



West Essex & East Hertfordshire Local Plans Modelling

Essex County Council

Technical Note 3 Stort Crossing/Northern Bypass Initial Testing (May 2016)

22 March 2017

Harlow Local Plan Modelling Technical Note 3: Stort Crossing / Northern Bypass Initial Testing (May 2016)

Project No: B3553R0U
 Document Title: Technical Note 3: Stort Crossing/Northern Bypass Initial Testing (May 2016)
 Document No.: 3
 Revision: 4
 Date: 22 March 2017
 Client Name: Essex County Council
 Project Manager: Chris Hook
 Authors: Wendy Rathbone and Martin Whittles
 File Name: \\uk-lon-FAS02\Projects\UNIF\Projects\B3553R0U Harlow Local Plan Modelling\Reports and Technical Notes\Forecast Technical Notes\TN3\2017-03 WEEH TN3 issue v2.docx

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Document history and status

Revision	Date	Description	By	Review	Approved
1	17/02/2017	Initial draft version	WR	MW	MW
2	14/03/2017	Draft version	MW	WR	
3	17/03/2017	Following MY & CH review	MW	MY/WR	CH/MW
4	22/03/2017	Final issue	MW	MY/WR	CH/MW

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 Harlow district 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.

The information on which Technical Note 3 is based was provided in May 2016. The report on Technical Note 3, however, was only issued in March 2017.

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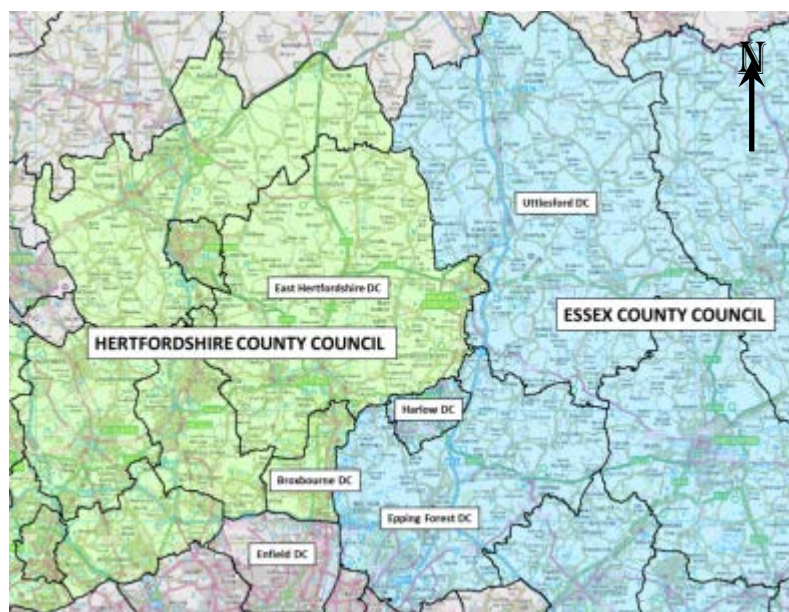
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1. Introduction

1.1 Introduction

Essex County Council (ECC) have 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 Area (SHMA). 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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The Harlow Transport Model, which has been built using Visum 14 software, is being used to assess the likely impact on the highway network of the emerging Local Plan strategic development sites with a particular focus on the area in and around Harlow. The Harlow Transport Model has a base year of 2014, and has been used to develop the M11 Junction 7a scheme. Since its initial use, it has been enhanced and recalibrated as described in the Harlow Base Model Enhancements Technical Report dated April 2016, but retains its base year of 2014.

This report, which is part of a suite of modelling reports, is concerned with assessing the impact of two of the elements of major highway infrastructure to the north of Harlow. These elements comprise::

- Phase 1: New Junction 7a on M11 (J7a)
- Phase 2: Additional road crossing of the River Stort in Harlow, comprising a dual carriageway linking the A414 at Eastwick with a new 3-arm roundabout north of the River Stort, and a further single carriageway link to River Way towards the eastern end of A414 Edinburgh Way. This would serve as a partial bypass of part of the A414 (a “second Stort crossing”)
- Phase 3: A Northern Bypass of Harlow, comprising both Phase 1 and 2, connected by a dual carriageway link with a grade separated junction at the A1184, north of Harlow Mill, and two further bridges (across the rail line and River Stort)

The impacts of Phase 2 and Phase 3 are reported in this Technical Note.

It should be noted that this assessment is based on early spatial options as defined in May 2016 that have since been refined and amended. As such, this report covers planning scenarios at a particular point in time in the local planning process, the outputs of which have helped to inform planning discussions of the four SHMA districts as their emerging local plans evolve.

1.2 Objectives

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

The purpose of this report is to identify the likely effects of Phases 2 and 3 of a Northern Bypass on both the local and strategic road network. The level of growth coming forward within the emerging local plans is likely to adversely affect the local road network in Harlow as reported in Technical Note 2: Spatial Options A-E (March 2016). It is recognised by Essex County Council and the districts that major highway infrastructure, in addition to J7a, would be required by the end of the local plans period (2033) to accommodate this growth.

The planning scenario used for modelling Phases 2 and 3 of the Northern Bypass is Spatial Option A1, which was defined in May 2016, and differs slightly from Spatial Option A, described in Technical Note 2, in that the location of some of the housing developments was varied. However, the overall quantum of housing is the same as for Option A. This development variation is explained in Section 2.

The impacts of J7a, which is Phase 1 of the Northern Bypass, are set to be reported by the separate J7a project. Hence they are considered beyond the scope of this commission. Nevertheless the Junction 7a and local plan modelling projects have shared information to ensure consistency of approach between the models as explained in Technical Note 1: Forecast Methodology. It should be noted that the Junction 7A study uses a variable demand model whilst WEEH local plan modelling uses a fixed trip matrix; and the growth assumptions, whilst similar, do differ as they were supplied at different points in time.

When considering the effects of Phases 2 and 3 of the Northern Bypass, they are compared against Phase 1, that is the road network which includes Junction 7A. In all cases the same fixed trip matrix based on Spatial Option A1 is used and the forecast year is 2033.

Specifically, Phase 2 is compared against Phase 1 which shows the impacts of the Second Stort Crossing. Then Phase 3 is compared against Phase 2 in order to show the impact of the full Northern Bypass. This reporting decision has been made because the phases of the Northern Bypass would be incrementally implemented and no option to construct the full Northern Bypass in one go is under consideration.

The modelling methodology used was the same as that reported in Technical Note 1. For the purpose of brevity, only AM peak hour flows are reported, which is sufficient to identify initial effects.

2. Development Assumptions

The location of housing across the wider Harlow area for both Option A and Option A1 for the period 2014-2033 is shown in Table 2.1 below. Option A1 has more homes to the south, fewer to the south-west and fewer to the east of the town, but the overall quantum of homes is the same for both spatial options. The quantum of housing in the whole SHMA area is around 41,000.

Table 2.1 Distribution of Wider Harlow Area Housing Development for each option 2014-2033

District / Site	Option A	Option A1	Difference
East Herts:			
Gilston	2,750	2,750	0
Harlow:			
Rest of Harlow (to nearest 100)	5,700	5,700	0
East Harlow	1,500	1,500	0
Epping Forest:			
Latton Priory	1,250	2,500	+1,250
West Sumners	1,000	1,000	0
West Katherines	750	0	-750
East Harlow	500	0	-500
Wider Harlow Total:	13,450	13,450	0

More detailed information on the 'Rest of Harlow' sites can be found in Technical Note 2: Spatial Options A-E.

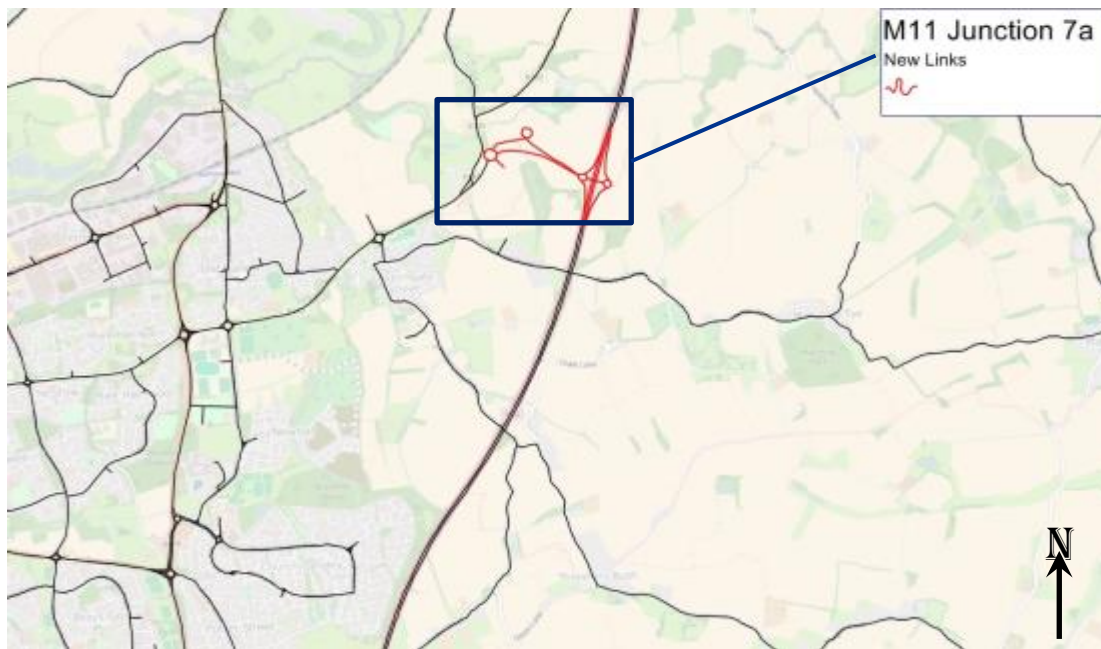
No changes were made to the employment assumptions for Option A1 from Option A and details of the Option A jobs information can also be found in Technical Note 2. The overall quantum of jobs is around 14,500 in the wider Harlow area, and around 32,800 in total in the SHMA area.

3. Network Changes

Indicative drawings of the three phases of the bypass scheme are illustrated schematically in Figure 3.1, Figure 3.2 and Figure 3.3. No detailed design has been undertaken of the Second Stort Crossing or Northern Bypass schemes, the modelling having been done for early high level assessment purposes only.

Phase 1 is the new Junction 7a as illustrated in Figure 3.1. A new grade separated 'dumbbell' layout motorway junction is expected to be constructed with slip roads to and off the M11 for northbound and southbound traffic. A short link road will connect the new junction to Sheering Road and Gilden Way via roundabouts. All 2033 Local Plan Modelling that has been undertaken has assumed the implementation of J7a. The impacts of J7a are covered by the separate J7a project and are beyond the scope of this work.

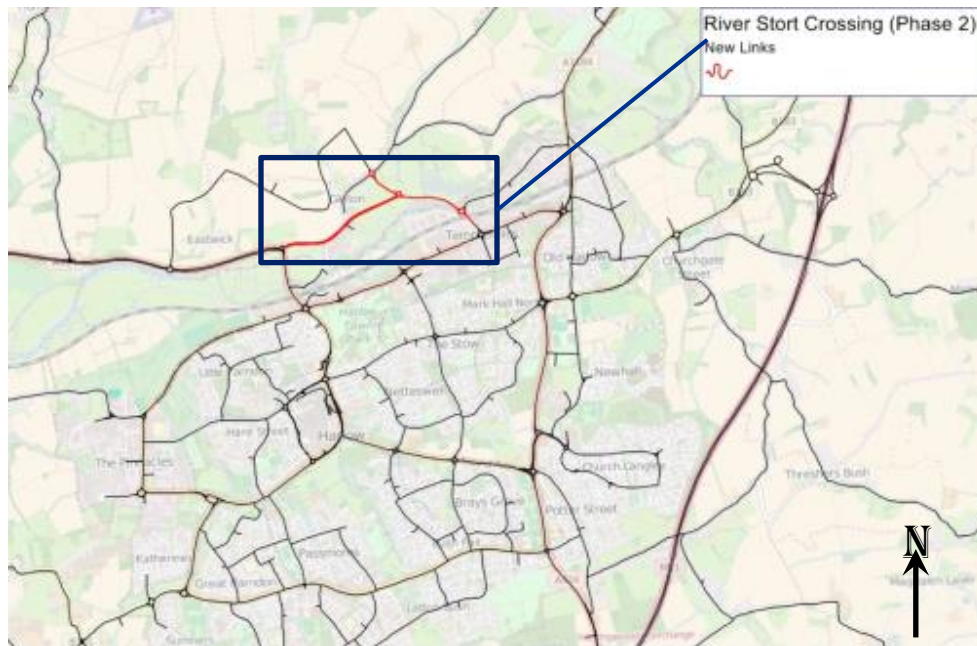
Figure 3.1 M11 Junction 7a (Phase 1)



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As shown in Figure 3.2, Phase 2 is assumed to provide an additional road crossing of the River Stort in Harlow, which has been modelled as a dual carriageway link between the A414 at Eastwick and a new 3-arm roundabout north of the River Stort, with a further single carriageway link to River Way towards the eastern end of A414 Edinburgh Way. The speed limit is set as 70mph in the model on the dual carriageway and 40mph on the single carriageway section.

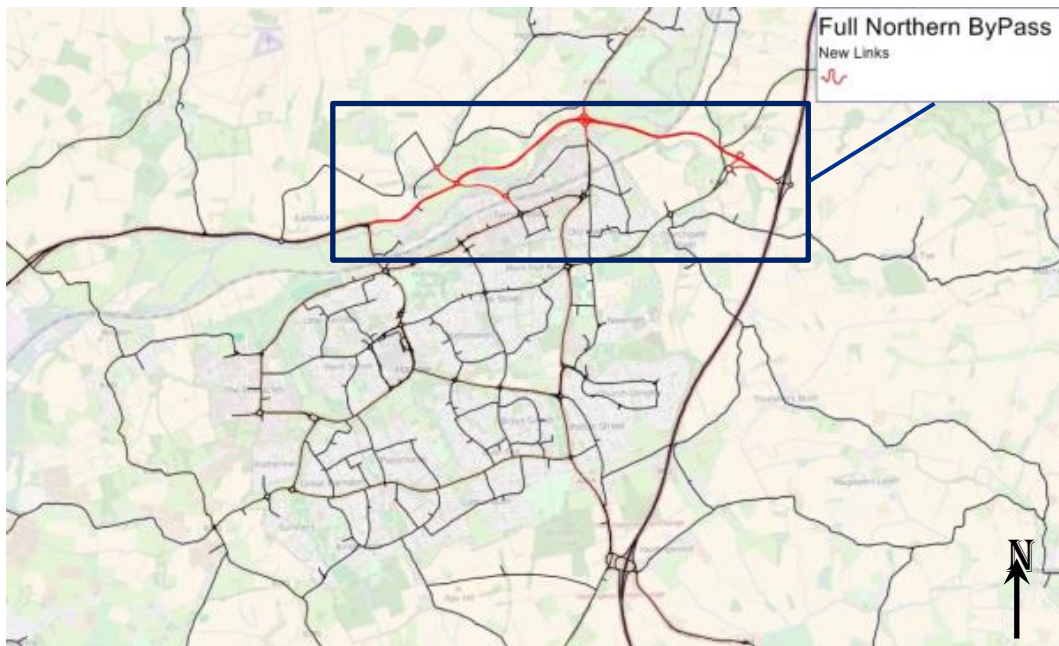
Figure 3.2 Harlow Northern Bypass River Stort Crossing (Phase 2)



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Phase 3 joins Phase 1 and 2 together to form a full Northern Bypass as shown in Figure 3.3. The connection is assumed to be a dual carriageway link with a grade separated junction at the A1184, north of Harlow Mill, and two further bridges (across the rail line and River Stort). The speed limit is set as 70mph in the model.

Figure 3.3 Harlow Full Northern Bypass (Phase 3)



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4. Flow Differences – Strategic

This section discusses the flow differences for the three phases of the bypass scheme for the wider model area.

Figure 4.1 shows the flow differences between Phase 2 and Phase 1. The most significant flow changes are shown to be in the Harlow area, as would be expected. However, changes along other routes would also be likely, with the A414 indicating a reduction in eastbound flows and an increase in westbound flows. The modelling indicates some wider re-routing of traffic, particularly from the A10 southbound to the M11 southbound between J8 and J7a, and some more localised reassignment through Hoddesdon and Dobbs Weir, which may be due to the modelling being less detailed in these areas.

Figure 4.1 Morning Peak Flow Differences – Northern Bypass River Stort Crossing (Phase 2) vs M11 Junction 7a (Phase 1)

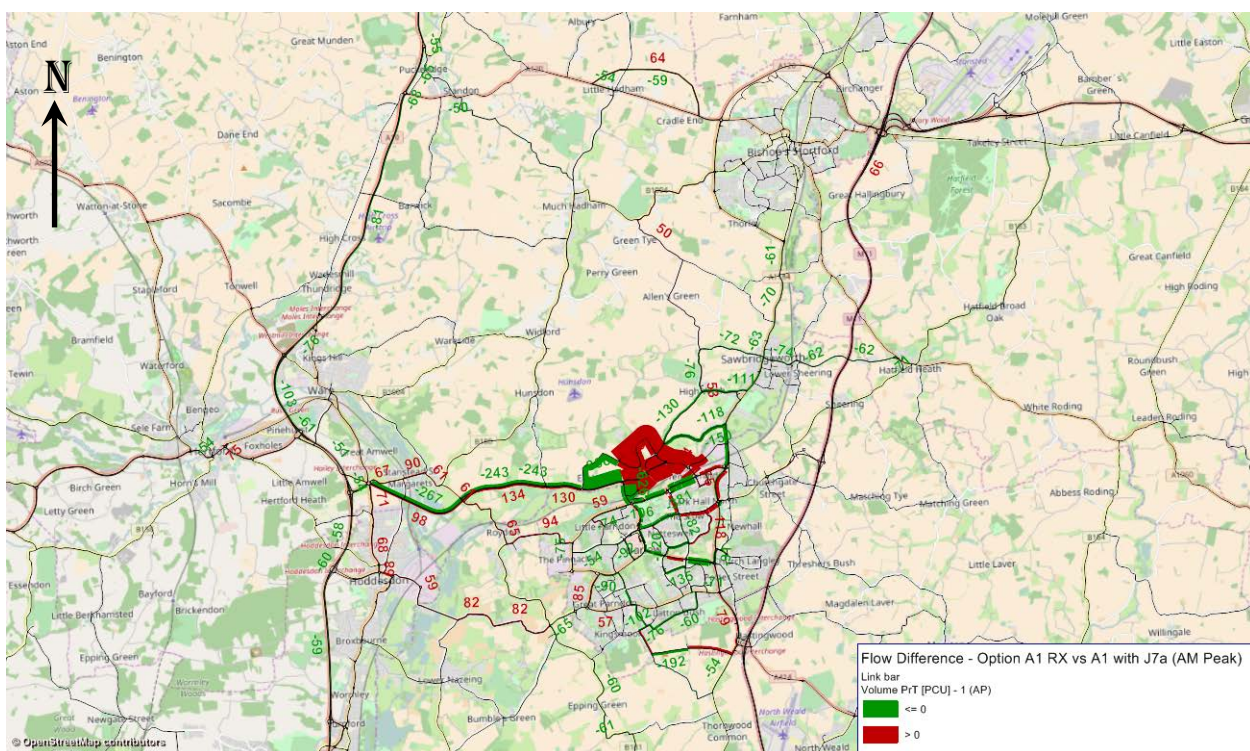


Figure 4.2 shows the flow differences between Phase 2 and Phase 3, and highlights that Phase 3 could result in increases in flows on the A414 and the M11, and reductions in flows on the A10 and on the A120 west of the M11, indicating wider reassignment of traffic as it reroutes to use the full bypass. It appears that some airport-related trips show a propensity to switch to the A120 east of M11 J8 and to M11 south of J8. Southbound flows on the A1184 would also be likely to reduce, although the modelling also indicates increases in flows on a minor route to the west of Sawbridgeworth, which may be a modelling rather than a routing issue.

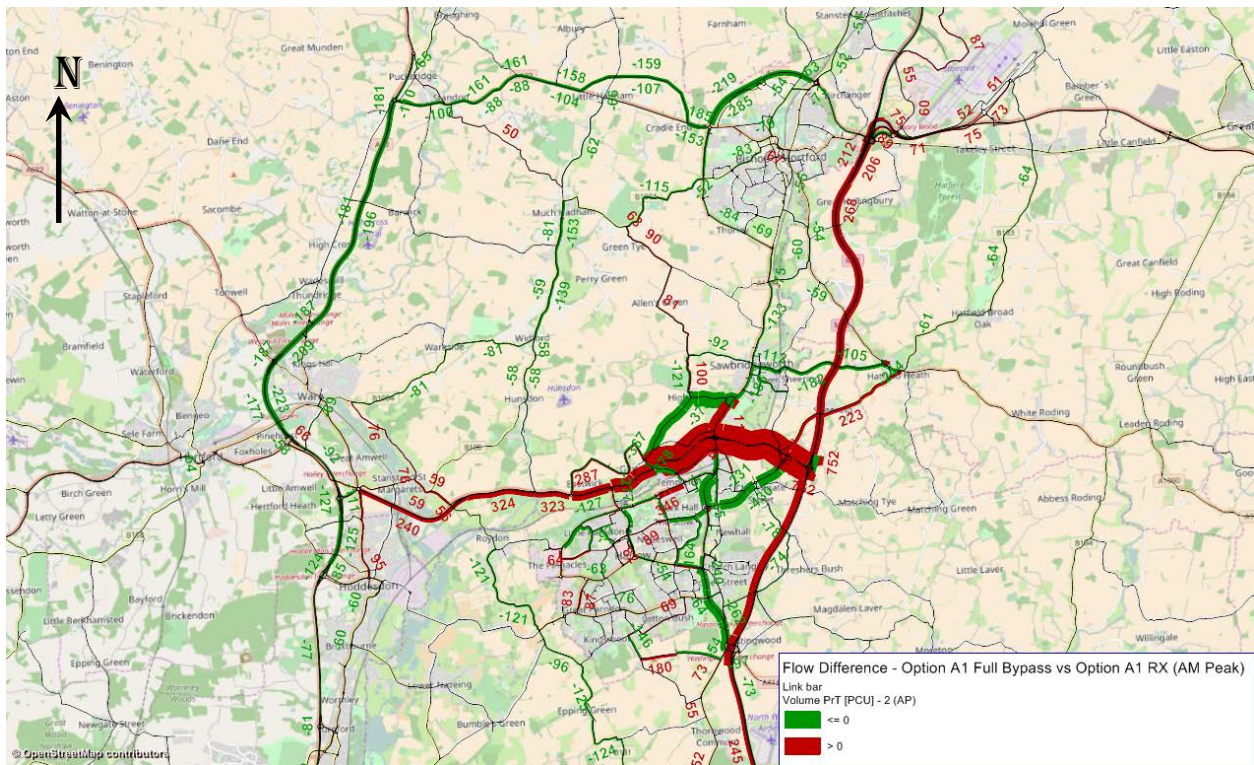
On the other more localised routes in the wider model area the full bypass would also be likely to reduce trips on less suitable rural routes (e.g. through Hatfield Broad Oak in the north-east, Much Hadham in the north-west, and Epping Green in the south) which further reduces the level of rat-running that J7a helps to remove. The model indicates some route switching including on routes between:

- Sawbridgeworth and Hatfield Heath
- High Wych Road and the A1184 south of Sawbridgeworth
- B183 Gilden Way and A414 Edinburgh Way to the bypass

- A414 north of M11 J7

Further investigation of these flow changes, using select link analysis, for example, may draw out more detailed information about the origins and destinations of the traffic which would be likely to use the bypass. This will be reported separately, as part of subsequent modelling tasks.

Figure 4.2 Morning Peak Flow Differences – Full Northern Bypass (Phase 3) vs Northern Bypass River Stort Crossing (Phase 2)



The network statistics for the whole model area is shown in Table 4.1. It can be seen that both total vehicle distance and total vehicle time reduces slightly with Phase 2 in place but that overall average network speeds reduce by some 12%. With Phase 3 in place, total vehicle distance and total vehicle hours both increase over Phase 2, but average network speeds increase, although they don't return to Phase 1 speeds. It should be noted that network statistics over such a large modelled area are difficult to interpret, as there is likely to be a lot of model 'noise' and wider impacts which are difficult to identify, particularly on a congested network. Accordingly, more localised network statistics are provided and discussed in the next section.

Table 4.1 Wider model area network statistics for phases of the Northern Bypass

Network statistics	Time Period AM							
	2014 Base	2033 Ph.1	2033 Ph.2	Difference Ph.2 v Ph.1	% change Ph.2 v Ph.1	2033 Ph.3	Difference Ph.3 v Ph.2	% change Ph.3 v Ph.2
Total Vehicle Distance (miles)	400,674	607,221	605,446	-1775	-0.3%	617,838	+12,392	+2.0%
Total Vehicle Time (hours)	7,065	12,561	12,391	-170	-1.4%	12,533	+142	+1.1%
Average Network Speed (mph)	35.4	34.8	30.5	-4.3	-12.4%	31.7	+1.2	+3.9%

5. Flow Differences – Local

5.1 Existing traffic movements

Earlier surveys have estimated the amount of through-traffic in Harlow, which can be used to indicate the scale of traffic reduction that could be anticipated from the phases of the Northern Bypass. The data also serves as a check that the scale of flow differences in the wider-Harlow area, which are forecast by the model, are realistic. The surveys were undertaken in 2014 as part of earlier work on the development of the base model.

As shown in Figure 5.1 and Figure 5.2 the level of through-traffic in the morning peak is in the region of 11%, and in the evening peak is some 24%, with 89% and 76% of traffic respectively being Harlow-related. In both peak periods this through-traffic is fairly well dispersed across each of the entry and exit points on the Harlow network, with the highest level on the A414 to the south of the town.

This indicates that the opportunities for removing through-traffic in the morning peak are comparatively small, with the majority of traffic on the network having origins or destinations within the town. In the evening peak, there would be more opportunity to remove this traffic from the local road network as indicated by the higher proportion of through-traffic observed.

Figure 5.1 : Through-Traffic Analysis AM Peak Hour

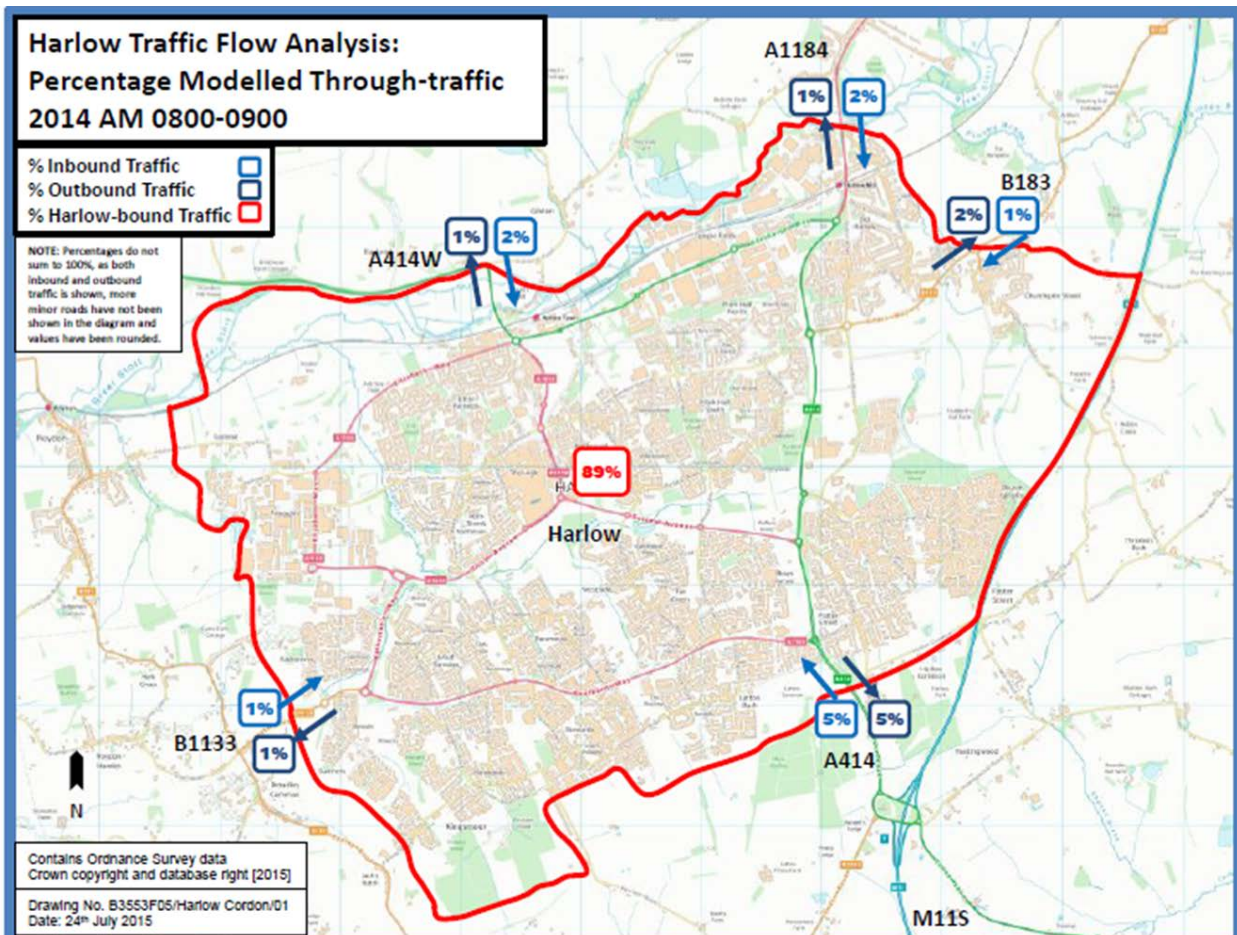
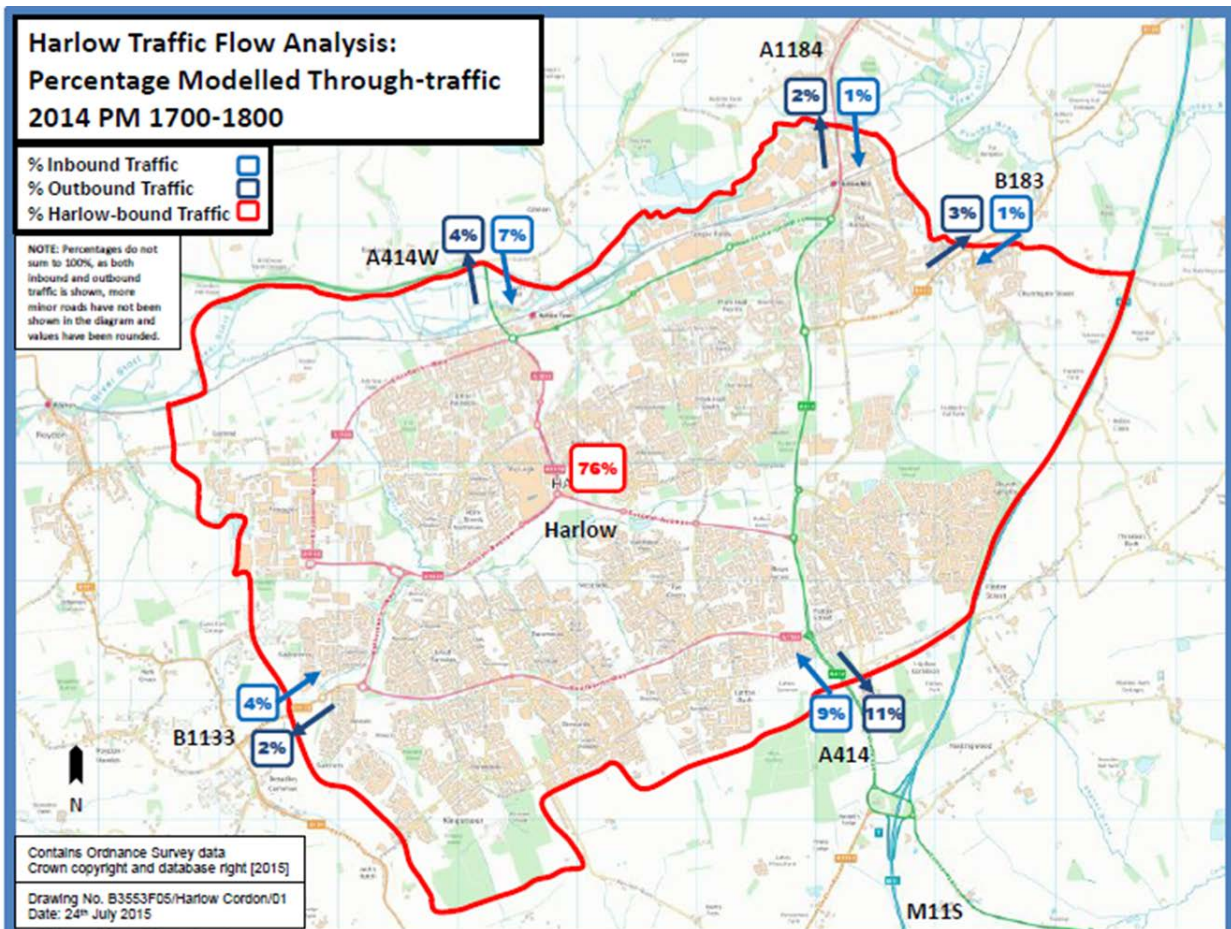


Figure 5.2 : Through-Traffic Analysis PM Peak Hour

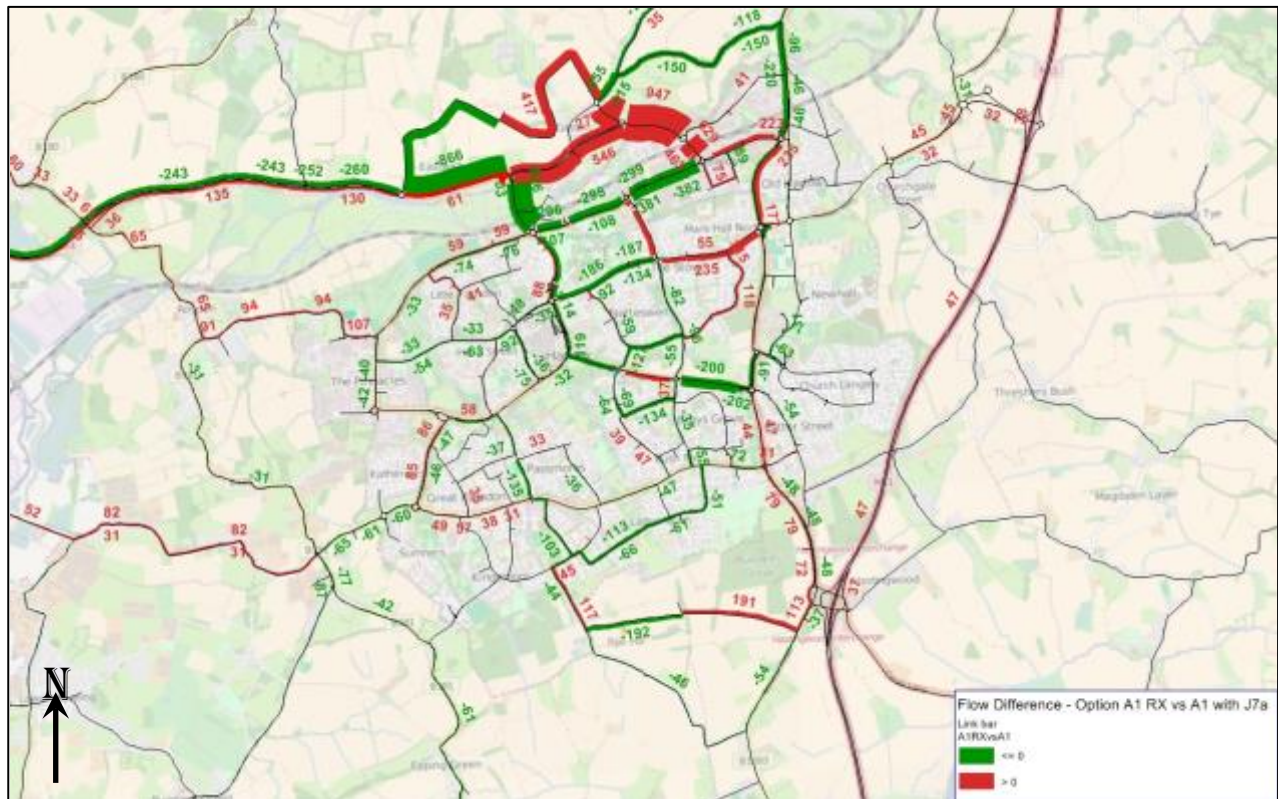


5.2 Flow differences

As indicated in Section 4, the greatest change in flows with the schemes in place is likely to be within the wider Harlow area. Figure 5.3 shows the modelled change in flows when comparing Phase 2 with Phase 1 (J7a only). This figure shows that Phase 2 is likely to result in a reduction in flows at the western end of the A414 Edinburgh Way, and on the A414 between Eastwick and Burnt Mill, as traffic reassigns to the new link and river crossing. Flows may also reduce along parallel routes through the town, such as the western end of First Avenue and along most of the A1025 Second Avenue. As would be expected, more traffic would be likely to use the A414 corridor to the east as an alternative to the A1019/A1025 route through the town. A few more trips may also be attracted to J7 and J7a as indicated in the figure.

To the west of the town, eastbound traffic would be likely to reduce on the A414; this is likely to be the result of traffic associated with the Gilston development reassigning to use the new crossing. A further effect is likely to be a reduction in flows on the A414 north of Burnt Mill. Such a reduction could help to support the introduction of sustainable travel measures on this north-south corridor, particularly to improve public transport connections between developments to the north and the rail station and town centre.

Figure 5.3 Change in Flows – Phase 2 v Phase 1 (J7a)



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Figure 5.4 shows the change in flows between Phase 2 and Phase 3. The figure indicates that trips are likely to be attracted to Junction 7a and away from Junction 7. However the overall increase in flows on the M11 and the A414 to the west indicate that wider re-routing of traffic is likely to be occurring. In addition to the reduction in flows along the western end of the A414 Edinburgh Way as a result of Phase 2, some further relief of the A414 and the B183 Gilden Way corridor is shown.

Within the town itself some switching of routes is apparent, for instance both First Avenue and Second Avenue to the west of Howard Way appear to have flow increases, whilst these same roads appear to have flow decreases to the east of Howard Way. Similarly at the Pinnacles, there appears to be a propensity for flows on Elizabeth Way to decrease, while flows on Fourth Avenue and Third Avenue increase. It is not possible to identify the reason for this reassignment, but it is considered that the overall effect of Phase 3 on the local road network in Harlow does not indicate significant reductions in flows within the town itself when compared with the effects of Phase 2 in isolation.



Figure 5.4 Change in Flows – Phase 3 v Phase 2

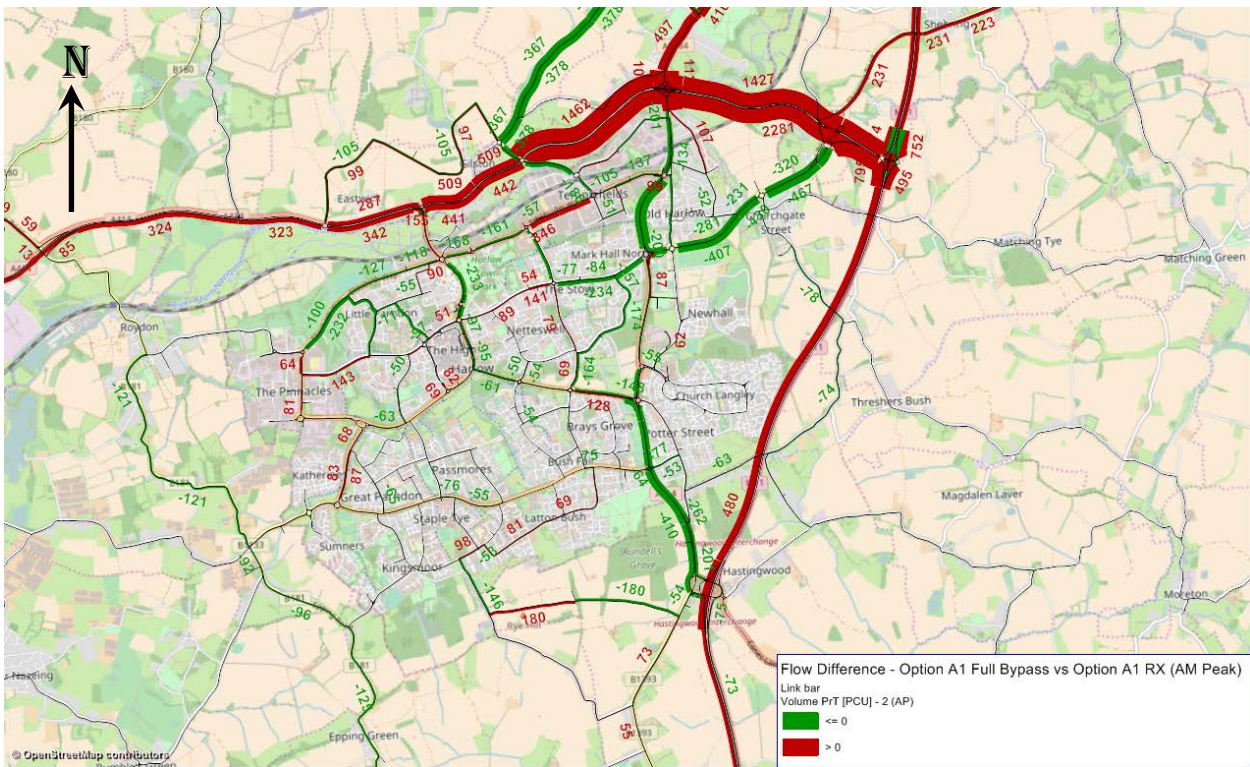


Table 5.1 shows the network statistics for the wider Harlow area and Figure 5.5 illustrates the road network for which these statistics have been compiled. It should be noted that the three phases of the Northern Bypass have been excluded from the road network in order to help identify change on the existing Harlow road network more clearly.

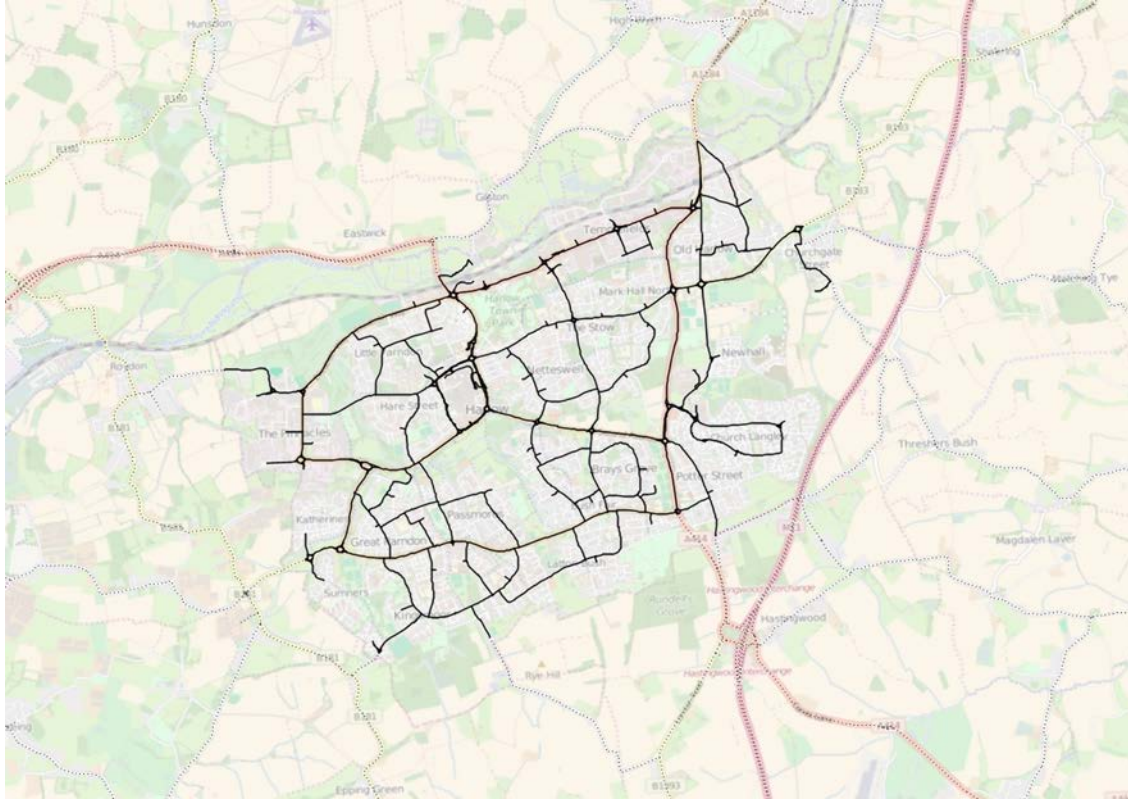
Phase 1 exhibits the lowest average network speed, with Phase 3 proving to be the fastest scenario with an average speed of approximately 16mph. Meanwhile vehicle distance travelled in the wider Harlow area decreases, which illustrates the reduction in traffic volumes shown in the above figures.

Table 5.1 Wider Harlow area network statistics for phases of the Northern Bypass (excluding the bypass links)

Network statistics	Time Period AM							
	2014 Base	2033 Ph.1	2033 Ph.2	Difference Ph.2 v Ph.1	% change Ph.2 v Ph.1	2033 Ph.3	Difference Ph.3 v Ph.2	% change Ph.3 v Ph.2
Total Vehicle Distance (miles)	35,205	51,565	50,222	-1343	-2.6%	47,443	-2,779	-5.5%
Total Vehicle Time (hours)	1,750	3,471	3,304	-167	-4.8%	2,976	-328	-9.9%
Average Network Speed (mph)	20.2	14.9	15.3	+0.4	2.7%	15.9	+0.6	+3.9%

It can be seen that, like the global network statistics reported in Table 4.1, both total vehicle distance and total vehicle time reduce with Phase 2 in place, but more than the change across the whole network. It should be noted that average network speeds for the Harlow area are much lower than for the whole network, reflecting the local nature of the roads. With Phase 2 in place average network speed would be likely to increase by some 2.7%. With Phase 3 in place, total vehicle distance and total vehicle hours both reduce over Phase 2, and the average network speed increases by some 3.8%, although it doesn't return to the Phase 1 speed. Focussing in on the Harlow area, the relative impacts of the phases can be more clearly seen from the statistics, and a clear progression through the phases indicates that each provides relief to the local road network.

Figure 5.5 Harlow road network for which network statistics are reported



6. Harlow Journey Time Differences

Technical Note 2 on Spatial Options A-E included assessment of journey times along six routes through the local road network. These routes included:

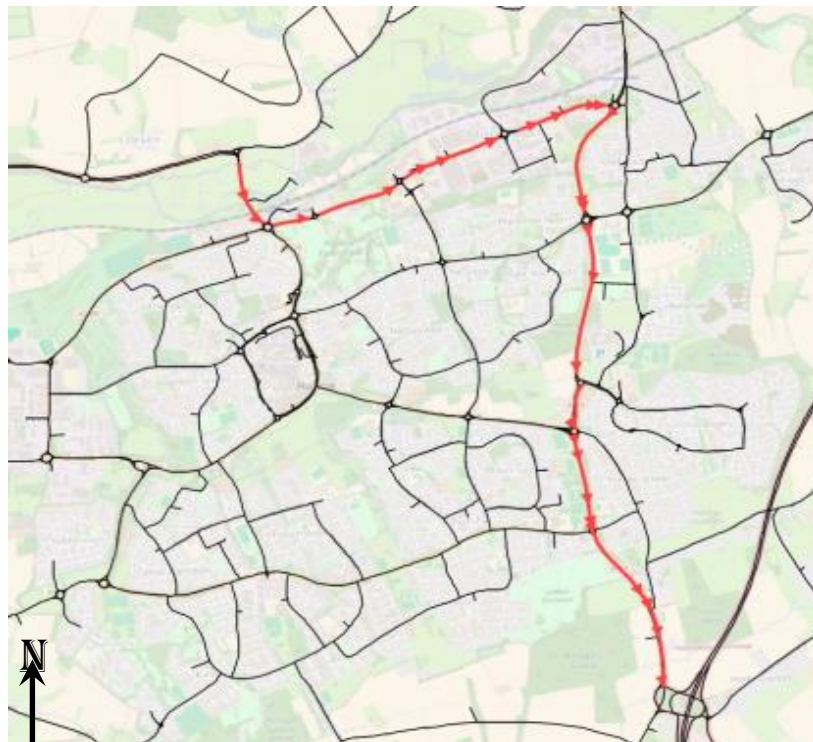
1. A414 Eastwick Road to Junction 7 M11 via A414 Edinburgh Way and A414;
2. A414 Eastwick Road to Junction 7 M11 via A1019 and A1025;
3. The Pinnacles to Hatfield Heath via First Avenue and B183;
4. Bishop's Stortford South to Junction 7 M11 via A1184 and A414;
5. Nazeing Common to A414 via A1025; and
6. Burnt Mill to A414 via Elizabeth Way and A1169.

In order to investigate the impact of the Second Stort Crossing and the Northern Bypass it was considered appropriate to investigate the effects on routes 1, 3 and 4 above.

6.1 A414 Eastwick Road to J7 M11 via Edinburgh Way and A414

The A414 through route between the Eastwick roundabout and the M11 J7 along Edinburgh Way is shown in Figure 6.1.

Figure 6.1 A414 Eastwick to M11 J7 via A414



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6.1.1 Southbound

The journey time data southbound is shown in Table 6.1 and graphically in Figure 6.2.

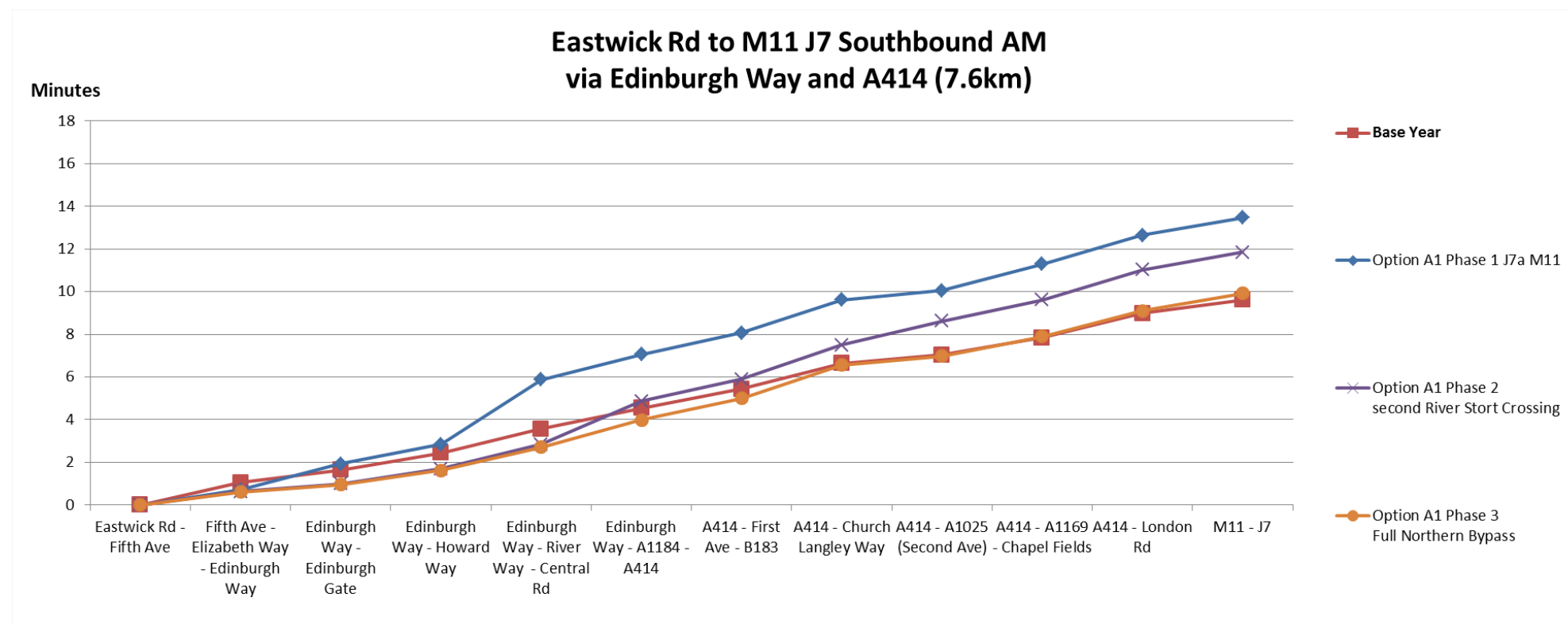
Table 6.1 Total journey times (minutes) Eastwick Rd to M11 J7 Southbound AM via Edinburgh Way and A414 (7.5km)

Journey times	Time Period AM			
	2014 Base	2033 Phase 1	2033 Phase 2	2033 Phase 3
Eastwick Rd - Fifth Ave	0.00	0.00	0.00	0.00
Fifth Ave - Elizabeth Way - Edinburgh Way	1.05	0.70	0.63	0.62
Edinburgh Way - Edinburgh Gate	1.64	1.93	0.99	0.96
Edinburgh Way - Howard Way	2.45	2.84	1.70	1.63
Edinburgh Way - River Way - Central Rd	3.56	5.87	2.85	2.71
A414 Edinburgh Way - A1184 Cambridge Road	4.55	7.06	4.87	3.99
A414 - First Ave - B183	5.44	8.08	5.89	5.00
A414 - Church Langley Way	6.64	9.62	7.50	6.56
A414 - A1025 (Second Ave)	7.04	10.05	8.62	6.98
A414 - A1169 - Southern Way	7.85	11.30	9.62	7.90
A414 - London Rd	8.99	12.64	11.02	9.10
M11 - J7	9.61	13.47	11.85	9.92
Change compared to J7a only			-1.62	
% change compared to J7a only			-12%	
Change compared to Phase 2				-1.93
% change compared Phase 2				-16%

The introduction of the Second Stort Crossing in Phase 2 is likely to reduce the southbound journey time on this route by 12% compared to Phase 1. The addition of the full Northern Bypass for Phase 3 could reduce the journey time on this route by a further 16% when compared to Phase 2.

As shown in Figure 6.1 the southbound journey times for the three phases in the morning peak hour take longer than the base year, which could be attributed to significant growth resulting from the emerging Local Plans. With Phase 2 in place it can be seen that journey times are likely to be faster than with just Phase 1. It is recognised that mitigation measures are needed along this section of the A414, as reported in Technical Note 2 on Spatial Options A-E, which could help to reduce congestion with Phase 1 in place. It can be seen that the full Northern Bypass would be likely to return journey times in this direction to close to base year levels.

Figure 6.2 Comparison of journey times for Options A1 for Eastwick Rd to M11 J7 Southbound AM via Edinburgh Way and A414



6.1.2 Northbound

The journey time data northbound is shown in Table 6.2 and graphically in Table 6.2.

Table 6.2 Total journey times (minutes) for M11 J7 to Eastwick Road Northbound AM via Edinburgh Way and A414 (7.5km)

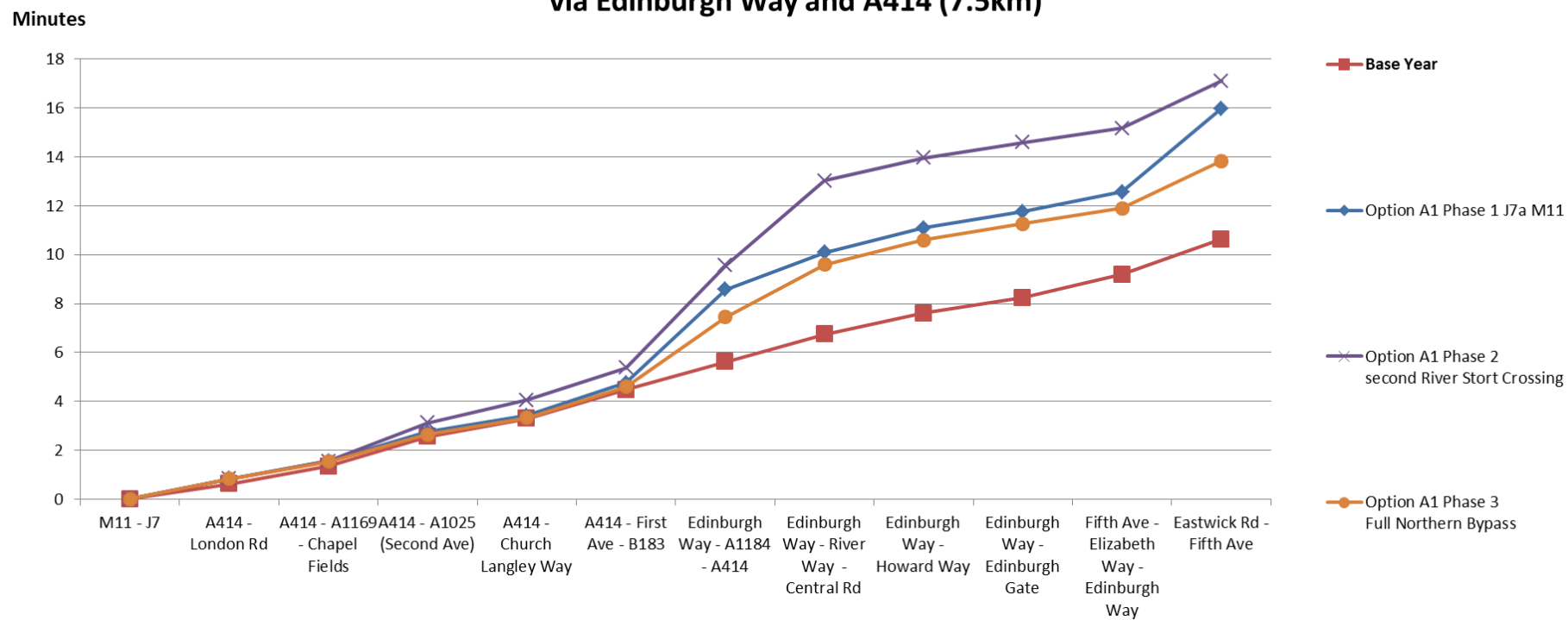
Journey times	Time Period AM			
	2014 Base	2033 Phase 1	2033 Phase 2	2033 Phase 3
M11 J7	0.00	0.00	0.00	0.00
A414 - London Rd	0.62	0.83	0.83	0.83
A414 - A1169 - Southern Way	1.34	1.55	1.55	1.55
A414 - A1025 (Second Ave)	2.57	2.74	3.12	2.65
A414 - Church Langley Way	3.30	3.42	4.06	3.33
A414 - First Ave - B183	4.48	4.75	5.37	4.60
A414 Edinburgh Way - A1184 Cambridge Road	5.62	8.58	9.55	7.45
Edinburgh Way - River Way - Central Rd	6.74	10.08	13.04	9.59
Edinburgh Way - Howard Way	7.61	11.08	13.96	10.60
Edinburgh Way - Edinburgh Gate	8.24	11.76	14.59	11.26
Fifth Ave - Elizabeth Way - Edinburgh Way	9.19	12.57	15.17	11.90
Eastwick Rd - Fifth Ave	10.63	15.97	17.10	13.83
Change compared to J7a only			+1.13	
% change compared to J7a only			+7%	
Change compared to Phase 2				-3.27
% change compared Phase 2				-19%

Northbound journey times are slower than southbound journey times in all scenarios. Phase 2 leads to an additional minute on the journey time, an increase of 7% compared to Phase 1 which, in the model, is likely to be from congestion on the East Road to River Way section of the A414. This may be reduced by introducing signal optimisation in the model, which was not done as part of this study. With the full Northern Bypass in place, the journey time reduces by 19% compared to Phase 2. This reduction may partly be attributed to a reduction in northbound flows on the A414 north of M11 J7, which starts to have an effect from Southern Way northwards, and also the reduction in flows on the western end of the A414 Edinburgh Way.

Figure 6.3 shows that for all scenarios, delays are likely to increase between B183, the A1184 and River Way. With Phase 2 in place, the increased flows on this section could lead to further delays at the River Way junction. The full Northern Bypass option provides some additional relief to the route.

Figure 6.3 Comparison of journey times for Options A1 M11 J7 to Eastwick Road Northbound AM

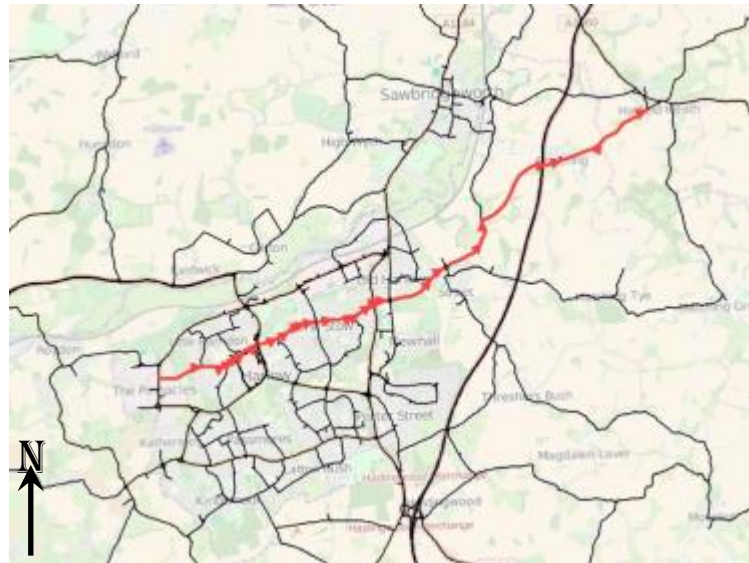
M11 J7 to Eastwick Rd Northbound AM via Edinburgh Way and A414 (7.5km)



6.2 The Pinnacles to Hatfield Heath via First Avenue and B183

The east-west route between The Pinnacles and Hatfield Heath via Fourth Avenue, First Avenue and the B183 is illustrated in Figure 6.4. It should be noted that this route is affected by a number of factors: increased employment at its western end, significantly increased committed and planned housing development and employment along, and in the vicinity of, Gilden Way, and the presence of Phase 1, the new J7a and link.

Figure 6.4 The Pinnacles to Hatfield Heath via B183 / Fourth Avenue



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6.2.1 Eastbound

The journey time data eastbound is shown in Table 6.3 and graphically in Figure 6.5.

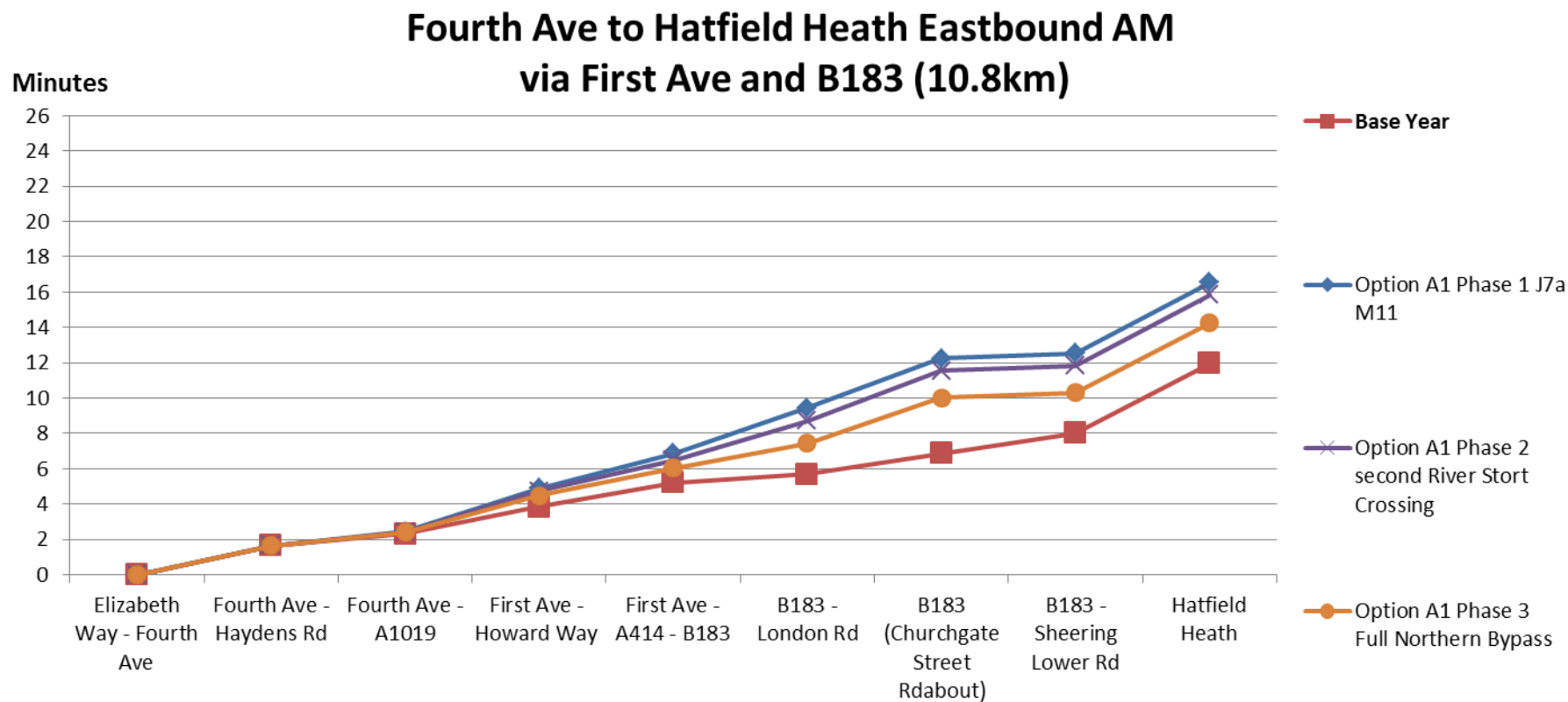
Table 6.3 Total journey times (minutes) Fourth Ave to Hatfield Heath Eastbound AM via First Ave and B183 (10.8km)

Journey times	Time Period AM			
	2014 Base	2033 Phase 1	2033 Phase 2	2033 Phase 3
Elizabeth Way - Fourth Ave	0.00	0.00	0.00	0.00
Fourth Ave - Haydens Rd	1.63	1.63	1.63	1.63
Fourth Ave - A1019	2.33	2.44	2.41	2.41
First Ave - Howard Way	3.84	4.90	4.73	4.47
First Ave - A414 - B183	5.20	6.86	6.50	6.04
B183 - London Rd	5.68	9.44	8.70	7.45
B183 (Churchgate Street Rdabout)	6.87	12.25	11.55	10.01
B183 - Sheering Lower Rd	8.00	12.54	11.84	10.30
Hatfield Heath	11.96	16.55	15.83	14.27
Change compared to J7a only			-0.72	
% change compared to J7a only			-4%	
Change compared to Phase 2				-1.56
% change compared Phase 2				-10%

Phase 2 and Phase 3 are likely to result in reduced journey times for this route when compared to Phase 1, as traffic is likely to reassign to parallel routes where traffic flows may reduce, particularly the western end of the A414 Edinburgh Way for Phase 2.

As shown in Figure 6.5, all options would be likely to experience increased delays, initially commencing at the junction of Fourth Avenue with A1019, and which worsen along the B183. Journey times increase noticeably from Howard Way eastwards, which could be reasonably attributed to the effect of increased development since this is not the peak direction of travel for the nearby employment area at The Pinnacles. As discussed in Technical Note 2 on Spatial Options A-E, additional mitigation measures have been identified for the Gilden Way corridor, and an optimum access strategy is needed for the East Harlow development site, which is discussed in Technical Note 5.

Figure 6.5 Comparison of journey times for Options A1 Hatfield Heath to Fourth Avenue Eastbound AM



6.2.2 Westbound

The journey time data westbound is shown in in Table 6.4 and graphically in Figure 6.6. It should be noted that the journey times in this direction are slower than the reverse direction for all scenarios.

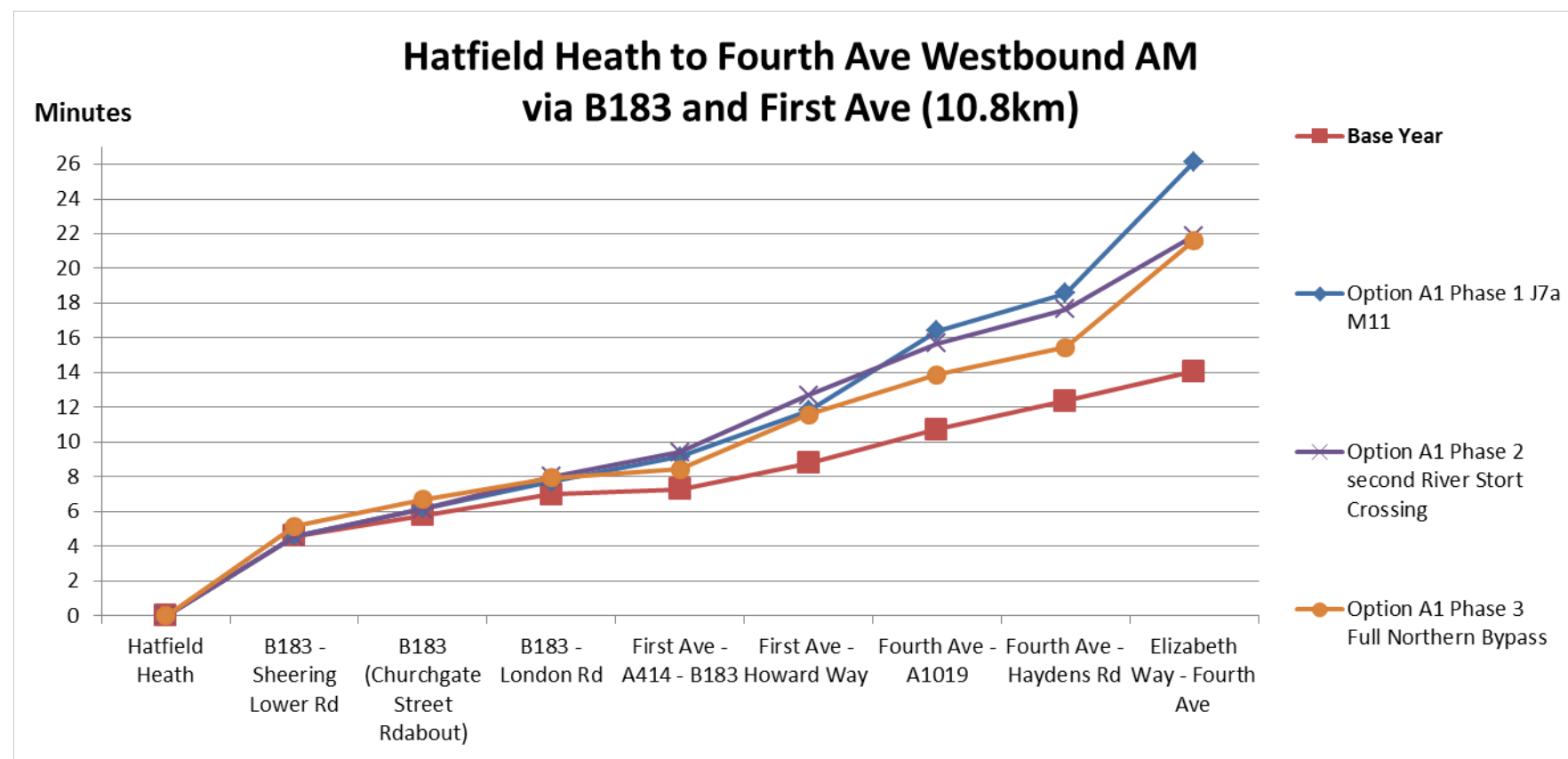
Table 6.4 Total journey times (minutes) Hatfield Heath to Fourth Avenue Westbound AM via First Avenue and B183

Journey times	Time Period AM			
	2014 Base	2033 Phase 1	2033 Phase 2	2033 Phase 3
Hatfield Heath	0.00	0.00	0.00	0.00
B183 - Sheering Lower Rd	4.59	4.61	4.55	5.17
B183 (Churchgate Street Rdabout)	5.77	6.18	6.12	6.69
B183 - London Rd	6.99	7.72	8.02	7.94
First Ave - A414 - B183	7.28	9.15	9.40	8.44
First Ave - Howard Way	8.78	11.82	12.68	11.60
Fourth Ave - A1019	10.72	16.42	15.69	13.87
Fourth Ave - Haydens Rd	12.36	18.56	17.66	15.47
Elizabeth Way - Fourth Ave	14.06	26.14	21.89	21.63
Change compared to J7a only			-4.25	
% change compared to J7a only			-16%	
Change compared to Phase 2				-0.26
% change compared Phase 2				-1%

Phase 2 would be expected to provide the most relief for journey times along this route with a reduction of more than 4 minutes over Phase 1. Phase 3 would be expected to have little additional effect when compared to Phase 2.

Figure 6.6 shows that journey times start to increase from the Sheering Road roundabout. The junction improvements which have since been identified, as referred to above, and further work to identify optimal access arrangements for the East Harlow site, will help to ameliorate traffic problems on this route.

Figure 6.6 Comparison of journey times for Options A1 Hatfield Heath to Fourth Avenue Westbound AM



6.3 Bishop's Stortford South to Junction 7 M11 via A1184 and A414

The north-south route between the south of Bishop's Stortford and Junction 7 of the M11 via the A1184 and A414 is illustrated in Figure 6.7. This route, which is the old A11, runs parallel to the M11, which replaced it as a strategic link. It should be noted that journey times are broadly similar in both directions indicating that there is no peak direction on this route.

Figure 6.7 Bishop's Stortford South to Junction 7 M11 via A1184 and A414



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6.3.1 Southbound

The journey time data southbound is shown in Table 6.5 and Figure 6.8.

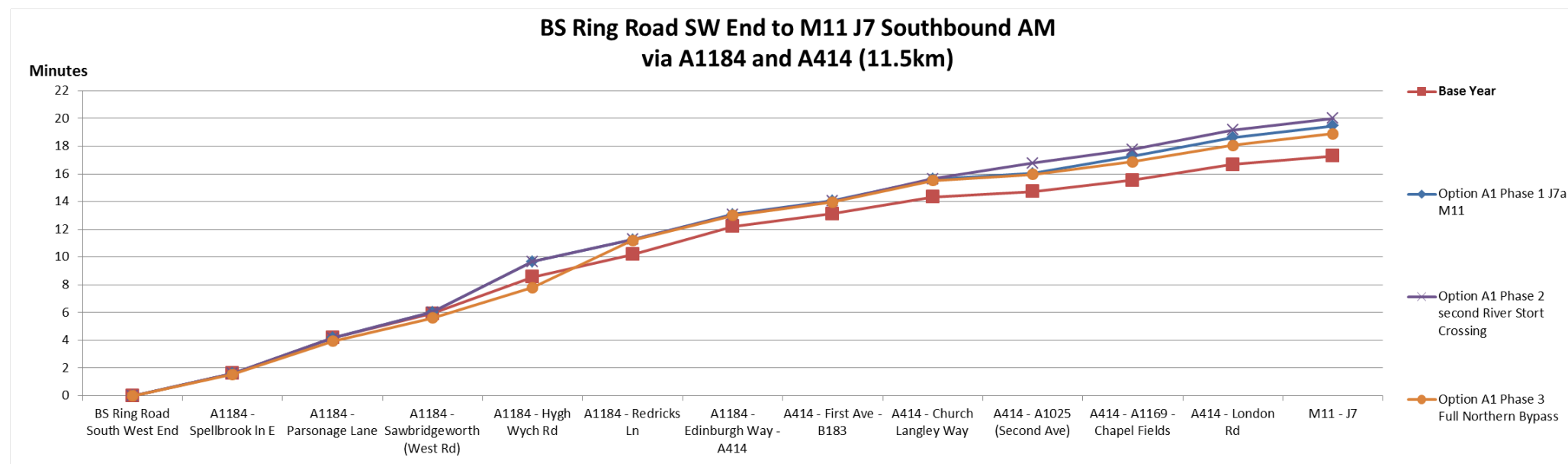
Table 6.5 Total journey times (minutes) Bishop's Stortford South to Junction 7 M11 Southbound AM

Journey times	Time Period AM			
	2014 Base	2033 Phase 1	2033 Phase 2	2033 Phase 3
BS Ring Road South West End	0.00	0.00	0.00	0.00
A1184 - Spellbrook In E	1.60	1.62	1.61	1.55
A1184 - Parsonage Lane	4.17	4.18	4.16	3.94
A1184 - Sawbridgeworth (West Rd)	5.93	6.02	6.03	5.61
A1184 - High Wych Rd	8.57	9.69	9.68	7.81
A1184 - Redricks Ln	10.20	11.26	11.27	11.19
A1184 - Edinburgh Way - A414	12.22	13.09	13.05	13.00
A414 - First Ave - B183	13.13	14.07	14.04	13.97
A414 - Church Langley Way	14.34	15.61	15.65	15.53
A414 - A1025 Second Ave	14.73	16.04	16.77	15.95
A414 - A1169 Southern Way	15.54	17.29	17.78	16.87
A414 - London Rd	16.68	18.63	19.17	18.07
M11 - J7	17.30	19.46	20.00	18.89
Change compared to J7a only			0.54	
% change compared to J7a only			3%	
Change compared to Phase 2				-1.11
% change compared Phase 2				-6%

It can be seen that Phase 2 journey times would be likely to increase slightly, by 3% when compared with Phase 1. However, with Phase 3 in place journey times would be likely to reduce by 6% when compared to Phase 2. The flow difference shown in Figure 4.2 indicates that southbound flows on this route would be likely to reduce with Phase 3 in place, which may account for the improved journey time.

As shown in Figure 6.8, the journey time is likely to be longer in the Phase 2 scenario due to delay at the A1184 High Wych Road and longer journey times along the A414 between Church Langley Way and Second Avenue; the increases in flows illustrated in Figure 4.1 help to explain these delays.

Figure 6.8 Comparison of journey times for Options A1 Bishop's Stortford South to Junction 7 M11 Southbound AM



6.3.2 Northbound

The journey time data northbound is shown in Table 6.6 and graphically in Figure 6.9. The total journey times are reasonably similar to those in the reverse direction.

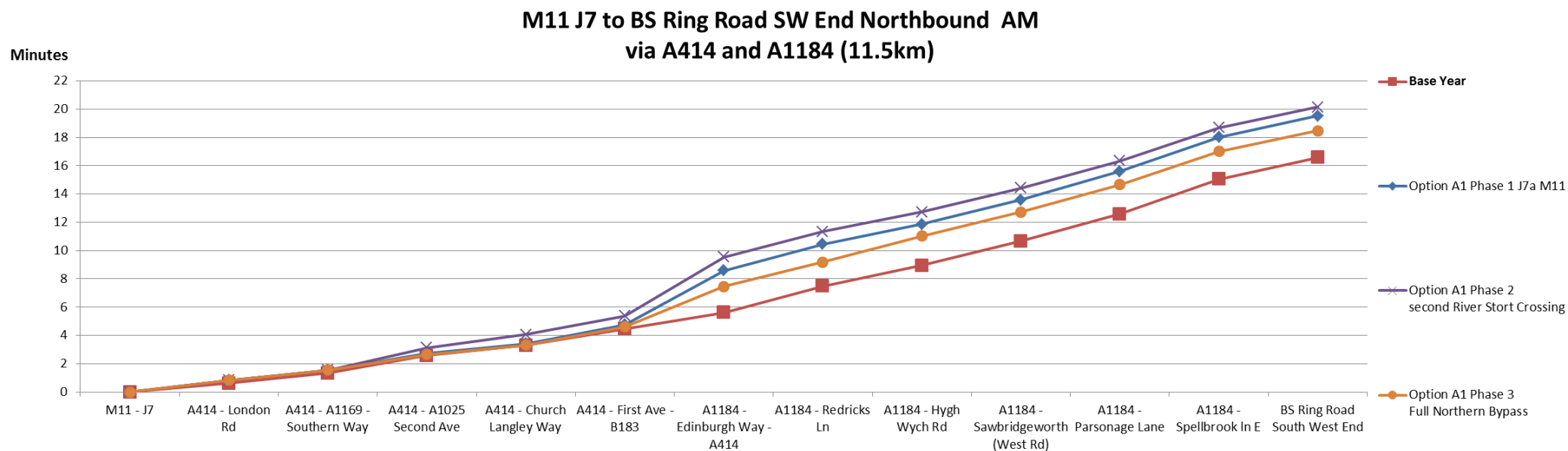
Table 6.6 Total journey times (minutes) Junction 7 M11 to Bishop's Stortford Ring Road SW Northbound AM

Journey times	Time Period AM			
	2014 Base	2033 Phase 1	2033 Phase 2	2033 Phase 3
M11 - J7	0.00	0.00	0.00	0.00
A414 - London Rd	0.62	0.83	0.83	0.83
A414 - A1169 - Southern Way	1.34	1.55	1.55	1.55
A414 - A1025 Second Ave	2.57	2.74	3.12	2.65
A414 - Church Langley Way	3.30	3.42	4.06	3.33
A414 - First Ave - B183	4.48	4.75	5.37	4.60
A1184 - Edinburgh Way - A414	5.62	8.58	9.55	7.45
A1184 - Redricks Ln	7.49	10.44	11.33	9.19
A1184 - High Wych Rd	8.94	11.87	12.72	11.03
A1184 - Sawbridgeworth (West Rd)	10.67	13.58	14.41	12.73
A1184 - Parsonage Lane	12.58	15.59	16.34	14.66
A1184 - Thorley Wash	15.05	18.02	18.70	17.00
BS Ring Road South West End	16.57	19.52	20.14	18.48
Change compared to J7a only			0.62	
% change compared to J7a only			3%	
Change compared to Phase 2				-1.66
% change compared Phase 2				-8%

Phase 2 results in increased journey time on this route, by some 3% when compared to Phase 1. The implementation of Phase 3 results in a reduced northbound journey time, by some 8% when compared to Phase 2.

Figure 6.9 shows that journey times tend to significantly increase on the A414 between First Avenue and the A1184 junction in all scenarios, with Phase 2 showing the greatest increase relative to the other scenarios. The journey profiles are similar from that point onwards. The delays, being worse with Phase 2, are likely to be the result of additional traffic using this section of the A414 with the Second Stort Crossing in place, as shown in Figure 4.1

Figure 6.9 Comparison of journey times for Options A1 Junction 7 M11 to Bishop's Stortford Ring Road SW Northbound AM



7. Summary and Conclusions

This report has used the WEEH transport model to investigate the impact of the Northern Bypass of Harlow, which has three phases:

- Phase 1: A new junction 7a to the M11 improving motorway access from eastern Harlow;
- Phase 2: A second crossing of the River Stort and link road from Eastwick to River Way; and
- Phase 3: A Northern Bypass of Harlow linking Phases 1 and 2.

As a result of traffic studies going back to 2012 alongside current congestion on the road network, it is recognised that additional infrastructure is needed within the Harlow area to accommodate existing committed growth as well as emerging Local Plans growth. Hence the reference case in the forecast year 2033 assumes that Phase 1 – Junction 7a on the M11 – will have been constructed.

The impact of Junction 7a is being reported in a parallel study. Therefore this report compares Phase 2 against Phase 1 in order to identify the likely impacts of a Second Stort Crossing; and compares Phase 3 against Phase 2 to identify the impacts of the full Northern Bypass, were that to be implemented at a later date.

The methodology of the study follows that set out in accompanying Technical Note 1 on Forecast Methodology. The development assumptions evolved from those considered in Technical Note 2 on Spatial Options A-E. Option A, which created lesser impact on the road network and was refined to become Spatial Option A1. The modelling of the Northern Bypass therefore has used Spatial Option A1 which includes approximately 13,500 homes and 14,500 jobs in the wider Harlow area, and 41,000 homes and 33,000 jobs across the whole SHMA area. The base year is 2014 and the forecast year is 2033

Section 4 of the report reviewed flow differences over a strategic area covered by the model. This showed that after Phase 2, the Second Stort Crossing, significant flow changes would be likely to be experienced in the Harlow area. However, changes along other routes would also be likely, with a reduction in eastbound flows and an increase in westbound flows indicated along the A414 west of Harlow. With Phase 3, the full bypass, in place, the model indicates increases in flows on the A414 and the M11, and reductions in flows on the A10 and on the A120 west of the M11, indicating wider reassignment of traffic as it reroutes to use the full bypass. In addition there are more localised flow changes. Table 7.1 illustrates the estimated increase in vehicle distance and time across the whole network following Phase 3. However, it is recognised that further investigation of origins and destinations of the traffic that would be likely to use the full bypass would be required to understand how the route choices may change.

Table 7.1 Whole model area network statistics for study phases

Network statistics	Time Period AM						
	2033 Ph.1	2033 Ph.2	Difference Ph.2 v Ph.1	% change Ph.2 v Ph.1	2033 Ph.3	Difference Ph.3 v Ph.2	% change Ph.3 v Ph.2
Total Vehicle Distance (miles)	607,221	605,446	-1775	-0.3%	617,838	+12,392	+2.0%
Total Vehicle Time (hours)	12,561	12,391	-170	-1.4%	12,533	+142	+1.1%
Average Network Speed (mph)	34.8	30.5	-4.3	-12.4%	31.7	+1.2	+3.9%

Section 5 investigates local flow differences in the wider Harlow area itself. By referring to previous surveys it is noted that through-traffic in Harlow ranged from approximately 10-25%, with the majority of traffic being Harlow-related. This is likely to influence the level of traffic that would be likely to be removed from the local road network with the new infrastructure in place.

As traffic reassigns to the new link and river crossing, Phase 2 is forecast to result in a reduction in flows at:

- Western end of the A414 Edinburgh Way;
- A414 between Eastwick and Burnt Mill; and
- Parallel east-west routes across the town, namely First Avenue and A1025 Second Avenue.

It is recognised that that reductions in flows on A414 Fifth Avenue north of Burnt Mill could also provide an opportunity to introduce sustainable transport facilities on this north-south corridor.

With Phase 3, a full bypass in place, flows on B183 Gilden Way would be likely to reduce, as would flows on the A414 north of M11 J7. The A414 Edinburgh Way corridor flows would also reduce slightly more than with just Phase 2. As shown in Table 7.2, Phase 2 and Phase 3 would be likely to incrementally decrease vehicle distance and time across the wider Harlow road network whilst improving average network speed.

Table 7.2 Wider Harlow area network statistics for phases of the Northern Bypass (excluding the bypass links)

Network statistics	Time Period AM						
	2033 Ph.1	2033 Ph.2	Difference Ph.2 v Ph.1	% change Ph.2 v Ph.1	2033 Ph.3	Difference Ph.3 v Ph.2	% change Ph.3 v Ph.2
Total Vehicle Distance (miles)	51,565	50,222	-1343	-2.6%	47,443	-2,779	-5.5%
Total Vehicle Time (hours)	3,471	3,304	-167	-4.8%	2,976	-328	-9.9%
Average Network Speed (mph)	14.9	15.3	+0.4	2.7%	15.9	+0.6	+3.9%

Section 6 then reviewed journey time forecasts for three key routes through Harlow

- A414 Eastwick Road to Junction 7 M11 via A414 Edinburgh Way and A414;
- The Pinnacles to Hatfield Heath via First Avenue and B183; and
- Bishop's Stortford South to Junction 7 M11 via A1184 and A414.

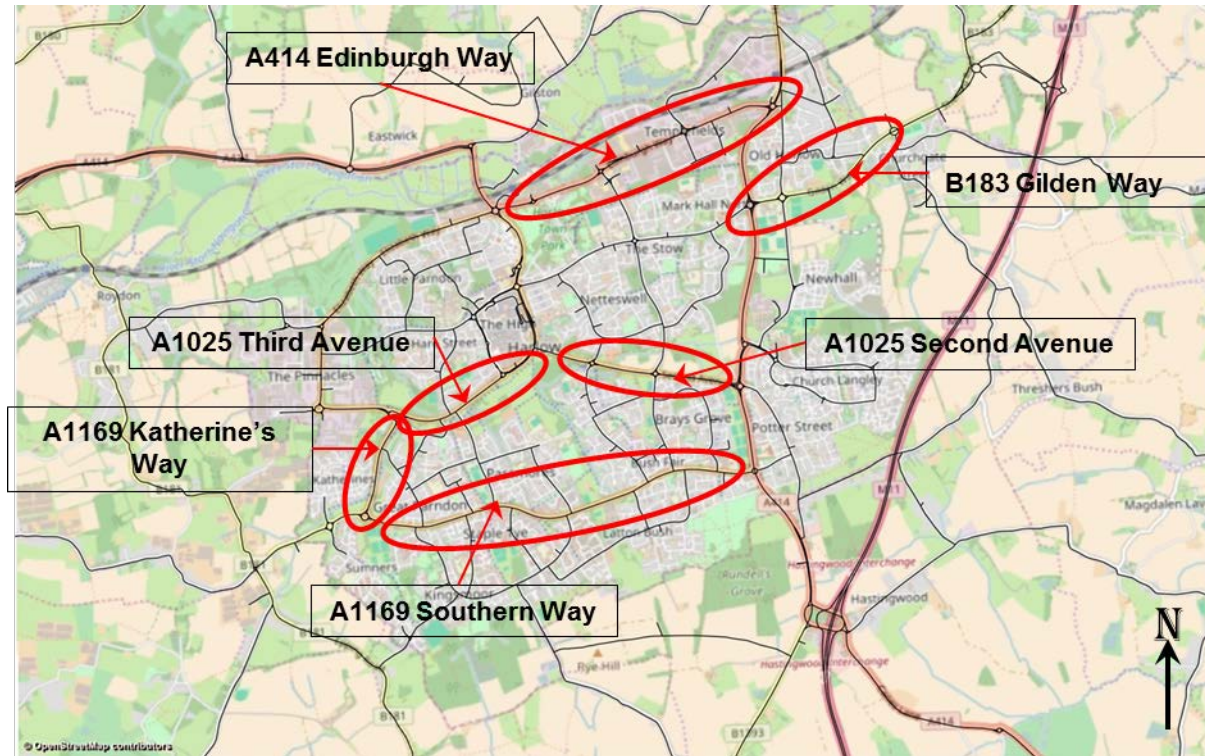
Overall journey time evaluations for the local road network are summarised below in Table 7.3, and it can be seen that the Phase 2 Second Stort Crossing would be likely to result in reduced journey times for almost all routes reported. The exception, north-west bound along the A414, is likely to be affected by delays between the A1184 and River Way junctions, which would be likely to increase due to additional traffic using this stretch of the network.

Table 7.3 Journey Time Analysis: Summary Phase 2 and Phase 3

	Journey Time changes Ph1 to Ph2		Journey Time changes Ph1 to Ph3		Journey Time changes Ph2 to Ph3	
	Minutes	% change	Minutes	% change	Minutes	% change
Eastwick to M11 J7 via A414 SB	-1.62	-12%	-3.55	-26%	-1.93	-16%
Eastwick to M11 J7 via A414 NB	+1.13	+7%	-2.14	-13%	-3.27	-19%
Pinnacles to Hatfield Heath EB	-0.72	-4%	-2.28	-14%	-1.56	-10%
Pinnacles to Hatfield Heath to WB	-4.25	-16%	-4.51	-17%	-0.26	-1%
M11 J7 to Bishop's Stortford SB	+0.54	+3%	-0.57	-3%	-1.11	-6%
M11 J7 to Bishop's Stortford NB	0.62	+3%	-1.04	-5%	-1.66	-8%

However, even on routes where journey times are likely to improve, the study has identified links and junctions where delays could increase as shown in Figure 7.1.

Figure 7.1 Locations identified for additional improvement and/or study



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These places have already been identified as needing additional mitigation work in Technical Note 2 and include the A414 Edinburgh Way (Howard Way and Harlow Retail Park, East Road and River Way, First Avenue/Gilden Way), and the B183 Gilden Way corridor. The Gilden Way/First Avenue corridor is likely to be most affected by J7a, and Phase 2, the Second Stort Crossing, is likely to result in reduced journey times along it. In the peak direction (westbound), the full bypass has little further effect on journey times on this route, although some further reduction would be likely eastbound.

The A414 evaluation is more complex as different sections are affected to differing extents by each of the phases. For the peak direction (northbound) the modelling indicates that Phase 1 and Phase 3 would have similar effects in reducing overall journey times, with Phase 2 providing the slowest time, primarily as a result of additional traffic between the A1184 and River Way. It is proposed to investigate improvements to the model assumptions in this area (e.g. signal optimisation) which may help to address this issue; further mitigation measures will also be explored. Delays in the vicinity of River Way are also evident in the reverse direction primarily with Phase 1 in place.

References

Jacobs, April 2016, "Harlow Base Model Enhancements Technical Report"

Jacobs, March 2017, "WEEH Local Plans Modelling Technical Note 1: Forecast Methodology"

Jacobs , March 2017, "WEEH Local Plans Modelling Technical Note 2: Spatial Options A-E (March 2016)"