

Basildon Local Plan

Part 1 - Draft Local Plan Transport & Highway Impact Assessment (July 2017)



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Glossary of Terms

ARCADY	See 'Junctions 8/9'
Assignment model	A highway assignment model identifies the most likely route a trip will be made by trips within a highway network, allocating trips to the best route based on time and distance to make that trip
BBC	Basildon Borough Council
BCAP	Basildon Cycling Action Plan
DfT	Department for Transport
Draft Local Plan Growth	Also referred to as 2016 Draft Local Plan Growth, for the purposes of this report this refers to the additional traffic generated by the level of development proposed within the Draft Local Plan published in January 2016.
ECC	Essex County Council
EH	Essex Highways, Essex is the Highway Authority responsible for the operation and maintenance of the roads in Basildon. Essex is supported by Ringway Jacobs who represent Essex as the Highways Authority.
GPS	Global Positioning System, in the context of this report it is data acquired from vehicles using satnav systems, purchased by the DfT to form their Trafficmaster database.
HELAA sites	Sites from the <i>Housing and Economic Land Availability Assessment</i> which have been proposed for allocation within the Local Plan, or reasonable alternatives, taken forward from the Draft Local Plan and New and Alternative sites consultations.
HIA	Highways Impact Assessment, this document forms the highways impact assessment for the Basildon Local Plan and has been produced in line with the guidance set out in the National Planning Policy Framework for Transport Evidence Bases.
Junctions 8/9	(formerly ARCADY) A computer modelling software package that models the capacity of mini and standard roundabouts, providing information on queue lengths and delays. It also includes PICADY which measures the capacity of priority junctions.
LINSIG	A modelling package used primarily for standalone junctions with traffic signal control, and models the effect on traffic capacities

and queuing. LINSIG also optimises signal timings to reduce delay or increase capacity at junctions.

NTM / NTEM

See 'Traffic Growth'

OA

Census data Output Areas, these are geographical areas created for Census data, specifically for the output of census data. The OA is the lowest geographical level at which census estimates are provided. In the context of this report Journey to Work census data from 2011 has been used.

Passenger Car Units / 'PCUs'

Unless otherwise stated, queue length outputs are expressed in terms of 'Passenger Car Units' (PCUs). This measurement accounts for all vehicle types, with a standard car measuring 1 PCU and larger Heavy Goods Vehicles modelled as 2 PCUs. Modelled queues represent the average maximum on each approach arm across the peak hour. They are therefore indicative of queuing extents at the busiest point of the peak hour and are not representative of average conditions.

PICADY

See 'Junctions 9'

RLA

Residential Land Available, which are defined as development sites with planning permission (Committed Development sites).

SATURN

An area-wide assignment modelling package utilised for previous (2014) Basildon Highway Impact Assessment, where a model network and trip matrix covered the urban and strategic road network in and around Basildon. The software considers the wider impact of network revisions by dynamically reassigning traffic along the most efficient routes possible, based on journey time and journey length.

SELEP

South East Local Enterprise Partnership

TEMPro

See 'Traffic Growth'

TRADS

'Traffic Flow Data System' maintained by Highways England that holds traffic flow data at sites on the UK's strategic road network.

Trafficmaster Data

GPS data used to derive average vehicle journey times across the UK's strategic and urban road network from a large sample of individual journeys. The data can then be used to determine average link speeds and areas of congestion on the road network (by measuring observed speed in relation to free-flow speed).

Traffic Growth (NTM/ NTEM/ TEMPro)	Observed traffic flows have been factored up to forecast year levels using the DfT's National Road Traffic Forecasts from the NTM (National Transport Model) by road type, which have been factored further by using National Trip End Model forecasts using TEMPRO (Trip End Model Presentation Programme) to determine a growth rate based on growth in local development trips in Basildon (at a Borough level), adjusted in line with current Local Plan development assumptions. TEMPro is the name of the software that presents the NTEM data set.
Transport Assessment (TA)	<p>A Transport Assessment sets out transport issues relating to a proposed development, identifying what measures will be taken, the anticipated impacts and safety for all modes of travel.</p> <p>The '<i>Trip Rate Information Computer System</i>' serving as a database of trip rates for developments surveyed in the UK. The database is used in transport planning to quantify the number of trips generated by new developments.</p>
V/C	Volume/Capacity
VISSIM	A microsimulation modelling package which is typically utilised to model a series of junctions situated within close proximity, and is currently being used to assess the impacts of the Basildon Town Centre Masterplan.
VISUM	An area-wide assignment modelling package which has been used to build a 'skeleton' model of the urban and strategic road network across the Borough. Similar to SATURN in functionality, for this study the model software has been used to assign Local Plan development traffic to the fastest route determined by applied average speed data taken from the Trafficmaster database.
WebTAG	The web-based ' <i>Transport Analysis Guidance</i> ' published by the DfT which consists of software tools and guidance on transport modelling and appraisal methods which are applicable for highways and public transport interventions.

1 Introduction

1.1 Background

- 1.1.1 Basildon Borough Council (BBC) is refining its Draft Local Plan 2014-2034, which will provide the planning framework for the future growth and development for the Borough over the next 20 years. A Draft Local Plan was published in January 2016 and was subject to a public consultation between 28 January and 24 March 2016. The Draft Local Plan was informed by work undertaken by Essex Highways over the last few years, including a Highway Impact Assessment (2013/14) and Mitigation & Modelling assessments (2014/15).
- 1.1.2 The transport assessments undertaken in the 2013 to 2015 period were designed to inform the earlier stages of planning and were based on the information about where development may take place as it was understood at the time. Since the last assessment, further detail has become available about the likely preferred growth scenario, there has also been feedback from the Draft Local Plan and New and Alternative sites consultations, this has led to the refinement of previous assessments.

1.2 This Study

- 1.2.1 This Highway Impact Assessment (HIA) has been produced in line with the National Planning Policy Guidance “Transport evidence bases in plan making and decision taking”, 2014.
- 1.2.2 The purpose of this study is to review the impact of proposed development traffic on the highway network in Basildon, bringing together previous studies and reports and assessing the impact of development proposed within the 2016 Draft Local Plan.
- 1.2.3 As stated previously, the methodology has been refined to address comments received during consultation and as a result a skeleton VISUM model has been produced and used to assign development traffic on the network.
- 1.2.4 This study is made up of several assessments:
- A sustainable access assessment – intended to identify the level of sustainable access to potential sites and opportunities to improve the provision of sustainable access to these sites. The results of this assessment are reported in the ‘Basildon Local Plan – Sustainable Accessibility Appraisal’, April 2017.
 - Included within this report is an extension and update to earlier Highway Impact Assessments:
 - Creation of a skeleton VISUM model to refine the distribution of development only traffic (this model does not assign background traffic, which is assigned using alternative methodologies – see Section 4 Assessment Methodology);

- Updating the assessment to include a new assessment year of 2034, using new traffic growth factors;
 - Updated trip rates and application of trips to the highway network, taking account of the updated Draft Local Plan development scenario;
 - Re-creation and update of junction models to assess specific junctions identified as part of the previous HIA work and creation of new junction models at some locations. Using more robust VISUM traffic assignment and improving the detail of junction assessment undertaken previously, rather than relying on strategic level assessment;
 - Update of mitigation junction models to assess already identified mitigations using the new VISUM development traffic assignment;
 - Production of updated results tables indicating where junctions will operate over and within capacity when Local Plan Development traffic is introduced.
- Also included in this report are conclusions on the most beneficial mitigations and requirements for additional assessment; and
 - Identification of cross boundary impacts resulting from development in Basildon.
- 1.2.5 A **'Part 2'** of this Highway Impact Assessment will eventually be produced to assess a Final Local Plan Growth scenario and to consider further mitigation requirements identified as part of this Part 1 assessment.

Impact Assessment

- 1.2.6 This study includes a full appraisal of the Draft Local Plan Growth scenario, of 16,060 dwellings, which is the maximum dwellings expected to be brought forward in the Draft Local Plan period, and over 78 hectares of employment/commercial development.
- 1.2.7 The modelling undertaken within this study supports and updates the earlier 2013/15 work. This study expands the scope of the assessment, through the inclusion of additional junction assessments, and enhances elements of the mitigation modelling through the use of VISUM to re-assign development traffic. It places greater emphasis on assessing the highway impact of future development on local junctions. This has been undertaken through the development of singular models of key junctions in Basildon (an approach used previously for the assessment of junctions in Wickford and Billericay), and aims to support the 'strategic' high-level assessment previously undertaken using outputs from an older Basildon SATURN model.
- 1.2.8 Where junction models have been produced they have been run for the following scenarios:
- Baseline (2014)

- Background Growth (2034)
- Draft Local Plan Growth (2034).
- Draft Local Plan Growth with mitigation (2034)

1.2.9 There will be further work following this study to test a Final Local Plan Growth scenario which will include all sites to be included in the final version of the Basildon Local Plan, taking account of the assessment to date. The Final Local Plan Growth (2034) scenario, and a Final Local Plan Growth with mitigation (2034) scenario will be assessed in the 'Part 2' Study.

1.3 The VISUM model

1.3.1 This study uses a skeleton VISUM model to assign development traffic to the network. It is not a full assignment model, but rather assigns development only traffic based on average link speed data obtained from Trafficmaster. Traffic assigned by this model is then added to background traffic flows and assessed in the standalone junction models. Further detail of the methodology applied follows later in this report.

1.3.2 The use of a VISUM model provides a more refined method of assignment of traffic than the earlier assessments, particularly at the periphery of the network. The 2013/15 assessments used a combination of a SATURN model for Basildon and spreadsheet-based models for Billericay and Wickford to assign traffic. The use of the VISUM model addresses concerns that have been raised during earlier consultation related to the level of interaction between the SATURN network model and the spreadsheet based models.

1.3.3 In addition, the VISUM model assesses development traffic reassignment associated with the proposed large-scale 'strategic' infrastructure schemes identified to mitigate development impact, for example a new junction on the A127 at Pound Lane / Cranfield Park Road. These have now been considered in tandem with nearby proposed smaller junction or road widening mitigation measures. The VISUM model, created for this assessment work, now allows for this level of review of development traffic assignment.

1.4 Format of this Report

1.4.1 This document sets out the methodology and findings of the highway impact assessment for the preferred spatial option for the Basildon Draft Local Plan, and is set out as follows:

Section 1 – Introduction

Section 2 – Provides an outline of previous transport studies undertaken.

Section 3 – Provides an overview of the Draft Local Plan growth scenario used for the assessment in this report.

- Section 4 –** Sets out the assessment methodology including identifying the study area, and describing the junctions forming part of the highway impact assessment.
- Section 5 –** This section sets out the highway mitigation and modelling assessments for the Draft Local Plan growth with mitigation measures on the road network in Basildon, Wickford and Billericay.
- Section 6 –** Results - this section summarises the key findings of the modelling assessments.
- Section 7 –** This section provides an appraisal of the existing and currently proposed sustainable transport infrastructure within the study area and identifies opportunities where improvements could be made in order to support the Local Plan.
- Section 8 –** This section presents a high level appraisal of cross-boundary implications.
- Section 9 –** This section outlines the key conclusions from the study.

2 Background: Previous Work

2.1.1 Throughout this report, reference is made to the “2013/15 Transport Studies” – this refers to the previous transport assessment work completed by Essex Highways in 2013, 2014 and 2015. Reference is made to specific reports where necessary and is summarised in Table 2-1.

Table 2-1: Summary of Highway Impact Assessment Undertaken to Date to Inform the Local Plan

Date of study	Scenarios	Development assumptions	Modelling software used
2013/14	Low growth option	16,000 dwellings + employment	Junction 9 and Linsig for junction capacity SATURN for Basildon Assignment, Spreadsheets for Wickford and Billericay
	High growth option	22,700 + employment	
2014/15	Mitigation options for above scenarios	16,000 dwellings + employment	Junction 9 and Linsig for junction capacity SATURN for Basildon Assignment, Spreadsheets for Wickford and Billericay
		22,700 + employment	
2016/17 (this study)	Preferred Local Plan Option – Draft Local Plan Jan 2016 Growth (2034)	16,060 dwellings 13.3ha B1, 22.6ha B2, 33.2ha B8, 7.8ha retail, 1.15 ha commercial	Junction 9 and Linsig for junction capacity VISUM for development traffic assignment 2013/15 assignment for background traffic.
	Background Growth (2034)	2869 dwellings and TEMPro growth	
	Baseline 2014	2011/2012/2014/ 2016 traffic surveys with TEMPro growth applied to 2014	

2.1.2 Basildon produced a Highways topic paper in 2015, the purpose of this topic paper was to provide an executive summary of all the technical documents that had been commissioned by Basildon Borough Council in partnership with Essex County Council to inform the Draft Local Plan.

2.2 2013/2014 Highways Impact Assessment

“Basildon Borough Local Plan Highway Impact Assessment”, Essex Highways, January 2014

2.2.1 This report was commissioned to provide an assessment of the highway impact of two Local Plan development options put forward by Basildon Borough Council (BBC) one for 16,000 and one for 22,700 dwellings and each with associated employment development up to the year 2031. The assessment was based around specific modelling of the Basildon, Billericay and Wickford areas with key junctions and links forming the study area.

- 2.2.2 The 2031 design year was modelled using a SATURN network within Basildon and bespoke spreadsheet models for Billericay and Wickford. Basildon was modelled using the SATURN area-wide modelling software as an existing model inclusive of the study area. Traffic flows in Billericay and Wickford were modelled separately in MS Excel spreadsheet models, as the existing SATURN model did not cover these towns in detail and the spreadsheets would be capable of including the simpler highway networks in the towns. The flows calculated within the spreadsheet models were then used to create junction models in Junctions 8 and PICADY software.
- 2.2.3 The results of the assessment showed that some of the development options may cause significant localised impacts as currently proposed. The additional traffic from the development along with the general Background Growth in traffic up to 2031 in some cases would exacerbate issues at junctions and on links already experiencing capacity constraints. Problems were most apparent in Billericay, Wickford, and East Basildon. The report identified the need to identify mitigation measures to be investigated. That led to two further pieces of work to look at Highway Mitigation, outlined below.

2.3 2014/2015 Highway Mitigation Modelling:

“Technical Note – Junction Mitigation Testing, Billericay”, Essex Highways, August 2014

“Wickford & Basildon Modelling Scheme Appraisal”, Essex Highways, December 2015.

- 2.3.1 A further study was undertaken to establish mitigation required to accommodate the Local Plan future development with several different mitigation measures assessed at junctions that had been identified as of particular concern in the earlier work, using the same assessment methodology.
- 2.3.2 An initial review into the associated design and cost implications was undertaken. Two separate notes were prepared, one which addressed junction mitigation options for Billericay and a second which addressed mitigation options in Wickford and Basildon.
- 2.3.3 These assessments determined that highway improvements could be made throughout the network to address capacity issues at a large proportion of junctions that would otherwise be expected to be over capacity following the realisation of the Local Plan.
- 2.3.4 These reports have been used to inform the current study, as outlined in the following methodology sections.

2.4 Concurrent Transport Studies

2.4.1 There are a number of other Transport Studies, relevant to the Local Plan, recently or currently being undertaken. Some of the most relevant are outlined below. As the majority of these studies are ongoing, relevant findings have not been accommodated in the latest Local Plan modelling. Where available, results from these studies will be considered in the 'Part 2' Study.

Basildon Town Centre Masterplan

2.4.2 In 2012 Basildon Borough Council adopted a Masterplan to guide the future development of its town centre to 2030. The Highway proposals from the masterplan are currently being progressed as part of the Basildon Integrated Transport Package - South East Local Enterprise Partnership (SELEP) Business Case.

2.4.3 Essex Highways has prepared a VISSIM model for the masterplan area, covering the main railway station and retail/commercial areas accessed via Broadmayne, Southernhay, Roundacre, Nether Mayne and Upper Mayne.

2.4.4 Ardent Consulting Engineers produced the Transport Assessment for the Masterplan for Basildon based on 2011 data which included an assessment of the traffic impact of redevelopment proposed as part of the Local Plan. Trip rates within the Ardent assessment are taken from TRICS and are based on an average over a number of years from similar sites selected from the TRICS database. The trip rates adopted by Ardent to calculate these values have been reviewed and are considered reasonable and so have been used within this assessment for Basildon Town Centre developments.

A127 Corridor for Growth

2.4.5 ECC is leading on various studies along the A127 extending between the M25 in the west and Southend in the east, which bisects and provides the key east-west highway route connection for the Borough along with the A13. It is particularly important as it presents a physical barrier between the southern settlement of Basildon and the northern settlements of Wickford and Billericay – access between each of these areas relies on a number of north/south interchanges and junctions along the A127 corridor.

2.4.6 Within the A127 Corridor for Growth study there are individual pieces of work which are currently at various stages of planning and development, the vast majority of which are focussed on interchange capacity and/or safety improvements. Further discussion regarding this ongoing work is presented throughout the body of this note.

Lower Thames Crossing

- 2.4.7 The Lower Thames Crossing is a proposed new road crossing of the River Thames which will connect the counties of Essex (north) and Kent (south). The scheme is being developed by Highways England, a decision on the preferred route for the crossing was made on 12 April 2017.
- 2.4.8 The planned route is expected to run from the M25 near North Ockendon with a new link / junction on the M25, cross the A13 at Orsett before crossing under the Thames east of Tilbury and Gravesend. A new link road will then take traffic to the A2 near Shorne, close to where the route becomes the M2.

Basildon Cycling Action Plan

- 2.4.9 In line with the Essex Cycling Strategy, the Basildon Cycling Action Plan (BCAP) is currently being developed, which will ultimately provide ECC / BBC with a strategy that includes a range of potential cycling improvements, these may provide opportunities to mitigate against some of the impact of future development traffic through encouraging residents and workers in the Borough to travel by bike. The aims of developing the Cycling Action Plan are to:
- Identify the current level of cycle demand within the Borough and how cycling levels can be increased;
 - Identify any cycle safety issues within the Borough;
 - Identify gaps in existing cycle provision, particularly relating to key routes;
 - Identify ways of closing the gaps in cycle provision and proposed cycle enhancements; and
 - Investigate ways of marketing existing and proposed cycle routes.
- 2.4.10 Whilst still being developed, the BCAP will ultimately form an important piece of work which will guide the provision of cycling infrastructure in support of the Draft Local Plan.

Neighbouring Authority Local Plans

- 2.4.11 Local Plans and associated transport assessments are being produced by neighbouring districts and Boroughs, where detail from these become available it will be used to inform conclusions on cross boundary impacts within the 'Part 2' Study.

3 Local Plan Growth Scenarios

- 3.1.1 Details of the land use and spatial arrangement of residential and employment sites, which together form BBC's **Draft Local Plan growth scenario** (as it is referred to hereafter), was confirmed by BBC to Essex Highways in February 2017. These have been refined since the previous 2013/15 Highways Assessment having considered the comments on the technical methodology following the Draft Local Plan and New and Alternative sites consultations.
- 3.1.2 The eventual Final Growth Scenario to be included within the proposed publication version of the Local Plan will be tested in the 'Part 2' Study.
- 3.1.3 The Draft Local Plan growth scenario analysed within this study comprises 16,060 dwelling units and approximately 70 Ha of employment land, 7.8 Ha retail and just over 1 Ha leisure. This is made up of 10,838 dwellings in Basildon, 3,200 dwellings in Wickford and 1,900 dwellings in Billericay¹. The majority of employment land is located at the fringes of existing employment land in Basildon.
- 3.1.4 Figure 3-1, at the end of this section, shows the location of the development sites forming the Draft Local Plan Growth. These sites are made up of residential and employment/commercial sites.

3.2 Housing Development Sites

- 3.2.1 Residential development sites are made up of:
- Housing and Economic Land Availability Assessment (HELAA) sites, which have either been proposed for allocation or sites which have reasonable alternatives taken from the Draft Local Plan and New / Alternative Sites consultation,
 - Urban and Town Centre sites,
 - Housing Allocation sites,
 - Residential Land Available (RLA) sites – sites with planning permission (committed development sites), and
 - Plotland sites – developable land located between existing housing.
- 3.2.2 More specific information on the detailed assumptions made is provided in Section 4.3.

3.3 Employment Sites

- 3.3.1 The planned employment development consists of:

¹Figure for Billericay includes development in Ramsden Bellhouse and Crays Hill.

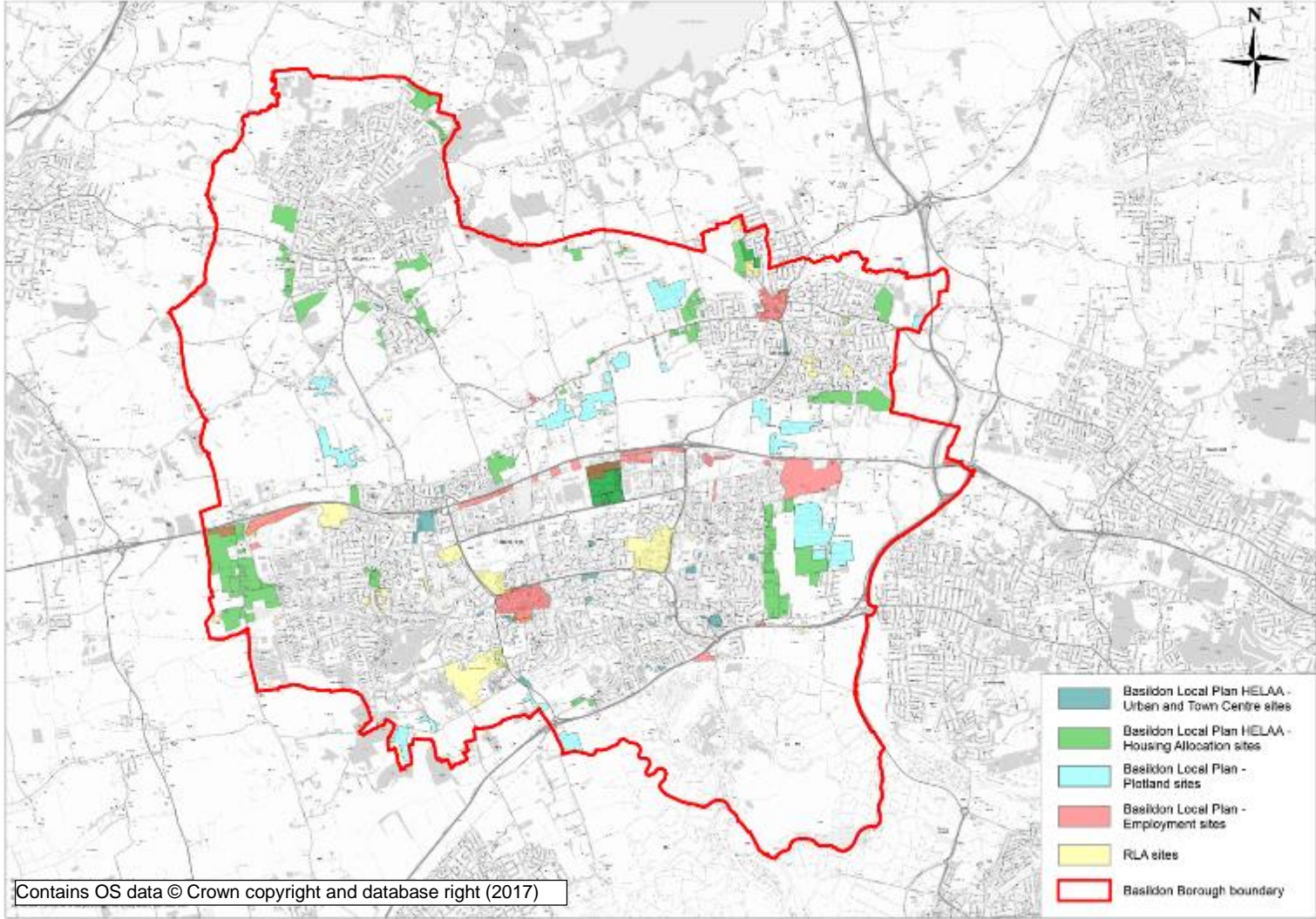
- Potential employment sites on the Green Belt
- Existing employment sites in the Urban Area, and
- Vacant/underutilised land in the Urban Area.

3.3.2 The majority of employment land is located at the fringes of existing employment sites along the northern edge of Basildon, with new expansion areas located to the west and east of the town. Employment opportunities have also been identified within the town centres of Wickford and Billericay.

3.4 Application of the growth scenario in this assessment

3.4.1 Trips generated by each of the sites identified within this growth scenario have been calculated and assigned to the highway network in accordance with the methodology set out in the following sections. This aspect of the assessment is referred to as the 'Draft Local Development Growth (2034)' scenario.

Figure 3-1: Draft Local Plan Growth Scenario (Housing and Employment)



4 Assessment Methodology

4.1 Introduction

4.1.1 This section outlines the methodology applied to assess the likely impact of the development proposed within the Draft Local Plan. As previously stated, the eventual Publication Local Plan scenario will be assessed as a Final Growth Scenario in a follow-up 'Part 2' Study.

4.2 Scenario modelling

4.2.1 Assessments of four Draft Local Plan scenarios have been undertaken in this 'Part 1' Study, these are outlined below:

- 2014 Baseline: includes a combination of traffic data obtained in 2011 uplifted to reflect conditions in 2014, with other traffic data which has been more recently collected between 2014 and 2016.

2034 Forecast Year:

- Background Growth: assumes TEMPro traffic growth and traffic from committed developments in Basildon Borough;
- 2016 Draft Local Plan Growth: Background Growth plus Local Plan development, with no alterations to the highway network.
- 2016 Draft Local Plan Growth with mitigation: Background Growth plus Local Plan development with highway network mitigations.

4.2.2 The following scenarios will be tested in the 'Part 2' Study once the Publication Local Plan is finalised:

2034 Forecast Year:

- 2017 Final Local Plan Growth with sustainable transport mitigation including reduced trip rates for selected sites based on their level of accessibility.
- 2017 Final Local Plan Growth: Background Growth plus Local Plan development, with no alterations to the highway network.
- 2017 Final Local Plan Growth with highway mitigation: Background Growth plus Local Plan development with highway network mitigations.

4.2.3 These will be referenced against the Baseline and Background Growth models from the 'Part 1' Study. A new Baseline and Background Growth junction model will be created for additional junctions identified for inclusion in the assessment.

4.2.4 The highway mitigations that have been modelled are based on discussions with BBC and ECC. Within this assessment, most of the mitigations tested have been included in the 2013/15 assessments. These earlier assessments have been updated with new development assumptions and a more robust development traffic assignment methodology.

- 4.2.5 The Final Local Plan Growth scenario and associated mitigation scenario, will be considered as part of an additional assessment to be provided in the 'Part 2' Study. This scenario will take account of the development sites to be included in the Local Plan, along with additional mitigation options that have been identified in the conclusions of this 'Part 1' Study.
- 4.2.6 Further details on how TEMPro growth was applied in combination with Local Plan proposals are set out in Section 4.10.
- 4.2.7 The Baseline and 'Background Growth' scenarios have been compared to the Draft Local Plan Growth and Draft Local Plan Growth plus mitigation scenarios in order to understand the impact of Local Plan Growth on the highway network.²

4.3 Development Trip Generation Rates

- 4.3.1 The *Trip Rate Information Computer System* (TRICS) database has been used in order to determine the number of vehicle arrivals and departures that are expected to be generated by the Draft Local Plan development sites in each peak period.
- 4.3.2 This approach is based on industry recognised best practice and has been updated since the earlier 2013/15 transport studies, although the methodology remains much the same.
- 4.3.3 The residential trip rates from the 2014 study split out types of trip by type of residential development (privately owned houses, flats, rental etc.) and by town centre sites and edge/out of town centre sites.
- 4.3.4 It was felt that it would be better to create trip rates by proximity to town centres rather than by tenure and dwelling type. This follows advice in the 2016 TRICS User Guide, which states that *"The most important data fields in terms of site selection compatibility are the main category and sub-category location types."* It is generally recognised that *"Sites in a town centre with good local public transport accessibility will naturally, as a rule, achieve a different type of modal split to a site in the country without any public transport."*
- 4.3.5 Trip rates have been calculated by creating average trip rates from observed sites with varying proportions of houses, flats, rented, shared ownership and privately owned dwellings. The proportion of tenure and dwelling type has been identified in Table 4-1 overleaf and is considered to be representative of the types of sites expected to come forward in Basildon. This follows the same methodology used for the Local Plan Highways Impact Assessments produced for other districts in Essex and are considered to represent robust trip rates.

² As per the requirements of the NPPF 'Transport Evidence bases in Plan Making and Decision Taking' Guidance. The Baseline and Background Growth scenarios are not development options in their own right.

Housing trip generation

- 4.3.6 Trip rates per dwelling unit have been extracted from the TRICS database for housing types, including flats, houses and a mixture of both. This analysis has used multi-modal surveys, and has excluded data from Ireland, Northern Ireland & Inner London Boroughs as well as weekend surveys.
- 4.3.7 The database includes a mixture of privately owned and affordable housing, but there are not separate trip rates for each. This is considered to represent an appropriate cross-section of the various housing types that would be delivered across the residential development sites forming the Draft Local Plan Growth Scenario.
- 4.3.8 Trip rates were calculated for a range of different development types and an average was generated by site proximity to town centres. On this basis, trip rates have been extracted from TRICS based on surveys from residential development located within the following five categories:
- Town Centre
 - Edge of Town Centre
 - Suburban Area
 - Edge of Town
 - Neighbourhood Centre.
- 4.3.9 The list above descends in order of proximity to the Town Centre, which are generally closer to major employment and retail areas, with the exception of Neighbourhood Centres. These locations are defined within TRICS.
- 4.3.10 The samples used to calculate a trip rate for each spatial category includes a mixture of privately owned, rented and affordable housing and therefore accounts for the possible cross-section of housing types which are likely to comprise the future residential mix. The breakdown of the sites included within the assessment are summarised below:

Table 4-1: Breakdown of TRICS sites used to calculate trip rates

Housing mix	Site location					Grand Total
	Edge of Town	Edge of Town Centre	Neighbourhood Centre	Sub-urban Area	Town Centre	
Mixed Affordable & Privately Owned	12	1	2	14	2	31
Mixed Houses / Flats	12	1	2	14	2	31

Mostly Affordable	11	4	3	11	3	32
Mixed Houses / Flats	3	1	1	3		8
Mostly Flats	3	2	2	6	3	16
Mostly Houses	5	1		2		8
Mostly Private	29	16		42	4	91
Mixed Houses / Flats	5	4		6	1	16
Mostly Flats	2	7		14	3	26
Mostly Houses	22	5		22		49

4.3.11 The median trip rates from TRICS have been obtained as a means of excluding any significant outliers from the database.

4.3.12 On the basis of the above, Table 4-2 presents the median peak hour housing trip rates extracted from the TRICS database for the five categories of site location, which have been adopted for this assessment.

Table 4-2: Summary of Median Vehicle Trip Generation Rates for Housing sites

Location of Site	Hourly Vehicle Movements Per Unit			
	AM Peak (08:00 -09:00)		PM Peak (17:00 -18:00)	
	ARR	DEP	ARR	DEP
Town Centre	0.042	0.091	0.091	0.065
Edge of Town Centre	0.096	0.208	0.196	0.158
Suburban Area	0.098	0.286	0.276	0.138
Edge of Town	0.133	0.333	0.330	0.158
Neighbourhood Centre	0.072	0.326	0.362	0.181

4.3.13 Using TRICS location definitions, each residential development site (including those less than 30 units in size) forming the Draft Local Plan Growth Scenario has been categorised into one of the five categories identified in Table 4-2: to determine future development traffic growth across the Borough.

Commercial trip generation

4.3.14 For commercial sites, BBC confirmed details of the likely split in employment land use for each of the different employment sites. The following assumptions have been made:

Table 4-3: Commercial Land uses

BBC Ref	Site Location	Employment Land Use Class, Gross Floor Area (m ²)				
		Office B1	Industrial Unit B2	Warehousing B8	Retail	Commercial Leisure
E8a	Edge of Town			56,400		
E8b	Edge of Town	30,000	60,000	105,000		
E7	Edge of Town	9,400	9,400	37,600		
E5	Edge of Town	24,543	57,267			
E3	Edge of Town	25,841	34,454	25,841		
E2	Edge of Town	6,548	26,190	32,738		
E2	Edge of Town	3,636	7,272	25,452		

E2	Edge of Town		14,400	14,400		
E2	Edge of Town			21,500		
E6	Edge of Town	5,303	12,373			
R2	Town Centre	25,000			30,464	10,000
E2	Edge of Town Centre	282	1,128			
E2	Suburban			2,000		
R5	Town Centre	500			15,232	500
E9	Edge of Town	1,600		1,600		
E9	Edge of Town			6,000		
E9	Edge of Town		3,800	3,800		
R6	Town Centre				15,232	500
R3	Town Centre				7,616	250
R4	Town Centre				7,616	250
H13	Edge of Town				1,000	
H14	Edge of Town				400	
H23	Edge of Town				500	
Total		132,652	226,284	332,330	78,060	11,500
						780,825

4.3.15 In the case of employment land, the expected Gross Floor Area of the development on the site, rather than the site area, has been used for the purposes of modelling.

4.3.16 Trip rates applied for commercial developments are set out in Table 4-4 below. Commercial/leisure land uses have been assumed to be split between cinema, restaurants and bars, community centres and fitness uses.

4.3.17 The previous assessments have not taken into consideration the generation of trips between new areas of employment and new areas of residential within the Borough – essentially these movements were previously double counted. Therefore, using census data, a reduction factor has been applied where new residential trips would be expected to travel to new employment within Basildon Borough.

Table 4-4: Summary of Average Vehicle Trip Generation Rates for Commercial sites

Land use		08:00-09:00 Arr	08:00-09:00 Dep	17:00-18:00 Arr	17:00-18:00 Dep
Employment	Office, town centre	0.5	0.049	0.071	0.518
	Office, edge of TC	1.809	0.247	0.236	1.76
	Industrial unit, edge of TC	0.375	0.087	0.15	0.4
	Warehousing, edge of TC	0.117	0.055	0.063	0.208
Commercial/leisure	Cinema	0	0	1.251	0.971
	Restaurants and bars, town centre	0	0	1.059	0.389
	Community Centre	1.033	0.453	0.495	0.707
	Fitness	0.695	1.012	2.193	0.938
Retail	Supermarket	2.24	1.848	4.359	4.928
	Local shops	3.617	3.249	4.436	4.759
	Convenience stores	2.834	2.002	3.666	4.914

Basildon Town Centre (Masterplan)

4.3.18 As part of the Draft Local Plan, redevelopment of the town centre has been considered, which would involve significant changes to the existing land uses. A Transport Assessment of the proposed redevelopment was undertaken by Ardent Consulting Engineers in 2011 and the principal outputs have been carried forward into the latest modelling undertaken. Expected highway changes, such as one way restrictions have been accounted for within the VISUM assignment model.³

Local workforce generation ('internal trips')

4.3.19 It has been recognised that some trips generated by new housing development will have a destination within a newly created place of employment. This would equate to a single trip, rather than one 'origin' trip generated by the housing plus a second 'destination' trip generated by the employment site (e.g. the same trip essentially being counted twice).

4.3.20 The origin of employment trips has been assumed based on 2011 journey to work percentage splits. Those that are expected to be made from developments within Basildon have been removed from the overall trip generation for the site as these trips are already accounted for within the residential development trip rates.

Housing sites

4.3.21 Reflective of the level of certainty around the development scenarios being assessed at that time, the 2013/15 transport studies adopted what is considered a more broad-brush approach to estimating trip generation rates, specifically by applying the basic TRICS database rates but splitting the development sites into only two categories based on location - either 'in town' or 'edge/out of town'. The previous trip rates also took into consideration if a housing unit was either rented or privately owned.

4.3.22 The 'new' trip rates adopted as part of this assessment are considered more robust than those used previously. Different trip rates have been used for sites depending on whether they are located in town centres, or on the edge of towns, taking account of the location and accessibility of each site.

³ As outlined earlier in this report, a VISSIM model of the town centre has now been developed for the town centre, and the results of this will be taken into account within the Part 2 assessment.

4.3.23 A site accessibility appraisal has been undertaken as part of this study, which has considered the potential for further improved sustainable access provision beyond what is currently available. It is possible that through delivery of these potential sustainable accessibility improvements, development sites may encourage trips by alternative modes and trip rates could be reduced to take account of this – currently trip rates assume a relatively high level of vehicular trips⁴.

4.3.24 In terms of the rates adopted, there is little difference on average across the previous and current trip rates applied, as shown in Table 4-5.

Table 4-5: Applied residential trip generation rates (average)

Study	Average Hourly Vehicle Movements Per Housing Unit			
	AM Peak		PM Peak	
	Arr	Dep	Arr	Dep
2013/15 transport studies	0.088	0.249	0.251	0.140
2017 transport study	0.101	0.249	0.230	0.133

4.3.25 It should also be noted that, due to their likely limited transport implications on the road network, sites of less than 30 units have not previously been modelled in detail and only a Borough-wide uplift was applied. These sites have now been given a TRICS location category and individual trip generation individually calculated. The resulting trips have been allocated in VISUM within the major conurbations of Basildon, Wickford and Billericay, to more accurately represent the trips being generated from these smaller sites.

4.3.26 In summary, whilst the ‘average’ trip rates across the board are not dissimilar to that adopted as part of previous highway impact and mitigation scheme assessment, the approach taken as part of the most recent study represents a more refined approach particularly to the location of individual sites as well as the modelling of smaller development sites which form part of the Draft Local Plan Growth Scenario.

Trip Rate Summary

4.3.27 For reference, the differences in the overall trip generation calculated between the 2013/15 transport studies and this current study (2017) are explained as follows:

- Variations in the assessed Local Plan growth scenario, in terms of site size, composition and location,
- A more detailed approach to calculating housing trip generation using TRICS which takes into consideration additional locational categories for development sites which recognises higher levels of access of sustainable modes of transport, and

⁴ It is proposed that the ‘Part 2’ Study considers a ‘Sustainable mitigations’ scenario, with reduced trip rates for some sites based on the assumption that specific sustainable measures are provided to mitigate development impact.

- Accounts made for ‘double-counting’ of internal trips that are generated by new residents travelling to new places of employment.

4.4 Scope of Modelled Study Area and Junctions

- 4.4.1 The study area consists of the entire Basildon Borough with a particular focus on the highway networks within and around the major settlements of Basildon, Wickford and Billericay.
- 4.4.2 A VISUM model has been built covering the entire Borough and has been used for development only traffic assignment. Individual junction models have been used to assess performance of junctions for each scenario. The extent of the VISUM network is shown in Figure 4-1 overleaf. The VISUM model provides development related traffic flow on all links identified in blue.
- 4.4.3 There is a need to understand the impact of development on capacity at specific junctions. When originally considering the requirements for data collection in 2011, a study area of junctions to be assessed was established for each town based on the importance of the junction in the local and Borough highway network, and the likelihood of the junction being impacted upon by additional development. The junctions that have been specifically modelled within the assessment are shown in Figure 4-2, with a full list in Table 4-6, and in more detail by area in Figure 4-3, Figure 4-4 and Figure 4-5. Junctions that are being considered as part of other studies have not been included within this report, where results are available, these will be reviewed in the ‘Part 2’ Study.
- 4.4.4 The 2013/15 transport studies were subsequently focussed on this study area and the identified junctions. For consistency, the same study area and junctions have been adopted in this ‘Part 1’ Study, including some additional junction locations, which are discussed in further detail in Section 4.5.

Figure 4-1: VISUM model network diagram, showing extent of the study area

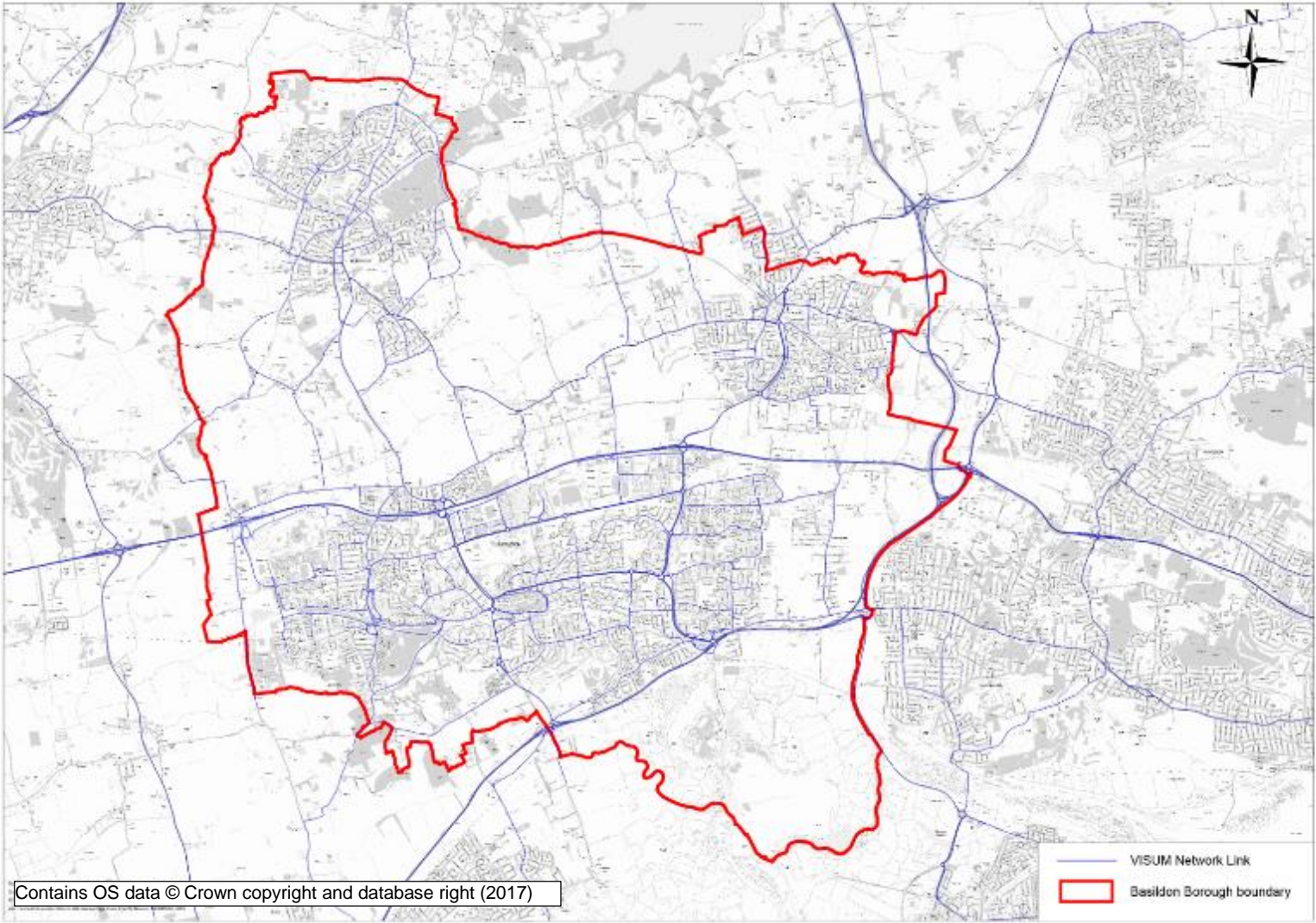
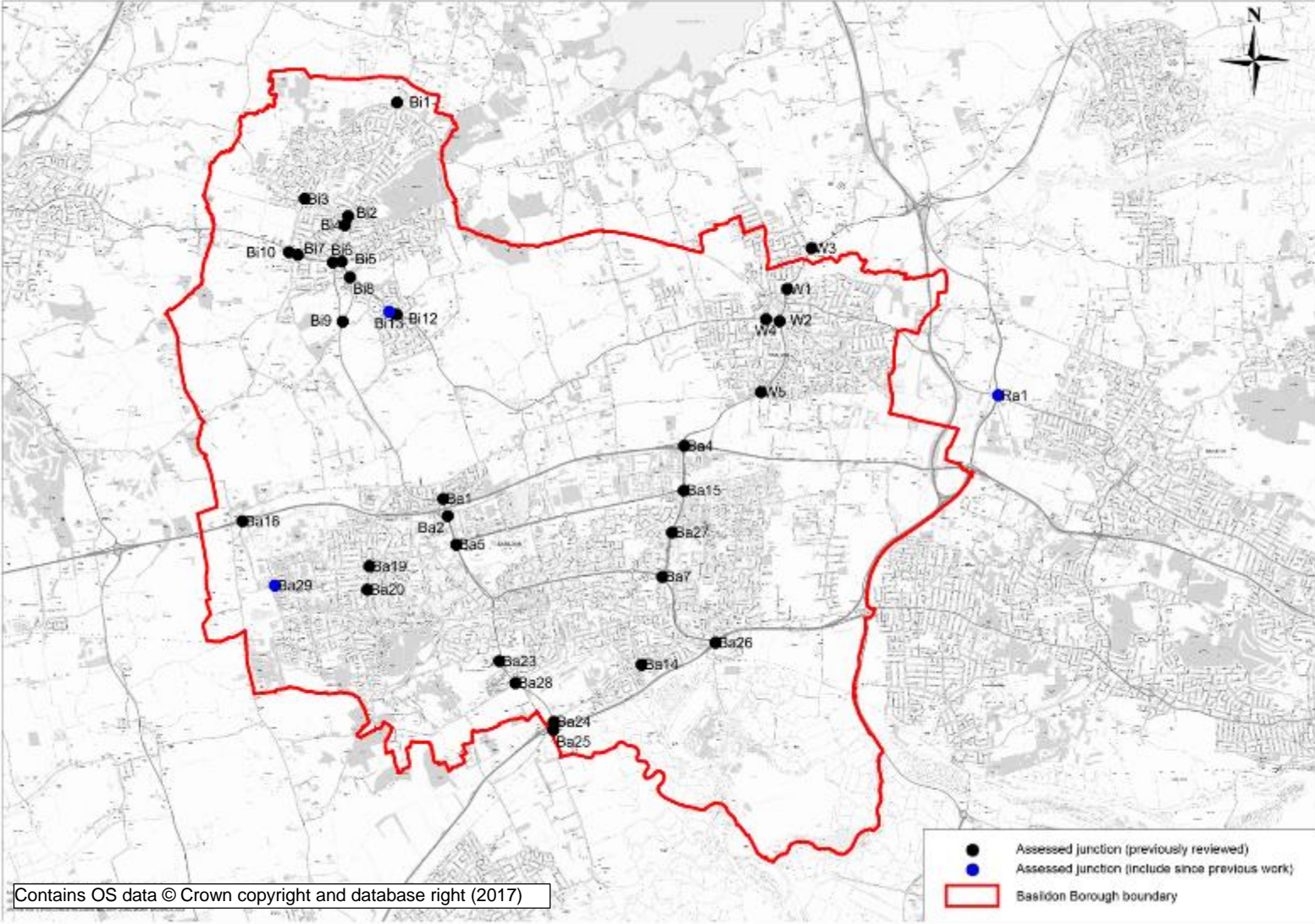


Figure 4-2: Map of the study area and junctions



4.5 Junctions Identified as In-Scope

- 4.5.1 Junctions that were previously assessed as part of the 2013-14 Highway Impact Assessment and the subsequent 2015 mitigation assessment have been included within the scope of assessment for this package of work.
- 4.5.2 Junction models have been produced for all in-scope junctions, in order to assess the specific impact at agreed locations across the Borough. Not every junction in the Borough has been assessed to this level of detail. Where capacity issues are not expected these have been excluded and where other studies are taking place separately these will be referred to but haven't been specifically assessed within this report.
- 4.5.3 The study focuses on the key strategic junctions. There may be impacts from specific development sites on local junctions on the highway network, these will need to be assessed by developers within Transport Assessments produced for sites as developments come forward. Any need for further mitigations will also need to be identified within these Transport Assessments. Developers should discuss their proposals with BBC and ECC at that time in order to define the scope of their assessment.
- 4.5.4 For the purposes of this assessment, discussions have been held with the ECC Strategic Development team in August 2016 to identify where the major development sites are likely to access the road network.
- 4.5.5 A qualitative evaluation of the size of development sites and the proximity of their site access points to nearby junctions on the local road network was also undertaken in consideration of their likely impact on key junctions, which lead to the selection of junctions that have been assessed within this report. A high level evaluation of the preferred principal access points to the strategic sites will be included in the 'Part 2' Study.
- 4.5.6 Junctions previously assessed were identified as in-scope as they were considered to be key junctions located on the main A and B roads through Basildon, Billericay and Wickford.
- 4.5.7 It was determined that the junctions already identified for assessment sufficiently covered the areas of the network that would be of 'strategic' importance in the delivery of the Draft Local Plan; with the exception of the following junctions which have subsequently been added into the assessment:
- A129 London Road / A1245 Chelmsford Road ('Carpenters Arms Roundabout'), Rayleigh
 - A129 Southend Road / Outwood Common Road / Hickstars Lane, Billericay
 - B148 West Mayne / Mandeville Way, Basildon.

- 4.5.8 It is noted that the A129 London Road / A1245 Chelmsford Road junction is located within the neighbouring district of Rochford, however given its proximity to Wickford, its strategic importance, and for the purposes of appraising cross-boundary impacts later on, this location has been included for assessment.⁵
- 4.5.9 This study has reviewed mitigations identified within previous assessments and has identified some additional locations where further mitigation options to address future year capacity issues will need to be considered.
- 4.5.10 On the above basis, an overview of the junctions which have been assessed as part of this study are shown previously on Figure 4-2 and listed overleaf in Table 4-6 for reference. The location of each of the assessed junctions in the context of Billericay, Wickford and Basildon is identified in greater detail in Figure 4-3 to Figure 4-5.
- 4.5.11 This study has allowed the identification of some additional junctions where mitigation schemes will be tested in the 'Part 2' Study. Those junctions where mitigations have been assessed are shown in Table 4-6. Junctions that will be included in the 'Part 2' Study are discussed within the conclusions of this report.

⁵ Cross boundary impacts on strategic links outside of Basildon Borough have been considered in Section 8.

Table 4-6: Junctions Assessed Within this Study Highway Impact Assessment

Code	Location	Junction	Type ⁶	2014 Baseline	2034 Back-ground Growth	2034 Draft LP Growth	2034 Draft Local Plan Growth + Mitigation
Bi1	Billericay	B1007 Stock Road / Queens Park Avenue / Potash Road	R	Y	Y	Y	A
Bi2		B1007 Stock Road / Radford Way	M-R	Y	Y	Y	A
Bi3		Mountnessing Road / Perry Street / Radford Way	R	Y	Y	Y	A
Bi5		A129 London Road / High Street / Sun Street	R	Y	Y	Y	Y
Bi6		A129 Sun Street / Chapel Street	R	Y	Y	Y	Y
Bi8		A129 Southend Road / A176	R	Y	Y	Y	Y
Bi9		A176 / Kennel Lane / Laindon Road	R	Y	Y	Y	Y
Bi10		A129 London Road / Mountnessing Road	P	Y	Y	Y	Y
Bi4		B1007 High Street / Norsey Road / Western Road	S	Y	Y	Y	A
Bi7		A129 London Road / Tye Common Road / Western Road	S	Y	Y	Y	A
Bi11		A129 Southend Road / Outwood Common Rd	P	Y	Y	Y	A
W1	Wickford	A132 Runwell Road / A132 / Runwell Road	R	Y	Y	Y	Y
W2		A132 Golden Jubilee Way / Radwinter Avenue / A129 London Road	R	Y	Y	Y	Y
W5		A132 / Cranfield Park Road / Nevendon Road	R	Y	Y	Y	Y
W3		A132 Runwell Road / Church End Lane	P	Y	Y	Y	Y
W4		A129 London Road / Nevendon Road / High Street	S	Y	Y	Y	A
Ra1		A129 London Road / A1245 Chelmsford Road	R	Y	Y	Y	A
Ba1	Basildon	A127 / A176 Noak Bridge Interchange North	R	Y	Y	Y	A
Ba2		A127 / A176 Noak Bridge Interchange South	R	Y	Y	Y	A
Ba4		A127/A132 Nevendon Interchange Junction	Sig. R	Y	Y	Y	A
Ba7		Broadmayne / South Mayne / Ashlyns	R	Y	Y	Y	A
Ba24		A13/A176 Five Bells Interchange North	R	Y	Y	Y	A
Ba25		A13/A176 Five Bells Interchange South	R	Y	Y	Y	Y
Ba26		A13/A132 Pitsea Interchange	R	Y	Y	Y	A
Ba5		Cranes Farm Road / A176 Upper Mayne / St. Nicholas Lane	R	Y	Y	Y	Y
Ba14		B1464 London Road / High Road / Clay Hill Road	M-R	Y	Y	Y	A
Ba15		Cranes Farm Road / A132 East Mayne	R	Y	Y	Y	A
Ba16		A127 / B148 West Mayne (Dunton) Interchange	R	Y	Y	Y	Y
Ba19		High Road / West Mayne / St. Nicholas Lane	R	Y	Y	Y	A
Ba20		High Road / Somerset Road / Laindon Link	R	Y	Y	Y	A
Ba23		A176 Nether Mayne / Hospital Access	S	Y	Y	Y	A
Ba28		A176 Nether Mayne / Dry Street	S	Y	Y	Y	Y
Ba27		A132 East Mayne / Whitmore Way / Felmores	R	Y	Y	Y	A
Ba29	B148 West Mayne / Mandeville Way	R	Y	Y	Y	Y	

⁶ Roundabout = R, Signalised Roundabout = Sig.R, Signals = S, Mini Roundabout = M-R, Priority = P
Y - indicates where a junction model has been created. A - indicates where the results will be assessed and a recommendation made for whether mitigation measures need to be identified.

Figure 4-3: Assessed Junctions – Billericay

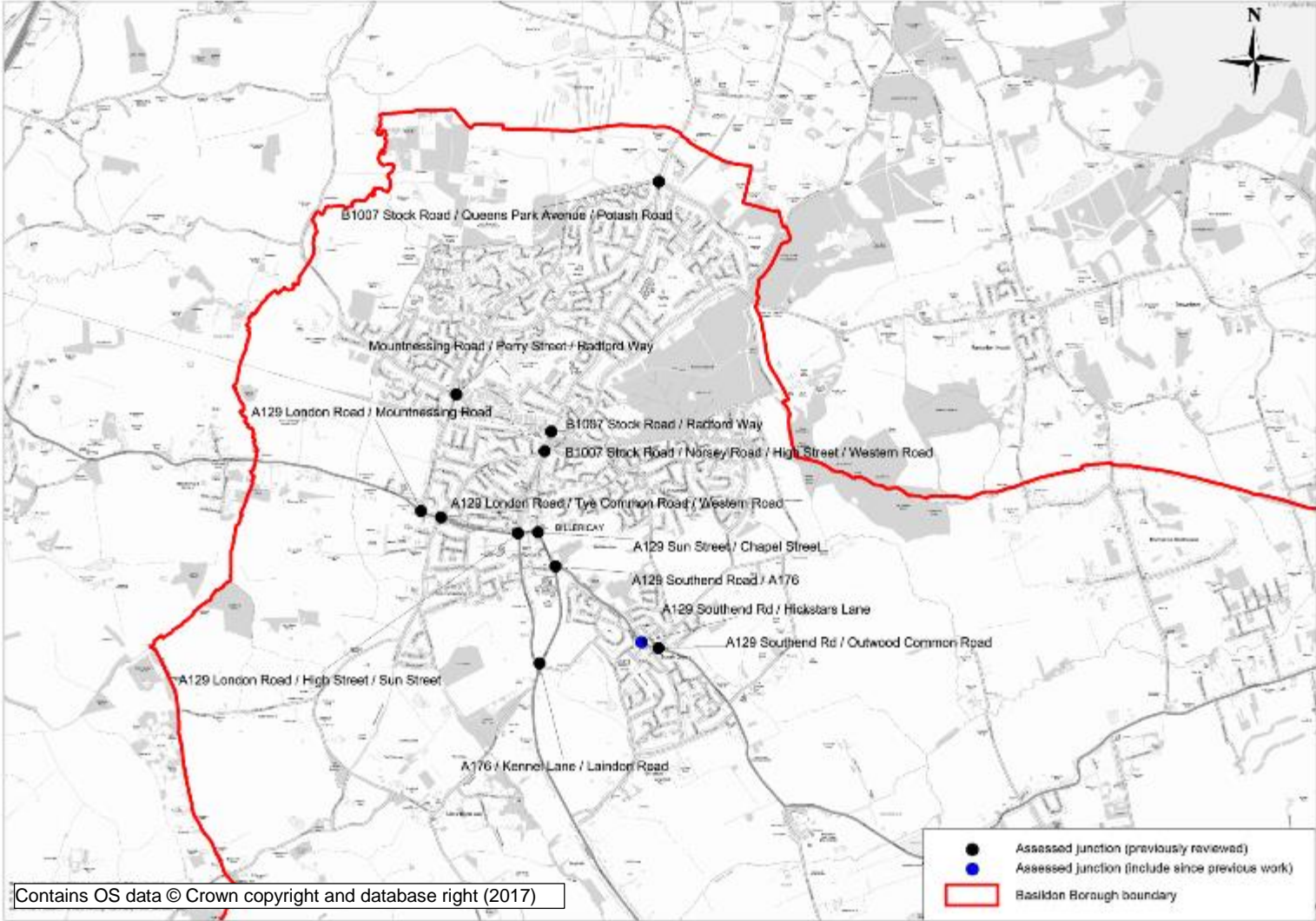


Figure 4-4: Assessed Junctions – Wickford

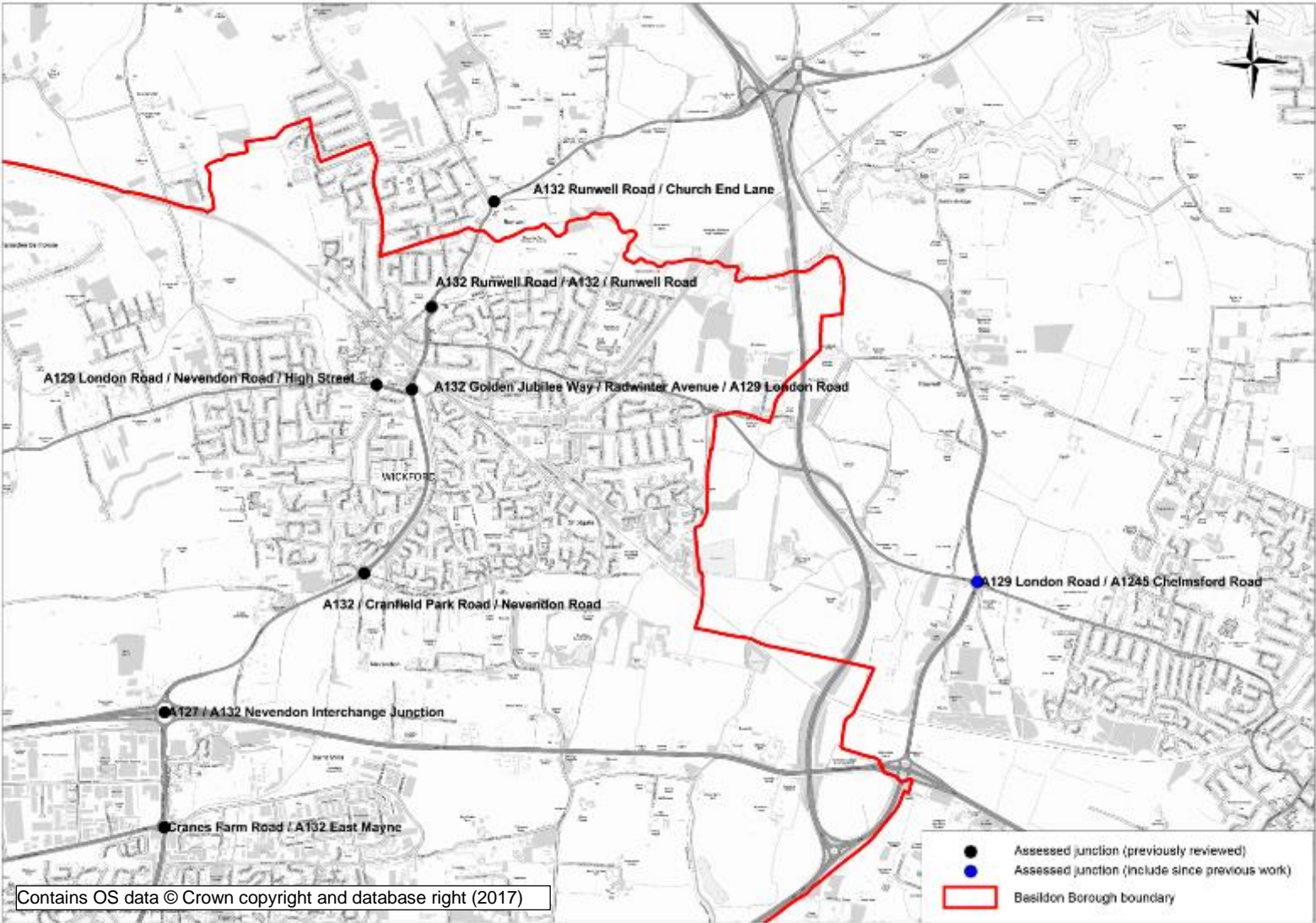
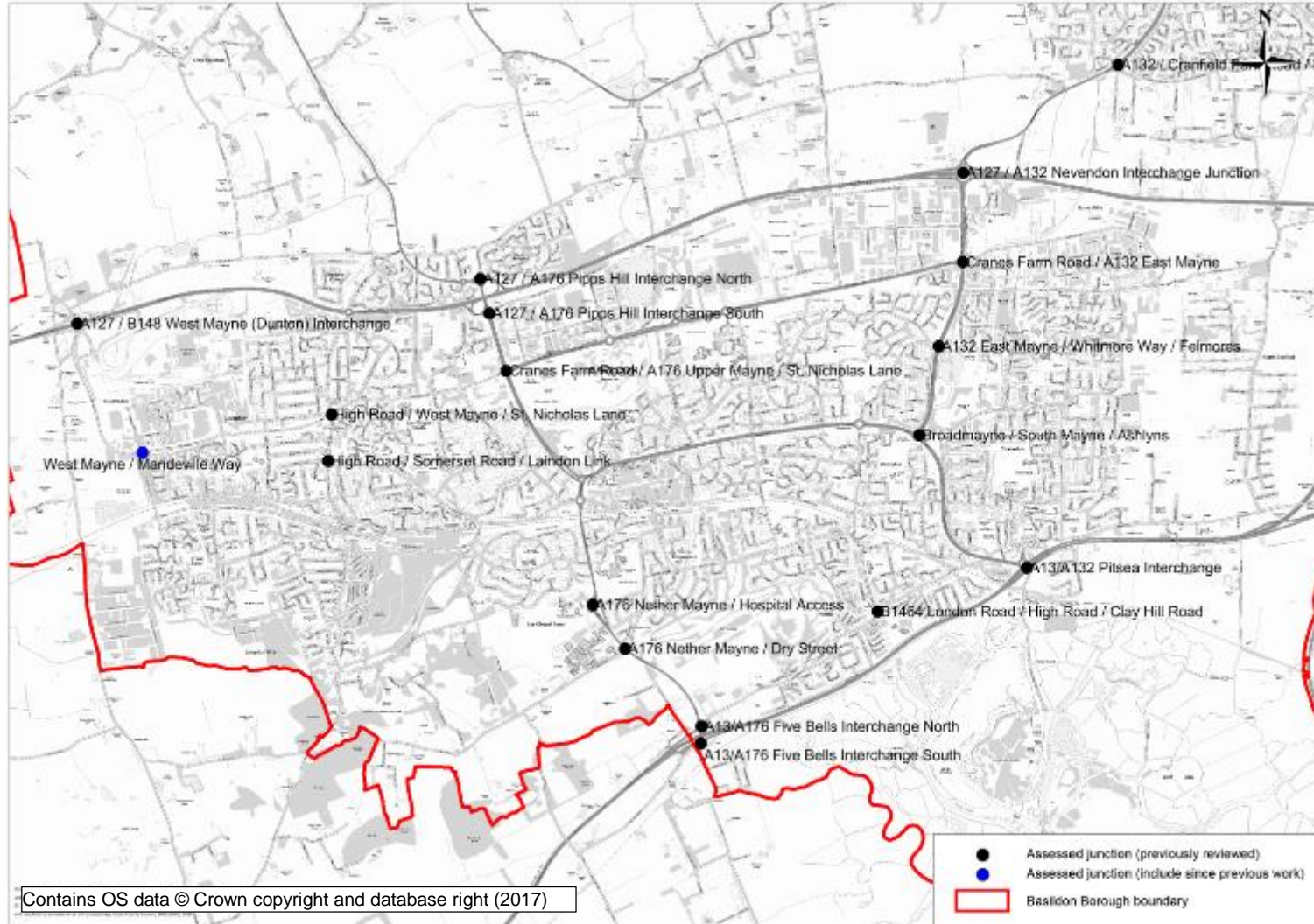


Figure 4-5: Assessed Junctions – Basildon



4.6 Excluded Junctions

4.6.1 A small number of junctions within the Borough, which were previously assessed as part of the 2013/15 transport studies, have been excluded from this latest assessment as more detailed assessments are being undertaken in some areas. Where this is the case it has been indicated in the following section. Where possible these studies have taken account of the Draft Local Plan Growth. When the Final Growth scenario is available, these other studies will be reviewed in the 'Part 2' Study and, where possible, any appropriate reassessment will be undertaken.

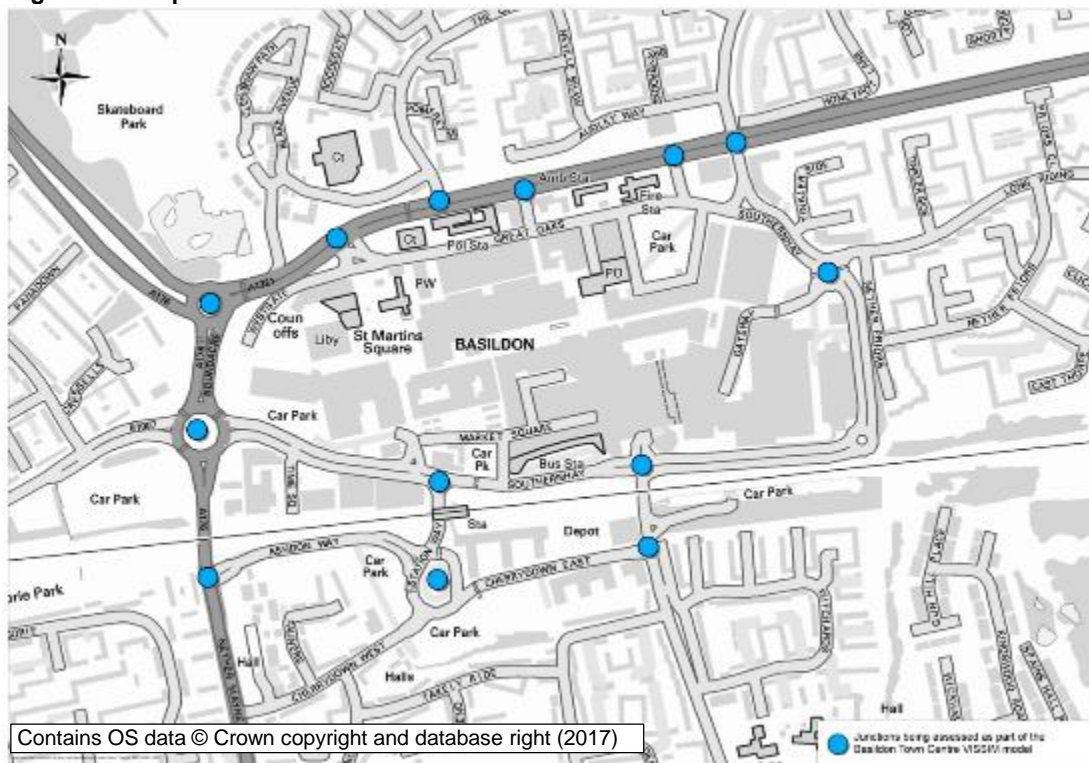
Basildon Town Centre VISSIM model

4.6.2 Essex Highways has developed a VISSIM Town Centre model as part of the Basildon Integrated Transport Package - South East Local Enterprise Partnership (SELEP) Business Case. This assessment includes consideration of a number of aspirations arising from the Basildon Town Centre Masterplan, including highway modifications in the immediate surrounds of the Town Centre. For reference, the area of focus for the work is shown in Figure 4-6.

4.6.3 As VISSIM is a refined transport modelling package, which takes into consideration detailed conditions at the micro-level, the junctions which are being examined as part of that package of work have been excluded from the assessments being undertaken for the Draft Local Plan. These junctions, which were previously assessed as part of the 2013/15 transport studies, include:

- Broadmayne / A176 Upper Mayne
- Broadmayne / Great Oaks / Westgate
- Broadmayne / Ghyllgrove
- Southernhay / Station Way / Roundacre
- Southernhay / Clay Hill Road
- Clay Hill Road / Cherrydown East
- Station Way / Ashdon Way
- A176 Nether Mayne / Ashdon Way
- Roundacre / A176 Nether Mayne / Laindon Link
- Broadmayne / The Gore
- Broadmayne / Little Oaks
- Broadmayne / Linkway
- Southernhay / Long Riding.

Figure 4-6: Map of Junctions Assessed in Basildon Town Centre VISSIM Model



4.6.4 The highway changes proposed as part of the Basildon Town Centre Masterplan have been incorporated into the VISUM model to ensure that the future highway network scenario is modelled consistently across both platforms.

4.6.5 The VISSIM model has recently been completed but results were not available at the time of undertaking the modelling work for this study and therefore the findings have not been included within this report. The results of the study will be considered separately in the 'Part 2' Study.

4.7 Corridor studies - A127 / A13 Interchanges and Junctions

4.7.1 As outlined previously, there are a number of simultaneous studies currently underway by ECC and Essex Highways for a number of junctions and interchanges along the A127 and A13 corridors. At the time of undertaking this highway impact study, these corridor schemes are all at various stages of initiation, development or delivery.

4.7.2 It is noted that a long-term scheme considering the widening of the main A127 carriageway to three lanes is likely to be assessed in due course by ECC, but a timeframe is unknown and this has not been considered within the mitigations assessed as part of this assessment.

4.7.3 A decision was made on the preferred route for the Lower Thames Crossing during the latter stages of completing this assessment. Highways England will need to provide advice on the likely impact of the new crossing on the highway network in Basildon – this has not been considered as part of this assessment.

4.7.4 The following junctions, which form part of the A127 Corridor for Growth study, are as follows (those for which individual junction assessments have been excluded from this assessment are identified in grey text). As stated previously, junctions have been excluded where other assessments are being undertaken, these will be revisited within 'Part 2' of this assessment in order to understand the impact of the Final Growth Scenario. The current status of improvement works is also indicated below:

A127 / B186 Warley Interchange	- Feasibility / outline design
A127 / A128 (Halfway House interchange)	- Feasibility
A127 / West Mayne (Dunton interchange)	- Planning not yet commenced
A127/High Rd "Fortune of War" roundabout	- Feasibility / options assessment
A127 / A176 (Noak Bridge interchange)	- Works not currently planned
A127 / A132 Nevendon Interchange	- Construction works complete
A127 / Pound Lane ⁷	- New interchange to be assessed
A127 / A130 Fairglen Interchange	- Options assessment
A127 / A129 Rayleigh Weir	- Completed May 2017
A13 / Sadlers Farm (local traffic)	- Planning not yet commenced

4.7.5 At the time of undertaking this study, results were not available for the Fortune of War roundabout options assessment and the Nevendon Interchange upgrade (completed March 2017) benefit realisation. Where available, the 'Part 2' study will include these two junctions within the detailed junction assessment undertaken for the Final Local Plan Development Growth scenario.

4.8 VISUM Network Model

4.8.1 A 'skeleton' VISUM model of the urban and strategic road network across Basildon Borough has been built (see Figure 4-1). The purpose of undertaking VISUM modelling at this stage of planning is to assign Local Plan Growth trips to the network as accurately as is reasonably possible. The VISUM model has not been used to assign background traffic on the highway network.

4.8.2 Local junction modelling, discussed and presented in subsequent sections of this report, examines operational impacts of development traffic on individual junctions, taking into account more refined junction characteristics and capacities.

⁷ This proposal is specifically assessed as part of the Basildon Draft Local Plan and is discussed in greater detail in Section 5.4.1.

- 4.8.3 2014/15 Trafficmaster journey time data has been used to determine the links that the development trips would use within the VISUM model network. The Trafficmaster data is GPS data that has been used to derive average vehicle journey times across the UK's strategic and urban road network from a large sample of individual journeys. The data has been inputted as the average link speeds along all areas of the Basildon strategic road network. The observed GPS speeds by their allocated time period, are the main determinant on the individual trip in selecting their routing on the VISUM network. The other main determinant would be the distance in length of the individual links as specified by the relevant network shapefile.
- 4.8.4 The VISUM model allows for robust development traffic assignment, which takes into account existing network congestion based on the Trafficmaster journey time information. Development traffic is reassigned within the VISUM model when the mitigation measures are introduced. Background traffic is reassigned using various different methodologies depending on information and models available and these methods are outlined in Section 5.
- 4.8.5 The VISUM network model study area includes both Fairglen and Sadler's Farm junctions, and extends west of A127 Dunton Interchange to test the potential impact of Local Plan development in neighbouring authorities.
- 4.8.6 The zone system used in the VISUM network model is based on 2011 Census journey-To-Work (JTW) Output Areas (OAs). This corresponds to the SATURN zone system from previous work, enabling a more direct comparison of demand between the two model approaches.
- 4.8.7 Sites comprising 30 units or more have been allocated to appropriate zones within the model. Specific zones have been created for some larger sites. Access to the network for larger sites has been agreed with ECC.
- 4.8.8 There are a number of sites identified within the Local Plan that are small developments of less than 30 units, and would therefore be unlikely to generate a significant amount of traffic on their own. In total these comprise 1319 units across 231 sites. These sites are located within and on the fringes of the major settlements of Basildon, Billericay and Wickford. Trips for these sites have been spread equally across the zones that they are located in or closest to.
- 4.8.9 Model matrices were constructed by allocating the development trips to spatially representative model zones and then arrivals and departures were distributed based on Census JTW data. As the Census data does not include JTW by mode at Output Area level, car driver data at Middle Layer Super Output Area (MSOA) level was factored to the appropriate level.
- 4.8.10 The various pedestrian and bus only schemes proposed in the Basildon Town Centre Masterplan (2012) have been included in the 2034 forecast scenario year.

4.8.11 VISUM models have been created to represent each of the following scenarios:

- Background Growth (2034): committed development traffic assigned using VISUM, with no alterations to the highway network.
- 2016 Draft Local Plan Growth (2034): Background Growth plus Local Plan development, with no alterations to the highway network.
- 2016 Draft Local Plan Growth with mitigation (2034) – used to assign development traffic, using one of the following VISUM models depending on the mitigation measures being tested:⁸
 - 2016 Draft Local Plan Growth (2034) – with no alterations to the highway network, used to assign traffic to junctions where no directly related reassignment is expected.
 - Dunton Link Road VISUM model – used to assign development traffic to junctions modelled to understand the impact of Dunton Link Road on the surrounding junctions.
 - Western Relief Road VISUM model – used to assign development traffic to the junctions modelled to understand the impact of the Western Relief Road. An additional version of this model was created to assess the combined impact of the Western Relief Road and the removal of one way restrictions on Laindon Road.
 - Pound Lane VISUM model – used to assign development traffic to the junctions modelled in the vicinity of the new junction and associated link roads.

4.8.12 Models have been created for the two weekday peak hours - AM and PM.

4.9 Assumptions: Highway Improvement Works

4.9.1 The 2034 VISUM models include a number of recently completed and proposed highway improvement projects that are expected to be completed by 2034. While it is realistic to assume that additional highway improvement works may be developed and/or delivered prior to the 2034 assessment year, such assumptions are limited and only the major schemes which currently have agreement have been accounted for within the VISUM model.

4.9.2 For reference, those major projects which have been included in the 2034 assessment scenarios are as follows:

⁸ Different VISUM models have been created for the different mitigation scenarios tested. The only difference between each model is that links have been added to allow the new movements created by the mitigation measures listed. Where mitigations measures are improvements to individual junctions, the Draft Local Plan Growth VISUM model has been used (so the same assignment is used as the unmitigated model). Where the mitigation measure being tested is a highway scheme, such as a new junction or link road, the VISUM model for that scenario has been used so that the reassignment of traffic resulting from the new routing created is understood.

- Additional northbound lane on A176 Nethermayne between Hospital roundabout and Roundacre roundabout
- Basildon Hospital access improvements
- Additional lane on the A127 Nevendon roundabout circulatory carriageway
- A130 northbound widening to three lanes between Rettendon and Howe Green (A12 interchange)
- Sadlers Farm interchange improvements (completed in 2012)
- Basildon Town Centre Masterplan improvements.

4.9.3 These works are viewed as separate to any highway mitigation schemes that emerge as a result of the assessments on the Local Plan growth scenarios which are assessed within this report.

4.10 Highway Network Traffic Volumes

4.10.1 A three-step process was applied to establish the post-development traffic volumes which were to be tested as part of the Highway Impact Assessment. This included:

1. Gathering 'base' traffic information from junction surveys – a *Base Case scenario*
2. Applying a Background Growth factor to these traffic volumes across the network to arrive at an assessment year 'base' – *Background Growth (2034) scenario*; and
3. Adding the modelled development trips for the *Draft Local Plan Growth (2034) scenario*.

Each of these steps are discussed in further detail below.

2014 Base Case

4.10.2 Manual Classified Turning Counts (turning traffic movements) were undertaken across the Borough between Tuesday 24th and Thursday 26th May 2011 between the hours of 07:00 to 10:00 and 16:00 to 19:00 to determine the volume of turning traffic during peak periods. Automatic Traffic Counts (ATCs) were also undertaken for a seven-day period from May 21st 2011 to record flows on key links between junctions in order to establish the pattern of flow over a weekly period and also in some instances, provide a form of validation of the turning count data.

4.10.3 This data previously formed the basis of the 2014/2015 highway impact and mitigation assessments. Where available, more recent junction counts have been used and compared against those used in previous studies. The count comparison between the various earlier studies and the recent years, generally indicates a slight increase in traffic in line with TEMPRO growth and therefore the application of TEMPRO growth to traffic counts to bring them all to 2014 base case levels is considered appropriate.

- 4.10.4 Manual Classified Turning Counts and Automated Classified counts were undertaken for the Five Bells and Pitsea interchanges in October 2014 and at Cranes Farm Road / East Mayne (Manual Classified counts completed in October 2012 and Automated Classified counts in February 2016 to verify the October turning movement counts. Manual Classified counts undertaken at the Nether Mayne / Dry Street junction (in March 2012) have also been included, as this junction was not included as part of the 2011 collection.
- 4.10.5 Lastly, new surveys were undertaken in November 2016 at Southend Road/ Outwood Common Road/ Hickstars Lane in Billericay and at West Mayne/ Mandeville Way in Basildon to ensure these junctions (newly added to the list of in-scope junctions) can be included in the highway impact assessments.
- 4.10.6 As per the previous 2013/15 transport studies, the use of the 2011 volumes plus the incorporation of newer survey information, where available, is considered appropriate for the purpose of forming a 'base case' scenario of network volumes across the Borough. For the base case, a scenario year of 2014 has been selected to match the Local Plan period. The junction survey volumes have been factored up (where necessary) to represent 2014 conditions⁹, and any highway improvement works that have been completed up to the year 2014 have also been included. Further information regarding this factoring process is discussed in the following section.

Background Growth (2034) Scenario

- 4.10.7 Department for Transport (DfT) modelling guidance prescribes the use of default trip growth rates obtained from the *Trip End Model Presentation Program* (TEMPro), a program which extracts trip data for each planning area from the National Trip End Model (NTEM) forecasts. The forecasts include population, employment, dwellings by car ownership, trip ends and simple traffic growth factors based on data from the National Transport Model (NTM).
- 4.10.8 In order to establish a future year scenario *without* Local Plan development, the 'base case' volumes were factored based on NTM/TEMPro to represent the future development year being assessed (2034).
- 4.10.9 Development assumptions were removed from TEMPro to ensure that double-counting of new development trips would be excluded as best as possible from the assessments; as the Draft Local Plan development trips are distributed via the VISUM model. The TEMPro NTM growth applied is therefore considered to be representative of the delivery of smaller development sites; and as such, any approved RLA developments less than 30 units in size are considered to be incorporated within the TEMPro growth allowances.

⁹ With the exception junctions which have been surveyed after 2014, where the newer (2016) counts have been conservatively adopted 'as-is' rather than being factored down.

4.10.10 These volumes therefore represent present-day distribution of trips across the network. Traffic is expected to continue to utilise the same routes through the Borough without regard for potential congestion issues that may arise as the general background traffic increases. The resulting network volumes represent network operation for a scenario where no Local Plan Growth comes forward but Background Growth continues. This is provided for comparison purposes, allowing conclusions to be drawn about the impact of the Local Plan Growth scenario, it is not a growth option in its own right.

Draft Local Plan Growth (2034)

4.10.11 Once the Background Growth (2034) flows have been established for both the AM and PM peak periods, the VISUM-modelled development flows are added. Therefore, the 2034 post-development scenario represents the base traffic flows factored up to the future assessment year, with the Draft Local Plan development trips overlaid.

4.10.12 Individual junctions have then been assessed with the Baseline (2014), Background Growth (2034) and Draft Local Plan Growth (2034) traffic movements for comparison, to determine the resulting implications of the Draft Local Plan Growth Scenario.

4.11 Junction Assessments

4.11.1 Each identified junction within the agreed study area for Basildon, Billericay and Wickford (as detailed in Section 4.5) has been assessed in order to ascertain the impact of the proposed development sites. The junctions have been assessed using standard industry software as follows:

- Priority Junctions – Junctions 9 (previously Junctions 8 - PICADY),
- Roundabouts – Junctions 9 (previously Junctions 8 - ARCADY), and
- Signalised Junctions – LinSig.

4.11.2 This approach is generally consistent with that adopted for the 2013/15 transport studies; the exception to this being for junctions in Basildon, where previous outputs were taken directly from the SATURN model, these have now been modelled with Junction 9 and LinSig. Whilst SATURN was able to provide a strategic indication of the level of congestion at junctions, the use of the junction modelling packages provides a much more detailed assessment of junction performance for each scenario tested. The 'Junctions' modelling package has been updated since the 2013/15 assessments. Where junction assessments were undertaken previously, these have been recreated for this study using the latest version of the software and the updated traffic flows outlined above.

5 Mitigation Modelling Assessment

5.1 Introduction

- 5.1.1 This section sets out the highway mitigation and modelling assessments for the Draft Local Plan Growth (2034) Scenario. It documents the work undertaken to appraise the effectiveness of highway measures to mitigate the identified impacts of the potential Draft Local Plan Growth Scenario on the road network in Basildon, Wickford and Billericay.
- 5.1.2 Earlier assessments of mitigation options have been updated with new development assumptions, updated background traffic flows, different base and future years, and a more robust development traffic assignment methodology.

5.2 Scope of Assessment

- 5.2.1 The National Planning Policy Framework outlines the need to identify cost effective mitigations of development impacts and states at paragraph 32 that *‘Development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe’*. There is no single definition of severe. The Department for Communities and Local Governments’ (DCLG) *‘Transport evidence bases in plan making and decision taking’*¹⁰ paragraph 003 states that the cumulative impacts of existing and proposed development on transport networks should be considered. It then states separately that the transport evidence base could also include an assessment of where *“alternative allocations or mitigation measures would improve the sustainability, viability and deliverability of proposed land allocations”*.
- 5.2.2 Traffic reassignment associated with the proposed large-scale ‘strategic’ infrastructure schemes (e.g. the new junction on the A127) have now been considered in tandem with nearby proposed smaller junction or road widening mitigation measures. The VISUM model, created for this assessment work, now allows for this level of review of development traffic assignment.
- 5.2.3 An initial review of schemes was carried out using existing (base) traffic data and the Basildon VISUM model. Where resource limitations were recognised in terms of breadth and/or depth of coverage, these were supplemented with assumptions on traffic distribution supported by existing traffic patterns. Where appropriate, traffic was assigned using the assignment from the 2015 Highways Mitigation Technical note. Assumptions used in the appraisal of each mitigation measure have been clearly stated in this report and are summarised in Table 5-1 to Table 5-3 later in this section.

¹⁰ <http://planningguidance.communities.gov.uk/blog/guidance/transport-evidence-bases-in-plan-making/transport-evidence-bases-in-plan-making-guidance/>

5.3 Methodology

5.3.1 The 2034 mitigation modelling has been undertaken using the preferred distribution of housing and employment growth referred to as the Draft Local Plan Growth Scenario, as described in Section 3. Modelling outputs presented in this section include those from Junctions 9 (ARCADY & PICADY) and LinSig junction modelling packages, along with outputs from model runs of the 2014 and 2034 Basildon VISUM model.

5.4 Assessed Mitigation Schemes

5.4.1 With reference to the mitigation modelling assessments completed in 2015, the following schemes have been considered for re-appraisal within this study based on Draft Local Plan growth scenarios, the 2034 assessment year, and the outputs from the VISUM modelling work. The mitigation measures generally fall into two categories: junction mitigations such as signalisation, lane widening etc., which will have a benefit primarily at the junction itself and highway schemes which will have a wider impact on the highway network.

5.4.2 It should be noted that although different mitigation measures have been tested, the cumulative impact of a combined package of measures has not been undertaken, which will be tested further in the 'Part 2' Study.

Wickford Junction mitigations:

- Signalisation of A132/Runwell Road Roundabout
- Full two-lane northbound approach along A132 to junction with Cranfield Park Road.

Basildon junction mitigations:

- Fortune of War Roundabout (now being assessed as part of a separate study)
- Widening of St. Nicholas Lane approach to roundabout junction with A176 Upper Mayne.¹¹
- Signalisation of A176 Nether Mayne / Dry Street junction
- Signalisation of the Five Bells Interchange Southern Roundabout

Wickford and East Basildon Highway Schemes

- Morbec Spur – modelling the impact on through-traffic in Wickford
- New A127 junction between Nevendon and Fairglen Interchanges at Pound Lane – modelling impact on flows in Wickford and surrounding road network

¹¹ Benefits of the St Nicholas lane junction are likely to be linked to the final proposals for Fortune of War junction, which are considered within a separate study. Where available, the results of this work will be considered in the 'Part 2' Study.

Basildon Highway Scheme

- Development of the 'Dunton Link Road' – modelling impact at the A127 Dunton Interchange

Billericay junction mitigations:

- A129 London Road / High Street / Sun Street – options to signalise this junction independently and in combination with other improvements
- Upgrade A129 London Road / Mountnessing Road from a priority junction to a roundabout.

Billericay Highway Schemes:

- Removal of one-way restrictions on Laindon Road at the junction with the A176 Kennel Lane/Laindon Road and impact appraisal on surrounding junctions
- A western link road between the A129 and A176, with impact appraisal on surrounding junctions

5.4.3 Due to the wider coverage of the VISUM model, these schemes have been revisited based on the 2013/2015 Assessments and are now assessed for the 2016 Draft Local Plan Growth scenario.

5.5 Scheme details

5.5.1 The assessment methodology for each mitigation is summarised in Table 5-1 to Table 5-3 later in this section.

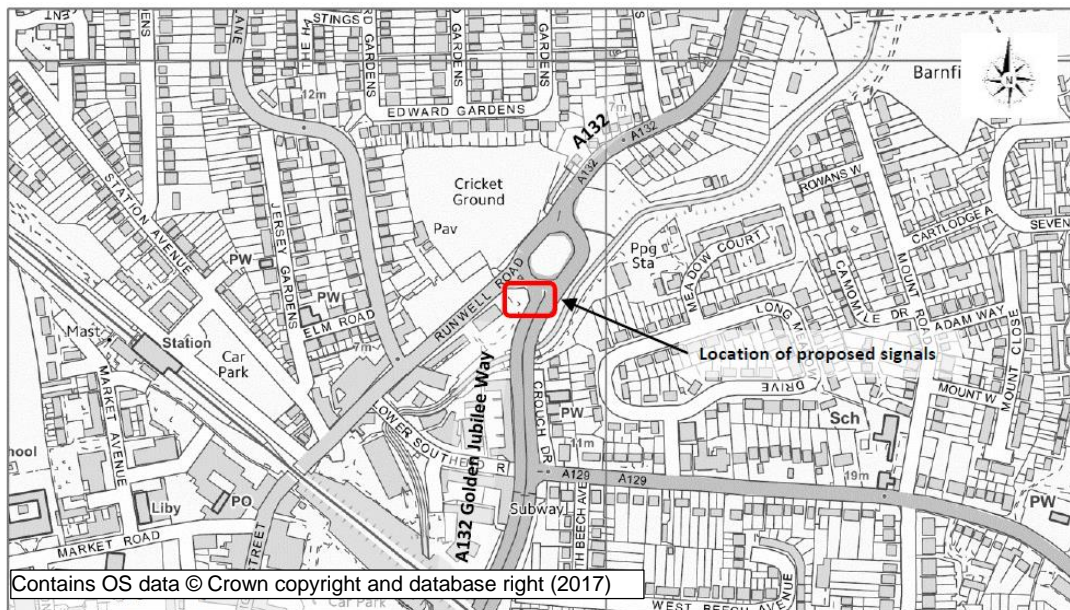
5.6 Assessment Methodology for Wickford and East Basildon Mitigation Schemes

5.6.1 A summary of the methodology applied to model the junction mitigations and highway schemes outlined for Wickford is provided in Table 5-1.

A132/Runwell Road Roundabout Junction Mitigation

5.6.2 Partial signalisation has been considered as a means of addressing future congestion concerns on the Runwell Road approach to the junction with the A132 in Wickford. It is envisaged that signalisation of the A132 southern arm (Golden Jubilee Way) will help provide 'gaps' in the circulatory flow of traffic at the roundabout to facilitate easier access from Runwell Road.

Figure 5-1: A132/Runwell Road Roundabout with Partial Signalisation



5.6.3 LINSIG software has been used to model the signalisation of the A132 southern arm and the south circulatory carriageway during the peak hours. Signal timings were devised in order to provide the best capacity benefits on the Runwell Road approach without detrimentally impacting flows along the A132. The peak hour results from the LINSIG assessment were then compared against those modelled in Junctions 9 (ARCADY) for the earlier 2014 forecast-year appraisal of the existing junction layout.

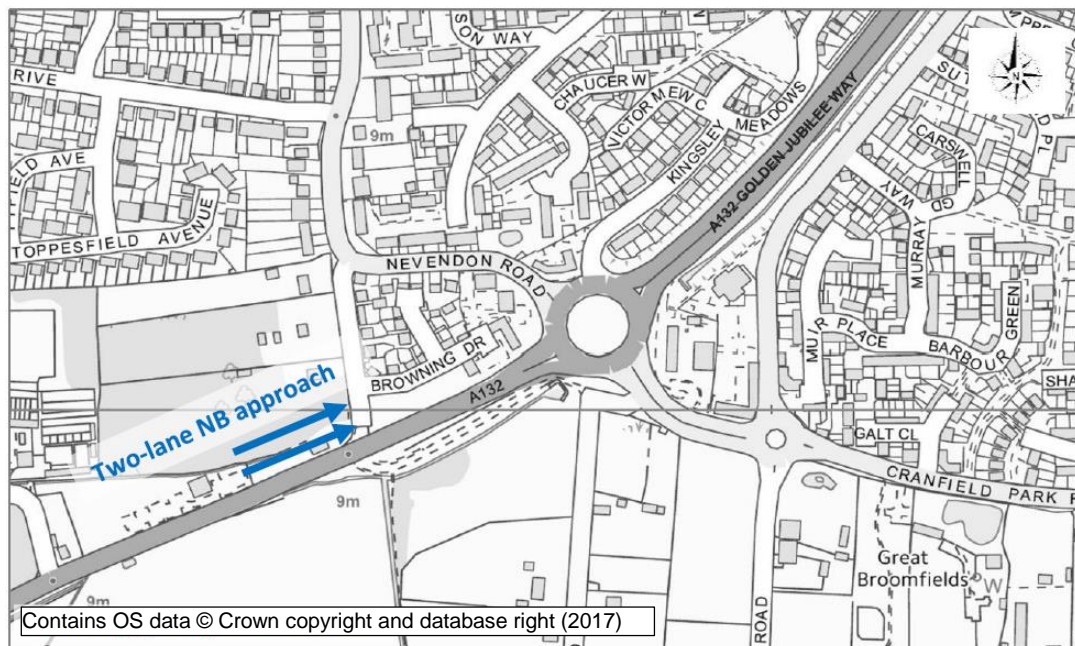
5.6.4 LINSIG demand matrices were based on vehicle turning movements calculated at the junction using the 2014 'base case' traffic data and the 2034 VISUM modelling work. The results of this assessment are discussed in Section 6.

A132 Northbound Cranfield Park Road Approach Highway Mitigation

5.6.5 Proposals are currently being considered to boost the link capacity along A132 Nevendon Road by providing an extended two-lane carriageway northbound from the Nevendon Interchange on the A127 – enabling the two-lane merge to occur further away from the Nevendon Interchange. Due to land/heritage constraints on the northern side, there is a possibility – subject to further design work – that the widening would have to occur off-line to the south, with a realignment of the carriageway to accommodate proposals.

5.6.6 This study considers the potential impact on traffic flow of extending the two-lane carriageway even further to the junction with Cranfield Park Road, thus removing the two-lane merge altogether and shifting the potential capacity constraint to the junction approach.

Figure 5-2: Two Lane Approach on A132 Nevendon Road



5.6.7 To consider the impact of the proposals on the junction with Cranfield Park Road, the roundabout was re-modelled in Junctions 9 (ARCADY) to account for a full two-lane northbound approach along A132 Nevendon Road to replace the current flared approach to the junction.

“Morbec Spur” Highway Scheme

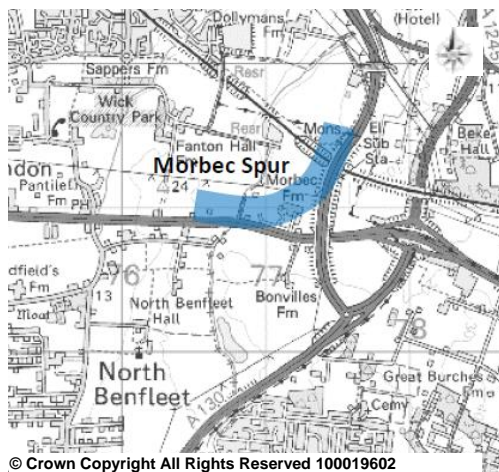
5.6.8 Development of the Morbec Spur, a direct left-turn off-slip from the A127 eastbound to the A130 northbound, has been one of a number of infrastructure improvement measures under consideration to reduce the volume of traffic travelling through the Fairglen Interchange. However existing conditions mean that there are significant land ownership and engineering feasibility issues related to this scheme that would impede delivery.

5.6.9 The rationale behind the proposal is that it would make access to the A127 more straightforward and could therefore be expected to reduce the perceived northbound rat-running along the A132 through Wickford and could assist with tackling congestion at key junctions on the A132 in Wickford. The location of the proposed Morbec Spur is shown in Figure 5-3.

5.6.10 In order to establish the volume of traffic that might use the proposed Morbec Spur, ANPR traffic surveys were undertaken to identify the traffic currently rat running through Wickford. These found that the level of rat running is fairly low, 110 and 113 northbound through-trip movements were calculated in the AM and PM peaks respectively. These through-movements were then manually subtracted from the relevant 2011 turning movement flows at each of the assessed junctions along the A132 route. It is accepted as unlikely that a Morbec Spur scheme would remove all through-routing in Wickford and, therefore, modelling for this task considers the impact of a maximum possible transfer of through-traffic.

5.6.11 For the purposes of the assessment of the scheme, it has been assumed that northbound traffic which currently rat-runs through Wickford would use the Morbec Spur instead, and therefore a simple manual change, using a spreadsheet model developed for the 13/15 traffic studies has been used to assign background traffic at the key junctions. The spreadsheet model was informed through identification of the extent of northbound rat-running traffic during an Automatic Number Plate Recognition (ANPR) survey on the 20th May 2014 which took place at the Rettendon Turnpike (A130/A132 junction) and on Nevendon Road immediately north of the Nevendon Interchange.

Figure 5-3: Location of Morbec Spur



5.6.12 The four key A132 junctions through Wickford that would be expected to experience a reduction in flow following the construction of the Morbec Spur, are as follows:

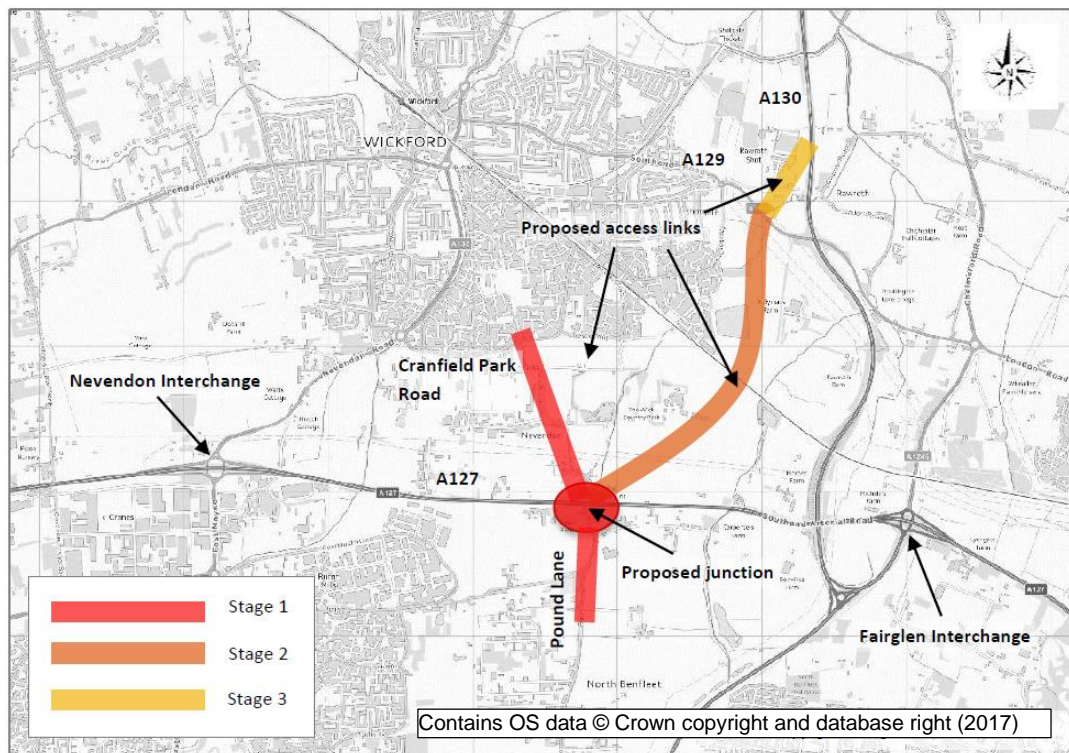
- A132 / Cranfield Park Road / Nevendon Road Junction
- A132 Golden Jubilee Way / Radwinter Avenue / A129 London Road / Superstore Junction
- A132 Runwell Road / A132 / Runwell Road Junction
- A132 Runwell Road / Church End Lane Junction

5.6.13 Each junction has been remodelled using Junctions 9 (ARCADY) to determine the resulting impact on capacity following the removal of through-traffic along the A132 in both 2014 and 2034 assessment years.

A127 / Pound Lane and Link Roads Highway Scheme

5.6.14 This assessment considered the potential, in terms of traffic impact only, of a new junction on the A127 located between the Nevendon and Fairglen interchanges in the vicinity of Pound Lane and Cranfield Park Road, to mitigate the impact of development traffic at the junction.

Figure 5-4: New Interchange at A127/ Pound Lane



5.6.15 A new grade separated junction on the A127 between the Nevendon and Fairglen interchanges would facilitate links to key parts of the local and strategic road network, and this assessment assumes a number of link connections built in incremental stages. The new junction would be expected to lead to traffic routing away from the four main junctions along the A132 through Wickford town centre:

- A132 Runwell Road / A132 / Runwell Road
- A132 Golden Jubilee Way / Radwinter Avenue / A129 London Road
- A132 / Cranfield Park Road / Nevendon Road
- A132 Runwell Road / Church End Lane

5.6.16 A VISUM model was created to include all phases of the proposed A127 / Pound Lane and Link Roads Highway Scheme and this was used to assign Local Plan Development growth onto the network for the junction models produced to test this option. The 2034 turning movements for background traffic was calculated by applying TEMPro growth to the turning movements used in the 2015 Mitigation study. These were calculated using a spreadsheet model.

5.6.17 Changes to traffic flows at Fairglen, Sadlers Farm and Nevendon Interchange were also assessed and the results are shown in Section 6.

Table 5-1: Wickford and East Basildon Mitigation Methodology Summary

Mitigation Scenario	Junctions modelled		Development traffic VISUM assignment model used	Change to background flows from previous assessment	Junction alterations
WICKFORD -based on assessment from "Basildon Local Plan Mitigation" report					
Morbec Spur	W1	A132 Runwell Rd / A132 / Runwell Rd	Local Development Growth	TEMPRO growth applied 2015 Highway mitigation scenario	No change to junction layout.
	W2	A132 Golden Jubilee Way / Radwinter Avenue / A129 London Rd			No change to junction layout.
	W5	A132/Cranfield Park Rd/Nevendon Rd			No change to junction layout.
	W3	A132 Runwell Road / Church End Ln			No change to junction layout.
A127 Pound Lane, new grade separated Junction	W1	A132 Runwell Rd/A132 /Runwell Rd	Pound Lane	Local Plan Growth models reassigned based on percentage change observed in Pound Lane VISUM model	No change to junction layout.
	W2	A132 Golden Jubilee Way/ Radwinter Avenue/A129 London Rd			
	W3	A132 Runwell Road / Church End Ln			
	W4	A129 /Nevendon Road / High St			
	W5	A132/Cranfield Park Rd/Nevendon Rd			
	Ba4	A127 / A132 Nevendon Interchange ¹²			
	Ba7	Broadmayne / South Mayne/ Ashlyns			
	Ba15	Cranes Farm Road /A132 East Mayne			
Ba27	A132 East Mayne / Whitmore Way / Felmores				
Signalise A132/ Runwell Rd	W1	A132 Golden Jubilee way / Runwell Rd	Local Plan Growth	TEMPRO growth applied 2015 Highway mitigation scenario.	Signalisation of the roundabout.
A132 junction Cranfield Park Rd	W5	A132 / Cranfield Park Road / Nevendon Road	Local Plan Growth	TEMPRO growth applied 2015 Highway mitigation scenario.	Two lane NB along A132 with Cranfield Park Rd.

¹² Improvements were made to Nevendon Interchange in 2017 and these changes have been used for all of the 2034 model scenarios (including the unmitigated scenario).

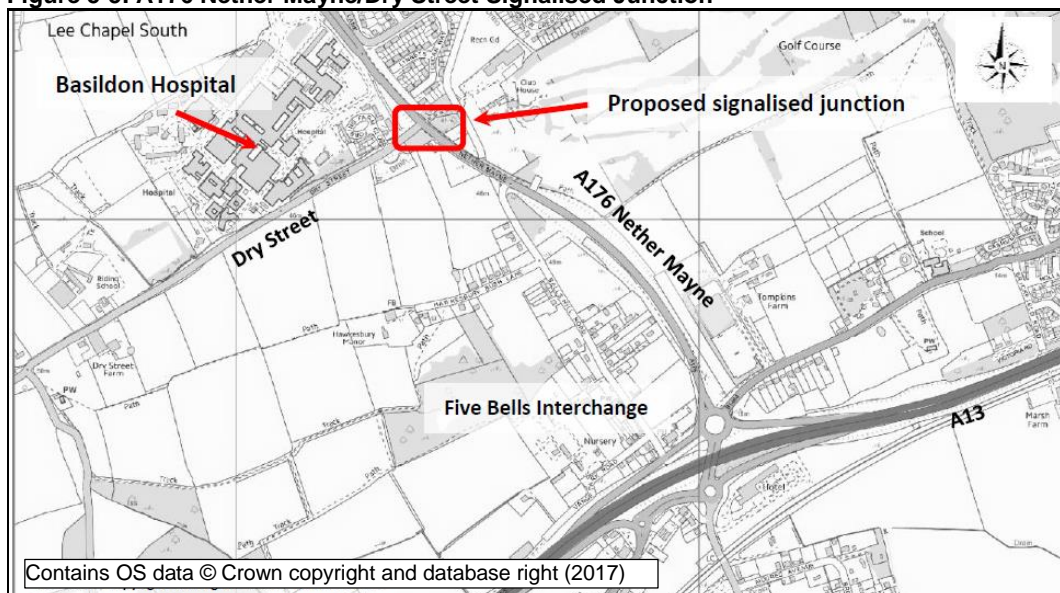
5.7 Assessment Methodology Basildon Mitigation Schemes

5.7.1 The Basildon mitigation schemes have all been modelled using the background traffic assignment from the 2015 Mitigation Modelling Technical Note. The methodology is summarised in Table 5-2 later in this section.

A176 Nether Mayne / Dry Street Junction Mitigation

5.7.2 With development sites proposed on land adjacent to Basildon Hospital, the junction of Dry Street with the A176 Nether Mayne has been identified as a potential pinch-point with forecast-year assessments predicting congestion at the location. To mitigate the impact of growth in future traffic flows, signalisation of the junction of the A176 with Dry Street is currently being delivered by the developers.

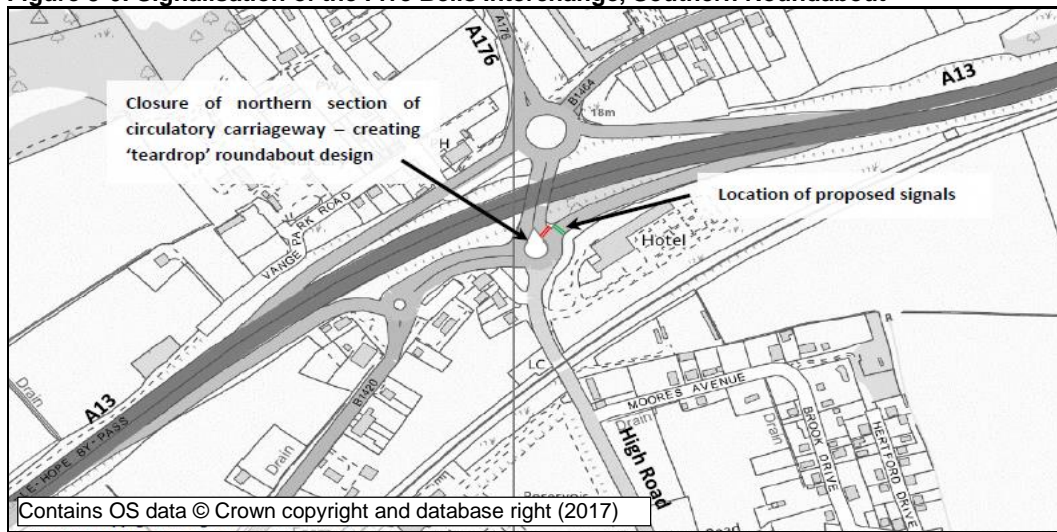
Figure 5-5: A176 Nether Mayne/Dry Street Signalised Junction



Five Bells Interchange Southern Roundabout Junction Mitigation

5.7.3 An option has been modelled to signalise the A13 off-slip arm at the entry to the junction, combined with the closure of the northern section of roundabout circulatory carriageway to create a 'teardrop' design. This would offer a better potential solution at the junction and is illustrated overleaf.

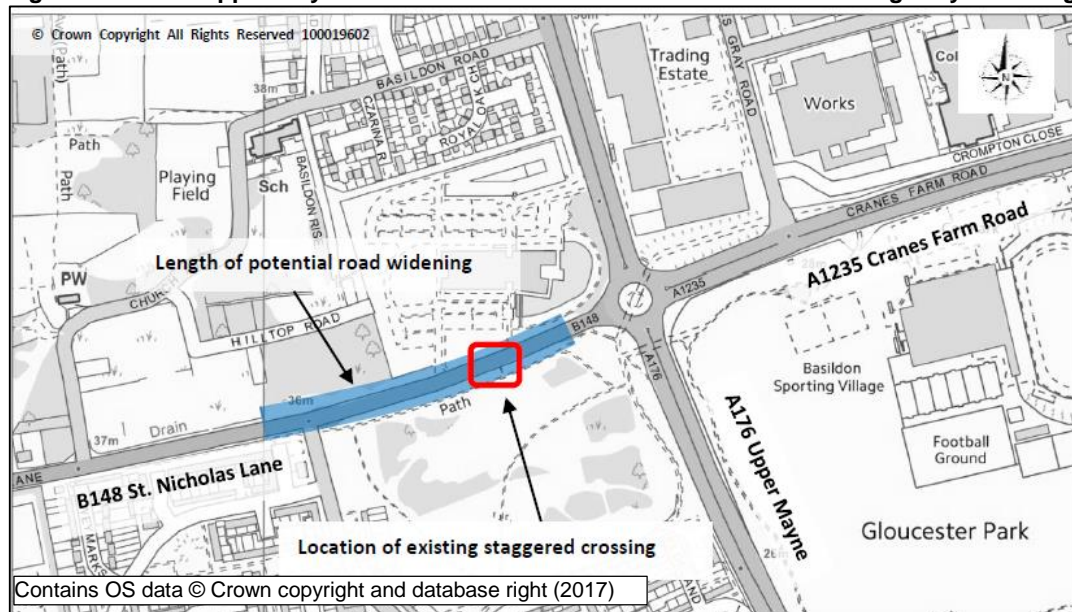
Figure 5-6: Signalisation of the Five Bells Interchange, Southern Roundabout



St. Nicholas Lane approach A176 Upper Mayne Highway Mitigation

5.7.4 Proposals are to lengthen the two-lane approach to the junction along St. Nicholas Lane via the relocation or replacement of the staggered pedestrian crossing further back along the approach arm, and the removal of cross-hatching on the carriageway approach. The impact of the scheme on pedestrian accessibility has not been assessed at this stage. Junctions 8 (ARCADY) was used to appraise the approach.

Figure 5-7: A176 Upper Mayne/B148 St Nicholas Lane Roundabout and Carriageway Widening



‘Dunton Link Road’ Highway Scheme

5.7.5 In order to accommodate the two development scenarios, a link road has been proposed connecting Lower Dunton Road to West Mayne. It is anticipated that, should this be the preferred location of the link road, it could help mitigate potential congestion caused by the growth in traffic at the A127 Dunton Interchange associated with the West Basildon Urban Extension development.

5.7.6 Due to the limited configuration of the Lower Dunton Road/West Mayne junction, right-turning traffic from Lower Dunton Road is required to u-turn at the Dunton Interchange, as shown in Figure 15 below. Accordingly, a reduction in flow through the Dunton Interchange is predicted following the development of the link road scheme.

Figure 5-8: Dunton Link Road

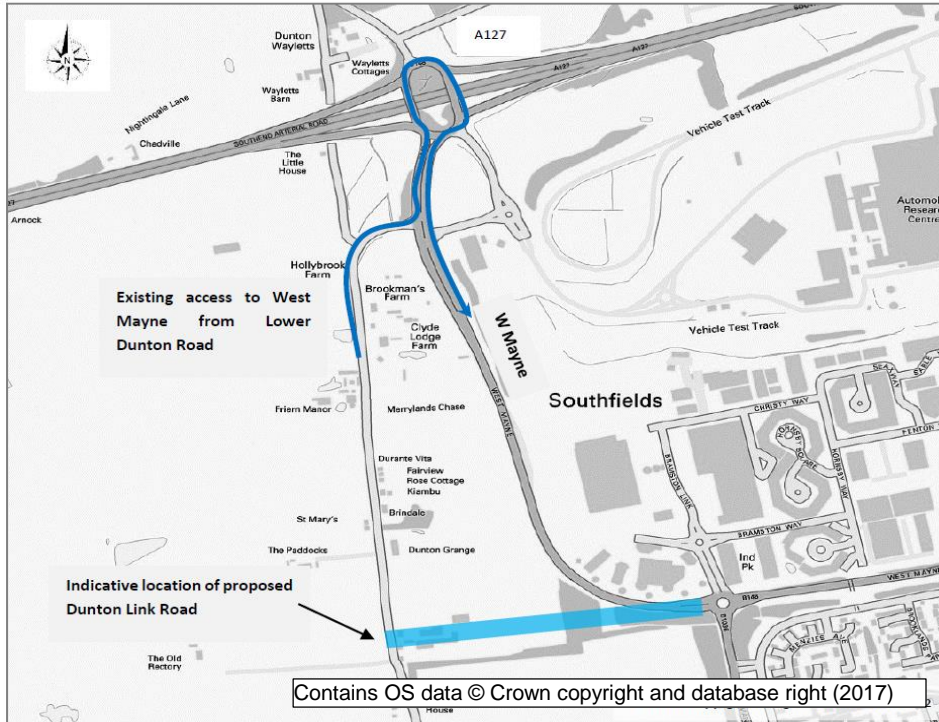


Table 5-2: Basildon Mitigation Methodology Summary

Mitigation Scenario	Junctions modelled		Development traffic VISUM assignment model used	Change to background flows from previous assessment	Junction alterations
Dunton Link Road	Ba16	A127 / B148 West Mayne (Dunton) Interchange	Dunton Model used	TEMPRO growth applied 2015 Highway mitigation scenario: Used Saturn to reassign background traffic	no change to junction layout
	BA29	West Mayne / Mandeville Way			no change to junction layout
Signalisation of A176 Nether Mayne / Dry Street	BA28	A176 Nether Mayne / Dry Street	Local Plan Growth	TEMPRO growth applied 2015 Highway mitigation scenario: Used Saturn to reassign background traffic	Signalised junction
Signalisation of the Five Bells Interchange	BA25	A13/A176 Five Bells Interchange South	Local Plan Growth	TEMPRO growth applied 2015 Highway mitigation scenario: Used Saturn to reassign background traffic	Signalised junction
Widening of St Nicholas Lane approach	BA5	Cranes Farm Road / A176 Upper Mayne / St. Nicholas Lane	Local Plan Growth	TEMPRO growth applied 2015 Highway mitigation scenario: Used Saturn to reassign background traffic	Widening of St Nicholas Lane approach to roundabout A176

5.8 Assessment methodology for Billericay Mitigation schemes

5.8.1 Two highway schemes have been identified that could mitigate the impact of development traffic on junctions within Billericay through routing traffic away from the congested junctions. These are the removal of the one-way restriction on Laindon Road, and the construction of a Western Link Road. The impact of these two improvements have been tested on the following junctions:

- Bi5 A129 London Road / High Street / Sun Street
- Bi6 A129 Sun Street / Chapel Street
- Bi8 A129 Southend Road / A176
- Bi9 A176 / Kennel Lane / Laindon Road

5.8.2 A VISUM model was produced to assess the impact of development only traffic reassignment resulting from the two schemes both individually and in combination.

5.8.3 In addition, two junction mitigations that have also been considered:

- Upgrade of Mountnessing Road junction from a priority junction to a roundabout
- Upgrade of London Road/High Street / Sun Street junction from a roundabout to a signalised junction.

5.8.4 The impact of these mitigations have been tested initially without reassignment of traffic. They have then been tested in combination with some of the highway scheme options and associated reassigned traffic flows have been used. A summary of the methodology used for reassignment for each scenario is shown in Table 5-3 at the end of this section.

A129 London Road / High Street / Sun Street Junction Mitigation

5.8.5 A signalised arrangement at Sun Corner has been modelled to incorporate all turning movements currently permitted at the existing roundabout layout. Signal timings have then been optimised to minimise delay in an attempt to better accommodate future year traffic flows.

5.8.6 The A129 London Road, east-west movements through the junction have been assigned two lanes, therefore necessitating a two-lane exit on the A129 London Road arm.

A129 London Road / Mountnessing Road Junction Mitigation

5.8.7 A mitigation measure looking at the construction of a roundabout at the junction of Mountnessing Road and the A129 London Road has been considered, as shown below.

Figure 5-9: Mountnessing Road Roundabout



5.8.8 The concept design developed as part of the 2015 Mitigation Modelling includes the following features:

- 20m two-lane approach on both A129 London Road approach arms
- 20m two-lane approach on Mountnessing Road approach arm
- Two-lane provision for right-turning movements from Mountnessing Road to A129 London Road west
- Two lane exit on the A120 London Road western arm to accommodate two lane turning movement
- 20m roundabout diameter

Laindon Road Removal of One Way Restrictions Highway Scheme

5.8.9 Proposals are to remove the one-way restriction on Laindon Road. This affects the southern section of Laindon Road, immediately north of the roundabout junction with the A176 Noak Hill Road. Its removal would enable northbound traffic flows from Noak Hill Road to access Laindon Road at the roundabout, and subsequently remove the requirement to pass through the A176/A129 Southend Road and A129 Sun Street/Chapel Street roundabouts towards Sun Corner.

Figure 5-10: A176 Laindon Road and Junctions to be Assessed



A Western Link Road Between the A129 and A176 Highway Scheme

5.8.10 A Western Link / Relief Road has been proposed between the A129 London Road and the A176. While there are two possible routes, the eventual route chosen is unlikely to make a significant difference to the effectiveness of the mitigation scheme. It will be other factors including constructability, environmental and visual impact will be the key route determinants.

Figure 5-11: Western Relief Road Location and Options



Table 5-3: Billericay Mitigation Methodology Summary

Mitigation Scenario	Junctions modelled	Development traffic VISUM assignment model used	Change to background flows	Junction alterations	
BILLERICAY - based on assessment from "2031 Billericay Mitigation Modelling" report					
Signalise Sun St junction	Bi5	A129 London Rd/High St/Sun St	Local Plan Growth	TEMPRO growth applied to Local Plan Growth Scenario models.	A signalised junction layout at Sun Corner
Mountnessing Road r/about	Bi10	A129 London Road / Mountnessing Road	Local Plan Growth	TEMPRO growth applied to Local Plan Growth Scenario models.	Upgrade from priority junction to roundabout.
Removal of the one-way restriction on Laindon Rd at the junction with the A176 Kennel Lane /Laindon Rd	Bi5	A129 /High St/ Sun St	Local Plan Growth	TEMPRO growth applied to two 2015 Highway mitigation scenarios: transfer of traffic currently from the A176 south to Sun Corner via the A176 and A129 Sun St corridor to Laindon Rd.	No junction changes from existing
	Bi6	A129 Sun St/Chapel St	Local Plan Growth		
	Bi8	A129 Southend Rd/A176	Local Plan Growth		
	Bi9	A176/Kennel Ln /Laindon Rd	Local Plan Growth		
	Bi5	A129 London Road / High St / Sun St	Local Plan Growth	TEMPRO growth applied to Local Plan Growth Scenario models.	Left-turn filter lane from Laindon Rd to A129 London Rd at Sun Corner.
	Bi5	A129 London Road / High Street / Sun Street	Local Plan Growth	TEMPRO growth applied to 2015 Highway mitigation scenario	A signalised junction layout at Sun Corner
A western link road	Bi5	A129 /High St/ Sun St	Local Plan Growth Western Link Road VISUM	TEMPRO growth applied to Local Plan Growth Scenario models.	No junction changes
	Bi6	A129 Sun Street / Chapel St			
	Bi8	A129 Southend Road / A176			
Western Link Road and Laindon Road one way removed	Bi5	A129 /High St/ Sun St	Local Plan Growth Western Link Road VISUM with Laindon Road one way removed.	Unmitigated flows at each junction modified as per the percentage change identified from the VISUM model.	No junction changes from existing
	Bi6	A129 Sun St/Chapel St			
	Bi8	A129 Southend Rd/A176			
	Bi9	A176/Kennel Ln /Laindon Rd			
	Bi5	A129 London Road / High St / Sun St		A signalised junction layout	

6 Results

6.1 Definition of results

- 6.1.1 Junctions outlined above have been assessed in order to ascertain the specific impact of the development proposed in the Basildon Borough at those junctions. For some junctions, mitigation scenarios have also been assessed.
- 6.1.2 The junction assessments have been undertaken using standard industry software. The junction modelling software estimates the performance of a junction in terms of how close to capacity it is operating at. Capacity is the maximum potential number of vehicles that can travel through the junction. It is usually expressed in terms of vehicles per hour or day. Junction modelling software expresses the performance of a junction in different ways, each method compares the number of vehicles (volume) using the junction in a given time period, to the total capacity of the junction during that time period.
- 6.1.3 Each modelling software uses different terminology to describe how close to capacity a junction is operating as follows:
- Junctions 8 (ARCADY) – ‘**Ratio of Flow to Capacity**’ (RFC): 0.85 = approaching capacity, 1.00 = at capacity
 - LINSIG – ‘**Degree of Saturation**’ (DoS): 85% = approaching capacity, 100% = at capacity
 - VISUM – Volume/Capacity (V/C): 0.85 = approaching capacity, 1.0 = at capacity.
- 6.1.4 Despite values being expressed as ratios or percentages, capacity outputs from the three modelling packages are broadly equivalent to one another, and are presented in this technical note in their varying forms for the purpose of comparative analysis.

6.2 Junction Modelling Results

- 6.2.1 This section breaks down the overall performance of each junction location in the Basildon Borough Council study area by scenario test. There are separate tables for the AM and PM time periods.
- 6.2.2 Maps have been produced to show junctions that have been assessed and their level of operation based on the following Red-Amber-Green (RAG) system:

RAG	Definition	V/C / RFC / DoS
	Green denotes a junction with all approaches operating with a Volume of traffic: Capacity (V/C) ratio of under 0.85 - which suggests that the junction has sufficient spare capacity.	<0.85
	Yellow indicates a junction with one or more approaches operating with a V/C ratio of between 0.85 and 1.00 - which suggests that the junction is nearing or at capacity	0.85 -1.0
	Amber denotes a junction where one or more approaches is operating with a V/C ration of between 1 and 1.15 – which shows that the junction exceeds capacity.	1-1.15
	Red indicates a junction with one or more approaches operating with a V/C ratio of 1.15 or over – which suggests that the junction is over capacity.	>1.15
	Some red coded junctions have failed due to being significantly over capacity, where this is the case, these results are indicated by an X.	X

6.2.3 For the amber junctions, where the junction is operating with a V/C of between 1 and 1.15 it is assumed that it may be possible to mitigate the impact of development traffic at the junction through sustainable transport measures. Further mitigation, considering reduced trip rates in line with reasonable sustainable transport improvements, will be considered in the 'Part 2' Study. It is possible that these may be sufficient to mitigate the impact of traffic on junctions where the V/C is within this range.

6.2.4 For some junctions, several mitigation scenarios have been tested. Within the summary tables the overall best operating mitigation option has been identified by calculating the average V/C for all arms of the output results for each junction and identifying the mitigation option with the lowest average V/C. The results shown in the summary table give the V/C for the worst operating arm of the junction. Full results of all mitigation scenarios tested follow in the summary tables.

6.2.5 The results show that some junctions are expected to operate over capacity even with highway mitigation measures in place. Where junctions are operating more than ~1.15 (115%) of capacity, it is anticipated that further measures to encourage sustainable modal shift could be required to accommodate the full impact of development traffic growth.

6.3 Mapped summary results

6.3.1 The following series of maps show the v/c of the worst operating arm of the junction based on the modelling results. The corresponding results have also been tabulated later in this section for each of the principal settlement areas.

Figure 6-1: Baseline (2014) junction model results AM

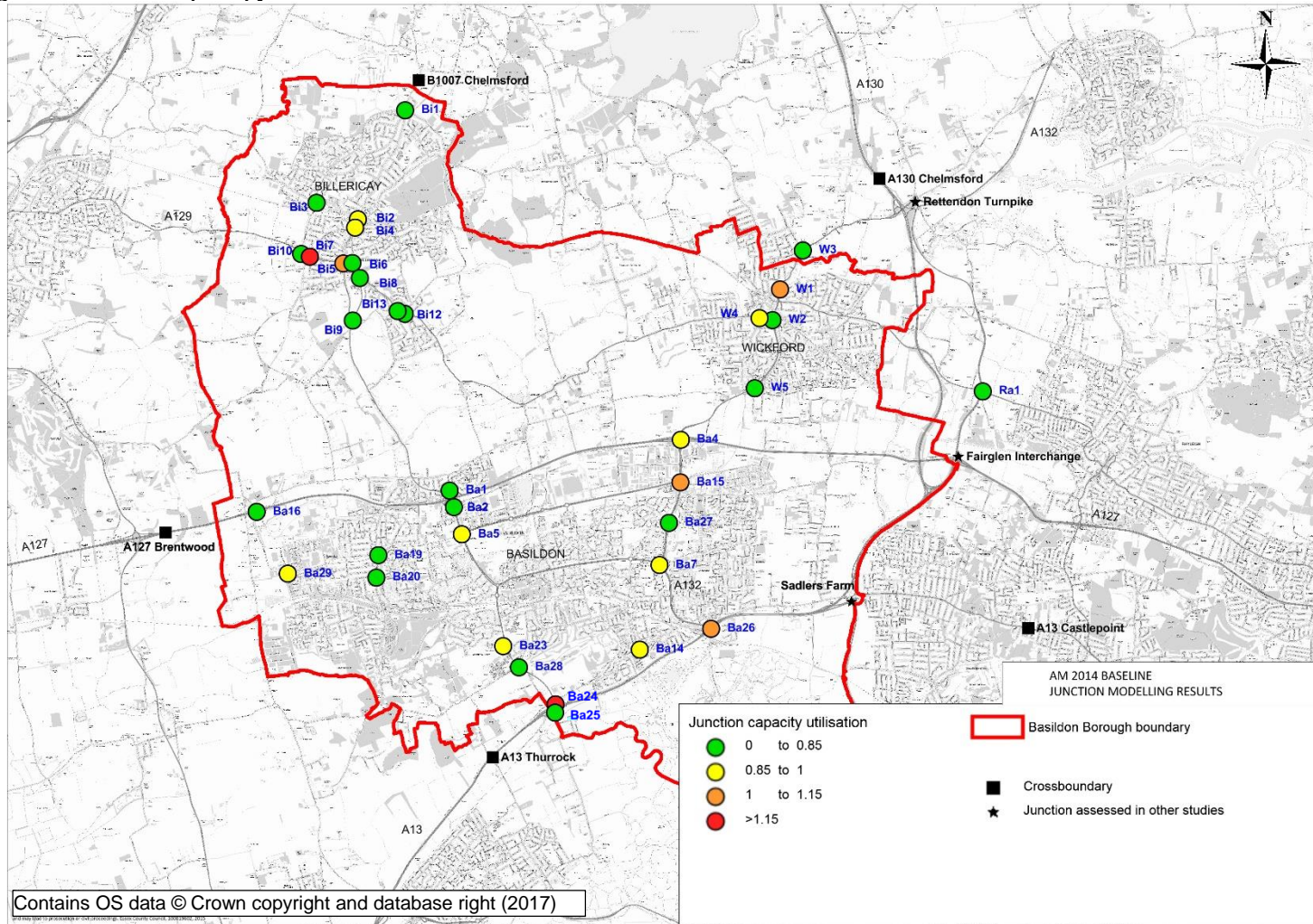


Figure 6-2: Baseline (2014) junction model results PM

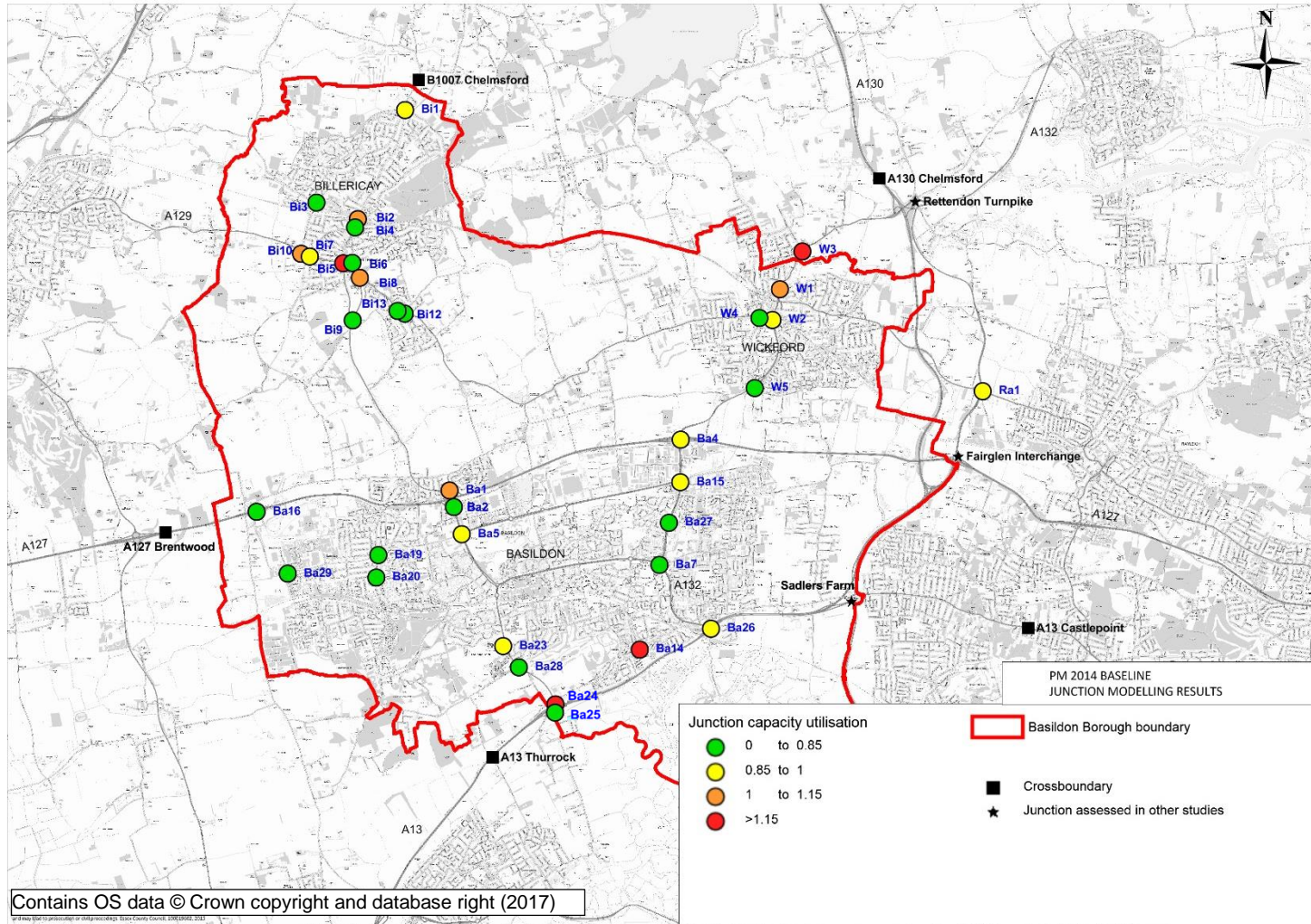


Figure 6-3: Background Growth (2034) Junction Model Results AM

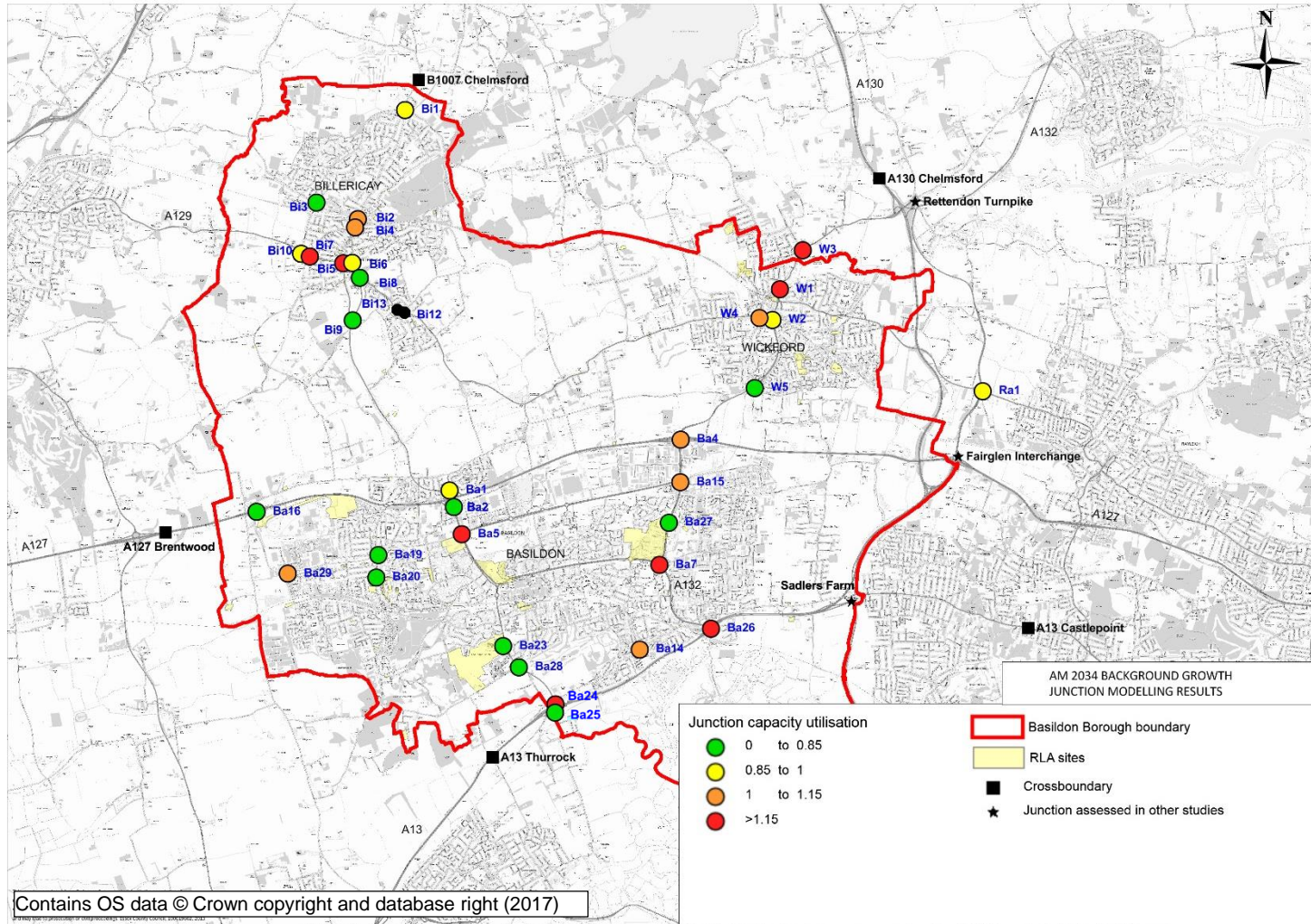


Figure 6-4: Background Growth (2034) Junction Model Results PM

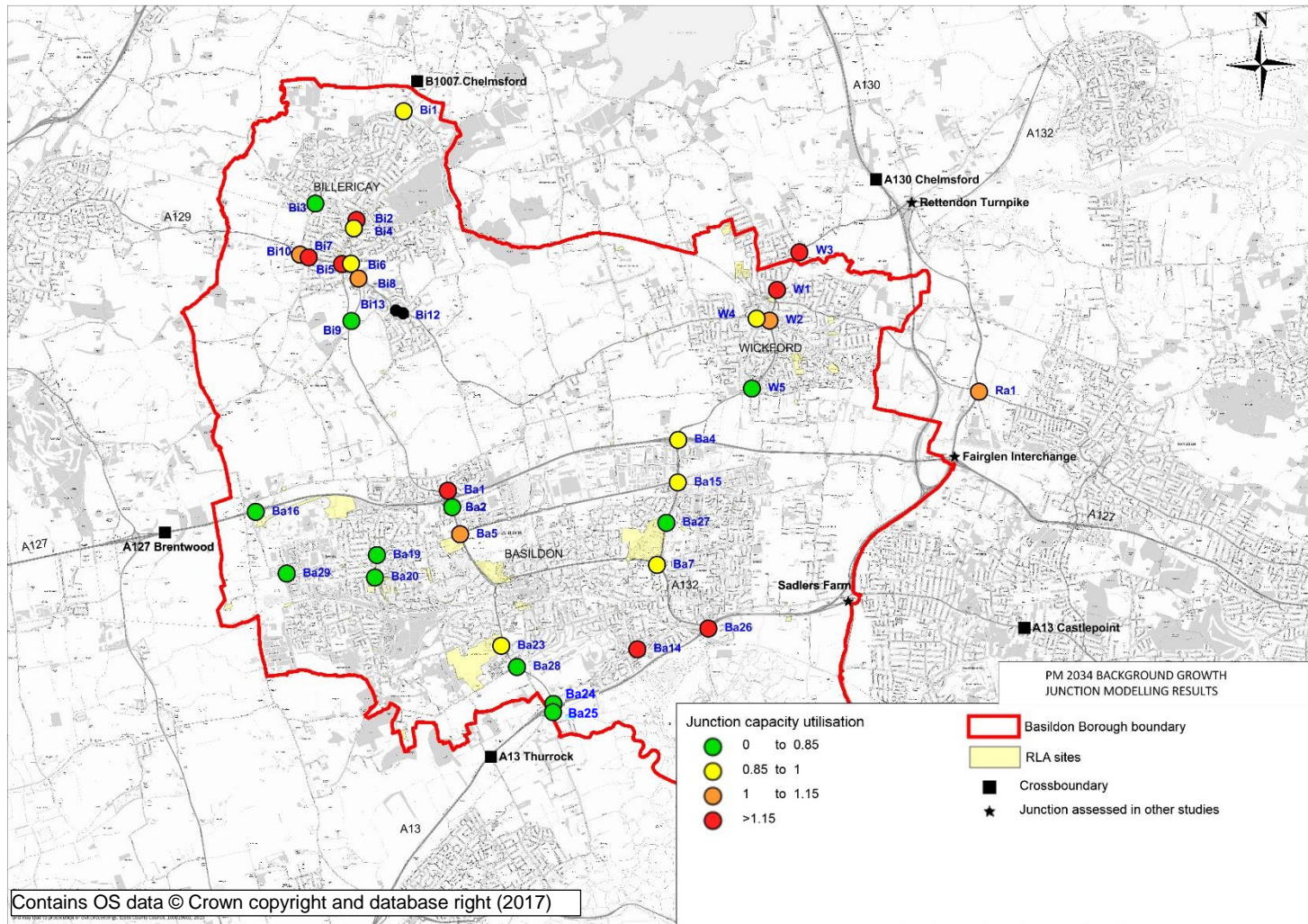


Figure 6-5: Draft Local Plan Growth (2034) Junction Model Results AM

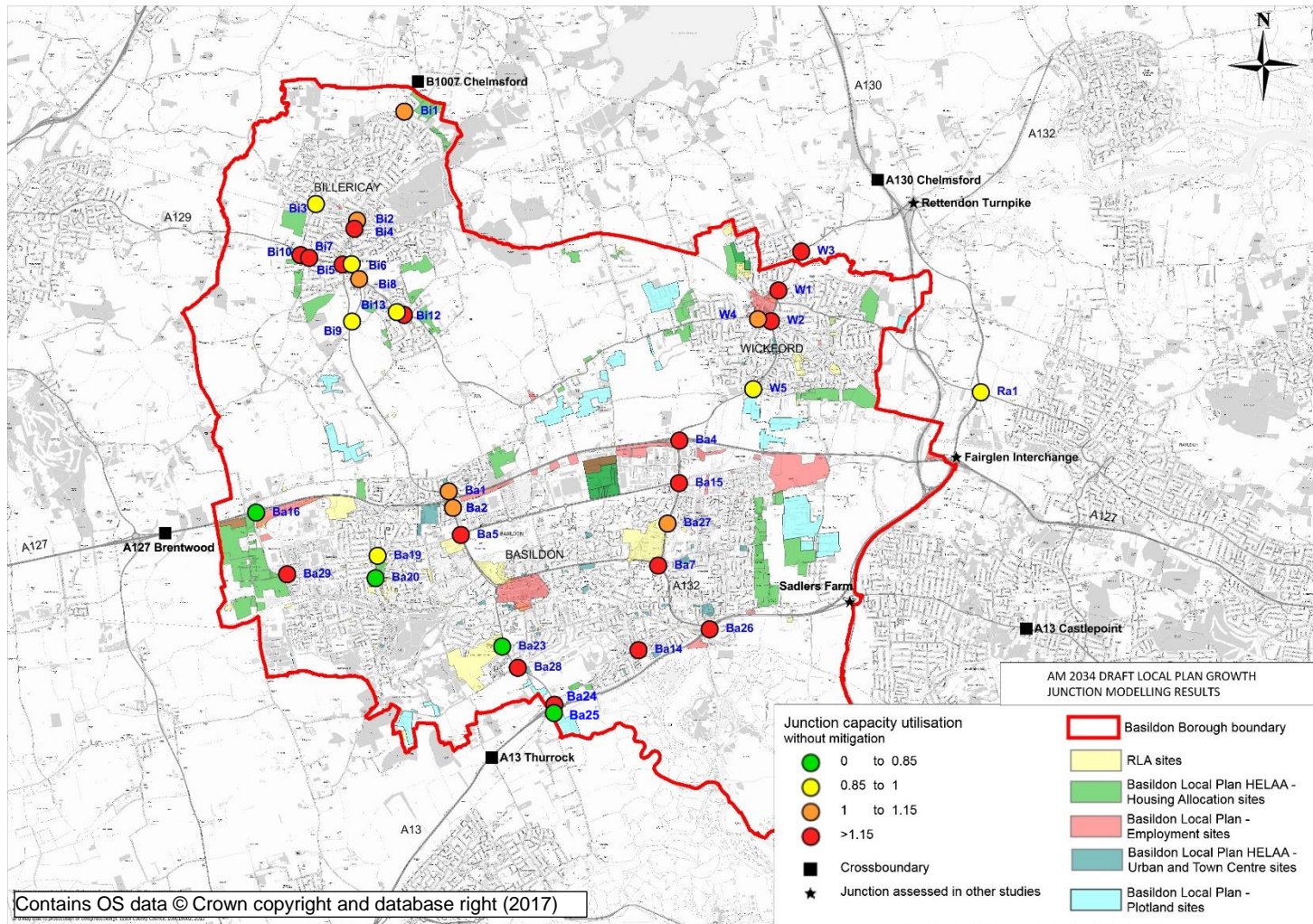


Figure 6-6: Draft Local Plan Growth (2034) Junction Model Results PM

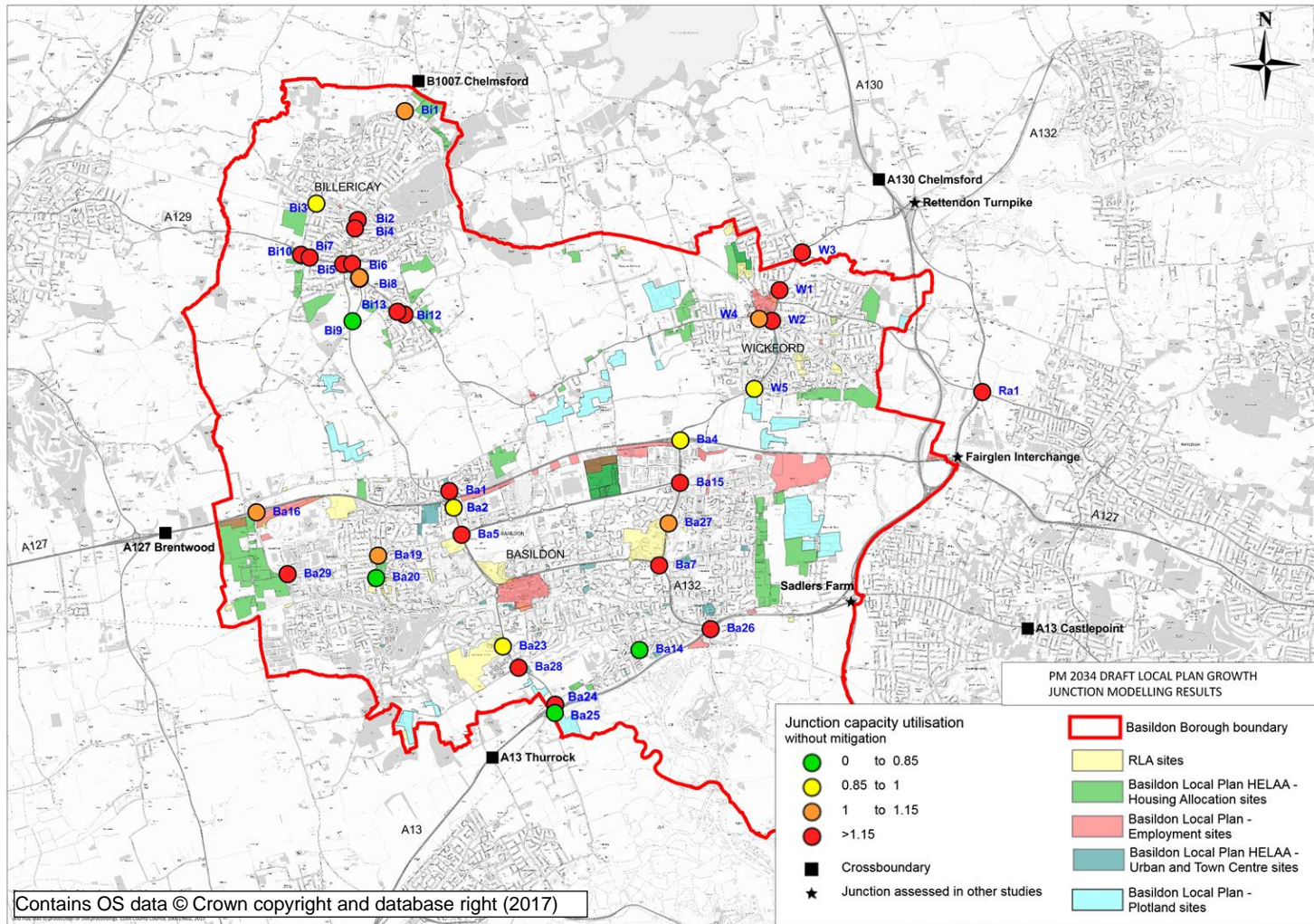


Figure 6-7: Draft Local Plan Growth (2034) Junction Model Results with Mitigation AM

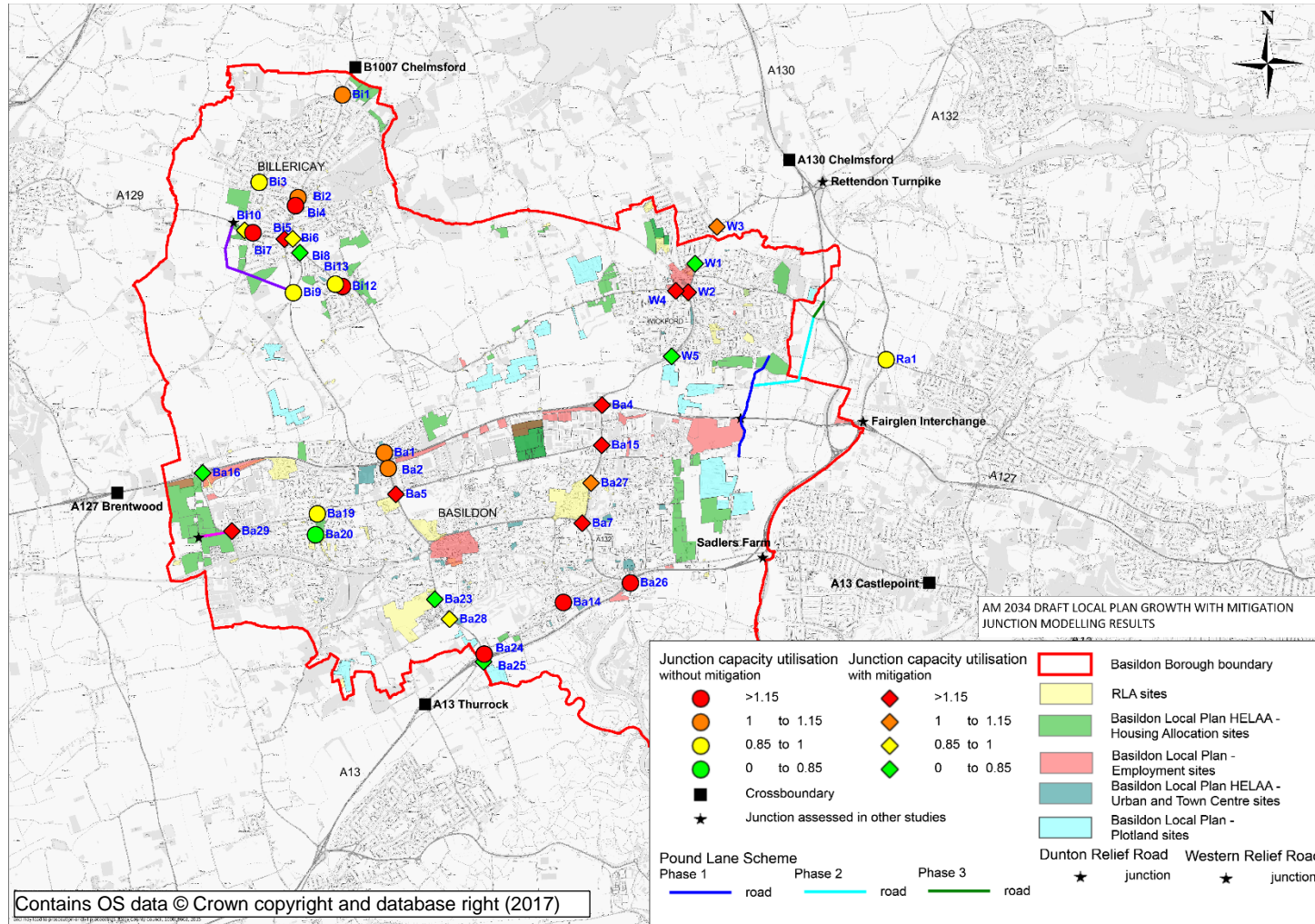
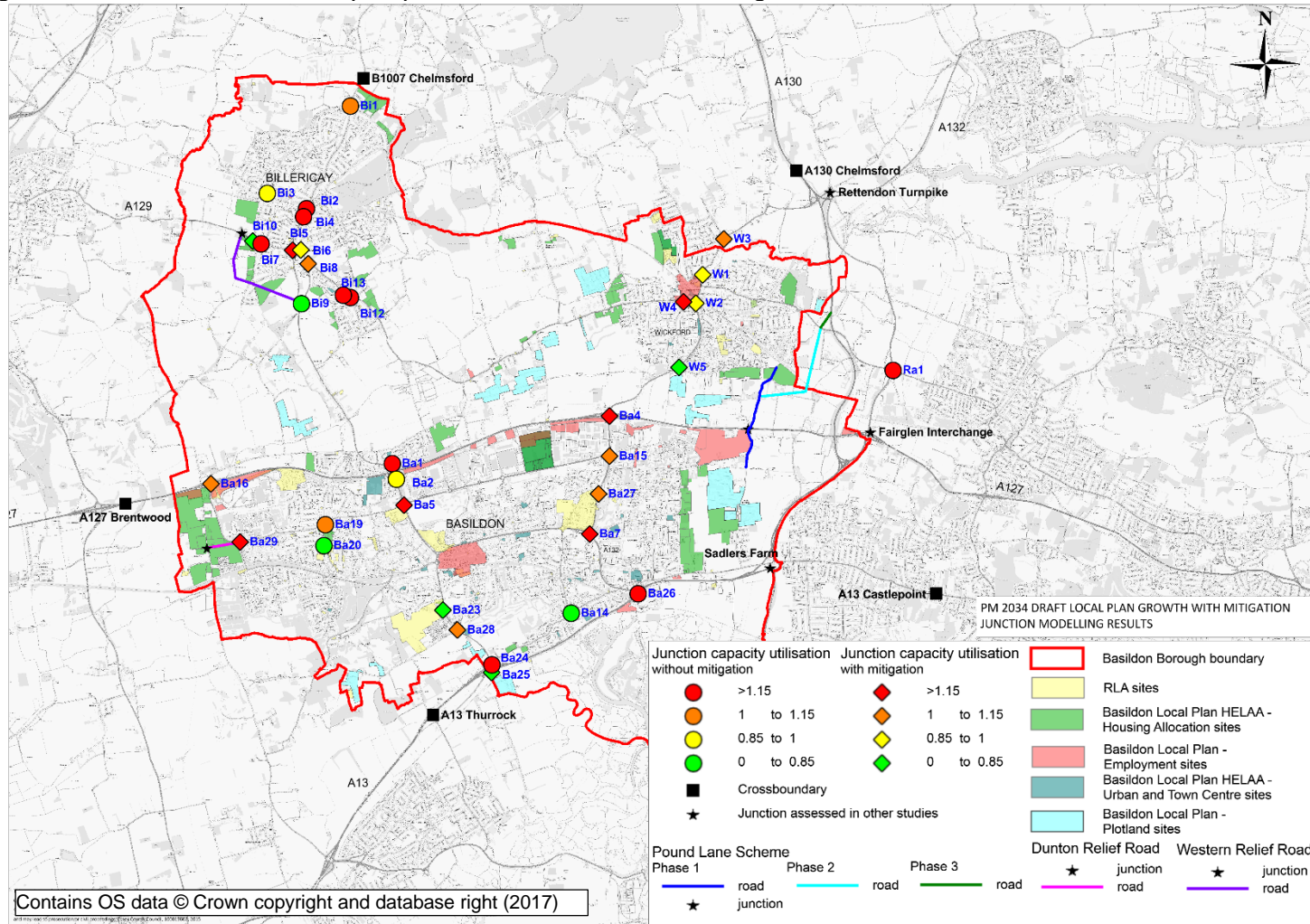


Figure 6-8: Draft Local Plan Growth (2034) Junction Model Results with Mitigation PM



6.4 Billericay Results

6.4.1 The results for Billericay are shown in Table 6-1 and Table 6-2, these tables show results from the junction assessments undertaken for Billericay for each of the four scenarios modelled. Where mitigation results are shown, these are the results from the best performing mitigation options taken forward. Results of the full mitigation assessment follows in Table 6-3 and Table 6-4.

The impact of the Draft Local Plan Growth

6.4.2 There are several junctions assessed that are currently operating within or are approaching capacity in the Base and Background Growth scenarios, but exceed capacity in the Local Plan Growth scenario:

- Bi1 B1007 Stock Road / Queens Park Avenue / Potash Road,
- Bi6 A129 Sun Street / Chapel Street
- Bi8 A129 Southend Road / A176
- Bi10 A129 London Road / Mountnessing Road

6.4.3 Bi9 A176 / Kennel Lane / Laindon Road and Bi 3 Mountnessing Road / Perry Street / Radford Way, operate within capacity in the Background Growth scenario and see very little change to their level of operation when development traffic is added to the network, continuing to operate within capacity.

6.4.4 The other junctions assessed demonstrated that they are likely to be exceeding capacity even in the Background Growth scenario, the addition of development traffic exacerbates the level of congestion expected at many of those junctions. When comparing the Background Growth junction performance to the Draft Local Plan Growth junction performance, there are very big RFC increases at several junctions:

- Bi4 B1007 Stock Road / Norsey Road / High Street / Western Road, in the PM peak
- Bi10 A129 London Road / Mountnessing Road, during both peaks
- Bi12 A129 Southend Rd / Outwood Common Road, during both peaks
- Bi13 A129 Southend Rd / Hickstars Lane, particularly in the PM peak.

6.4.5 There are a number of junctions that have arms with a saturation of 1.15 / 115% or above for one or both peaks. These junctions are:

- Bi2 B1007 Stock Road / Radford Way
- Bi4 B1007 Stock Road / Norsey Road / High Street / Western Road
- Bi6 A129 Sun Street / Chapel Street
- Bi7 A129 London Road / Tye Common Road / Western Road

- Bi12 A129 Southend Rd / Outwood Common Road
- Bi13 A129 Southend Rd / Hickstars Lane

Billericay Draft Local Plan Growth plus Mitigation

6.4.6 The results for the mitigation junction modelling are illustrated in the maps in Figure 6-7 and Figure 6-8. The results shown in the maps are for the best operating mitigations, as identified in Table 6-1 and Table 6-2. The detailed breakdown of results from all mitigations modelled are presented in Table 6-3 and Table 6-4 which follow.

6.4.7 As outlined within the methodology section, two highway schemes have been identified that could mitigate the impact of development traffic on junctions within Billericay. These are the removal of the one-way restriction on Laindon Road, and the construction of a Western Link Road. The impact of these two improvements have been tested on the following junctions:

- Bi5 A129 London Road / High Street / Sun Street
- Bi6 A129 Sun Street / Chapel Street
- Bi8 A129 Southend Road / A176
- Bi9 A176 / Kennel Lane / Laindon Road.
- Bi10 A129 London Road / Mountnessing Road

6.4.8 These two schemes have been tested individually and in combination and the results of these assessments are shown in Table 6-3 and Table 6-4.

6.4.9 For Billericay, two junction mitigations that have also been considered:

- Upgrade of Mountnessing Road junction from a priority junction to a roundabout.
- Upgrade of London Road/High Street / Sun Street junction from a roundabout to a signalised junction.

6.4.10 The results show that the removal of the one-way restriction at Laindon Road would improve operational capacity overall, particularly in the AM peak. There is benefit at the junctions from these schemes in the PM peak but not sufficient benefit to allow all junctions to operate within capacity. The removal of the one-way restriction has very little impact on the operation of Bi6 A129 Sun Street/Chapel Street junction.

6.4.11 This mitigation does have a negative impact on performance at junction Bi9 A176 / Kennel Lane / Laindon Road but this junction is expected to continue to operate within capacity even with the mitigation in place. A significant improvement is expected at junction Bi10 A129 London Road / Mountnessing Road.

Table 6-1: Billericay Junction Results AM

Junction ID	Junction Location	Existing Junction Type	Performance Summary				Mitigation option presented ¹³
			AM				
			2014 Baseline	Background Growth (2034)	Draft Local Plan Growth no mitigation	Draft Local Plan Growth with mitigation	
Billericay							
Bi1	B1007 Stock Road / Queens Park Avenue / Potash Road	Roundabout	0.83	0.97	1.02		Anticipated that provision of sustainable transport modes will accommodate development traffic, to be tested in Part 2.
Bi2	B1007 Stock Road / Radford Way	Mini-Roundabout	0.92	1.03	1.06		Anticipated that provision of sustainable transport modes will accommodate development traffic, to be tested in Part 2.
Bi3	Mountnessing Road / Perry Street / Radford Way	Roundabout	0.75	0.84	0.86		No mitigation expected to be required
Bi5	A129 London Road / B1007 High Street / Sun Street/ Laindon Rd	Roundabout	1.10	1.23	1.26	2.55	With Western Relief Road
Bi6	A129 Sun Street / Chapel Street	Roundabout	0.78	0.85	0.98	0.94	With Western Relief Road
Bi8	A129 Southend Road / A176	Roundabout	0.75	0.84	1.07	0.79	With Western Relief Road
Bi9	A176 / Kennel Lane / Laindon Road	Roundabout	0.74	0.84	0.89		No mitigation expected to be required
Bi10	A129 London Road / Mountnessing Road	Priority	0.70	0.89	1.45	0.86	Upgrade Mountnessing Road junction from priority to roundabout
Bi4	B1007 Stock Road / Norsey Road / High Street / Western Road	Signals	0.90	1.01	1.25		Mitigation option to be identified within Part 2 report
Bi7	A129 London Road / Tye Common Road / Western Road	Signals	1.21	1.65	1.68		Mitigation option to be identified within Part 2 report
Bi12	A129 Southend Rd / Outwood Common Road	Priority	0.77		1.23		Mitigation option to be identified within Part 2 report
Bi13	A129 Southend Rd / Hickstars Lane	Priority	0.57		0.86		No mitigation expected to be required

¹³ Note that as individual sites come forward a Transport Assessment will be required to verify that impacts from the development will not have a detrimental impact at junctions near to the site – and therefore additional mitigations may be required to accommodate site specific impacts.

Table 6-2: Billericay Junction Results PM

Junction ID	Junction Location	Existing Junction Type	Performance Summary				
			PM				
			2014 Baseline	Background Growth (2034)	Draft Local Plan Growth no mitigation	Draft Local Plan Growth with mitigation	Mitigation option presented
Billericay							
Bi1	B1007 Stock Road / Queens Park Avenue / Potash Road	Roundabout	0.87	0.99	1.13		Anticipated that provision of sustainable transport modes will accommodate development traffic, to be tested in Part 2.
Bi2	B1007 Stock Road / Radford Way	Mini-Roundabout	1.13	1.26	1.31		Mitigation option to be identified within Part 2 report
Bi3	Mountnessing Road / Perry Street / Radford Way	Roundabout	0.73	0.82	0.85		No mitigation expected to be required
Bi5	A129 London Road / High Street / Sun Street	Roundabout	1.26	1.41	1.76	1.73	With Western Relief Road
Bi6	A129 Sun Street / Chapel Street	Roundabout	0.81	0.89	1.26	0.92	With Western Relief Road
Bi8	A129 Southend Road / A176	Roundabout	1.00	1.11	1.13	1.08	With Western Relief Road
Bi9	A176 / Kennel Lane / Laindon Road	Roundabout	0.48	0.52	0.52		No mitigation expected to be required
Bi10	A129 London Road / Mountnessing Road	Priority	1.00	1.14	4.37	0.70	Upgrade Mountnessing Road junction from priority to roundabout
Bi4	B1007 Stock Road / Norsey Road / High Street / Western Road	Signals	0.83	0.94	3.75		Mitigation option to be identified within Part 2 report
Bi7	A129 London Road / Tye Common Road / Western Road	Signals	0.96	1.58	2.21		Mitigation option to be identified within Part 2 report
Bi12	A129 Southend Rd / Outwood Common Road	Priority	0.73		1.18		Mitigation option to be identified within Part 2 report
Bi13	A129 Southend Rd / Hickstars Lane	Priority	0.58		1.47		Mitigation option to be identified within Part 2 report

- 6.4.12 In the unmitigated scenario, Bi10 was expected to operate significantly worse when development traffic was added to the network. The Laindon Road mitigation has very little impact at Bi6 A129 Sun Street / Chapel Street which is expected to continue to operate over capacity when mitigation is in place.
- 6.4.13 The results show that the introduction of a Western Link Road would have a benefit at all junctions tested in the PM peak but would significantly increase congestion at A129 London Road/High Street/Sun Street junction in the AM.
- 6.4.14 On the basis that both highway schemes provided some benefit at the junctions tested, a further assessment was undertaken to understand whether the combined benefit of the two schemes would be sufficient to provide capacity for the Draft Local Plan Growth. A further test was undertaken to test the impact of both schemes, with results shown in Table 6-3 and Table 6-4 below.
- 6.4.15 As a result of the combined impact of these two mitigation schemes, junction Bi5 is significantly over capacity in both the AM and PM Peak periods, this is caused by the reassignment of traffic north on Laindon Road. Operation is improved in the PM peak through the introduction of signals, but doesn't bring the junction under capacity.
- 6.4.16 Junction Bi8 performs better as a result of mitigation measures and is significantly under capacity in the AM Peak, however it is only marginally under capacity in the PM Peak. The level of congestion that would be expected to be experienced at this junction with both of these schemes in place would likely result in queues back to other nearby junctions, causing wider network congestion than is shown in the individual model results.
- 6.4.17 As it stands, when considering the combined impact at the junctions in the area, in both time periods, the Western Relief Road on its own provides the most benefit at the junctions in Billericay as shown on the mitigation maps.
- 6.4.18 The upgrade of the A129/Mountnessing Road from a priority junction to a roundabout has significant benefits, the results show the mitigation measures work in increasing capacity sufficiently at the junction for the demand.
- 6.4.19 The upgrade of the A129 London Road/High Street/Sun Street to a signalised junction makes the operation worse in the AM peak and provides very little benefit in the PM peak. When combined with the removal of one way restrictions on Laindon Road the situation is worse in the AM peak and improved in the PM peak but not to within capacity.

6.4.20 Based on the analysis of results detailed above, illustrating a number of limitations with the mitigation options run in parallel, it is recommended that further assessments are undertaken in the Part 2 Study, investigating a revised combined package of measures considered more suitable to the highway network. Additionally, while the traffic reassignment methodology used is considered suitable for the initial option testing purposes for the Draft Local Plan as carried out above, a more detailed assessment of traffic reassignment will be undertaken in the 'Part 2' Study in order to better understand the full impact of the different schemes and overall network performance.

Table 6-3: Billericay Mitigation Options Results AM

Junction ID	Junction Location	Draft Local Plan Growth – no mitigations	Junction mitigations		Highway Schemes				
			Signalised junction	Upgrade Mountnessing Road junction from priority to roundabout	Removal of one way restrictions on A176 Laindon Road (existing junction layout)	Removal of one way restrictions on A176 Laindon Road (signalised layout)	Western Link Road (existing junction layouts)	Combined Western Link Road and A176 removal of restrictions on Laindon Road (existing junction layouts)	Combined Western Link Road and A176 removal of restrictions on Laindon Road Upgrade to signals
Bi5	A129 London Road / High Street / Sun Street	1.26	1.74		1.09	1.59	2.55	1.51	1.91
Bi6	A129 Sun Street / Chapel Street	0.98			0.90		0.94	0.36	
Bi8	A129 Southend Road / A176	1.07			0.84		0.79	0.63	
Bi9	A176 / Kennel Lane / Laindon Road	0.89			0.90			1.42	
Bi10	A129/Mountnessing Road	1.45		0.86				0.29	

Table 6-4: Billericay Mitigation Options Results PM

Junction ID	Junction Location	Draft Local Plan Growth - no mitigations	Junction mitigations		Highway Schemes				Combined Western Link Road and A176 removal of restrictions on Laindon Road (Upgrade to signals)
			Signalised junction	Upgrade Mountnessing Road junction from priority to roundabout	Removal of one way restrictions on A176 Laindon Road (existing junction layout)	Removal of one way restrictions on A176 Laindon Road (signalised layout)	Western Link Road (existing junction layouts)	Combined Western Link Road and A176 removal of restrictions on Laindon Road (existing junction layouts)	
Bi5	A129 London Road / High Street / Sun Street	1.76	1.63		1.2	1.24	1.73	3.37	1.65
Bi6	A129 Sun Street / Chapel Street	1.26			1.26		0.92	0.55	
Bi8	A129 Southend Road / A176	1.13			1.12		1.08	0.90	
Bi9	A176 / Kennel Lane / Laindon Road	0.52			0.73			1.05	
Bi10	A129/Mountnessing Road	4.37		0.70				0.09	

6.5 Wickford Results

6.5.1 The results for Wickford are shown in Table 6-5 and Table 6-6, these tables show results from the junction assessments undertaken for Wickford for each of the four scenarios modelled. Where mitigation results are shown, these are the results from the best performing mitigation options taken forward. Results of the full mitigation assessment follows in Table 6-7 and Table 6-8.

The impact of the Draft Local Plan Growth

- 6.5.2 The results show that junction W5 A132 / Cranfield Park Road / Nevendon Road performs below full capacity during peak times under Draft Local Plan growth.
- 6.5.3 W2 A132 Golden Jubilee Way / Radwinter Avenue / A129 London Road and W4 A129 London Road / Nevendon Road / High Street are approaching capacity in the Background Growth scenario, but do not exceed capacity until Development traffic is added to the network.
- 6.5.4 Junctions W1 (A132 Runwell Road / A132 / Runwell Road), and W3 (A132 Runwell Road / Church End Lane) are junctions that have arms with a saturation of 1.15 / 115% or above for one or both peaks in both the Background Growth and Local Plan growth scenarios.
- 6.5.5 Of particular note, the results return an exponential number, denoted by X, for junction W3 which suggests the junction will require significant measures to bring demand below capacity.
- 6.5.6 Overall the level of RFC for junctions W1, W2, and W3 suggest there may be a requirement for larger mass transit or engineering mitigation measures in order to offset traffic delays.

Table 6-5: Wickford Junction Results AM

Junction ID	Junction Location	Existing Junction Type	Performance Summary				
			AM				
			2014 Baseline	Background Growth (2034)	Draft Local Plan Growth no mitigation	Draft Local Plan Growth with mitigation	Mitigation option presented
Wickford							
W1	A132 Runwell Road / A132 / Runwell Road	Roundabout	1.07	1.19	1.38	0.68	Pound Lane junction and all link roads. No other changes to junction layout
W2	A132 Golden Jubilee Way / Radwinter Ave / A129 London Road	Roundabout	0.81	0.96	1.31	1.22	Pound Lane junction and all link roads. No other changes to junction layout
W5	A132 / Cranfield Park Road / Nevendon Road	Roundabout	0.80	0.77	0.87	0.77	Pound Lane junction and all link roads. No other changes to junction layout.
W3	A132 Runwell Road / Church End Lane	Priority	0.57	1.86	X	1.11	Pound Lane junction and all link roads. No other changes to junction layout
W4	A129 London Road / Nevendon Road / High St	Signals	0.87	1.00	1.07	1.83	Pound Lane junction and all link roads. No other changes to junction layout. Provision of sustainable transport modes to mitigate to be tested in Part 2.
Ra1	A129 London Road / A1245 Chelmsford Road	Roundabout	0.76	0.86	0.89		

Table 6-6: Wickford Junction Results PM

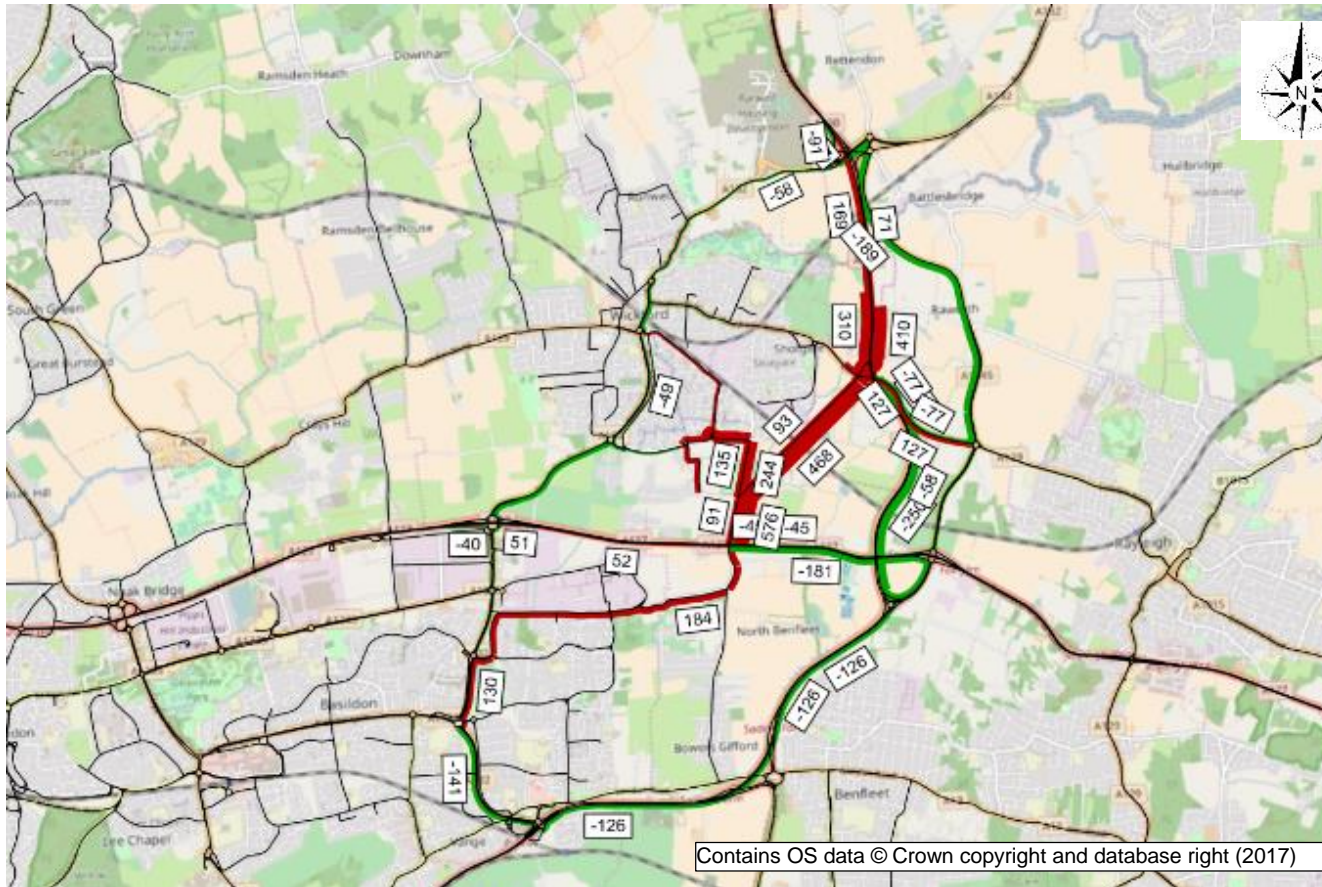
Junction ID	Junction Location	Existing Junction Type	Performance Summary				
			PM				
			2014 Baseline	Background Growth (2034)	Draft Local Plan Growth no mitigation	Draft Local Plan Growth with mitigation	Mitigation option presented
Wickford							
W1	A132 Runwell Road / A132 / Runwell Road	Roundabout	1.07	1.34	2.09	0.89	Pound Lane junction and all link roads. No other changes to junction layout
W2	A132 Golden Jubilee Way / Radwinter Ave/ A129 London Road	Roundabout	0.85	1.00	1.26	0.96	Pound Lane junction and all link roads. No other changes to junction layout
W5	A132 / Cranfield Park Road / Nevendon Road	Roundabout	0.63	0.69	0.91	0.49	Pound Lane junction and all link roads. No other changes to junction layout
W3	A132 Runwell Road / Church End Lane	Priority	1.34	X	X	1.10	Pound Lane junction and all link roads. No other changes to junction layout
W4	A129 London Road / Nevendon Road /High St	Signals	0.73	0.90	1.08	1.36	Pound Lane junction and all link roads, No other changes to junction layout. Provision of sustainable transport modes to mitigate to be tested in Part 2.
Ra1	A129 London Road / A1245 Chelmsford Road	Roundabout	0.95	1.14	1.35		

Wickford and East Basildon Draft Local Plan with Mitigation

- 6.5.7 The results for Wickford and East Basildon mitigation junction modelling are illustrated in the maps shown in Figure 6-7 and Figure 6-8. The results shown in the maps are for the best operating mitigations, as identified in Table 6-5 and Table 6-6 above. The detailed breakdown of results from all mitigations modelled is presented in Table 6-7 and Table 6-8 which follow.
- 6.5.8 Two junction mitigations were considered for Wickford:
- A two lane northbound approach on Nevendon Road to the W5 A132 / Cranfield Park Road / Nevendon Road junction was modelled. This actually worsened the overall operation of the junction in the AM peak and made no difference to performance in the PM peak, which is because it becomes more difficult for traffic from other arms to access this junction when the capacity of the Nevendon Road arm is increased.
 - A partial signalisation of W1 A132 Runwell Road / A132 Golden Jubilee Way / Runwell Road, was shown to have some benefit, although this didn't provide sufficient additional capacity to accommodate development traffic without sustainable measures also provided.
- 6.5.9 There were two highway mitigations assessed for Wickford, the construction of 'Morbec Spur' and a new junction at Pound Lane with associated link roads. It was anticipated that as a result of these highway schemes, traffic routing would change, potentially relieving pressure on the junctions in Wickford.
- 6.5.10 In general, the Morbec Spur mitigation provided less benefit than the new Pound Lane junction. There are several engineering feasibility issues in relation to the delivery of the Morbec Spur and traffic surveys have demonstrated that the number of vehicles 'rat-running' that this scheme could reduce is actually a lot lower than expected, results show that there is little benefit from the scheme at the assessed junctions. Therefore, it is not recommended that this option is taken forward.
- 6.5.11 The VISUM model identified the level of reassignment expected from the Pound Lane junction and associated link roads, this is shown in Figure 6-9 and Figure 6-10. The flow diagram shows that the new Pound Lane Junction and associated link roads attract traffic away from the southbound A130 in the AM peak. There is also some traffic attracted away from the southbound A132 through Wickford to Nevendon interchange. There is a significant increase in traffic heading south to Basildon via Pound Lane with the improvement.

- 6.5.12 The modelling showed benefit at the Wickford junctions with traffic re-routing onto the Pound Lane link and away from the A132, reducing congestion at the junctions in Wickford and this is shown in the junction modelling results for the Wickford junctions. W1, W3 and W5 were all expected to be over capacity in the unmitigated scenario, but will be expected to operate at less than 1.15 RFC in the mitigated scenario. Junction W2 is expected to be over capacity in the AM peak, although the operation will still be better than in the unmitigated scenario. Junction W4 is expected to get worse and this is because more traffic is expected to enter and leave Wickford via Radwinter Road/Salcott Crescent rather than via the A132. There are slightly different trends between the AM and PM peak shown by the re-assignment of traffic, with traffic travelling to Rochford in the PM peak switching from the A129 to the A127. This effect is not observed in the AM peak.
- 6.5.13 Junctions in East Basildon were also affected by the new junction and these were therefore modelled. The results of these models are also shown in Table 6-7 and Table 6-8. The VISUM model showed that traffic would re-route through Pound Lane to get to Basildon, rather than using the A130 and A13 which they were using prior to the introduction of the new junction. This results in increased traffic at Ba7 Broadmayne/South Mayne/ St Nicholas Lane and Ba27 A132 East Mayne/ Whitmore Way/Felmores. At Ba27, the junction modelling results show an RFC of less than 1.15 / 115% and the level of congestion isn't significantly worse than the unmitigated scenario, this may be mitigated through improved sustainable transport measures. For Ba7, this junction is already congested in the future year scenario and the additional traffic from this scheme exacerbates this.
- 6.5.14 The scheme results in a reduced level of traffic overall at the Nevendon Interchange (Ba4) when compared to the unmitigated scenario, but some arms do result in an increase in traffic, in particular congestion is expected on the A127 East exit arm in the AM peak and the Nevendon Road Southbound in the PM peak.
- 6.5.15 It is possible that restrictions could be made at either the Pound Lane Junction, or on Burnt Mills Road, which would reduce the traffic accessing East Basildon from the Pound Lane junction, but this may put additional pressure on the Nevendon Interchange. Given the limitations associated with this initial option testing, it is recommended that this is investigated further in the 'Part 2' Study. This will ensure a more robust assessment, using the development proposed in the Final Growth Scenario and a more detailed analysis of traffic reassignment, to reach a justifiable conclusion.

Figure 6-9: Changes in Traffic Flow Resulting from a new Interchange at the A127/Pound Lane Junction AM ¹⁴



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

¹⁴ Maps and flow diagrams are taken from the VISUM model. Red lines show increases in traffic as a result of the pound lane junction, green lines show reduction in development traffic as a result. Where no coloured line is shown there is no change in flow.

Figure 6-10: Changes in Traffic Flow Resulting from a new Interchange at the A127/Pound Lane Junction PM



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

Table 6-7: Wickford and East Basildon Mitigation Options Results AM

Junction ID	Junction Location	Performance Summary					
		AM					
		Draft Local Plan Growth – no mitigations	Partial Peak hour signalisation of W1	Two lane NB rbt approach on Nevendon Road	With Morbec Spur	Pound Lane and links	With Dunton Relief Road
W5	A132 / Cranfield Park Road / Nevendon Road	0.87		1.14	0.81	0.77	
W2	A132 Golden Jubilee Way / Radwinter Ave/ A129 London Road	1.31			1.12	1.22	
W1	A132 Runwell Road / Golden Jubilee Way/ Runwell Road	1.38	1.11		1.25	0.68	
W3	A132 Runwell Road / Church End Lane	X			X	1.11	
W4	A129 London Road / Nevendon Road / High Street	1.07				1.83	
Ba4	A127 / A132 Nevendon Interchange Junction	1.23				2.99	
Ba7	Broadmayne / South Mayne / Ashlyns	2.46				3.16	
Ba15	Cranes Farm Road / A132 East Mayne	1.39				1.18	
Ba27	A132 East Mayne / Whitmore Way / Felmores	1.11				1.14	
Ba25	A13/A176 Five Bells S	0.54					0.41
Ba5	Cranes Farm Road /A176 Upper Mayne/St. Nicholas	1.63					1.31
Ba 16	A127 / B148 West Mayne (Dunton) Interchange	0.80					0.78
Ba 23	A176 Nether Mayne / Hospital	0.82					0.63
Ba 28	A176 Nether Mayne/Dry St	1.71					0.99
Ba 29	West Mayne/Mandeville	1.17					1.15

Table 6-8: Wickford and East Basildon Mitigation Options Results PM

Junction ID	Junction Location	Performance Summary					
		PM					
		Draft Local Plan Growth – no mitigations	Partial Peak hour signalisation	Two lane NB rbt approach on Nevendon Road	With Morbec Spur	Pound Lane and links	With Dunton Relief Road
W5	A132 / Cranfield Park Road / Nevendon Road	0.91		0.91	0.82	0.49	
W2	A132 Golden Jubilee Way / Radwinter Ave/ A129 London Road	1.26			1.26	0.96	
W1	A132 Runwell Road / Golden Jubilee Way / Runwell Road	2.09	1.16		1.94	0.89	
W3	A132 Runwell Road / Church End Lane	X			X	1.10	
W4	A129 London Road / Nevendon Road / High St	1.08				1.36	
Ba4	A127 / A132 Nevendon Interchange Junction	0.97				1.53	
Ba7	Broadmayne / South Mayne / Ashlyns	1.79				2.35	
Ba15	Cranes Farm Road / A132 East Mayne	1.22				1.10	
Ba27	A132 East Mayne / Whitmore Way / Felmores	1.11				1.13	
Ba25	A13/A176 Five Bells S	0.65					0.42
Ba5	Cranes Farm Road /A176 Upper Mayne/St. Nicholas	1.41					1.44
Ba 16	A127 / B148 West Mayne (Dunton) Interchange	1.04					1.01
Ba 23	A176 Nether Mayne / Hospital	0.97					0.82
Ba 28	A176 Nether Mayne/Dry St	X					1.00
Ba 29	West Mayne/Mandeville	1.27					1.20

6.6 Basildon Results

6.6.1 The results are shown in Table 6-9 and Table 6-10. These tables show results from the junction assessments undertaken for Basildon for each of the four scenarios modelled. There were not multiple mitigations modelled for each junction in Basildon and therefore the results of the modelling of these are all shown in the same tables.

Impact of Local Plan Growth

6.6.2 For Basildon, the following junctions see an increase in RFC between the Background Growth scenario and the Draft Local Plan Growth scenario that results in the junction exceeding its operational capacity.

6.6.3 Modelling results show that Junctions Ba25 A13/A176 Five Bells Interchange South, Ba20 High Road / Somerset Road / Laindon Link, and Ba23 A176 Nether Mayne / Hospital Access perform below capacity during peak times under Draft Local Plan growth. Ba23 is approaching capacity in all scenarios.

6.6.4 Several junctions are already operating close to or exceeding capacity in the Base and Background Growth scenarios and this is only exacerbated when Local Plan growth is added:

- Ba1 A127 / A176 Noak Bridge Interchange North
- Ba5 Cranes Farm Road / A176 Upper Mayne / St. Nicholas Lane
- Ba7 Broadmayne / South Mayne / Ashlyns
- Ba14 B1464 London Road / High Road / Clay Hill Road
- Ba15 Cranes Farm Road / A132 East Mayne
- Ba 24 A13/A176 Five Bells Interchange North
- Ba26 A13/A132 Pitsea Interchange

6.6.5 There are two junctions that are operating within capacity in the base and Background Growth scenarios but have arms with a saturation of 1.15 / 115% or above for one or both peaks when development traffic is added to the network. These junctions are:

- Ba28 A176 Nether Mayne / Dry Street
- Ba29 West Mayne / Mandeville Way

6.6.6 The following junctions see traffic demand during one or both periods that exceeds junction capacity but within the 115% barrier:

- Ba2 A127 / A176 Noak Bridge Interchange South
- Ba16 A127 / B148 West Mayne (Dunton) Interchange

- Ba19 High Road / West Mayne / St. Nicholas Lane
- Ba27 A132 East Mayne / Whitmore Way / Felmores

6.6.7 Ba4 A127 / A132 Nevendon Interchange Junction, is expected to exceed capacity based on the modelling work. Improvements have already been introduced at this junction but the benefits realisation work has not yet been completed, this junction will be reviewed in the 'Part 2' Study.

Basildon Local Plan Growth plus Mitigation

6.6.8 Several different junction mitigations have been identified for Basildon, as outlined in Section 5.4. The results for Basildon mitigation junction modelling are illustrated in the maps shown in Figure 6-7 and Figure 6-8.

6.6.9 Ba25 A13/A176 Five Bells Interchange South, was included within the assessment as this junction was assessed in the previous modelling. This current assessment confirms that this mitigation, although it does provide additional capacity in the AM peak, is not required in order to accommodate Local Plan Growth.

6.6.10 The mitigation schemes for Junction Ba5 Cranes Farm Road / A176 Upper Mayne / St. Nicholas Lane, Junction Ba28 A176 Nether Mayne / Dry Street, Ba16 A127 / B148 West Mayne (Dunton) Interchange and Junction Ba29 West Mayne / Mandeville Way assume the introduction of a Dunton relief road. Junction Ba5 also assumes widening of St Nicholas Lane and Junction Ba28 assumes signalisation. The modelling shows that the mitigation measures would result in the reassignment of traffic, which would reduce the impact on all of these junctions in both peaks, with the exception of a slight detrimental impact to the operation of Junction Ba5 in the PM peak. It should be noted that the reassignment of traffic in isolation will not solely address forecast capacity issues across the network and physical improvements will be required in combination to help mitigate the traffic impact.

6.6.11 Junction Ba28, which includes signalisation as well as reassignment of traffic sees a significant improvement in RFC as a result of the mitigation measures taken.

Table 6-9: Basildon Junction Results AM

Junction ID	Junction Location	Existing Junction Type	Performance Summary				Mitigation option presented/ Comments
			AM				
			2014 Baseline	Background Growth (2034)	Draft Local Plan Growth no mitigation	Draft Local Plan Growth with mitigation	
Basildon							
Ba1	A127 / A176 Noak Bridge Interchange North	Roundabout	0.80	0.95	1.08		Provision of sustainable transport modes to mitigate to be tested in Part 2
Ba2	A127 / A176 Noak Bridge Interchange South	Roundabout	0.63	0.71	1.01		Provision of sustainable transport modes to mitigate to be tested in Part 2
Ba4	A127 / A132 Nevendon Interchange Junction	Sig. Roundabout	0.98	1.01	1.23	2.99	Pound Lane junction and all link roads. No other changes to junction layout. This junction will be reviewed within Part 2 of the study ¹⁵
Ba24	A13/A176 Five Bells N	Roundabout	1.37	1.67	2.78		A mitigation has been agreed as part of the Dry Street Development ¹⁶
Ba25	A13/A176 Five Bells S	Roundabout	0.45	0.50	0.54	0.41	Assumes Dunton relief road is in place.
Ba26	A13/A132 Pitsea Interchange	Roundabout	1.06	1.27	2.52		Mitigation to be identified within Part 2
Ba5	Cranes Farm Road /A176 Upper Mayne/St. Nicholas	Roundabout	0.99	1.26	1.63	1.31	Assumes Dunton relief road is in place.
Ba14	B1464 London Road / High Road / Clay Hill Road	Mini-Roundabout	0.93	1.04	1.37		Mitigation to be identified within Part 2
Ba15	A1235 Cranes Farm Road / A132 East Mayne	Roundabout	1.04	1.11	1.39	1.18	Pound Lane junction and all link roads. No other changes to junction layout. Mitigation to be identified within Part 2
Ba16	A127 / B148 West Mayne (Dunton) Interchange	Roundabout	0.38	0.44	0.80	0.78	Assumes Dunton relief road is in place
Ba19	High Road / West Mayne / St. Nicholas Lane	Roundabout	0.71	0.81	0.97		No mitigation expected to be required
Ba20	High Road / Somerset Road / Laindon Link	Roundabout	0.36	0.40	0.57		No mitigation expected to be required
Ba23	A176 Nether Mayne / Hospital	Signals	0.86	0.81	0.82	0.63	Assumes Dunton relief road is in place
Ba28	A176 Nether Mayne/Dry St	Priority	0.18	0.30	1.71	0.99	Assumes Dunton relief road is in place. Junction signalised
Ba27	A132 East Mayne / Whitmore Way / Felmores	Roundabout	0.75	0.84	1.11	1.14	Pound Lane junction and all link roads. No other changes to junction layout. Provision of sustainable transport modes to mitigate to be tested in Part 2

¹⁵ A new layout was constructed during the completion of this study which will be considered in the 'Part 2' Study.

¹⁶ Traffic generated by the Dry Street scheme is included within the Background Growth and Draft Local Plan Growth models.

Ba29	West Mayne/Mandeville	Roundabout	0.88	1.01	1.17	1.15	Assumes Dunton relief road is in place. No change to junction
Ba7	Broadmayne / South Mayne / Ashlyns	Roundabout	0.97	1.18	2.46	3.16	Pound Lane junction and all link roads. No other changes to junction layout. Mitigation to be identified within Part 2

Table 6-10: Basildon Junction Results PM

Junction ID	Junction Location	Junction Type	Performance Summary				
			PM				
			2014 Baseline	Background Growth (2034)	Draft Local Plan Growth no mitigation	Draft Local Plan Growth with mitigation	Mitigation option presented
Basildon							
Ba1	A127 / A176 Noak Bridge N	Roundabout	1.06	1.17	1.31		Mitigation to be identified within Part 2
Ba2	A127 / A176 Noak Bridge S	Roundabout	0.71	0.82	0.88		No mitigation expected to be required
Ba4	A127 / A132 Nevendon Interchange Junction	Sig. Roundabout	0.89	0.89	0.97	1.53	Pound Lane junction and all link roads. No other changes to junction layout. This junction will be reviewed within Part 2 of the study ¹⁷
Ba24	A13/A176 Five Bells N	Roundabout	1.19	0.64	1.84		A mitigation has been agreed as part of the Dry Street Development ¹⁸
Ba25	A13/A176 Five Bells S	Roundabout	0.60	0.65	0.65	0.42	Assumes Dunton relief road is in place
Ba26	A13/A132 Pitsea Interchange	Roundabout	0.97	1.34	2.62		Mitigation to be identified within Part 2
Ba5	Cranes Farm Road /A176 Upper Mayne/St. Nicholas	Roundabout	0.97	1.11	1.41	1.44	Assumes Dunton relief road is in place, change in performance is due to reassignment of traffic
Ba14	B1464 London Road / High Road / Clay Hill Road	Mini-Roundabout	1.22	1.34	0.81		No mitigation expected to be required
Ba15	A1235 Cranes Farm Road / A132 East Mayne	Roundabout	0.85	0.90	1.22	1.10	Pound Lane junction and all link roads. No other changes to junction layout. Mitigation to be identified within Part 2
Ba16	A127 / B148 West Mayne (Dunton) Interchange	Roundabout	0.46	0.54	1.04	1.01	Assumes Dunton relief road is in place
Ba19	High Road / West Mayne / St. Nicholas Lane	Roundabout	0.63	0.72	1.06		Provision of sustainable transport modes to mitigate to be tested in Part 2
Ba20	High Road / Somerset Road / Laindon Link	Roundabout	0.48	0.52	0.64		No mitigation expected to be required
Ba23	A176 Nether Mayne / Hosp	Signals	0.91	0.91	0.97	0.82	Assumes Dunton relief road is in place

¹⁷ A new layout was constructed during the completion of this study which will be considered in the 'Part 2' Study.

¹⁸ Traffic generated by the Dry Street scheme is included within the Background Growth and Draft Local Plan Growth models.

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Ba28	A176 Nether Mayne/Dry St	Signals	0.42	0.70	X	1.00	Assumes Dunton relief road is in place. Junction signalised
Ba27	A132 East Mayne / Whitmore Way / Felmores	Roundabout	0.71	0.81	1.11	1.13	Pound Lane junction and all link roads. No other changes to junction layout. Provision of sustainable transport modes to mitigate to be tested in Part 2
Ba29	West Mayne/Mandeville	Roundabout	0.66	0.71	1.27	1.20	Assumes Dunton relief road is in place. No change to junction
Ba7	Broadmayne / South Mayne / Ashlyns	Roundabout	0.84	0.99	1.79	2.35	Pound Lane junction and all link roads. No other changes to junction layout. Mitigation to be identified within Part 2

6.7 Junction Modelling Conclusions

Billericay

6.7.1 Within Billericay, there are several junctions that are currently operating within capacity in the base and Background Growth scenarios but exceed capacity in the Local Plan Growth scenario:

- Bi1 B1007 Stock Road / Queens Park Avenue / Potash Road, the modelling of this junction shows similar results to the previous 2013/15 assessment. This junction is operating below 1.15 RFC in both peak periods and this may be mitigated through the introduction of sustainable modes. Site H19 is located adjacent to this junction and has received a good sustainable access score, so it is realistic to expect that a reduced vehicular trip rate may be achieved at this location.
- Bi6 A129 Sun Street / Chapel Street, the modelling of this junction shows similar results to the previous 2013/15 assessment. Mitigation measures identified at this location fully mitigate the impact of development traffic at the junction, bringing them well within capacity in both peak periods.
- Bi8 A129 Southend Road / A176 the modelling of this junction shows similar results to the previous 2013/15 assessment. However, mitigation measures identified bring the operation of the junction down to 0.98 in the PM peak and well within operational capacity in the AM peak. This junction may operate within capacity with reduced trip rates created from the increased use of sustainable transport modes.
- Bi9 A176 / Kennel Lane / Laindon Road, the 2013/15 assessment showed that this junction would be over capacity in all scenarios in the future year, whereas this assessment shows that the junction is approaching capacity when Local Plan development traffic is added to the network but junction capacity is not expected to be exceeded. The level of development proposed near to this junction has reduced since the last assessment. The introduction of the Western Relief Road and the removal of one way restrictions on Laindon Road result in reassignment that has a detrimental impact at this junction.
- Bi10 A129 London Road / Mountnessing Road, the modelling of this junction shows similar results to the previous 2013/15 assessment. Mitigation measures to remove the one-way restriction on Laindon Road is expected to mitigate the impact of development traffic at this junction.

6.7.2 Bi12 A129 Southend Rd / Outwood Common Road and Bi13 A129 Southend Rd / Hickstars Lane are currently operating within capacity but are expected to exceed capacity when Draft Local Plan Growth is added to the network.

- 6.7.3 Capacity issues at Bi12 and Bi13 are created from the volume of traffic generated by the housing sites proposed at H26a&b which, within this assessment it is assumed these could deliver nearly 300 dwellings. These sites score well within the sustainability appraisal due to their proximity to local amenities such as schools and shops. It may be justified within Part 2 of this study to consider an alternative trip rate for this site to take account that travel to school trips are unlikely to be made by car. Highway mitigation solutions may need to be considered at this location – these should be investigated and delivered by the developers of these sites.
- 6.7.4 The results for junction Bi2 B1007 Stock Road / Radford Way show that the junction will exceed capacity in the Background Growth scenario but it does not get significantly worse when Local Plan growth is added. The modelling of this junction shows similar results to the previous 2013/15 assessment. There is no development with direct access to this junction so a highways mitigation option may need to be considered at this location.
- 6.7.5 Bi4 B1007 Stock Road / Norsey Road / High Street / Western Road is expected to reach capacity in the Background Growth scenario and is expected to significantly exceed capacity when local development traffic is added to the network. The modelling of this junction shows similar to results to the previous 2013/15 assessment. Again, there is no specific development site located adjacent to this junction so the change in operation at this junction is a result of the combined impact of development within the Billericay and the wider Borough. Therefore, a highway mitigation option may need to be considered at this location.
- 6.7.6 The modelling results show that Bi5 A129 London Road / High Street / Sun Street is expected to operate over capacity even in the base year, local development traffic does increase the congestion although not very significantly. The modelling of this junction indicates that the removal of the one-way restriction on Laindon Road combined with the construction of the Western Link Road will actually increase congestion in both the AM and PM peaks. When combined with increased use of sustainable modes from development sites, it is possible that the capacity of this junction may be slightly improved, although this is unlikely to have a significant impact.

6.7.7 It should be noted that previous assessments did not forecast any specific capacity issues at Junction Bi7. While the updated modelling for this 'Part 1' Study does now show some potential impacts at this junction, the assessment does not fully consider the anticipated reassignment of traffic generated by the Western Link Road. The full impact of the Western Link Road is expected to have a beneficial impact at the junction, which will be considered in more detail in the 'Part 2' Study. Should there be any residual impacts, following the introduction of the Western Link Road, further mitigation will be considered at the junction.

Wickford and East Basildon

6.7.8 Several of the junctions assessed are either approaching or exceeding capacity within the Background Growth scenario, and congestion at these junctions is exacerbated when Draft Local Plan Growth is added to the network. Two possible mitigation options were tested for these junctions, a new junction at Pound Lane and link roads, or Morbec Spur, a new link between the A127 and A130 bypassing Fairglen Interchange. The new junction at Pound Lane was shown to have the most benefit to the junctions assessed in Wickford. The Morbec Spur has been discounted from further assessment due to its limited benefit in creating additional capacity at the junctions in Wickford.

6.7.9 However, these measures didn't fully mitigate the development impact in the AM peak at W2 A132 Golden Jubilee Way / Radwinter Avenue / A129 London Road, and in both peaks at W4 A129 London Road / Nevendon Road / High Street. The previous 2013/15 assessment suggested that the new Pound Lane junction should be expected to mitigate the impact of development traffic. The difference within this assessment may be because of the large number of trips forecast to be generated by the commercial development proposed in Wickford and the more robust method of trip assignment. Trip rates used currently do not assume linked trips, generally associated with retail development, and therefore the assessment provides a 'worst case'. Robust assumptions in relation to linked trips to commercial land uses combined with increased use of sustainable modes could reduce the impact at these junctions.

6.7.10 The new Pound Lane junction and link road are expected to result in additional traffic using the junctions in East Basildon resulting in increased congestion at Ba7 Broadmayne / South Mayne / Ashlyns and to a lesser extent at Ba27 A132 East Mayne / Whitmore Way / Felmores. Although traffic levels will be expected to reduce overall at Nevendon Interchange, the overall operation worsens due to significant increases in traffic on some arms.

6.7.11 In addition, Wickford sees a large increase junction demand and delay at the junction Ra1 (A129 London Road / A1245 Chelmsford Road) in the PM peak as a result of the Draft Local Plan Growth, this may also be mitigated through a review of trip rate assumptions for commercial/employment land within Wickford.

Basildon

6.7.12 For Basildon, the following junctions see an increase in RFC between the Background Growth scenario and the Draft Local Plan Growth scenario that results in the junction exceeding its operational capacity.

6.7.13 Modelling results show that several junctions are already operating close to capacity and this is only exacerbated when Local Plan growth is added:

- Ba1 A127 / A176 Noak Bridge Interchange North, this junction exceeds capacity in the PM peak in the base year and this is exacerbated when Local Plan Growth traffic is added. This is in contrast to the 2013/15 assessments which identified this junction as operating within capacity for most development scenarios.
- Ba5 Cranes Farm Road / A176 Upper Mayne / St. Nicholas Lane, is approaching capacity in the base year and exceeds capacity in the future years. Widening the St Nicholas Lane approach to the roundabout will have some benefit, improving capacity to a similar level to the Background Growth in the AM peak, but does not create sufficient additional capacity to fully accommodate expected Local Plan traffic growth.
- Ba7 Broadmayne / South Mayne / Ashlyns is also operating close to capacity and additional development traffic results in the operational capacity being exceeded. Again, there are several development sites located near to this junction.
- Ba 24 A13/A176 Five Bells Interchange North is assessed as operating over capacity in the base year and future year within this study. The 2013/15 study found that this junction only exceeded capacity in the PM peak, but this was the case for all development scenarios tested.
- Ba26 A13/A132 Pitsea Interchange is also approaching capacity in the base year and exceeds capacity in the future years. The 2013/15 assessment also found that this junction was approaching or at capacity in all development scenarios. The assessment has demonstrated that in the base year the congestion is primarily related to the A13 west entry in the AM and Broadway link in the PM, when Draft Local Plan Growth is added all arms will experience congestion in one or both of the peak periods.

- 6.7.14 Ba19 High Road / Somerset Road / Laindon Link is operating within capacity for all assessments in the 2013/15 studies. This study has found that this junction will slightly exceed capacity when Draft Local Plan Growth is added, but this is of a level where mode shift to sustainable modes may be able to mitigate this impact.
- 6.7.15 Ba14 B1464 London Road / High Road / Clay Hill Road is operating over capacity in all scenarios, in the 2013/15 assessments this junction was operating within capacity for the base year but exceeded capacity for all future year scenarios.
- 6.7.16 Ba15 Cranes Farm Road / A132 East Mayne is operating over capacity in all scenarios, in the 2013/15 assessments this junction was approaching capacity for the base year but exceeded capacity for all future year scenarios.
- 6.7.17 Ba29 B148 West Mayne / Mandeville Way exceeds capacity when Draft Local Plan growth is added to the network, even with traffic reassigned for the Dunton relief road. The junction operates close to capacity in the Background Growth scenario. There are over 2400 dwellings proposed within sites 10a and 10b, a large proportion of which are expected to use this junction. This junction wasn't assessed as part of the 2013/15 study and was added at this stage in recognition of the possible impact from the development proposals. Ba4 A127 / A132 Nevendon Interchange Junction, is expected to exceed capacity based on the modelling work, however improvements have already been introduced at this junction which are expected to accommodate Local Plan development traffic.
- 6.7.18 Based on the findings outlined above (illustrating continual capacity constraints in the future scenarios with the addition of the Draft Local Plan Growth), and the limitations associated with this initial option testing, it is apparent that further work is required within the 'Part 2' study, looking at alternative mitigations options that provide a more effective solution. This will explore additional mitigation measures for the Basildon area in combination with larger scale infrastructure improvements as a preferred package of measures.

General conclusions

- 6.7.19 In general, the modelling results are consistent with the previous assessment undertaken, there are some differences, which are due either to changes in development assumptions or because of more accurate assignment of development traffic.

- 6.7.20 Modelling used within this assessment assumes that some of the large sites are accessed from a single point which puts significant pressure on some of the nearby junctions. When modelling the final growth scenario, it will be beneficial to consider whether some larger sites will access the network from more than one location, spreading the impact onto the road network.
- 6.7.21 This assessment has considered the overall impact of all development proposed within the Draft Local Plan Growth scenarios. Transport Assessments will still be required for sites as they come forward in order to establish the specific impacts of the individual sites and to ensure that they are appropriately mitigated. These assessments would take into account the additional detail that would be expected to be available that could affect the traffic impact of the development proposed.
- 6.7.22 While the mitigation options illustrate potential benefits across certain sections of the selected road network, there are still a number of junctions that present capacity issues and network constraints in the future year. The 'Part 2' Study will assess the final package of mitigation measures to be taken forward, which will be considered in line with the proposed Final Growth Scenario to ensure schemes are appropriate in scale, and 'fit for purpose'.
- 6.7.23 Specific consideration will be given to scoping alternative mitigation measures at junctions where little or no benefit has been identified from the previous mitigation options tested, as demonstrated in the Basildon area. For the Wickford and Billericay areas, the modelling results identify additional mitigation tests are required at junctions where mitigation options have not yet been considered.
- 6.7.24 The mitigation package will include the likely combination of measures, which best perform and complement other committed highway improvement schemes and the more significant infrastructure improvements proposed.

7 Sustainable Transport Infrastructure Appraisal

7.1 Introduction

- 7.1.1 The Basildon Draft Local Plan (January 2016) identifies a number of strategic policies which, amongst other things, set out to ensure the delivery of an enhanced and integrated transport network, facilitating improvements to footpaths, footways and cycling infrastructure, as well as public transport infrastructure and services.
- 7.1.2 The guidance note titled '*Transport evidence bases in plan making and decision making – October 2014*', published under the Department for Communities and Local Government's National Planning Policy Framework (NPPF), outlines the sustainable approach recommended to inform a transport assessment of a Local Plan. This includes consideration of "*The locations of proposed land allocations and areas/corridors of development and potential options for the provision of sustainable transport and transport networks to serve them*".
- 7.1.3 A qualitative desktop appraisal has been undertaken to identify potential sustainable transport measures that could be implemented within the local area. While facilitating modal shift and healthier choices through reductions in car travel, these measures can also be considered as alternative or supporting mitigation options to the infrastructure improvements proposed on the local highway network, when accommodating the growth in total person trips projected in the Borough in 2034. This could provide benefits not only in alleviating the traffic and congestion pressures forecasted on the existing highway network, but could reduce the need for implementing costly highway schemes, when supporting the additional local plan growth across a range of alternative local transport and sustainable networks. These findings will be used to inform the Sustainable Transport Strategy for the Basildon area which, in turn, will feed into the wider South Essex area strategy if produced.
- 7.1.4 This qualitative assessment focused on the consideration of sustainable infrastructure targeted at particular areas of the Borough based on the location and relative size of Draft Local Plan development sites. It has also involved co-ordination with work currently being undertaken to develop the Basildon Cycling Action Plan in order to identify possible cycle infrastructure improvements as part of the Essex County Cycling Strategy.

7.1.5 The objective of this appraisal is to highlight key corridors where future demand for sustainable transport is likely to exist, and therefore where measures may be required to facilitate a mode shift away from private motor vehicles, in order to help focus the efforts of the strategic policies relating to sustainable transport provision set out in the Draft Local Plan.

7.2 Bus Network

Identification of existing infrastructure

7.2.1 An overview of the existing bus provision in the Borough, including bus routes, stops and frequencies, has been undertaken in order to identify possible gaps in future service provision. The consideration of 'gaps' may range between areas that have no bus services at all, infrequent bus services, or bus services with insufficient or inadequately located bus stops. In order to set the context, Figure 7-1 has been prepared to show the provision of existing bus infrastructure and services in the context of the Draft Local Plan growth scenario.

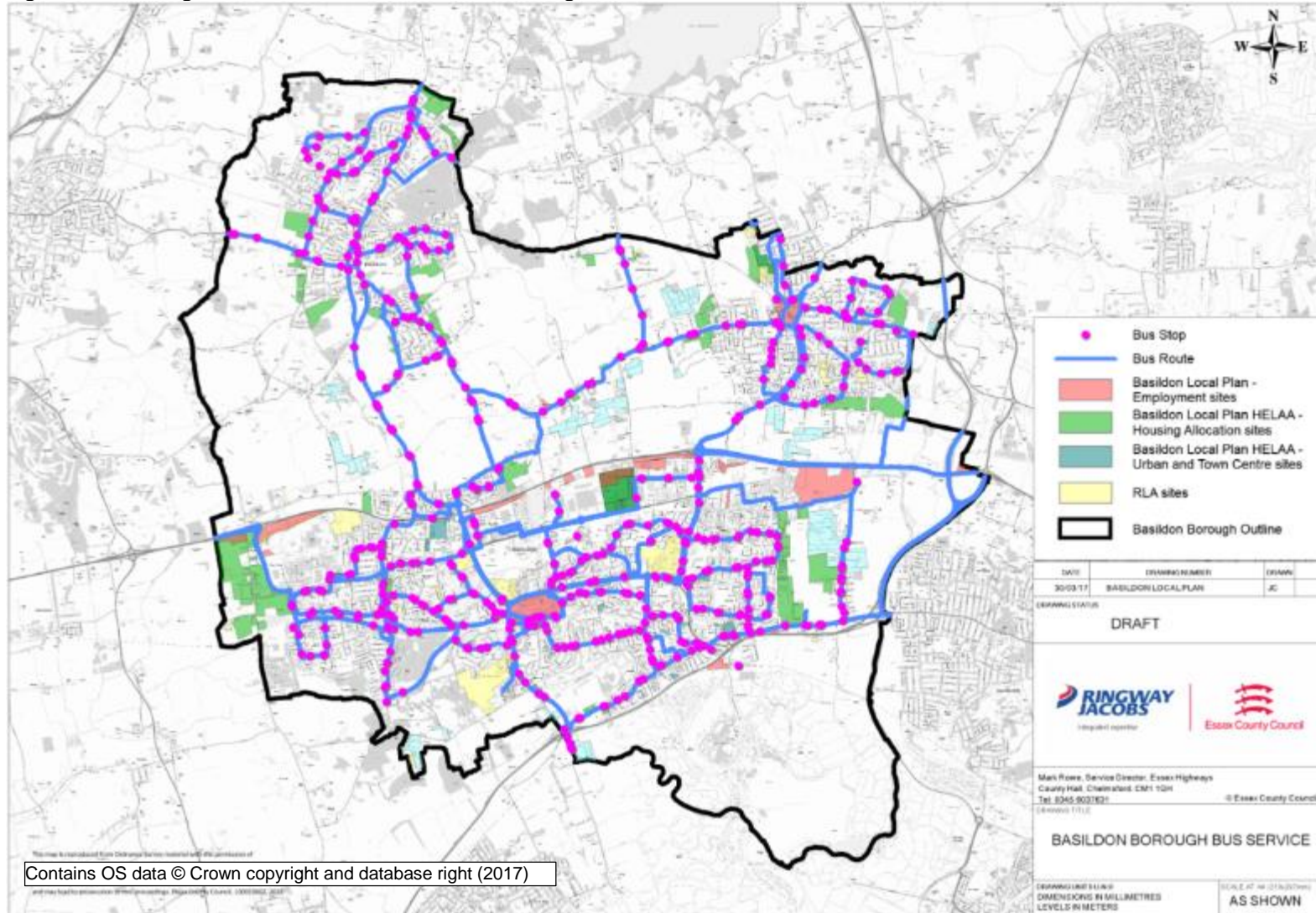
7.2.2 The mapping of existing bus routes against the location of planned future growth as shown in Figure 7-1 allows for an appraisal of locations where extending or diverting bus routes, increasing the capacity of existing bus services and/or the provision of new bus services to developments (specifically those that are large enough for a new service to be economically viable) and the promotion of existing bus services might be necessary.

7.2.3 In addition to this, census Journey to Work (JTW) patterns across Basildon have also been analysed to determine areas of scope for encouraging uplift in bus modes based on the volumes of short distance commuter trips to key locations in the Borough. From this information it is evident that a high level of demand exists for bus connections to rail services, as well as connections to and from Basildon itself from other parts of the Borough, particularly from Wickford and Billericay.

Potential improvement options – bus routes

7.2.4 Provision of new bus services or alterations to existing services would be dependent on site location both in regard to general services and the rest of the bus network, social mix, design of the development etc. Isolated developments in rural areas would be less likely to sustain a service than those on the edge of town.

Figure 7-1: Existing Bus Route Network in Basildon Borough



- 7.2.5 Discussions with Essex County Council's Passenger Transport team determined levels of development estimated in the region of 400-600 dwellings as appropriate for provision of a new bus service. On this basis, there are a number of sites which form part of the Draft Local Plan growth scenario which may be of sufficient size to attract a new bus service. There are a number of closely situated sites which, when combined, could be of sufficient size also to attract a new bus route.
- 7.2.6 Based on this list of 'major' sites, reference has been made to the JTW census data and specifically the car trips made to and from each approximate area. The car driver trips have been considered because it more clearly identifies the 'desire lines' for those travelling to and from work and shows those trips that have the highest potential to be completed instead via a bus service.
- 7.2.7 An appraisal of the larger development sites which do not currently have immediate access to a bus service is presented below, along with recommendations to resolve these shortfalls.

Southwest of Billericay – Housing Allocations H20 to H23

- 7.2.8 Located to the southwest of Billericay, Housing Allocation sites H20 to H23 are anticipated to comprise of some 945 residential units, with access anticipated via Tye Common Road which currently is not served by a bus route, as shown in Figure 7-2. Bus route no. 9 (Basildon – Brentwood) and no. 256 (Basildon – Billericay) both currently operate within the vicinity of Tye Common Road.
- 7.2.9 Based on 2011 JTW data, a high proportion of car driver trips to and from south Billericay have a destination within Brentwood, Laindon or Basildon. Existing bus trips to/from work are minimal, but either occur to Basildon or to Chelmsford. See Figure 7-3.
- 7.2.10 The level of residential development forecast suggests that a new or diverted bus route via Tye Common Road / Frithwood Lane and/or along the new link road should be provided to ensure that new residents can access Billericay town centre, Basildon and Brentwood via public transport. The service could either be a new route or a diversion or connection into existing inter-town services.

Figure 7-2: Potential bus service provision southwest of Billericay

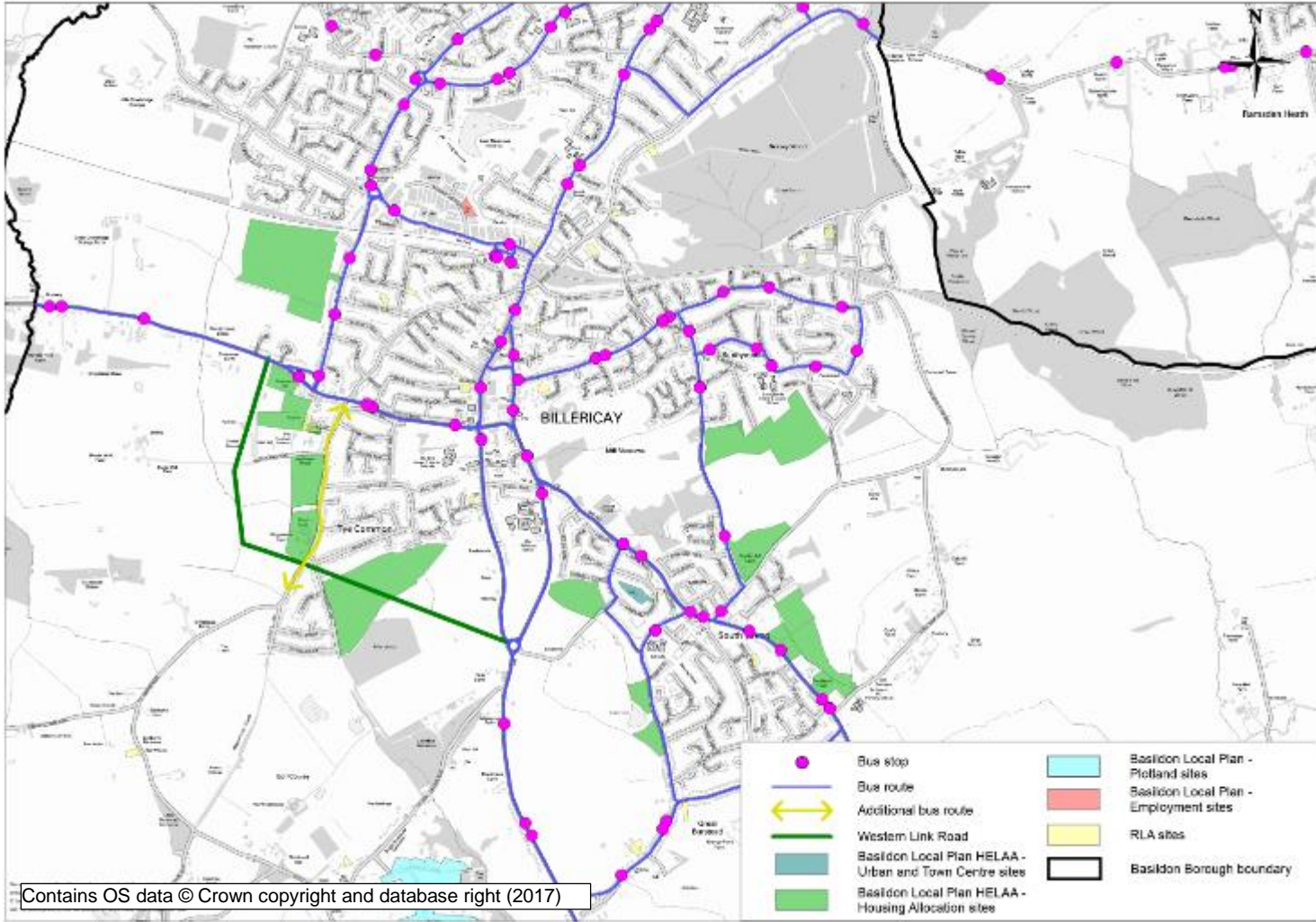
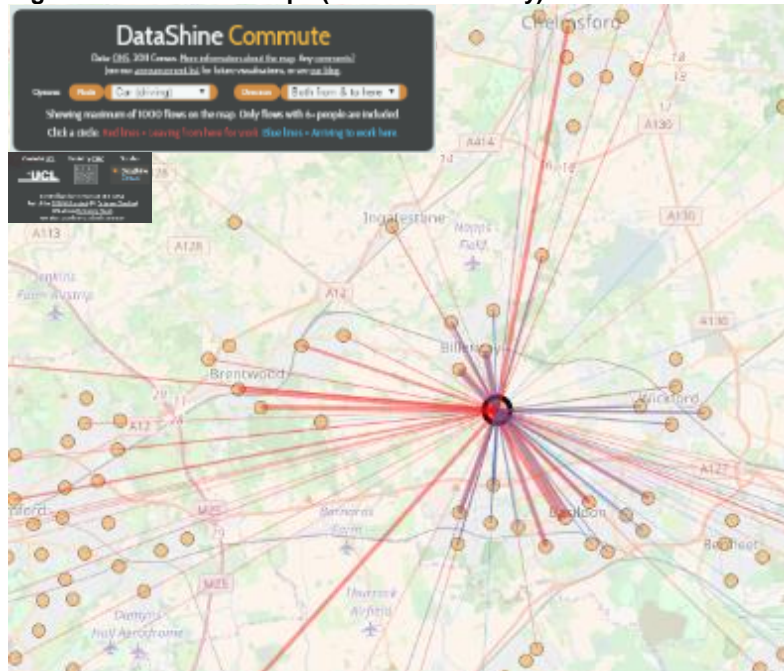


Figure 7-3: 2011 JTW Trips (south of Billericay) – Car Driver



Source: <http://commute.datashine.org.uk/>(2017)

Southeast of Wickford – Housing Allocations H14 & Burnt Mills

7.2.11 Housing Allocation H14, located to the southeast of Wickford on Cranfield Park Road, is anticipated to accommodate some 870 residential units. Although fairly frequent bus services currently operate along Cranfield Park Road / Salcott Crescent to the northeast of the Housing Allocation, the shape of the site(s) means that these services will not be located within a convenient walking distance to most new residents.

7.2.12 Based on 2011 JTW data, see Figure 7-5, a high proportion of car driver trips to and from south Wickford have a destination predominantly within Basildon or Laindon, as well as Wickford and Shotgate. Existing bus trips to/from work are minimal, but all occur in the direction of Basildon.

7.2.13 These movement patterns along with the anticipated size of Housing Allocation H14 suggest that it could be supported by a new bus route or a diversion of an existing service which currently operate to the northwest of the site. Either way, a service or services should provide a public transport connection into Wickford and to Basildon / Laindon to facilitate these trips which are currently popular by private car.

7.2.14 The potential new A127 interchange presents an opportunity for a new north-south bus route connecting Cranfield Park Road and Pound Road to also serve the proposed employment areas along Burnt Mills Road, as shown in Figure 7-4.

Figure 7-4: Potential bus service provision southwest of Wickford

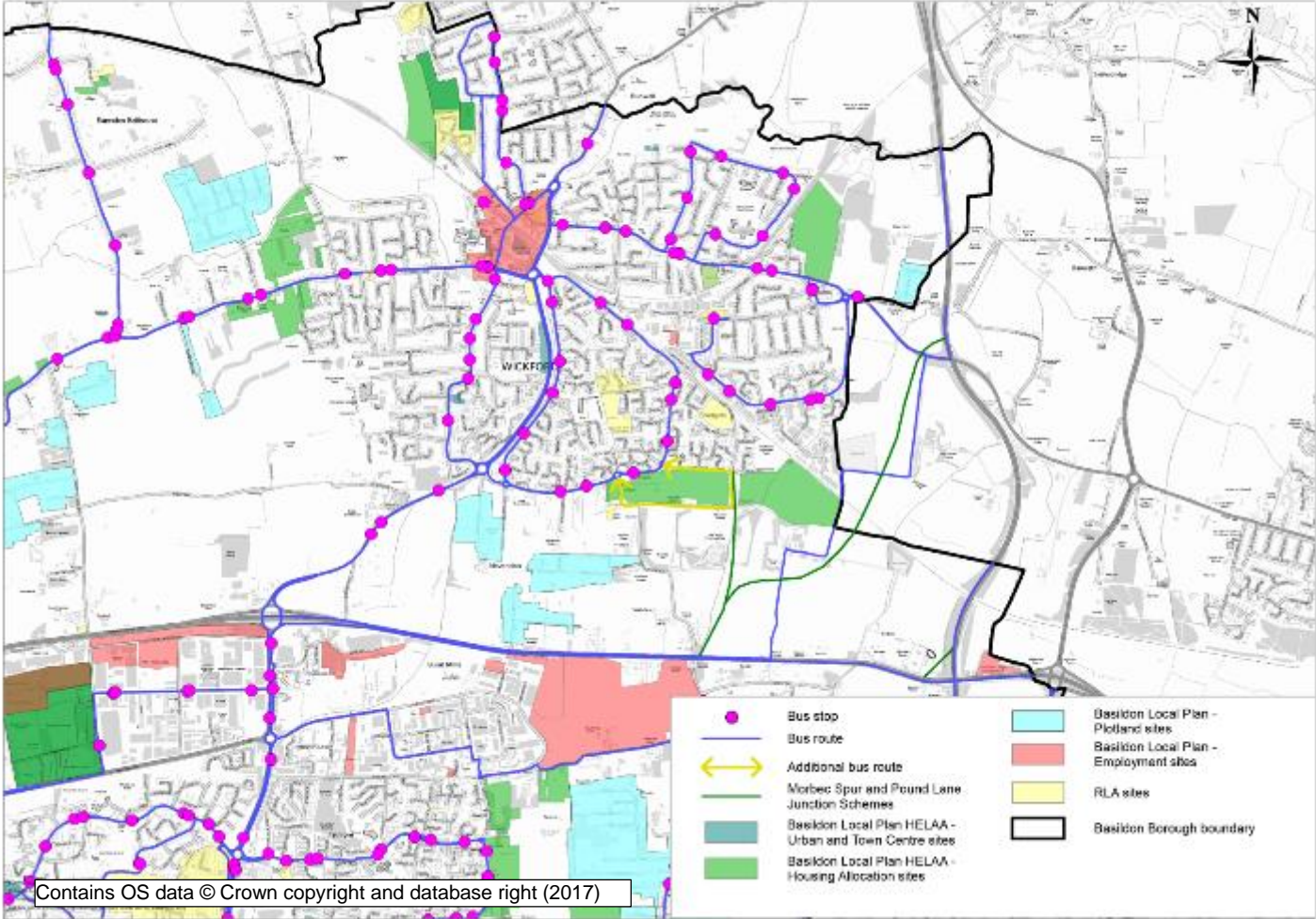
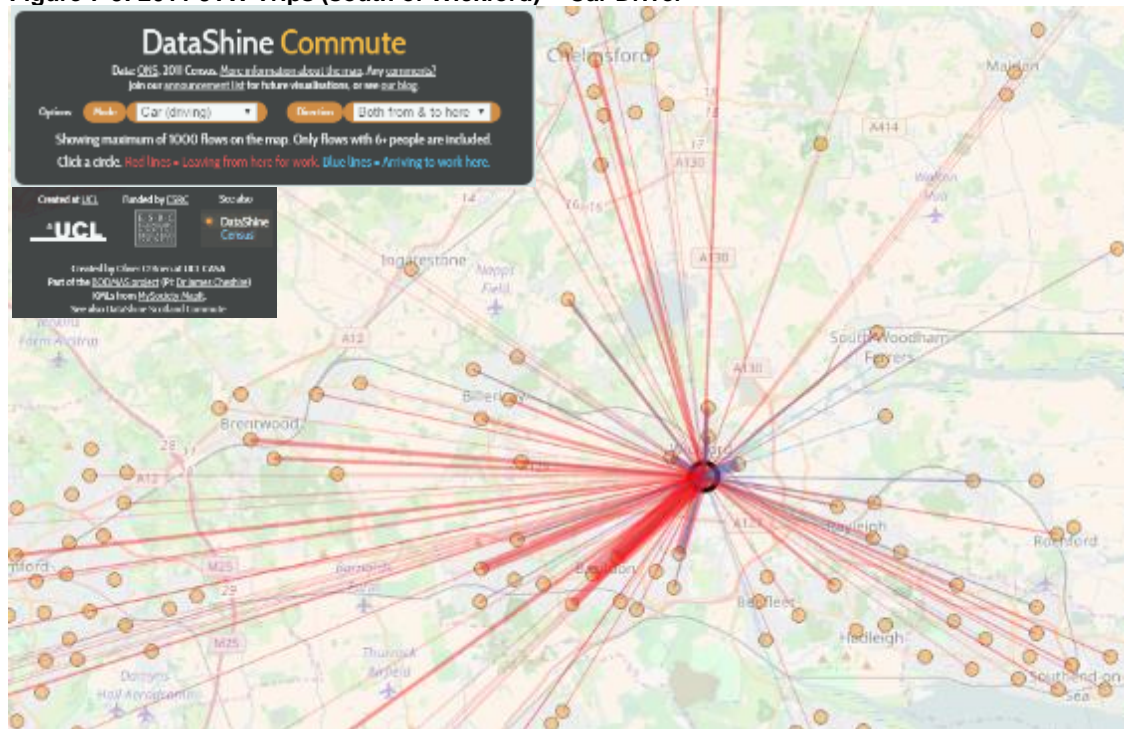


Figure 7-5: 2011 JTW Trips (south of Wickford) – Car Driver



Source: [http://commute.datashine.org.uk/\(2017\)](http://commute.datashine.org.uk/(2017))

West of Basildon – Housing Allocation H10

7.2.15 Housing Allocation H10, located to the west Basildon and Laindon and on the western side of West Mayne is anticipated to accommodate just over 1,000 new residential units as well as some 5.5Ha of employment. Currently bus services run along the main routes surrounding this land. A potential opportunity exists to extend these route(s) to connect future residents with Laindon, Basildon and other key employment areas within the Borough.

7.2.16 Based on 2011 JTW data, a high proportion of car driver trips to and from south Wickford have a destination predominately within various parts of Basildon – most predominately the employment land in Laindon and Basildon Town Centre - as well as Brentwood. Existing bus trips to/from work are minimal, but all occur to Basildon.

Figure 7-6: Potential bus service provision west of Basildon

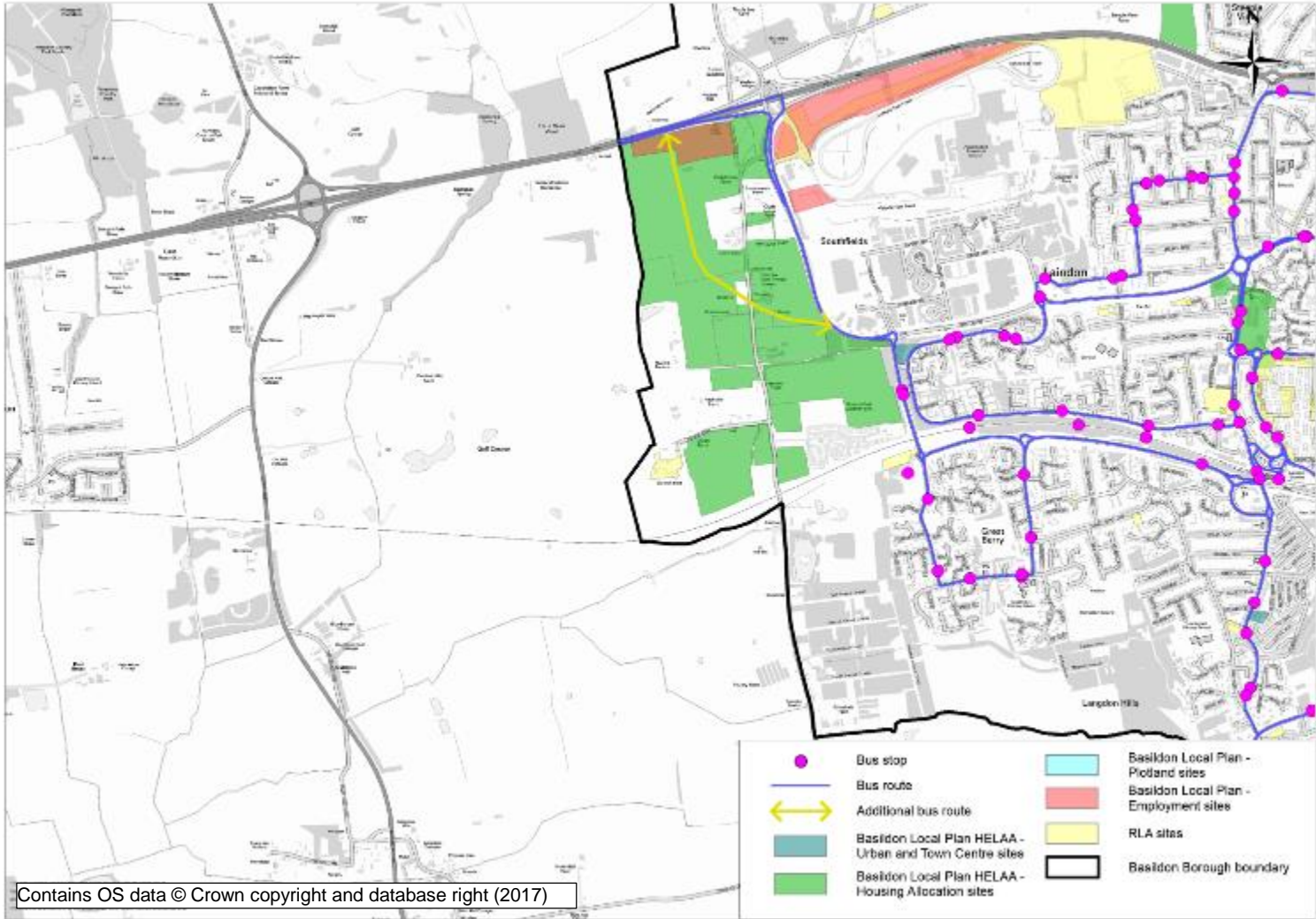
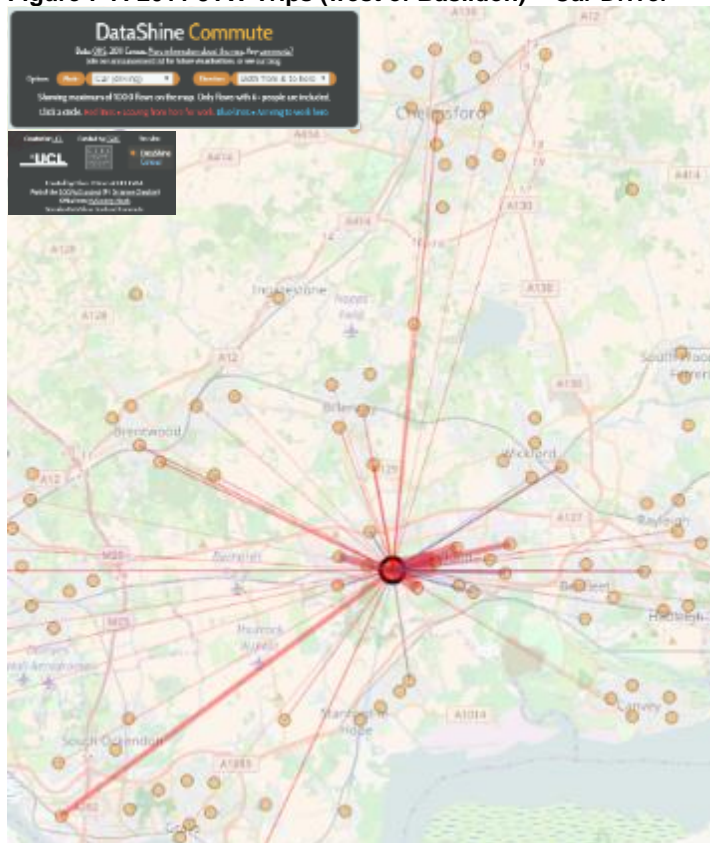


Figure 7-7: 2011 JTW Trips (west of Basildon) – Car Driver



Source: [http://commute.datashine.org.uk/\(2017\)](http://commute.datashine.org.uk/(2017))

Housing Allocations H8 and H13

- 7.2.17 Proposed to be located at the southern and eastern fringes of Basildon respectively, Housing Allocations H8 (725 residential units) and H13 (2,000 residential units) are of a size likely to be solely capable of supporting a bus service or multiple services.
- 7.2.18 Housing Allocation H13 is bisected by open space and as such would need to be adequately serviced by bus along both its eastern and western ‘halves’.
- 7.2.19 It should also be noted that a small development (20 to 30 dwellings) could support a change to an existing bus service (i.e. looping through the estate and re-joining the existing route) if required resources were limited to kick-starting and marketing/publicity for example. With reference to existing route maps and the Draft Local Plan growth scenario, the following sites could potentially benefit from a diversion from an existing bus route.

Potential improvement options – junction priority

- 7.2.20 Based on existing journey to work patterns, see Figure 7-7, and the distribution and quantum of anticipated residential and employment-based development which forms the Draft Local Plan, there are considered to be three main public transport ‘corridors’ where demand is likely to grow significantly see Figure 7-8.
- 7.2.21 Any bus infrastructure proposals will be subject to agreement on their viability with bus companies. This, it is envisaged, should be undertaken as part of development Transport Assessments in the future.

7.3 Cycling Network

Identification of existing cycling infrastructure

- 7.3.1 Figure 7-9 has been prepared to show the existing cycling network in Basildon, which is comprised of a mixture of on and off-road facilities, part of which comprises the National Cycle Route. For context, the sites which form the Draft Local Plan growth scenario have been overlaid onto this figure to show how the existing infrastructure relates to the likely future development.
- 7.3.2 As can be seen, there is a good provision of facilities through Basildon Town Centre (particularly east-west), but limited connectivity within Wickford and Billericay. Apart from the connection between Basildon and Wickford, there is no cycle connection between any other major conurbations within the Borough.
- 7.3.3 The National Cycle Route passes through the heart of Basildon to/from Southend in the east and Thurrock in the south, and also extends south from Chelmsford but terminates at Heath Road, at the northern side of Billericay.
- 7.3.4 Figure 7-9 also demonstrates that there are a number of sites within the Draft Local Plan growth scenario which are not (currently) linked into town centre locations with cycling infrastructure, particularly in Billericay and Wickford.

Figure 7-8: Indicative Demand Corridors

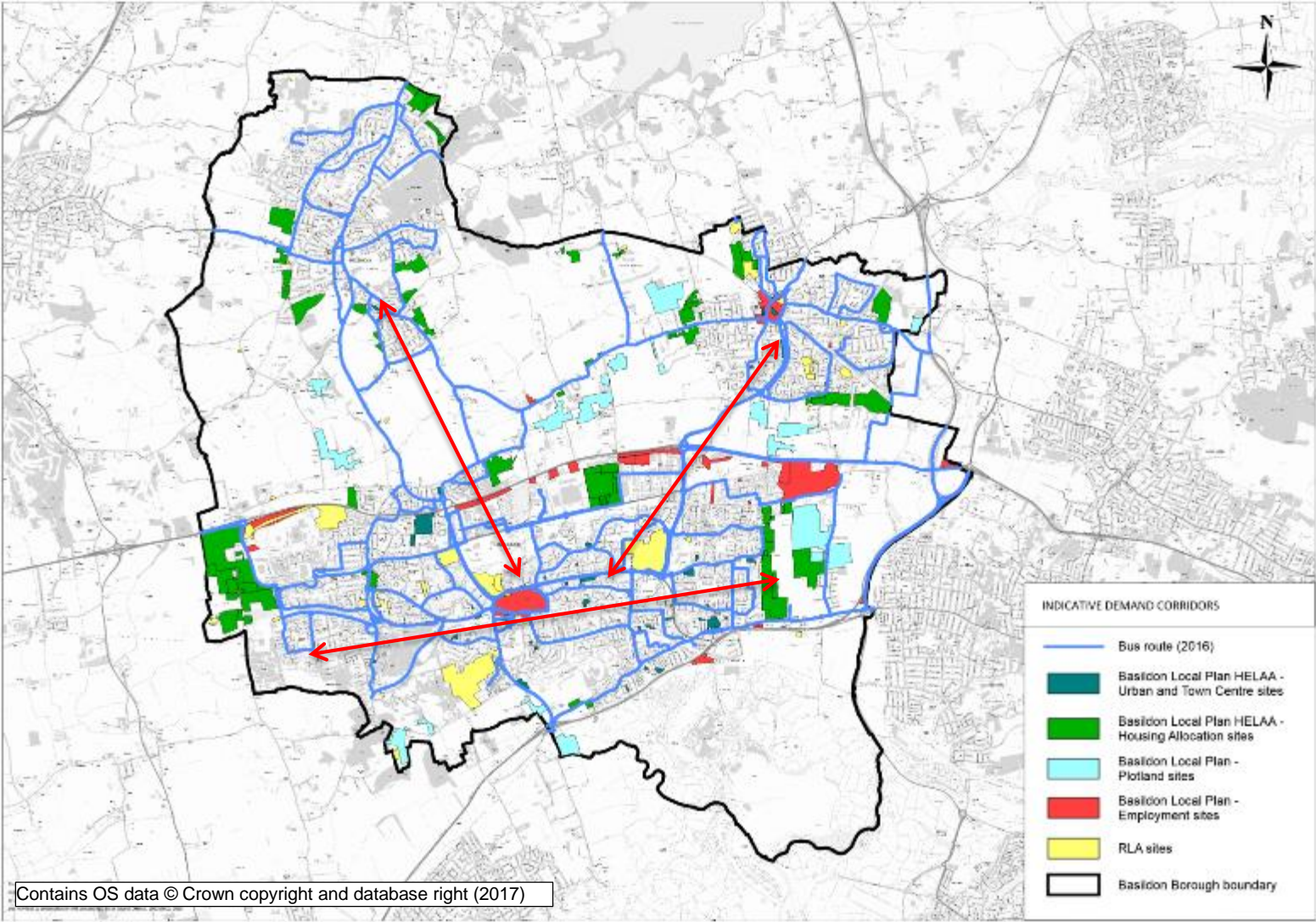
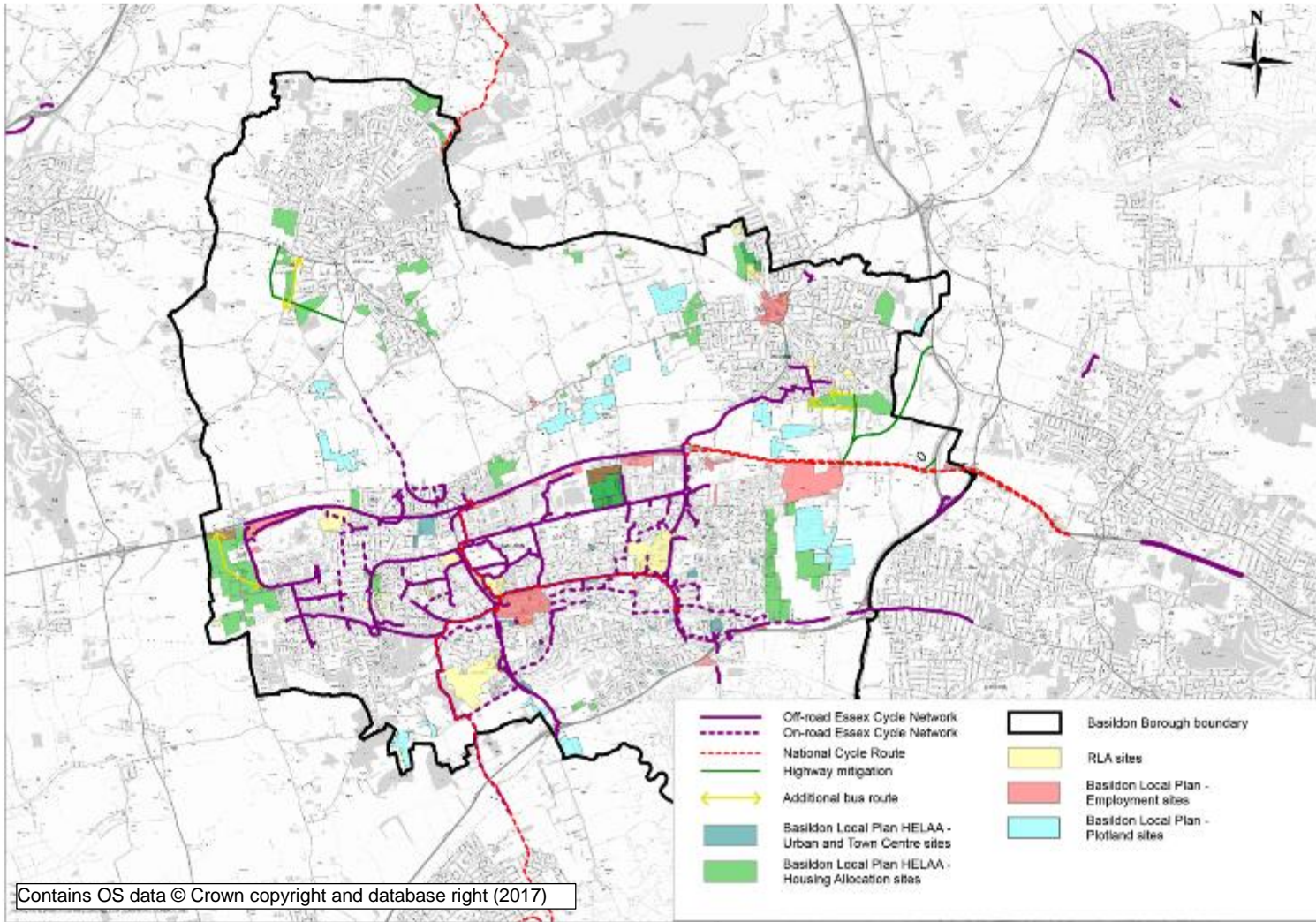


Figure 7-9: Existing Cycling Network in Basildon (with Draft Local Plan development sites)



Potential improvement opportunities

- 7.3.5 Through the delivery of the BCAP, it is hoped that the provision of complete cycle routes or even a coherent cycle network will encourage people to make short trips by bicycle rather than by car. Future development can then add to the cycle network, thus providing an even wider cycle network, encouraging both existing and future short trips to be made by bicycle. The delivery of such cycling schemes and recommendations identified as part of the BCAP are to be supported through policy within the Basildon Local Plan.
- 7.3.6 A Cycle Action Plan for Basildon is currently being produced, this is expected to identify opportunities to provide additional cycle routes and facilities, supporting the increasing the proportion of trips made by bike.

7.4 Sustainable Transport Measures

- 7.4.1 For the larger sites, both residential and employment, it will be important to include a requirement through the Planning Process for sustainable modes of travel to be considered and thoroughly planned for in both 'hard' measures (e.g. such as cycle paths, bus routes, pedestrian connections, etc.) as well as 'soft' measures (e.g. travel plans, incentives such as subsidised costs, etc.). It will be important for large sites to plan for all modes of travel not just the private motor car.
- 7.4.2 Personal Travel Planning (PTP) schemes could also be considered, involving engaging with residents through interviews and handing out PTP packs that include useful transport leaflets and incentives, to promote sustainable transport.

7.5 Trip Rate Variation

- 7.5.1 A study was undertaken to inform the Braintree Local Plan Interim Assessment (Essex Highways, May 2016) which looked at the propensity to use public transport. This study reviewed the potential for morning peak hour journeys to switch to public transport modes by reviewing multi-modal surveys in the TRICS database¹⁹, and then calculating and analysing typical bus trip rates per dwelling based on location and varying levels of public transport provision.
- 7.5.2 The TRICS database, which contains survey data on the number of trips that enter and leave developments, has been explored to see which conditions result in higher or lower vehicle trip generation and public transport use characteristics.

¹⁹ Note that sites within TRICS are from throughout England and are not specific to Braintree. The sites used in the study had varying availability of public transport.

- 7.5.3 Through the analysis of the trip rates, it was demonstrated that where there are good levels of public transport provision, then car trip generation is likely to be less than where there is poor public transport provision. Correlation between the public transport provision for the sites used from the TRICS database and 2011 Census JTW data was investigated and it was found that there is a positive correlation between trips to work by public transport and public transport provision, although not necessarily strong.
- 7.5.4 Correlation coefficients were calculated, where +1 is a perfect positive correlation and -1 is a perfect negative correlation and 0 is no correlation. Houses scored 0.81 (strong) and flats scored 0.59 (modest). There is negative correlation between car use and public transport provision, particularly for flats, so where there is poor public transport provision there will be high use of cars; the scores were 0.39 (weak / no correlation) for houses and -0.52 (modest) for flats.
- 7.5.5 The study undertaken for Braintree indicates that it is reasonable to assume that a higher proportion of trips will be made by sustainable modes where good sustainable transport is provided. A reduction in trip rates has not been applied within this assessment. However, where a site is located on the edge of town but not on the outer fringe of a town and is accessible by public transport or based on the recommendations below is likely to have public transport access in the future, the 'suburban' trip rate has been adopted. This is considered to be more representative of residential development which has access to local services including public transport connections; rather than development that sits at the outer fringes of urban areas where private car use may be more probable.
- 7.5.6 In considering a Final Growth Scenario and associated mitigation options, a reduction in trip rates that can be justified in combination with the sustainable transport mitigations proposed, will be included within the assessment of the mitigation measures.

7.6 Summary

- 7.6.1 Although not exhaustive, the above review identifies a number of opportunities where provisions for sustainable modes of transport are likely to both (a) be required in the future to support development, and (b) if provided are likely to be capable of encouraging more sustainable modes of travel from the outset.

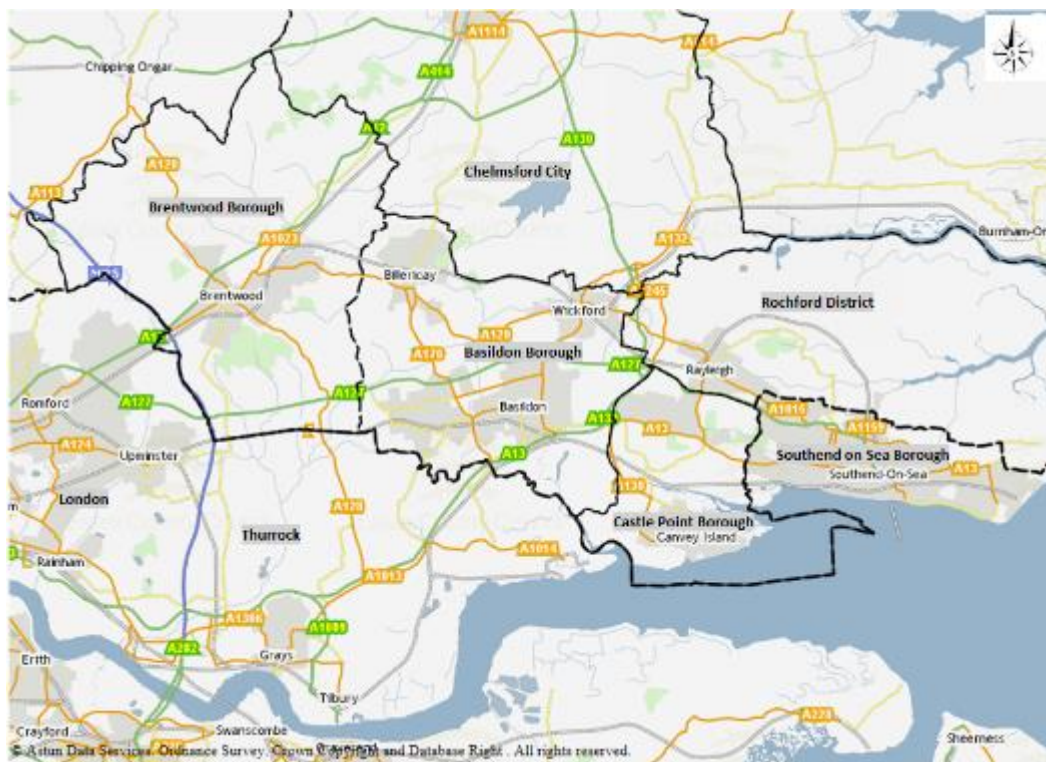
At this stage, it is not proposed to undertake any design work on walking/cycling proposals; however, the development of the Basildon Cycling Action Plan will continue to develop options and proposals. In addition, a Sustainable Transport Strategy will be developed for Basildon and this will feed into a wider South Essex Sustainable Transport Strategy should one be developed.

8 Cross Boundary Impacts

8.1 Introduction

8.1.1 Whilst the previous sections have focussed on the internal impacts within the Borough, this section provides a comparison of the current assumptions for the cross-boundary trips forecast by the Draft Basildon Local Plan and the surrounding Boroughs and Districts, which are also in various stages of developing their own Local Plans. For reference, the neighbouring Boroughs / districts are shown in Figure 8-1.

Figure 8-1: Basildon's Neighbouring Boroughs & Districts



8.1.2 The purpose of this appraisal is to consider the impact of the Basildon Local Plan development traffic on the road network at the Borough boundary with neighbouring authorities, to aid in a clearer consideration of the transport effects between the various Boroughs, Districts and Unitary authorities.

8.2 Methodology

8.2.1 The key highway links which have formed the focus of this appraisal include:

- B1007 in Stock (Chelmsford CC)
- A130 (Chelmsford CC)

- A127 (Brentwood BC) (Southend UA) (Rochford DC) (Castle Point BC)
- A13 (Thurrock UA) (Southend UA) (Castle Point DC)

8.2.2 Cross-boundary development flows on the strategic road network have been identified using the VISUM network model for the 2034 Draft Local Plan growth scenario combined with DfT traffic counts with TEMPro growth applied at the boundary locations.

8.2.3 Further work with neighbouring Boroughs will be undertaken to understand the impact of development in those Boroughs / districts on the road network in Basildon. The trip generation and TEMPro growth rates will account for an element of trip generation/attraction to and from areas outside of the Borough and therefore to some extent external impacts are partially accounted for.

8.2.4 The location of the points where cross boundary impacts were measured are shown in Figure 4-2. The potential cross-boundary impacts of the Basildon Local Plan development trips have been indicated by calculating the percentage change in flows on the network at each location assessed.

8.3 Cross-Boundary Impact Appraisal

8.3.1 The flows and percentage increases on the key strategic cross boundary routes are outlined in Table 8-1.

Table 8-1: Cross Boundary Traffic Flows and Percentage Increases

Location	Background Growth 2034 two way flows		Draft Local Plan Growth 2034 two way flows		Increase in flow	
	AM	PM	AM	PM	AM	PM
B1007 Chelmsford	1684	1722	1684	1820	0%	6%
A130 Chelmsford	3609	3604	4061	3948	13%	10%
A127 Brentwood	5726	5698	6639	7775	16%	36%
A13 Thurrock	5381	5401	6404	6812	19%	26%
A13 Castle Point	4558	4553	5013	4751	10%	4%

8.3.2 The results show some significant increases in traffic at some locations in both percentages and absolute numbers. The B1007, A13 to/from Castle Point and A130 to/from Chelmsford experience relatively low levels of traffic increase as a result of Local Plan Growth.

8.3.3 The table above shows the impact of Basildon development traffic plus TEMPro growth on the network. Development traffic flows expected from the Local Plan growth set out in the Local Plans of neighbouring authorities has not been specifically considered because these plans are not sufficiently developed and do not have detailed traffic modelling outputs for comparison purposes.

8.3.4 As mentioned previously in this report, cross boundary impacts are being considered in greater detail as part of the A13, A127 and future A12 corridor studies.

8.3.5 The 'Part 2' Study will consider the impact of the Final Local Plan Growth at the following key strategic junctions located on or near the Borough boundary:

- A13 / Sadlers Farm
- A127/A130 Fairglen Interchange
- A130 / A132 Rettendon Turnpike
- A127 / Halfway House

9 Conclusions

- 9.1.1 This assessment has considered the overall impact of all development proposed within the Local Plan Growth scenarios. Transport Assessments will still be required for sites as they come forward in order to establish the specific impacts of the individual sites and to ensure that they are appropriately mitigated. These assessments would include a more detailed assessment of the eventual development proposals to determine the traffic impact and required mitigation.
- 9.1.2 Many of the junctions assessed are expected to either operate within capacity when Local Plan development traffic is added to the network, or mitigations already identified are expected to be able to accommodate the expected additional traffic. However, there are some key junctions where new mitigations need to be identified or where mitigations identified to date do not create sufficient capacity to accommodate development traffic. These additional measures will be considered and tested in more detail in the 'Part 2' Study.
- 9.1.3 The results of this study have been cross referenced against the previous Highway Impact Assessment work that has been undertaken to ensure consistency. There are some differences in results, due to changes to the development scenarios considered and the more robust assignment methodology used within this assessment.
- 9.1.4 Access to sustainable modes will be an extremely important measure to mitigate the impact of Local Plan traffic. A Sustainable Transport Strategy will be produced for the Basildon area which will feed into the wider South Essex area strategy if developed. A Sustainable Accessibility Appraisal has been undertaken to support this Highway Impact Assessment, and there have been several areas where the potential to improve sustainable access have been identified.
- 9.1.5 If sustainable modes are implemented across the Borough, there may be justification for assuming a reduced number of vehicle trips. This reduced trip rate could have a positive effect at several junctions that are operating just over capacity in the Local Plan Growth scenario, possibly bringing them to a level of operation within capacity. Where it can be justified a reduced trip rate will be applied and tested within the 'Part 2' Study. Whilst road infrastructure measures have been assessed as part of this study, these should ultimately be considered within an overall context of looking towards adopting a more sustainable, cost-effective approach to mitigating traffic growth in Basildon in the future.

9.1.6 The assessment to date identifies the impact from Basildon development on the wider highway network. Further work to understand the wider cross boundary impacts should be considered in collaboration with neighbouring local authorities.

9.2 Billericay

9.2.1 The Sustainable Accessibility Appraisal demonstrated most sites identified for residential development in Billericay have good or high levels of sustainable access although there are sites or alternative options that have limited levels. The majority of sites in Billericay have potential for encouraging cycle use based on their proximity to local services and this opportunity needs to be maximised in order to increase cycle use. There are some sites, due to their size, which could warrant either a new bus service to the site or have the potential for an existing bus service to be redirected closer to the site, which would have potential to increase the public transport mode share.

9.2.2 For Billericay, when considered in combination at the junctions assessed, the removal of the one-way restriction on the A176 Laindon Road provides good mitigation at the junctions assessed. Capacity issues are expected to remain in the PM peak.

9.2.3 The Western relief road goes some way to relieve congestion in the PM peak. The assessment has also considered the removal of the one-way restriction in combination with the implementation of the Western Link Road, this created additional congestion at Bi5 A129 London Road / High Street / Sun Street junction, which is partly relieved through the signalisation of that junction. Further upgrades to this junction may be required to mitigate development impacts and these will be considered within the 'Part 2' Study.

9.2.4 The upgrade of Mountnessing Road to a roundabout is expected to successfully relieve significant congestion that would be expected here when development traffic is introduced to the existing highway network.

9.2.5 There may be scope to review how development sites to the east of Billericay access the road network as there is expected to be a significant volume of development traffic using the A129 Southend Road/ Outwood Common Road.

9.2.6 There are several junctions for which this study has identified or confirmed the need for mitigation options to be identified and these will be considered in detail within Part 2.

9.3 Wickford

- 9.3.1 The Sustainable Accessibility Appraisal demonstrated that the sites identified for residential development in Wickford have good or high levels of sustainable access, which means that there is potential for reduced reliance on cars, and higher use of sustainable modes. The majority of sites in Wickford had potential for encouraging cycle use based on their proximity to local services and this opportunity needs to be maximised in order to increase cycle use. In general, the sites in Wickford are not large enough to provide potential to provide better public transport services than what is already provided to and from the residential sites. Only site H14, Land south of Cranfield Park Road, had potential to change existing bus services to serve the development site, this was based on the size of the site and proximity to the nearest bus route.
- 9.3.2 For Wickford, the proposed Pound Lane junction and associated new links to the highway network provide good mitigation for Local Plan development growth, particularly in the AM peak. This mitigation was also undertaken for the junctions in East Basildon, this assessment found that there was an increase in congestion at these junctions. Options to reduce this impact will be considered within the 'Part 2' Study, these are likely to include the option to deliver only the first link road from Pound Lane and to restrict movements on routes to the South of the A127, -particularly between Pound Lane and Burnt Mills Road.
- 9.3.3 Junction W3 (A132 Runwell Road / Church End Lane) may require a wider analysis to understand if growth in demand as a result of new developments can be better mitigated as it currently shows as significantly over capacity in the Draft Local Plan Growth scenario. In addition, Wickford sees a large increase junction demand and delay at the junction Ra1 (A129 London Road / A1245 Chelmsford Road) as a result of the Draft Local Plan Growth in the PM.

9.4 Basildon

- 9.4.1 The Sustainable Accessibility Appraisal demonstrated that some sites in Basildon had better sustainable access than others, with several showing limited levels of sustainable access. The large sites within Basildon do have potential for better public transport services to be provided and the majority of sites had potential for encouraging cycle use based on their proximity to local services. If this potential is realised it could be expected to reduce reliance on cars, reducing vehicle trips.
- 9.4.2 Modelling used within this assessment assumes that some of the large sites are accessed from a single point which puts significant pressure on some of the nearby junctions. When modelling the Final Growth Scenario, it will be beneficial to consider whether some larger sites will access the network from more than one location, spreading the impact onto the road network.

9.4.3 Possible mitigation measures will need to be considered within the 'Part 2' Study for the B1464 London Road/High Road/ Clay Hill Road junction as Draft Local Plan Growth is expected to result in the junction exceeding its operational capacity.

9.5 Next steps

9.5.1 As outlined throughout this report, there will be a 'Part 2' Study produced to conclude the overall assessment of the eventual Local Plan Final Growth Scenario. The assessment that will be included within 'Part 2' is based on the findings from the study to date. It will refine the combination of mitigations proposed to support the delivery of the Local Plan Growth and will assess a Final Local Plan Growth scenario, which is anticipated to have a different level of development to that tested to date.

9.5.2 Three overarching scenarios will be tested, in combination with a number of different junction mitigations and highway schemes. The scenarios to be tested will be:

- 2017 Final Local Plan Growth (2034): Background Growth plus Local Plan development, with no alterations to the highway network.
- 2017 Final Local Plan Growth with highway mitigation (2034) with draft Local Plan 2016 growth development traffic and highway network mitigations.
- 2017 Final Local Plan Growth with sustainable transport mitigation (2034) with draft Local Plan 2016 growth development traffic and reduced trip rates for select sites based on their assessed level of accessibility.

9.5.3 These will be referenced against the Baseline and Background Growth models from the 'Part 1' assessment. New Baseline and Background Growth junction models will be created for additional junctions identified for inclusion in the assessment.

9.5.4 Where available, results from the Basildon Town Centre VISSIM model will be taken into account and the VISUM network produced for this study will be modified to match any changes between the VISSIM model and the proposals within the Basildon Town Centre masterplan.

9.5.5 Modelling undertaken for the Lower Thames Crossing will be reviewed and taken into account as far as possible within the 'Part 2' Study.

9.5.6 Where available, junctions that have been assessed as part of other recent studies will also be assessed within the context of the Local Plan Final Growth Scenario. The junctions to be included are:

- Sadlers Farm

- Fortune of War
- Rettendon Turnpike
- Fairglen
- Halfway House

9.5.7 Results from the 'Part 1' Study have indicated that there are some junctions where RFC is over 1.2 in the future year and additional mitigation measures will be considered within 'Part 2' to identify a solution to sufficiently accommodate development traffic at these locations.

9.5.8 The Pound Lane improvement that has been assessed within this report will be reviewed within 'Part 2', and delivery of only part of the scheme (Phase 1 only) will be assessed, in combination with some localised movement restrictions to identify a solution that provides benefit to Wickford and East Basildon.

9.5.9 'Part 2' will identify any new cross boundary information that can be used from neighbouring Local Plans in order to identify cross boundary impacts.

9.5.10 Finally, conclusions will be developed to establish a complete list of mitigations required to support the delivery of the Final Local Plan Growth and an indication as to the point at which mitigations will be required or developments that will be dependent on those mitigations will be identified.