



**West Essex and East Hertfordshire Local Plans
Modelling**

Essex County Council

Technical Note 5: East Harlow Corridor VISSIM Study (Sept 2016)

Technical Note

5 October 2017

Technical Note 5: WEEH East Harlow VISSIM Study
**West Essex and East Hertfordshire Local Plans Modelling:
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Limitation Statement

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This report is part of a suite of technical notes on the WEEH Local Plans modelling project and should be read in conjunction with these other technical notes. The analysis and forecasts contained in this report make use of information and input assumptions made available to Jacobs at a point in time. As conditions change the analysis and forecasts would be expected to change. Hence the findings set out in this report should be understood as relevant to that point in time when the information and assumptions were made.

The WEEH transport model is focussed on the district of Harlow but covers adjacent districts in West Essex and East Hertfordshire. The WEEH model contributes to the understanding of strategic impacts between the districts but does not intend to replace local transport models used in the districts surrounding Harlow.

Executive Summary

Jacobs, on behalf of Essex County Council (ECC), undertook detailed evaluation of the likely impact on the local road network of the East Harlow development site, using Visum and Vissim modelling packages. Of particular concern to ECC was the impact of this site on the ability of Gilden Way to carry the level of traffic that would be likely to result from the J7a scheme, and possible impacts on the M11 motorway.

The Emerging Local Plans indicate that Harlow DC and Epping Forest DC would require in the order of 2,600 and 750 homes on this site, respectively, totalling 3,350 homes. The modelling did not include any employment on the site, nor any hospital relocation assumptions.

Initial modelling described in Section 2 assumed that there would be four access points from the site onto Gilden Way:

- Approximately 200 homes via Hobbs Cross / Churchgate St (loading point 1 –LP1)
- The remaining homes were distributed fairly equally between:
 - a new left-in/left-out priority junction in the vicinity of Mayfield Farm (loading point 2 –LP2),
 - via an additional arm off the new Sheering Road roundabout (part of the J7a scheme) (loading point 3 –LP3), and
 - a new signalised junction east of London Road , ‘Nursery’ (loading point 4 –LP4),

VISSIM and local junction modelling was then used to derive and test options for mitigation measures, which is described in Section 3. This also assumed the distribution of development trips across the loading points could be altered by assuming eastbound arrival traffic would use either the Sheering Road roundabout (loading point 3), or the new signalised western junction (loading point 4) on an equal split basis.

It was noted, however, that the highway improvements were not sufficient to reduce delays on the westbound arm of the Sheering Road roundabout. Consequently it was considered appropriate to also reduce development size (or total car trips generated) at East Harlow by 10%.

The table below shows the number of homes across the East Harlow strategic development site which are assumed to use each loading point alongside recommended mitigation measures.

Loading Point	Junction Type	Initial number of homes using each loading point tested in Section 2	Revised number of homes using each loading point tested in Section 3	Final number of homes using each loading point tested in Section 4	Changes identified and other comments
LP1 Churchgate rbt	Existing rbt	220	220	190	No design change
LP2 Mayfield Farm	Left- in/Left-out	1020	1040	940	No design change (inclusion of signals at this access was tested but worsened conditions)
LP3 Sheering Rd rbt	Rbt	1100	1110	1000	<ul style="list-style-type: none"> • Provision of a left turn slip road from M11 J7a link road approach at LP3 • Provide traffic signals for the Sheering Road North arm at Sheering Road roundabout

Loading Point	Junction Type	Initial number of homes using each loading point tested in Section 2	Revised number of homes using each loading point tested in Section 3	Final number of homes using each loading point tested in Section 4	Changes identified and other comments
LP4 Nursery	Signals	1020	980	890	<ul style="list-style-type: none"> Widen B183 Gilden Way eastbound to two lanes between the exit of London Road roundabout to LP4 Replace the straight crossing on Gilden Way (W) arm of the junction at Loading Point 4 with a staggered pedestrian crossing
Totals		~3,350	~3,350	~3,020	

It should be noted, however, that the altered distribution of development traffic across the loading points requires a high level of internal connectivity within the development site between the Sheering Road roundabout and the new western junction access (loading points 3 and 4). However, this potential arrival traffic distribution would not be enforceable, being greatly reliant on driver choice.

If this internal connectivity cannot be realised and enforced then a further reduction in development size would be required on top of the 10% reduction already identified. The further reduction in development size has been estimated to be in the order of 250 homes.

Hence this Technical Note concludes that the number of private vehicle trips that could be generated on the East Harlow site may need to be reduced in order to avoid unacceptable impacts on the M11 J7a corridor. This could either be from an overall reduction in dwellings, or through other mechanisms, including delivering much higher levels of non-car trips than currently is the case in the Harlow area.

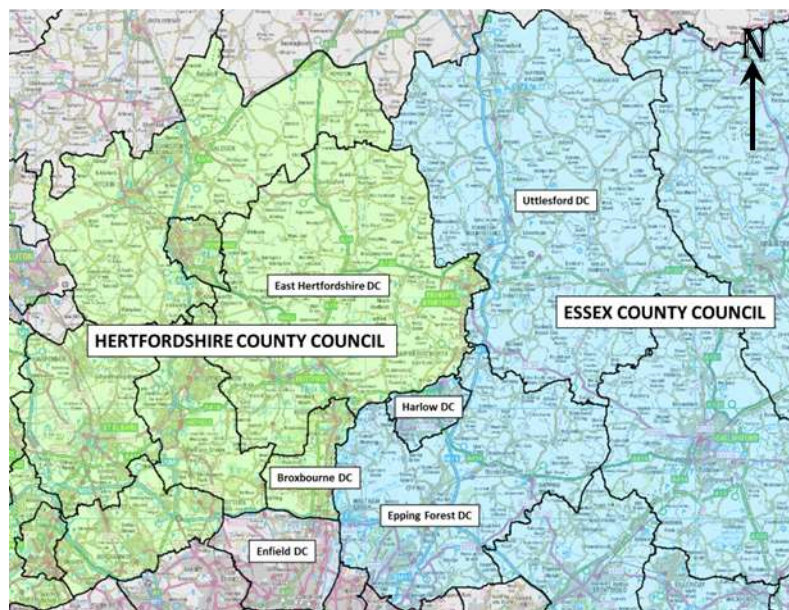
It is recommended that this is explored further through the wider Harlow area masterplanning process and site specific analysis, with the objective of increasing the sustainability of the East Harlow site (and adjoining areas).

1. Introduction

1.1 Introduction

Essex County Council (ECC) has been providing ongoing traffic modelling support through Essex Highways and Jacobs in relation to the emerging Local Plan proposals for the four districts which comprise the West Essex and East Hertfordshire (WEEH) Strategic Housing Market Assessment (SHMA) area. This has been conducted through the Co-operation for Sustainable Development Board, which comprises officers and Members from East Hertfordshire, Epping Forest, Harlow and Uttlesford District Councils, Hertfordshire and Essex County Councils, and Highways England.

Figure 1-1: Local Authorities in the Vicinity of Harlow



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A VISUM transport model of the WEEH area is being used to assess the likely impact on the highway network of the strategic development sites around Harlow as identified in the WEEH emerging Local Plans, their likely scale and possible infrastructure requirements that may result.

An existing Gilden Way VISSIM micro-simulation model had previously been developed by Jacobs to understand the likely impact of the proposed M11 Junction 7a (M11 J7a) scheme on the B183 Gilden Way corridor. This has been used in conjunction with the VISUM model to study the likely impacts of the proposed East Harlow development in greater detail.

The WEEH modelling project has produced the following technical notes reflecting its scope of work:

- Technical Note 1: Forecasting methodology
- Technical Note 2: Spatial Options A-E Results
- Technical Note 3: Spatial Option A1 Stort Crossing/Northern Bypass
- Technical Note 4: Emerging Option
- Technical Note 5: East Harlow VISSIM model
- Technical Note 6: Latton Priory and Southern Way Impacts

1.2 Objectives

Following option testing undertaken to evaluate various WEEH development scenarios and growth levels, ECC requested more detailed evaluation of the likely impacts of specific strategic sites to inform the WEEH Local Plans process. The objectives of this particular study are to use the Gilden Way VISSIM model to:

1. Investigate the likely impact of significant housing development at East Harlow on the B183 Gilden Way corridor and whether and how this could be mitigated, particularly to avoid queuing back onto the M11 motorway; and
2. Evaluate the likely scale of development that could be delivered at East Harlow as part of the Emerging Option scenario.

The modelling work undertaken for this commission represents an initial study into potential impacts of the East Harlow development. Further more detailed work would be required as part of any planning application specific to East Harlow.

1.3 Approach

In order to assess the impact of the East Harlow strategic development a VISSIM model was developed as described in the next subsection. Within this model we are able to alter:

- The Gilden Way corridor road network
- The loading points to and from the East Harlow development
- The distribution of trips to and from between the different loading points
- The total amount of trips to and from East Harlow

In Section 2 we assess the impact of the East Harlow development along the Gilden Way corridor using a network consistent with current J7A and Local Plan models and four loading points to and from East Harlow. This identifies local congestion issues.

Then in Section 3 we derive, test and compare options for mitigating the congestion issues identified. This involves small changes to the network and altering the distribution of trips between the loading points, but keeping the total amount of trips constant. Hence the Sections 2 and 3 answer the first study objective.

It is noted that the congestion issues are not fully resolved. Consequently in Section 4 we assess the impact of reducing the development size by reducing the total amount of trips and, hence, provide an answer to the second study objective.

Section 5 provides a summary of the findings and recommendations.

1.4 VISSIM model development and method of assessment

The Gilden Way VISSIM model used as the basis for this study was originally developed by Jacobs as part of the assessment to understand the likely impact of the proposed M11 Junction 7a (M11 J7a) scheme and the improvement works along the B183 Gilden Way corridor. The VISSIM model network inherited to use for this study includes all the schemes listed below from the M11 J7a scheme for which it was originally used:

- Completion of the M11 J7a proposed scheme;
- A new roundabout at Sheering Road (Sheering Road Roundabout);
- Two lanes westbound on Gilden Way between M11 and A414;
- Hamburger layout at the Churchgate Roundabout;
- Part signalisation of the A414 / First Avenue Roundabout;
- Extending the A414 northbound exit lanes to two lanes for approximately 200m from the A414 / First Avenue Roundabout; and

- New Hall and Enterprise Zone Development schemes which include a new signalised junction to the south of the A414 / First Avenue Roundabout, widening of the northbound approach to the A414 / First Avenue Roundabout and closure to general traffic of London Road to the south of the Gilden Way / London Road roundabout.

Traffic flows from the Harlow Transport VISUM Model were imported into the Gilden Way VISSIM model to study the impact of the proposed East Harlow development in greater detail, visually assess the predicted performance of the corridor, and provide recommendations for mitigation schemes that may be necessary along the B183 Gilden Way corridor.

A Reference Case VISSIM model was created by importing the origin-destination matrices for the car, LGV and HGV vehicle class from the relevant cordon of the 2033 Reference Case VISUM model into the Gilden Way VISSIM model described above. This model was used to show how the network would be likely to perform without developments at major sites, including East Harlow.

The 2033 Emerging Option includes the major strategic sites developments as identified by the WEEH SHMA on 24/08/2016 and set out in an Uncertainty Log ("160914 UL 2033 Emerging Max_V2_Final"), which is described in Technical Note 4. The VISSIM model of this option was created by importing the traffic flows from the relevant cordon of the 2033 Emerging Option VISUM model to the Gilden Way VISSIM model. Additional loading points corresponding to the East Harlow development zones in the VISUM model were added to the VISSIM model to enable more realistic loading of traffic from different parts of the East Harlow development than is contained in the VISUM models.

In Sections 2-4 the amount and distribution of trips between these loading points is described alongside any differences in the VISSIM network – as these are the variables which are altered in order to test and compare options, and hence meet the study objectives.

The method of assessment used in each of the sections is consistent. Table 1-1 below describes the level of assessment carried out at each junction on the Gilden Way corridor.

Table 1-1 Gilden Way Corridor Junctions Assessments

Junction	Level of Assessment
A414 / B183 Gilden Way / First Avenue	Visual
B183 Gilden Way / London Rd	Visual
B183 Gilden Way / E Harlow access (loading point 4)	LinSig and Visual
B183 Gilden Way / Mulberry Green	Visual
B183 Gilden Way / Churchgate St / Harlowbury access (loading point 1)	Visual
B183 Gilden Way / E Harlow access (loading point 2)	Visual
B183 Sheering Road / J7a Link / E Harlow access (loading point 3)	ARCADY / LinSig / Visual
J7a Link / M11 J7a	Visual

2. Initial distribution and network

2.1 Network and loading assumptions

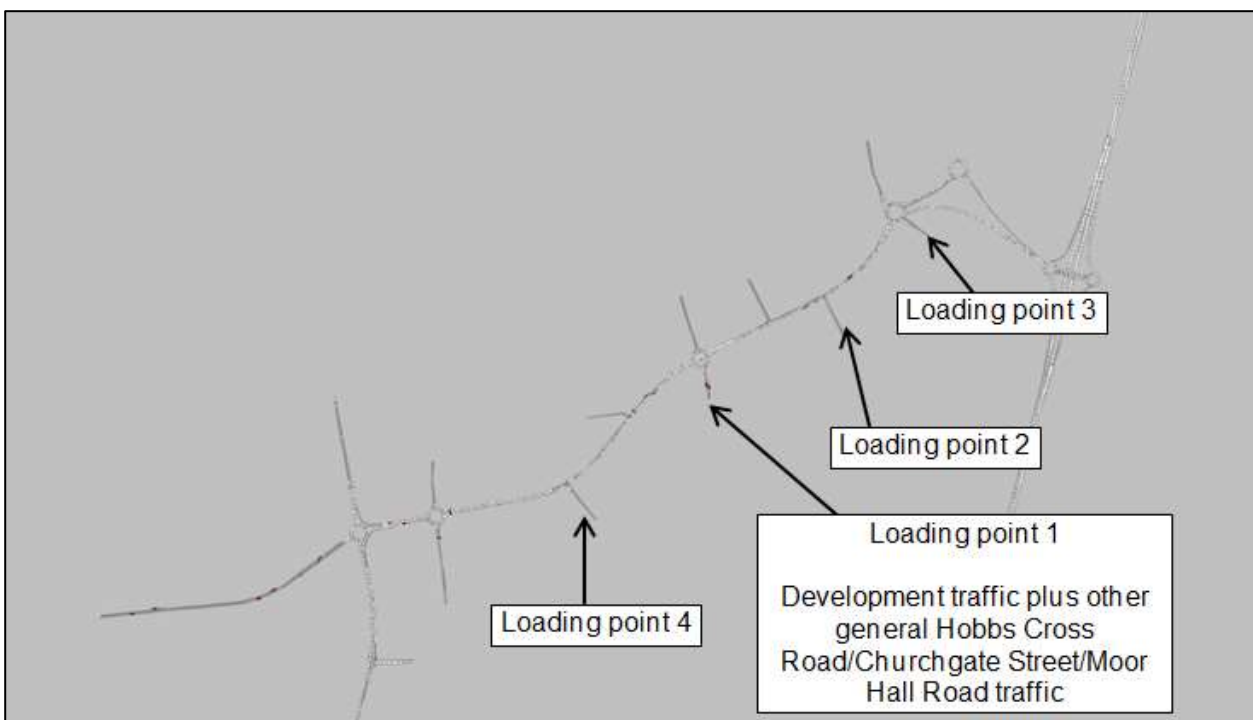
A list of emerging Local Plan developments (2014-2033) was provided by ECC on behalf of Harlow (HDC), Epping Forest (EFDC), Uttlesford (UDC) and East Hertfordshire (EHDC) District Councils to identify the appropriate developments to include in the Local Plan forecast modelling using the VISUM transport model. For the assessed case between 2014 and 2033, the sites that have been identified to provide the level of development to meet the Objectively Assessed Housing Need (OAHN) for the WEEH SHMA area amount to approximately 43,000 homes and 30,500 jobs, referred to as the Emerging Option, as set out in the Uncertainty Log ("160914 UL 2033 Emerging Max_V2_Final"). A reference case scenario was also developed for comparison purposes by using TEMPro (NTEM v6.2) and a lower level of development growth.

Within the wider Harlow area itself, the Emerging Option residential developments provide 15,250 homes and the employment developments provide 15,300 jobs.

With East Harlow there are 3,350 homes forecast across two development sites. This report, however, simply refers to a single East Harlow development of up to 3,350 homes. In addition, there is existing housing in east Harlow, which generates trips.

It is proposed that there would be four access/egress points along the B183 Gilden Way corridor for the East Harlow development as shown in Figure 2-1 below:

Figure 2-1: Access/Egress Points for the East Harlow Development



Loading Point 1 has approximately 200 homes connected onto Hobbs Cross Road / Churchgate Street / Moor Hall Road. For the initial assessment, the remaining East Harlow development traffic was split equally amongst the 3 other access/egress locations. A summary of the approximate number of trips/homes to be served at each location is shown in Table 2-1.

Table 2-1: East Harlow Development Loading Points and Homes served by each access

Loading Point	Description	Approx. No. of Homes Implied	Development Trips (AM), PCU		Development Trips (PM), PCU	
			From	To	From	To
1	Approximately 200 homes connected onto Hobbs Cross Road / Churchgate Street / Moor Hall Road	208-222	79	30	41	71
2	A Left-in Left-out priority junction just west of Mayfield Farm	1010-1027	390	129	187	330
3	An Arm on the Sheering Road / J7a Link Roundabout	1088-1108	413	143	205	341
4	New signalised junction west of Mulberry Green	1010-1027	390	129	187	330
Total		3350	1272	431	620	1072

This section compares the network performance of the 2033 Reference Case with the Emerging Option scenario which has the East Harlow development traffic apportioned more or less equally across the three main accesses (loading points 2, 3 and 4). It enables a visual comparison of the impact of the Emerging Option on the Gilden Way / J7a corridor and highlights issues that needed further investigation to achieve optimal operational capacity, which is reported in the next chapter.

Apart from minor adjustments to some link connectors in VISSIM to better manage lane usage on approaches to junctions and inside the gyratory of the roundabouts, no significant network improvement measures have been applied to the models at this stage. All traffic inputs and vehicle routings in VISSIM were kept consistent with the origin-destination matrices produced from the cordoned Harlow VISUM models.

2.2 AM Peak Assessment

In the reference case, the M11 J7a and the Sheering Road roundabout on Gilden Way appear to perform reasonably well in the AM peak. A queue would be likely to be generated on the westbound approach to the Churchgate (Hamburger) Roundabout from a proposed gating strategy which would use the signals at the Churchgate Roundabout to better manage the progression of traffic through this roundabout and the London Road and A414 / First Avenue roundabouts further west. The A414/ First Avenue Roundabout would be likely to be oversaturated in the reference case with significant delays occurring on the northbound and westbound approaches. This would also be likely to lead to exit blocking at the London Road roundabout and a long westbound queue extending to near the junction with Mulberry Green.

The M11 J7a would be likely to continue to perform well in the 2033 Emerging Option scenario. At the Sheering Road roundabout, the Sheering Road (N) approach and the access road from the East Harlow development would be likely to be oversaturated in the Emerging Option scenario due to increased traffic on the opposing circulating movements and on the approaches themselves. The queue on the westbound approach to the Churchgate roundabout mentioned above in the reference case would be likely to extend further past the new access at the East Harlow development (Loading Point 2), preventing traffic from the development from joining Gilden Way at that point. Similarly, the westbound delay at the A414/ First Avenue Roundabout would be likely to get worst in the Emerging Option due to increased demand and would be likely to cause exit blocking at the new junction at Loading Point 4 for the East Harlow Development.

The following screenshots in Figure 2-2 to Figure 2-11 are taken during the VISSIM simulation of the Reference Case and Emerging Option scenarios for the AM peak. They provide a visual comparison of how each junction would be likely to perform in each scenario.

Figure 2-2 indicates that the M11 J7a would be likely to perform well within capacity in the Reference Case during the AM peak and Figure 2-3 indicates that the junction would be likely to continue to operate within capacity in the Emerging Option.

Figure 2-2: M11 J7a – 2033 AM Reference Case



Figure 2-3: M11 J7a –2033 Emerging Option

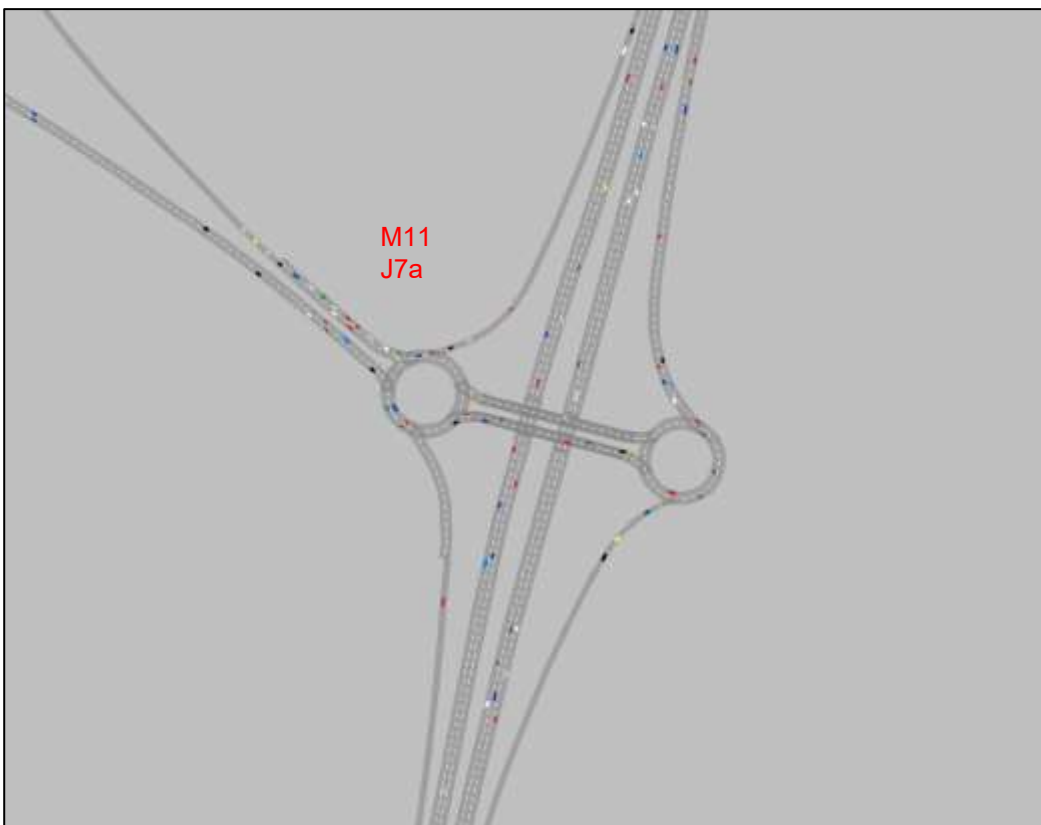


Figure 2-4 shows that the Sheering Road roundabout and the M11 J7a link road would be likely to perform within capacity in the Reference Case but that the Sheering Road (N) approach would be likely to become oversaturated in the Emerging Option scenario as shown in Figure 2-5 as a result of increased traffic on the opposing circulating movement within the roundabout and on the approach itself. The model also indicates that traffic from the East Harlow development would be likely to struggle to enter the roundabout at loading point 3.

Figure 2-4: Sheering Road Roundabout/ M11 J7a Link – 2033 AM Reference Case

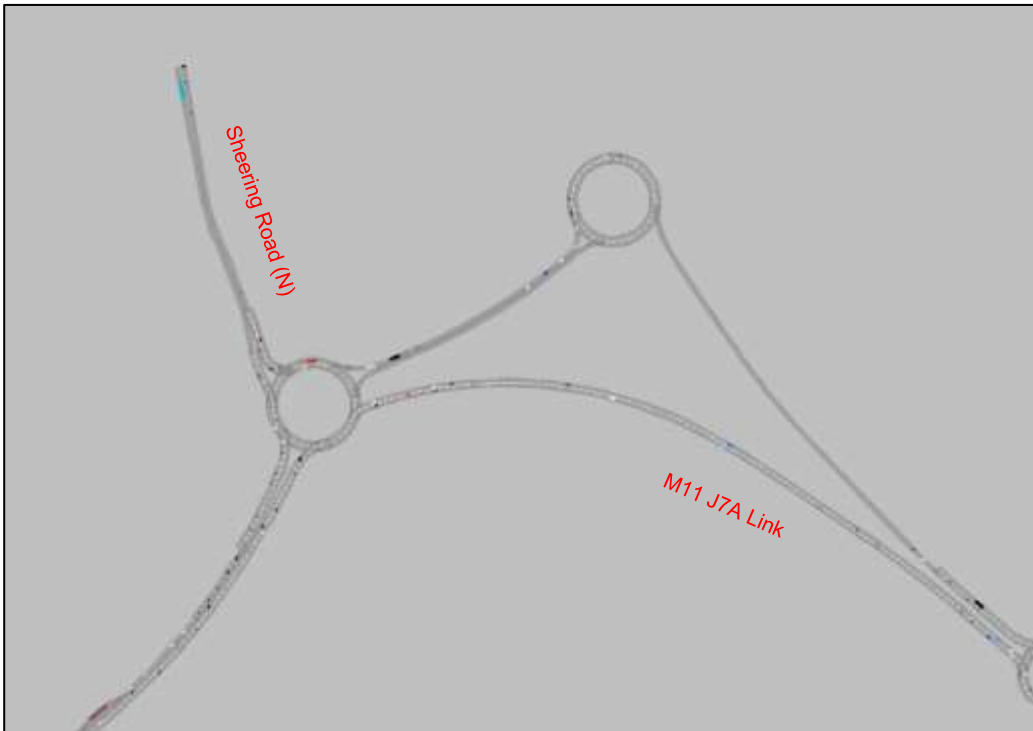
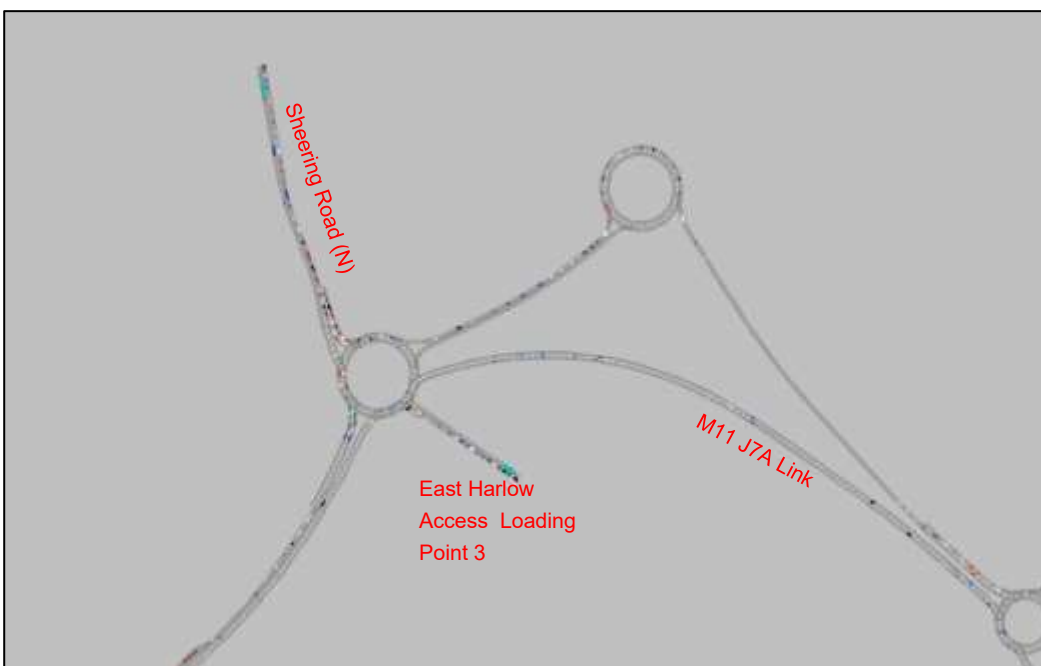


Figure 2-5: Sheering Road Roundabout/ M11 J7a Link – 2033 Emerging Option



As shown in Figure 2-6, in the Reference Case a queue is likely to be generated on the westbound approach to the Churchgate (Hamburger) Roundabout extending to the pedestrian crossing east of the Harlowbury access. This is the result of a proposed gating strategy which would use the signals at the Churchgate Roundabout to better manage the progression of traffic through this roundabout and the London Road and A414 / First Avenue roundabouts further west. This strategy is proposed as part of the M11 J7a Gildea Way scheme. The model of the Emerging Option as shown in Figure 2-7 indicates that this queue would be likely to extend further east past the new access at the East Harlow development (Loading Point 2), preventing traffic from the development from joining Gildea Way at that point. The operation of the Churchgate roundabout was therefore investigated in more detail, as reported in the next chapter, which was primarily a review of the proposed signal timings.

Figure 2-6: Churchgate Roundabout – 2033 AM Reference Case



The model of the Emerging Option as shown in Figure 2-7 indicates that this queue would be likely to extend further east past the new access at the East Harlow development (Loading Point 2), preventing traffic from the development from joining Gildea Way at that point. The operation of the Churchgate roundabout was therefore investigated in more detail, as reported in the next chapter, which was primarily a review of the proposed signal timings.

Figure 2-7: Churchgate Roundabout – 2033 Emerging Option



The westbound approach to the London Road roundabout would be likely to experience high levels of delays as a result of exit blocking caused by queues from the A414 roundabout, as shown in Figure 2-8. This queue would be likely to extend to just west of Mulberry Green in the Reference Case. Figure 2-9 also shows that this westbound delay is likely to get slightly worse in the Emerging Option. This is likely to be caused by increased demand and exit blocking at the London Road roundabout rather than any direct impact of the new junction at Loading Point 4.

Figure 2-8: London Road Roundabout & New T-Junction– 2033 AM Reference Case



Figure 2-9: London Road Roundabout & New T-Junction– 2033 Emerging Option

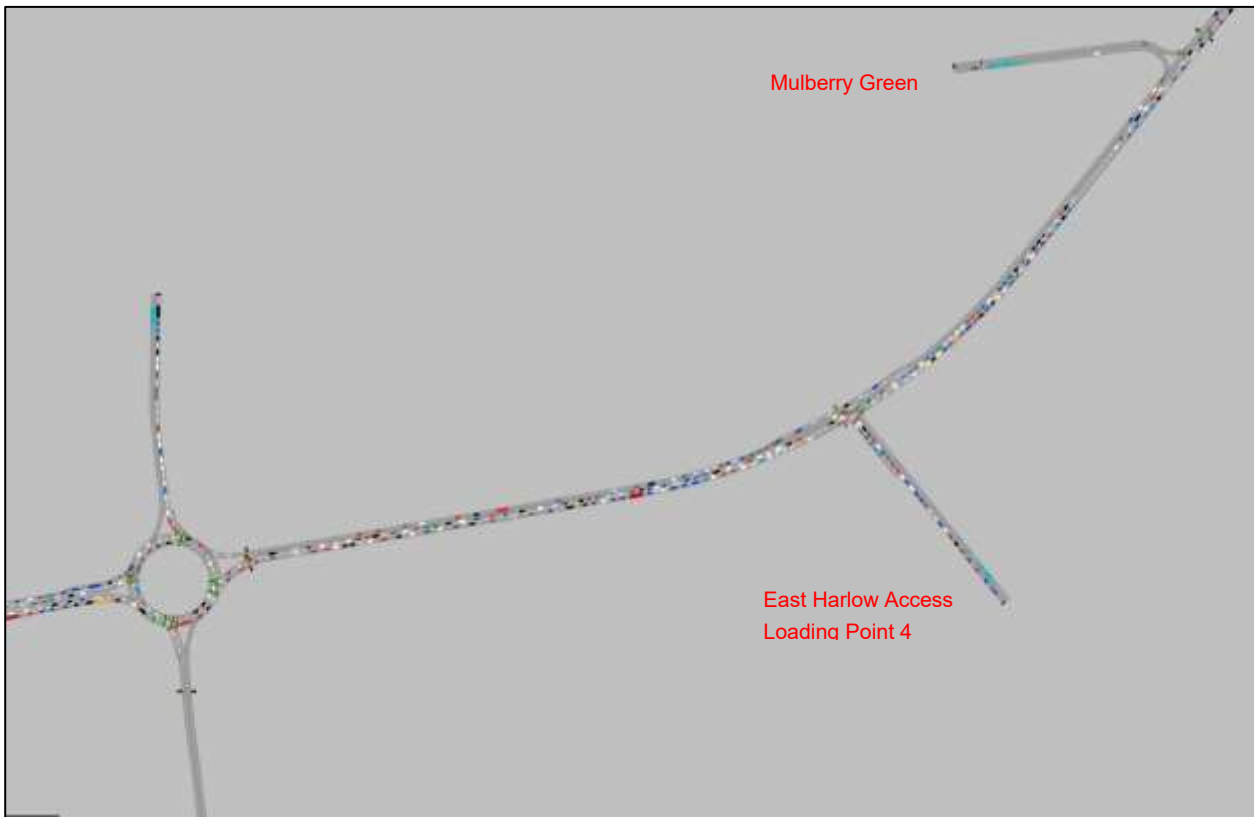


Figure 2-9 also shows that traffic on London Road (N) would be likely to struggle to enter the London Road roundabout due to increased demand at this junction and to delays on the eastbound exit caused by the pedestrian crossing, new junction at Loading Point 4 and vehicles having to merge from two lanes to one.

The A414 / First Avenue Roundabout is likely to be oversaturated in both the Reference Case and the Emerging Option, as shown in Figure 2-10 and Figure 2-11. The northbound and westbound queues would be likely to extend beyond the next upstream junction in both the Reference Case and Emerging Option scenarios.

Figure 2-10: A414/ First Avenue roundabout – 2033 AM Reference Case



Figure 2-11: A414/ First Avenue roundabout –2033 Emerging Option



2.3 PM Peak Assessment

As with the AM peak assessment, most of the Gilden Way junctions appear to perform reasonably well in the PM peak for the Reference Case scenario with significant delays only likely to occur on the eastbound and westbound approaches to the A414/ First Avenue Roundabout. Traffic on London Road southbound at the London Road Roundabout would also be likely to struggle to find gaps to enter the roundabout due to the dominating eastbound traffic on the roundabout. The signalised pedestrian crossing on the eastbound exit of the roundabout may also cause exit blocking, further reducing the capacity at the roundabout.

The screenshots in Figure 2-12 to Figure 2-19 are taken during the VISSIM simulation of the reference case and emerging option scenarios for the PM peak. They provide a visual comparison of how each junction would be likely to perform in each scenario.

Figure 2-12 shows the M11 J7a and Sheering Road roundabout would be likely to perform well within capacity in the PM Reference Case. Figure 2-13 shows there would be likely to be long delays on the westbound approach (M11 J7a link road) to the Sheering Road roundabout in the Emerging option due to high right turning flows from Sheering Road (N). Queues on the M11 J7a link road would likely extend back to J7a itself and onto the northbound off-slip during the PM peak. Traffic from the East Harlow development would also be likely to struggle to enter the roundabout due to the dominating westbound flow both from Sheering Road (N) and the M11 J7a link road.

Figure 2-12: M11 J7A & Sheering Road Roundabout – 2033 PM Reference Case



Figure 2-13: M11 J7A & Sheering Road Roundabout –2033 Emerging Option

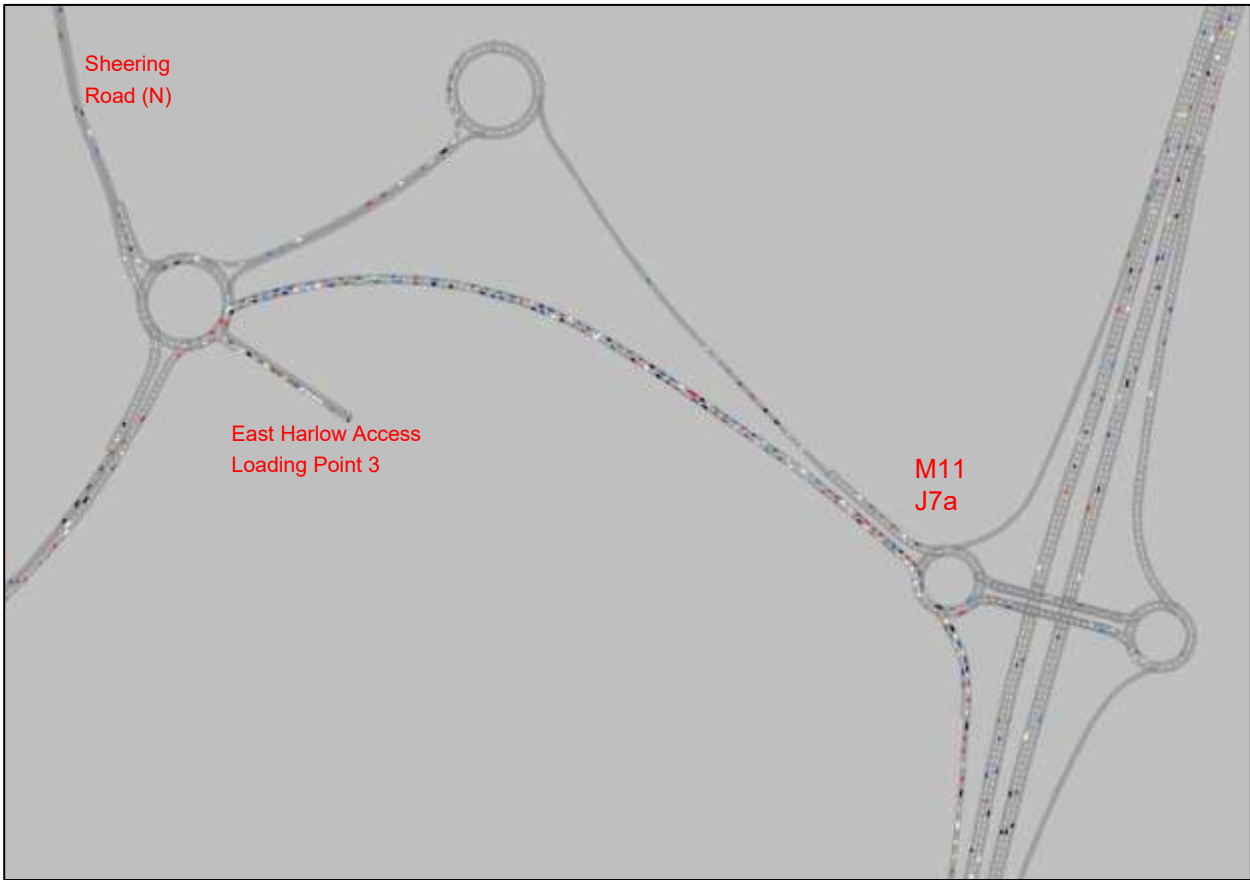


Figure 2-14 and Figure 2-15 show that the Churchgate roundabout would be likely to operate within capacity in both the Reference Case and Emerging Option in the PM peak and there are no issues for traffic to join Gilden Way from Loading Point 2 of the East Harlow development.

Figure 2-14: Churchgate Roundabout – 2033 PM Reference Case



Figure 2-15: Churchgate Roundabout –2033 Emerging Option



In order to minimise any road widening along Gilden Way, the eastbound approach to the new signalised junction for East Harlow development (Loading Point 4) was initially modelled as a single lane with a 30m flare to allow straight ahead traffic to bypass vehicles waiting to turn right. As shown in Figure 2-17 the model indicates in the Emerging Option that this arrangement would be likely to cause significant delays to eastbound traffic with queues extending back as far as the A414/First Avenue Roundabout. The queues on the westbound approach to the London Road roundabout also appeared to be shorter in the Emerging Option due to a large proportion of westbound traffic being delayed/held back at the Sheering Road roundabout.

Figure 2-16: London Road Roundabout & New T-Junction– 2033 PM Reference Case

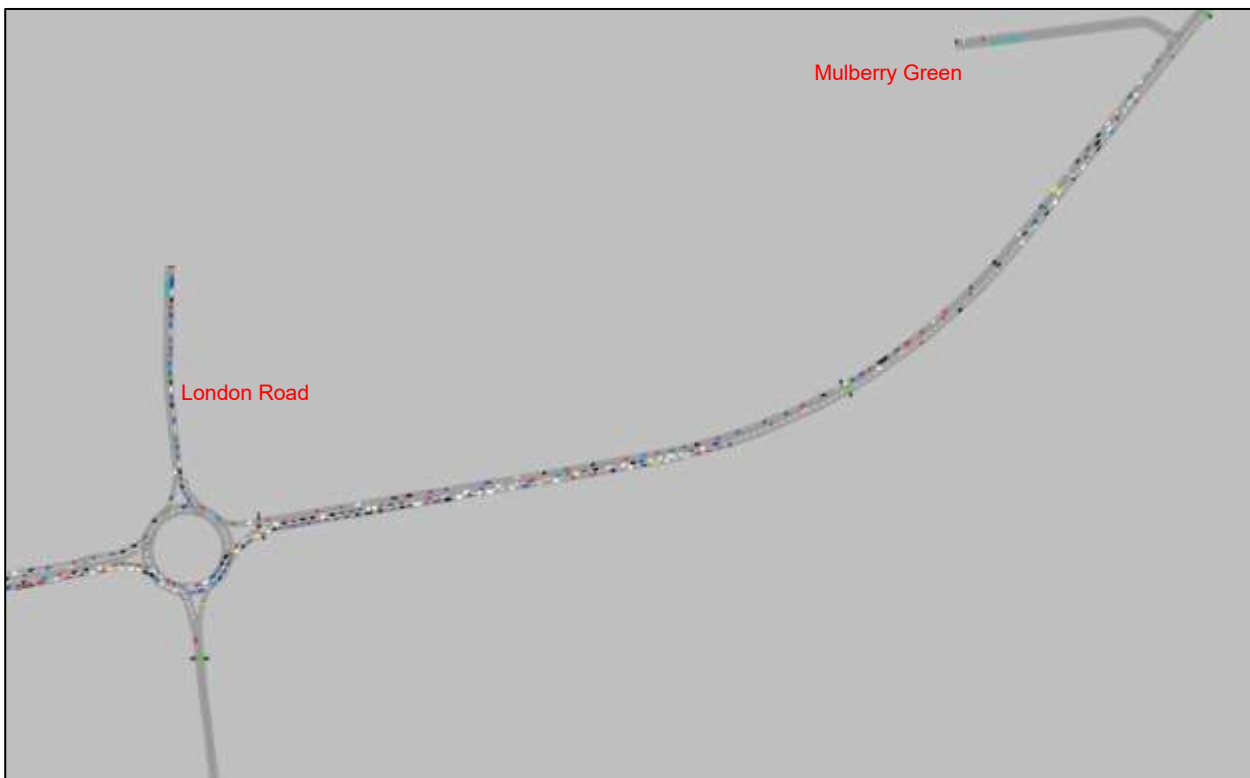


Figure 2-17: London Road Roundabout & New T-Junction– 2033 PM Emerging Option



The A414 / First Avenue Roundabout would be likely to be oversaturated in both the Reference Case and the Emerging Option, as shown in Figure 2-18 and Figure 2-19. Long queues would likely occur on the eastbound and westbound approaches to this junction in both the Reference Case and Emerging Option scenarios.

Figure 2-18: A414 Roundabout – 2033 PM Reference Case



Figure 2-19: A414 Roundabout – 2033 PM Emerging Option



3. Proposed Highway Designs

This section provides a detailed description of the further optioneering process that took place to arrive at the recommended junction design layouts and corridor modifications for the Gilden Way / J7a corridor. This involved the use of either LinSig or ARCADY, as appropriate, to determine the optimal operational design capacity of each of the junctions, which was then iteratively fed back into the Vissim modelling. It also required revised assumptions about the level of East Harlow traffic assigned to each loading point, as set out in Figure 2-1.

3.1 Changes to loading distribution

Following visual evaluation of the operation of the initial Emerging Option in VISSIM, the proportion of development traffic at each loading point was adjusted to improve the operation of each junction. It was found from the initial assessment that the turn restrictions (no right turn in and out) at the Mayfield Farm access (Loading Point 2) generated substantial u-turning traffic at Sheering Road roundabout (traffic coming from the west u-turning to then turn left as it reapproaches from the east), and also traffic wishing to head east u-turning at the Churchgate roundabout. This would be likely to adversely affect westbound traffic approaching from J7a, with increased delays likely for this traffic, resulting in queues building up on the J7a approach to the Sheering Road roundabout.

The first solution investigated was to assume that all of the Mayfield Farm access (loading point 2) arrival traffic from the west would instead turn right into the site at the Sheering Road roundabout (loading point 3). Testing of this concluded, however, that this was likely to result in a large increase in traffic turning right into the site at the Sheering Road roundabout, which would still be likely to adversely impact on westbound traffic approaching from J7a.

A further solution then assumed that all eastbound arrival traffic would use either the Sheering Road roundabout (loading point 3), or the new signalised western junction (loading point 4) on an equal split basis. The resulting development traffic flows assumptions (and approximate number of homes implied per access) after these adjustments are shown in Table 3-1. In addition, the traffic flows for each turning movement at loading points 2, 3 and 4 are shown in Figure 3-1.

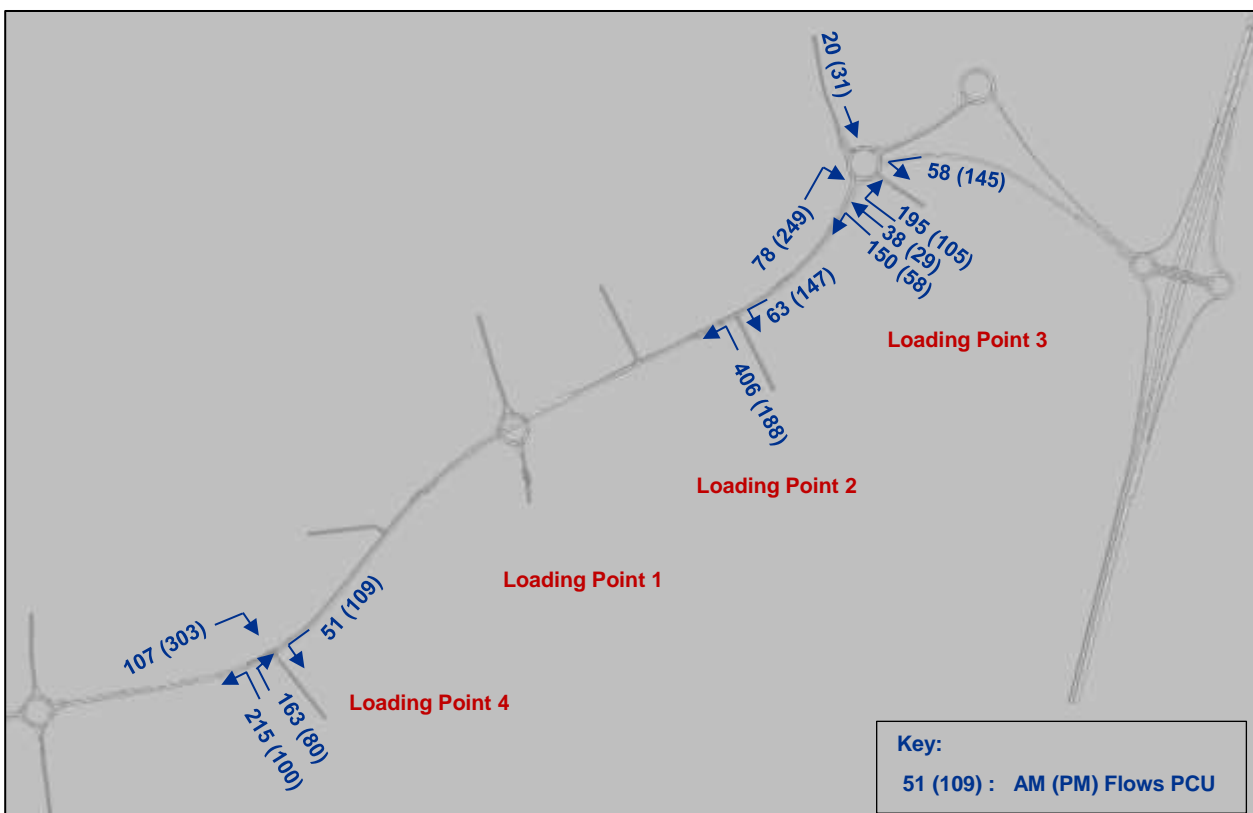
Table 3-1: Adjusted East Harlow Development Traffic Flows

Loading Point	Description	Approx. No. of Homes Implied	Development Trips (AM), PCU		Development Trips (PM), PCU	
			From	To	From	To
1	Approximately 200 homes connected onto Hobbs Cross Road / Churchgate Street / Moor Hall Road	208-222	79	30	41	71
2	A Left-in Left-out priority junction just west of Mayfield Farm	1016-1069	406	63	188	147
3	An Arm on the Sheering Road / J7a Link Roundabout	1077-1140	409	180	211	442
4	New signalised junction west of Mulberry Green	973-996	378	158	180	412
Total		3350	1272	431	620	1072

It should be noted that this traffic distribution assumption would require a high level of internal connectivity within the development site between the Sheering Road roundabout and the new western junction access (loading points 3 and 4). However, this potential arrival traffic distribution would not be enforceable, being greatly reliant on driver choice. As such, although good internal connectivity within the site could influence driver choice, reducing site development traffic impact on Gilden Way traffic, particularly approaching from the motorway at the Sheering Road roundabout, could not be guaranteed.

While this traffic distribution has been modelled in this section it may be that an overall reduction in the number of homes would be needed in order to reduce the likelihood of westbound traffic being adversely affected at the Sheering Road roundabout. This is considered in conclusion of this report.

Figure 3-1: AM and PM Turning Flows at development in 2033 Emerging Option VISSIM (PCU)



3.2 Loading Point 4: New Signalised Junction

This would be a new junction providing access to the southern end of the East Harlow development (Loading Point 4). It is intended to be an all movements junction with pedestrian facilities.

Several layout options were tested initially in LinSig. In running these tests, it became clear that due to traffic demand on Gilden Way eastbound and the junction's proximity to the London Road Roundabout, two lanes in the eastbound direction on Gilden Way would be required.

A summary of the other layout options that were tested but discarded are provided in Table 3-2. The results from the LinSig modelling are included in Appendix A.

Table 3-2: Layout Options Considered for New Signalised Junction at Loading Point 4

Options	Results
<p>1. <u>Signalised junction with all-red pedestrian stage</u></p> <ul style="list-style-type: none"> - one nearside ahead lane and a short 30m long right turn flare on eastbound approach - Two lanes retain on westbound - One left lane and one right lane on access road. - Straight crossings with an all-red pedestrian signal stage 	<p>All three arms of the junction would be likely to be over capacity.</p>
<p>2. <u>Signalised junction with extended right turn flare lane on eastbound:</u></p> <ul style="list-style-type: none"> - one nearside ahead lane and an extended 60m long right turn lane on eastbound approach. - Two lanes retain on westbound - One left lane and one right lane on access road. - Staggered pedestrian crossings on west and southern arms 	<p>LinSig indicates the eastbound arm remains over capacity in both AM and PM peaks and the East Harlow development access road remain over capacity in the AM peak.</p>
<p>3. <u>Segregated ahead and right turn movements on eastbound with downstream merge</u></p> <ul style="list-style-type: none"> - The layout in option 2 modified to include an island separating the ahead and right movements on eastbound. The ahead movement will run on a separate signal stream with the associated pedestrian crossing. - Eastbound ahead traffic will need to merge with right turn traffic from access road downstream of junction 	<p>Degree of saturation reduced at development access road but eastbound arm on Gilden Way remain oversaturated.</p> <p>This option was also discarded due to the additional island on Gilden Way increasing crossing time and inconvenience for pedestrian.</p>

The suggested design therefore consists of two lanes on the eastbound approach that reduces to a single lane further downstream to tie in with the highway design proposal for the J7a Gilden Way scheme; the westbound approach would remain as two lanes. It is proposed to provide two lanes for the egress from the East Harlow development with the offside lane allowing both left and right turns, due to the high level of left turning demand from the development.

The revised eastbound two lane section on Gilden Way starts from the exit of the London Road Roundabout. This also provides the benefit of reducing delays on the London Road southbound approach as it reduces the impact of exit blocking from the pedestrian crossing on the eastern arm of the roundabout and allows a smoother exit for vehicles on the roundabout without requiring merging back into one lane.

LinSig modelling was undertaken for the preferred junction layout at Loading Point 4. The geometric parameters coded in the model were based on best design and modelling practice, and some high level measurements from the available OS base mapping.

The results from the LinSig modelling are included in Appendix A and summarised in Table 3-3 below. These are only indicative to assist in determining if this junction layout is feasible and should not be treated as definitive.

Table 3-3: LinSig Results of Preferred Option

Lane No.	Lane Description	AM Peak		PM Peak	
		DoS (%)	MMQ (PCU)	DoS (%)	MMQ (PCU)
1/1	B183 Gilden Way (W) Ahead	81.4	25.6	98.9	67.6
1/2	B183 Gilden Way (W) Right	79.4	4.0	86.1	11.5
2/1	B183 Gilden Way (E) Left + Ahead	75.6	21.5	49.6	10.7
2/2	B183 Gilden Way (E) Ahead	82.3	26.6	88.4	34.9
3/1	Access Rd Left	78.5	7.4	55.6	2.9
3/2	Access Rd Left + Right	79.4	7.5	71.3	4.1
PRC		9.4%		-9.9%	

Key to abbreviations

DoS	Degree of Saturation
MMQ	Mean Maximum Queue
PCU	Passenger Car Unit
PRC	Practical Reserve Capacity

Preliminary results from LinSig indicates all arms of the junction would be likely to operate within capacity in the AM peak. Although the degree of saturation on the eastbound approach would be likely to reduce significantly in the PM peak when compared to the other options, LinSig predicted this arm would still be likely to be operating close to capacity in the PM peak with degree of saturation at 98.9% and the junction operating with PRC of -9.9%, suggesting the proposed junction could still experience high levels of delays in the PM peak. Further tests were carried out in VISSIM to assess the delays and queues at the junction. Screenshots showing the operation of the revised junction at Loading Point 4 and at London Road roundabout are shown in Figure 3-2 and Figure 3-3 for the AM and PM peaks respectively.

Figure 3-2: Refined Emerging Option VISSIM (AM Peak)

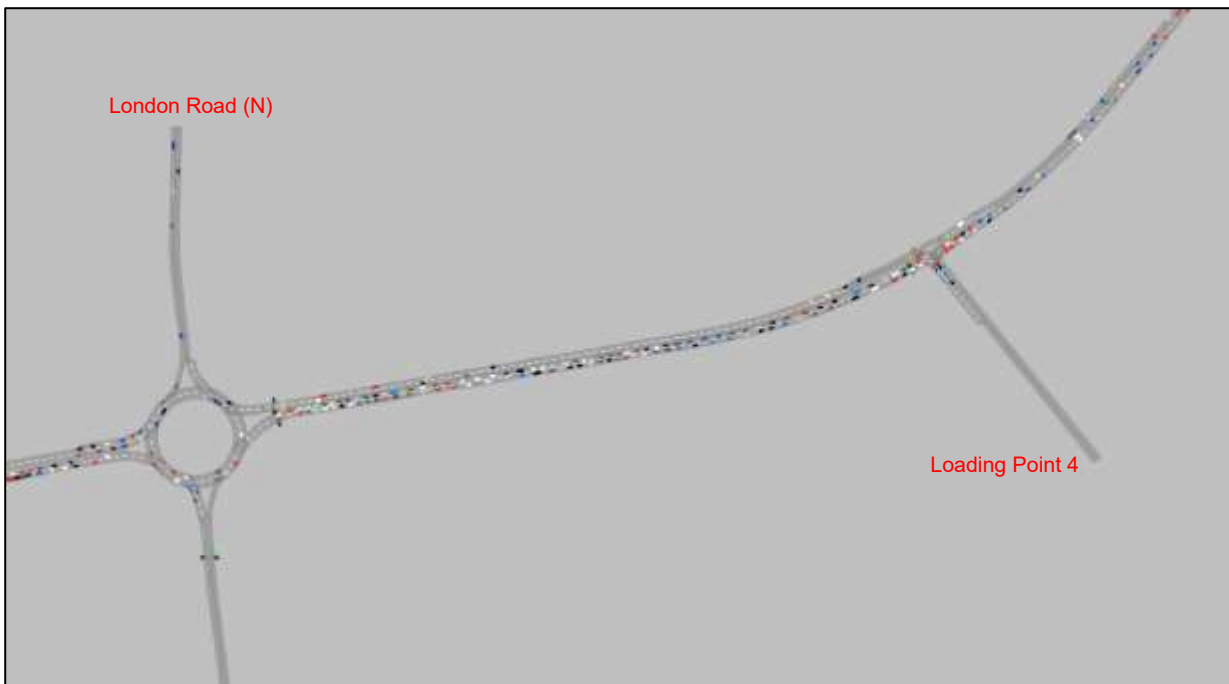


Figure 3-3: Refined Emerging Option VISSIM (PM Peak)



The proposed junction design would be expected to result in reduced queuing on Gilden Way eastbound and on London Road southbound. As shown in Figure 3-3, a small queue remains on Gilden Way eastbound in the PM peak, however this no longer be likely to extend to the London Road roundabout. The queues from the development at loading point 4 would also be likely to be reduced in the AM peak as a result of the junction redesign.

The westbound queues caused by exit blocking at the London Road roundabout previously extended back to the Mulberry Green junction in both the Reference Case and in the Emerging Option during the AM peak.

Further fine-tuning of signal timings at the A414 / First Avenue roundabout slightly reduced this queue, however this westbound delay remains in the AM peak with queues often extending to Loading Point 4. It is recommended the operation capacity of the A414 / First Avenue and London Road roundabouts to be further investigated to reduce westbound delays on Gilden Way.

3.3 Loading Point 3: Sheering Road Roundabout

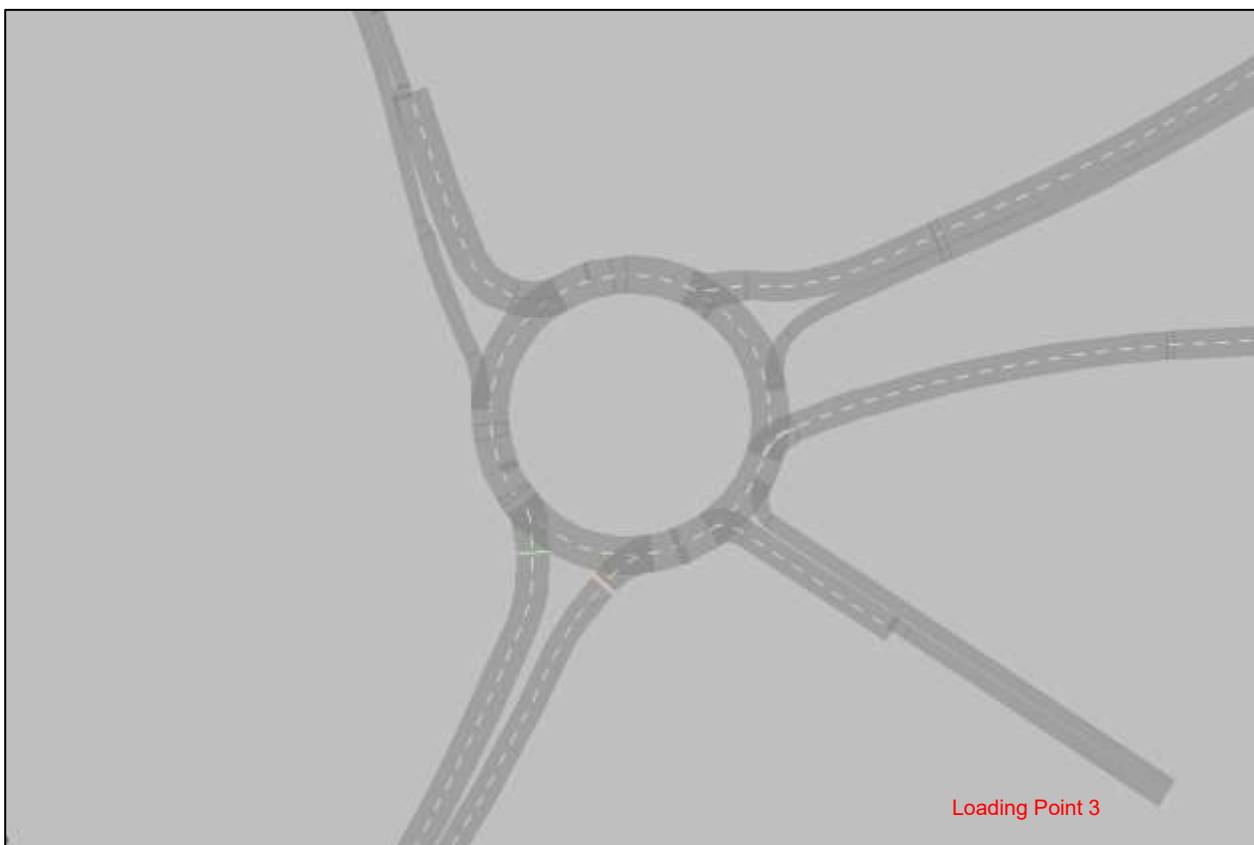
Sheering Road Roundabout is a new junction within the M11 J7a Gilden Way scheme and its purpose is to link the existing B183 Gilden Way/Sheering Road corridor with the M11.

The M11 J7a scheme highway design modelled for this testing is for a roundabout with two circulatory lanes; it should be noted that this design has since been modified but it is not considered likely that this would be likely to impact on the overall operational capacity assumptions made for this testing.

The westbound approach from the M11 would consist of two lanes; the eastbound approach from Harlow would be one lane, as would the southbound approach from Sheering, both of which would flare to two lanes on their approaches to the roundabout. The exits to the J7a link road and towards Harlow would both have two lanes, while that towards Sheering would have one lane. A screenshot from VISSIM, of the initial layout of the roundabout is shown in Figure 3-4, together with Loading Point 3 to serve the northern part of the East Harlow development, which has a single lane flaring to two lanes at the roundabout, together with a single lane exit.

Another westbound approach link is shown in Figure 3-4 which enables future access to land north of the J7a link road. This link has no traffic flows at this stage, and has been included in the VISSIM network for completeness, but does not affect the operational capacity of the roundabout at this stage.

Figure 3-4: Initial Layout at Sheering Road Roundabout



Several options have been considered for reducing delays on the M11 J7a link road westbound approach. These were tested either in LinSig or directly in VISSIM and a summary of these and their outcomes are provided in Table 3-4.

Table 3-4: Improvement Options Considered for Sheering Road Roundabout

Options	Results
1. Provision of a left turn slip from M11 J7a link Road to the East Harlow development (Loading Point 3)	VISSIM indicates that the westbound arm would still be likely to be oversaturated with queues extending back to the M11 J7a slip roads
2. 4-arm signalised junction	Junction would be likely to be oversaturated with DoS >100% on the M11 J7a link road, Sheering Road north and south arms
3. Partially signalised roundabout with signals at the M11 J7a Link arm	This would be likely to reduce delays on westbound approach but would generate queues in excess of 6pcu (approx. 35m) at the internal stop lines on the circulating lanes of the roundabout that would be likely to block and increase delays to eastbound and southbound traffic.
4. Partially signalised roundabout with signals at the Sheering Road North arm	This could potentially create more gaps in the circulating traffic for westbound traffic and traffic from the development to enter the roundabout. However, the reductions in delays on the westbound arm were still considered to be insufficient to prevent queues from blocking back to M11 J7a.

The results from the junction design optioneering exercise indicated that all four options were not sufficient to reduce the delays on the westbound arm. Further tests using a combination of these options together with a reduction in overall development traffic for the East Harlow site were then carried out. This modelling suggested that a 10% reduction in site development traffic and implementation of both Options 1 and 4 would likely be needed in order for the junction to operate satisfactorily. A screenshot from VISSIM with these changes applied in the PM peak (the worst case) is shown in Figure 3-5.

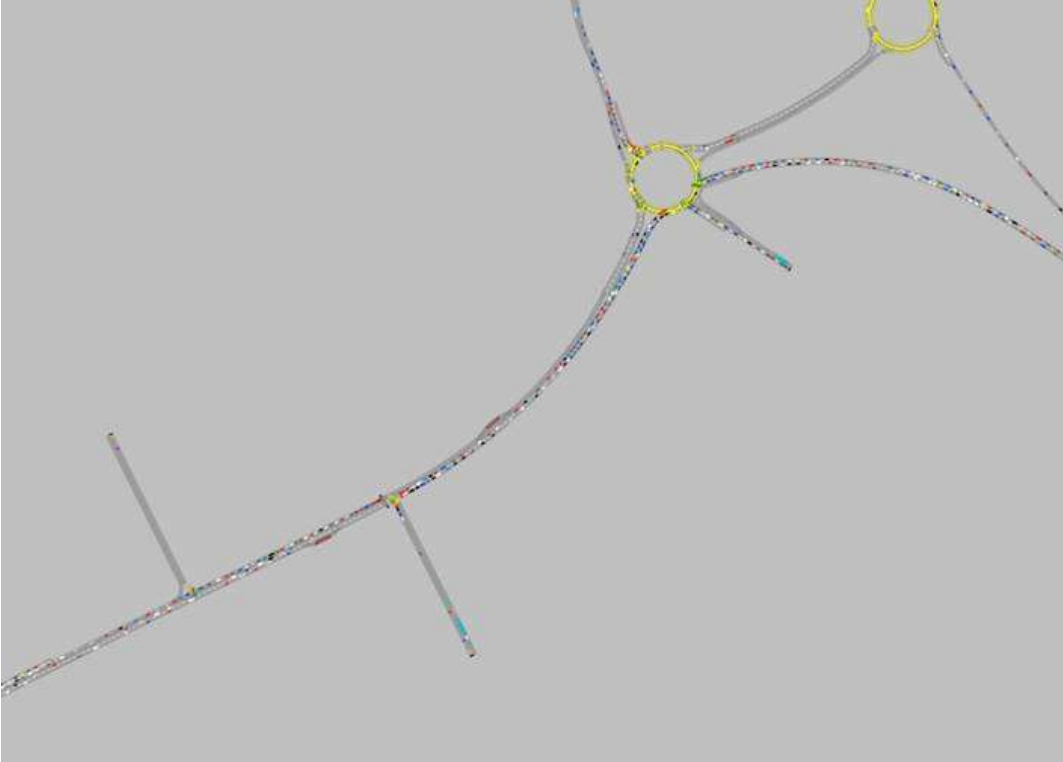
Figure 3-5: Sheering Road Roundabout Refined Emerging Option VISSIM (PM Peak)



3.4 Loading Point 2: Mayfield Farm

The introduction of traffic signals allowing a right turn into the development from Gilden Way was modelled in VISSIM. This resulted in longer queues at the junction indicating over-saturation. In addition, signals were tested in conjunction with a reduction in development flows of 10% (looking ahead to the next section). This also showed that the junction remained over-saturated in both the AM and PM peaks. The PM peak situation is shown in Figure 3.6.

Figure 3.6 : Mayfield Farm Signals Reduced Emerging Option VISSIM (PM Peak)



The junction operated slightly better if Gilden Way is widened to two lanes eastbound. However, any benefit was undermined by the fact that the westbound approach would be likely to be oversaturated with queues building up at Loading Point 3 and Sheering Road roundabout in both the AM and PM peaks. The PM peak situation is shown in Figure 3.7.

Figure 3.7 : Mayfield Farm Signals with widened Gilden Way Emerging Option VISSIM (PM Peak)



As a result of these tests the introduction of signals at Loading Point 2 is not being recommended.

4. Refined Emerging Option VISSIM

4.1 Network improvements with reduced development trips

Following on from Section 3, this section combines the network improvements identified around Loading Points 3 and 4 with the suggestions for reducing the overall level of development traffic by 10%.

The network improvements identified are:

- Gilden Way to be widened to two lanes from the exit of London Road roundabout to the new junction at Loading Point 4;
- Replace the straight crossing on Gilden Way (W) arm of the junction at Loading Point 4 with a staggered pedestrian crossing;
- Provision of a left turn slip from M11 J7a link Road to the East Harlow development (Loading Point 3) at the Sheering Road roundabout;
- Provide partial signals at the Sheering Road roundabout with the Sheering Road North arm signal controlled;

Based on reducing the development traffic by 10% the new trip distribution to and from the East Harlow development is set out in Table 4-1

Table 4-1: Reduced East Harlow Development Traffic Flows

Loading Point	Description	Approx. No. of Homes Implied	Development Trips (AM), PCU		Development Trips (PM), PCU	
			From	To	From	To
1	Approximately 200 homes connected onto Hobbs Cross Road / Churchgate Street / Moor Hall Road	187-200	71	27	37	64
2	A Left-in Left-out priority junction just west of Mayfield Farm	914-962	365	57	169	132
3	An Arm on the Sheering Road / J7a Link Roundabout	969-1026	368	162	190	398
4	New signalised junction west of Mulberry Green	876-896	340	142	162	371
Total		3015	1145	431	620	1072

4.2 Operational Analysis

In order to assess the network and junction performance of the refined emerging option, which includes a 10% reduction in trips, journey time information has been extracted from the VISSIM models. The extent of the journey time sections are shown in Figure 4-1. A comparison of the modelled journey times between the Reference Case and the Refined Emerging Option in each peak hour is provided in the Table 4-2 and Table 4-3.

Each VISSIM model was run for five seeds and the output data collected for journey times along the northbound/ southbound movements on A414 and eastbound/westbound journeys on B183 Gilden Way corridor.

Running the model with different seeds is required to test the sensitivity of the models towards daily flow fluctuations. The results presented in Table 4-2 and Table 4-3 are the averages of the five seeds model runs.

Figure 4-1: Extent of VISSIM Journey Time Sections



Table 4-2: VISSIM Journey Time Comparison (AM Peak)

Journey Time Route	Distance (m)	Route Description		End-to-End Journey Times (seconds)		
		From	To	2033 Reference Case	Refined Emerging Option (with 10% reduction)	Diff
B183 Eastbound	4790	A414 / First Ave Roundabout	M11 J7a	443	489	46
B183 Westbound	4458	M11 J7a	A414 / First Ave Roundabout	705	691	-14
A414 Northbound	1375	300m south of Newhall Junction	Bridge by Park Hill	195	204	9
A414 Southbound	1350	Bridge by Park Hill	300m south of Newhall Junction	180	198	18
					TOTAL	59
					AVERAGE	15

Table 4-3: VISSIM Journey Time Comparison (PM Peak)

Journey Time Route	Distance (m)	Route Description		End-to-End Journey Times (seconds)		
		From	To	2033 Reference Case	Refined Emerging Option (with 10% reduction)	Diff
B183 Eastbound	4790	A414 / First Ave Roundabout	M11 J7a	485	508	23
B183 Westbound	4458	M11 J7a	A414 / First Ave Roundabout	522	430	-92
A414 Northbound	1375	300m south of Newhall Junction	Bridge by Park Hill	161	216	55
A414 Southbound	1350	Bridge by Park Hill	300m south of Newhall Junction	187	174	-14
					TOTAL	-27
					AVERAGE	-7

Table 4-2 and Table 4-3 show that the eastbound journey time on Gilden Way from First Avenue to M11 J7a would be likely to increase in both the AM and PM peaks as a result of both the additional signals at Loading Point 4 and at Sheering Road roundabout as well as the additional traffic from the East Harlow development and other strategic development sites outside of the scope of this VISSIM study (but within the scope of the strategic VISUM model).

The results also indicated a reduction in westbound journey times in both the AM and PM peaks would be likely despite the longer delays on the approach to the Sheering Road roundabout as observed in the VISSIM model. Breakdowns of the westbound journey times into smaller segments are shown in Table 4-4 and Table 4-5. The analysis showed that journey time in Section 1 (from M11 J7a to Sheering Road roundabout) increased in the PM peak but journey time in Section 3 (from Churchgate roundabout to First Avenue) reduced in both AM and PM peaks which resulted in an overall decrease in journey times along the whole route from M11 J7a to First Avenue due to the increased queuing that would be likely in Section 1 “holding back” traffic from the downstream sections.

Table 4-4: Westbound Journey Time Sections (AM Peak)

Journey Time Route	Route Description		Journey Times (seconds)		
	From	To	2033 Reference Case	Refined Emerging Option (with 10% reduction)	Diff
B183 Westbound (Section 1)	M11 J7a	Sheering Road Roundabout	61	68	7
B183 Westbound (Section 2)	Sheering Road Roundabout	Churchgate Roundabout	196	194	-2
B183 Westbound (Section 3)	Churchgate Roundabout	A414 / First Ave Roundabout	479	472	-7

Table 4-5: Westbound Journey Time Sections (PM Peak)

Journey Time Route	Route Description		Journey Times (seconds)		
	From	To	2033 Reference Case	Refined Emerging Option (with 10% reduction)	Diff
B183 Westbound (Section 1)	M11 J7a	Sheering Road Roundabout	59	98	39
B183 Westbound (Section 2)	Sheering Road Roundabout	Churchgate Roundabout	107	102	-5
B183 Westbound (Section 3)	Churchgate Roundabout	A414 / First Ave Roundabout	354	231	-123

5. Conclusions

This report set out to:

1. Investigate the likely impact of significant housing development at East Harlow on the B183 Gilden Way corridor and whether and how this could be mitigated, particularly to avoid queuing back onto the M11; and
2. Evaluate the likely scale of development that could be delivered at East Harlow as part of the Emerging Option scenario.

Using a VISSIM local transport model, Section 2 assessed the impact of the proposed East Harlow development sites with 3,350 homes, on the M11 J7a Gilden Way corridor by comparing the development option with a reference case without development. In the development option, East Harlow development trips were loaded on the network across four loading points, with the majority of trips split more or less equally between Loading Points 2-4.

VISSIM and local junction modelling were then used to derive and test options for mitigation measures in Section 3. This also assumed the distribution of development trips across the loading points could be altered by assuming eastbound arrival traffic would be likely to use either the Sheering Road roundabout (loading point 3), or the new signalised western junction (loading point 4) on an equal split basis.

In Section 3 the following changes in highway design were identified for the B183 Gilden Way corridor to facilitate major development on the East Harlow site:

- Widen B183 Gilden Way eastbound to two lanes between the exit of London Road roundabout to the new junction at the southern access for East Harlow (Loading Point 4);
- Replace the straight crossing on Gilden Way (W) arm of the junction at Loading Point 4 with a staggered pedestrian crossing;
- Provision of a left turn slip road from M11 J7a link road approach to the East Harlow northern access road (Loading Point 3);
- Provide traffic signals for the Sheering Road North arm at Sheering Road roundabout;
- The internal road layout of the East Harlow development site should be designed to provide high level of connectivity between the four accesses so that development traffic can use any one of the four accesses to reach any part of the site.

It was noted, however, that the highway improvements were not sufficient to reduce delays on the westbound arm of the Sheering Road roundabout. Consequently it was considered appropriate to also reduce development size (or total car trips generated) at East Harlow by 10%. In addition, introduction of traffic signals at Loading Point 2 by Mayfield Farm was tested but not recommended.

Section 4 then proceeds to use the VISSIM model for journey time analysis in order to demonstrate that the network operates satisfactorily although with some increased delays when the above highway changes are made along with a 10% reduction in development trips.

It should be noted, however, that the altered distribution of development traffic across the loading points requires a high level of internal connectivity within the development site between the Sheering Road roundabout and the new western junction access (loading points 3 and 4). However, this potential arrival traffic distribution would not be enforceable, being greatly reliant on driver choice.

If this internal connectivity cannot be realised and enforced then a further reduction in development size would likely be required on top of the 10% reduction already identified. The further reduction in development size has been estimated to be in the order of 250 homes.