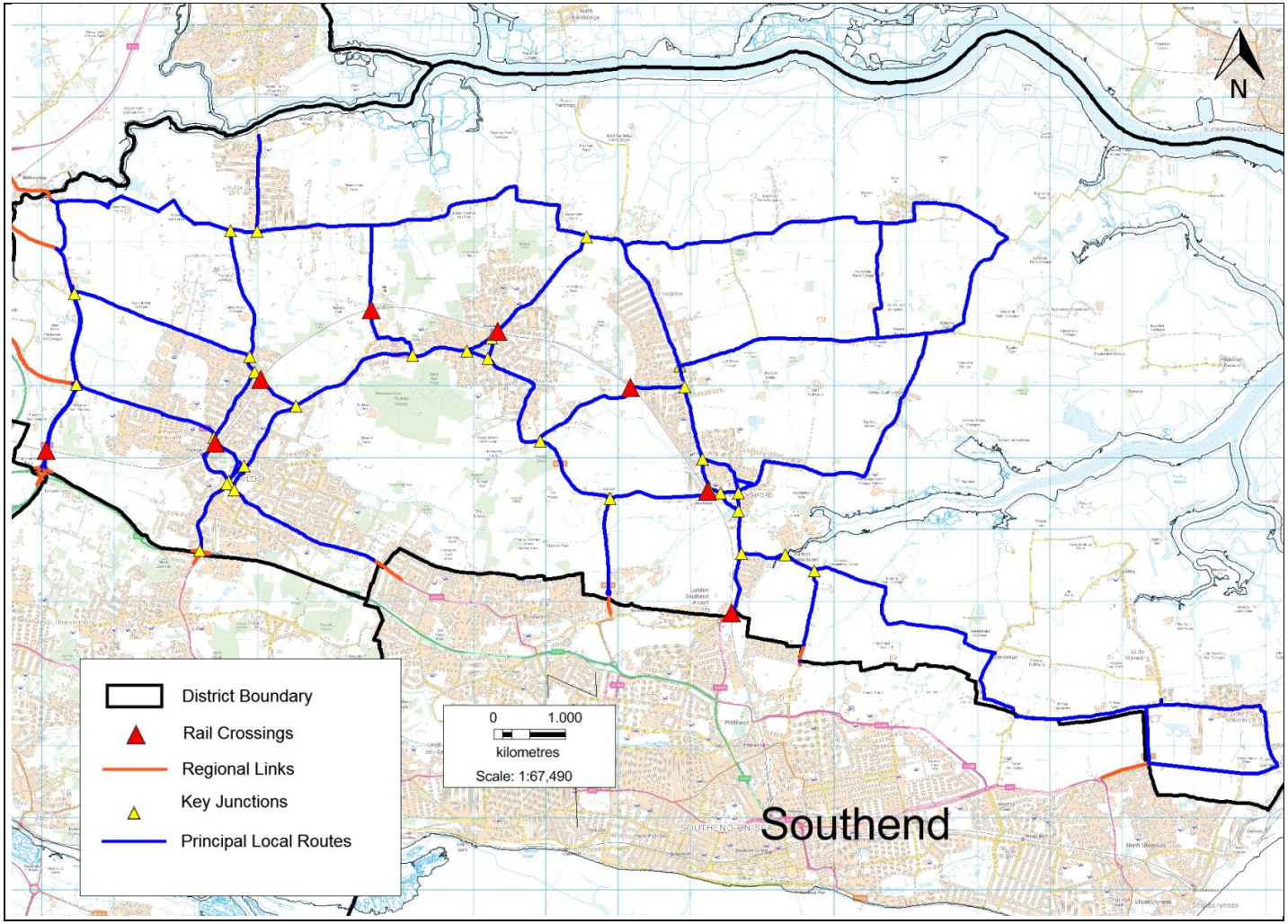
Key regional links are the sections of local and strategic roads which extend beyond the boundary of the District, connecting the District to other regions.

- Hawk Hill – At the north-western boundary of the District, Hawk Hill connects to Battlesbridge and Battlesbridge train station. Hawk Hill continues to the Hawk Hill Roundabout and Rettendon Turnpike, connecting to South Woodham Ferrers, Wickford and Chelmsford
- A1245 – At the north-western boundary of the District, the A1245 continues to the Hawk Hill Roundabout and Rettendon Turnpike, connecting to South Woodham Ferrers, Wickford and Chelmsford
- A129 – At the western boundary of the District, the A129 connects to Wickford.
- A1245 – At the south-western boundary of the District, the A1245 connects with the A127 and the A130, both described in Section 4.2.1
- A129/A127 Rayleigh Weir – At the southern boundary of the District, south of Rayleigh town centre the A129 connects to the A127, described in Section 4.2.1 and continues to Hadleigh where it connects with the A13
- A1015 – At the southern boundary of the District and east of Rayleigh town centre, the A1015 connects Rayleigh with Southend-on-Sea
- B1013 – At the southern boundary of the District, the B1013 connects the District to Southend-on-Sea via Cherry Orchard Way and crosses west of London Southend Airport area. It also connects with the A127 (as described in Section 4.2.1)
- Southend Road – At the southern boundary of the District, south of Rochford town centre, Southend Road connects the District to Southend-on-Sea and crosses east of London Southend Airport. It also connects with the A127 via the A1159 (as described in Section 4.2.1)
- Sutton Road – At the south boundary of the District and to the south-east of Rochford town centre, Sutton Road connects the District with Southend-on-Sea and A1159 and B1015 roads
- Barling Road/Poynters Lane Wakering Road – At the southern boundary of the District and to the west/south-west of Great Wakering, these roads connect the mostly-rural south-east of the District with Southend-on-Sea

4.2.3 Principal Local Routes and Junctions

The main spine of the network is the semi-circular B1013 route. Principal routes radiate from the B1013 and connect to an outer radial route. A peripheral network serves the mostly-rural northeast and southeast of the District.

Figure 4.2: Rochford District Road Network



Source: Background mapping contains OS data © Crown copyright and database rights (2017)

Principal Local Routes

The principal local routes are selected based on general hierarchy and other factors. All numbered A- and B-roads are included. Other roads are included based on the size and density of the catchment area, or important linkages. Routes that are used by bus routes are also considered principal routes in most cases. Additionally, Trafficmaster data indicates some additional roads that are frequently travelled. The complete list of roads that make up the principal local network can be found in Appendix D.

Key Junctions

The key junctions on the primary road network are a selection of junctions along the network that represent especially important linkages based on level of use. The junctions are selected based on a combination of the principal route junctures, Trafficmaster data, and local Parish reports. The complete list of key junctions can be found in Appendix D.

4.2.4 Parking

Council owned car parks in the District charge fees for parking from 7a.m. to 7p.m., Monday to Friday and 7a.m. to 1p.m. on Saturday. Parking is free on Sundays and public holidays. Privately operated NCP car parks located at local railway stations in Rayleigh, Rochford and Hockley are also available, charging across a 24/7 period. Most of the parking is designed to improve access to local shopping Districts, local employment centres or facilities around train stations. The key major retail car park in the District is the Airport Retail Park.

Rayleigh

Rayleigh has 7 car parks for a total of 330 mixed-stay spaces, 400 short-stay spaces (not applied to season ticket holders), and 40 spaces by the station designated long-stay and only available to season ticket holders.

Rochford

Rochford has 3 council car parks for a total of 305 mixed-stay spaces and 10 short-stay spaces. The Rochford train station has an additional 208 spaces.

Hockley

Hockley has 2 car parks for a total of 150 mixed-stay spaces. Hockley train station has an additional 148 spaces.

Hawkwell

Hawkwell has 1 car park with 16 short-stay spaces that are free for up to one hour.

Hullbridge

Hullbridge has 1 car park with 117 short-stay spaces that are free up to a maximum stay of 17 hours.

4.2.5 Hotspot Analysis

Core Strategy

The Council's Core Strategy identifies highways improvements to be made in several areas. This report focuses on the roads and junctions identified above in the document

review (Section 2.2), as priorities to be implemented, with improvement options detailed below in Section 5.3.

Statutory Local Development Plans

The Rayleigh Centre Area Action Plan identifies two major intersections in the town centre as having traffic safety and congestion issues, these are:

- Crown Hill/High Street roundabout
- Websters Way/Eastwood Road roundabout

The Rochford Town Centre Area Action Plan identifies four major intersections in the town centre as having traffic safety and congestion issues, these are:

- Ashingdon Road/Hall Road/West Street roundabout
- West Street/Bradley Way roundabout
- West/North/East/South Streets intersection
- Bradley Way/South Street/Southend Road roundabout

The Hockley Area Action Plan describes traffic issues at the Spa Road / Main Road roundabout.

Non-Statutory Local Development Plans and Community Engagement

Several problem areas are identified in the Hullbridge Village Plan 2012-2014, Hockley Parish Plan 2007, Hawkwell Parish Plan 2011, and Great Wakering Parish Plan 2015 by local residents and councils. Areas of concern raised during the Council's early community engagement workshops and survey in 2016 have also been included to inform the new Local Plan. The following areas are perceived as congestion problem hotspots:

- Ashingdon Road – general levels of congestion at peak times
- Lower Road – problems caused by vehicles turning into side streets
- Watery Lane – seen by authorities as a back road but often used as a shortcut
- Rawreth Lane – congestion issues resulting from junctions at both ends
- Main Road, Hawkwell
- Rectory Road Railway Bridge
- Hawkwell near schools
- Nursery Corner, Hawkwell
- Spa Road eastbound bus stop The Spa, stop ID: "esxagjtd"
- Southend Road/Hockley Rise
- A127/A130 Fairglen interchange
- Folly Lane/Main Road
- Spa Road/Great Eastern Road/Station Approach
- Websters Way/High Street

- High Street/Eastwood Road
- Several points in Rayleigh, Hockley and Rochford where highways travel under railway bridges

Trafficmaster Analysis

This section outlines the analysis undertaken using GIS software, examining the congestion hotspot data based on the latest available Trafficmaster data showing free flow comparisons for AM and PM peak hours for a neutral month average in 2014 - 2015. The Trafficmaster data provided by Essex Highways is included in Appendix E.

Trafficmaster uses in-vehicle GPS journey time data – from Teletrac Navman (a fleet management company) & Citroen Vans / lease vehicles to derive average journey times, speeds, congestion (% of free flow) and reliability. All routes in the District with a minimum of 50 observations during peak period and 50 observations at free flow have been mapped. This minimum is chosen because links with fewer observations may provide unreliable outputs.

The resulting map is a Red Amber Green (RAG) assessment of the key junctions and links in the District. The observed percentage of free flow speeds are a proxy for junction stress. A very low percentage of free flow speed is a proxy for congestion. The following table (Table 4.1) defines the terms used in the analysis as they relate to the percentage of free flow speed. While we refer to the hotspot areas as congestion, it is an important caveat that this is inferred congestion, based on percentage of free flow speed. The descriptions below are for the AM and PM peak hours, though the hour before and after the peak is also analysed to ensure complete coverage of hotspot areas.

The full output maps for this analysis can be found in Appendix E. Some areas of Rochford District are not included in the Trafficmaster maps due to the lack of data. More rural areas to the east of Rochford and the area of Great Wakering did not factor into the analysis due to having fewer than the minimum 50 observations required during both peak and off-peak times.

Table 4.1: Congestion Description

Percent of Free Flow Speed	Described Level of Congestion
85-100%	Free Flow Speed
65-85%	Low
45-65%	Medium
25-45%	High
<25%	Severe

AM Peak Traffic (08:00-09:00) Hotspots

The main spine of the network, the B1013, experiences medium to high levels of congestion over the majority of its length. From the beginning of the road in the centre of Rayleigh to the Rectory Road junction south of Hawkwell this route experiences low percentage of free flow speeds and then again when the road approaches and passes through Rochford. This route is used as a through road and also partly supports the local bus network so the delays here are particularly important.

The main areas of concern along the A127 are located to the south of Eastwood and on the approach to the junction with the A1159, with the results showing high levels of congestion at these sections of the road, while other areas show medium to low levels of congestion. The A127 is one of the key routes for serving the Rochford area, however, rat running and high use of the local road network across the District takes place as a result of the major delays on the A127. The District would therefore, benefit from improvements along this key corridor to relieve some of the congestion on the network.

Along the A1245 two problem areas can be observed. Approaching from the south, the London Road / Chelmsford Road Carpenters Arms roundabout appears to experience delays and low percentage of free traffic flow. The second congestion hotspot can be seen on the northbound approach on the Rawreth Lane/Chelmsford Road junction. This is a signalised junction with a dedicated right-turn lane but is affected by low percentage of free-flow traffic.

Rayleigh experiences high congestion throughout the principal local network. Low percentages of free-flow speed are observed along Station Road, Crown Hill, High Street/High Road, and Websters Way in all directions. The stretch of London Road west of the railway track experiences congestion in both directions. Down Hall Road southbound experiences severe congestion and appears to be backed up from the London Road intersection. Station Crescent southbound is also congested due to the intersection at London Hill. The B1013/Hockley Road southbound is congested due to the intersection with Websters Way.

The Trafficmaster data also highlights several non-primary routes receiving high use and congestion in the Rayleigh area. This appears to be due to congestion in the primary road network and drivers taking detours, which provides similar results to the previous town centre modelling work using VISSIM undertaken in 2015. This study found that traffic levels in the town centre are so great that options identified within the study to relieve congestion had little benefit in movements from one side of the town to the other, although there was more benefit expected on Saturdays and the study did identify the potential to provide safety benefits for pedestrians.

Nearly all of the principal routes connecting Hullbridge experience congestion with Watery Lane being the only exception where traffic flows at free-flow speed. Ferry Road experiences medium to high congestion throughout its length and in both directions. Lower Road experiences congestion and it can be seen to experience low percentages of free flow speed, particularly for westbound traffic approaching the Ferry Road and the

Hullbridge Road intersections. Hullbridge Road experiences high congestion for southbound traffic along its entire length. It is particularly impacted by the Rawreth Lane mini-roundabout junction, this junction is identified in a number of documents, for improvements. A planning application (16/00162/FUL) to improve this roundabout has been approved. Southeast of this junction, Hambro Hill Road connects to the B1013 and experiences congestion in both directions.

Around Hockley town centre all the principal local routes are shown to be congested in all directions. The B1013/Spa Road/Southend Road mini-roundabout is particularly congested.

In the Rochford town centre area, Ashingdon Road shows low percentage of free flow speed in both directions, particularly the section from Brays Lane to West Street. Southbound traffic along South Street, Southend Road and Sutton Road appears to be congested with vehicles travelling to Southend.

The post-AM peak hour (09:00-10:00) sees improvement across the network though congestion still occurs at all the aforementioned hotspots. The areas that remain most congested through the late peak appears to be the Hockley, Rochford and Rayleigh town centres/High Street surrounding areas.

The pre-AM peak (07:00-08:00) is also an improvement over the peak in most areas; while congestion persists in most of the hotspots, it is not as bad relative to the peak. The notable exceptions are Hullbridge Road and the areas directly surrounding the Rayleigh and Hockley train stations. These areas are nearly or as congested in the pre-AM peak hour as in the peak.

PM Peak (17:00-18:00) Congestion Hotspots

The main spine of the B1013 experiences medium congestion along its whole length through the PM peak. High levels of congestion are observed when the B1013 approaches the Spa Road mini-roundabout from both directions.

The main areas of concern along the A127 are located to the south of Eastwood and on the approach to the junction with the A1159, with the results showing high levels of congestion at these sections of the road, while other areas show medium to low levels of congestion, in line with the results presented for the AM peak.

Congestion along the A1245 is severe with low level of free flow speed, for southbound traffic from Rawreth Lane to the A127 junction. Southbound traffic approaching the Rawreth Lane junction also experiences high congestion. Northbound traffic experiences congestion approaching both the A129 roundabout and the Rawreth Lane junction. Rawreth Lane is observed as having high levels of congestion along its entire length in both directions.

London Road/A129 experiences severe congestion approaching the A1245 Carpenters Arms roundabout. Beyond that, eastbound traffic on London Road experiences high levels of congestion, particularly approaching the Victoria Avenue intersection.

Westbound traffic on London Road experiences relatively medium congestion with high congestion approaching Victoria Avenue.

Within Rayleigh, all principal local routes experience a range of medium to high congestion. There is more evidence of traffic along secondary routes in the PM peak than in the AM peak which may indicate more “rat runs”. Similar with the AM peak, the area around the station experiences low percentage of free flowing traffic along Station Road, Down Hall Road and Crown Hill. High Road/High Street and Websters Way appear to be the worst affected routes in Rayleigh.

The Hullbridge area and Hullbridge Road appear to have medium levels of congestion. Notably Watery Lane experiences high congestion for eastbound traffic. As stated in the Hullbridge Village Plan this route is used as a shortcut by locals and visitors alike, despite not being designed as such. The Ferry Road and Lower Road approaches to the junction’s roundabout appear to experience congestion, signifying that this roundabout is a problem area.

The centre of Hockley has relatively high levels of congestion at all peak times, with the B1013/Spa Road/Southend Road mini-roundabout showing evidence of high congestion. The main routes through Hockley, in particular Spa Road, and the area around Hockley station to the east are particularly affected by low percentage flows.

In the Rochford area, we observe medium to high levels of congestion along the majority of Ashingdon Road. Rectory Road is also highly congested and it appears to stem from the railway bridge where the road merges into one lane for both directions. Medium levels of congestion are seen in Rochford town centre. High levels of congestion are observed for all three approaches to the Ashingdon Road/Hall Road/ West Street Roundabout. Bradley Way southbound is highly congested.

The Sutton Road/Southend Road Anne Boleyn roundabout is identified as a problem area due to high congestion for the Sutton Road and northbound Southend Road roundabouts. Sutton Road northbound appears to have high congestion beginning from Southend though the Shopland road and Purdeys Way junctions. Purdeys Way also experiences congestion to enter the roundabout.

The pre-PM peak hour (16:00-17:00) sees slightly reduced congestion across most of the network except for Rayleigh town centre, which is slightly worse than the peak hour. Hockley also sees an increase in traffic along secondary routes Church Road, Folly Lane and Plumberow Avenue. This could be caused by schools.

The post-PM peak hour (18:00-19:00) sees improvements in congestion conditions across the network. Particularly the Rochford town centre and the Sutton Road/ Southend Road area see marked improvement. The areas around Rayleigh and Hockley train stations and along Watery Lane, experience relatively higher congestion in this period than during the peak.

4.2.6 Constraints

The key constraints identified in potential expansion of the network are twofold: rail crossings and historic town centres.

Rail Crossings

Rail crossings over or under roads pose a bottleneck where any road expansion will require significant investment, as detailed below in Table 4.2.

Table 4.2: Rail Crossings Review

Crossing Location	Crossing Type	Number of Lanes	Pedestrian Access	Comments
A1245	Rail Bridge	2	No	A constraint on the exit from the Michelins Farm development site; No funding to widen the bridge
London Hill/ A129	Rail Bridge	1	Yes	Height Restriction of 4.7m
Hambro Hill	Rail Bridge	1	Yes - but reduced under bridge	Height Restriction of 3.7m
Church Road	Rail Bridge	1	Limited	Height Restriction of 4.3m; Narrowing of the road under the bridge with no central separation provided
Spa Road	Rail Bridge	1	Grade separated with handrails but reduced width	Height Restriction of 4.1m; Slight narrowing of carriageway
Rectory Road	Rail Bridge	1 for both directions	on one side	Height Restriction of 4.1m; Directional signalisation under the bridge due to Carriageway narrowing
Hall Road	Rail Bridge	1	Grade separated with handrails but insufficient width for pedestrians	Height Restriction of 4.1m; Slight narrowing of carriageway

Rochford Road/ Southend Road	Road Bridge	1	Yes - with road buffer on one side	No impedance of traffic

Historic Town Centres

Older narrow roads in historic areas may pose a bottleneck problem for traffic. Development in these areas is often not possible due to the historic nature. In Rochford District, areas of note are North/East/South/West Street surrounding Market Square in Rochford, and London Hill/High Street in Rayleigh.

4.3 Public Transport

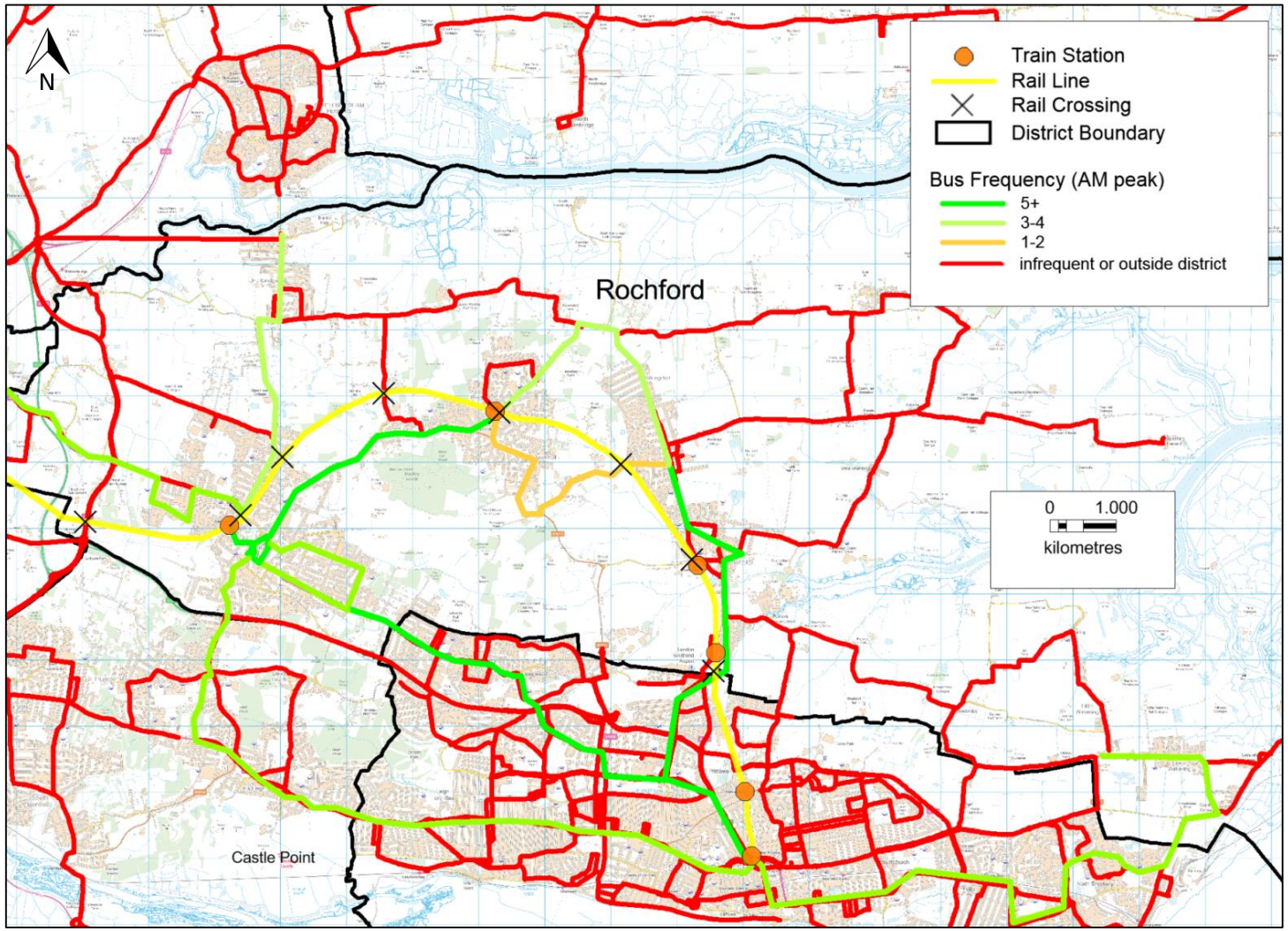
This analysis has been undertaken by taking information for public transit that is publicly available such as schedules and routes, from service provider sources or other sources on the internet.

4.3.1 Bus

Rochford District is serviced by a number of different bus companies. The extent of the network can be seen below in Figure 4.3. The network follows closely the principal local routes with some additional routes in the population centres and toward recreation opportunities in the periphery. Many of the scheduled services are intended for school children, evidenced by the fact they only operate on school days and some only once a day after school. The school bus services reach all of the main population centres in Rochford District. Below we focus on commuter services and analyse the frequency of service for each of the main population centres.

Rayleigh is the best served town with bus commuting options to all of the nearby employment centres. In particular, there are several options for commuting by bus to Southend-on-Sea. Hockley and Rayleigh are served with the Arriva 7/8 bus to Southend-on-Sea that has a peak hour frequency of 5 buses per hour, but lack regular service to any other employment centres by bus.

Figure 4.3: Bus and Rail Network



Source: Background mapping contains OS data © Crown copyright and database rights (2017)

Table 4.3: Rayleigh Bus Service

Direction	Route Number and Operator	AM Peak Hour Frequency
Southend	1 Arriva	4
	3A/E Regal busways	1
	7/8 Arriva	3
	20 First in Essex	4
	25/A/B First in Essex	2
	X30 First in Essex	1
Chelmsford	3A/E Regal Busways	1
	X30 First in Essex	1
Hockley/Rochford/ Southend	7/8 Arriva	3
Hullbridge	20 First in Essex	3
Basildon	25/A/B First in Essex	3

Table 4.4: Hockley Bus Service

Direction	Route Number and Operator	AM Peak Hour Frequency
Southend	7/8 Arriva	5
Rochford	7/8 Arriva	5
Rayleigh	7/8 Arriva	2

Table 4.5: Rochford Bus Service

Direction	Route Number and Operator	AM Peak Hour Frequency
Southend	7/8 Arriva	5
	60 Stephenson's of Essex	1
Hockley	7/8 Arriva	5
Rayleigh	7/8 Arriva	2

4.3.2 Community Bus Services

Rochford District has a Community Transport scheme available to permanent residents of either Rochford District or Castle Point Borough who are unable to use public transport or have restricted mobility. There is free membership of the scheme and a set fare initially for distances up to 3 miles with a standard charge for each mile over that. The service travels within Rochford District and Castle Point Borough with journeys into Southend-On-Sea and Basildon Borough.

4.3.3 Train

Rayleigh, Hockley, Rochford and London Southend Airport have train stations serviced by the Greater Anglia Main Line. This is the Southend Victoria to London Liverpool Street line run by Greater Anglia. Direct trains run roughly 3 times per hour. The price starts at £16.30 for a standard return ticket to London Liverpool Station and £3.50 to Southend, as of August 2017.

Table 4.6: Rochford District Train Services

Station	Time to Liverpool Street	AM Peak Frequency	Time to Southend	AM Peak Frequency
Southend Airport	60 minutes	4	4 minutes	3
Rochford	58 minutes	4	8 minutes	3
Hockley	55 minutes	4	12 minutes	3
Rayleigh	51 minutes	4	15 minutes	3

4.4 Cycling/Pedestrian

4.4.1 Cycling

The current network of cycling-only infrastructure in Rochford District is minimal but there are plans to extend it with a new national cycle route. Currently, there is a traffic-free, separated route that runs along the A127. A connecting arm extends north from London Southend Airport into the centre of Rochford town along Cherry Orchard Way and Hall Road as a shared pedestrian/cycle pathway. Along part of Hullbridge Road there is a separated shared pedestrian/cycle pathway. There is also a short separated section along Ashingdon Road.

4.4.2 Pedestrians

The ample green space surrounding the communities in Rochford District provide good opportunities for walking, whether for recreation or as an alternative mode of transportation.

4.4.3 Regional Links

Some regional links exist that are exclusively for use by cyclists and pedestrians:

- Burnham ferry – "Burnham Ferry is the sole authorised ferry between Essex Marina, and Burnham-on-Crouch Town Quay (opposite the Anchor pub). The Ferry runs 6 days a week excluding Wednesdays from Easter (Good Friday) to the end of September." (http://www.burnhamferry.co.uk/)

4.5 Summary

A review of the current transportation networks for all modes in the Rochford District was undertaken, using data obtained from multiple sources to attempt to get a complete picture of the current transport network. The analysis identifies issues regarding congestion and constraints. Looking to the future, some of the possible improvements and impacts resulting from development are reviewed.

The local road network in Rochford District has been analysed and shows that it serves the central towns relatively well, with a crescent of major roads (B1013 and Ashingdon Road) linking them to each other, as well as the wider network. However, the villages and towns towards the east of the District such as Canewdon and Great Wakering are far more dependent on minor roads and have little accessibility to the wider network. The A130 and A127 provide north-south and east-west regional connections respectively, providing access to London and the wider south-east network. Key junctions within the District have also been determined and analysed to consider their resistance to the potential of higher levels of traffic in the future.

Levels of congestion in the District were obtained through Trafficmaster data, and show mid to high levels of congestion on the major routes within the District at peak times, and mid to low levels off-peak.

The levels of public transport have also been analysed, with bus routes and local stations mapped to determine the levels of local access. The level of cycling and walking facilities has also been reviewed, with the potential schemes that encourage this mode of travel previously considered within the document review in Section 2.2.

5 Planned Improvements

5.1 Background

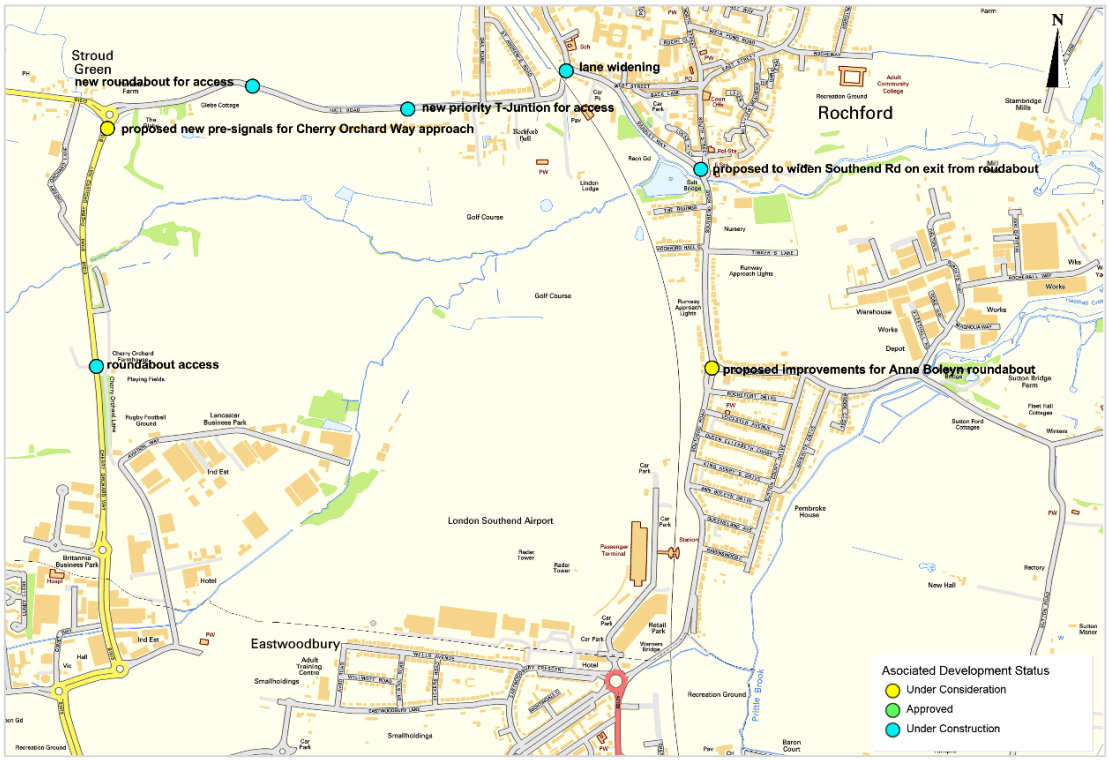
A number of road network improvements are being considered, planned or are expected to be delivered as part of the Council's local development plan, Essex County Council's plans or as part of housing or employment developments.

First, Section 5.2 and Section 5.3 detail the improvements put forth from planning documents related to new developments, planning application numbers from which information has been sourced are referenced where relevant in the sections below. A map of these planned improvements can be seen below in Figures 5.1 to Figure 5.3 (Note: some of the planned improvements are associated with multiple planning applications, where this was the case, the more advanced application status was taken to represent that improvement). Section 5.4 outlines the priority highway improvements as stated by Rochford District Council.

Figure 5.1: Hullbridge and Rayleigh Planned Improvements

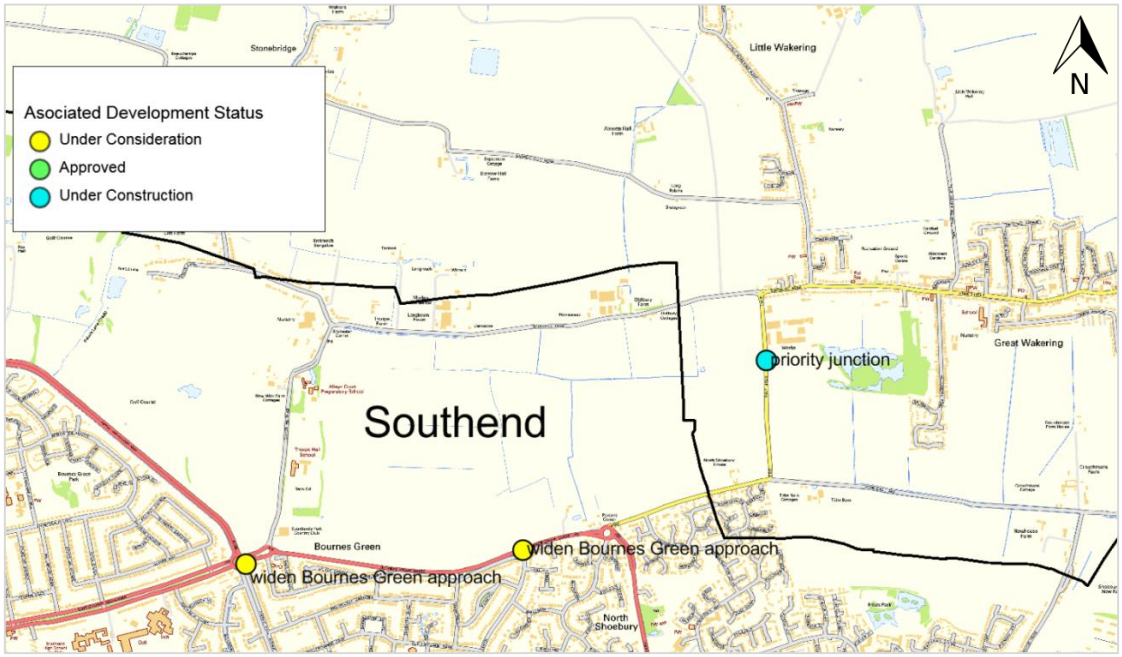
Source: Background mapping contains OS data © Crown copyright and database rights (2017). Map created from information provided in the planning applications referenced in the sections below.

Figure 5.2: Rochford and Southend Business Park Planned Improvements



Source: Background mapping contains OS data © Crown copyright and database rights (2017). Map created from information provided in the planning applications referenced in the sections below.

Figure 5.3: Great Wakering Planned Improvements



Source: Background mapping contains OS data © Crown copyright and database rights (2017). Map created from information provided in the planning applications referenced in the sections below.

5.2 Projected Impact and Mitigation of Residential Development

All information here is compiled from transport assessments found in planning applications, made by third parties who take no responsibility and make no assurances regarding the accuracy of the data and estimates. Not all of the included improvements have been approved by the Council or Highway Authority at the time of writing.

5.2.1 West Rochford – Ref: ROC/0552/13 (Allocation Plan: SER2)

This development on the land west of Oak Road and north of Hall Road poses a significant increase in peak flows along an already congested section of the network. The first phase of the development is currently on site. The development planning application details numerous improvements to mitigate congestion which have now been implemented. The development is projected to generate 482 two-way trips in the AM peak and 357 in the PM peak.

Hall Road – Two Access Roads with Roundabout and Priority T-junction
The effect on peak flows will be significant with development trips projected to increase flows 14-18%.

Ashingdon Road/Hall Road/West Street Mini-roundabout
The projected effect on peak delays will be very high, with up to a 125% increase. Widening has been undertaken at this intersection.

Bradley Way/South Street Roundabout
The projected effect on peak delays will be high, with up to a 60% increase. The transport assessment produced for the planning application for this development proposes to widen Southend Road to result in 'nil-detriment'.

Hall Road/Cherry Orchard Way roundabout
The projected effect on peak delays will be low; however, the base case is already over capacity. It is proposed to provide pre-signals for the Cherry Orchard Way approach to the roundabout to improve the flow.

B1013 Cherry Orchard Way/Eastwoodbury Lane Roundabout
The projected effect on peak delays will be high, with up to a 50% increase, and the base case is already above capacity. It is proposed to modify current situation that has one left and one right turn lanes for the Cherry Orchard Way approach into 2 right turn lanes. Models predict this brings the junction to under capacity. This junction lies outside of Rochford District.

B1013 Eastwoodbury Lane/Nestuda Way Roundabout
The projected effect on peak delays will be high, with up to a 50% increase. It is proposed to make minor amendments to the approaches. This junction lies outside of Rochford District.

Sustainable Transport Options

A foot/cycle way has been built along the north side of Hall Road. The development site is within walking distance of shops, bus and rail links in Rochford. There are also cycling/walking opportunities to the Airport Business Park and proposed improvements to bus connectivity.

5.2.2 South West Hullbridge – Ref: 14/00813/OUT (Allocation Reference: SER6)

This development is projected to generate 228 two-way trips in the AM peak and 261 two-way trips during the PM peak.

Access via New Roundabout on Lower Road

A new 3-arm roundabout will be constructed on Lower Road for primary access to the site. The roundabout should operate within capacity.

Lower Road/Watery Lane/Hullbridge Junction

The Lower Road approach will operate near capacity and the Watery Lane approach over capacity due to the development. It is proposed to construct a ghosted right turn lane.

Rawreth Lane/Hullbridge Road Junction

This junction is at capacity pre-development and a roundabout improvement is proposed to be delivered by the development of land at the junction of Rawreth Lane and Hullbridge Road (under planning application 16/00162/FUL). A proportionate contribution will be expected from north of London Road Rayleigh developers (14/00627/OUT).

Watery Lane

Safety concerns have been identified on this road due to the high number of incidents that have occurred here. Various improvements to reduce vehicle speed and improve safety are proposed.

5.2.3 Land North of London Road, Rayleigh – Ref: 15/00362/OUT (Allocation Plan: SER1)

This development is predicted to add 295 two-way trips during the AM peak and 323 during the PM peak. The largest impact will be to the flows along London Rd and numerous improvements to mitigate the impact are proposed.

Primary London Road Access and Rawreth Lane Access

A priority junction with right turn lane should prevent queuing.

Secondary Industrial Estate Road Access

No predicted issues.

Hullbridge Road/Rawreth Lane

This junction is reaching capacity prior to development and the congestion would likely be exacerbated by additional developments at Hullbridge and north of London Road, Rayleigh. A new roundabout is planned for this location and this development will contribute a proportion of the cost (see separate planning application 16/00162/FUL).

A1245 Chelmsford Road/Rawreth Lane

This junction is projected to operate within capacity, however queuing on Rawreth Lane is observed to affect the flow. It is likely that improvements to the Hullbridge Road/ Rawreth Lane junction above will alleviate this problem.

A129 London Road Corridor

A detailed analysis shows the queuing occurs in the PM peak for eastbound traffic heading to Rayleigh. A series of potential mitigation measures along this section are proposed:

- Signalising and associated works of Down Hall Road/London Road junction,
- Improved road markings and associated works at the London Hill/Station Hill priority junction,
- Signal upgrade at Victoria Avenue/London Road junction to include but not limited to the provision of MOVA traffic signal control, associated enabling works and signal head upgrade,
- Introducing a two lane merge for traffic exiting the Chelmsford Road roundabout to London Road eastbound,
- Introducing ghost right hand turn lanes for eastbound traffic on London Road

Sustainable Transport

To promote sustainable travel modes, it is proposed to improve the existing public footpath number 23 up to the St Nicholas Primary School and the creation of a new footpath extension into the site. Additionally, there will be the provision of a bus service linking the proposed development with Rayleigh railway station and town centre.

5.2.4 Star Lane Brickworks– Ref: 12/00252/FUL (Allocation Site: BFR1)

This former brickworks site is located adjacent to the West Great Wakering site. This site is predicted to generate 63 AM peak two-way trips and 59 PM peak two-way trips. The junctions listed below, both within ECC jurisdiction and Southend-on Sea have secured appropriate mitigation measures to mitigate the development impact.

Star Lane Access – New priority junction

Predicted to operate within traffic capacity.

Bournes Green Chase/ Maplin Way Roundabout

The development is predicted to put the roundabout over capacity and the proposed mitigation is to widen the Bournes Green Chase approach.

Bournes Green Chase / Royal Artillery Way / Southchurch Blvd / Thorpe Hall Ave Roundabout

The development is predicted to put the roundabout over capacity and the proposed mitigation is to widen the Bournes Green Chase approach.

Sustainable Transport
To promote sustainable transport modes, it is proposed to build a local cycle/pedestrian link and improve the Star Lane bus shelter.

5.2.5 West Great Wakering (South of High Street) – Ref: 16/00668/OUT (Allocation Site: SER9b)

When this study began, this site had planning approval. Phase 1 has now been completed (**Star Lane Brickworks– Ref: 12/00252/)**. The development to the south of the High Street was projected to generate 88 two-way AM peak trips and 79 two-way PM peak trips. The development is on the border between Rochford District and Southend Borough and some of the proposed mitigation measures are in the Southend Borough.

Sustainable Transport
To promote sustainable transport modes, it is proposed to include a local cycle/pedestrian link to the High Street and improve local bus shelters.

5.2.6 West Great Wakering – Ref: 16/00731/FUL (West of Little Wakering Road) (Allocation Site: SER9a)

This approved development to the west of Little Wakering Road has outline planning permission, and is projected to generate 60 two-way AM peak trips and 56 two-way PM peak trips. The development is on the border between Rochford District and Southend Borough and some of the proposed mitigation measures are in Southend Borough.

Barrow Hall Road/Site Access Priority Junction
The development is predicted to operate within the capacity of the junction in both AM and PM peak periods with the development fully occupied.

Little Wakering Road/Barrow Hall Road Priority Junction
The development is predicted to operate within the capacity of the junction in both AM and PM peak periods with the development fully occupied.

Little Wakering Road/High Street/Southend Road Mini-roundabout
The development is predicted to operate within the capacity of the junction in both AM and PM peak periods with the development fully occupied.

Star Lane/Southend Road Mini-roundabout
The development is predicted to operate within the capacity of the junction in both AM and PM peak periods with the development fully occupied.

5.2.7 Three Acres, Anchor Lane, Canewdon (16/00733/FUL) (Allocation Site: SER7)

This approved development to the south of Canewdon has full planning permission and is projected to generate 20 additional vehicular movements in the PM peak and 19

additional vehicular movements in the AM peak. The transport assessment suggests that this would not result in an impact on the free flowing of the local highway network.

5.3 Projected Impact and Mitigation of Non-Residential Development

5.3.1 Airport Business Park – Ref: 15/00781/OUT

This is an outline planning application that has been approved (with all matters reserved excluding the site access junction off Cherry Orchard Way), and is still subject to a detailed full planning application.

This major multi-use business development will contain the following floor space:

- Multi-use business
- Retail/Restaurant/Bar/Café (A3/A4) – 1,832 sqm
- Restaurant/Bar
- Hotel (90 bedrooms)

The parking provision for the site is 2055 space and the expected trip generation is 1120 two-way trips during the AM peak and 932 two-way trips during the PM peak.

Site Access – New Roundabout on Cherry Orchard Way
The site access is a new 4-arm roundabout on Cherry Orchard Way, which has been delivered as part of Phase 1 works. Modelling predicts that the roundabout will operate within capacity. This is also intended to deliver improved access to Cherry Orchard Jubilee Country Park which will be subject to a separate planning application.

Eastwoodbury Lane/Nestuda Way
Modelling predicts that westbound Eastwoodbury Lane approach will operate well over capacity in the AM peak resulting in very large queues (up to 300). The TA suggests that it will be within capacity given driver rebalancing to access A127 via (slightly longer) Nestuda Way.

Hall Road/Ashingdon Road/West Street Roundabout
This junction is predicted to be slightly over capacity but it is suggested that this is due to other developments in the area, and that drivers will change habits to avoid queuing.

The Section 106 agreement for this site has also agreed a contribution for Sustainable Transport infrastructure totalling some £150,000, as well as improvements to cycleways in the area, particularly between Cherry Orchard Way and Hall Road. Details of these cycleways were set out in the London Southend Airport and Environs Joint Area Action Plan Walking and Cycling 'Greenway Network' Study, dated December 2015[3].

[3] https://www.rochford.gov.uk/sites/default/files/planning_newevibasecycling2016.pdf

5.3.2 Wallasea Island

Wallasea Island is located in the important Crouch estuary and will be expanded using infill from the Crossrail and Silvertown Tunnel projects. Due to the nature of the rural roads that access the site, all spoil has been transported by boat. Headed by the Royal Society for the Protection of Birds (RSPB) the development is envisaged to be a "multi-functional nature conservation, recreational and educational resource". The impact on the transport and road networks is not fully elaborated however. The proposal predicts 50,000 annual visitors, of which the majority will arrive by car, and worst-case scenario up to 100,000 visitors. The majority of visitors will arrive in off-peak hours so the strain on the local road network is suggested to be minimal.

Wallasea Island area supports employment at Baltic Wharf and Essex Marina, and there is potential to increase employment in the area. The development of the RSPB site should take into consideration sustainable transport solutions, in line with the ECCs initiative to explore opportunities to improve sustainable transport to the site, of which, may increase accessibility of this area.

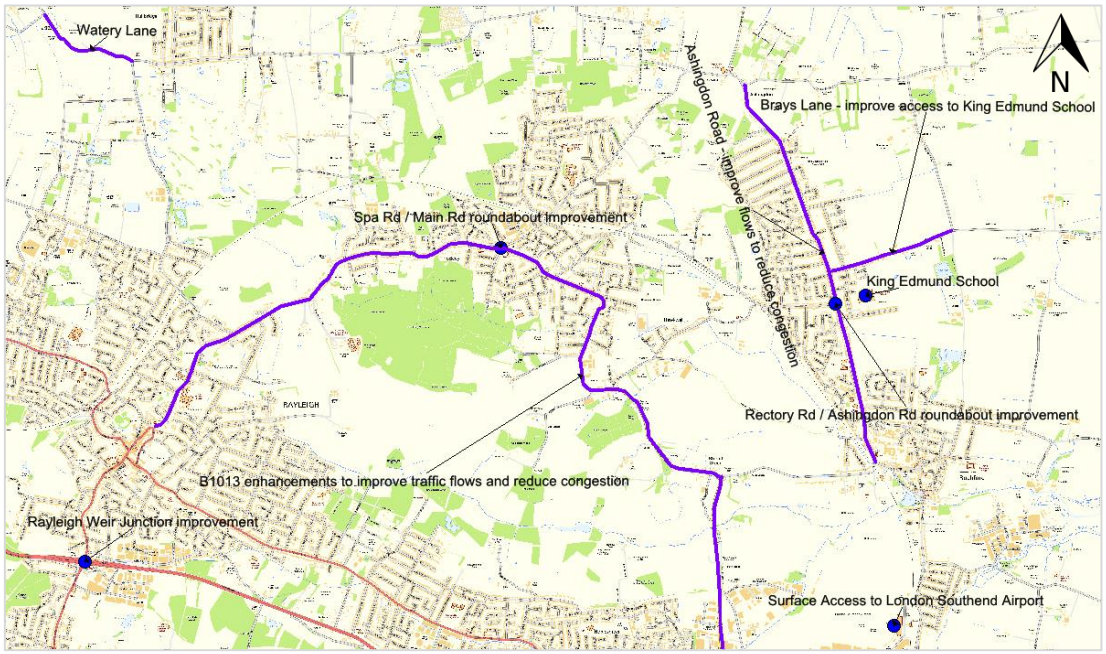
5.3 Highway Improvements

5.3.1 Rochford District Priorities

In the Core Strategy adopted by the Rochford District Council in December 2011 a number of priority areas for highway improvements are set out. Rochford District Council states that it will work with the Essex County Council as the Highways Authority to address highway congestion, as Rochford District does not have responsibility for the highway network. The following areas are the ones prioritised for improvement:

- Brays Lane, Ashingdon (improved to access to King Edmund School) (Note: works completed)
- Ashingdon Road to improve traffic flows and reduce congestion
- Rectory Road/Ashingdon Road Roundabout
- Watery Lane
- Spa Road/Main Road Roundabout Hockley
- A127 Rayleigh Weir junction
- Enhancements to the B1013 to improve traffic flows and reduce congestion
- Surface access to London Southend Airport

Figure 5.4: Rochford District Council Priority Highway Improvements



Source: Background mapping contains OS data © Crown copyright and database rights (2017). Map created from information provided in the Rochford District Council Core Strategy December 2011 referenced in the section above.

5.4 Summary

A review of the improvements put forward to mitigate the impact of new developments within the local area has been undertaken, using information produced within the associated transport assessments for each of the planning applications.

Within each transport assessment, the transport impacts of the development have been predicted, and improvement options proposed to mitigate against increased congestion as a result of the new development, and to provide sufficient road capacity and junction performance on the local highway network.

Following this, the priority highway improvements as stated by Rochford District Council have been reviewed, as detailed in the Core Strategy adopted by the Rochford District Council in December 2011.

6 Summary

The key issues and opportunities identified through this study are summarised below.

6.1 Issues

6.1.1 Personal Vehicle Travel

Rochford District has high rates of car ownership and usage; 67% of commuter trips take place in a car. This, combined with the rural character of the District and the minor roads that make up the principal local network leads to congestion issues. From the travel to work data it can be seen that train travel is a viable alternative to cars, with 16% mode share for commuting. Bus travel only makes up 3% of trip and walking makes up 6%.

6.1.2 Mode Shift to Train

In an attempt to get people out of cars, train appears a suitable alternative, however, 70.1% of train trips are between 40-60km, likely being commuter trips to London. Most commuters to London already take the train meaning efforts to promote train travel are less likely to have a significant impact.

6.1.3 Mode Shift to Bus

Getting people out of cars and into buses appears to be a challenge, as shown by the very low 3% mode share. However, 45.2% of commutes are made within 10km of home, and the biggest employment draw is nearby Southend. The bus service to Rayleigh seems good and with varied destinations such as Chelmsford and Basildon, as well as local destinations. Rochford and Hockley have more limited destinations but the frequency of the service to Southend is 5 buses per hour at the AM peak. Mode shift towards more bus travel may have a significant impact if it is possible to increase the appeal to commuters.

6.1.4 Congestion

The main congested areas are Rayleigh, Hockley and Rochford town centres. Rayleigh is most affected with the congestion extending beyond the railway line and down to A127 Rayleigh Weir roundabout in PM peak. The congestion at junctions of Lower Road with Hullbridge Road and Ferry Road has significant impact on the accessibility to Hullbridge in peak hours.

The key congested corridors are as follows;

- A1245 between A127 Fairglen Junction, A129 London Road junction and Rawreth Lane,
- Rawreth Lane between A1245 to Hullbridge Road,
- Hullbridge Road from Hullbridge to Hambro Hill railway underpass,

- A129 London Road to London Hill railway underpass, including Victoria Avenue signalised junction,
- B1013 Rayleigh to Rochford, A1015 Rayleigh Road,
- Ashingdon Road from its junction with Canewdon Road to Hall Road including Rectory Road roundabout, and
- Sutton Road from Southend Road to A1159 Eastern Avenue in Southend

Any intensification of development with the Rochford District will have additional congestion impacts on these key junctions and corridors and would need to be carefully considered.

6.1.5 Highway Improvement Priorities

Rochford District has identified the following priorities for highway improvement, namely;

- Brays Lane, Ashingdon (improved to access to King Edmund School) note: (complete),
- Ashingdon Road to improve traffic flows and reduce congestion,
- Rectory Road/Ashingdon Road Roundabout,
- Watery Lane,
- Spa Road/Main Road Roundabout Hockley,
- Rayleigh Weir junction,
- Enhancements to the B1013 to improve traffic flows and reduce congestion, and
- Surface access to London Southend Airport

6.1.6 A127 Southern Arterial Road

The section of A127 in Rochford District between Fairglen roundabout (including its junction with A130) and its boundary with Southend (including Rayleigh Weir roundabout, where previous improvements were completed in May 2017 to upgrade the signals at this junction) requires capacity improvements to support any further development in Castle Point Borough, Rochford Districts and Southend Borough. ECC is looking for contributions from developments in these areas to fund any proposed improvements and will also seek funding through bid opportunities as they arise.

6.1.7 Constraints

Several rail underpasses put a constraint on possible network improvements such as lane widening. The extent to which this constraint impacts the network will need further investigation and potentially affecting future additional public transport in the District.

6.2 Opportunities

6.2.1 Intensification

All three town centre Area Action Plans have identified potential for increased local employment and retail opportunities. Further intensification of town centres with employment and residential areas, near to amenities such as schools and rail links will promote sustainable travel modes and minimise impact of development on the network. Maintaining the character of the town centres is an important goal that must be managed when considering intensification as an option.

6.2.2 Public Transport Improvement

Any new development should be served by a sufficient level of public transport service (such as regular bus service to key employment areas). If development is proposed in an area that does not meet this criterion, then contributions should be sought to establish better transit links.

6.3 Conclusions

This report provides a baseline assessment of transportation issues and challenges currently facing the District. With a number of opportunities also drawn from this assessment, this review can be used to efficiently explore a number of appropriate future development scenarios.

Through undertaking an initial assessment across four key areas of focus, *Document Review*, *Data Review*, *Transport Network Analysis* and *Planned Improvements*, a range of transport impacts and demands at both existing and future stages have been identified.

As proposals are developed for land use within the new Local Plan period, the information within this study can be used to scope a detailed assessment of the transport impacts of the options identified.

Appendices

Appendix A: Summary of Major Planning Applications August 2017

Table A1: Details of Large Planning Applications with Permission

Land	Developer	Development Known as	Planning Application Number	Date Submitted	Planning Status	Build Status	Number of Units	Allocations Reference
Land North of London Road and South of Rawreth Lane and West of Rawreth Industrial Estate	Countryside Properties (UK) Ltd	Land west of Rayleigh	14/00627/OUT	August 2014	Refused January 2015 Appeal to Planning Inspectorate withdrawn			
			15/00362/OUT resubmission	June 2015	Application permitted June 2016 Section 106 agreed	Not started	500 dwellings plus primary school, open space 2017/18-60 2018/19-120 2019/20-120 2020/21-100 2021/22-100	SER1
			17/00578/REM	June 2017	Pending Consideration			

Land	Developer	Development Known as	Planning Application Number	Date Submitted	Planning Status	Build Status	Number of Units	Allocations Reference
Land between Windermere Avenue and Lower Road Malyons Hullbridge	Southern and Regional Developments Ltd	Hullbridge	14/00813/OUT	November 2014	Application permitted and Section 106 agreed January 2017	Not started	500 dwellings proposed 2019/20- 100 2020/21- 100 2021/22- 100 2022/23- 100 2023/24- 100	SER6
Land at the junction of Rawreth Lane and Hullbridge Road, Rayleigh		Roundabout for Hullbridge	16/00162/FUL	February 2016	Application permitted October 2016	Not started		
Pond Chase Nursery, Folly Lane, Hockley	Charles Church	Folly Lane	15/00599/FUL	August 2015	Application permitted Approved subject to S106 June 2016	Started	70 homes: 2016/17- 5 2017/18- 35 2018/19- 30	SER3
Bullwood Hall Lane, Hockley	Harrow Estates plc		15/00379/OUT	June 2015	Application permitted January 2016	Not started	60 homes: 2018/19- 30 2019/20- 30	

Land	Developer	Development Known as	Planning Application Number	Date Submitted	Planning Status	Build Status	Number of Units	Allocations Reference
Stambridge Mills	ILD (Stambridge) Ltd		11/00494/FUL	August 2011	Application withdrawn			BFR3
Star Lane Brickworks, Great Wakering	Inner London Developments (Wakering)Ltd	Wyborne Park – Taylor Wimpey	12/00252/FUL	April 2012	Application permitted June 2015	Started	116 homes: 2016/17- 20 2017/18- 60 2018/19- 36	BFR1
Land between Star Lane and Alexandra Road, South of High Street, Great Wakering	Taylor Wimpey East London Ltd & Swan Hill Homes Ltd	West Great Wakering	16/00668/OUT	July 2016	Application permitted and Section 106 agreed July 2017	Not started	Up to 180 dwellings	SER9b
Land West of Little Wakering Road and South of Barrow Hall Road, Little Wakering	Cogent Land LLP & Iceni	West Great Wakering	16/00731/OUT	July 2016	Application permitted subject to agreement of Section 106 (yet to be agreed as at August 2017)	Not started	Up to 120 dwellings	SER9a
Three Acres, Anchor Lane, Canewdon	Sanctuary Group and Dove Jeffery Homes	Three Acres	16/00733/FUL	July 2016	Application permitted and Section 106 agreed April 2017	Not started	35 dwellings	SER7

Land	Developer	Development Known as	Planning Application Number	Date Submitted	Planning Status	Build Status	Number of Units	Allocations Reference
Birch Lodge, Anchor Lane, Canewdon	Marks Heeley Ltd	Birch Lodge	17/00258/FUL	March 2017	Pending consideration		14 proposed	SER7
Timber Grove, London Road, Rayleigh	Pannells Developments/ Fitzroy	Timber Grove Village	15/00593/FUL	August 2015	Application withdrawn			
			16/00899/FUL	September 2016	Pending Consideration			
Hall Road, Rochford	Bellway Homes	'Notes'	10/00234/OUT 13/00552/REM 16/00183/REM	April 2010 September 2013 February 2016 Application permitted	July 2013 Application permitted January 2014 Application permitted June 2016	Started	600 dwellings	SER2
Land Adjacent Grange Villa, London Road, Rayleigh	Silver City Estates Ltd and Barton Willmore	Grange Villa	15/00736/FUL	October 2015	Application permitted subject to agreement of Section 106 (yet to be agreed as at August 2017)		47 dwellings	

Land	Developer	Development Known as	Planning Application Number	Date Submitted	Planning Status	Build Status	Number of Units	Allocations Reference
Land East of Rugby Club, Aviation Way, Rochford	Henry Boot Developments (South) Ltd	The Airport Business Park, Southend	15/00781/OUT	October 2015	Application permitted and Section 106 agreed October 2016			
Land Rear of Cherry Orchard Brickworks, Cherry Orchard Lane, Rochford	Henry Boot Developments Ltd	Relocated rugby club	15/00776/OUT	October 2015	Permitted March 2016			

Source: http://www.rochford.gov.uk/planning/planning_applications/major_planning_applications

Appendix B: VISSIM Model Report 2015

Rayleigh Town Centre

VISSIM Modelling Technical Report

June 2015

RINGWAY JACOBS integrated expertise

Essex County Council

Document Control Sheet

Document prepared by:

Luke Beagon
Transport Consultant
For:

Transport Planning
Victoria House
Chelmsford
CM1 1JR

T +966 13 898 9900 Ext 323
E luke.beagon@jacobs.com
W www.essex.gov.uk/highways

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Approved for Issue By	Signature	Date
T Kruger		18-6-15

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Contents

1 Background

1.1 Introduction

Currently Rayleigh town centre is experiencing congestion in the High Street area, particularly at the location of the mini roundabouts and the pedestrian crossings, which in turn affect traffic operations in the wider network. Essex Highways have been requested to develop a traffic model to test options that could possibly address or mitigate some of the problems that are experienced.

1.2 Modelling Approach

Three base models were developed using PTV's VISSIM micro simulation software namely for the weekday AM and PM and Saturday peak periods. These models were then utilised to test the impact of two proposed options for improvements to the network on each of the three peak periods. The options were also tested in a scenario with general growth of traffic in the network.

PTV's VISSIM micro-simulation software package has been used to create the Rayleigh town centre base year and proposed option models. VISSIM models each vehicle individually, including driver behaviour characteristics, and provides a visual representation of the interaction between vehicles, assisting in the assessment of the road network operation and model calibration. PTV's VISSIM version 7 has been used.

1.3 Study Area

Rayleigh town centre is situated less than one mile from the A127 Southend Arterial Road. The study area is primarily made up of the A129 High Street, B1013 Hockley Road, A1015 Eastwood Road and A129 Crown Hill. Rayleigh Rail Station is situated to the northwest of the town centre, approximately ten minutes on foot. The town centre study area is illustrated below in Figure 1.1

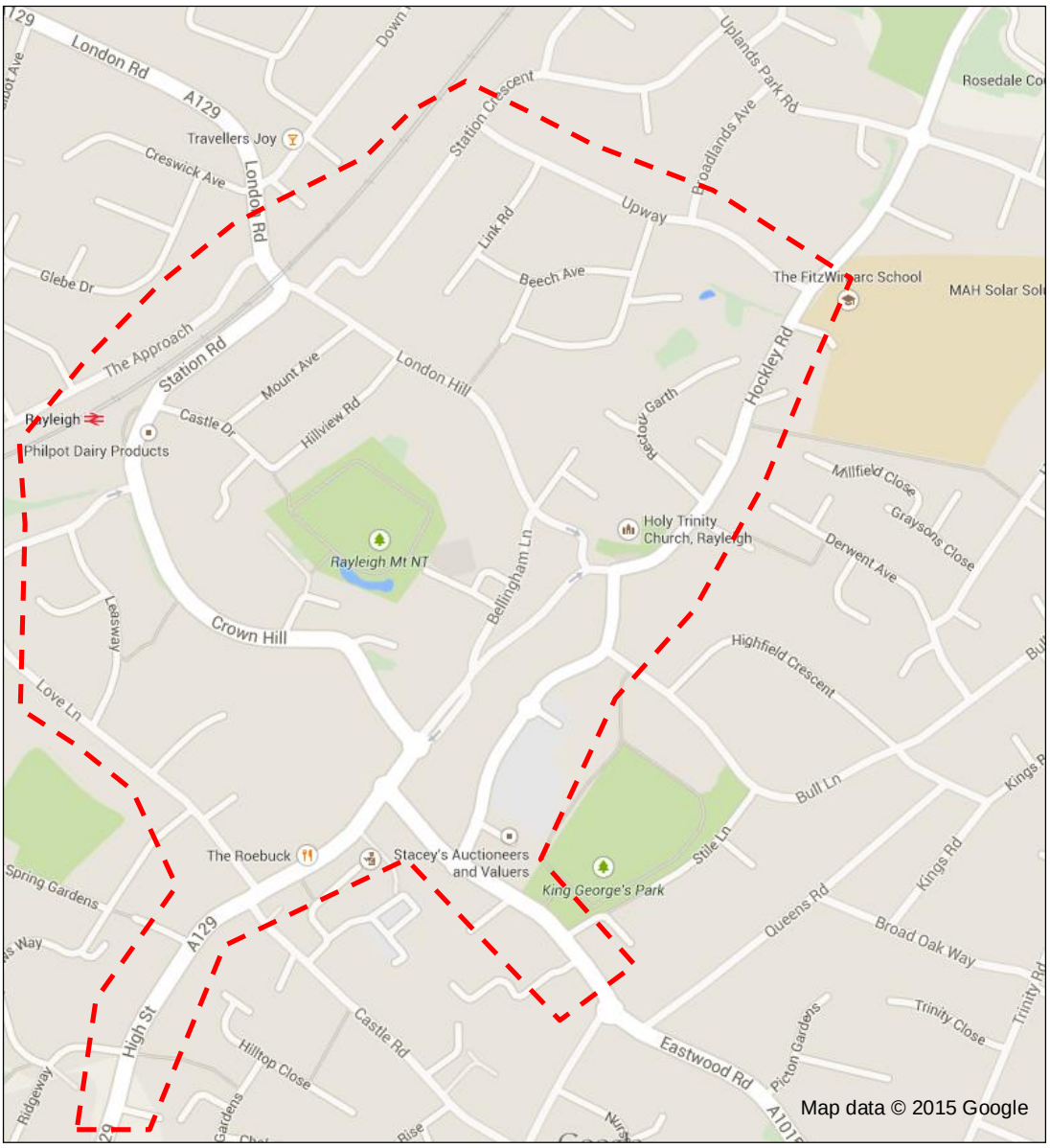


Figure 1.1: Rayleigh VISSIM model study area

1.4 Project Objectives

The key objectives of this assessment include;

- The modelling of the current operational issues and vehicular traffic delays experienced during the identified three peak periods in Rayleigh Town Centre; and
- The development and assessment of two potential options to address the established issues.

In order to undertake these items, it was necessary to produce a local model of the area that represents current conditions during the identified three peak periods. Following production and validation of the base models, two proposed scenarios were identified by ECC;

Option 1

- Upgrade town centre zebra crossings to puffin crossings.
- Widen the London Hill / High Street junction to two lanes on each arm. On the High Street arm of the adjacent signalised junction one lane will go ahead to Hockley Road and one will turn right to Websters Way.
- Implement a mini roundabout at the London Road / London Hill junction.
- Permit right turn movements from the Train Station car park exit on Love Lane; and
- Implement bus stops in lay-bys where possible.

Option 2

As Option 1 with the addition of;

- Signalisation of the Websters Way / Eastwood Road roundabout. This will include a pedestrian stage within the signal cycle instead of changing the two existing zebras to puffin crossings; and
- Divert northwest bound traffic from Eastwood Road to High Road via Daws Heath Road and Castle Road from the mini roundabout at Eastwood Road / Daws Heath Road.

These proposed options are in keeping with the aims and objectives identified within the Rayleigh Area Action Plan.

2 Data Collection

2.1 Introduction

In order to undertake the Rayleigh VISSIM modelling a comprehensive set of traffic surveys were conducted in Rayleigh town centre in October 2014.

Five types of surveys were undertaken:

- Classified Junction Turning Counts;
- Queue Lengths;
- Automatic Number Plate Recognition Surveys;
- Automatic Traffic Counter Surveys; and
- Pedestrian Crossing Surveys.

2.2 Classified Junction Turning Count Surveys

Classified Junction Turning Counts were undertaken to record the type of vehicle by turning movement for all vehicles passing through specified junctions in the study area.

The vehicle classifications collected were:

- Pedal Cycles;
- Motorcycles;
- Cars;
- Light goods vehicles;
- Buses and Coaches;
- Heavy goods vehicles (two or three axles rigid, above 7.5 tonnes gvw); and
- Heavy goods vehicles (four axles rigid, three to six axles articulated).

The Classified Junction Turning Counts were undertaken at 15 locations as specified below in Table 2.1 between the hours of 06:00 and 19:00 on Thursday 9 October 2014. Saturday counts at the 15 locations were undertaken between the hours of 12:00 and 16:00 on Saturday 11 October 2014. The surveyed junctions are also illustrated below in Figure 2.1.

Table 2.1: Junction locations for classified junction turning counts

Count Location No.	Count Location	No. of Arms	Junction Type
1	A129 Station Rd / London Rd / London Hill	3	Priority Jct
2	A129 Station Rd / A129 Crown Hill / Love Ln	3	Priority Jct
3	London Hill / Bellingham Lane	3	Priority Jct
4	High Street / Bellingham Lane	3	Priority Jct
5	Websters Way / Bull Lane	3	Priority Jct
6	Websters Way / Car Park Exit	3	Priority Jct
7	B1013 Hockley Rd / Upway	3	Priority Jct
8	Hockley Rd / Websters Way / High Street	3	Signalised Jct
9	Crown Hill / High Street (N) / High Street (S)	3	Roundabout
10	High St (N) / Eastwood Rd / High St (S)	3	Roundabout
11	Love Ln /High St (N) /Castle Rd /High St (S)	4	Crossroads
12	Websters Way (N)/Car Pk/Websters Way (S)	3	Roundabout
13	Websters Way/Eastwood Rd (E)/Eastwood Rd (W)	3	Roundabout
14	Station Crescent / Upway	3	Priority Jct
15	Websters Way / Car Park Entrance	3	Priority Jct

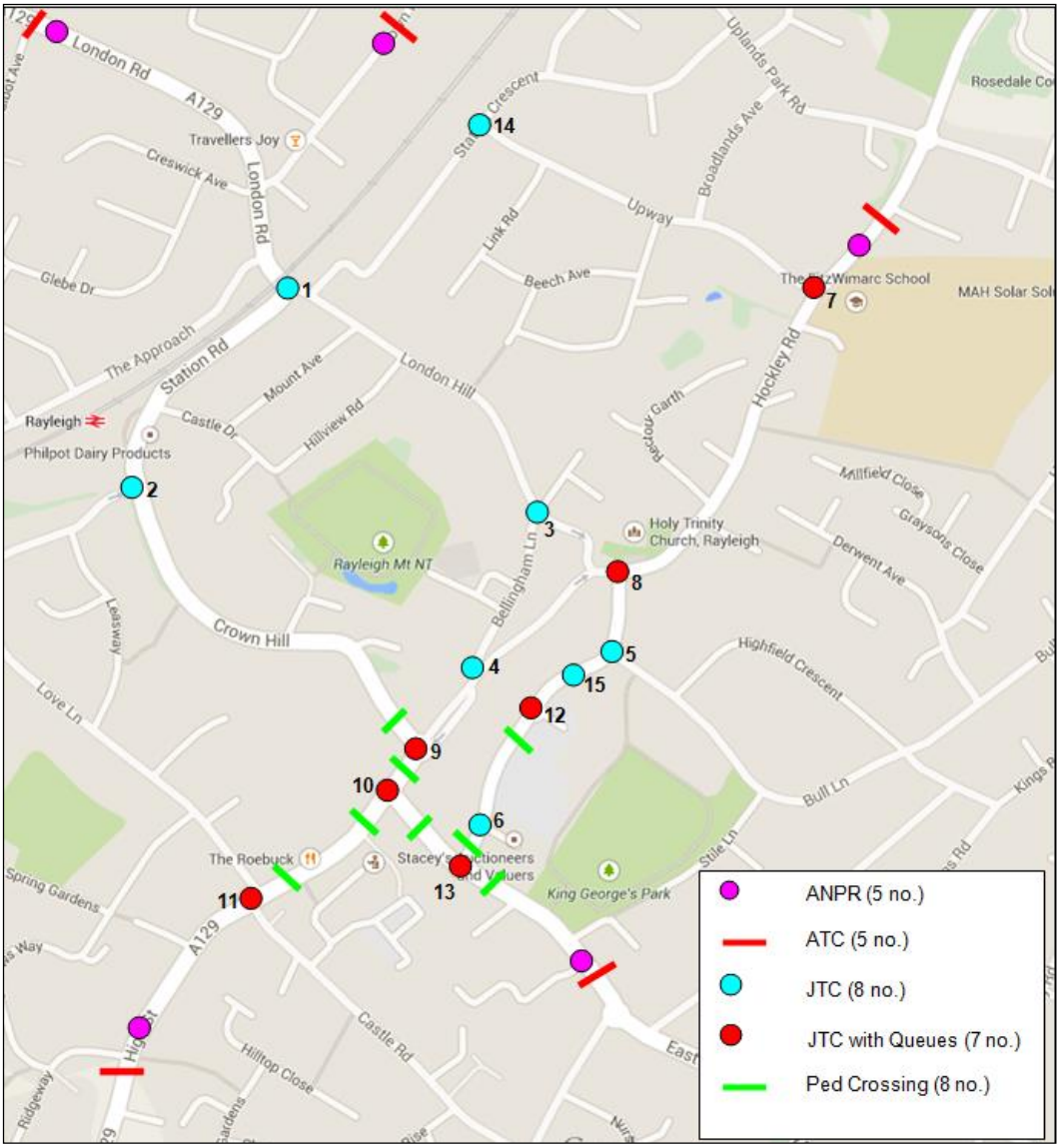


Figure 2.1: Traffic Surveys Location Plan

2.3 Queue Length Surveys

Queue lengths were undertaken at seven junction locations marked in red on Figure 2.1 . The queue length surveys were undertaken between 06:00 – 10:00 and 14:00 – 19:00 on Thursday 9 October to capture the AM and PM peak periods. On Saturday 11 October the queue length surveys were undertaken between 12:00 and 16:00 to capture the Saturday peak period.

2.4 Automatic Number Plate Recognition Survey

ANPR detectors were located at five locations shown in purple on Figure 2.1. The ANPR surveys were from 06:00 – 19:00 on Thursday 9 October and from

12:00 – 16:00 on Saturday 11 October to capture vehicular movements to and from the five selected zones on the fringes of the town centre.

2.5 Automatic Traffic Counter Surveys

ATCs were located at five locations shown as a red line on Figure 2.1 . All five ATCs were installed for a 7 day period during October 2014.

2.6 Pedestrian Surveys

Pedestrians Surveys were undertaken at eight locations shown as green lines on Figure 2.1 . The pedestrian surveys were from 06:00 – 19:00 on Thursday 9 October and from 12:00 – 16:00 on Saturday 11 October to capture selected pedestrian crossing movements at key locations within the town centre.

3 Base Modelling

3.1 Introduction

The base year models are representative of traffic flow in the morning, evening and Saturday peak periods for October 2014. The three base models simulate the following peak time periods:

- 07:30 – 08:30 AM weekday peak period;
- 17:00 – 18:00 PM weekday peak period; and
- 13:30 – 14:30 Saturday peak period.

The periods were selected based on longer term data obtained from the automatic traffic counters. There is clear evidence for an earlier AM weekday peak near the railway station compared to the town centre, but overall 07:30 to 08:30 represents the hour with the highest flow. On Saturdays all hours between 09:30 and 18:00 are almost equally busy, with 13:30 to 14:30 representing a period of slightly higher flow.

A warm up and cool down period, thirty minutes before and after each peak hour, has been included in the model simulations. These warm up and cool down periods enable realistic traffic numbers to be present on the highway before and after the evaluated time periods.

3.2 Model Development

One of the main benefits of VISSIM modelling is its ability to reassign traffic using path and cost parameters. For instance, in this study VISSIM can model the effect of a series of proposed changes to the highway infrastructure in Rayleigh town centre as vehicles will reassign to the most cost and time effective routes.

A transport model in VISSIM consists of transport supply and travel demand data. Transport supply data is represented in a network model, which includes the following network objects that can be modified interactively:

- **Links**: Links represent single or multi-lane carriageways with a specified direction of flow.
- **Connectors**: These are used to provide continuous routes between links. In order to join links together connectors are used to construct junctions and changes in road layout.
- **Vehicle Inputs**: Define the total number of vehicles which enter the network on a link (at the extremities of the model), for each defined time period. There are 19 zones where vehicles enter and exit the Rayleigh town centre model. Individual 19 x 19 Origin / Destination matrices were developed using the October 2014 traffic survey data and VISUM macro simulation software for each of the AM, PM and Saturday peak periods. This exercise provided the matrices required for the VISSIM micro modelling in which the traffic was assigned to each of the models using the Dynamic Assignment functionality in VISSIM.
- **Priority Rules**: Define rights of way at non signalised junctions. Includes gap acceptance information which can be adjusted.
- **Desired Speed Decision**: Dictates the speed at which a vehicle wishes to travel at.
- **Reduced Speed Areas**: Dictates the speed at which the vehicle will travel at. These are used to model short areas of speed change for example at sharp bends and junctions.
- **Vehicle Classes:** Categorise the vehicle types used in the model. The vehicle classes used include light vehicles (motorcyclists, cars and LGVs) and heavy vehicles (HGVs, Buses and Coaches). All vehicles with the exception of scheduled bus services were input to the models using zone to zone matrices based on the October 2014 traffic surveys and the VISUM macro modelling outputs. All scheduled bus services in Rayleigh town centre were input independently based on their timetabled routes.

During the development stage of the network, Ordinance Survey (OS) data in electronic format (CAD) was used to replicate a detailed account of the existing highway arrangement in VISSIM. Junction layouts and markings were obtained from the OS MasterMap, on site observations and aerial photography.

Speed limits and road restrictions were gathered from site visits and local knowledge. Where appropriate, vehicle speeds have been restricted to ensure that the model replicates on site behaviour.

In order to replicate the traffic signal timings whilst incorporating the demand dependent element into the signals, the Vehicle Actuated Programming (VAP) module has been used. Logic used within the VAP programming has been directly taken from the traffic signal timing data provided by Essex County Council.

Speed limits throughout the model are set at 30 mph. Vehicles are assigned the standard 30 mph speed distributions when they are generated. Speed distribution can be defined as the distribution of vehicle numbers travelling at any given speed in a speed range, affecting capacities and achievable desired speeds.

A full extent of the Rayleigh town centre VISSIM model is shown below on Figure 3.1.

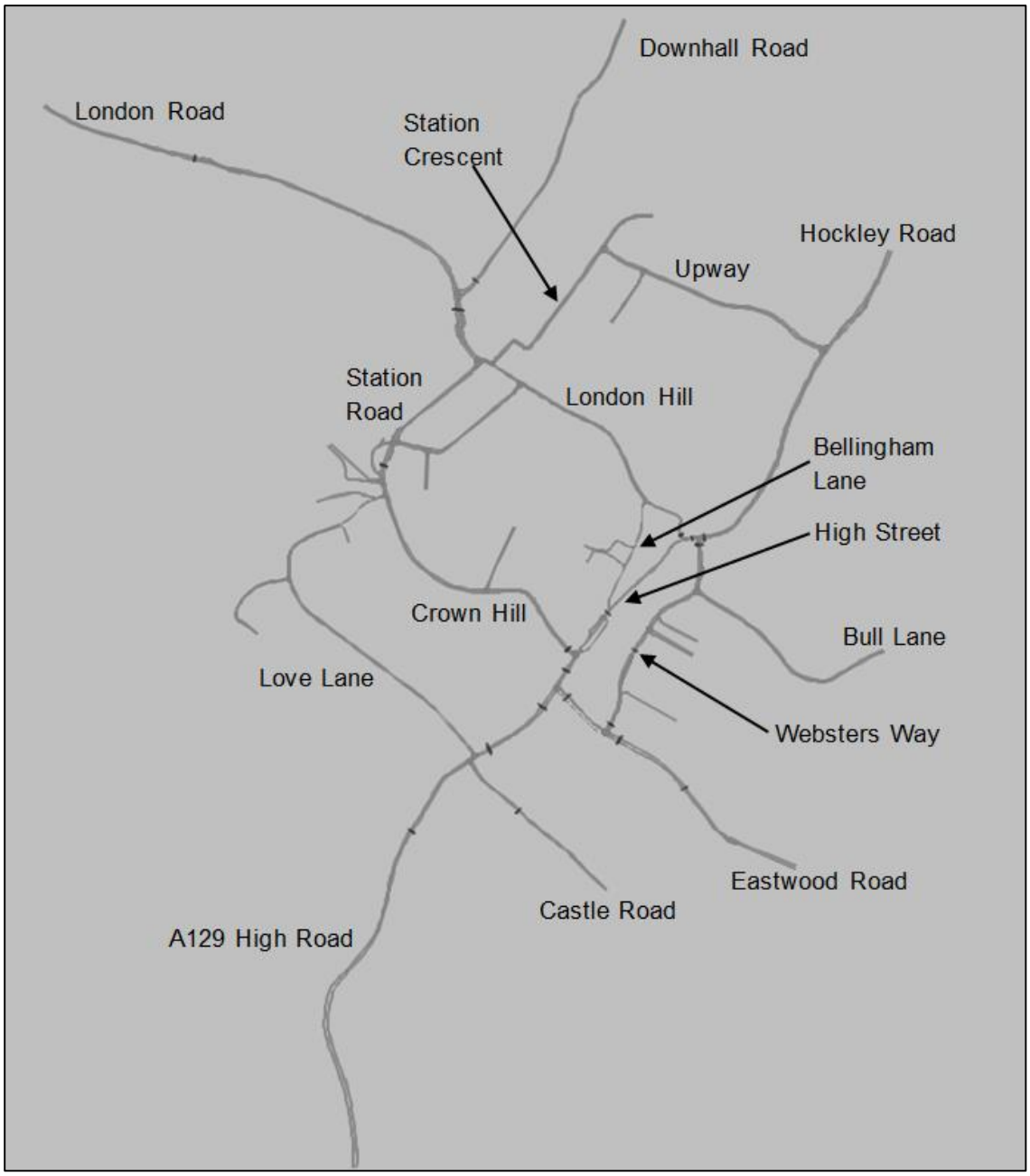


Figure 3.1: Rayleigh Town Centre model extents

3.3 Base Model Calibration and Validation Results

Model calibration is defined within the Design Manual for Roads and Bridges (DMRB) as:

'*Adjusting the parameters used within the various methods mathematical relationships within the model to reflect the data as well as is necessary to reflect the models objectives*.'

The calibration of the three Rayleigh base models is focused on the comparison of the turning movement counts and a review of the model network and driver behaviour.

Model validation is an essential part of the development of a base year model. Validation acts as a confirmation of the ability of the model to represent the current traffic conditions and patterns in the modelled area. A successfully validated base model substantiates the model as a robust tool for future scheme assessments and proposed transport intervention testing.

Previously, modelling guidelines have indicated that 85% of modelled flows and turning movements should have a GEH of less than 5.0. The GEH value (named after Geoffrey E. Havers, who proposed it in the 1970s) is in the form of a Chi-squared statistic and incorporates both relative and absolute errors, giving an overall measure of the accuracy of the model by comparing modelled and observed flows. Smaller values of GEH represent a better fit, a zero value would indicate a perfect fit.

The formula for the statistic is presented below:

$$GEH = \sqrt{\frac{(M-C)^2}{0.5 \times (M+C)}}$$

M = Modelled Flow
C = Observed Flow

More recent guideline requirements are that the modelled flows should be within one of the three parameters below;

- Individual flows within 15% for flows 700 – 2700 vehicles per hour (vph);
- Individual flows within 100 vph for flows less than 700 vph; or
- Individual flows within 400 vph for flows greater than 2700 vph.

The following calibration and validation results are based on an average of five runs, with different random seeds, ensuring that daily variation in vehicle arrival times were replicated.

Turning Movement Counts – (Calibration Results)

Observed turning movement counts at the 15 junctions in the network have been compared against the base model turning movement counts. Table 3.1 to Table 3.3 below illustrate the full turning movement GEH statistic results for the AM, PM and Saturday base model simulations. In each case all the turning movements are within the modelling guidelines criteria with the only exception of the Upway (SE) to Station Crescent (SW) movement in the AM peak period at the edge of the model. This indicates that all three base models have been well calibrated.

Table 3.1: AM Base Model GEH Turning Movement Count Calibration Results

Turning Volume Calibration for AM Model										
Junction No	Junction Name	From	To	Observed	Modelled	Difference-Total	GEH	Individual flows within 15% for flows 700 – 2700 vph	Individual flows within 100 vph for flows <700 vph	Individual flows within 400 vph for flows > 2700
				PCUs	PCUs					
JC 01	A129 London Road / London Hill / A129 Station Road	A129 London Road (N)	London Hill (SE)	272.3	318.9	46.6	2.71	N/A	Pass	N/A
		A129 London Road (N)	Station Road (SW)	599.1	526.9	-72.2	3.04	N/A	Pass	N/A
		London Hill (SE)	A129 London Road (N)	205.8	174.9	-30.9	2.24	N/A	Pass	N/A
		London Hill (SE)	Station Road (SW)	8.2	59	50.8	8.76	N/A	Pass	N/A
		Station Road (SW)	A129 London Road (N)	715	708	-7	0.26	Pass	N/A	N/A
		Station Road (SW)	London Hill (SE)	30	36	6	1.04	N/A	Pass	N/A
JC 02	Crown Hill/Love Lane	A129 Station Road (N)	A129 Crown Hill (S)	595.7	608.2	12.5	0.51	N/A	Pass	N/A
		A129 Crown Hill (S)	A129 Station Road (N)	569.4	594.3	24.9	1.03	N/A	Pass	N/A
		Love Lane (W)	A129 Station Road (N)	257.6	252	-5.6	0.35	N/A	Pass	N/A
		Love Lane (W)	A129 Crown Hill (S)	14	12	-2	0.55	N/A	Pass	N/A
JC 03	London Hill / Bellingham Lane	London Hill (N)	Church Street (E)	127.8	157.8	30	2.51	N/A	Pass	N/A
		Bellingham Lane (S)	London Hill (N)	20	26	5.8	1.21	N/A	Pass	N/A
		Bellingham Lane (S)	Church Street (E)	9.8	20.9	11.1	2.83	N/A	Pass	N/A
JC 04	High Street / Bellingham Lane	Bellingham Lane (N)	High Street (NE)	3	0	-3	2.45	N/A	Pass	N/A
		High Street (SW)	Bellingham Lane (N)	59.8	86.9	27.1	3.16	N/A	Pass	N/A
		High Street (SW)	High Street (NE)	350	267.1	-82.9	4.72	N/A	Pass	N/A
JC 05	Webster Way / Bull Lane	Websters Way (N)	Bull Lane (SE)	145.3	148.4	3.1	0.26	N/A	Pass	N/A
		Websters Way (N)	Websters Way (SW)	571.1	620.6	49.5	2.03	N/A	Pass	N/A
		Bull Lane (SE)	Websters Way (N)	48.5	68	19.5	2.55	N/A	Pass	N/A
		Bull Lane (SE)	Websters Way (SW)	179.7	148.2	-31.5	2.46	N/A	Pass	N/A
		Websters Way (SW)	Websters Way (N)	63	44	-19	2.60	N/A	Pass	N/A
		Websters Way (SW)	Bull Lane (SE)	19.5	40.3	20.8	3.80	N/A	Pass	N/A
JC 06	Webster Way Car Park South Exit	Websters Way (N)	Websters Way (S)	719.8	754.8	35	1.29	Pass	N/A	N/A
		Car park exit (E)	Websters Way (S)	14.5	22.3	7.8	1.82	N/A	Pass	N/A
		Websters Way (S)	Websters Way (N)	134.8	110.8	-24	2.17	N/A	Pass	N/A
JC 07	B 1013 Hockley Road / Upway	B 1013 Hockley Road (NE)	B 1013 Hockley Road (S)	484.6	461.1	-23.5	1.08	N/A	Pass	N/A
		B 1013 Hockley Road (NE)	Upway (W)	86.5	114.6	28.1	2.80	N/A	Pass	N/A
		B 1013 Hockley Road (S)	B 1013 Hockley Road (NE)	274.6	307.1	32.5	1.91	N/A	Pass	N/A
		B 1013 Hockley Road (S)	Upway (W)	26.5	40.3	13.8	2.39	N/A	Pass	N/A
		Upway (W)	B 1013 Hockley Road (NE)	93.8	87.9	-5.9	0.62	N/A	Pass	N/A
		Upway (W)	B 1013 Hockley Road (S)	54.5	81	26.5	3.22	N/A	Pass	N/A
JC 08	B 1013 Hockley Road / Websterway / High Street	Church Street (N)	B1013 Hockley Road (E)	30	31	1	0.18	N/A	Pass	N/A
		Church Street (N)	Websters Way (S)	101.6	180.9	79.3	6.67	N/A	Pass	N/A
		B1013 Hockley Road (E)	Websters Way (S)	500.7	530.1	29.4	1.30	N/A	Pass	N/A
		Websters Way (S)	B1013 Hockley Road (E)	108.3	106	-2.3	0.22	N/A	Pass	N/A
		High Street (W)	B1013 Hockley Road (E)	233.1	204.8	-28.3	1.91	N/A	Pass	N/A
		High Street (W)	Websters Way (S)	125.6	62	-63.6	6.57	N/A	Pass	N/A
JC 09	High Street / Crown Hill	High Street (S)	High Street (N)	315.7	250	-65.7	3.91	N/A	Pass	N/A
		High Street (S)	Crown Hill (W)	588.1	587.3	-0.8	0.03	N/A	Pass	N/A
		Crown Hill (W)	High Street (N)	104.1	97.3	-6.8	0.68	N/A	Pass	N/A
		Crown Hill (W)	High Street (S)	482.4	482.5	0.1	0.00	N/A	Pass	N/A
JC 10	A129 High Rd / A1015 Eastwood Rd	A129 High Road (NE)	A1015 Eastwood Road (SE)	251.6	246.5	-5.1	0.32	N/A	Pass	N/A
		A129 High Road (NE)	A129 High Road (SW)	242.5	236	-6.5	0.42	N/A	Pass	N/A
		A1015 Eastwood Road (SE)	A129 High Road (NE)	574.2	476.3	-97.9	4.27	N/A	Pass	N/A
		A1015 Eastwood Road (SE)	A129 High Road (SW)	470	514.2	43.9	1.98	N/A	Pass	N/A
		A129 High Road (SW)	A129 High Road (NE)	336	361	25	1.34	N/A	Pass	N/A
		A129 High Road (SW)	A1015 Eastwood Road (SE)	77.6	44.2	-33.4	4.28	N/A	Pass	N/A
JC 11	A129 High Street / Castle Road / Love Lane	A129 High Road (NE)	Castle Road (SE)	27.3	40.9	13.6	2.33	N/A	Pass	N/A
		A129 High Road (NE)	A129 High Road (SW)	605.6	621.4	15.8	0.64	N/A	Pass	N/A
		A129 High Road (NE)	Love Lane (NW)	59.8	88.9	29.1	3.37	N/A	Pass	N/A
		Castle Road (SE)	A129 High Road (NE)	8	84	76	11.21	N/A	Pass	N/A
		Castle Road (SE)	A129 High Road (SW)	209.8	193	-16.8	1.18	N/A	Pass	N/A
		Castle Road (SE)	Love Lane (NW)	92.4	35	-57.4	7.19	N/A	Pass	N/A
		A129 High Road (SW)	A129 High Road (NE)	406	325.5	-80.5	4.21	N/A	Pass	N/A
		A129 High Road (SW)	Castle Road (SE)	81.3	86.9	5.6	0.61	N/A	Pass	N/A
		A129 High Road (SW)	Love Lane (NW)	118.9	145.2	26.3	2.29	N/A	Pass	N/A
		Love Lane (NW)	A129 High Road (NE)	30	6	-24	5.66	N/A	Pass	N/A
		Love Lane (NW)	Castle Road (SE)	24.8	26.9	2.1	0.41	N/A	Pass	N/A
		Love Lane (NW)	A129 High Road (SW)	25.4	37	11.6	2.08	N/A	Pass	N/A
JC 12	Websterway Car Park Entrance	Websters Way (N)	Car Park Main (E)	5.5	0	-5.5	3.32	N/A	Pass	N/A
		Websters Way (N)	Websters Way (S)	707.6	749.8	42.2	1.56	Pass	N/A	N/A
		Car Park Main (E)	Websters Way (N)	8.5	5.3	-3.2	1.22	N/A	Pass	N/A
		Car Park Main (E)	Websters Way (S)	2	5	3	1.60	N/A	Pass	N/A
		Websters Way (S)	Websters Way (N)	90	79	-11	1.20	N/A	Pass	N/A
		Websters Way (S)	Car Park Main (E)	17.5	19	1.5	0.35	N/A	Pass	N/A
JC 13	A1015 Eastwood Rd / Websters Way	Websters Way (N)	A1015 Eastwood Road (SE)	160.7	215.5	54.8	4.00	N/A	Pass	N/A
		Websters Way (N)	A1015 Eastwood Road (NW)	573.6	557.3	-16.3	0.69	N/A	Pass	N/A
		A1015 Eastwood Road (SE)	Websters Way (N)	82.7	89.3	6.6	0.71	N/A	Pass	N/A
		A1015 Eastwood Road (SE)	A1015 Eastwood Road (NW)	473.3	438.2	-35.1	1.64	N/A	Pass	N/A
		A1015 Eastwood Road (NW)	Websters Way (N)	47.5	9	-38.5	7.24	N/A	Pass	N/A
		A1015 Eastwood Road (NW)	A1015 Eastwood Road (SE)	282.3	282.7	0.4	0.02	N/A	Pass	N/A
JC 14	Station Crescent / Upway	Station Crescent (NE)	Upway (SE)	1	30	29	7.37	N/A	Pass	N/A
		Station Crescent (NE)	Station Crescent (SW)	112.6	77.9	-34.7	3.56	N/A	Pass	N/A
		Upway (SE)	Station Crescent (NE)	4	1	-3	1.90	N/A	Pass	N/A
		Upway (SE)	Station Crescent (SW)	90.4	217.6	127.2	10.25	N/A	Fail	N/A
		Station Crescent (SW)	Station Crescent (NE)	68.2	86.9	18.7	2.12	N/A	Pass	N/A
		Station Crescent (SW)	Upway (SE)	125.8	184.9	59.1	4.74	N/A	Pass	N/A
JC 15	Webster Way Car Park North Entrance	Websters Way (NE)	Car park north entrance (SE)	21.5	23.3	1.8	0.38	N/A	Pass	N/A
		Websters Way (NE)	Websters Way (SW)	715.1	745.8	30.7	1.14	Pass	N/A	N/A
		Websters Way (SW)	Websters Way (NE)	95.8	62.3	-33.5	3.77	N/A	Pass	N/A
				16688.1	16878.9	190.8	1.47	N/A	N/A	Pass

12.94

Table 3.2: PM Base Model GEH Turning Movement Count Calibration Results

Turning Volume Calibration for PM Model										
Junction No	Junction Name	From	To	Observed	Modelled	Difference-Total	GEH	Individual flows within 15% for flows 700 – 2700 vph	Individual flows within 100 vph for flows <700 vph	Individual flows within 400 vph for flows > 2700
				PCUs	PCUs					
JC 01	A129 London Road / London Hill / A129 Station Road	A129 London Road (N)	London Hill (SE)	457	464	7	0.34	N/A	Pass	N/A
		A129 London Road (N)	Station Road (SW)	512	433	-79	3.64	N/A	Pass	N/A
		London Hill (SE)	A129 London Road (N)	142	159	16.8	1.37	N/A	Pass	N/A
		London Hill (SE)	Station Road (SW)	29	46	17	2.78	N/A	Pass	N/A
		Station Road (SW)	A129 London Road (N)	644	619	-24.7	0.98	N/A	Pass	N/A
		Station Road (SW)	London Hill (SE)	47	67	19.6	2.60	N/A	Pass	N/A
JC 02	Crown Hill/Love Lane	A129 Station Road (N)	A129 Crown Hill (S)	561	551	-10.3	0.44	N/A	Pass	N/A
		A129 Crown Hill (S)	A129 Station Road (N)	508	420	-88.2	4.09	N/A	Pass	N/A
		Love Lane (W)	A129 Station Road (N)	239	182	-57.1	3.94	N/A	Pass	N/A
		Love Lane (W)	A129 Crown Hill (S)	44	17	-27.2	4.92	N/A	Pass	N/A
JC 03	London Hill / Bellingham Lane	London Hill (N)	Church Street (E)	226	193	-32.6	2.25	N/A	Pass	N/A
		Bellingham Lane (S)	London Hill (N)	45	40	-4.5	0.69	N/A	Pass	N/A
		Bellingham Lane (S)	Bellingham Lane (S)	37	57	20.7	3.02	N/A	Pass	N/A
JC 04	High Street / Bellingham Lane	Bellingham Lane (N)	High Street (NE)	16	0	-16	5.66	N/A	Pass	N/A
		High Street (SW)	Bellingham Lane (N)	61	68	7.2	0.90	N/A	Pass	N/A
		High Street (SW)	High Street (NE)	419	448	29.2	1.40	N/A	Pass	N/A
JC 05	Webster Way / Bull Lane	Websters Way (N)	Bull Lane (SE)	242	223	-19.2	1.26	N/A	Pass	N/A
		Websters Way (N)	Websters Way (SW)	483	543	60.6	2.68	N/A	Pass	N/A
		Bull Lane (SE)	Websters Way (N)	21	50	29	4.87	N/A	Pass	N/A
		Bull Lane (SE)	Websters Way (SW)	80	64	-16	1.89	N/A	Pass	N/A
		Websters Way (SW)	Websters Way (N)	124	114	-10	0.92	N/A	Pass	N/A
		Websters Way (SW)	Bull Lane (SE)	47	61	13.8	1.88	N/A	Pass	N/A
JC 06	Webster Way Car Park South Exit	Websters Way (N)	Websters Way (S)	600	588	-12.1	0.50	N/A	Pass	N/A
		Car park exit (E)	Websters Way (S)	2	68	66	11.16	N/A	Pass	N/A
		Websters Way (S)	Websters Way (N)	127	154	27	2.28	N/A	Pass	N/A
JC 07	B 1013 Hockley Road / Upway	B 1013 Hockley Road (NE)	B 1013 Hockley Road (S)	318	333	15.6	0.86	N/A	Pass	N/A
		B 1013 Hockley Road (NE)	Upway (W)	51	58	7.3	0.99	N/A	Pass	N/A
		B 1013 Hockley Road (S)	B 1013 Hockley Road (NE)	468	426	-42.3	2.00	N/A	Pass	N/A
		B 1013 Hockley Road (S)	Upway (W)	61	49	-11.5	1.55	N/A	Pass	N/A
		Upway (W)	B 1013 Hockley Road (NE)	178	176	-2.8	0.21	N/A	Pass	N/A
		Upway (W)	B 1013 Hockley Road (S)	22	59	37.5	5.91	N/A	Pass	N/A
JC 08	B 1013 Hockley Road / Websterway / High Street	Church Street (N)	B1013 Hockley Road (E)	42	14	-27.2	5.15	N/A	Pass	N/A
		Church Street (N)	Websters Way (S)	200	229	28.7	1.96	N/A	Pass	N/A
		B1013 Hockley Road (E)	Websters Way (S)	340	395	55.6	2.90	N/A	Pass	N/A
		Websters Way (S)	B1013 Hockley Road (E)	145	163	18	1.45	N/A	Pass	N/A
		High Street (W)	B1013 Hockley Road (E)	298	305	7.6	0.44	N/A	Pass	N/A
		High Street (W)	Websters Way (S)	176	145	-31.4	2.48	N/A	Pass	N/A
JC 09	High Street / Crown Hill	High Street (S)	High Street (N)	392	417	25.5	1.27	N/A	Pass	N/A
		High Street (S)	Crown Hill (W)	514	495	-19	0.85	N/A	Pass	N/A
		Crown Hill (W)	High Street (N)	113	97	-15.8	1.54	N/A	Pass	N/A
		Crown Hill (W)	High Street (S)	472	525	52.3	2.34	N/A	Pass	N/A
JC 10	A129 High Rd / A1015 Eastwood Rd	A129 High Road (NE)	A1015 Eastwood Road (SE)	289	309	19.9	1.15	N/A	Pass	N/A
		A129 High Road (NE)	A129 High Road (SW)	201	214	13.5	0.94	N/A	Pass	N/A
		A1015 Eastwood Road (SE)	A129 High Road (NE)	484	460	-24.3	1.12	N/A	Pass	N/A
		A1015 Eastwood Road (SE)	A129 High Road (SW)	332	331	-1.2	0.07	N/A	Pass	N/A
		A129 High Road (SW)	A129 High Road (NE)	399	450	51.1	2.48	N/A	Pass	N/A
		A129 High Road (SW)	A1015 Eastwood Road (SE)	78	43	-35.3	4.53	N/A	Pass	N/A
JC 11	A129 High Street / Castle Road / Love Lane	A129 High Road (NE)	Castle Road (SE)	30	35	5	0.88	N/A	Pass	N/A
		A129 High Road (NE)	A129 High Road (SW)	456	418	-37.6	1.80	N/A	Pass	N/A
		A129 High Road (NE)	Love Lane (NW)	57	100	43	4.85	N/A	Pass	N/A
		Castle Road (SE)	A129 High Road (NE)	27	57	29.8	4.59	N/A	Pass	N/A
		Castle Road (SE)	A129 High Road (SW)	73	60	-13.2	1.62	N/A	Pass	N/A
		Castle Road (SE)	Love Lane (NW)	20	20	0	0.00	N/A	Pass	N/A
		A129 High Road (SW)	A129 High Road (NE)	436	438	2	0.10	N/A	Pass	N/A
		A129 High Road (SW)	Castle Road (SE)	172	164	-8.3	0.64	N/A	Pass	N/A
		A129 High Road (SW)	Love Lane (NW)	107	131	24.1	2.21	N/A	Pass	N/A
		Love Lane (NW)	A129 High Road (NE)	21	2	-19	5.60	N/A	Pass	N/A
		Love Lane (NW)	Castle Road (SE)	17	0	-17.4	5.90	N/A	Pass	N/A
		Love Lane (NW)	A129 High Road (SW)	10	36	25.6	5.31	N/A	Pass	N/A
JC 12	Websterway Car Park Entrance	Websters Way (N)	Car Park Main (E)	13	21	8	1.94	N/A	Pass	N/A
		Websters Way (N)	Websters Way (S)	539	563	24.7	1.05	N/A	Pass	N/A
		Car Park Main (E)	Websters Way (N)	34	23	-11	2.06	N/A	Pass	N/A
		Car Park Main (E)	Websters Way (S)	11	25	14	3.30	N/A	Pass	N/A
		Websters Way (S)	Websters Way (N)	120	155	34.8	2.97	N/A	Pass	N/A
		Websters Way (S)	Car Park Main (E)	13	4	-9	3.09	N/A	Pass	N/A
JC 13	A1015 Eastwood Rd / Websters Way	Websters Way (N)	A1015 Eastwood Road (SE)	247	219	-28	1.83	N/A	Pass	N/A
		Websters Way (N)	A1015 Eastwood Road (NW)	412	421	8.9	0.44	N/A	Pass	N/A
		A1015 Eastwood Road (SE)	Websters Way (N)	98	135	37	3.43	N/A	Pass	N/A
		A1015 Eastwood Road (SE)	A1015 Eastwood Road (NW)	428	372	-55.5	2.78	N/A	Pass	N/A
		A1015 Eastwood Road (NW)	Websters Way (N)	29	5	-24	5.82	N/A	Pass	N/A
		A1015 Eastwood Road (NW)	A1015 Eastwood Road (SE)	337	343	6.5	0.35	N/A	Pass	N/A
JC 14	Station Crescent / Upway	Station Crescent (NE)	Upway (SE)	1	29	28	7.23	N/A	Pass	N/A
		Station Crescent (NE)	Station Crescent (SW)	57	40	-17	2.44	N/A	Pass	N/A
		Upway (SE)	Station Crescent (NE)	4	9	5	1.96	N/A	Pass	N/A
		Upway (SE)	Station Crescent (SW)	92	173	80.8	7.01	N/A	Pass	N/A
		Station Crescent (SW)	Station Crescent (NE)	112	79	-32.7	3.35	N/A	Pass	N/A
		Station Crescent (SW)	Upway (SE)	192	263	70.6	4.68	N/A	Pass	N/A
JC 15	Webster Way Car Park North Entrance	Websters Way (NE)	Car park north entrance (SE)	23	25	2	0.41	N/A	Pass	N/A
		Websters Way (NE)	Websters Way (SW)	544	582	38.5	1.62	N/A	Pass	N/A
		Websters Way (SW)	Websters Way (NE)	158	174	15.8	1.23	N/A	Pass	N/A
				16199	16446	246.2	212.9269			

12.95

Table 3.3: Saturday Base Model GEH Turning Movement Count Calibration Results

Turning Volume Calibration for SAT Model										
Junction No	Junction Name	From	To	Observed	Modelled	Difference-Total	GEH	Individual flows within 15% for flows 700 – 2700 vph	Individual flows within 100 vph for flows <700 vph	Individual flows within 400 vph for flows > 2700
				PCUs	PCUs					
JC 01	A129 London Road / London Hill / A129 Station Road	A129 London Road (N)	London Hill (SE)	297.7	321	23.3	1.32	N/A	Pass	N/A
		A129 London Road (N)	Station Road (SW)	418	405	-12.7	0.63	N/A	Pass	N/A
		London Hill (SE)	A129 London Road (N)	186.3	199.2	12.9	0.93	N/A	Pass	N/A
		London Hill (SE)	Station Road (SW)	44	72	28	3.68	N/A	Pass	N/A
		Station Road (SW)	A129 London Road (N)	519	507.3	-12	0.53	N/A	Pass	N/A
		Station Road (SW)	London Hill (SE)	35	31	-4	0.70	N/A	Pass	N/A
JC 02	Crown Hill/Love Lane	A129 Station Road (N)	A129 Crown Hill (S)	465.2	514	48.8	2.21	N/A	Pass	N/A
		A129 Crown Hill (S)	A129 Station Road (N)	368	401.3	33.5	1.71	N/A	Pass	N/A
		Love Lane (W)	A129 Station Road (N)	182.9	159	-23.9	1.83	N/A	Pass	N/A
		Love Lane (W)	A129 Crown Hill (S)	2	19	17	5.25	N/A	Pass	N/A
JC 03	London Hill / Bellingham Lane	London Hill (N)	Church Street (E)	135.5	134	-1.5	0.13	N/A	Pass	N/A
		Bellingham Lane (S)	London Hill (N)	86	95.2	9.4	0.99	N/A	Pass	N/A
		Bellingham Lane (S)	Bellingham Lane (S)	37	35	-2	0.33	N/A	Pass	N/A
JC 04	High Street / Bellingham Lane	Bellingham Lane (N)	High Street (NE)	14	0	-14	5.29	N/A	Pass	N/A
		High Street (SW)	Bellingham Lane (N)	126.5	143	16.5	1.42	N/A	Pass	N/A
		High Street (SW)	High Street (NE)	360.7	343	-17.7	0.94	N/A	Pass	N/A
JC 05	Webster Way / Bull Lane	Websters Way (N)	Bull Lane (SE)	147.4	115.2	-32.2	2.81	N/A	Pass	N/A
		Websters Way (N)	Websters Way (SW)	465.1	494.9	29.8	1.36	N/A	Pass	N/A
		Bull Lane (SE)	Websters Way (N)	28.5	77	48.5	6.68	N/A	Pass	N/A
		Bull Lane (SE)	Websters Way (SW)	104.1	52	-52.1	5.90	N/A	Pass	N/A
		Websters Way (SW)	Websters Way (N)	162.4	101	-61.4	5.35	N/A	Pass	N/A
		Websters Way (SW)	Bull Lane (SE)	55	91	36	4.21	N/A	Pass	N/A
JC 06	Webster Way Car Park South Exit	Websters Way (N)	Websters Way (S)	446	377.9	-68.1	3.36	N/A	Pass	N/A
		Car park exit (E)	Websters Way (S)	187.5	219	31.5	2.21	N/A	Pass	N/A
		Websters Way (S)	Websters Way (N)	263.9	232	-31.9	2.03	N/A	Pass	N/A
JC 07	B 1013 Hockley Road / Upway	B 1013 Hockley Road (NE)	B 1013 Hockley Road (S)	355.5	320.4	-35.1	1.91	N/A	Pass	N/A
		B 1013 Hockley Road (NE)	Upway (W)	41.5	69	27.5	3.70	N/A	Pass	N/A
		B 1013 Hockley Road (S)	B 1013 Hockley Road (NE)	434.8	345	-89.8	4.55	N/A	Pass	N/A
		B 1013 Hockley Road (S)	Upway (W)	54.5	66	11.5	1.48	N/A	Pass	N/A
		Upway (W)	B 1013 Hockley Road (NE)	105	120	15	1.41	N/A	Pass	N/A
		Upway (W)	B 1013 Hockley Road (S)	14.3	10	-4.3	1.23	N/A	Pass	N/A
JC 08	B 1013 Hockley Road / Websterway / High Street	Church Street (N)	B1013 Hockley Road (E)	35	0	-35	8.37	N/A	Pass	N/A
		Church Street (N)	Websters Way (S)	141.5	157	15.5	1.27	N/A	Pass	N/A
		B1013 Hockley Road (E)	Websters Way (S)	337	335.4	-1.6	0.09	N/A	Pass	N/A
		Websters Way (S)	B1013 Hockley Road (E)	188.9	180	-8.9	0.66	N/A	Pass	N/A
		High Street (W)	B1013 Hockley Road (E)	226.4	226.6	0.2	0.01	N/A	Pass	N/A
		High Street (W)	Websters Way (S)	154.2	118	-36.2	3.10	N/A	Pass	N/A
JC 09	High Street / Crown Hill	High Street (S)	High Street (N)	367.9	322	-45.9	2.47	N/A	Pass	N/A
		High Street (S)	Crown Hill (W)	366.1	382.3	16.2	0.84	N/A	Pass	N/A
		Crown Hill (W)	High Street (N)	112	160	48	4.12	N/A	Pass	N/A
		Crown Hill (W)	High Street (S)	370	390	20	1.03	N/A	Pass	N/A
JC 10	A129 High Rd / A1015 Eastwood Rd	A129 High Road (NE)	A1015 Eastwood Road (SE)	186.6	190	3.4	0.25	N/A	Pass	N/A
		A129 High Road (NE)	A129 High Road (SW)	195.3	200	4.7	0.33	N/A	Pass	N/A
		A1015 Eastwood Road (SE)	A129 High Road (NE)	412.4	440.3	27.9	1.35	N/A	Pass	N/A
		A1015 Eastwood Road (SE)	A129 High Road (SW)	385.6	385.1	-0.5	0.03	N/A	Pass	N/A
		A129 High Road (SW)	A129 High Road (NE)	328.2	286	-42.2	2.41	N/A	Pass	N/A
		A129 High Road (SW)	A1015 Eastwood Road (SE)	121.3	145.2	23.9	2.07	N/A	Pass	N/A
JC 11	A129 High Street / Castle Road / Love Lane	A129 High Road (NE)	Castle Road (SE)	50	71	21	2.70	N/A	Pass	N/A
		A129 High Road (NE)	A129 High Road (SW)	504.1	471.1	-33	1.49	N/A	Pass	N/A
		A129 High Road (NE)	Love Lane (NW)	33	45	12	1.92	N/A	Pass	N/A
		Castle Road (SE)	A129 High Road (NE)	20	44	24	4.24	N/A	Pass	N/A
		Castle Road (SE)	A129 High Road (SW)	136.3	137	0.7	0.06	N/A	Pass	N/A
		Castle Road (SE)	Love Lane (NW)	33	0	-33	8.12	N/A	Pass	N/A
		A129 High Road (SW)	A129 High Road (NE)	433.7	373.2	-60.5	3.01	N/A	Pass	N/A
		A129 High Road (SW)	Castle Road (SE)	152.3	151	-1.3	0.11	N/A	Pass	N/A
		A129 High Road (SW)	Love Lane (NW)	59	92	33	3.80	N/A	Pass	N/A
		Love Lane (NW)	A129 High Road (NE)	15	15	0	0.00	N/A	Pass	N/A
		Love Lane (NW)	Castle Road (SE)	17	5	-12	3.62	N/A	Pass	N/A
		Love Lane (NW)	A129 High Road (SW)	12	16	4	1.07	N/A	Pass	N/A
JC 12	Websterway Car Park Entrance	Websters Way (N)	Car Park Main (E)	18	37	19	3.62	N/A	Pass	N/A
		Websters Way (N)	Websters Way (S)	390.8	302.9	-87.9	4.72	N/A	Pass	N/A
		Car Park Main (E)	Websters Way (N)	111	81	-30	3.06	N/A	Pass	N/A
		Car Park Main (E)	Websters Way (S)	35	87	52	6.66	N/A	Pass	N/A
		Websters Way (S)	Websters Way (N)	103.4	132	28.6	2.64	N/A	Pass	N/A
		Websters Way (S)	Car Park Main (E)	154.5	121	-33.5	2.85	N/A	Pass	N/A
JC 13	A1015 Eastwood Rd / Websters Way	Websters Way (N)	A1015 Eastwood Road (SE)	227.3	212	-15.3	1.03	N/A	Pass	N/A
		Websters Way (N)	A1015 Eastwood Road (NW)	406.2	383.9	-22.3	1.12	N/A	Pass	N/A
		A1015 Eastwood Road (SE)	Websters Way (N)	177.4	169	-8.4	0.64	N/A	Pass	N/A
		A1015 Eastwood Road (SE)	A1015 Eastwood Road (NW)	392.5	443.5	51	2.49	N/A	Pass	N/A
		A1015 Eastwood Road (NW)	Websters Way (N)	86.5	64	-22.5	2.59	N/A	Pass	N/A
		A1015 Eastwood Road (NW)	A1015 Eastwood Road (SE)	218.9	271.2	52.3	3.34	N/A	Pass	N/A
JC 14	Station Crescent / Upway	Station Crescent (NE)	Upway (SE)	1	10	9	3.84	N/A	Pass	N/A
		Station Crescent (NE)	Station Crescent (SW)	63.5	55	-8.5	1.10	N/A	Pass	N/A
		Upway (SE)	Station Crescent (NE)	1	5	4	2.31	N/A	Pass	N/A
		Upway (SE)	Station Crescent (SW)	87	146	59	5.47	N/A	Pass	N/A
		Station Crescent (SW)	Station Crescent (NE)	88	84	-4	0.43	N/A	Pass	N/A
		Station Crescent (SW)	Upway (SE)	120.3	142	21.7	1.89	N/A	Pass	N/A
JC 15	Webster Way Car Park North Entrance	Websters Way (NE)	Car park north entrance (SE)	151.4	202	50.6	3.81	N/A	Pass	N/A
		Websters Way (NE)	Websters Way (SW)	410.8	342.2	-68.6	3.54	N/A	Pass	N/A
		Websters Way (SW)	Websters Way (NE)	213.4	193	-20.4	1.43	N/A	Pass	N/A
				14994.6	**14891.3**					

12.96

Journey Times – (Validation Results)

Base model journey times have been compared to the observed journey times which were recorded on site using 5 ANPR cameras located on the fringes of Rayleigh town centre. The five ANPR camera locations are labelled A – E in Figure 3.2 below.

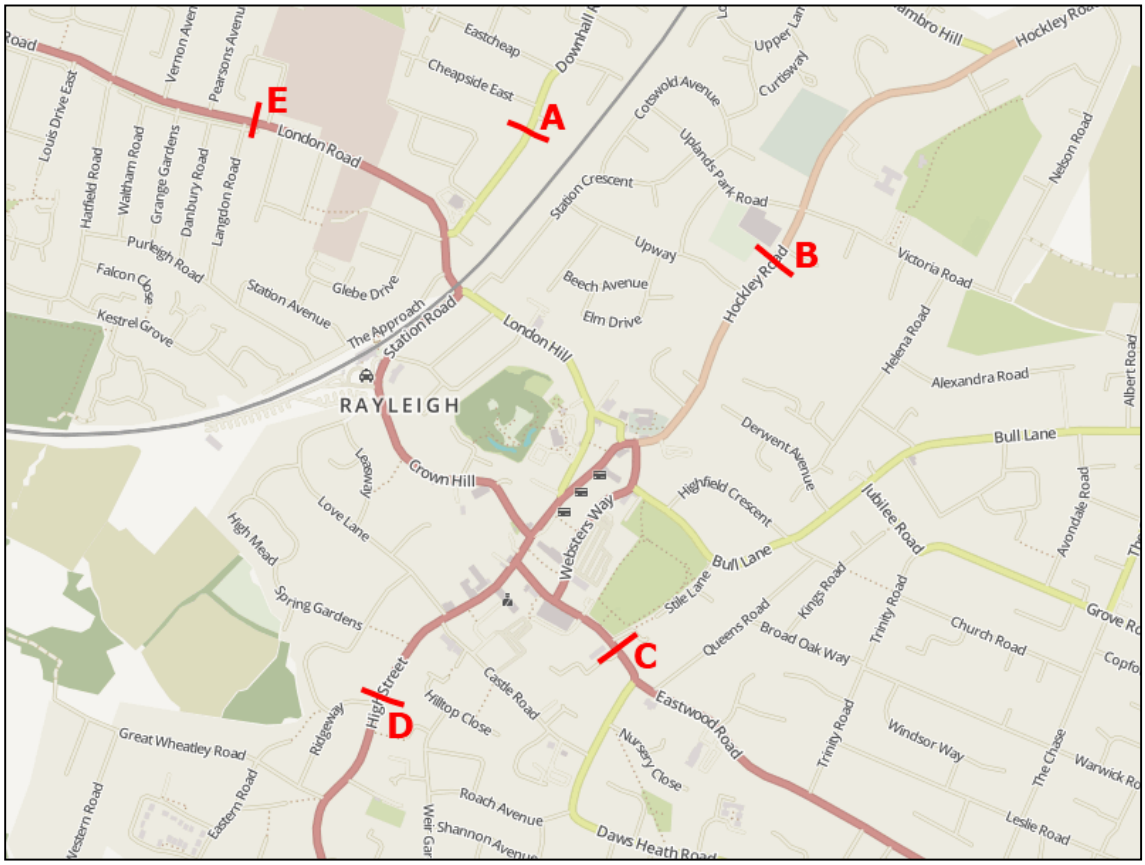


Figure 3.2: Rayleigh Town Centre ANPR camera locations

Due to the distance between the five camera locations and the varying route choice in the town centre some modelled journey times are outside the recommended 15% of the observed journey times (see Table 3.4, Table 3.6 and Table 3.8 below). The observed ANPR journey time data was manually sifted by the Essex Highways traffic data collection team to remove the obvious cases were vehicles had stopped in the town centre before continuing their journey. However this technique may not have provided a 100% accurate journey time dataset which could be another reason why some of the journey time comparisons are over the recommended 15% threshold.

Table 3.4: AM Base Model Journey Time Validation Results

Journey Time No.	Corridors	From-To	ANPR Journey Time (mins)	Base Model Journey Time (mins)	% Difference
1	Downhall Road-Hockley Road	A - B	5.25	4.48	-14.6%
2	Downhall Road-Eastwood Road	A - C	5.55	7.02	26.4%
3	Downhall Road-High Street	A - D	5.98	7.10	18.7%
4	Downhall Road-London Road	A - E	3.22	3.60	11.9%
5	Hockley Road-Eastwood Road	B – C	3.65	4.00	9.6%
6	Hockley Road-High Street	B – D	4.82	4.98	3.5%
7	Hockley Road-London Road	B – E	6.22	5.13	-17.4%
8	Hockley Road-Downhall Road	B - A	Insufficient data	5.03	--
9	Eastwood Road-High Street	C - D	3.12	2.93	-5.9%
10	Eastwood Road-London Road	C - E	5.80	5.38	-7.2%
11	Eastwood Road-Downhall Road	C - A	6.05	5.65	-6.6%
12	Eastwood Road-Hockley Road	C - B	3.40	3.50	2.9%
13	High Street-London Road	D - E	6.12	6.38	4.4%
14	High Street-Downhall Road	D - A	5.80	6.65	14.7%
15	High Street-Hockley Road	D - B	5.77	6.00	4.0%
16	High Street-Eastwood Road	D - C	4.32	4.63	7.3%
17	London Road-Downhall Road	E - A	1.23	1.42	14.9%
18	London Road-Hockley Road	E - B	3.30	2.78	-15.7%
19	London Road-Eastwood Road	E - C	4.42	5.27	19.2%
20	London Road-High Street	E - D	4.72	5.15	9.2%

The AM peak base model has 14 journey times within the 15% threshold. The largest difference in the compared journey times was 26.4% for the Downhall Road to Eastwood Road route (A – C). This modelled journey time is based on one route through the town centre however the observed ANPR journey time incorporates vehicles taking multiple routes and therefore it's likely that these observed vehicles took other less time consuming routes. As can be seen in Table 3.5 below the Zone A to Zone C movement was undertaken by 28 cars during the AM peak which was one of the smaller vehicle demands in the model.

Table 3.5: AM Base Model Origin / Destination Vehicle Volumes

AM PEAK 07:30 - 08:30 Car

Zone	A	B	C	D	E
A	0	10	28	62	232
B	14	0	74	254	72
C	36	38	0	50	200
D	66	126	24	0	120
E	138	54	114	62	0

Table 3.6: PM Base Model Journey Time Validation Results

Journey Time No.	Corridors	From-To	ANPR Journey Time (mins)	Base Model Journey Time (mins)	% Difference
1	Downhall Road-Hockley Road	A - B	8.28	6.45	-22.1%
2	Downhall Road-Eastwood Road	A - C	6.20	7.07	14.0%
3	Downhall Road-High Street	A - D	5.82	6.02	3.4%
4	Downhall Road-London Road	A - E	2.05	1.68	-17.9%
5	Hockley Road-Eastwood Road	B - C	3.90	2.90	-25.6%
6	Hockley Road-High Street	B - D	4.28	3.97	-7.4%
7	Hockley Road-London Road	B - E	4.60	3.08	-33.0%
8	Hockley Road-Downhall Road	B - A	6.72	7.83	16.6%
9	Eastwood Road-High Street	C - D	1.75	2.00	14.3%
10	Eastwood Road-London Road	C - E	3.95	4.52	14.3%
11	Eastwood Road-Downhall Road	C - A	4.15	3.55	-14.5%
12	Eastwood Road-Hockley Road	C - B	2.88	2.97	2.9%
13	High Street-London Road	D - E	5.83	5.38	-7.7%
14	High Street-Downhall Road	D - A	5.53	6.23	12.7%
15	High Street-Hockley Road	D - B	5.23	5.25	0.3%
16	High Street-Eastwood Road	D - C	4.17	4.05	-2.8%
17	London Road-Downhall Road	E - A	1.30	1.40	7.7%
18	London Road-Hockley Road	E - B	2.95	2.70	-8.5%
19	London Road-Eastwood Road	E - C	5.50	5.77	4.8%
20	London Road-High Street	E - D	5.40	4.72	-12.7%

The PM peak base model has 15 journey times within the 15% threshold. The largest difference in the compared journey times was -33.0% for the Hockley Road to London Road route (B – E). This modelled journey time is based on the shortest route via Upway and Station Crescent however the observed ANPR journey time incorporates vehicles taking multiple routes through the town and therefore it's likely that some of the observed vehicles took the more time consuming route through the centre to drop-off/pick-up etc. As can be seen in Table 3.7 below the Zone B to Zone E movement was undertaken by 36 cars during the PM peak which was one of the smaller vehicle demands in the model.

Table 3.7: PM Base Model Origin / Destination Vehicle Volumes

PM PEAK 17:00 - 18:00 Car

Zone	A	B	C	D	E
A	0	12	36	44	104
B	8	0	92	112	36
C	48	68	0	28	104
D	72	248	44	0	52
E	196	132	172	48	0

Table 3.8: Saturday Base Model Journey Time Validation Results

Journey Time No.	Corridors	From-To	ANPR Journey Time (mins)	Base Model Journey Time (mins)	% Difference
1	Downhall Road-Hockley Road	A - B	5.75	6.58	14.5%
2	Downhall Road-Eastwood Road	A - C	6.68	6.67	-0.2%
3	Downhall Road-High Street	A - D	6.68	7.12	6.5%
4	Downhall Road-London Road	A - E	1.30	1.38	6.4%
5	Hockley Road-Eastwood Road	B - C	6.65	7.98	20.1%
6	Hockley Road-High Street	B - D	8.30	8.93	7.6%
7	Hockley Road-London Road	B - E	3.12	2.83	-9.1%
8	Hockley Road-Downhall Road	B - A	10.80	11.00	1.9%
9	Eastwood Road-High Street	C - D	3.00	2.48	-17.2%
10	Eastwood Road-London Road	C - E	4.27	4.88	14.5%
11	Eastwood Road-Downhall Road	C - A	4.25	4.88	14.9%
12	Eastwood Road-Hockley Road	C - B	3.58	4.10	14.4%
13	High Street-London Road	D - E	6.28	7.23	15.1%
14	High Street-Downhall Road	D - A	5.62	6.68	19.0%
15	High Street-Hockley Road	D - B	6.33	7.27	14.7%
16	High Street-Eastwood Road	D - C	6.08	5.43	-10.7%
17	London Road-Downhall Road	E - A	1.25	1.35	8.0%
18	London Road-Hockley Road	E - B	4.00	2.65	-33.8%
19	London Road-Eastwood Road	E - C	7.00	6.13	-12.4%
20	London Road-High Street	E - D	6.67	5.80	-13.0%

The Saturday peak base model has 15 journey times within the 15% threshold. The largest difference in the compared journey times was -33.8% for the London Road to Hockley Road route (E – B). This modelled journey time is based on the shortest route via Station Crescent and Upway however the observed ANPR journey time incorporates vehicles taking multiple routes through the town and therefore it's likely that some of the observed vehicles took more time consuming routes through the centre to drop-off/pick-up etc. As can be seen in Table 3.9 below the Zone E to Zone B movement was undertaken by 97 cars during the Saturday peak.

Table 3.9: Saturday Base Model Origin / Destination Vehicle Volumes

SATURDAY PEAK 13:30 - 14:30 Car

Zone	A	B	C	D	E
A	0	4	42	50	125
B	7	0	43	117	27
C	48	70	0	93	121
D	85	172	70	0	67
E	144	97	89	44	0

Overall, this section has compared fixed journey time routes in the models with more variable routes observed on site. For this reason it has not always been possible to achieve a modelled journey time that is within 15% of the observed. On-site fixed route journey time observations on individual streets / roads compared with identical journey time routes in the models would be more likely to yield more closely aligned journey time validation results as this would be comparing like for like journey routes. It is also noted that in most instances where the modelled journey times are over 15% these have been on lower vehicle demand zone to zone movements.

4 Modelling of Options

4.1 Introduction

Using the AM, PM and Saturday peak period base models two proposed scenarios were tested. The two options requested by Essex County Council include local junction improvements, an upgrade of the current pedestrian facilities and the implementation of bus lay-bys where possible. The two options are outlined below;

Option 1

- Upgrade town centre zebra crossings to puffin crossings.
- Widen the London Hill / High Street junction to two lanes on each arm. On the High Street arm of the adjacent signalised junction one lane will go ahead to Hockley Road and one will turn right to Websters Way.
- Implement a mini roundabout at the London Road / London Hill junction.
- Permit right turn movements from the Train Station car park exit on Love Lane; and
- Implement bus stops in lay-bys where possible.

Option 2

As Option 1 with the addition of;

- Signalisation of the Websters Way / Eastwood Road roundabout. This will include a pedestrian stage within the signal cycle instead of changing the two existing zebras to puffin crossings; and
- Divert northwest bound traffic from Eastwood Road to High Road via Daws Heath Road and Castle Road from the mini roundabout at Eastwood Road / Daws Heath Road.

Both options have also been tested with 10 years growth. The growth was obtained from extracts from the National Transport Model (NTM 2013) for Principal Urban Road and adjusted for the local area (Rayleigh zone 22LU1) using the Dft's TEMPRO results. Results are summarised below in Table 4.1. The 2015 NTM forecasts only became available more recently, but it has been confirmed that the 2015 Scenario 1 forecasts correspond closely to the previous 2013 forecasts.

Table 4.1: Growth Rates (+10 years)

	Growth Factor (+ 10 years)
AM Peak	13.7%
PM Peak	14.1%
Saturday Peak	14.7%

The effect these options have on easing congestion and reducing vehicle journey times through the town is a key interest of this modelling study. It is anticipated that any benefits gained from these proposed options would benefit the town's air quality as Rayleigh has been identified as an Air Quality Management Area.

4.2 Total Modelled Vehicles per Peak Hour

Modelled vehicle hours during each of the peak periods gives an indication of total vehicle times in the model. These can be compared over each of the modelled scenarios to assess the benefits of one option over another or which scenario will be the most resilient when 10 years growth is applied.

Each of the three base peak hour periods have a similar amount of travelled vehicle hours recorded and the delay in hours experienced. However it was the AM base peak hour that had the highest number of vehicle hours (287.3 hrs) and delay (147.9 hrs) experienced of the three base models. The PM peak hour and Saturday peak hour were the second and third busiest respectively. The vehicle hours travelled and vehicle delay results are summarised below in Table 4.2.

Table 4.2: Total Vehicle Hours and Vehicle Delay Experienced

	Travelled vehicle hours in peak hour	Delayed vehicle hours in peak hour
Base AM	287.3	147.9
Opt 1 AM	285.0	146.5
Opt 1 AM-Growth	353.4	213.5
Opt 2 AM	288.6	154.9
Opt 2 AM-Growth	352.6	218.2
Base PM	255.6	135.5
Opt 1 PM	240.2	119.9
Opt 1 PM-Growth	347.9	229.7
Opt 2 PM	238.1	117.6
Opt 2 PM-Growth	351.6	238.5
Base Saturday	237.5	115.0
Opt 1 Saturday	197.7	69.2
Opt 1 Saturday-Growth	206.6	95.4
Opt 2 Saturday	173.3	61.7
Opt 2 Saturday-Growth	198.7	87.5

As illustrated in Table 4.2 both the AM and PM option scenarios offer minor decreases in the total vehicle hours travelled and in the delay experienced by the vehicles. The reductions experienced in the Saturday options are greater. When the 10 year growth rate is applied to the Saturday options they are still below what is presently experienced in the 2014 base model.

4.3 Option 1 Journey Time Results

AM Option 1 Journey Times Results

Table 4.3 below illustrates that the AM Option 1 model indicates a journey time reduction in 9 of the 20 journey time routes. Those routes originating at High Street (Zone D) experience the greatest reductions in journey times. However the option also indicates a journey time increase in 11 of the 20 journey time routes. It would appear that gains experienced in some areas are detrimentally affecting other areas during the AM peak period.

Table 4.3: AM Option 1 Model Journey Time Results

Journey Time No.	Corridors	From-To	Base Model Journey Time (mins)	Option 1 Model Journey Time (mins)	Difference (mins)
1	Downhall Road-Hockley Road	A - B	4.48	4.16	-0.32
2	Downhall Road-Eastwood Road	A - C	7.02	8.81	1.79
3	Downhall Road-High Street	A - D	7.10	9.31	2.21
4	Downhall Road-London Road	A - E	3.60	3.38	-0.22
5	Hockley Road-Eastwood Road	B - C	4.00	5.35	1.35
6	Hockley Road-High Street	B - D	4.98	6.00	1.01
7	Hockley Road-London Road	B - E	5.13	3.02	-2.11
8	Hockley Road-Downhall Road	B - A	5.03	2.91	-2.12
9	Eastwood Road-High Street	C - D	2.93	3.30	0.37
10	Eastwood Road-London Road	C - E	5.38	6.37	0.98
11	Eastwood Road-Downhall Road	C - A	5.65	6.79	1.14
12	Eastwood Road-Hockley Road	C - B	3.50	3.64	0.14
13	High Street-London Road	D - E	6.38	5.36	-1.03
14	High Street-Downhall Road	D - A	6.65	5.51	-1.14
15	High Street-Hockley Road	D - B	6.00	3.73	-2.27
16	High Street-Eastwood Road	D - C	4.63	2.95	-1.68
17	London Road-Downhall Road	E - A	1.42	1.40	-0.02
18	London Road-Hockley Road	E - B	2.78	2.84	0.06
19	London Road-Eastwood Road	E - C	5.27	6.71	1.45
20	London Road-High Street	E - D	5.15	6.49	1.34
21	Downhall Road - Centre	A-Centre	6.08	6.83	0.75
22	Hockley Road - Centre	B-Centre	4.05	7.02	2.97
23	Eastwood Road - Centre	C-Centre	2.93	3.72	0.78
24	High Street - Centre	D-Centre	5.97	2.43	-3.53
25	London Road - Centre	E-Centre	3.95	4.62	0.67
26	Centre - Downhall Road	Centre-A	2.80	2.95	0.15
27	Centre - Hockley Road	Centre-B	2.22	2.73	0.52
28	Centre - Eastwood Road	Centre-C	1.18	1.27	0.08
29	Centre - High Street	Centre-D	1.53	1.58	0.05
30	Centre - London Road	Centre-E	2.77	2.93	0.17

Table 4.4 below illustrates the differences in vehicle numbers entering the model from the 5 main zones in the Option 1 model and Base model during the AM peak period. Zones A, B, D and E demonstrate that a greater number of vehicles can be accommodated in the Option 1 model, this complements the reduced journey time data experienced at these zones in Table 4.3. Zone C demonstrates a decrease in the number of vehicles that can be accommodated again complementing the increased journey time experienced from this zone.

Table 4.4: AM Option 1 Flows vs. Base Flows

Corridor	From Zone	Base Model Flow	Option 1 Model Flow	Diff from Base Model Flow
Downhall Road	A	472	510	38
Hockley Road	B	551	567	16
Eastwood Road	C	510	484	-26
High Street	D	517	537	20
London Road	E	655	690	35

PM Option 1 Journey Times Results

Table 4.5 below illustrates that the PM Option 1 model indicates a journey time reduction in 7 of the 20 journey time routes. Those routes originating at Downhall Road, Hockley Road and High Street (Zones A, B & D) experience the greatest reductions in journey times. However the option also indicates a journey time increase in 13 of the 20 journey time routes. It would appear that gains experienced in some areas are detrimentally affecting other areas during the PM peak period.

Table 4.5: PM Option 1 Model Journey Time Results

Journey Time No.	Corridors	From-To	Base Model Journey Time (mins)	Option 1 Model Journey Time (mins)	Difference (mins)
1	Downhall Road-Hockley Road	A - B	6.45	2.89	-3.56
2	Downhall Road-Eastwood Road	A - C	7.07	6.67	-0.40
3	Downhall Road-High Street	A - D	6.02	6.86	0.84
4	Downhall Road-London Road	A - E	1.68	1.85	0.17
5	Hockley Road-Eastwood Road	B - C	2.90	3.33	0.43
6	Hockley Road-High Street	B - D	3.97	4.35	0.38
7	Hockley Road-London Road	B - E	3.08	2.79	-0.29
8	Hockley Road-Downhall Road	B - A	7.83	2.74	-5.10
9	Eastwood Road-High Street	C - D	2.00	2.29	0.29
10	Eastwood Road-London Road	C - E	4.52	5.35	0.83
11	Eastwood Road-Downhall Road	C - A	3.55	5.54	1.99
12	Eastwood Road-Hockley Road	C - B	2.97	3.19	0.22
13	High Street-London Road	D - E	5.38	5.79	0.40
14	High Street-Downhall Road	D - A	6.23	6.21	-0.02
15	High Street-Hockley Road	D - B	5.25	4.60	-0.65
16	High Street-Eastwood Road	D - C	4.05	3.22	-0.83
17	London Road-Downhall Road	E - A	1.40	1.43	0.03
18	London Road-Hockley Road	E - B	2.70	2.79	0.09
19	London Road-Eastwood Road	E - C	5.77	6.30	0.53
20	London Road-High Street	E - D	4.72	5.67	0.96
21	Downhall Road - Centre	A-Centre	4.77	6.05	1.28
22	Hockley Road - Centre	B-Centre	5.27	4.78	-0.48
23	Eastwood Road - Centre	C-Centre	3.33	2.83	-0.50
24	High Street - Centre	D-Centre	4.43	3.03	-1.40
25	London Road - Centre	E-Centre	4.42	5.93	1.52
26	Centre - Downhall Road	Centre-A	2.80	2.88	0.08
27	Centre - Hockley Road	Centre-B	3.40	3.00	-0.40
28	Centre - Eastwood Road	Centre-C	1.10	1.10	0.00
29	Centre - High Street	Centre-D	1.42	1.40	-0.02
30	Centre - London Road	Centre-E	2.78	2.87	0.08

Table 4.6 below illustrates the differences in vehicle numbers entering the model from the 5 main zones in the Option 1 model and Base model during the PM peak

period. Zones B, C and D demonstrate that a greater number of vehicles can be accommodated in the Option 1 model. Zones A and E demonstrate a decrease in the number of vehicles that can be accommodated again complementing the increased journey time experienced from these zones.

Table 4.6: PM Option 1 Flows vs. Base Flows

Corridor	From Zone	Base Model Flow	Option 1 Model Flow	Diff from Base Model Flow
Downhall Road	A	382	346	-36
Hockley Road	B	364	370	6
Eastwood Road	C	474	509	35
High Street	D	683	684	1
London Road	E	937	889	-48

Saturday Option 1 Journey Times Results

Table 4.77 below illustrates that the Saturday Option 1 model indicates a journey time reduction in 15 of the 20 journey time routes. All routes with the exception of Eastwood Road (Zone C) experience reductions in journey times. The option does indicate a small journey time increase in the remaining 5 journey time routes however it is deemed that the overall impact of the Option 1 model on a Saturday is a positive one.

Table 4.7: Saturday Option 1 Model Journey Time Results

Journey Time No.	Corridors	From-To	Base Model Journey Time (mins)	Option 1 Model Journey Time (mins)	Difference (mins)
1	Downhall Road-Hockley Road	A - B	6.58	2.68	-3.90
2	Downhall Road-Eastwood Road	A - C	6.67	4.33	-2.33
3	Downhall Road-High Street	A - D	7.12	5.22	-1.90
4	Downhall Road-London Road	A - E	1.38	1.46	0.07
5	Hockley Road-Eastwood Road	B - C	7.98	3.41	-4.58
6	Hockley Road-High Street	B - D	8.93	4.42	-4.51
7	Hockley Road-London Road	B - E	2.83	2.75	-0.08
8	Hockley Road-Downhall Road	B - A	11.00	2.52	-8.49
9	Eastwood Road-High Street	C - D	2.48	2.89	0.40
10	Eastwood Road-London Road	C - E	4.88	5.39	0.50
11	Eastwood Road-Downhall Road	C - A	4.88	5.43	0.55
12	Eastwood Road-Hockley Road	C - B	4.10	3.57	-0.53
13	High Street-London Road	D - E	7.23	5.30	-1.93
14	High Street-Downhall Road	D - A	6.68	5.38	-1.31
15	High Street-Hockley Road	D - B	7.27	4.23	-3.04
16	High Street-Eastwood Road	D - C	5.43	2.91	-2.52
17	London Road-Downhall Road	E - A	1.35	1.33	-0.02
18	London Road-Hockley Road	E - B	2.65	2.69	0.04
19	London Road-Eastwood Road	E - C	6.13	4.61	-1.52
20	London Road-High Street	E - D	5.80	4.37	-1.43
21	Downhall Road - Centre	A-Centre	6.10	3.13	-2.97
22	Hockley Road - Centre	B-Centre	6.10	4.83	-1.27
23	Eastwood Road - Centre	C-Centre	2.10	2.78	0.68
24	High Street - Centre	D-Centre	2.17	2.15	-0.02
25	London Road - Centre	E-Centre	5.72	3.15	-2.57
26	Centre - Downhall Road	Centre-A	2.70	2.70	0.00
27	Centre - Hockley Road	Centre-B	3.03	2.03	-1.00
28	Centre - Eastwood Road	Centre-C	1.35	1.32	-0.03
29	Centre - High Street	Centre-D	1.68	1.60	-0.08
30	Centre - London Road	Centre-E	2.55	2.82	0.27

Table 4.8 below illustrates the differences in vehicle numbers entering the model from the 5 main zones in the Option 1 model and Base model during the Saturday peak period. Zones C and D demonstrate that a greater number of vehicles can be accommodated in the Option 1 model, this complements the reduced journey time data experienced at these zones in Table 4.7. Zones A, B and E demonstrate a decrease in the number of vehicles that can be accommodated, however the model does indicate travel time reductions for vehicles entering the model from these zones.

Table 4.8: Saturday Option 1 Flows vs. Base Flows

Corridor	From Zone	Base Model Flow	Option 1 Model Flow	Diff from Base Model Flow
Downhall Road	A	356	336	-20
Hockley Road	B	401	378	-23
Eastwood Road	C	537	588	51
High Street	D	577	623	46
London Road	E	684	636	-48

4.4 Option 2 Journey Time Results

AM Option 2 Journey Times Results

Table 4.9 below illustrates that the AM Option 2 model indicates a journey time reduction in 9 of the 20 journey time routes. Those routes originating at High Street (Zone D) experience the greatest reductions in journey times. However the option also indicates a journey time increase in 11 of the 20 journey time routes. It would appear that gains experienced in some areas are detrimentally affecting other areas during the AM peak period.

Table 4.9: AM Option 2 Model Journey Time Results

Journey Time No.	Corridors	From-To	Base Model Journey Time (mins)	Option 2 Model Journey Time (mins)	Difference (mins)
1	Downhall Road-Hockley Road	A - B	4.48	4.24	-0.24
2	Downhall Road-Eastwood Road	A - C	7.02	9.94	2.92
3	Downhall Road-High Street	A - D	7.10	9.09	1.99
4	Downhall Road-London Road	A - E	3.60	3.16	-0.44
5	Hockley Road-Eastwood Road	B - C	4.00	7.28	3.28
6	Hockley Road-High Street	B - D	4.98	7.90	2.92
7	Hockley Road-London Road	B - E	5.13	2.80	-2.34
8	Hockley Road-Downhall Road	B - A	5.03	2.70	-2.33
9	Eastwood Road-High Street	C - D	2.93	3.80	0.86
10	Eastwood Road-London Road	C - E	5.38	6.04	0.65
11	Eastwood Road-Downhall Road	C - A	5.65	5.32	-0.33
12	Eastwood Road-Hockley Road	C - B	3.50	3.72	0.22
13	High Street-London Road	D - E	6.38	5.63	-0.75
14	High Street-Downhall Road	D - A	6.65	5.81	-0.84
15	High Street-Hockley Road	D - B	6.00	3.50	-2.50
16	High Street-Eastwood Road	D - C	4.63	5.09	0.46
17	London Road-Downhall Road	E - A	1.42	1.40	-0.01
18	London Road-Hockley Road	E - B	2.78	2.83	0.04
19	London Road-Eastwood Road	E - C	5.27	7.90	2.63
20	London Road-High Street	E - D	5.15	6.35	1.20
21	Downhall Road - Centre	A-Centre	6.08	7.77	1.68
22	Hockley Road - Centre	B-Centre	4.05	6.40	2.35
23	Eastwood Road - Centre	C-Centre	2.93	2.30	-0.63
24	High Street - Centre	D-Centre	5.97	1.58	-4.38
25	London Road - Centre	E-Centre	3.95	5.43	1.48
26	Centre - Downhall Road	Centre-A	2.80	2.98	0.18
27	Centre - Hockley Road	Centre-B	2.22	2.00	-0.22
28	Centre - Eastwood Road	Centre-C	1.18	2.15	0.97
29	Centre - High Street	Centre-D	1.53	1.57	0.03
30	Centre - London Road	Centre-E	2.77	2.97	0.20

PM Option 2 Journey Times Results

Table 4. below illustrates that the PM Option 2 model indicates a journey time reduction in 6 of the 20 journey time routes. Those routes originating at High Street (Zone D) experience the greatest reductions in journey times. However the option also indicates a journey time increase in 12 of the 20 journey time routes. No vehicles were recorded using journey time route numbers 9 and 16 during the PM peak Option 2 model as they then have all used the alternative Daws Heath Road and Castle Road route now available in this option. It would appear that gains experienced in some areas are detrimentally affecting other areas during the PM peak period.

Table 4.10: PM Option 2 Model Journey Time Results

Journey Time No.	Corridors	From-To	Base Model Journey Time (mins)	Option 2 Model Journey Time (mins)	Difference (mins)
1	Downhall Road-Hockley Road	A - B	6.45	2.93	-3.52
2	Downhall Road-Eastwood Road	A - C	7.07	7.49	0.43
3	Downhall Road-High Street	A - D	6.02	6.60	0.59
4	Downhall Road-London Road	A - E	1.68	1.86	0.17
5	Hockley Road-Eastwood Road	B - C	2.90	4.89	1.99
6	Hockley Road-High Street	B - D	3.97	5.90	1.93
7	Hockley Road-London Road	B - E	3.08	2.73	-0.35
8	Hockley Road-Downhall Road	B - A	7.83	2.75	-5.08
9	Eastwood Road-High Street	C - D	2.00	-	-
10	Eastwood Road-London Road	C - E	4.52	5.32	0.80
11	Eastwood Road-Downhall Road	C - A	3.55	4.77	1.22
12	Eastwood Road-Hockley Road	C - B	2.97	3.83	0.86
13	High Street-London Road	D - E	5.38	5.32	-0.06
14	High Street-Downhall Road	D - A	6.23	5.47	-0.77
15	High Street-Hockley Road	D - B	5.25	3.75	-1.50
16	High Street-Eastwood Road	D - C	4.05	-	-
17	London Road-Downhall Road	E - A	1.40	1.45	0.05
18	London Road-Hockley Road	E - B	2.70	2.79	0.09
19	London Road-Eastwood Road	E - C	5.77	6.15	0.38
20	London Road-High Street	E - D	4.72	4.83	0.12
21	Downhall Road - Centre	A-Centre	4.77	5.62	0.85
22	Hockley Road - Centre	B-Centre	5.27	5.40	0.13
23	Eastwood Road - Centre	C-Centre	3.33	2.63	-0.70
24	High Street - Centre	D-Centre	4.43	2.07	-2.37
25	London Road - Centre	E-Centre	4.42	5.30	0.88
26	Centre - Downhall Road	Centre-A	2.80	2.92	0.12
27	Centre - Hockley Road	Centre-B	3.40	2.62	-0.78
28	Centre - Eastwood Road	Centre-C	1.10	1.98	0.88
29	Centre - High Street	Centre-D	1.42	1.40	-0.02
30	Centre - London Road	Centre-E	2.78	2.95	0.17

Saturday Option 2 Journey Times Results

Table 4.11 below illustrates that the Saturday Option 2 model indicates a journey time reduction in 15 of the 20 journey time routes. All routes with the exception of Eastwood Road (Zone C) experience reductions in journey times. The option does indicate a small journey time increase in the remaining 5 journey time routes however it is deemed that the overall impact of the Option 2 model on a Saturday is a positive one.

Table 4.11: Saturday Option 2 Model Journey Time Results

Journey Time No.	Corridors	From-To	Base Model Journey Time (mins)	Option 2 Model Journey Time (mins)	Difference (mins)
1	Downhall Road-Hockley Road	A - B	6.58	2.68	-3.90
2	Downhall Road-Eastwood Road	A - C	6.67	5.01	-1.66
3	Downhall Road-High Street	A - D	7.12	5.07	-2.05
4	Downhall Road-London Road	A - E	1.38	1.41	0.02
5	Hockley Road-Eastwood Road	B - C	7.98	4.31	-3.67
6	Hockley Road-High Street	B - D	8.93	5.30	-3.64
7	Hockley Road-London Road	B - E	2.83	2.69	-0.14
8	Hockley Road-Downhall Road	B - A	11.00	2.53	-8.47
9	Eastwood Road-High Street	C - D	2.48	2.80	0.31
10	Eastwood Road-London Road	C - E	4.88	5.45	0.57
11	Eastwood Road-Downhall Road	C - A	4.88	5.27	0.39
12	Eastwood Road-Hockley Road	C - B	4.10	3.92	-0.18
13	High Street-London Road	D - E	7.23	4.72	-2.52
14	High Street-Downhall Road	D - A	6.68	4.91	-1.78
15	High Street-Hockley Road	D - B	7.27	3.51	-3.75
16	High Street-Eastwood Road	D - C	5.43	2.89	-2.54
17	London Road-Downhall Road	E - A	1.35	1.33	-0.02
18	London Road-Hockley Road	E - B	2.65	2.70	0.05
19	London Road-Eastwood Road	E - C	6.13	5.59	-0.54
20	London Road-High Street	E - D	5.80	4.55	-1.25
21	Downhall Road - Centre	A-Centre	6.10	3.20	-2.90
22	Hockley Road - Centre	B-Centre	6.10	4.72	-1.38
23	Eastwood Road - Centre	C-Centre	2.10	2.25	0.15
24	High Street - Centre	D-Centre	2.17	1.60	-0.57
25	London Road - Centre	E-Centre	5.72	3.17	-2.55
26	Centre - Downhall Road	Centre-A	2.70	2.73	0.03
27	Centre - Hockley Road	Centre-B	3.03	2.32	-0.72
28	Centre - Eastwood Road	Centre-C	1.35	2.30	0.95
29	Centre - High Street	Centre-D	1.68	1.57	-0.12
30	Centre - London Road	Centre-E	2.55	2.82	0.27

4.5 Growth Options Journey Time Results

As the Saturday models offer a good number of journey time reductions they have been tested to determine their robustness when a 10 year growth rate is applied. The Saturday growth models therefore replicate the likely flows for the year 2024. Table 4.12 below details the modelled Saturday Option 1 with growth against the modelled Saturday Option 1. The table indicates that small journey time increases will occur for flows originating at all five of the main zones. However the growthed journey times are still below what is presently experienced in the base 2014 model.

Table 4.12: Saturday Option 1 vs. Growth Option 1 Journey Time Results

Journey Time No.	Corridors	From-To	Option 1 Model Journey Time (mins)	Option 1 Model Journey Time with growth (mins)	Difference (mins)
1	Downhall Road-Hockley Road	A - B	2.68	2.55	-0.13
2	Downhall Road-Eastwood Road	A - C	4.33	5.60	1.27
3	Downhall Road-High Street	A - D	5.22	6.23	1.02
4	Downhall Road-London Road	A - E	1.46	1.62	0.16
5	Hockley Road-Eastwood Road	B - C	3.41	4.52	1.11
6	Hockley Road-High Street	B - D	4.42	5.57	1.15
7	Hockley Road-London Road	B - E	2.75	2.80	0.05
8	Hockley Road-Downhall Road	B - A	2.52	2.63	0.12
9	Eastwood Road-High Street	C - D	2.89	2.93	0.05
10	Eastwood Road-London Road	C - E	5.39	6.62	1.23
11	Eastwood Road-Downhall Road	C - A	5.43	6.57	1.14
12	Eastwood Road-Hockley Road	C - B	3.57	3.95	0.38
13	High Street-London Road	D - E	5.30	5.45	0.15
14	High Street-Downhall Road	D - A	5.38	5.75	0.37
15	High Street-Hockley Road	D - B	4.23	4.37	0.14
16	High Street-Eastwood Road	D - C	2.91	2.97	0.06
17	London Road-Downhall Road	E - A	1.33	1.37	0.04
18	London Road-Hockley Road	E - B	2.69	2.68	-0.01
19	London Road-Eastwood Road	E - C	4.61	5.63	1.02
20	London Road-High Street	E - D	4.37	5.55	1.18
21	Downhall Road - Centre	A-Centre	3.13	4.45	1.32
22	Hockley Road - Centre	B-Centre	4.83	5.73	0.90
23	Eastwood Road - Centre	C-Centre	2.78	3.63	0.85
24	High Street - Centre	D-Centre	2.15	2.57	0.42
25	London Road - Centre	E-Centre	3.15	4.20	1.05
26	Centre - Downhall Road	Centre-A	2.70	2.78	0.08
27	Centre - Hockley Road	Centre-B	2.03	2.60	0.57
28	Centre - Eastwood Road	Centre-C	1.32	1.35	0.03
29	Centre - High Street	Centre-D	1.60	1.60	0.00
30	Centre - London Road	Centre-E	2.82	2.85	0.03

Table 4.13 below details the modelled Saturday Option 2 with growth against the modelled Saturday Option 2. The table indicates that small journey time increases will occur for flows originating at Hockley Road with negligible increases experienced on the other zone origins. Once again the growthed journey times are still below what is presently experienced in the base 2014 model.

Table 4.13: Saturday Option 2 vs. Growth Option 2 Journey Time Results

Journey Time No.	Corridors	From-To	Option 2 Model Journey Time (mins)	Option 2 Model Journey Time with growth (mins)	Difference (mins)
1	Downhall Road-Hockley Road	A - B	2.68	2.55	-0.13
2	Downhall Road-Eastwood Road	A - C	5.01	5.82	0.81
3	Downhall Road-High Street	A - D	5.07	5.87	0.80
4	Downhall Road-London Road	A - E	1.41	1.50	0.09
5	Hockley Road-Eastwood Road	B - C	4.31	6.62	2.31
6	Hockley Road-High Street	B - D	5.30	8.23	2.94
7	Hockley Road-London Road	B - E	2.69	2.63	-0.06
8	Hockley Road-Downhall Road	B - A	2.53	2.52	-0.02
9	Eastwood Road-High Street	C - D	2.80	-	-
10	Eastwood Road-London Road	C - E	5.45	6.15	0.70
11	Eastwood Road-Downhall Road	C - A	5.27	5.95	0.68
12	Eastwood Road-Hockley Road	C - B	3.92	4.73	0.82
13	High Street-London Road	D - E	4.72	4.77	0.05
14	High Street-Downhall Road	D - A	4.91	5.08	0.18
15	High Street-Hockley Road	D - B	3.51	3.75	0.24
16	High Street-Eastwood Road	D - C	2.89	-	-
17	London Road-Downhall Road	E - A	1.33	1.37	0.04
18	London Road-Hockley Road	E - B	2.70	2.68	-0.02
19	London Road-Eastwood Road	E - C	5.59	6.38	0.79
20	London Road-High Street	E - D	4.55	5.32	0.76
21	Downhall Road - Centre	A-Centre	3.20	3.93	0.73
22	Hockley Road - Centre	B-Centre	4.72	8.05	3.33
23	Eastwood Road - Centre	C-Centre	2.25	3.17	0.92
24	High Street - Centre	D-Centre	1.60	1.70	0.10
25	London Road - Centre	E-Centre	3.17	3.88	0.72
26	Centre - Downhall Road	Centre-A	2.73	2.78	0.05
27	Centre - Hockley Road	Centre-B	2.32	2.40	0.08
28	Centre - Eastwood Road	Centre-C	2.30	2.23	-0.07
29	Centre - High Street	Centre-D	1.57	1.63	0.07
30	Centre - London Road	Centre-E	2.82	2.85	0.03

5 Summary and Conclusions

This Technical Report details the methodology used to develop the base VISSIM model including the on-site data collection, model calibration and validation, and discussion on the base and proposed model outputs.

The following sources of data have been used to develop and validate the Rayleigh Town Centre base VISSIM model. The data collected has been listed below;

- October 2014 – Classified Junction Turning Counts;
- October 2014 – Queue Lengths;
- October 2014 – Automatic Number Plate Recognition Surveys;
- October 2014 – Automatic Traffic Counter Surveys; and
- October 2014 – Pedestrian Crossing Surveys.

The coding of the Rayleigh Town Centre model has been based on CAD OS MasterMap data, on-site observations and aerial photography. Signal data was obtained from Essex County Council and coded into to the VISSIM model using the VAP programming module.

The key calibration and validation results for the Rayleigh Town Centre base VISSIM model have been detailed in Section 3.3 of this report. It is considered that the Rayleigh Town Centre base model provides a good replication of the current on-site scenario.

Both Option 1 and Option 2 indicate a varying degree of benefits and dis- benefits depending on the individual journey routes in the AM and PM peak hour periods. It is noted that a reduction in journey times on certain routes in the AM and PM models is often combined with an increase in journey times on other routes. The models indicate that creating a time saving in some areas of the AM and PM models simultaneously creates a time delay in other areas of the models.

However the Option 1 and Option 2 scenarios do indicate a greater level of reduced journey times in the Saturday peak period. There are still a few instances where there are minor increases in journey times in the Saturday peak period but these are on a smaller number of routes than the AM and PM peak periods. There are 15 journey time reductions and 5 minor journey time increases in the Saturday peak period in both Options 1 and 2.

Overall, the Option 1 model has indicated a slightly higher amount of time saved than Option 2 in the Saturday peak period (36.53 mins saved in Option 1

compared with 34.76 mins saved in Option 2). Both options offer little overall journey time reductions during the AM and PM peak periods. For this reason it is likely that the implementation of either Option 1 or 2 on site would offer insignificant journey time reductions in the AM and PM peak periods but would likely offer enhanced journey time reductions in the Saturday peak period as indicated in Table 4.7 and Table 4.11 above. The Saturday pattern could also be representative of inter-peak and off-peak conditions, indicating that both options bring benefits in lower or slightly lower flow conditions, but fail to bring noticeable benefits under peak demand.

To test the robustness of the Saturday Option 1 and Option 2 models both have had a 10 year growth rate applied to them. The results indicate that although there are some small increases in journey times the overall vehicle hours spent in the model are still below what is presently experienced in the 2014 base model.

The study has delivered a better understanding of the traffic issues in Rayleigh town centre and three base models for the AM, PM and Saturday peak periods. However, traffic levels within the town are so great that the proposed options offer little reduction in zone to zone (from one side of the town to the other) journey times in the AM and PM peak periods. The Saturday models indicate a greater level of journey time savings in the 2014 base model and the 2024 growth model. This may be due to the different traffic patterns in the town on a Saturday afternoon with more vehicles likely to be visiting the town as a destination rather than passing through the town as could be the case during the AM and PM peaks.

Each of the options if implemented on site would offer greater pedestrian safety, better lane capacity at the signalised junction, a traffic calming measure at the London Road / London Hill junction, an additional movement choice from the train station and improved journey times into the town on High Street (Zone D). This infrastructure would provide benefits for traffic travelling in the town centre however this study has examined specifically the benefits to journey times from one side of the town to the other. These benefits would only be noticed on a Saturday but it is likely a worthwhile exercise to implement the improvements on site for the benefit of vehicles and pedestrians in the town centre.

Appendix C: Review of Local Development Framework Allocations Plan August 2017

Table A2: Review of Allocations Plan

Policy	Planning Application Submitted	Permitted	Number of Dwellings Per Planning Application	Site Capacity According to Allocations Plan	Dwellings in Housing Trajectory
BFR1 Star Lane Industrial Estate, Great Wakering	Yes Development underway Star Lane Brickworks 12/00252/FUL	Yes	116	131 dwellings (SHLAA)	116
BFR2 Eldon Way/Foundry Industrial Estate, Hockley	Yes 15/00144/OUT For 20 flats	Pending decision	20	100 dwellings (Hockley Area Action Plan)	80 (20 x 4 years)
BFR3 Stambridge Mills, Rochford	Yes 11/00494/FUL	Withdrawn	N/A	98 dwellings (SHLAA)	98
BFR4 Rawreth Industrial Estate, Rayleigh	No	No application as at August 2017	N/A	222 dwellings (SHLAA)	222
SER1 North of London Road, Rayleigh	Yes Land west of Rayleigh 14/00627/OUT	No Resubmitted 15/00362/OUT - agreed subject to S106	500	500 units Pre 2021	500
SER2 West Rochford	Yes Development underway 10/00234/OUT	Yes	600	600 dwellings Pre 2021	600
SER3 West Hockley	Yes Pond Chase Nursery, Folly Lane 15/00599/FUL	Yes	70	50 dwellings Pre 2021	70

Policy	Planning Application Submitted	Permitted	Number of Dwellings Per Planning Application	Site Capacity According to Allocations Plan	Dwellings in Housing Trajectory
SER3 West Hockley	Yes 12/00586/OUT 'Westview', Church Road	Non-determination Appeal dismissed Resubmitted 16/01065/FUL - application for 5 detached homes permitted	5	As above	5
SER4 South Hawkwell	Completed development Yes 12/00381/FUL ROC/00139/14	Yes	176	176 dwellings Pre 2021	176
SER5 East Ashingdon South of Brays Lane and to the east of Spencer Gardens. King Edmund School borders site to the South	Completed development 11/00315/OUT 12/00398/REM	Yes	100	Minimum 100 dwellings Pre 2021	100
SER6 South West Hullbridge From Lower Road to West Avenue/Windermere Avenue SER 6a proposed residential area pre 2021 SER 6b proposed residential area post 2021	Yes Land to the west of Hullbridge 14/00813/OUT	Yes	500	500 dwellings	500
SER7 South Canewdon	Yes	Approved	35	49 dwellings	49

Policy	Planning Application Submitted	Permitted	Number of Dwellings Per Planning Application	Site Capacity According to Allocations Plan	Dwellings in Housing Trajectory
East of lane providing access to Canewdon Hall Farm and St Nicholas Church to the north of Anchor Lane	Three Acres, Anchor Lane, Canewdon 16/00733/FUL			Pre 2021 (with below)	
SER7 South Canewdon East of lane providing access to Canewdon Hall Farm and St Nicholas Church to the north of Anchor Lane	Application at Birch Lodge not yet decided 17/00258/FUL	Pending decision	14	49 dwellings Pre 2021 (with above)	49
SER8 South East Ashingdon Agricultural land between Oxford Road to the north, Ashingdon road to the west	No planning application as of August 2017	No	N/A	500	500
SER9a west of Little Wakering Road	Yes Land west of Little Wakering Road and South of Barrow Hall Road 16/00731/OUT	Yes	Up to 120	250 (with below)	250
SER 9b south of the High Street	Yes 16/00668/OUT	Yes	Up to 180	250 (with above)	250

Appendix D: List of key roads and junctions on the Local Road Network

List of Roads in Local Road Network

- Beaches Road/Watery Lane
- Lower Road
- Ferry Road
- Ashingdon Road
- Brays Lane
- Rectory Road
- Greensward Lane/Spa Road
- Great Eastern Road/Station Road
- A1245 - Chelmsford Road
- Rawreth Lane
- Hullbridge Road/Hambro Hill
- B1013 – Hockley Road/High Road/Aldermans Hill/Southend Road/Main Road/ Hall Road/Cherry Orchard Way
- Hall Road
- A129 – London Road/Station Road/Crown Hill/High Road
- Down Hall Road
- Station Cres/Upway
- London Hill
- Websters Way
- High Street
- A1015 – Eastwood Road
- Dalys Road
- North Street
- East Street
- South Street
- West Street
- Bradley Way
- Weir Pond Road
- Stambridge Road
- Canewdon Road/Lark Hill Road
- Scotts Hall Road
- Lambourne Hall Road
- Apton Hall Road
- Creeksea Ferry Road
- Sutton Road
- Shopland Road
- Barling Road
- Southend Road (Wakering)

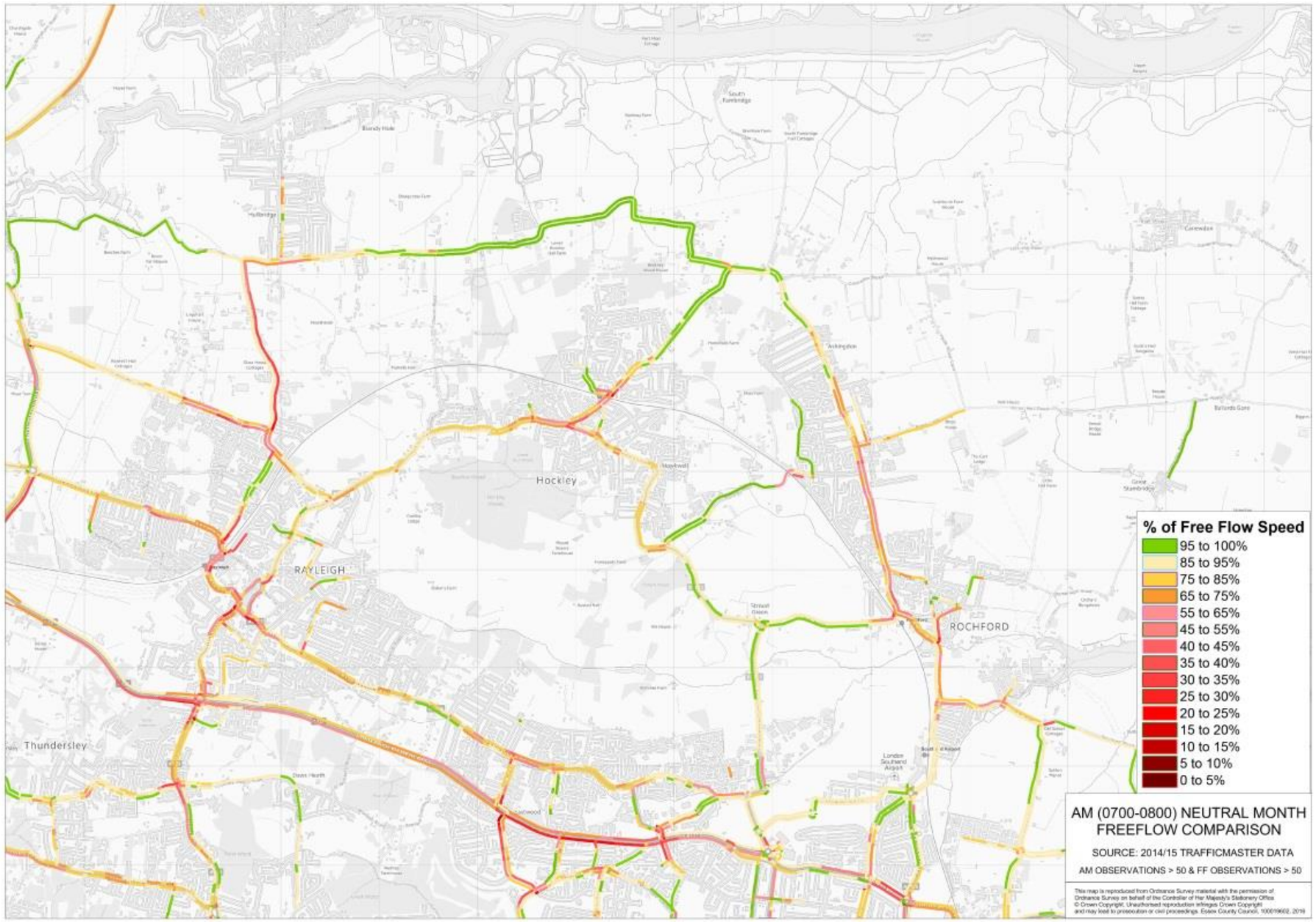
- High Street (Wakering)
- Star Lane
- Shoebury Road
- Poynters Lane

List of Key Junctions in Local Road Network

- Ferry Road/Lower Road
- Lower Road/Watery Lane/Hullbridge Road
- Church Road/Folly Lane
- A1245 Chelmsford Road/Rawreth Lane/Church Road
- Rawreth Lane/Hullbridge Road
- Hullbridge Road/Down Hall road
- Hambro Hill/B1013 Hockley Road
- B1013 Main Rd/Woodlands Road/Southend Road/Spa Road Roundabout
- Spa Road/Station Road
- Great Eastern Road/Southend Road
- A1245 Chelmsford Road/A129/London road Roundabout
- Down Hall Road London Road
- Station Road/London Hill
- Crown Hill/High Street/A129 Roundabout
- A129 High Road/A1015 Eastwood Road Roundabout
- A1015 Eastwood Road/Websters Way
- B1013 Hockley Road/Websters Way
- A129/A127 Roundabout Onramp
- Hall Road/Cherry Orchard Way Roundabout
- Ashingdon Road/Brays Lane
- Ashingdon Road/Rectory Road min-roundabout
- Ashingdon Road/Dalys Road/Roche Avenue Roundabout
- Ashingdon Road/Hall Road/West Street Roundabout
- North/East/West/South Street
- West Street/Bradley Way Roundabout
- Bradley Way Southend Road/South Street Roundabout
- Southend Road/Sutton Road Roundabout
- Sutton Road/Shopland Road
- Southend Road/Star Lane/High Street

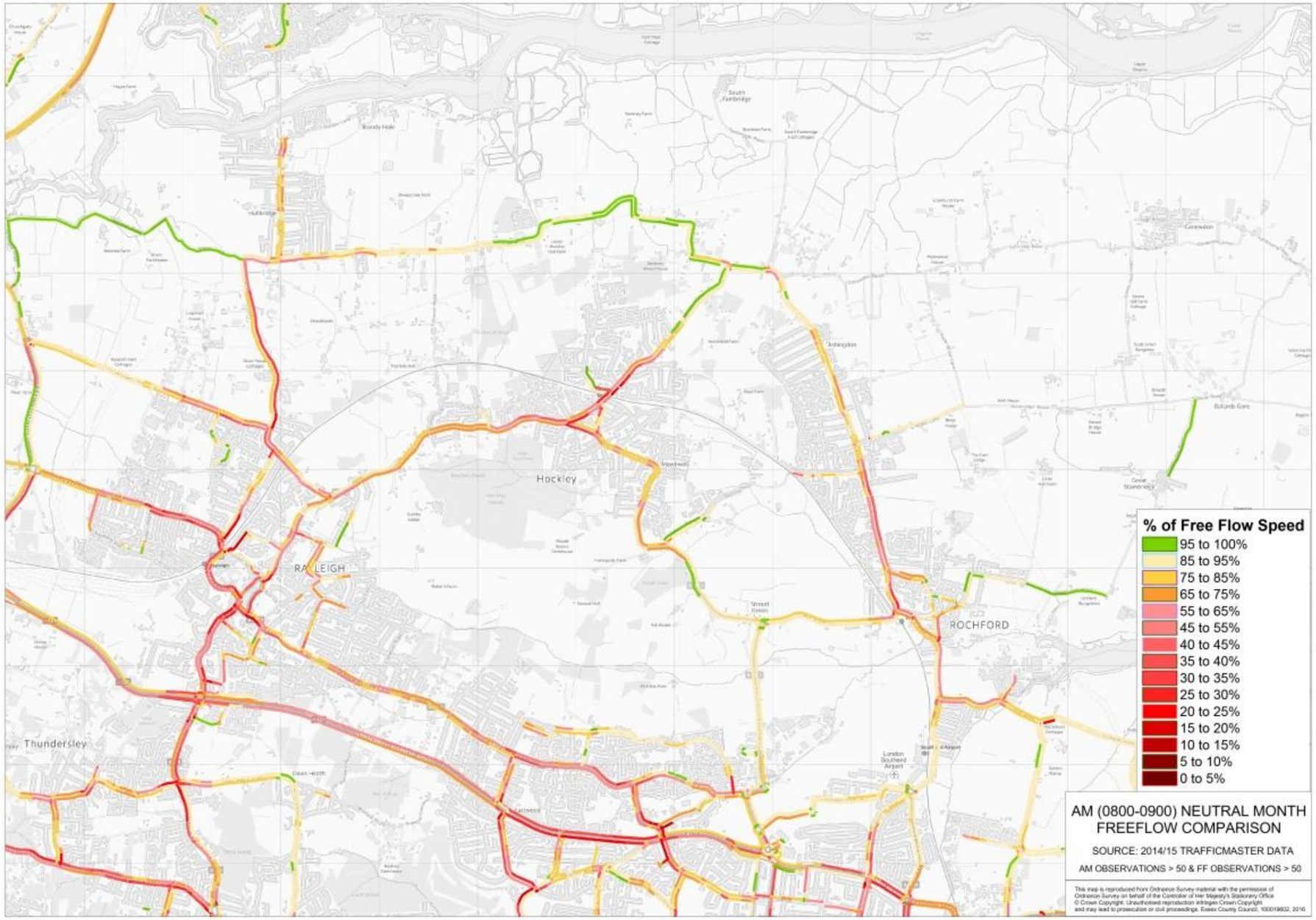
Appendix E: Trafficmaster Data

Figure 0.1: Trafficmaster Data 07:00-08:00 AM



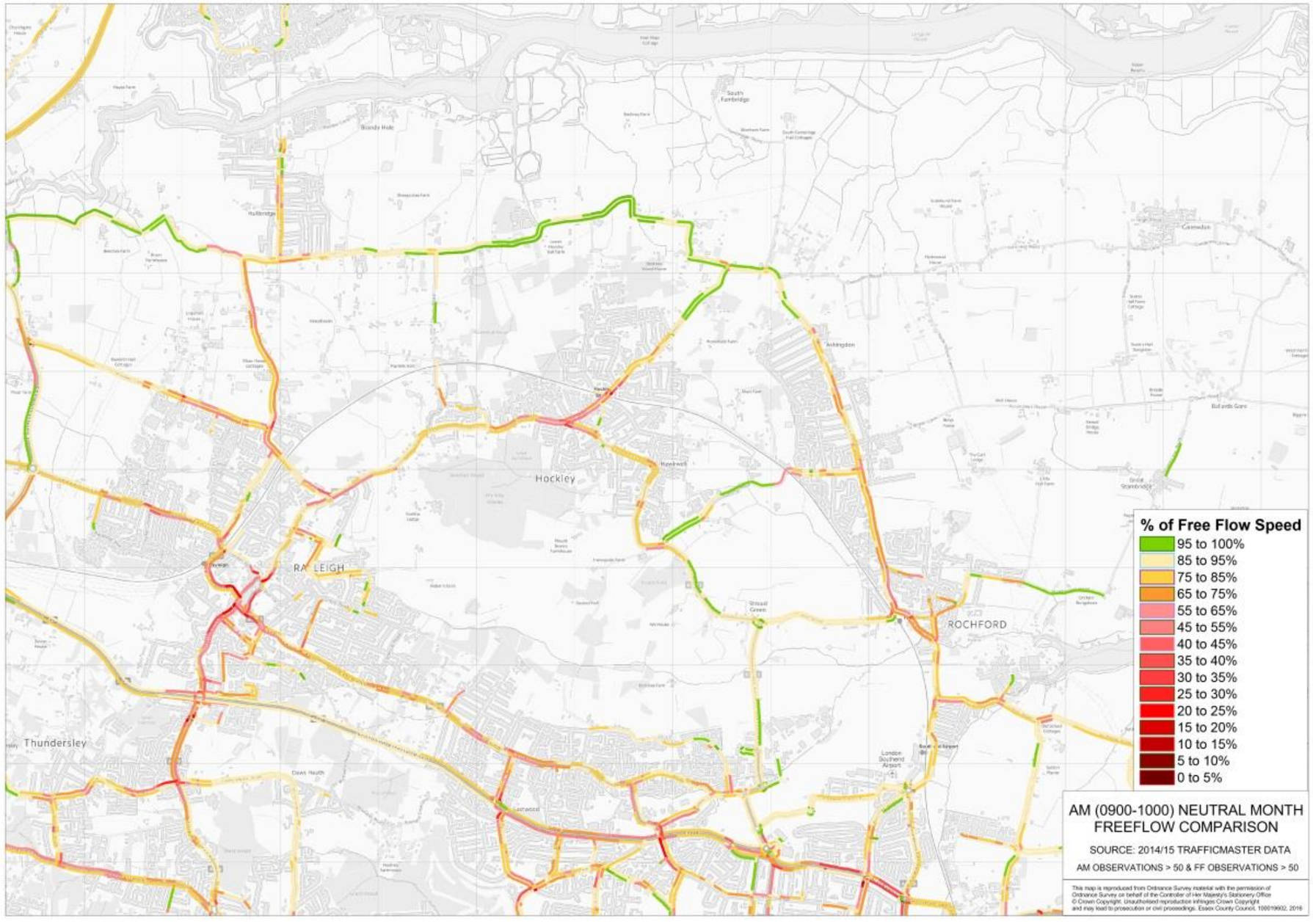
Source: Background mapping contains OS data © Crown copyright and database rights (2017). Map created from 2014-2015 Trafficmaster data provided by Essex Highways referenced in Section 4.2.5 above.

Figure 0.2: Trafficmaster Data 08:00-09:00 AM



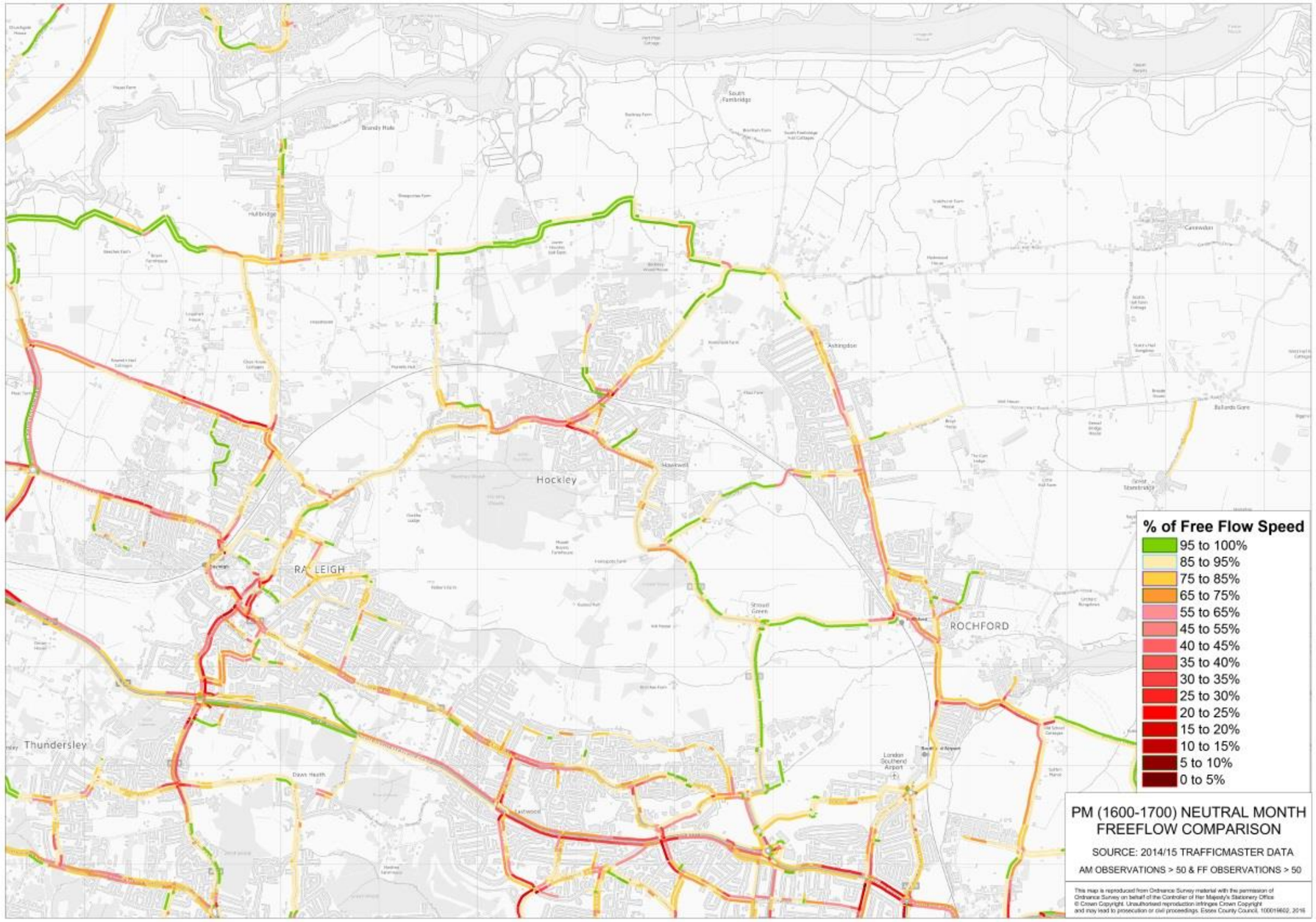
Source: Background mapping contains OS data © Crown copyright and database rights (2017). Map created from 2014-2015 Trafficmaster data provided by Essex Highways referenced in Section 4.2.5 above.

Figure 0.3: Trafficmaster Data 09:00-10:00 AM



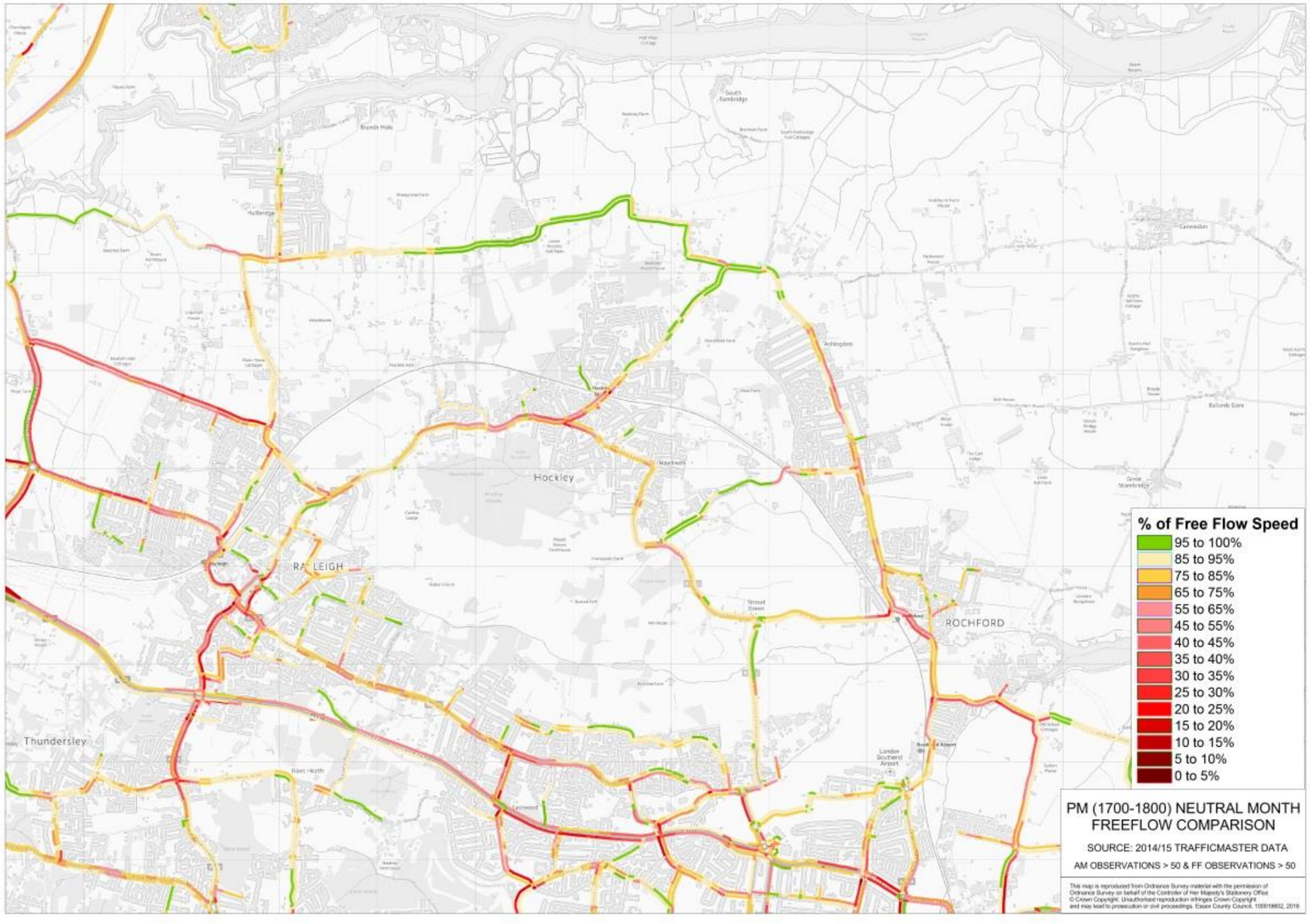
Source: Background mapping contains OS data © Crown copyright and database rights (2017). Map created from 2014-2015 Trafficmaster data provided by Essex Highways referenced in Section 4.2.5 above.

Figure 0.4: Trafficmaster Data 16:00-17:00 PM



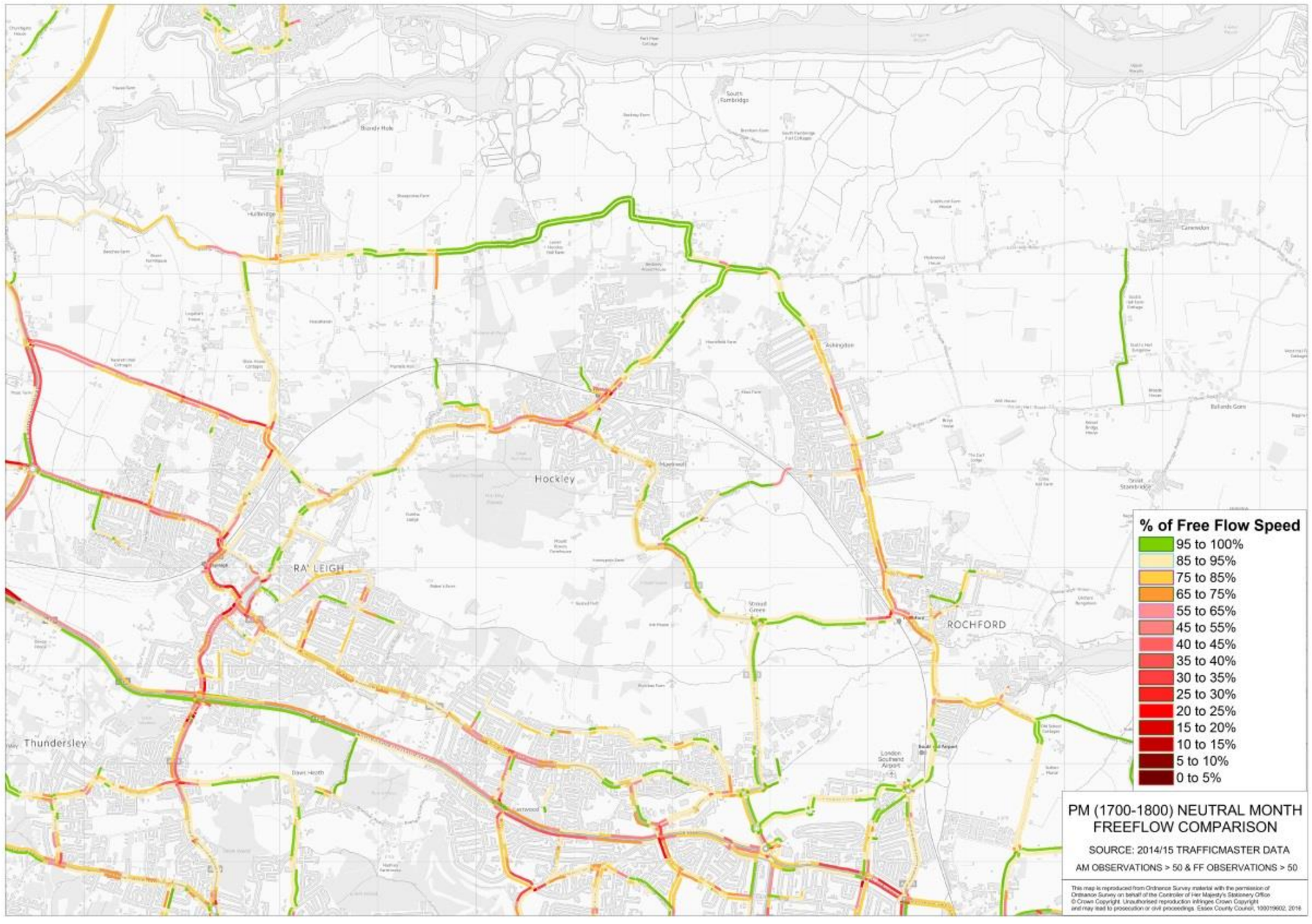
Source: Background mapping contains OS data © Crown copyright and database rights (2017). Map created from 2014-2015 Trafficmaster data provided by Essex Highways referenced in Section 4.2.5 above.

Figure 0.5: Trafficmaster Data 17:00-18:00 PM



Source: Background mapping contains OS data © Crown copyright and database rights (2017). Map created from 2014-2015 Trafficmaster data provided by Essex Highways referenced in Section 4.2.5 above.

Figure 0.6: Trafficmaster Data 18:00-19:00 PM



Source: Background mapping contains OS data © Crown copyright and database rights (2017). Map created from 2014-2015 Trafficmaster data provided by Essex Highways referenced in Section 4.2.5 above.