Document Control Sheet

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1.1 Introduction

1.1.1 The purpose of this technical note is to review elements of the 2017/18 THIA modelling to better understand the impact of the proposed A127 grade-separated junction on traffic flows through Wickford, to re-evaluate the impact of Local Plan development on the Nevendon Interchange, and to further validate the assumptions made around sustainable mitigation impact.

Reviewed elements of the 2017/18 modelling are as follows:

1.1.2 The review specifically references methodologies, outputs and findings as reported in the following Local Plan evidence base reports:

- 'Basildon Local Plan Part 1 - Draft Local Plan Transport & Highway Impact Assessment': Essex Highways, July 2017 (EV074_BC)
- *'Basildon Local Plan Part 2 – Publication Local Plan Transport & Highway Impact Assessment'*: Essex Highways, March 2018 (EV069_BC)
- *'Basildon Local Plan Part 2 Transport & Highway Impact Assessment (March 2018) Addendum':* Essex Highways, August 2018 (EV075_BC)
- *'Basildon Local Plan – Publication Local Plan Transport & Highway Impact Assessment- Pound Lane/Cranfield Park Road Junction Addendum'*: Essex Highways, October 2019

1.1.3 The additional modelling analysis and commentary will help provide material in support of the existing transport evidence base at examination in summer 2020.

1.2 Review of A127 grade-separated junction

Review the stated benefits of the A127 grade-separated junction on the A132 Runwell Road / Church End Lane junction in Wickford

1.2.1 The A132 Runwell Road / Church End Lane junction in north Wickford was last assessed as part of an expanded junction capacity appraisal of alternative mitigation without the proposed A127 grade-separated junction. Given land restrictions in the vicinity, a mini-roundabout layout was assessed as a preferred alternative. This was shown to offer limited capacity benefits over the existing layout by reducing the ratio-of-flow-to-capacity (RFC) of the worst-performing arm – Church End Lane.

1.2.2 Although the grade separated junction is not believed to be required to deliver Local Plan growth during the plan period, model findings nevertheless suggested that a grade-separated junction on the A127 would provide greater capacity benefits at the Runwell Road / Church End Lane junction by diverting flows away from the A132.

1.2.3 To better understand and qualify these benefits, this task looks in more detail at the earlier modelling undertaken for the Part 2 Transport & Highway Impact Appraisal (THIA), by reviewing the traffic assignment methodology used and the 2036 traffic flows subsequently modelled at the junction.

1.2.4 Vehicle turning movements at the junction in Scenario 2 – '2034 Final Growth Scenario: No Mitigation' have been compared with turning movements in Scenario 4 – '2034 Final Growth Scenario: Initial Mitigation with A127 grade separated junction'. Values are shown in Figures 1 and 2 below for the AM and PM peak hours.

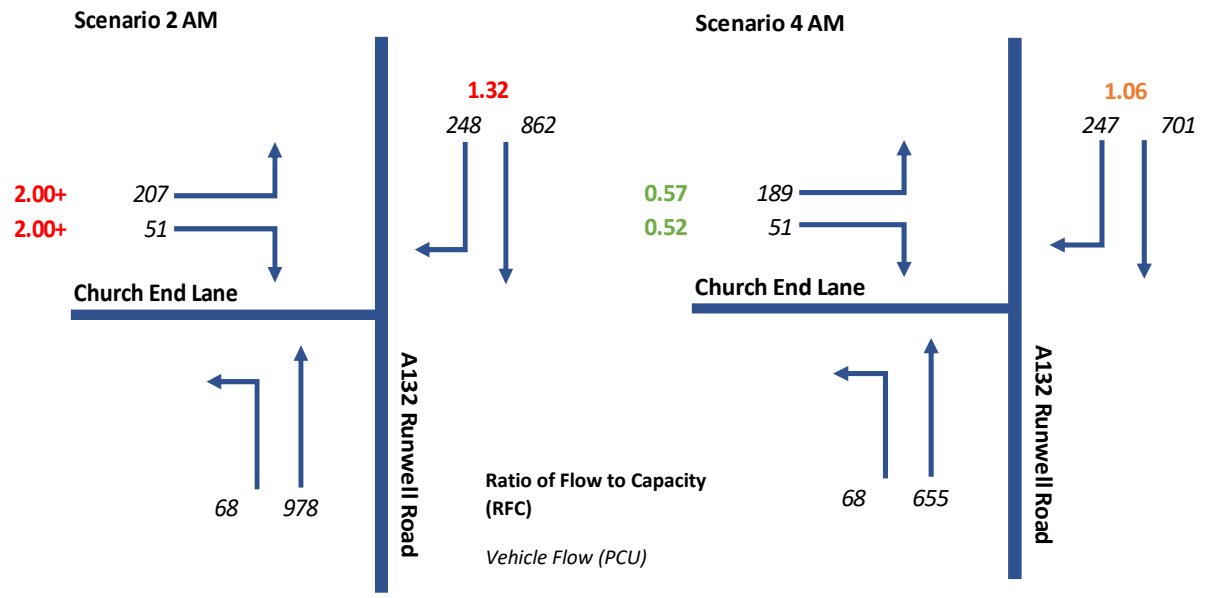

Figure 1: Modelled 2034 turning flows and RFC values at A132 Runwell Road/Church End Lane junction – Scenarios 2 & 4 - AM Peak

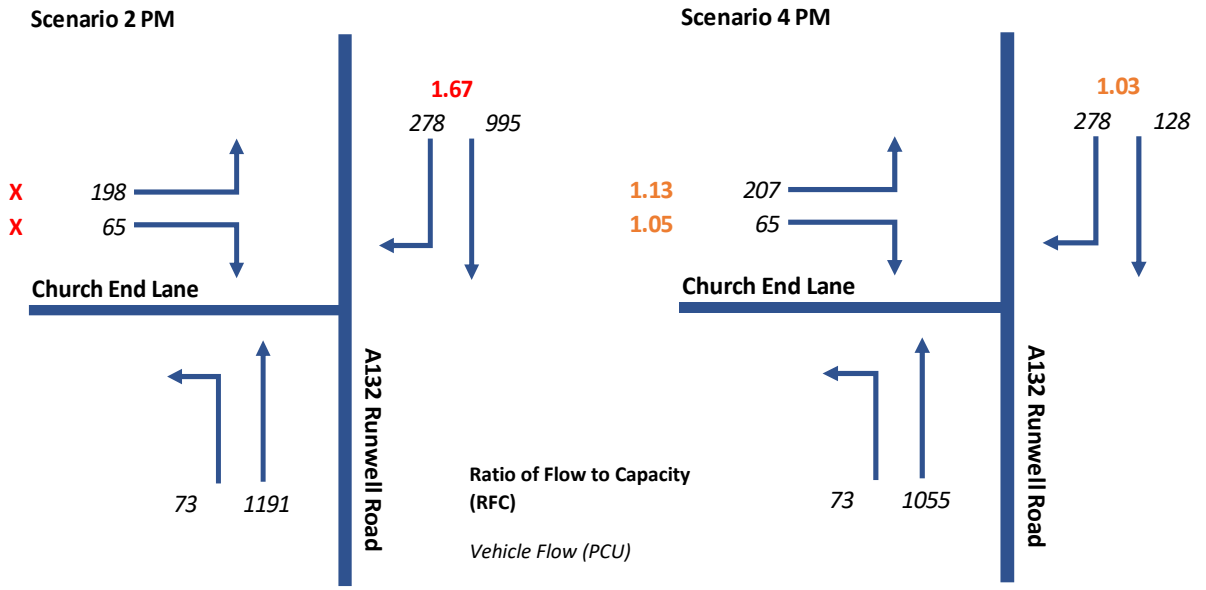

Figure 2: Modelled 2034 turning flows and RFC values at A132 Runwell Road/Church End Lane junction – Scenarios 2 & 4 - PM Peak

1.2.5 The difference in modelled turning flows between Scenarios 2 and 4 represents the change in flow through the junction as a direct result of the proposed grade-separated junction on the A127. It is reasonable to make this assertion since other mitigation modelled in the area was assessed at a local junction level only and would therefore not have impacted the assignment of traffic modelled at other junctions.

1.2.6 Directional flows on the A132 through the junction are shown to reduce in both assessed peak hours. This eases congestion on Church End Lane by enabling more movements from the minor arm and reduces the RFC along the A132 by providing more gaps for right-turn movements to Church End Lane.

1.2.7 A review of Visum model outputs from Scenario 2 and Scenario 4 (i.e. with/without the A127 grade separated junction) as shown in Figures 3 and 4 below, suggests that the impact of the proposed scheme on Local Plan development trips through the A132 Runwell Road/Church End Lane junction is comparatively small – numbering less than 50 trips northbound along the A132 in the AM peak and 150 trips southbound in the PM peak.

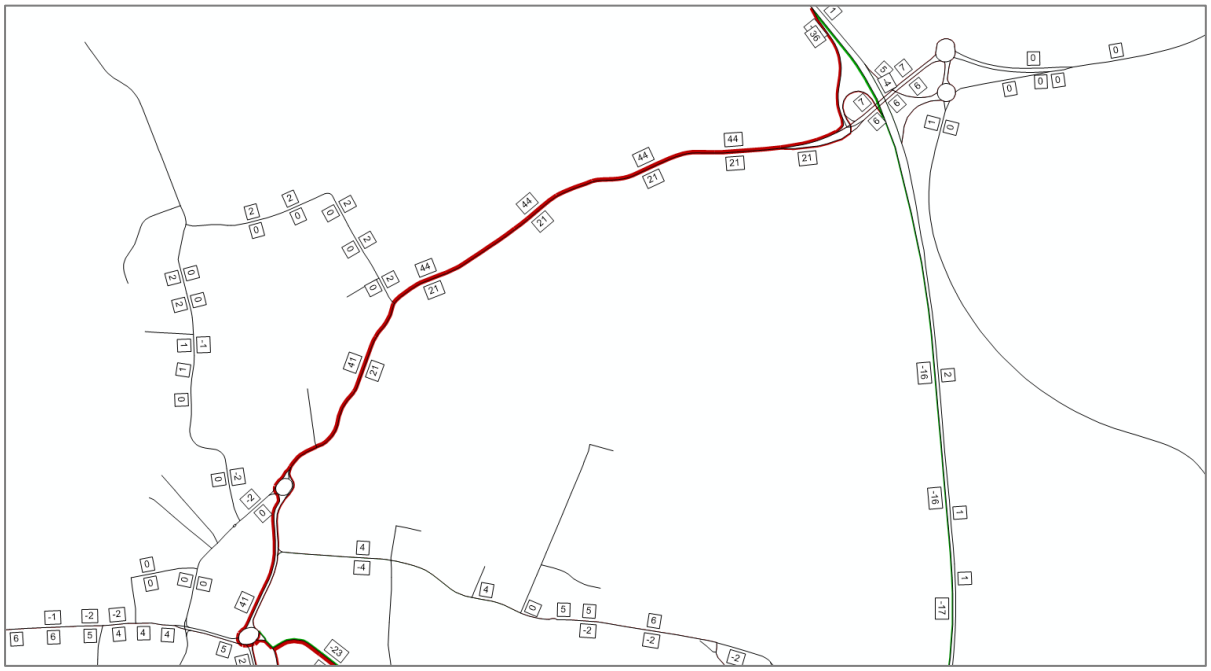

Figure 3: Modelled 2034 flow difference along A132 between Scenario 2 and 4 in AM peak

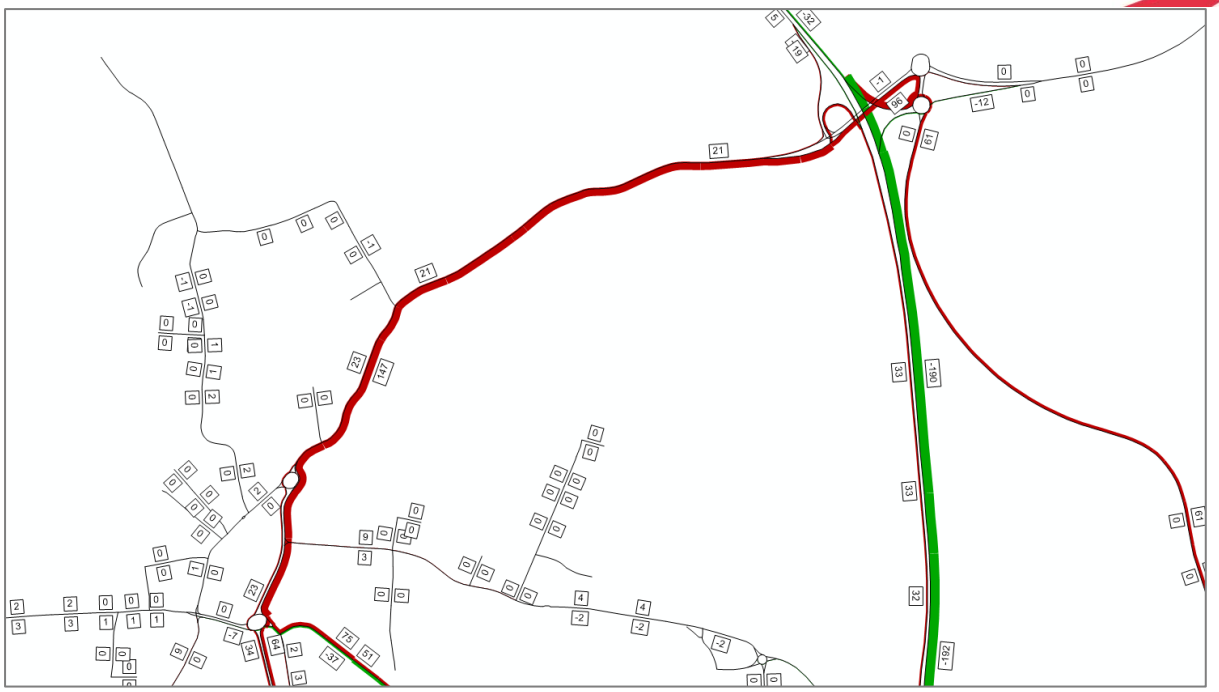

Figure 4: Modelled 2034 flow difference along A132 between Scenario 2 and 4 in PM peak

1.2.8 Therefore, network capacity benefits in north Wickford attributable to the A127 grade separated junction would appear to be more the result of a reassignment of background traffic flows away from the A132 route.

1.2.9 Background traffic flow reassignment via the A127 grade-separated junction was determined through use of 2011 Census Journey-to-Work (JTW) trips assigned through the Visum model. A comparison of assigned Census JTW trips between Scenarios 2 and 4 determined peak hour directional flow reductions along the A132 of around 25% (on average) as a direct result of the A127 grade-separated junction.

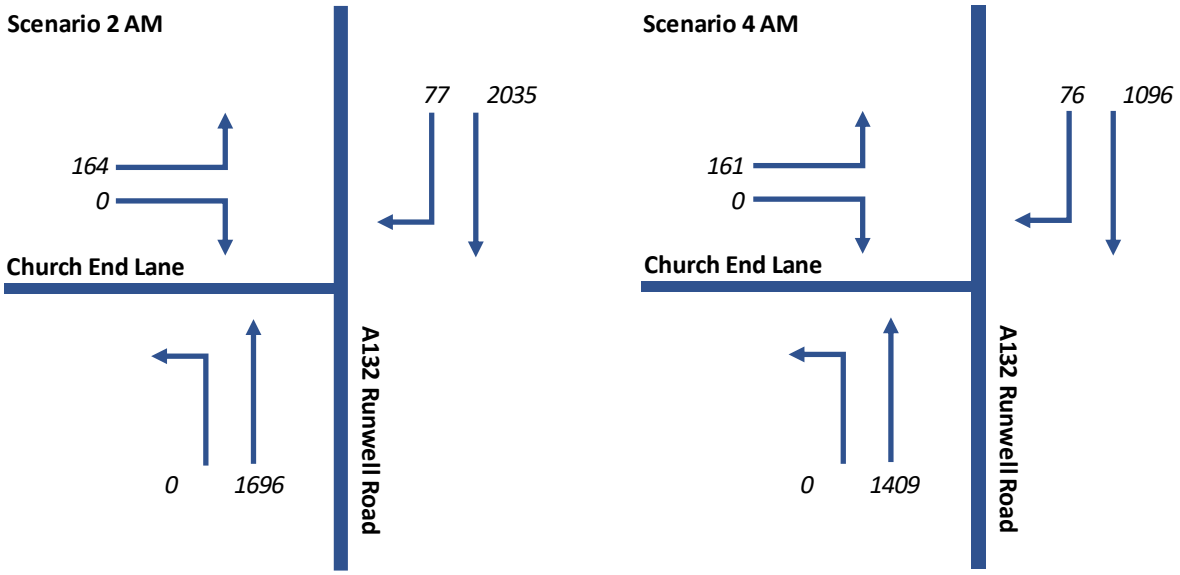

Figure 5: Visum-assigned 2011 Census JTW trips through the A132 Runwell Road/Church End Lane junction – Scenarios 2 & 4 - AM Peak

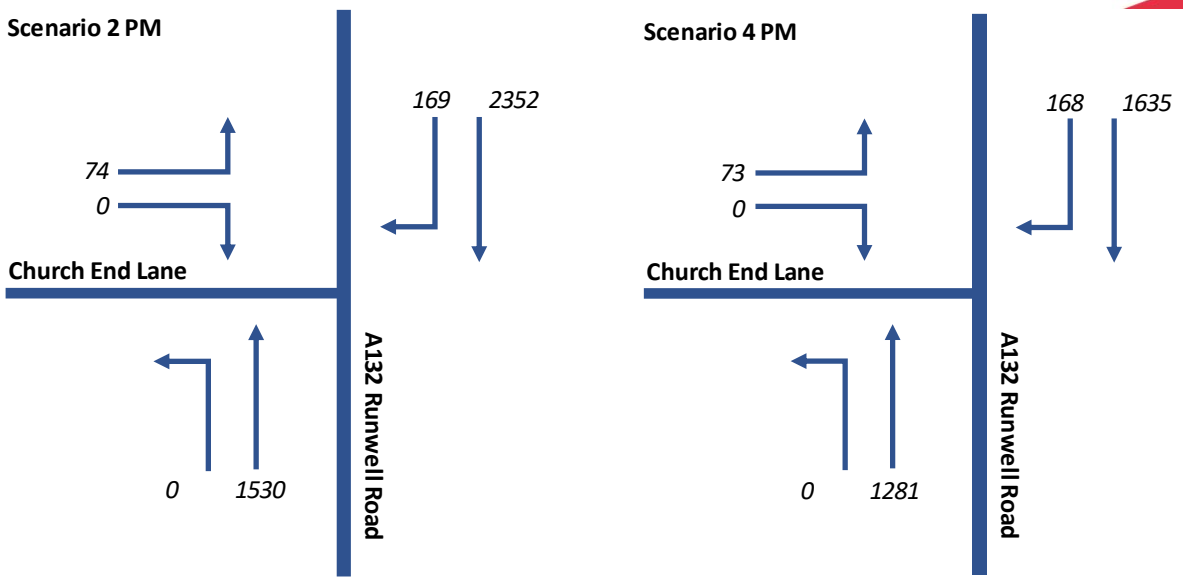

Figure 6: Visum-assigned 2011 Census JTW trips through the A132 Runwell Road/Church End Lane junction – Scenarios 2 & 4 - PM Peak

1.2.10 The results from the earlier Part 2 THIA modelling should, however, be caveated as follows:

1.2.11 Reported junction capacities were based on the assumption that 100% of in-scope background traffic would re-route to the proposed A127 grade-separated junction. Given the absolute nature of this assumption, sensitivity tests were undertaken for the THIA which considered a lower transfer of background traffic flows. However, it was acknowledged that an 'optimum' assignment pattern could not be fully assessed within the limitations of the modelling undertaken.

1.2.12 The fixed assignment of development trips through the Visum model is based exclusively on present-day vehicle speeds on links and is unaffected by junction capacity restrictions or the impact of traffic growth. It is apparent that modelled route assignment therefore favours trunk roads and 'A' roads over lower speed 'B' roads and urban links where there is no clear and obvious route choice. This, it is understood, is likely to strengthen the impact of the proposed A127 grade-separated junction on routes such as the A132 and A130.

1.2.13 Although not built in time for the 2017/18 THIA, there would be merit in re-evaluating the impact of the proposed A127 grade-separated junction using the Essex Countywide Visum Model. This would allow for a more robust assessment using a full assignment model for both development traffic and background traffic across the local road network. Such an assessment would be expected to form part of a wider Business Case for the junction.

1.3 Review of 'East Wickford link road'.

Review the findings from the earlier assessment of an 'East Wickford link road' in relation to the capacity benefits (or lack of) modelled at the A132 Runwell Road / Church End Lane junction in Wickford

1.3.1 An 'East Wickford link road' was previously explored in Part 1 of the Draft Local Plan THIA in July 2017, as a three-phase scheme initially proposed around the A127 grade-separated junction. Phase 1 covered the grade-separated junction itself, with the addition of Phases 2 and 3 (the 'East Wickford

link road') which extended a route north-east from the junction to the A129 in Shotgate, and then to the northbound carriageway of the A130.

1.3.2 Modelling results from the 2017 report illustrated traffic diverting from strategic routes onto the new link, resulting in 'rat running' through east Basildon and the town centre, causing local congestion issues. Upon consideration of these findings, Phases 2 and 3 of the scheme were not taken forward to Part 2 of the THIA appraisal in 2018.

1.3.3 ECC have now requested that the 'East Wickford Link Road' is reviewed and re-evaluated within the narrative of exploring the relative benefits of Phase 1 of the A127 grade-separated junction alone on the capacity of the A132 Runwell Road / Church End Lane junction.

1.3.4 The following flow diagrams are taken from the Basildon VISUM model and were originally included in the Part 1 Transport & Highway Impact Appraisal (THIA) report issued in July 2017. Red lines show increases in development traffic and green lines show reductions in development traffic following construction of the A127 grade-separated junction and East Wickford link road. Where no coloured line is shown there is no change in modelled flow.

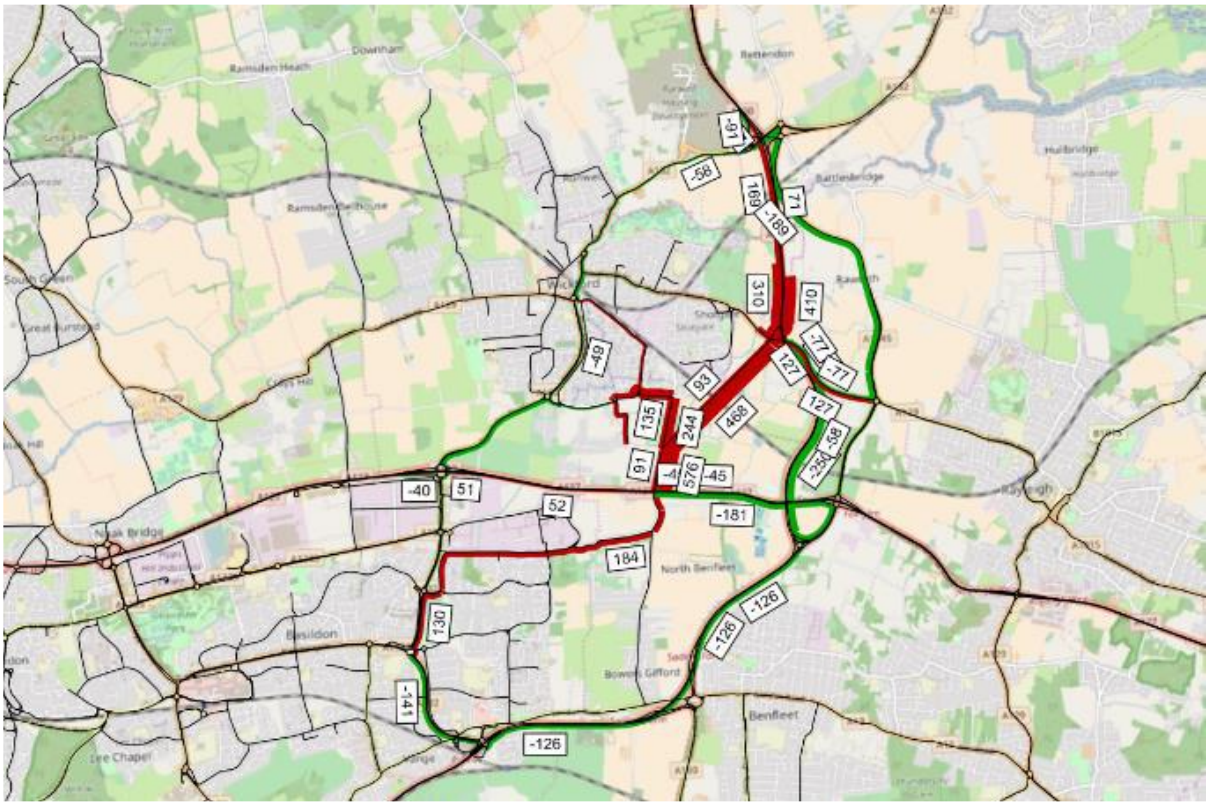

Figure 7: Changes in development traffic flow with a new junction on the A127 at Pound Lane/Cranfield Park Road - AM

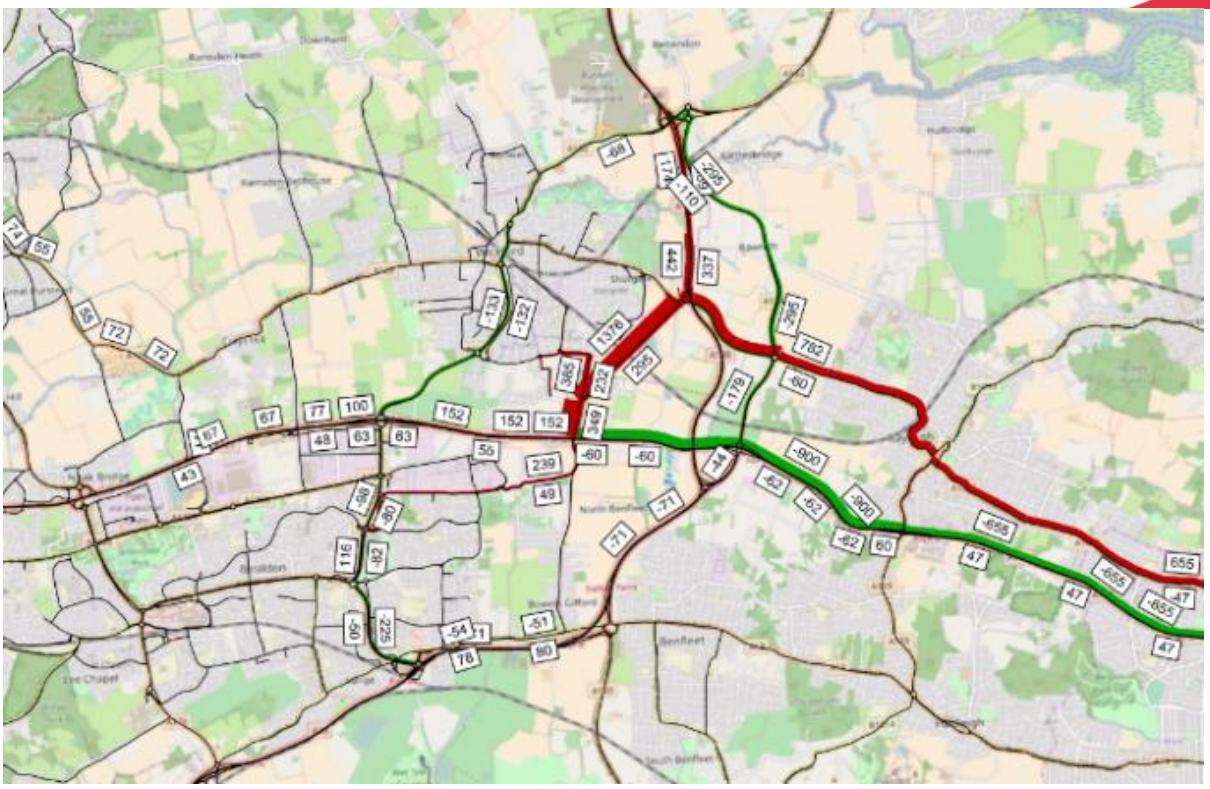

Figure 8: Changes in development traffic flow with a new junction on the A127 at Pound Lane/Cranfield Park Road - PM

1.3.5 Development flows along the A132 through Wickford were shown to be largely unaffected by the presence of an East Wickford link road. Traffic movements along the A132 at the junction with Church End Lane were modelled to reduce by no more than 70 vehicles in either peak hour.

1.3.6 However, the modelled impact of background traffic flow reassignment was not considered as part of the Part 1 appraisal. Indeed, the use of Census JTW data was not introduced until Part 2 of the THIA. As is apparent from the Part 2 capacity assessment of the junction of A132 Runwell Road/Church End Lane junction, the proposed A127 grade-separated junction alone might be expected to have a significant impact on background traffic flows along the A132.

1.3.7 The construction of the Visum 'skeleton' model was such that trips were reassigned across the road network based on current day and (in the case of new road infrastructure) assumed fixed link speeds. Without acknowledgement of future link capacity, it has therefore not been possible to evaluate the full potential benefits of a proposed East Wickford link road in terms of freeing up capacity at junctions along the A132.

1.3.8 With this in mind, there could be merit in re-evaluating the benefits of a proposed East Wickford link road using the Essex Countywide Visum Model. This was not available at the time of the Part 1 and Part 2 THIA, but would be considered as an appropriate tool for further assessment.

1.3.9 The value of undertaking any re-appraisal of the East Wickford link road would, however, be dependent on the outcome of a similar re-evaluation of the benefits of the A127 grade-separated junction alone on the A132 through Wickford. This could be explored in further detail as part of a wider Business Case for the scheme.

1.4 Review of Nevendon Interchange

Check the distribution of proposed development trips through Nevendon Interchange with/without the A127 grade-separated junction

1.4.1 A review of findings from the THIA and addendum studies demonstrated that the modelled capacity of the Nevendon Interchange was not impacted significantly by development trips modelled from nearby Local Plan sites in Wickford and North Benfleet.

1.4.2 Given the extent of development in the area and particularly from employment site E6 adjacent to the Burnt Mills Industrial Estate, this task looks to confirm the distribution of trips in the Visum skeleton model with/without the A127 grade-separated junction. Focus of the analysis has been placed on vehicles routing through the Nevendon Interchange and the impact on junction capacity.

1.4.3 Figures 9 and 10 on the following page illustrate the Visum modelled distribution of trips to and from site E6 in the AM and PM peaks respectively with the current road layout and no mitigation (Scenario 2).

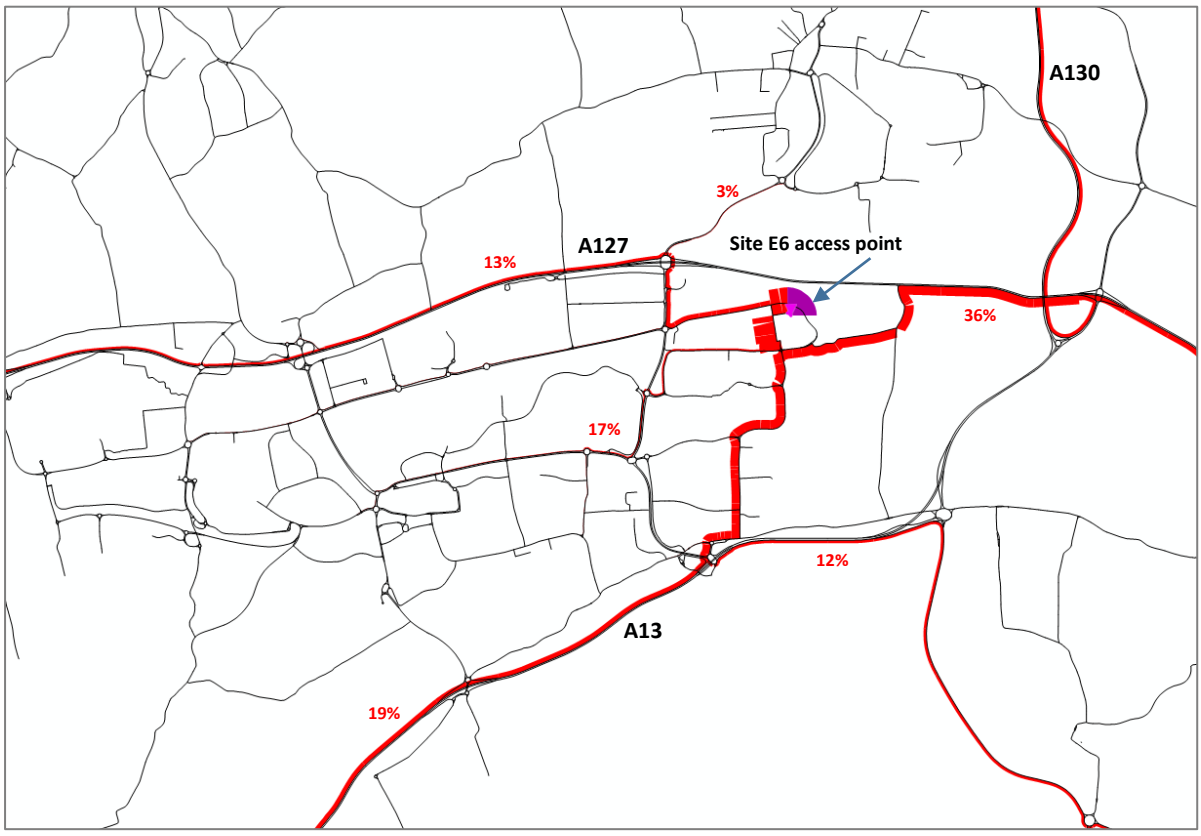

Figure 9: AM peak Visum modelled distribution of trips to Site E6 adjacent to the Burnt Mills Industrial Estate (Scenario 2)

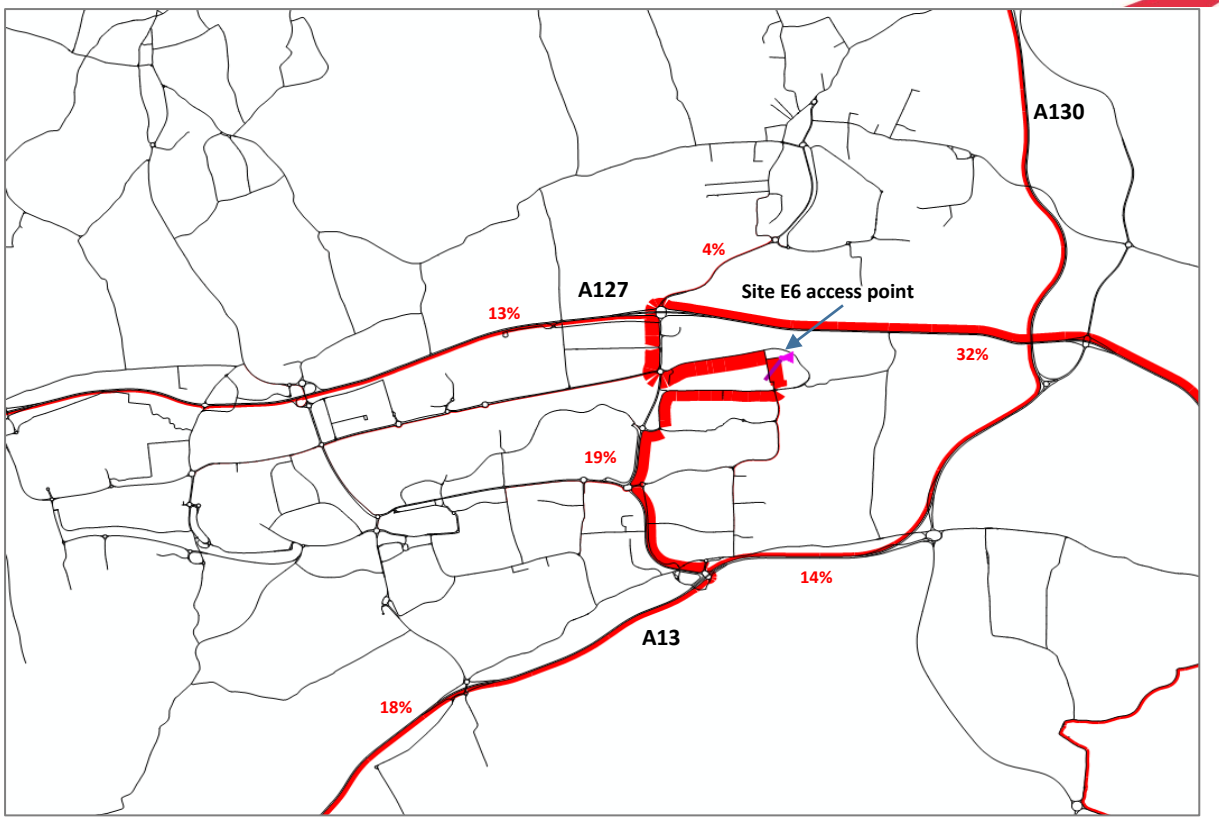

Figure 10: PM peak Visum modelled distribution of trips from Site E6 adjacent to the Burnt Mills Industrial Estate (Scenario 2)

1.4.4 Of 370 modelled arrivals to site E6 in the AM peak hour, approximately 16% are shown to route through the Nevendon Interchange from both Wickford and the A127 west. Of 314 departures from site E6 in the PM peak hour, just short of 50% are modelled to route through the junction for onward journeys to Wickford and via the A127 east and west.

1.4.5 Figure 11 below, illustrates total peak hour 2034 development flows modelled in VISUM routing through the Nevendon Interchange based on the current road network with no mitigation (Scenario 2).

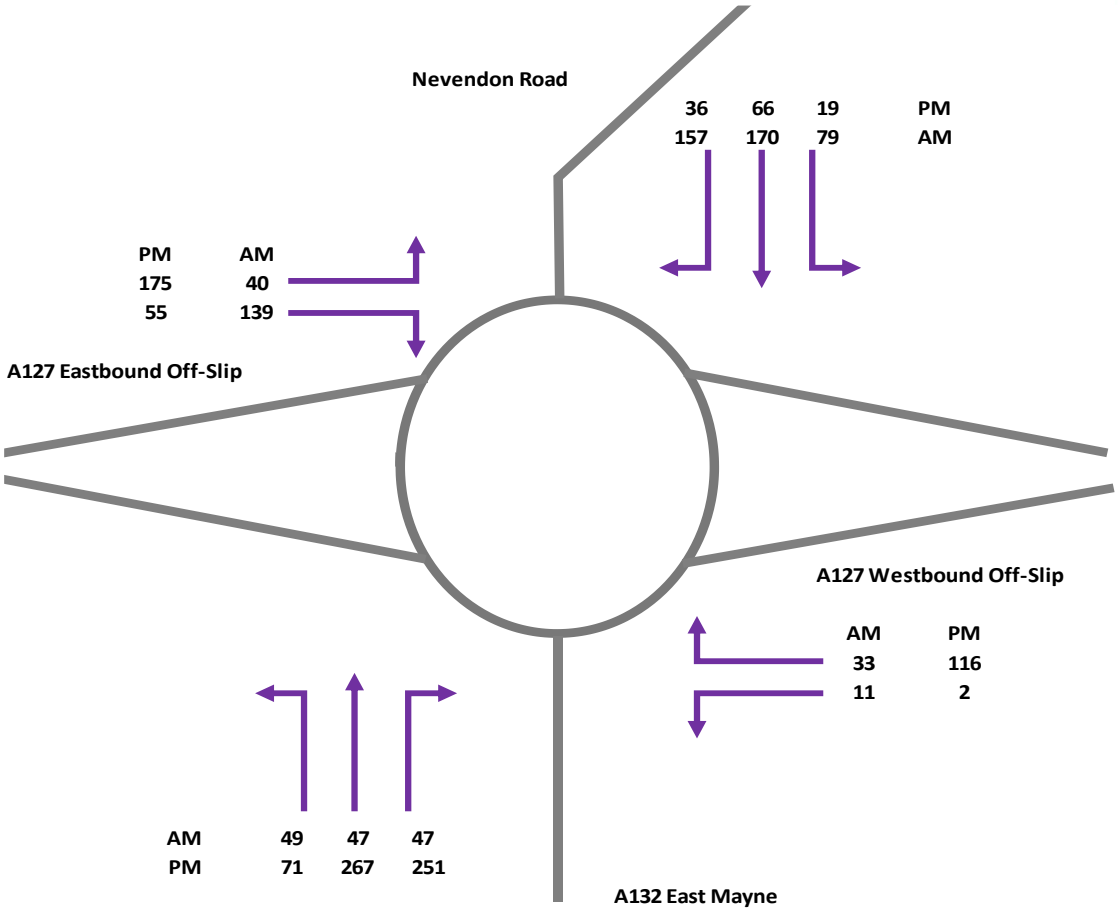

Figure 11: 2034 Local Plan development flows assigned through Nevendon Interchange using Basildon VISUM Model (Scenario 2)

1.4.6 Earlier THIA capacity assessments of the Nevendon Interchange used 2014 base year count data factored using NTM/NTEM adjusted local growth figures to derive forecast background demand matrices. This count data was taken from surveys conducted at the junction prior to the 2016/17 improvement scheme which consisted of the following:

- Widening of the Nevendon roundabout from two to three lanes
- Introduction of a new left turn lane under traffic signal control for vehicles travelling from the west on the A127 Southend Arterial Road to the A132 northbound to Wickford
- Upgrade to traffic signals

1.4.7 A separate peak hour capacity assessment of the Nevendon Interchange with background growth to 2034 (Scenario 1) has been undertaken for this latest study, using updated March 2018 count data taken from surveys at the junction with the improvement measures in place.

1.4.8 This assessment serves as an independent verification of the capacity results stated in the THIA reports and looks to provide justification for the spare capacity modelled at the junction – particularly in the PM peak, despite observed current-day congestion.

1.4.9 Compared with the original 2014 flows, those recorded at the junction in 2018 were shown to be 2% lower in the AM peak and 13% higher in the PM peak.

1.4.10 Using the 2018 flows to derive forecast background demand matrices, capacity modelling of the Nevendon Interchange was undertaken for Scenario 1 (2034 background growth only), with results compared against those published in the THIA. The capacity modelling was undertaken using LinSig

software, given the presence of signals at the junction. However, to maintain consistency with results presented in the THIA, the Degree of Saturation (DoS) percentages modelled for each arm have been reported as RFC values.

1.4.11 Recalculated results for Scenario 1 reveal a fall in the highest approach arm RFC in the AM peak from 1.00 to 0.93 on the A127 eastbound off-slip, and a rise in the highest approach arm RFC in the PM peak from 0.89 to 0.93 on the A132 East Mayne approach arm. Further details are shown in Table 1 below.

	2034 AM		2034 PM	
	2014	2018	2014	2018
A132 Nevendon Road	0.66	0.78	0.63	0.78
A127 Westbound Off-Slip	0.88	0.88	0.84	0.74
A132 East Mayne	0.60	0.64	**0.89**	**0.93**
A127 Eastbound Off-Slip	**1.00**	**0.93**	0.74	0.86

Table 1: Ratio of flow to capacity of Nevendon Interchange approach arms in 2034 Scenario 1 - using 2014 and 2018 observed data

1.4.12 The latest capacity assessment of the Nevendon Interchange appears to validate the findings in the THIA reports for Scenario 1. The modelled performance of the junction in Scenarios 2, 3 & 4 (with Local Plan development) based on 2018 count data, could result in a possible reversal of the AM and PM peak hour results. This will unlikely affect overall conclusions regarding the need for sustainable mitigation to ensure that the junction operates within capacity.

1.4.13 It is understood that the modelled capacity performance of the junction does not appear to reflect perceived levels of congestion observed under current PM peak hour conditions. However, latest 2018/19 Teletrac journey time data (as illustrated in Figure 12) suggests that PM peak hour congestion is more prevalent in the vicinity of the junction, rather than on the entry arms to the junction itself.

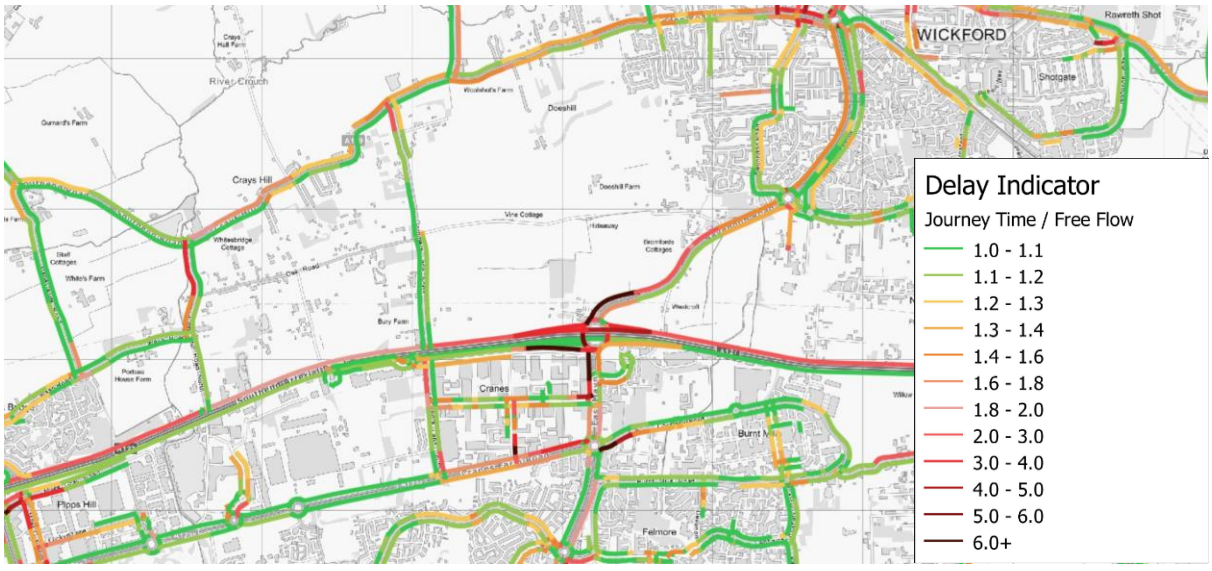

Figure 12: Ratio of 2018-19 Teletrac observed-to-free-flow average journey times in PM peak – serving as an indicator of delay

1.4.14 Delays are most apparent on the northbound lane merge along Nevendon Road (north of the interchange), and along Christopher Martin Road on the approach to the junction with East Mayne

(south of the interchange). However, link and junction capacities at these locations would not have been included within the Nevendon Interchange junction capacity assessment.

1.4.15 Whilst Local Plan modelling for the THIA focuses on approach arm capacity at the Nevendon Interchange, surrounding congestion in the local area is nevertheless considered within the A127 Air Quality Management Plan Outline Business Case[1]. Within this, sustainable schemes (e.g. targeted travel planning, cycle hub in Basildon, flagship cycle routes) have been identified to mitigate the impact of traffic growth and the increase in vehicle emissions. Funding for identified schemes is currently being sought through DEFRA.

1.5 Review of Sustainable Mitigation Threshold

Review and provide a rationale for the use of a 1.15 Ratio of Flow to Capacity (RFC) value as a threshold for the consideration of infrastructure mitigation

1.5.1 An RFC value of 1.15 has been used in the THIA as a threshold for the consideration of infrastructure mitigation at specific junctions. Junctions modelled with maximum approach arm RFCs of between 1.00 and 1.15 are shown to be over-capacity but considered to have excess peak-hour demand that could be accommodated through the provision of sustainable transport mitigation.

1.5.2 At the time of the junction capacity modelling for the THIA, location-specific sustainable mitigation had not been identified from which to evaluate the impact on traffic flows through assessed junctions in Basildon, Wickford and Billericay. It was also acknowledged that mode shift to sustainable measures could not be modelled robustly without detailed demand modelling that fell outside the strategic scope of the Local Plan modelling.

1.5.3 In order to meet NPPF guidance on promoting sustainability within the Local Plan transport evidence base, it was, however, important to ensure that sustainable mitigation was prioritised over junction capacity improvements during the mitigation appraisal. To achieve this without confirmation of specific sustainable mitigation, it was necessary to establish a capacity threshold at junctions below which the potential for mode shift and/or peak spreading could be reasonably accounted.

1.5.4 The RFC value of 1.15 was not derived from empirical data from sustainable transport studies. Rather it was judged a reasonable value given its acceptance on other Local Plans in Essex – notably Epping Forest. The THIA junction capacity modelling results present a worst-case scenario and do not consider the impact of variable demand. Therefore a 15% buffer would likely account for demand variability as a result of reasonable levels of peak-spreading as well as mode shift encouraged through the provision and promotion of sustainable measures.

1.5.5 To evaluate the robustness of the 1.15 RFC threshold, the capacity modelling of Junction Ba15 - Eastmayne / Cranes Farm Road Roundabout has been revisited. With reference to the October 2019 addendum modelling, the junction is shown to perform with a maximum approach arm RFC of 1.15 in the AM Peak under Scenario 3b. This assumes background growth and Local Plan development in 2034 with further mitigation included as an alternative to the A127 grade-separated junction.

[1] Outline Business Case: Air Quality Management Plan – A127, Ringway Jacobs / Essex County Council, December 2018.

1.5.6 Table 2 below shows the AM peak modelled demand and capacity at Junction Ba15 per quarter-hour period. Assuming a typical peaked demand profile, excess demand of around 75 vehicles is modelled on the East Mayne southern approach to the roundabout in the busiest quarter hour (08:30-08:45).

Scenario 3b AM		08:00-08:15		08:15-08:30		08:30-08:45	
Arm	RFC	Demand (PCU)	Capacity (PCU)	Demand (PCU)	Capacity (PCU)	Demand (PCU)	Capacity (PCU)
E Mayne North	0.94	439	589	538	589	538	574
Courtauld Road	0.68	186	391	228	391	228	336
E Mayne South	1.15	473	534	579	534	579	504
Cranes Farm Road	0.42	132	301	161	301	161	276

Scenario 3b AM	08:45-09:00		
Arm	Demand (PCU)	Capacity (PCU)	Spare Peak Hour Capacity (PCU)
E Mayne North	439	586	385
Courtauld Road	186	386	676
E Mayne South	473	532	2
Cranes Farm Road	132	277	568

Table 2: Potential for peak spreading at Junction Ba15 in AM peak with a maximum RFC of 1.15

1.5.7 The difference between demand and capacity accumulated across the four quarter-hour periods can be used to gauge the extent of spare peak hour capacity on each approach arm. If a flat profile was assumed, excess modelled demand on the East Mayne southern approach arm during the busiest quarter-hour periods could be accommodated across the whole of the peak hour with little-to-no spare capacity left over.

1.5.8 In effect, the East Mayne southern approach arm would operate at capacity for the entirety of the peak hour were peak spreading to occur. It should be noted that this is not necessarily a desirable outcome, but one that could reasonably be lessened through mode-shift to sustainable travel alternatives.

1.5.9 Two further junctions modelled in the Part 2 THIA study were revisited, as these were shown to have maximum approach arm RFCs close to a value of 1.15 in different assessed scenarios. Junction W2 was shown to have a maximum RFC value of 1.16 in the PM peak with Scenario 4, whilst Junction Ba7 was shown to have a maximum RFC value of 1.13 in the PM peak with Scenario 2.

1.5.10 Using similar peak spreading assumptions as described above, the most congested approach arms at Junctions W2 and Ba7 were left with spare peak hour capacity of 40 vehicles and 2 vehicles respectively.

1.5.11 Task 5 of the Local Plan examination support study considers the impact on junction capacity of potential mode-shift to sustainable travel alternatives in Basildon, Wickford and Billericay. The study is documented in the technical note: 'Basildon Local Plan Examination Support – Assessing implications of mode-shift on junction capacity mitigation modelling', Essex Highways, January 2020.

1.5.12 Findings suggested that there was reasoned justification for lowering Local Plan development car trip rates given the prevalence of existing bus and rail services in the vicinity of proposed development sites. With a higher level of public transport usage modelled, sensitivity testing suggested a typical peak hour reduction in Local Plan development traffic flow at junctions of around 15%.

1.5.13 Background traffic was not discounted as part of the sensitivity testing. Therefore, the overall reduction in vehicle demand at assessed junctions was modelled at around 1.7% on average. However, this percentage might reasonably be increased with further investment in bus, walking and cycling infrastructure in the area.

1.5.14 Such reductions might be expected to limit the extent of peak spreading at junctions to ensure operation within practical capacity across the peak hour. The impact of limited mode-shift would therefore help to further justify a threshold RFC value of 1.15, below which traffic conditions at junctions might reasonably be managed without the need for physical mitigation.