

Figure 9.9 : Turn Delay Difference between Base 2014 and Medium DM 2021 models – AM

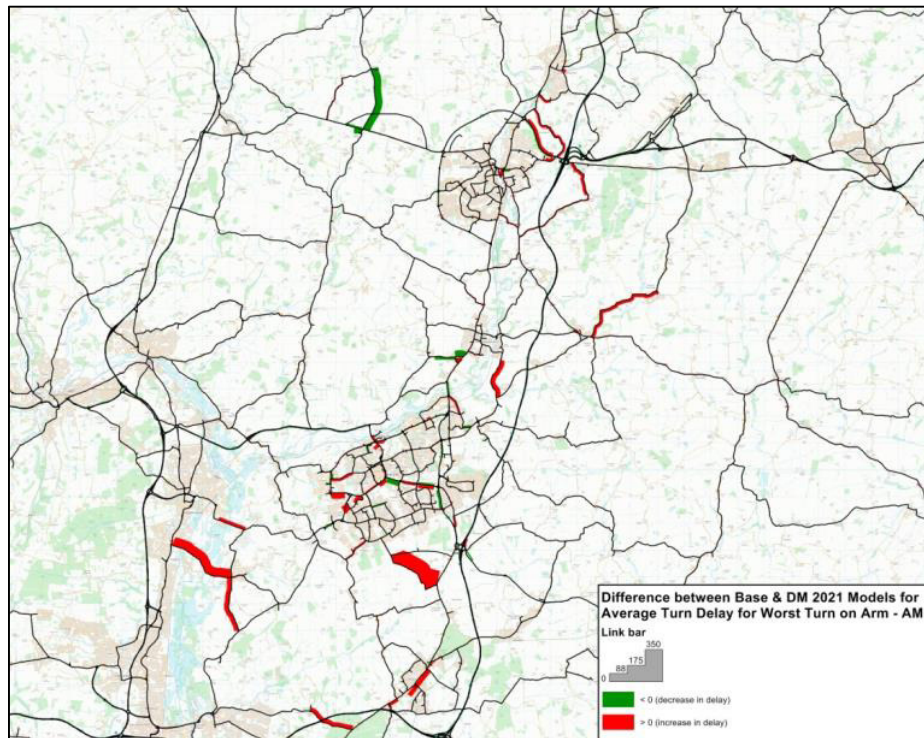
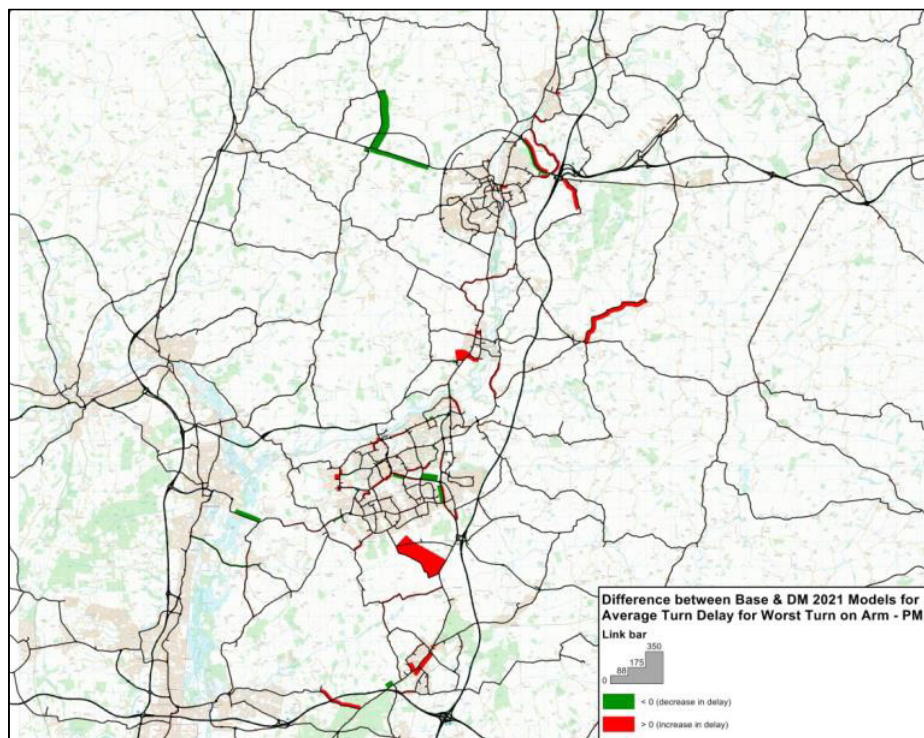


Figure 9.10 : Turn Delay Difference between Base 2014 and Medium DM 2021 models – PM



- 9.6.9 Figure 9.11 and Figure 9.12 show delay changes between the Base and Do-Minimum 2036 models, for the AM and PM periods respectively. Plots for the IP can be found in Appendix I.
- 9.6.10 Note that the magnitude of delay is represented by the width of the bars, and not by their length. The length is only representative of the length of the coded link and not the extent of queuing or delay.
- 9.6.11 The below figures show some significant increases and decreases in traffic flow in different parts of the network. An explanation of significant changes is provided below:
- As in the above 2021 analysis Little Hadham Bypass experiences decreases in turn delay, although increased traffic flow dilutes the improvements seen in 2021;
 - The Crowngate Roundabout and Clocktower Roundabout both see minor decreases in delay, however traffic growth again dilutes the benefits of the junction improvements;
 - Elsewhere delays generally increase between 2014 and 2036 in both time periods, and increases are more severe than in 2021; and
 - The most marked areas of delay increases are similar to those talked about above for 2021; however the impacts of growth are higher.

Figure 9.11 : Turn Delay Difference between Base 2014 and Medium DM 2036 models – AM

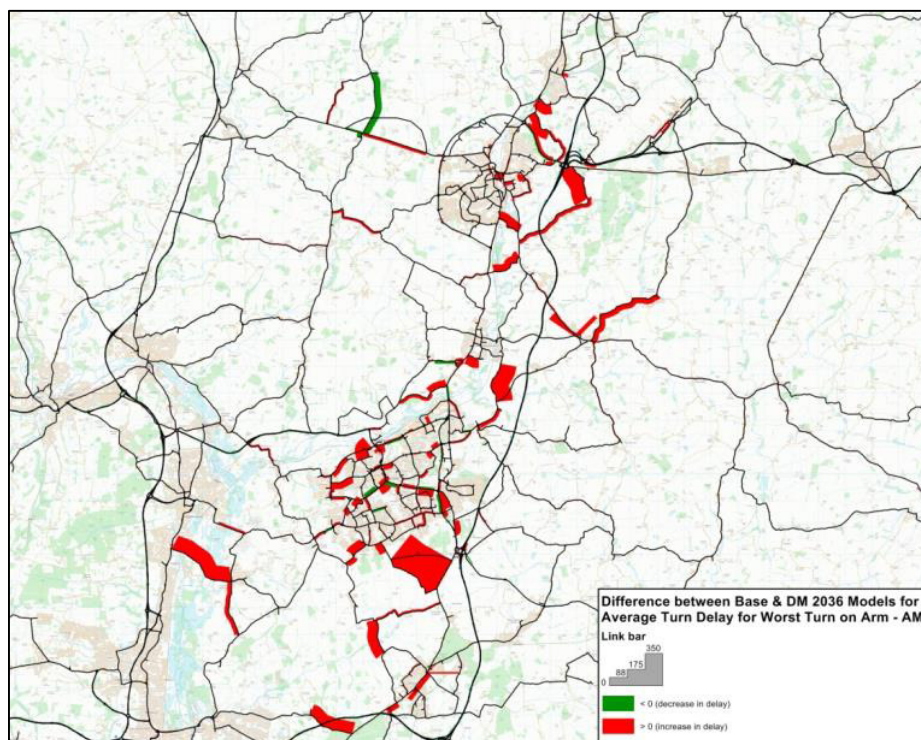
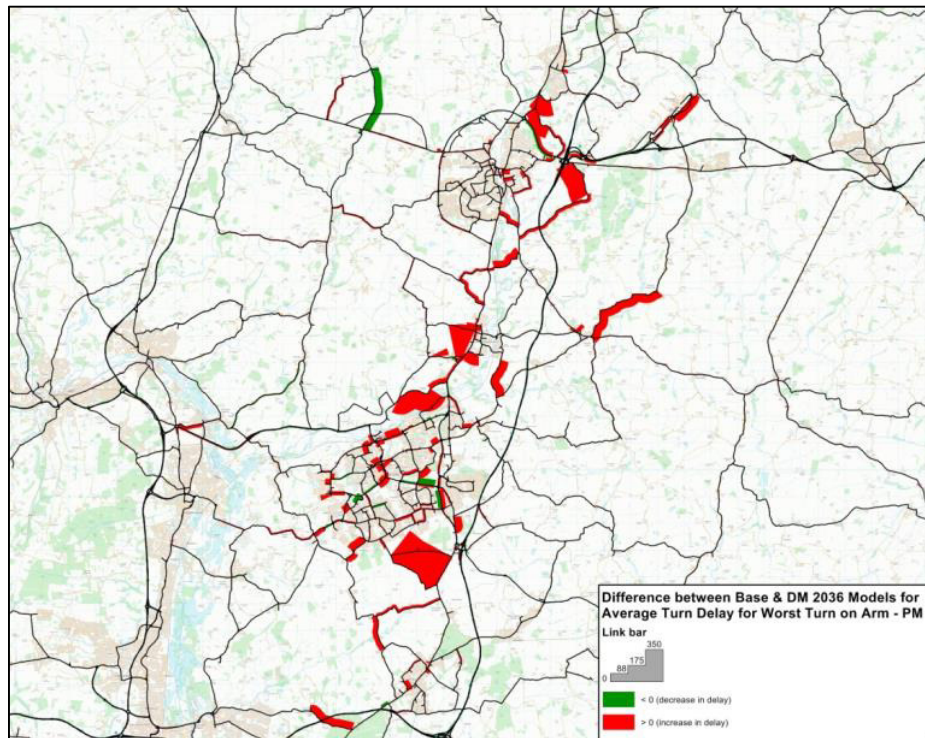


Figure 9.12 : Turn Delay Difference between Base 2014 and Medium DM 2036 models – PM



10. M11 J7a Scheme Impacts – Medium Scenario

10.1 Flow Impacts from the M11 J7a Scheme in 2021 for Medium Growth

- 10.1.1 As detailed in Section 3.7 'Do-Something' (DS) networks were built to represent the local road network with the inclusion of the scheme, the new M11 J7a. The scheme includes a link between the M11 and B183 Sheering Road, and capacity improvements on the B183 between the new link and the A414.
- 10.1.2 A series of model runs have been carried out to investigate the potential impacts of a proposed Harlow Northern Bypass. The results of this can be found in the 'Northern Bypass Addendum', which was also produced in April 2016. The Northern Bypass has not been included in any of the model runs presented in this main report.
- 10.1.3 A plot displaying the location and design of the proposed M11 J7a scheme that has been modelled can be found in Figure 3.9. It is assumed that the scheme would be in place by 2021.
- 10.1.4 The plots below in Figure 10.1 and Figure 10.2 are for the AM peak and PM peak hours respectively. The area shown covers the entire detailed modelled area as well as some additional network to the east and the west. Plots, which are zoomed to provide more detail of changes, are also provided in Appendix H for all three time periods.
- 10.1.5 The figures show significant changes in modelled traffic flow in different parts of the network. All flow changes are considered to be logical representations of what is likely to occur with the do-something scheme in place. The significant flow changes are:
- M11 J7-J8: To the north of the scheme flows on the M11 would be expected to increase significantly, while M11 flows to south of the scheme would decrease. The J8:J7a increase is greater than the J7:J7a decrease, indicating that in addition to traffic switching from using J7 to using J7a, additional vehicles to and from the north would also use the motorway to access Harlow via J7a in preference to using other less suitable minor routes in the vicinity.
 - In the PM peak hour traffic on the M11 south of J7 increases, this is likely to be as a result of freeing up capacity at M11 J7, which gets very congested in the PM peak.
 - A consequence of traffic using J7a to access Harlow is that traffic flows would be expected to significantly increase along B183 Gilden Way to the west of the new link.
 - The location of the new junction facilitates traffic wishing to access the north and east of the town. This is expected to result in reductions in flows on the A414 to the south of Gilden Way, which would be greater immediately to the north of J7, as a result of this traffic using the new motorway junction.
 - To the north of the modelled area the modelling indicates an increase in traffic using the A120 immediately either side of M11 J8; this is likely to be partly due to the switch from more local roads to the motorway to make use of the new access into Harlow. This is supported by the general decrease in flows on the more minor north south roads between Bishop's Stortford and Harlow.
 - Within Harlow there are noticeable traffic increases along the key links in northern Harlow, including the A414 Edinburgh Way, First Avenue and A414 London Road. This increase further supports the supposition that traffic within the northern part of Harlow has a greater propensity to use the more northerly M11 access point. Key links in the southern section of Harlow are shown to experience a complementary reduction in flows.

Figure 10.1 : Traffic Flow Difference between DM and DS models for Medium 2021 – AM

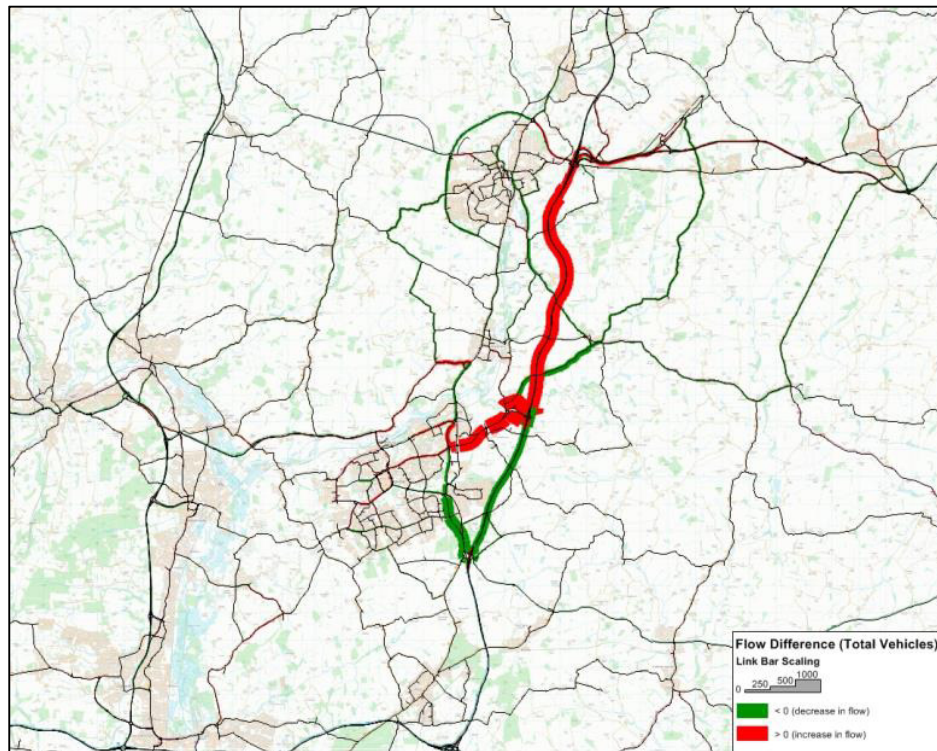
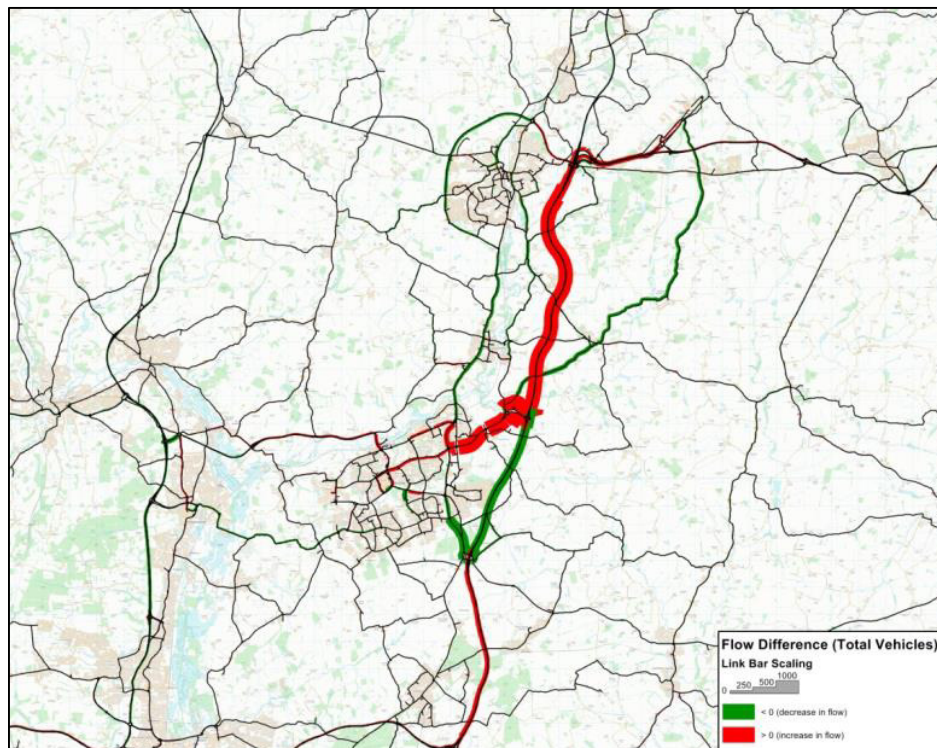
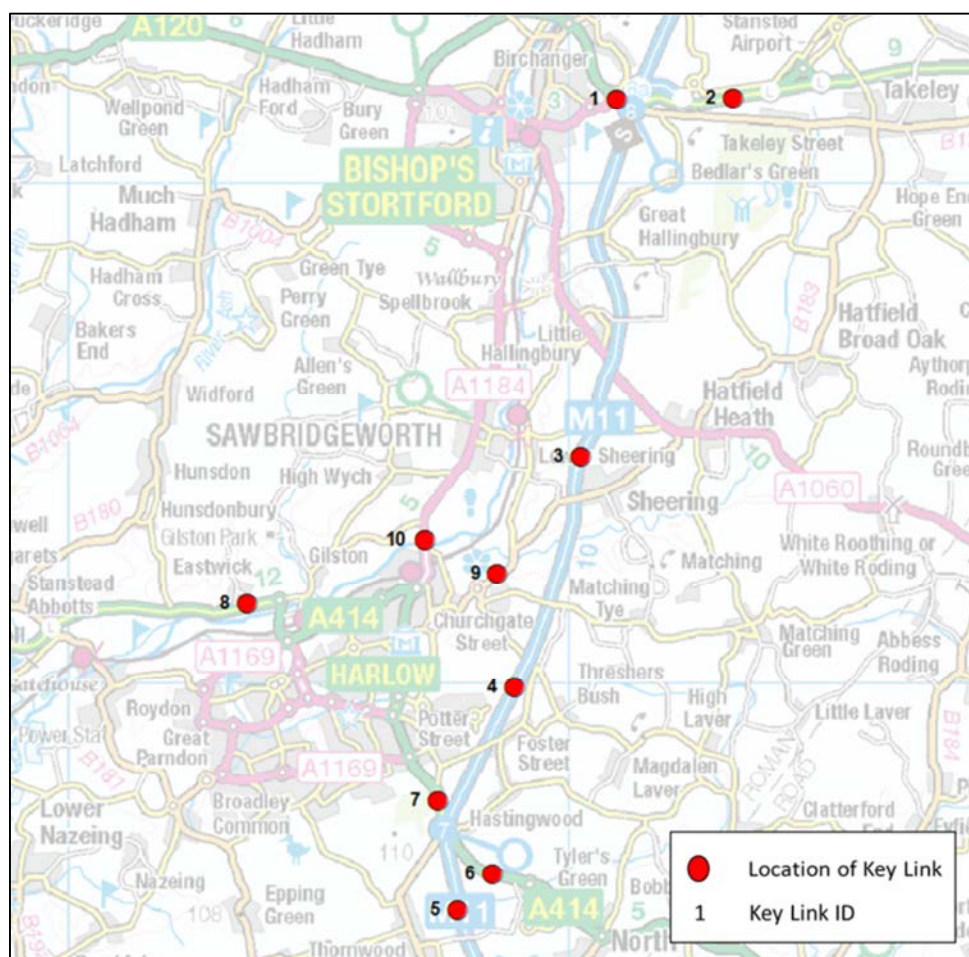


Figure 10.2 : Traffic Flow Difference between DM and DS models for Medium 2021 - PM



- 10.1.6 Figure 10.3 displays links in the road network that are considered important, similarly to Figure 9.3. This plot below includes one additional site on the M11, in order to better assess the traffic flow differences with the proposed scheme, M11 J7a, included.

Figure 10.3 : Locations of Key Links for Traffic Flow Comparison – Medium - DM to DS



- 10.1.7 The above links are examined on an individual basis for the AM and PM in Table 10.1. The table shows how 2-way total vehicle flows have changed between the do-minimum and do-something 2021 situations.
- 10.1.8 The table below mirrors the flow difference plots above as traffic is re-routing to the SRN away from the local road network, and in particular currently well utilised local rat-runs.
- 10.1.9 Reductions in traffic flow are modelled on the following links, demonstrating that the scheme helps to relieve these locations:
- A414 (west of J7) – this is currently the only principal road linking Harlow to the SRN, it sees a significant decrease in flow as a result of re-routing with M11 J7a introduced;
 - A1184 Cambridge Road – this road is near to capacity and heavily congested in peak periods, the M11 J7a scheme removes some traffic from this link; and
 - M11 (south of J7a) – the M11 between J7 and J7a displays a reduction in flow as a result of the scheme with a new entry point allowing traffic to access the motorway at a more northerly location.

- 10.1.10 Traffic flow has increased significantly on some links as a result of the scheme and consequent re-routing. There are a number of links, which display small increases, these links are strategic and include the M11 (expect between J7 and J7a), A120 and A414 (east of M11 J7).
- 10.1.11 The M11 north of J7a experiences a large increase in traffic as a result of better access to Harlow via the SRN; this encourages routing shifts to the motorway from local routes for many relatively short distance trips.
- 10.1.12 The most significant traffic growth for any link is on the B183 Gilden Way near the M11 J7a scheme itself. This link sees a 74% and 78% increase in flow for the AM and PM periods respectively. This road is now a major link between Harlow and the SRN, and traffic has grown accordingly.

Table 10.1 : Key link traffic flows –Medium 2021 DM and DS Comparison

ID	Link Name	2-way Traffic Flow (All Vehicles)							
		DM		DS		Difference DS - DM		% Change from DM to DS	
		AM	PM	AM	PM	AM	PM	AM	PM
1	A120, west of M11 J8	3707	3598	3866	3785	159	187	4%	5%
2	A120, between M11 J8 and Stansted Airport	5117	5886	5400	6253	282	367	6%	6%
3	M11, north of J7a	7084	8022	8091	9078	1007	1055	14%	13%
4	M11, south of J7a			6524	7366	-560	-656	-8%	-8%
5	M11, south of J7	8020	8817	8075	9160	56	343	1%	4%
6	A414, east of M11 J7	1738	1521	1779	1590	41	69	2%	5%
7	A414, west of m11 J7	4312	4700	3410	3959	-902	-742	-21%	-16%
8	A414, west of Eastwick Roundabout	2084	2781	2180	2928	96	147	5%	5%
9	B183 Gilden Way, east of Harlowbury Roundabout	1664	1630	2888	2901	1225	1271	74%	78%
10	A1184 Cambridge Road, at the River Stort bridge	1673	1677	1485	1431	-188	-246	-11%	-15%

10.2 Flow Impacts from the M11 J7a Scheme in 2036 for Medium Growth

- 10.2.1 Two future years have been assessed for each growth scenario, the impact of the M11 J7a scheme has already been discussed above, and the impact of the scheme in 2036 will follow in this section.
- 10.2.2 The plots below in Figure 10.4 and Figure 10.5 are for the AM peak and PM peak respectively. As with 2021 plots, which are zoomed to provide better detail of changes are provided in Appendix H for all three time periods.
- 10.2.3 The below figures show some large increases and decreases in traffic flow in different parts of the network. All are deemed logical considering the scheme that has been put in place in the DS situation. The changes for most of the network are similar to 2021, and Section 10.1 should be referred to.
- 10.2.4 There are no major differences in the patterns of traffic flow change observed for 2036 that suggest that the M11 J7a scheme has a different impact than to what is described for 2021. The only noticeable change is that the trends explained for 2021 are exaggerated in 2036. Where there are decreases in 2021 the decreases appear to be larger in 2036, and likewise with flow increases. This is simply because the volumes of traffic in the 2036 forecast year are markedly higher than in the modelled 2021 situation.
- 10.2.5 The most notable locations at which scheme impacts are greater than the 2021 observations are as follows:
- M11 – north of M11 J7a
 - M11 – south of M11 J7a

- B183 Harlow Road – east of M11 J7a
- A414 London Road – connection to M11 J7
- B183 Gilden Way –west of M11 J7a

Figure 10.4 : Traffic Flow Difference between DM and DS models for Medium 2036 - AM

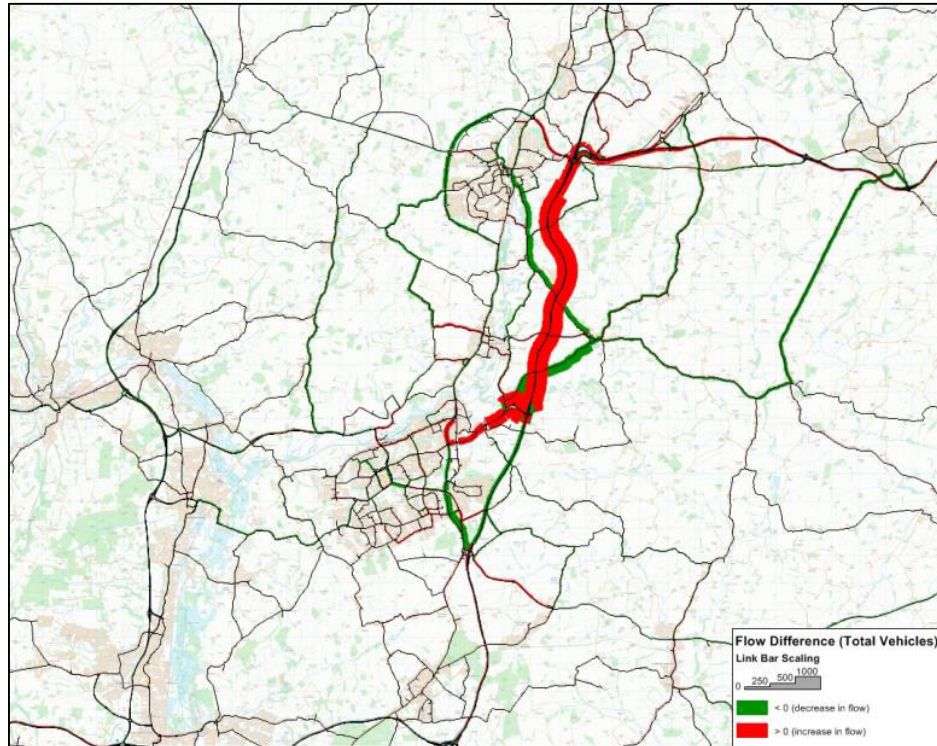
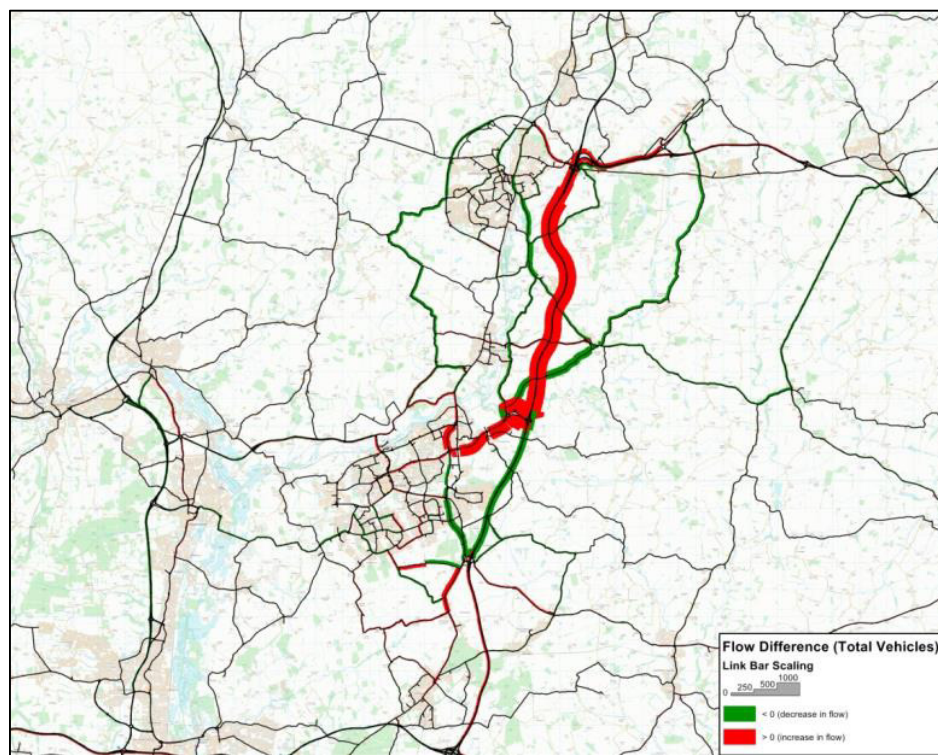


Figure 10.5 : Traffic Flow Difference between DM and DS models for Medium 2036 - PM



- 10.2.6 The key links identified in the previous section are also examined for the 2036 models in Table 10.2. The table shows how 2-way total vehicle flows have changed between the do-minimum and do-something 2036 situations.
- 10.2.7 The table below echoes findings from the 2021 analysis, with traffic re-routing to the SRN away from the local road network.
- 10.2.8 Reductions in traffic flow in 2036 are modelled on the following links, the reasons for traffic flow decreases is likely to be the same as explained in the previous 2021 section:
- A414 (west of J7); and
 - M11 (south of J7a)
- 10.2.9 Two links show a mixed picture between time periods, however the changes are small in magnitude and probably represent that the scheme has little impact upon these sites in 2036. These links are as follows:
- A414 (west of Eastwick Roundabout)
 - A1184 Cambridge Road
- 10.2.10 As in 2021, traffic flow has increased significantly on some links as a result of the scheme and consequent re-routing. There are a number of links, which display small increases, these links are strategic and include the M11 (except between J7 and J7a), A120 and A414 (east of M11 J7).
- 10.2.11 As explained in the 2021 analysis the M11 north of J7a experiences a large increase in traffic as a result of better access to Harlow via the SRN.

- 10.2.12 The most significant traffic growth for any link is on the B183 Gilden Way near the M11 J7a scheme itself. This link sees a 44% and 47% increase in flow for the AM and PM periods respectively. This road is now a major link between Harlow and the SRN, and traffic has grown accordingly. The percentage increases are much smaller than those witnessed in 2021; this is due to traffic being constraint at this location due to limits on the capacity of this road.

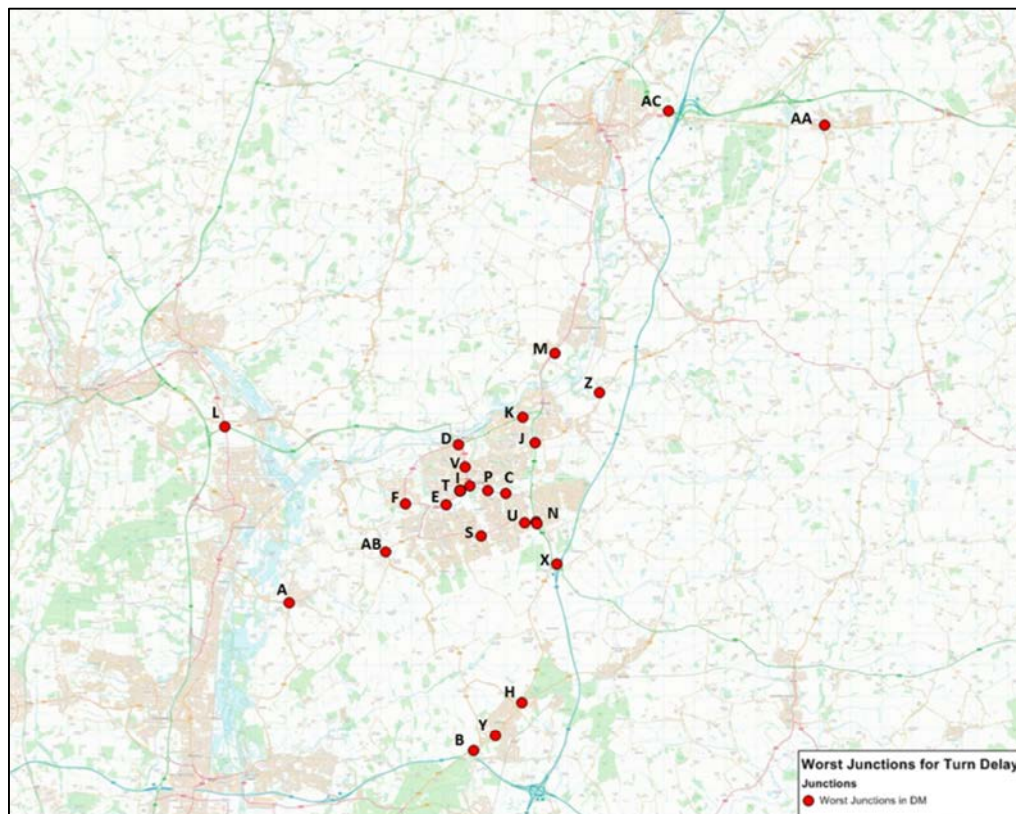
Table 10.2 : Key link traffic flows –Medium 2036 DM and DS Comparison

ID	Link Name	2-way Traffic Flow (All Vehicles)							
		DM		DS		Difference DS - DM		% Change from DM to DS	
		AM	PM	AM	PM	AM	PM	AM	PM
1	A120, west of M11 J8	4952	4709	5238	4921	286	212	6%	4%
2	A120, between M11 J8 and Stansted Airport	6280	7149	6729	7555	449	406	7%	6%
3	M11, north of J7a	8726	9950	10259	11211	1533	1261	18%	13%
4	M11, south of J7a			8433	9426	-294	-524	-3%	-5%
5	M11, south of J7	9954	10371	10024	10563	70	192	1%	2%
6	A414, east of M11 J7	2149	2037	2284	2136	134	99	6%	5%
7	A414, west of m11 J7	4884	5435	4466	5027	-418	-408	-9%	-8%
8	A414, west of Eastwick Roundabout	2812	3097	2758	3164	-55	66	-2%	2%
9	B183 Gilden Way, east of Harlowbury Roundabout	2398	2259	3451	3314	1053	1055	44%	47%
10	A1184 Cambridge Road, at the River Stort bridge	1883	1689	1838	1773	-45	84	-2%	5%

10.3 Impacts upon Delay from the M11 J7a Scheme in 2021 for Medium Growth

- 10.3.1 Section 9.4 describes the location of delay and capacity constraint across the detailed modelled area. The principle areas highlighted as congested were as follows:
- Lower Nazeing and Epping signalised junctions;
 - Key distributor routes in Harlow, including A414, A1025 Second Avenue, A1025 Third Avenue and Velizy Avenue; and
 - M11 J7
- 10.3.2 Figure 10.6 shows the locations of the junctions identified as the worst for turn delay in 2021. Each junction has an individual ID and can also be found in Table 10.3, which displays the impact of the scheme upon these junctions.

Figure 10.6 : Location of Worst Junctions for delay in the Medium 2021 DM Models



10.3.3 The junctions shown below are in the same order as in the Table 9.3, therefore the junctions at the top of the list are those that suffer the worst turn delay in the do-minimum situation in 2021.

10.3.4 The key observations from the below values are that:

- Junctions in Lower Nazeing and Epping experience small improvements with turn delay decreasing between the DM and DS simulations with the exception of Lower Nazeing in the PM where there is a very small increase in delay.
- Within Harlow junctions that see a significant improvement from the M11 J7a scheme are as follows:
 - A414 London Road Hamburger Roundabout;
 - M11 J7 - Signalised junction at NB On-slip;
 - Second Avenue / Tripton Road Roundabout; and
 - B183 Sheering Road / Sheering Lower Road, near Sheering.
- The junction which sees the largest improvement (over a minute and a half) is the A1184 Harlow Road / Hand Lane in Sawbridgeworth.
- Conversely there a number of junctions, all of which are in Harlow, where turn delay significantly increases as a result of the introduction of the new motorway junction, this occurs at:
 - Burnt Mill Roundabout;
 - A414 London Road / B183 Gilden Way Roundabout;
 - Third Avenue / Abercrombie Way Signals;
 - Third Avenue / Haydens Road Roundabout;

- Southern Way / Partridge Road; and
- A1019 Velizy Avenue / First Avenue Roundabout.

- 10.3.5 In addition to the above there are some junctions where the impact of the scheme is less clear, or changes between time periods.
- 10.3.6 Overall the scheme appears to have most positive impact on concentrated areas around the M11 J7 and the current connection to the SRN, as well as relieving some junctions where well used minor roads meet local A and B roads that have had some traffic re-routed away from them.
- 10.3.7 The M11 J7a increases strain at junctions in Harlow particularly along some of the key routes that are already suffering from high levels of turn delay.

Table 10.3 : Impact of the scheme upon the top 20 worse junctions in Medium DM 2021

ID	Location	Sum of turn delay (minutes)					
		AM		PM		Difference	
		DM	DS	DM	DS	AM	PM
A	Lower Nazeing Signals	11.81	11.32	8.89	8.98	-0.49	0.09
D	Burnt Mill Roundabout, Harlow	9.91	10.57	4.03	5.14	0.66	1.11
F	A1169 Elizabeth Way / A1025 Third Avenue Roundabout (The Pinnacles)	7.11	7.47	3.91	3.65	0.36	-0.26
B	High Road / Theydon Road Signals, Epping	4.63	4.59	4.03	3.54	-0.04	-0.49
C	Second Avenue / Howard Way Roundabout, Harlow	5.93	4.91	3.58	5.79	-1.02	2.21
J	A414 London Road / B183 Gilden Way Roundabout, Harlow	5.11	6.05	2.46	4.87	0.94	2.41
E	Third Avenue / Abercrombie Way Signals, Harlow	2.69	3.78	3.08	3.21	1.09	0.13
T	Third Avenue / Haydens Road Roundabout, Harlow	3.91	4.63	2.04	2.89	0.72	0.85
H	Thornwood Road / The Plain Signals, Epping	2.07	2.09	3.08	3.06	0.02	-0.02
K	A414 Edinburgh Way / East Road Signals, Harlow	2.38	1.98	2.22	2.31	-0.4	0.09
L	Great Amwell Roundabout	1.59	1.85	2.38	2.6	0.26	0.22
N-1	A414 London Road Hamburger Roundabout (southern signals)	2.00	1.88	1.88	1.7	-0.12	-0.18
N-2	A414 London Road Hamburger Roundabout (northern signals)	1.76	1.44	2.01	1.68	-0.32	-0.33
S	Southern Way / Partridge Road, Harlow	2.13	2.29	1.60	1.73	0.16	0.13
X	M11 J7 - Signalised junction at NB On-slip	1.89	1.64	1.81	1.52	-0.25	-0.29
P	Second Avenue / Tripton Road Roundabout	-	-	3.73	3.08	-	-0.65
M	A1184 Harlow Road / Hand Lane, Sawbridgeworth	3.28	1.91	-	-	-1.37	-
U	A1169 Southern Way / Traces Road, Harlow	-	-	1.97	1.95	-	-0.02
Y	B1393 Epping High Street / Tower Road, Epping	-	-	1.91	1.69	-	-0.22
Z	B183 Sheering Road / Sheering Lower Road, near Sheering	1.78	0.89	-	-	-0.89	-
V	A1019 Velizy Avenue / First Avenue Roundabout, Harlow	1.63	1.87	-	-	0.24	-
AA	Takeley Cross, Takeley	-	-	1.75	1.28	-	-0.47
AB	B181 Epping Road / B1133 Water Lane, Broadly Common	-	-	1.65	1.55	-	-0.1
AC	A120 / A1250 Dunmow Road, Bishop's Stortford	1.47	1.44	-	-	-0.03	-
I	Crowngate Roundabout, Harlow	1.46	1.6	-	-	0.14	-

- 10.3.8 Figure 10.7 and Figure 10.8 found in this section of the report are for the AM peak and PM peak respectively, and show the difference in delays between the DM and DS networks. Thus, demonstrating the impact of the M11 J7a scheme upon congestion in the surrounding area. Plots for the IP can be found in Appendix I.
- 10.3.9 Note that the magnitude of delay is represented by the width of the bars, and not by their length. The length is only representative of the length of the coded link and not the extent of queuing or delay.
- 10.3.10 The measure of delay used for these plots considers the maximum turn delay (in seconds) on each arm of every junction that is coded within the model. The maximum turn delay refers to the worst turn on that arm. The delay for each turn is calculated as an average turn delay for vehicles across the whole hour period being assessed. Within VISUM the maximum turn delay for arms must be displayed for a specific user class, it is not calculated across all classes. Consequently, it was decided to select Car Commute (CC). Checks were carried out to ensure that there was not a large variation between user classes and it was found that the variation was usually zero and always negligible.
- 10.3.11 The green link bars represent a decrease in delay for this link, which represents an arm of the junction it goes in to. Conversely red link bars display locations where there is an increase in delay. All delay values are in seconds.
- 10.3.12 Only links with a difference over 30 seconds are displayed. Any changes smaller than this are not included in these plots.
- 10.3.13 The area covered within the plots includes entire detailed modelled area as well as some additional network to the east and the west.
- 10.3.14 The below figures show some significant increases and decreases in delay associated with the introduction of a new junction on the M11. All observed changes are deemed logical, especially when examined alongside the observations on traffic flow difference. An explanation of each significant change in 2021 is provided below:
- There are decreases in turn delay affecting links between Bishop's Stortford / Stansted Airport and Harlow. These links represent some well used alternative routes to the M11 between these locations, a reduction in traffic on these routes as result of re-routing onto the M11 has led to significant improvements with regards delay. This is particularly evident along the B183 Dunmow Road, north of Hatfield Heath.
 - Sheering Lower Road is recognised to be a rat-run for traffic along the Harlow – Bishop's Stortford corridor. This road sees a marked decrease in turn delay for traffic joining the B183 as result of the scheme for the same reasons as above.
 - There are some significant increases in delay along B183 Gilden Way and First Avenue as a consequence of the scheme, and resulting from additional traffic in these locations.
 - The delay on Rye Hill Road, between Harlow and Epping decreases due to the number of vehicles rat-running to avoid the A414 London Road reducing. The number of people using Rye Hill Road to enter Harlow from M11 J7 decreases, as such this opposing movement for vehicles leaving Rye Hill Road on to the B1393 becomes less.

Figure 10.7 : Turn Delay Difference between DM and DS models for Medium 2021 – AM

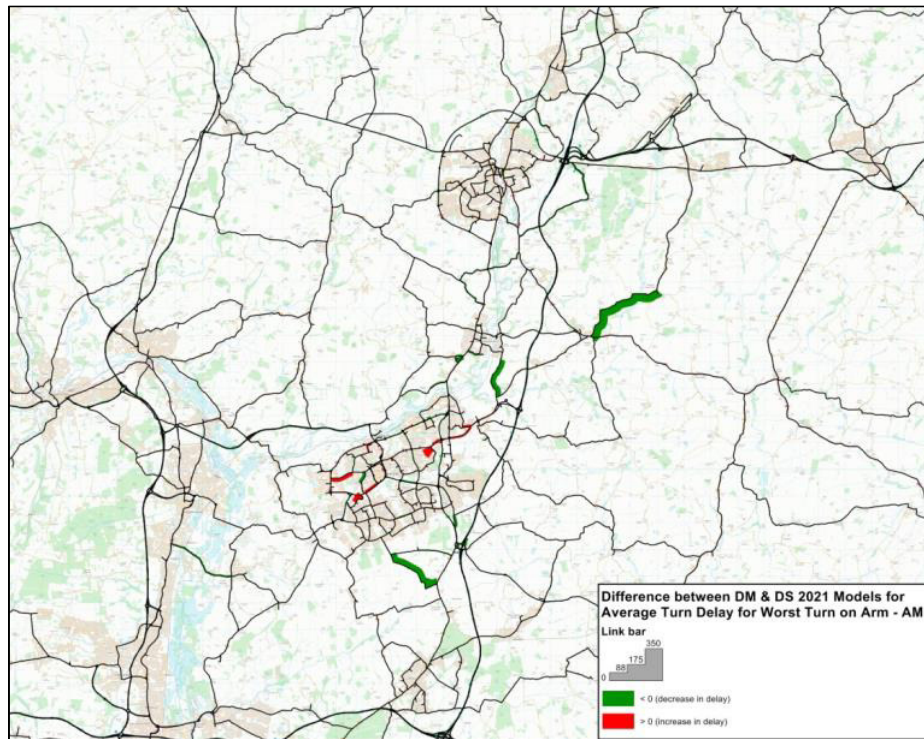
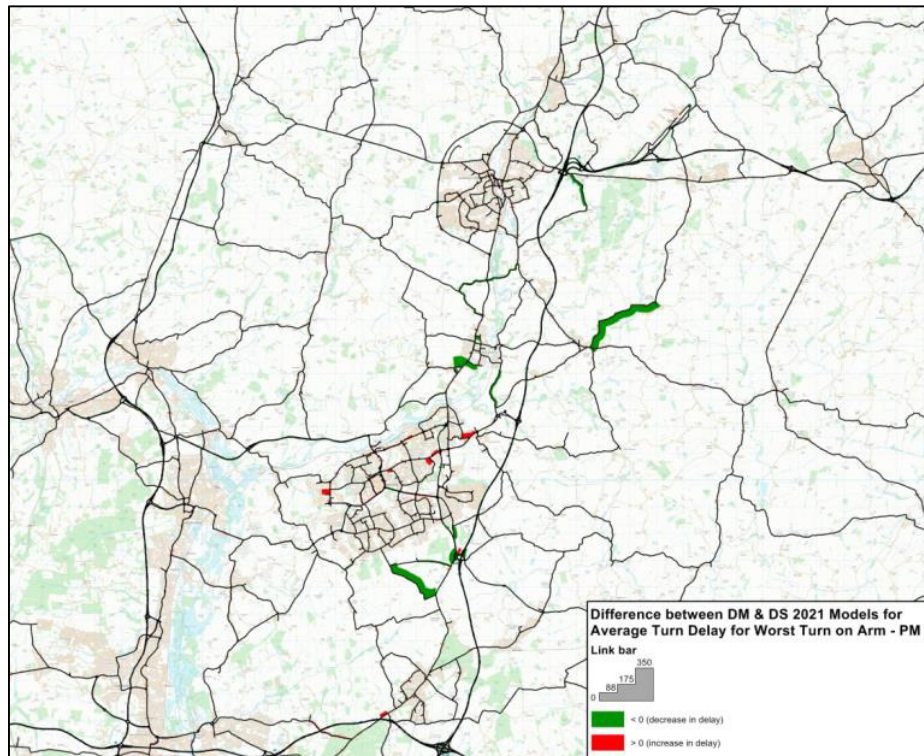


Figure 10.8 : Turn Delay Difference between DM and DS models for Medium 2021 - PM



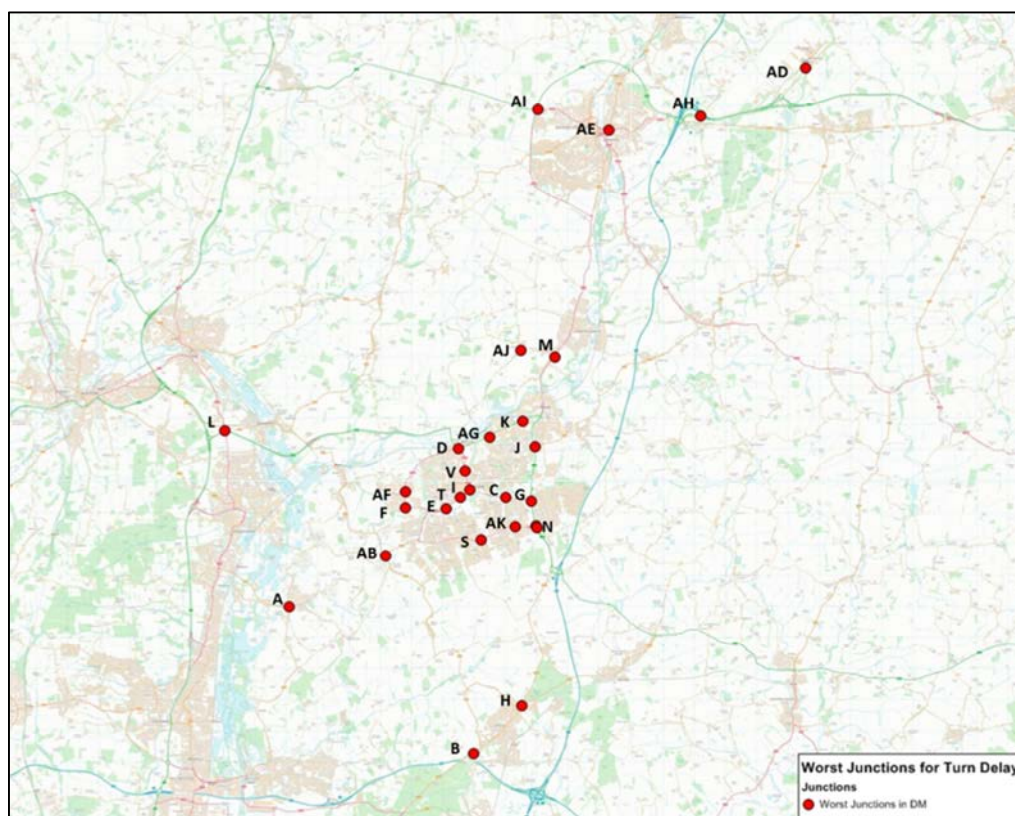
10.4 Impacts upon Delay from the M11 J7a Scheme in 2036 for Medium Growth

10.4.1 Section 9.5 describes the location of delay and capacity constraint across the detailed modelled area. The principle areas highlighted as congested were as follows:

- Lower Nazeing and Epping signalised junctions;
- Key distributor routes in Harlow, including A414, A1025 Second Avenue, A1025 Third Avenue and Velizy Avenue;
- In the AM, some important junctions that allow access to large residential estates; and
- In the PM, some large junctions in Bishop's Stortford and Stansted Airport.

10.4.2 Figure 10.9 shows the locations of the junctions identified as the worst for turn delay in 2036. Each junction has an individual ID and can also be found in Table 10.4, which displays the impact of the scheme upon these junctions.

Figure 10.9 : Location of Worst Junctions for delay in the Medium 2036 DM Models



10.4.3 The junctions shown below are in the same order as in the Table 10.3, therefore the junctions at the top of the list are those that suffer the worst turn delay in the do-minimum situation in 2036.

10.4.4 The key observations from the below values are that:

- The signalised junctions in Epping experience significant increases in turn delay between the DM and DS simulations in the PM, whereas in the AM the levels of delay stay stable;
- Within Harlow most junctions see a significant improvement from the M11 J7a scheme, the largest improvements are as follows:
 - Clocktower Roundabout
 - A414 London Road Hamburger Roundabout

- A414 Edinburgh Way / East Road Signals
 - The area which sees the largest improvement in the AM is around High Wych Road near Sawbridgeworth at the Hand Lane and High Wych Lane junctions;
 - In the PM the junctions in Bishop's Stortford and Stansted Airport significantly improve, conditions at the A1250 /A1060 Bishop's Stortford Cross improve most;
 - Conversely there a number of junctions in Harlow where turn delay significantly increases as a result of the introduction of the new motorway junction, this occurs at:
 - A414 London Road / B183 Gilden Way Roundabout
 - Second Avenue / Howard Way Roundabout
 - Southern Way / Partidge Road
 - The Lower Nazeing signalised junction, which is the most congested junction in the detailed model area also sees a further increase in delays as a result of the M11 J7a scheme in 2036;
- 10.4.5 In addition to the above there are some junctions where the impact of the scheme is less clear, or changes between time periods.
- 10.4.6 Overall the scheme appears to have a positive impact across most of the junctions that are severely congested in the do-minimum 2036 models. The junctions most negatively affected are centred in the vicinity of the scheme, and are located on those roads which will experience the largest increases in traffic flow as a consequence of the M11 J7a scheme.

Table 10.4 : Impact of the scheme upon the top 20 worse junctions in Medium DM 2036

ID	Location	Sum of turn delay (minutes)					
		AM		PM		Difference	
		DM	DS	DM	DS	AM	PM
A	Lower Nazeing Signals	13.78	14.24	9.28	9.69	0.46	0.41
J	A414 London Road / B183 Gilden Way Roundabout, Harlow	7.54	10.4	8.23	8.73	2.86	0.5
D	Burnt Mill Roundabout, Harlow	9.35	9	7.49	7.7	-0.35	0.21
F	A1169 Elizabeth Way / A1025 Third Avenue Roundabout (The Pinnacles)	6.64	6.68	8.02	8.1	0.04	0.08
C	Second Avenue / Howard Way Roundabout, Harlow	7.11	9.28	5.72	7.26	2.17	1.54
B	High Road / Theydon Road Signals, Epping	5.55	5.54	4.01	5.44	-0.01	1.43
V	A1019 Velizy Avenue / First Avenue Roundabout, Harlow	4.39	4.01	4.37	4.93	-0.38	0.56
E	Third Avenue / Abercrombie Way Signals, Harlow	4.49	3.64	3.01	2.97	-0.85	-0.04
H	Thornwood Road / The Plain Signals, Epping	3.11	3.09	3.41	3.65	-0.02	0.24
G	Clocktower Roundabout, Harlow	2.74	1.58	3.85	1.74	-1.16	-2.11
I	Crowngate Junction, Harlow	2.81	2.83	3.47	3.2	0.02	-0.27
N-1	A414 London Road Hamburger Roundabout (southern signals)	3.24	2.26	2.83	2.27	-0.98	-0.56
N-2	A414 London Road Hamburger Roundabout (northern signals)	2.94	1.68	3.04	2.72	-1.26	-0.32
AD	Thremhall Avenue Eastern Roundabout, Stansted Airport	-	-	7.31	6.75	-	-0.56
AE	A1250 /A1060 Bishop's Stortford Cross	-	-	6.85	4.2	-	-2.65
AF	A1169 Elizabeth Way / Fourth Avenue, The Pinnacles	4.61	4.6	-	-	-0.01	-
L	Great Amwell Roundabout	-	-	4.86	4.76	-	-0.1
AG	A414 Edinburgh Way / Howard Way, Harlow	-	-	4.65	4.72	-	0.07
K	A414 Edinburgh Way / East Road Signals, Harlow	3.92	2.43	-	-	-1.49	-
AH	Priory Wood Roundabout, Stansted Airport	-	-	4.15	4.05	-	-0.1
T	Third Avenue / Haydens Road Roundabout, Harlow	3.77	3.06	-	-	-0.71	-

ID	Location	Sum of turn delay (minutes)					
		AM		PM		Difference	
		DM	DS	DM	DS	AM	PM
M	A1184 Harlow Road / Hand Lane, Sawbridgeworth	3.69	2.15	-	-	-1.54	-
AB	B181 Epping Road / B1133 Water Lane, Broadly Common	-	-	3.67	3.22	-	-0.45
AI	A120 Hadham Road / A1184 Bishops Park Way, Bishop's Stortford	-	-	3.41	2.51	-	-0.9
AJ	High Wych Road / High Wych Lane, High Wych	2.9	0.09	-	-	-2.81	-
S	Southern Way / Partidge Road, Harlow	2.71	3.19	-	-	0.48	-
AK	A1169 Southern Way / Trotters Road, Harlow	2.68	2.63	-	-	-0.05	-

- 10.4.7 Figure 10.10 and Figure 10.11 found below are for the AM peak and PM peak respectively for 2036, and show the difference in delays between the DM and DS networks. Plots for the IP can be found in Appendix I.
- 10.4.8 Note that the magnitude of delay is represented by the width of the bars, and not by their length. The length is only representative of the length of the coded link and not the extent of queuing or delay.
- 10.4.9 The changes for most of the network are similar to 2021, and Section 10.3 above should be referred to.
- 10.4.10 There are no major differences in the patterns of delay change observed for 2036 compared to 2021. However, where there are decreases in 2021 the decreases appear to be larger in 2036, and likewise with delay increases. This is likely to be because the volumes of traffic in the 2036 forecast year are significantly higher than in the modelled 2021 situation, therefore producing more delay.
- 10.4.11 There are a few locations at which the trends are different from 2021, these are described below:
- There are further improvements with decreasing delay between Bishop's Stortford / Stansted Airport and Harlow. More roads in this area see delay reductions, particularly along the A1060 and the minor roads that fed it.
 - Another area of delay decrease is in the vicinity of the A414 London Road because of a reduction in traffic along this route. This major feeder road for the M11 J7 appears to be partially relieved by the building of M11 J7a.
 - There is evidence of Edinburgh Way sees an increase in delays in 2036 at one location as a result of additional flow along this road.
 - Rye Hill Road between Harlow and Epping experiences a large increase in delay due to modest increases in traffic using the M11 J7 and interacting with the B1393. This has the effect of increasing flow for Rye Hill Road and therefore producing more delay for traffic using this route. For this road the scheme appears to have the opposite impacts in 2021 and 2036.

Figure 10.10 : Turn Delay Difference between DM and DS models for Medium 2036 – AM

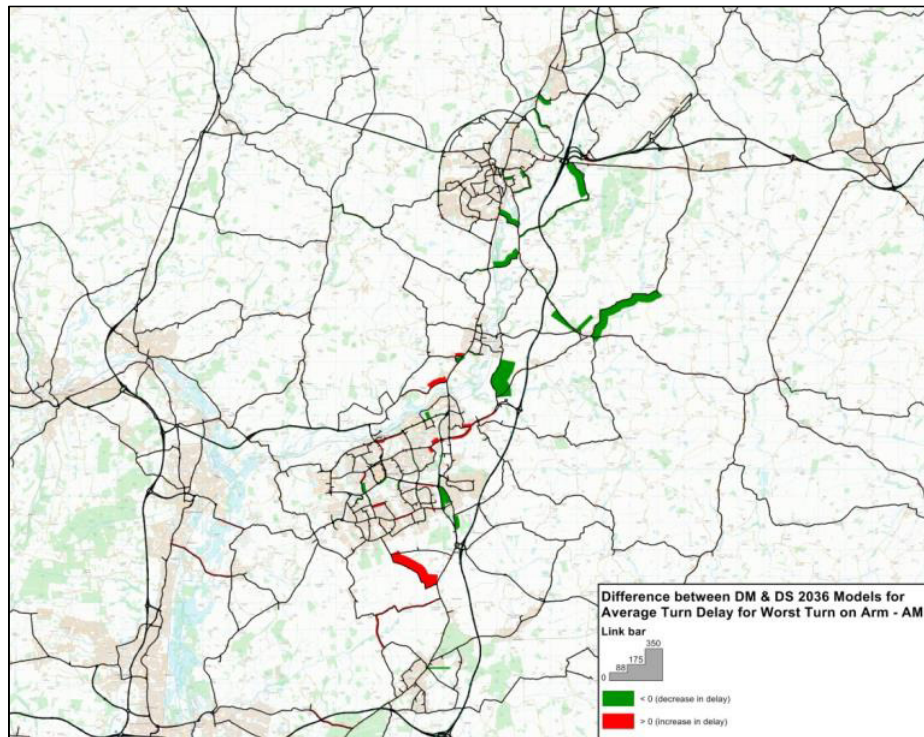
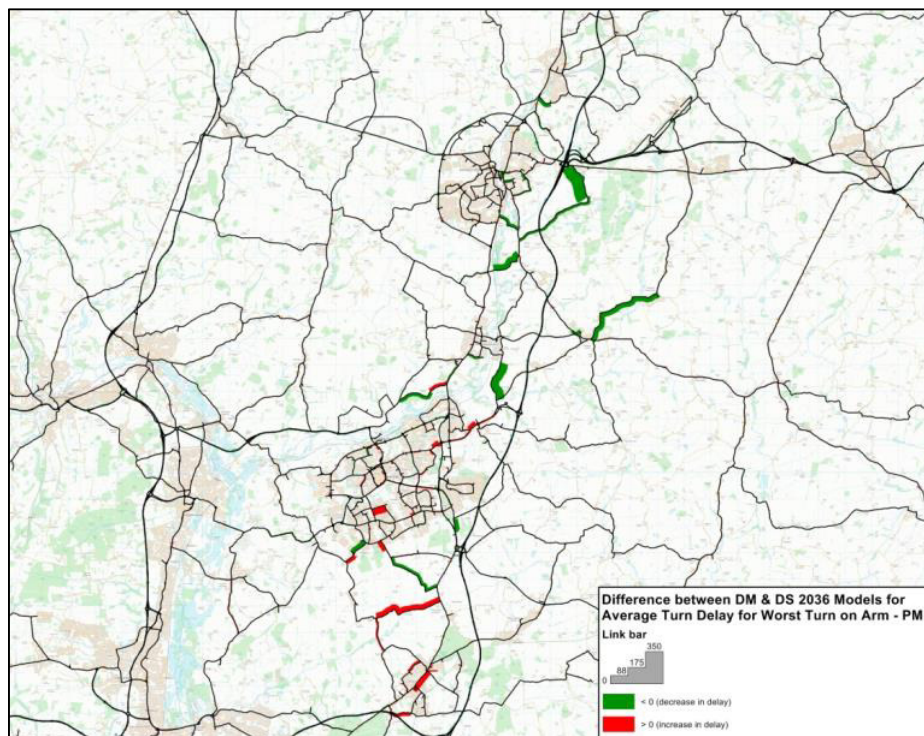


Figure 10.11 : Turn Delay Difference between DM and DS models for Medium 2036 - PM



11. Forecast Model Output – High Scenario

11.1 Flow Changes between the Base Year and 2021 for High Growth

- 11.1.1 The increases in traffic flows expected in 2021 are illustrated in the plots below. In the plots, the increase in flow is shown as red bands, and green bands indicate flow reductions that occur in the forecast year. All difference plots are produced by analysing total vehicle flows, which includes all five user classes.
- 11.1.2 The plots below in Figure 11.1 and Figure 11.2 are for the AM peak and PM peak hours respectively. The area shown covers the entire detailed modelled area as well as some additional network to the east and the west. Plots, which are zoomed to provide more detail of changes, are also provided in Appendix H for all three time periods.
- 11.1.3 The plots show a general increase in traffic across the area covered by the M11 J7a Model; this is particularly evident on the SRN.
- 11.1.4 In Harlow, there are significant increases in traffic around key growth sites such as the committed developments at Harlowbury and New Hall, and the potential Local Plan sites at Latton Priory and The Pinnacles. The extra trips produced by these developments leads to significant traffic growth along key routes, for example the A414 and B183 Gilden Way.
- 11.1.5 In Bishop's Stortford noticeable increases in traffic flow are shown around the vicinity of Bishop's Stortford North and Bishop's Stortford South development sites. The extra trips generated by these sites, together with the new A120 Little Hadham bypass, contribute to increased flows on the A120 around the town, particularly leading into M11 J8, as well as on the A1184 south western bypass.
- 11.1.6 Although across the network traffic flow generally increases, there are a number of locations at which flow reduces between 2014 and 2021, in most cases this is due to local network improvements resulting in routing changes. Examples of such locations follow:
- A120 Little Hadham Bypass: The new bypass link around the village of Little Hadham significantly decreases flow on the bypassed link through the village;
 - Bishop's Stortford: Flows on the B1383 south of the town centre reduce slightly, which is likely to be the result of traffic reassigning within the town; and
 - Harlow town centre: There are some routing changes around the town centre which are likely to be as a result of planned local junction improvements that have been modelled.

Figure 11.1 : Traffic Flow Difference between Base 2014 and High DM 2021 models - AM

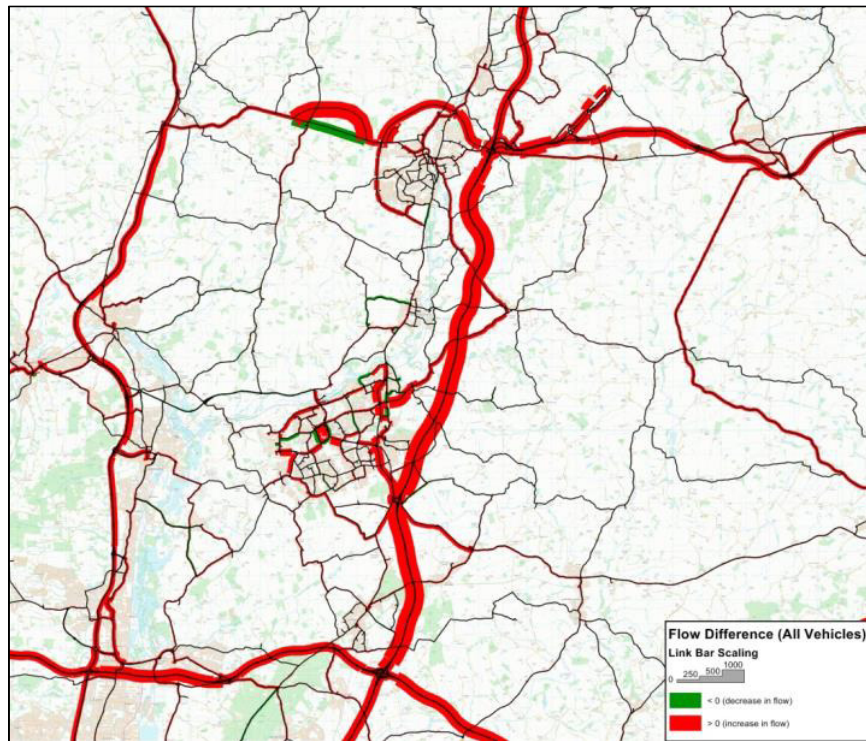
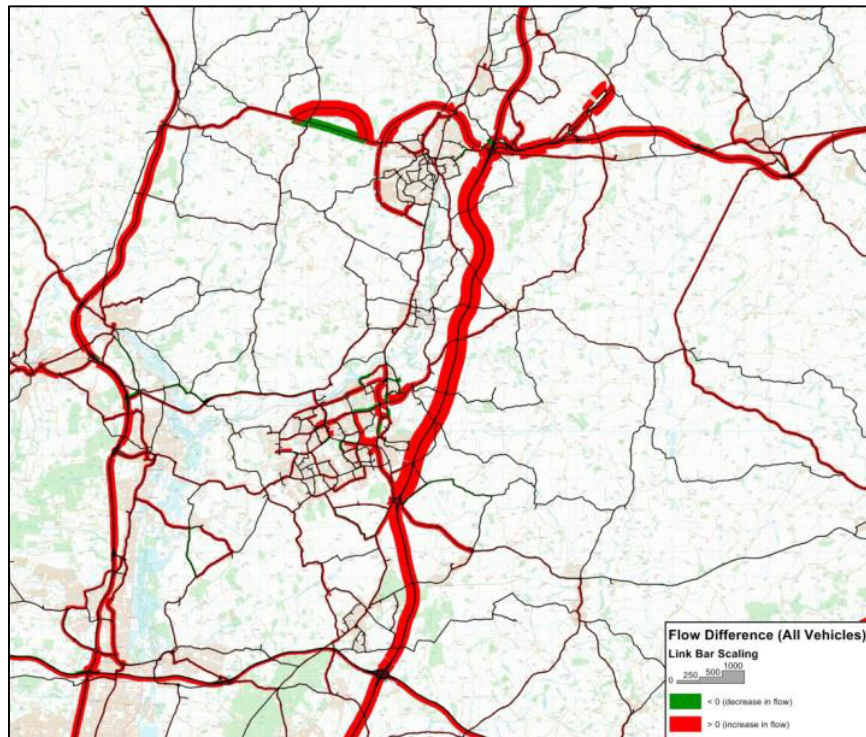
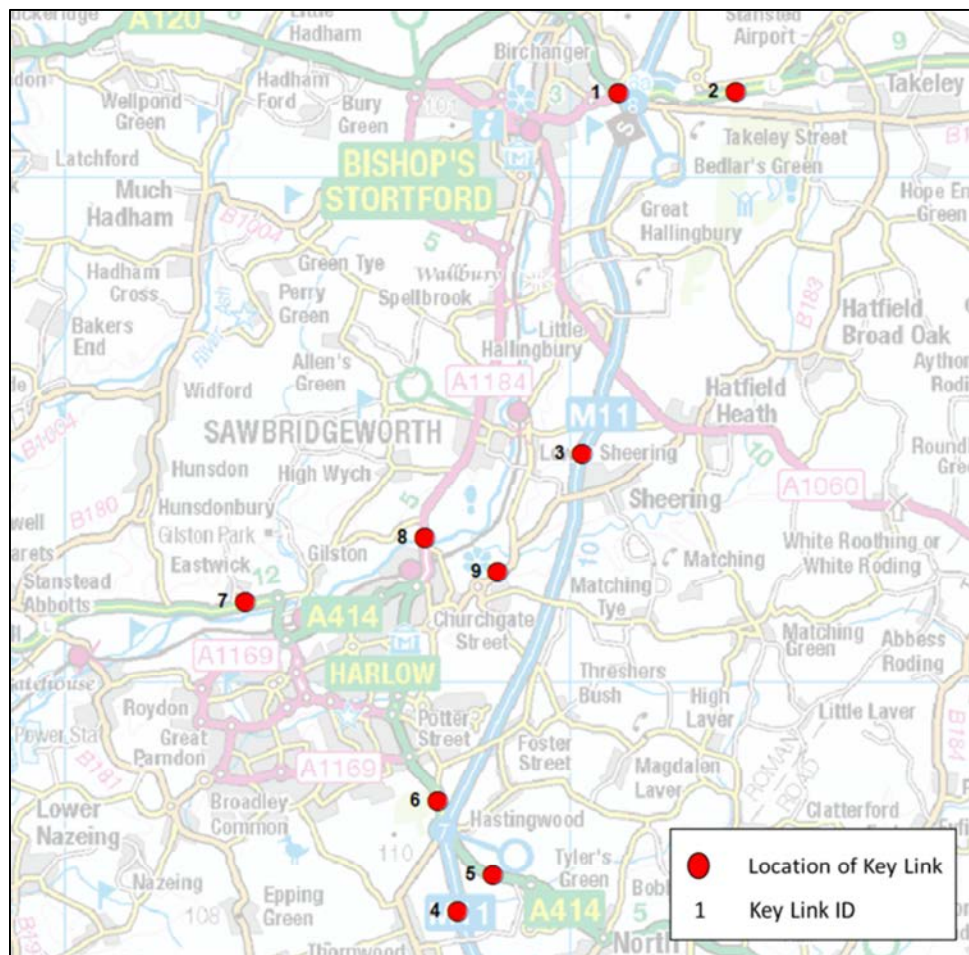


Figure 11.2 : Traffic Flow Difference between Base 2014 and High DM 2021 models - PM



- 11.1.7 Figure 11.3 displays links in the road network that are considered important, both for the local road network performance, as well as in relation to the M11 J7a scheme.

Figure 11.3 : Locations of Key Links for Traffic Flow Comparison – Base to High DM



- 11.1.8 The above links are examined on an individual basis for the AM and PM peak hours in Table 11.1. The table shows how 2-way total vehicle flows have changed between the Base and do-minimum 2021 situations.
- 11.1.9 Section 4.7 provides information on the growth in trips for each matrix produced for the do-minimum models. The overall growth in car trips in 2021 for both the AM and PM peak hours is 10%, for goods vehicles the number of trips increases by 16% and 18% in the AM and PM respectively.
- 11.1.10 Most of the links included in the analysis below show evidence of traffic growth higher than the total growth. This is particularly evident for the A120 and M11, which are key strategic links.
- 11.1.11 Site 8 has lower traffic growth of 1% in the AM and 7% in the PM. This is at a location, which is known to be very congested and near capacity in the 2014 base situation. As such an increase in traffic here has been limited due to constraints associated with the capacity of this route.
- 11.1.12 Similarly Site 7 has growth of 2% in the AM and 3% in the PM. This location is likely to be subject to capacity constraints at locations that feed into this link; most notably the A414 between Eastwick Roundabout and Burnt Mill Roundabout is very congested at peak times and is often subject to significant queuing.

Table 11.1 : Key link traffic flows – Base and High 2021 DM Comparison

ID	Link Name	2-way Traffic Flow (All Vehicles)							
		Base		2021		Difference 2021 - Base		% Change from Base	
		AM	PM	AM	PM	AM	PM	AM	PM
1	A120, west of M11 J8	2894	2875	3846	3698	952	823	33%	29%
2	A120, between M11 J8 and Stansted Airport	4007	4701	5145	5845	1138	1144	28%	24%
3	M11, north of J7	5729	6571	7159	8094	1430	1523	25%	23%
4	M11, south of J7	6642	7828	8049	8856	1407	1028	21%	13%
5	A414, east of M11 J7	1402	1193	1736	1580	334	388	24%	32%
6	A414, west of m11 J7	3681	4204	4341	4701	660	497	18%	12%
7	A414, west of Eastwick Roundabout	2029	2638	2076	2711	47	72	2%	3%
8	A1184 Cambridge Road, at the River Stort bridge	1582	1568	1602	1674	20	107	1%	7%
9	B183 Gilden Way, east of Harlowbury Roundabout	1405	1345	1762	1659	357	314	25%	23%

11.2 Flow Changes between the Base Year and 2036 for High Growth

- 11.2.1 Similarly to 2021 the increases in traffic flows expected in 2036 are illustrated in the images below. The plots below in Figure 11.4 and Figure 11.5 are for the AM and PM peak hours respectively. As with 2021 additional plots are provided in Appendix H for all three time periods.
- 11.2.2 The plots show a general increase in traffic across the area covered by the M11 J7a model, as would be expected given the significantly higher levels of growth than within the 2021 models. The increase is again evident on the SRN, but is also high around the fringes of Harlow and Bishop's Stortford where large potential Local Plan housing developments are located.
- 11.2.3 In Harlow, the largest increases in traffic flow are seen in the vicinity of the potential development sites that encircle the town, including Gilston Park, East Harlow, Latton Priory and Sumners. The additional trips resulting from these developments lead to significant traffic growth across the local road network, particularly along routes such as the A414 linking to J7, B183 Gilden Way and the A414 towards Hertford.
- 11.2.4 In Bishop's Stortford the largest increases in traffic flow are evident around Bishop's Stortford North and Bishop's Stortford South. As in 2021 the extra trips generated by these sites contribute to increased flows on the full length of the ring-road, particularly leading into M11 J8. There are also noticeable increases in traffic flow along the A1060 and B183 between Bishop's Stortford and Harlow, and along the A120 and B1004 to the west of Bishop's Stortford.
- 11.2.5 Details of highway schemes that impact upon traffic levels is given above in Section 3.1. There are no further significant highway schemes between 2021 and 2036 that have large impacts upon traffic growth and local routing.

Figure 11.4 : Traffic Flow Difference between Base 2014 and High DM 2036 models - AM

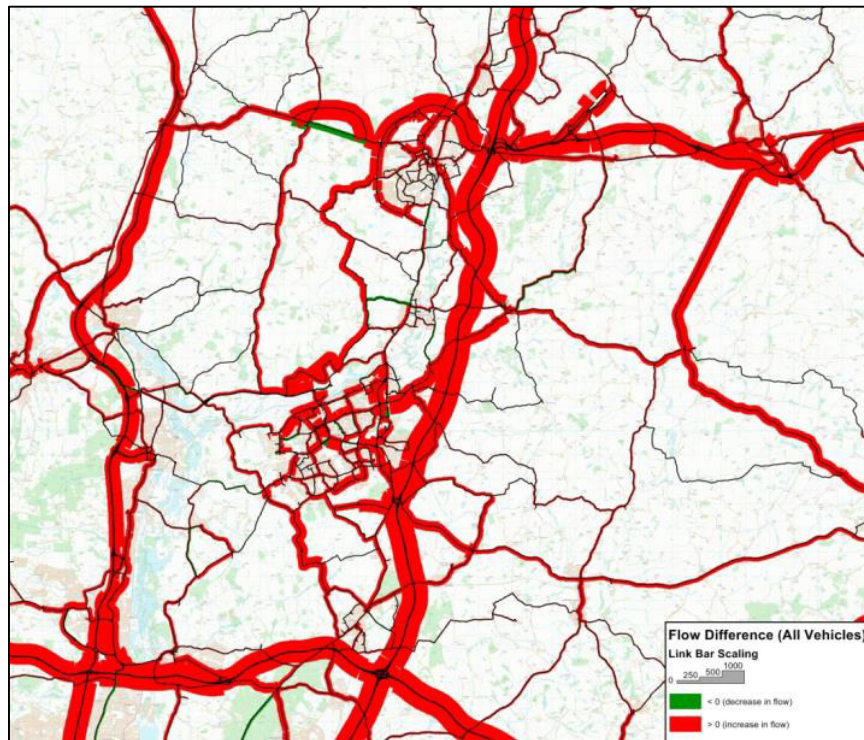
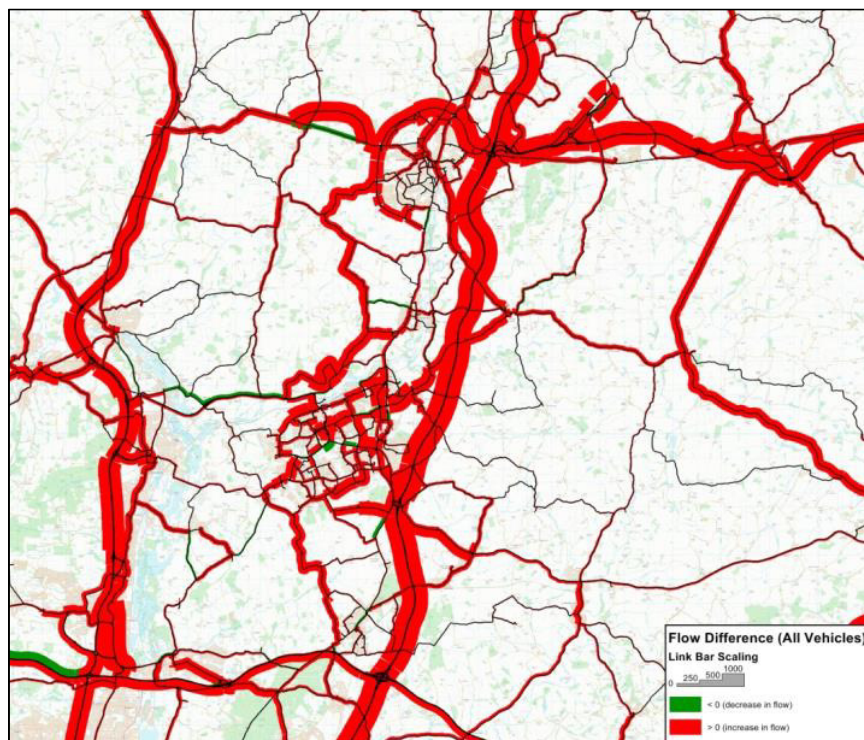


Figure 11.5 : Traffic Flow Difference between Base 2014 and High DM 2036 models - PM



- 11.2.6 The key links identified in the previous section for 2021 are also examined for the 2036 models in Table 11.2. The table shows how 2-way total vehicle flows have changed between the Base and do-minimum 2036 situations.
- 11.2.7 Section 4.7 shows that overall growth in car trips in 2036 is 28% and 29% for the AM and PM respectively, for goods vehicles the number of trips increases by 53% and 57% in the AM and PM respectively.
- 11.2.8 As with traffic growth in 2021 most of the links included in the analysis below display evidence of traffic growth being higher than the total growth. This is particularly evident for the A120 and M11, which are key strategic links.
- 11.2.9 As in 2021, Site 8 has slightly lower traffic growth than the overall growth of 24% in the AM and 19% in the PM. This is likely to be for similar reasons as were explained in Section 11.1.
- 11.2.10 Unlike 2021, Site 7 has traffic growth comparable to overall levels in the AM (41%), although there is evidence that traffic growth is still lower than overall in the PM (8%). Some of the bottleneck mentioned in Section 11.1 will have been removed with the inclusion of the dualling of the A414 between Eastwick Roundabout and Burnt Mill Roundabout.

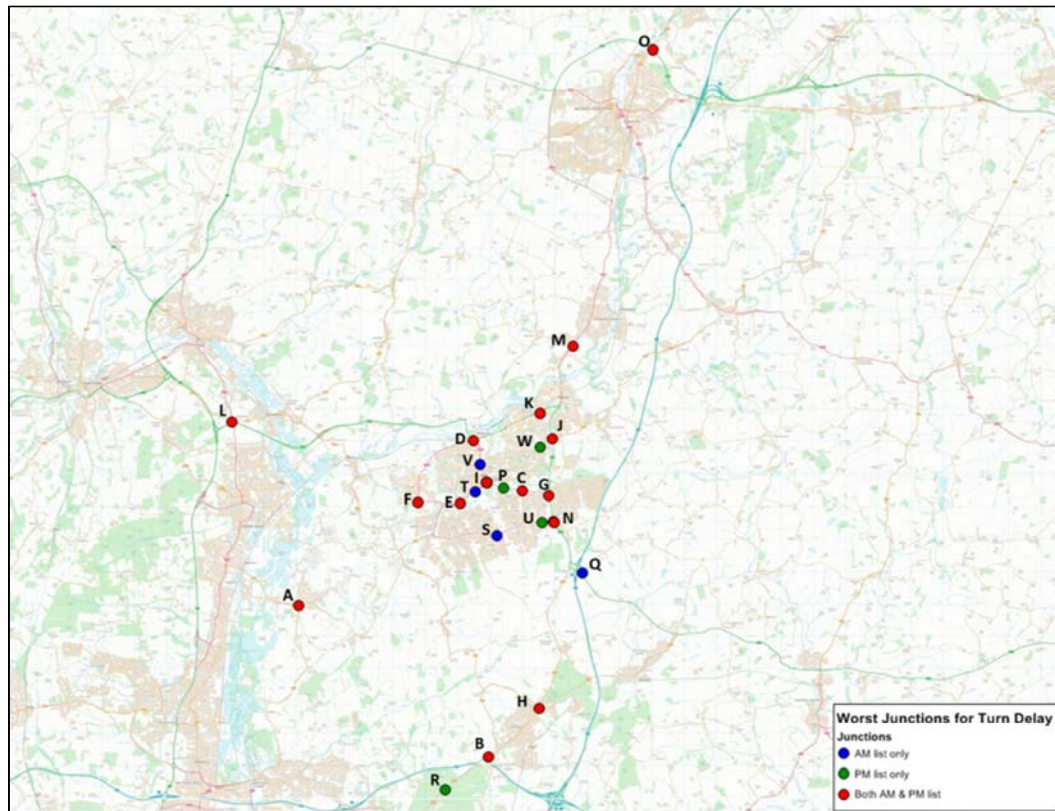
Table 11.2 : Key link traffic flows – Base and High 2036 DM Comparison

ID	Link Name	2-way Traffic Flow (All Vehicles)							
		Base		2036		Difference 2036 - Base		% Change from Base	
		AM	PM	AM	PM	AM	PM	AM	PM
1	A120, west of M11 J8	2894	2875	5055	4841	2161	1966	75%	68%
2	A120, between M11 J8 and Stansted Airport	4007	4701	6299	7339	2292	2638	57%	56%
3	M11, north of J7	5729	6571	8677	10105	2948	3534	51%	54%
4	M11, south of J7	6642	7828	9867	10374	3225	2546	49%	33%
5	A414, east of M11 J7	1402	1193	2177	2063	775	870	55%	73%
6	A414, west of m11 J7	3681	4204	5104	5520	1423	1316	39%	31%
7	A414, west of Eastwick Roundabout	2029	2638	2864	2840	835	201	41%	8%
8	A1184 Cambridge Road, at the River Stort bridge	1582	1568	1969	1865	387	297	24%	19%
9	B183 Gilden Way, east of Harlowbury Roundabout	1405	1345	2463	2427	1058	1082	75%	80%

11.3 Delay in the Base 2014 Model

- 11.3.1 The plots that follow in this section of the report show the worst junctions for delay for the AM peak and PM peak in the 2014 base year models. This highlights the stress points on the network as shown by the models in 2014, following sections will look at the projected delay situation in the 2021 and 2036 future year models for the NTEM do-minimum scenario.
- 11.3.2 It is challenging to define what constitutes a congested junction, or indeed how to define severe turn delay. The method of selecting the 20 worst junctions within each model is described below.
- 11.3.3 Total turn delay for each junction was calculated by adding together the maximum turn delay from each arm. The maximum turn delay was produced in minutes and is the average delay for the worst turn on the arm over the one hour modelled period.
- 11.3.4 A filter was applied to main turns and turns so that only turns with more than a total vehicle flow per hour of 100 were included in this analysis.
- 11.3.5 Furthermore a filter was applied to main nodes and nodes to exclude low flow junctions:
- only junctions with a total vehicle flow per hour of more than 1500 were considered; and
 - only junctions with 'Two-way yield', 'Signalized' and 'Roundabout' control types were included.
- 11.3.6 The total turn delay was used within the filter, with the threshold for main nodes and nodes requiring alteration until only 20 junctions remained in the final list.
- 11.3.7 Another challenge in producing analysis on delay in the network relates to the limitations of transport modelling software:
- All macro modelling software assumes all drivers have full information of the routes available to them and the relative cost of each, and habitual behaviour is also not considered within route choice. This can lead to flows, and consequently delays on popular routes being underestimated.
 - Signing strategies may guide drivers to utilising certain routes; however this aspect of road design is not modelled. Consequently, modelled routings reflective of reality may be hard to replicate, leading to flow and delay being underestimated.
- 11.3.8 Additionally, analysis carried out in producing the base model has shown that replicating delays at roundabouts is very difficult in VISUM. This is due to the methods the software uses to calculate delay, which is based upon ICA (Intersection Capacity Analysis). It has been established that delay is consistently lower than what observed data suggests it should be. To mitigate this deficiency and to sufficiently validate the base model against TrafficMaster journey time data it was necessary to reduce modelled link speeds in the vicinity of roundabout junctions.
- 11.3.9 Harlow, in particular has a large number of junctions that are roundabouts and so the above point is important to consider.
- 11.3.10 Figure 11.6 shows the location of the 20 worst junctions in the 2014 base network.

Figure 11.6 : Locations of worst turn delay junctions for the 2014 Base model



- 11.3.11 In addition to the above plot Table 11.3 displays the rankings of the junctions for both the AM and PM peaks. A summary of the total turn delays is also provided.
- 11.3.12 The key points that are evident from this analysis of junction delay are as follows:
- The general pattern of where stress points on the network are located is similar between the AM and the PM periods;
 - Signalised junctions in Lower Nazeing and Epping suffer from some of the worst congestion in both peaks; and
 - The main concentration of junctions with significant delay is in Harlow, especially along the main routes such as the A414, A1025 Second Avenue and A1025 Third Avenue.
- 11.3.13 The above trends correlate with the observed data from TrafficMaster that was used to validate the base model. The worst areas for delays identified below are on the same sections of routes that are shown to be slowest by journey time analysis contained within the LMVR.
- 11.3.14 For more in-depth analysis of the journey times routes and associated observed and modelled travel times refer to Section 11 of the Harlow Transport Model LMVR.

Table 11.3 : Top 20 worst junctions in the Base 2014 model – AM & PM

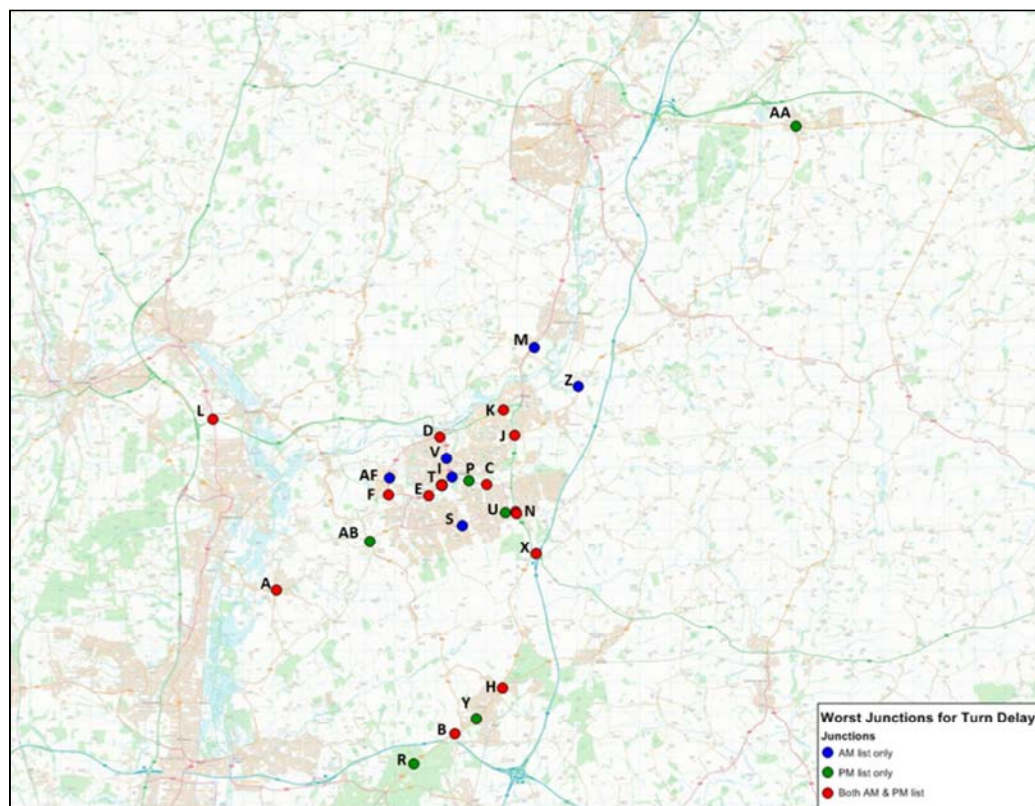
ID	Location	AM Rank	PM Rank	Overall Score	Sum of average turn delays (minutes)	
					AM	PM
A	Lower Nazeing Signals	1	1	2	7.32	9.52
B	High Road / Theydon Road Signals, Epping	3	2	5	4.14	6.05
C	Second Avenue / Howard Way Roundabout, Harlow	7	4	11	2.63	3.59
D	Burnt Mill Roundabout, Harlow	4	8	12	3.61	2.22
E	Third Avenue / Abercrombie Way Signals, Harlow	8	5	13	2.32	2.93
F	A1169 Elizabeth Way / A1025 Third Avenue Roundabout (The Pinnacles)	2	13	15	4.95	1.85
G	Clocktower Roundabout, Harlow	12	3	15	2.09	5.03
H	Thornwood Road / The Plain Signals, Epping	6	12	18	3.09	1.88
I	Crowngate Roundabout, Harlow	5	18	23	3.35	1.49
J	A414 London Road / B183 Gilden Way Roundabout, Harlow	16	7	23	1.93	2.31
K	A414 Edinburgh Way / East Road Signals, Harlow	14	10	24	2.02	2.12
L	Great Amwell Roundabout	17	11	28	1.62	2.09
M	A1184 Harlow Road / Hand Lane, Sawbridgeworth	10	20	30	2.3	1.31
N-1	A414 London Road Hamburger Roundabout (southern signals)	19	16	35	1.39	1.58
O	A120 Bishop's Stortford Ring Road / B1383 Stansted Road Roundabout, Bishop's Stortford	18	17	35	1.39	1.57
N-2	A414 London Road Hamburger Roundabout (northern signals)	20	19	39	1.32	1.49
P	Second Avenue / Tripton Road Roundabout	-	6	-	-	2.54
Q	A414 Canes Lane / Hastingwood Road Junction (M11 J7a)	9	-	-	2.3	-
R	B1393 Epping Road / Crown Hill Junction, Epping	-	9	-	-	2.15
S	Southern Way / Partidge Road, Harlow	11	-	-	2.21	-
T	Third Avenue / Haydens Road Roundabout, Harlow	13	-	-	2.06	-
U	A1169 Southern Way / Tracys Road, Harlow	-	14	-	-	1.7
V	A1019 Velizy Avenue / First Avenue Roundabout, Harlow	15	-	-	1.93	-
W	First Avenue / Momples Road, Harlow	-	15	-	-	1.64

11.4 Delay in the 2021 Do-Minimum Model for High Growth

11.4.1 The plots that follow in this section of the report show the worst junctions for delay for the AM peak and PM peak in the 2021 do-minimum models. This highlights the stress points on the network in 2021 with the projected housing and employment growth predicted for the High Growth Scenario, as well as with the committed highway improvements included.

11.4.2 Figure 11.7 shows the location of the 20 worst junctions in the 2021 do-minimum network.

Figure 11.7 : Locations of worst turn delay junctions for the High 2021 Do-Minimum



11.4.3 In addition to the above plot Table 11.4 displays the rankings of the junctions for both the AM and PM peak hours. A summary of the total turn delays is also provided.

11.4.4 The key areas of the network that are affected by junction delay in 2021 are detailed below.

- The general pattern of where stress points on the network are located is similar between the AM and the PM peak periods;
- However, it appears that around Velizy Way in Harlow town centre is worse in the AM peak hour, whilst the PM peak hour displays more junctions in residential areas in south Harlow;
- Signalised junctions in Lower Nazeing and Epping still suffer from some of the worst congestion in both peaks;
- The main concentration of junctions with significant delay is in Harlow, especially along the main routes such as the A414, A1025 Second Avenue and A1025 Third Avenue;
- In 2021 it seems that both Southern Way and M11 J7 have become more congested with junctions now appearing in the worst 20 in these locations for both peak periods; and
- Overall, the location of the 20 worst junctions between the 2014 base and do-minimum has not significantly changed.

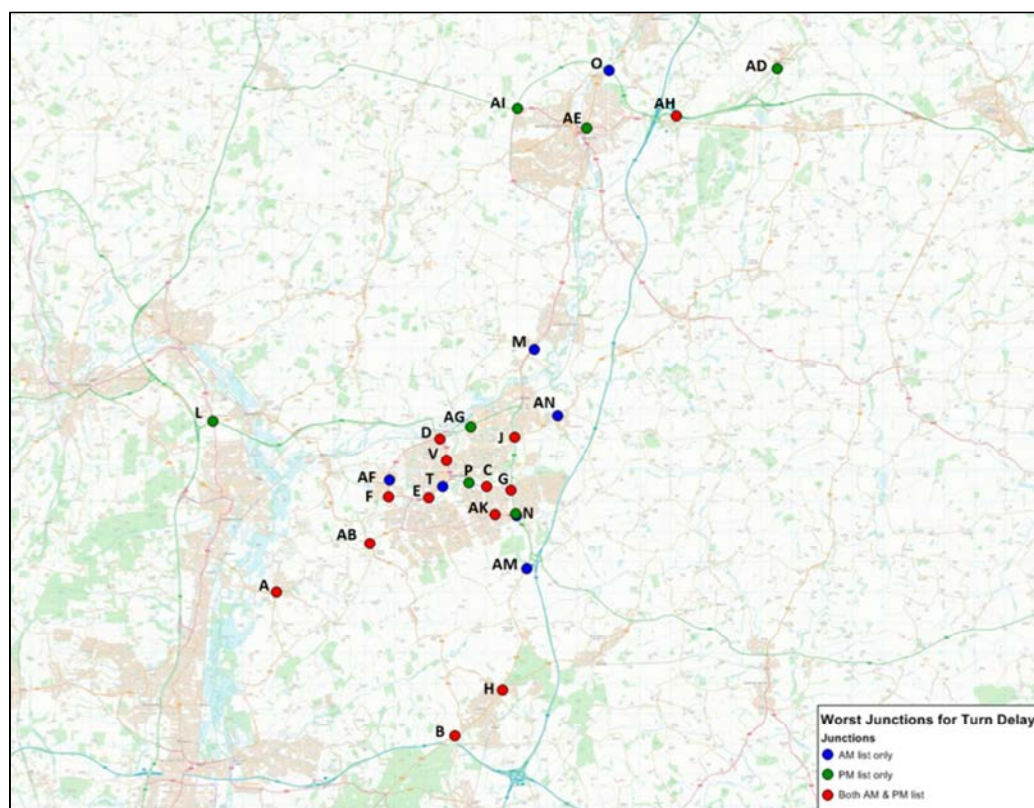
Table 11.4 : Top 20 worst junctions in the High 2021 Do-Minimum Model – AM & PM

ID	Location	AM Rank	PM Rank	Overall Score	Sum of average turn delays (minutes)	
					AM	PM
A	Lower Nazeing Signals	1	1	2	11.36	8.85
D	Burnt Mill Roundabout, Harlow	2	4	6	10.15	4.13
F	A1169 Elizabeth Way / A1025 Third Avenue Roundabout (The Pinnacles)	3	5	8	7.26	3.71
C	Second Avenue / Howard Way Roundabout, Harlow	6	2	8	4.29	6.05
B	High Road / Theydon Road Signals, Epping	5	3	8	4.41	4.61
J	A414 London Road / B183 Gilden Way Roundabout, Harlow	4	11	15	5.88	2.76
E	Third Avenue / Abercrombie Way Signals, Harlow	9	7	16	3.42	3.11
T	Third Avenue / Haydens Road Roundabout, Harlow	7	10	17	3.98	2.84
H	Thornwood Road / The Plain Signals, Epping	14	8	22	2.09	3.05
K	A414 Edinburgh Way / East Road Signals, Harlow	10	13	23	3.32	2.23
N-1	A414 London Road Hamburger Roundabout (southern signals)	11	18	29	2.33	1.86
L	Great Amwell Roundabout	19	12	31	1.55	2.31
N-2	A414 London Road Hamburger Roundabout (northern signals)	17	15	32	1.80	1.95
X	M11 J7 - Signalised junction at NB On-slip	16	20	36	1.84	1.81
P	Second Avenue / Tripton Road Roundabout	-	6	-	-	3.44
AF	A1169 Elizabeth Way / Fourth Avenue, The Pinnacles	8	-	-	3.78	-
R	B1393 Epping Road / Crown Hill Junction, Epping	-	9	-	-	2.91
S	Southern Way / Partidge Road, Harlow	12	-	-	2.18	-
M	A1184 Harlow Road / Hand Lane, Sawbridgeworth	13	-	-	2.17	-
Y	B1393 Epping High Street / Tower Road, Epping	-	14	-	-	1.96
Z	B183 Sheering Road / Sheering Lower Road, near Sheering	15	-	-	2.01	-
U	A1169 Southern Way / Tracys Road, Harlow	-	16	-	-	1.93
AB	B181 Epping Road / B1133 Water Lane, Broadly Common	-	17	-	-	1.88
V	A1019 Velizy Avenue / First Avenue Roundabout, Harlow	18	-	-	1.66	-
AA	Takeley Cross, Takeley	-	19	-	-	1.83
I	Crowngate Roundabout, Harlow	20	-	-	1.53	-

11.5 Delay in the 2036 Do-Minimum Model for High Growth

11.5.1 Figure 11.8 shows the location of the 20 worst junctions in the 2036 do-minimum network.

Figure 11.8 : Locations of worst turn delay junctions for the High 2036 Do-Minimum



11.5.2 In addition to the above plot Table 11.5 displays the rankings of the junctions for both the AM and PM peak hours. A summary of the total turn delays is also provided.

11.5.3 The key areas of the network that are affected by junction delay in 2036 are detailed below:

- The general pattern of where stress points are located has begun to diverge between the AM and the PM periods in 2036;
- The main concentration of junctions is still in Harlow along the main routes mentioned previously, however, these junctions have become more severe and have a worse ranking;
- Signalised junctions in Lower Nazeing and Epping still suffer from some of the worst congestion in both peaks;
- In the AM there are multiple junctions in Harlow and Sawbridgeworth that now appear within the 20 worst junctions;
- In the PM there is evidence that junctions in Bishop's Stortford and around Stansted Airport may now be experiencing significant levels of congestion; and
- Overall, Harlow remains the area of most concern, particularly along key distributor roads.

Table 11.5 : Top 20 worst junctions in the High 2036 Do-Minimum Model – AM & PM

ID	Location	AM Rank	PM Rank	Overall Score	Sum of average turn delays (minutes)	
					AM	PM
A	Lower Nazeing Signals	1	2	3	13.64	9.72
J	A414 London Road / B183 Gilden Way Roundabout, Harlow	4	1	5	8.65	10.35
D	Burnt Mill Roundabout, Harlow	2	7	9	10.81	5.44
F	A1169 Elizabeth Way / A1025 Third Avenue Roundabout (The Pinnacles)	6	3	9	7.03	7.93
C	Second Avenue / Howard Way Roundabout, Harlow	5	6	11	7.80	6.41
B	High Road / Theydon Road Signals, Epping	7	12	19	5.23	3.94
AB	B181 Epping Road / B1133 Water Lane, Broadly Common	11	9	20	4.29	5.03
G	Clocktower Roundabout, Harlow	9	13	22	4.99	3.93
E	Third Avenue / Abercrombie Way Signals, Harlow	10	18	28	4.46	3.17
AK	A1169 Southern Way / Trotters Road, Harlow	14	15	29	3.85	3.53
AH	Priory Wood Roundabout, Stansted Airport	18	11	29	3.13	4.25
V	A1019 Velizy Avenue / First Avenue Roundabout, Harlow	13	17	30	4.17	3.28
H	Thornwood Road / The Plain Signals, Epping	19	16	35	3.13	3.34
AM	B1393 London Road / Latton Priory Link Road	3	-	-	10.19	-
AD	Thremhall Avenue Eastern Roundabout, Stansted Airport	-	4	-	-	7.55
AE	A1250 /A1060 Bishop's Stortford Cross	-	5	-	-	7.17
L	Great Amwell Roundabout	-	8	-	-	5.17
AF	A1169 Elizabeth Way / Fourth Avenue, The Pinnacles	8	-	-	5.16	-
AG	A414 Edinburgh Way / Howard Way, Harlow	-	10	-	-	5.00
T	Third Avenue / Haydens Road Roundabout, Harlow	12	-	-	4.22	-
AI	A120 Hadham Road / A1184 Bishops Park Way, Bishop's Stortford	-	14	-	-	3.78
N-1	A414 London Road Hamburger Roundabout (southern signals)	15	-	-	3.80	-
O	A120 Bishop's Stortford Ring Road / B1383 Stansted Road Roundabout, Bishop's Stortford	16	-	-	3.46	-
AN	Harlowbury Roundabout (B183 Gilden Way)	17	-	-	3.13	-
N-2	A414 London Road Hamburger Roundabout (northern signals)	-	19	-	-	3.10
M	A1184 Harlow Road / Hand Lane, Sawbridgeworth	20	-	-	3.05	-
P	Second Avenue / Tripton Road Roundabout	-	20	-	-	2.98

11.6 Traffic Growth Delay Impacts in the Forecast Year Models

- 11.6.1 The model outputs in this section display the impact of future year growth upon delay, specifically maximum turn delay on each arm is assessed. Firstly the impacts in 2021 for both the AM and PM peak periods will be investigated, followed by 2036.
- 11.6.2 The measure of delay used for these plots considers the maximum turn delay (in seconds) on each arm of every junction that is coded within the model. The maximum turn delay refers to the worst turn on that arm. The delay for each turn is calculated as an average turn delay for vehicles across the whole hour period being assessed. Within VISUM the maximum turn delay for arms must be displayed for a specific user class, it is not calculated across all classes. Consequently, it was decided to select Car Commute (CC). Checks were carried out to ensure that there was not a large variation between user classes and it was found that the variation was usually zero and always negligible.
- 11.6.3 The link bars represent delay changes associated with the link, which in turn represents the arm of the junction it goes in to. Green bars show a decrease in delay, whilst red bars show an increase in delay.

- 11.6.4 Only links with a maximum turn delay of 60 seconds or more are displayed, any smaller changes are not included in these plots. Links that have a vehicle flow of less than 100 during the time period assessed are also excluded, as these roads are considered to be very minor.
- 11.6.5 The area covered within the plots includes the entire detailed modelled area as well as some additional network to the east and the west.
- 11.6.6 Figure 11.9 and Figure 11.10 show delay changes between the Base and Do-Minimum 2021 models, for the AM and PM periods respectively. Plots for the IP can be found in Appendix I.
- 11.6.7 Note that the magnitude of delay is represented by the width of the bars, and not by their length. The length is only representative of the length of the coded link and not the extent of queuing or delay.
- 11.6.8 The figures below show some significant increases and decreases in traffic flow in different parts of the network. An explanation of significant changes is provided below:
- Little Hadham Bypass is projected to have been completed by 2021 resulting in less delay at the, now bypassed, Little Hadham crossroads;
 - The Crowngate Roundabout in Harlow is improved between 2014 and 2021, and so delay is decreased on the A1025 Second Avenue arm particularly in the AM;
 - Likewise, the Clocktower Roundabout sees small improvements in turn delays due to a committed improvement scheme;
 - Elsewhere delays generally increase between 2014 and 2021 in both time periods;
 - Roads leading to M11 J8 experience an increase in turn delay;
 - There are increased delays on some local rat-runs including the B183 and Lower Sheering Road;
 - Rye Hill Road has a large increase in delay leading on to the B1393 London Road;
 - There are increased congestion issues across Harlow with the impact of growth most noticeable in the AM peak hour; and
 - In the AM peak hour delays on roads crossing the Lea Valley towards Harlow show large increases in turn delay.

Figure 11.9 : Turn Delay Difference between Base 2014 and High DM 2021 models – AM

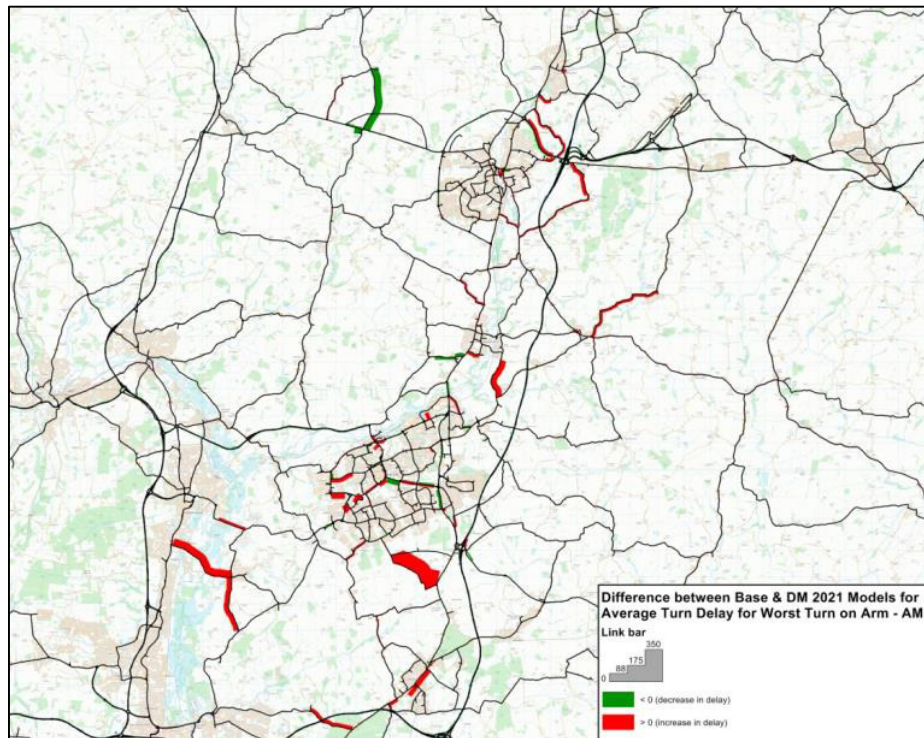
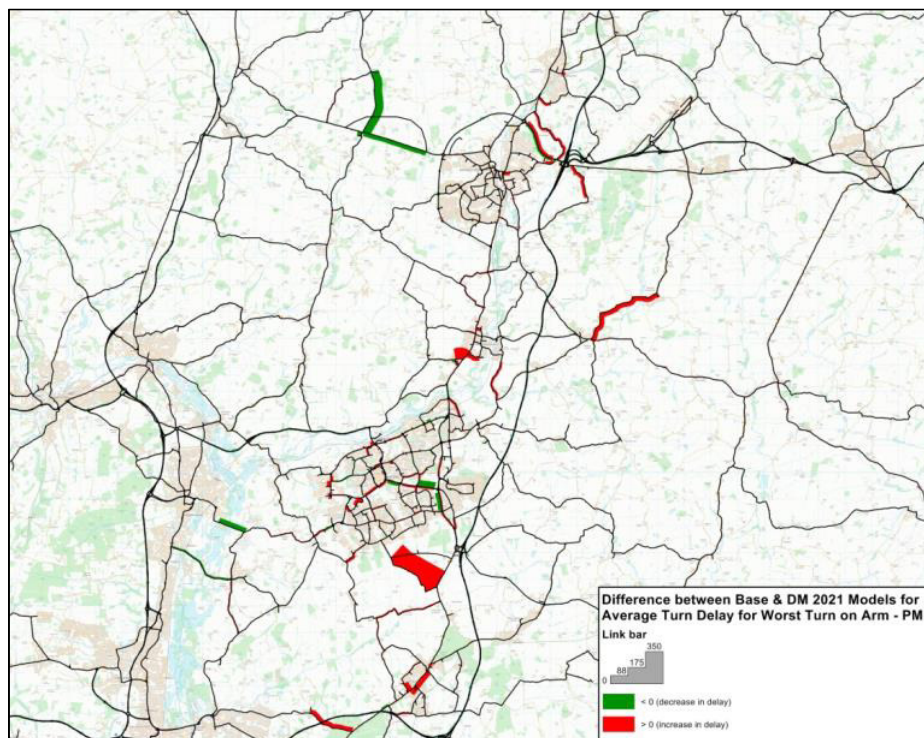


Figure 11.10 : Turn Delay Difference between Base 2014 and High DM 2021 models – PM



- 11.6.9 Figure 11.11 and Figure 11.12 show delay changes between the Base and Do-Minimum 2036 models, for the AM and PM periods respectively. Plots for the IP can be found in Appendix I.
- 11.6.10 Note that the magnitude of delay is represented by the width of the bars, and not by their length. The length is only representative of the length of the coded link and not the extent of queuing or delay.
- 11.6.11 The figures below show some significant increases and decreases in traffic flow in different parts of the network. An explanation of significant changes is provided below.
- As in the 2021 analysis Little Hadham Bypass experiences decreases in turn delay, although growth in traffic flows dilutes the improvements seen in 2021;
 - The Crowngate Roundabout and Clocktower Roundabout both see minor decreases in delay, however traffic growth again dilutes the benefits of the junction improvements;
 - Elsewhere delays generally increase between 2014 and 2036 in both time periods, and increases are more severe than in 2021; and
 - The most marked areas of delay increases are similar to those detailed above for 2021; however the impacts of growth are higher.

Figure 11.11 : Turn Delay Difference between Base 2014 and High DM 2036 models – AM

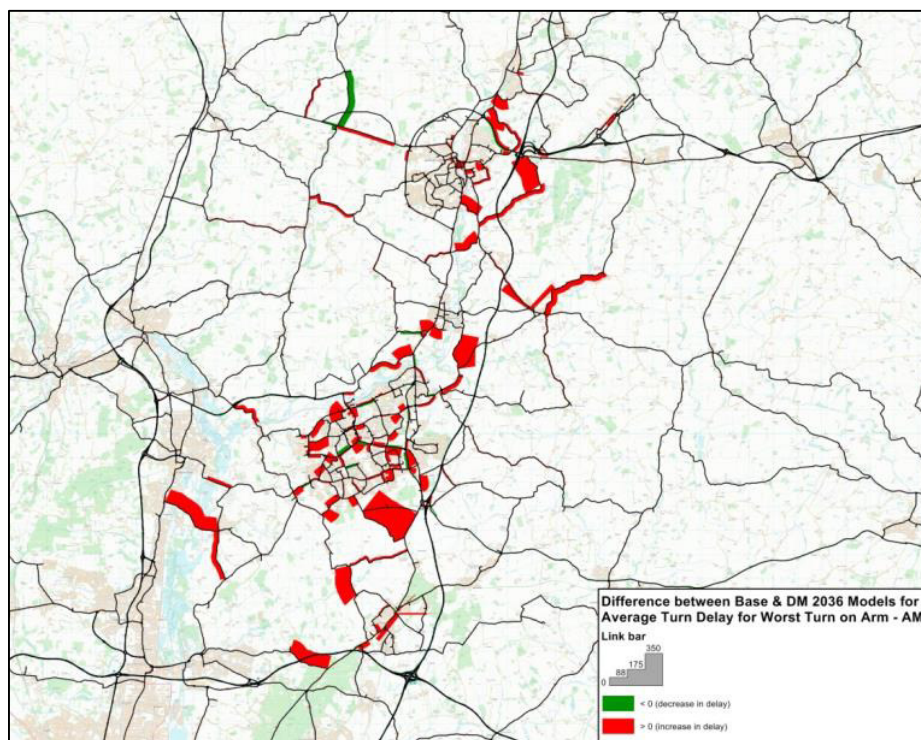
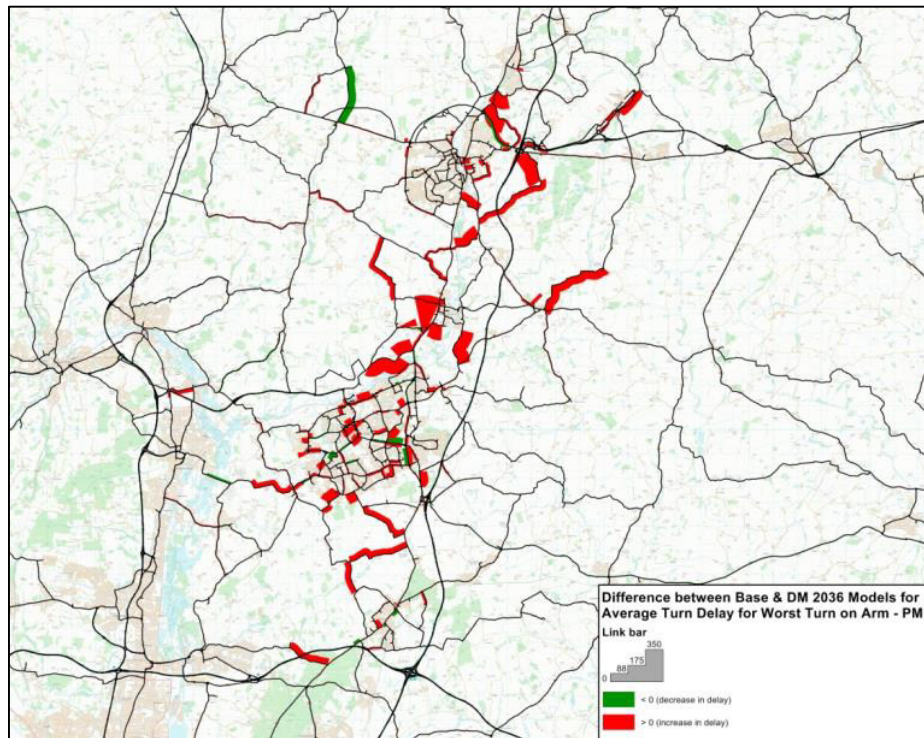


Figure 11.12 : Turn Delay Difference between Base 2014 and High DM 2036 models – PM



12. M11 J7a Scheme Impacts – High Scenario

12.1 Flow Impacts from the M11 J7a Scheme in 2021 High Growth

- 12.1.1 As detailed in Section 3.7 'Do-Something' (DS) networks were built to represent the local road network with the inclusion of the scheme, the new M11 J7a. The scheme includes a link between the M11 and B183 Sheering Road, and capacity improvements on the B183 between the new link and the A414.
- 12.1.2 A series of model runs have been carried out to investigate the potential impacts of the proposed Harlow Northern Bypass. The results of this can be found in the 'Northern Bypass Addendum', which was also produced in April 2016. The Northern Bypass has not been included in any of the model runs included in this main report.
- 12.1.3 A plot displaying the location and design of the proposed scheme for M11 J7a that has been modelled can be found in Figure 3.9. It is assumed that the scheme would be in place by 2021.
- 12.1.4 The plots below in Figure 12.1 and Figure 12.2 are for the AM and PM peak hours respectively. The area shown covers the entire detailed modelled area as well as some additional network to the east and the west. Plots, which are zoomed to provide more detail of changes, are also provided in Appendix H for all three time periods.
- 12.1.5 The figures show significant changes in modelled traffic flow in different parts of the network. All flow changes are considered to be logical representations of what is likely to occur with the do-something scheme in place. Significant flow changes are described below.
- M11 J7-J8: To the north of the scheme flows on the M11 would be expected to increase significantly, while M11 flows to south of the scheme would decrease. The J8:J7a increase is greater than the J7:J7a decrease, indicating that in addition to traffic switching from using J7 to using J7a, additional vehicles to and from the north would also use the motorway to access Harlow via J7a in preference to using other less suitable minor routes in the vicinity.
 - In the PM peak hour traffic on the M11 south of J7 is shown to increase. This is likely to be as a result of freeing up capacity at M11 J7, which gets very congested in the PM peak.
 - A consequence of traffic using J7a to access Harlow is that flows would be expected to significantly increase along B183 Gilden Way to the west of the new link.
 - The location of the new junction facilitates traffic wishing to access the north and east of the town. This is expected to result in reductions in flows on the A414 to the south of Gilden Way, which would be greater immediately to the north of J7, as a result of this traffic using the new motorway junction.
 - To the north of the modelled area the modelling indicates an increase in traffic using the A120 immediately either side of M11 J8; this is likely to be partly due to the switch from more local roads to the motorway to make use of the new access into Harlow. This is supported by the general decrease in flows on the more minor north south roads between Bishop's Stortford and Harlow
 - Within Harlow there are noticeable traffic increases along the key links in northern Harlow, including the A414 Edinburgh Way, First Avenue and A414 London Road. This increase further supports the supposition that traffic within the northern part of Harlow has a greater propensity to use the more northerly M11 access point. Key links in the southern section of Harlow are shown to experience a complementary reduction in flows.

Figure 12.1 : Traffic Flow Difference between DM and DS models for High 2021 – AM

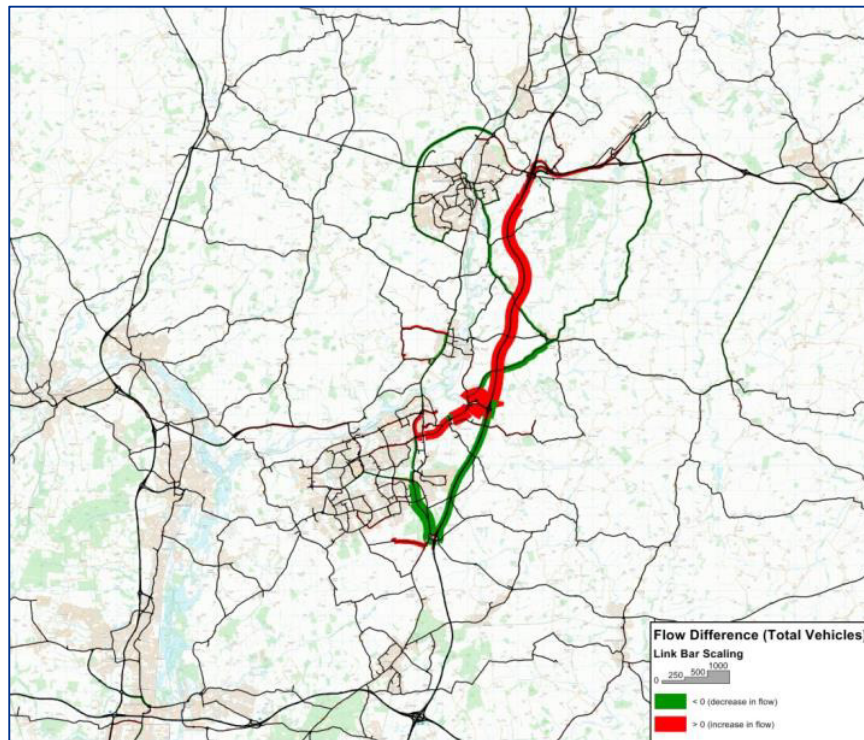
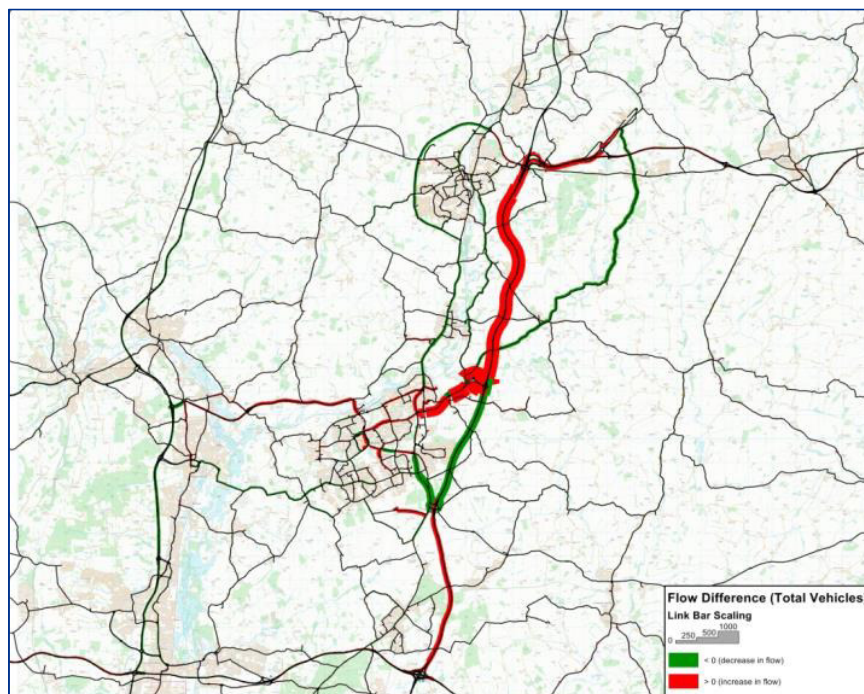
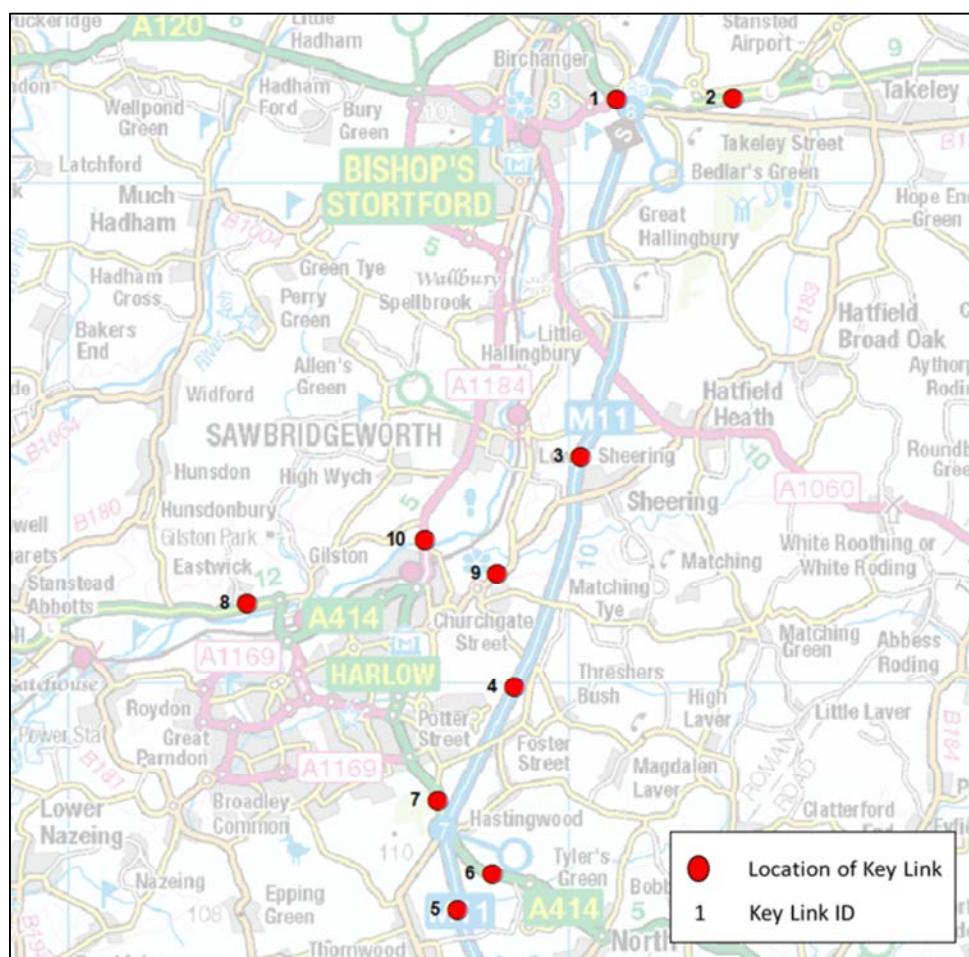


Figure 12.2 : Traffic Flow Difference between DM and DS models for High 2021 - PM



- 12.1.6 Figure 12.3 displays links in the road network that are considered important, similarly to Figure 11.3. This plot below includes one additional site on the M11, in order to better assess the traffic flow differences after the M11 J7a is included.

Figure 12.3 : Locations of Key Links for Traffic Flow Comparison – High - DM to DS



- 12.1.7 The above links are examined on an individual basis for the AM and PM in Table 12.1. The table shows how 2-way total vehicle flows have changed between the do-minimum and do-something 2021 situations.
- 12.1.8 The table below mirrors the flow difference plots as traffic is re-routing to the SRN away from the local road network, and in particular currently well utilised local rat-runs.
- 12.1.9 Reductions in traffic flow are modelled on the following links, demonstrating that the scheme is likely to help to relieve these locations:
- A414 (west of J7) – this is currently the only principal road linking Harlow to the SRN, it is likely to see a significant decrease in flow as a result of re-routing with M11 J7a introduced;
 - A1184 Cambridge Road – this road is near to capacity and heavily congested in peak periods, the M11 J7a scheme is likely to remove some traffic from this link; and
 - M11 (south of J7a) – the M11 between J7 and J7a is likely to experience a reduction in flow as a result of the scheme with a new entry point allowing traffic to access the motorway at a more northerly location.

- 12.1.10 Traffic flow has increased significantly on some links as a result of the scheme and consequent re-routing. There are a number of links, which display small increases, these links are strategic and include the M11 (expect between J7 and J7a), A120 and A414 (east of M11 J7).
- 12.1.11 The M11 north of J7a is shown to experience a large increase in traffic as a result of better access to Harlow via the SRN; this encourages routing shifts to the motorway from local routes for many relatively short distance trips.
- 12.1.12 The most significant traffic growth for any link is modelled on the B183 Gilden Way near the M11 J7a scheme itself. This link sees a 65% and 74% increase in flow for the AM and PM periods respectively. This road is now a major link between Harlow and the SRN, and traffic has grown accordingly.

Table 12.1 : Key link traffic flows – DM and High DS 2021 Comparison

ID	Link Name	2-way Traffic Flow (All Vehicles)							
		DM		DS		Difference DS - DM		% Change from DM to DS	
		AM	PM	AM	PM	AM	PM	AM	PM
1	A120, west of M11 J8	3846	3698	3991	3860	145	162	4%	4%
2	A120, between M11 J8 and Stansted Airport	5145	5845	5432	6295	287	450	6%	8%
3	M11, north of J7a	7159	8094	8141	9150	982	1057	14%	13%
4	M11, south of J7a			6570	7486	-589	-608	-8%	-8%
5	M11, south of J7	8049	8856	8114	9234	65	378	1%	4%
6	A414, east of M11 J7	1736	1580	1776	1606	40	25	2%	2%
7	A414, west of m11 J7	4341	4701	3386	4067	-955	-634	-22%	-13%
8	A414, west of Eastwick Roundabout	2076	2711	2189	2950	113	239	5%	9%
9	B183 Gilden Way, east of Harlowbury Roundabout	1762	1659	2907	2884	1145	1225	65%	74%
10	A1184 Cambridge Road, at the River Stort bridge	1602	1674	1506	1450	-95	-224	-6%	-13%

12.2 Flow Impacts from the M11 J7a Scheme in 2036 High Growth

- 12.2.1 Two future years have been assessed for each growth scenario, the impact of the M11 J7a scheme in 2021 has already been discussed above, and the impact of the scheme in 2036 will follow in this section.
- 12.2.2 The plots below in Figure 12.4 and Figure 12.5 are for the AM peak and PM peak respectively. As with 2021 plots, which are zoomed to provide more detail of changes are provided in Appendix H for all three time periods.
- 12.2.3 The figures below show some large increases and decreases in traffic flow in different parts of the network. All are deemed logical considering the scheme that has been put in place in the do-something situation. The changes for most of the network are similar to 2021, see Section 12.1.
- 12.2.4 There are no major differences in the patterns of traffic flow change observed for 2036 that suggest that the M11 J7a scheme has a different impact than to what is described for 2021. The only noticeable change is that the trends explained for 2021 are exaggerated in 2036. Where there are decreases in 2021 the decreases appear to be larger in 2036, and likewise with flow increases. This is simply because the volumes of traffic in the 2036 forecast year are markedly higher than in the modelled 2021 situation.
- 12.2.5 The most notable locations at which scheme impacts are greater than the 2021 observations are as follows:
- M11 – north of M11 J7a

- M11 – south of M11 J7a
- B183 Harlow Road – east of M11 J7a
- A414 London Road – connection to M11 J7
- B183 Gilden Way –west of M11 J7a

Figure 12.4 : Traffic Flow Difference between DM and DS models for High 2036 - AM

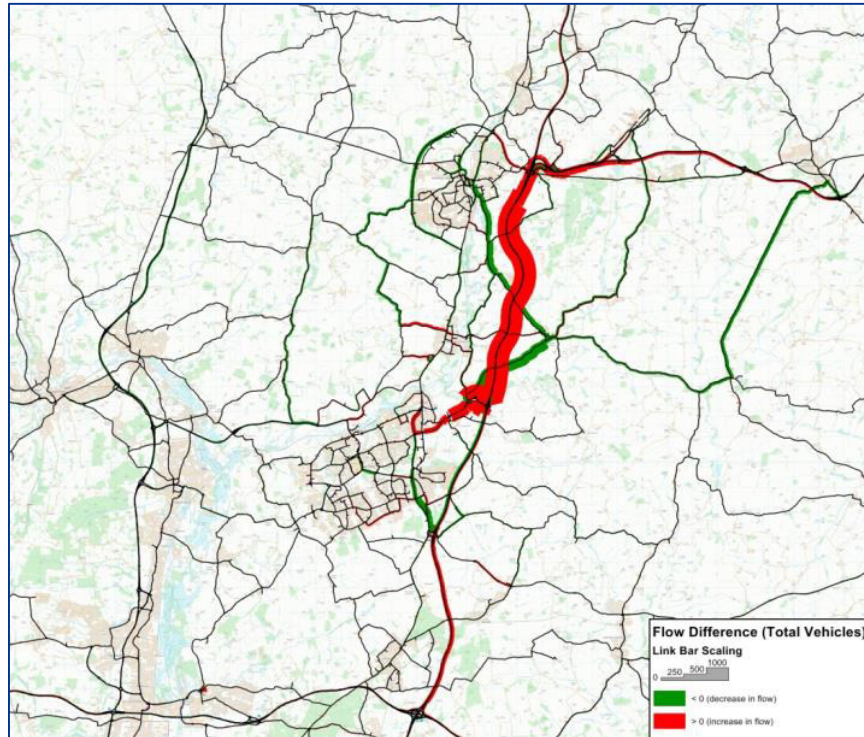
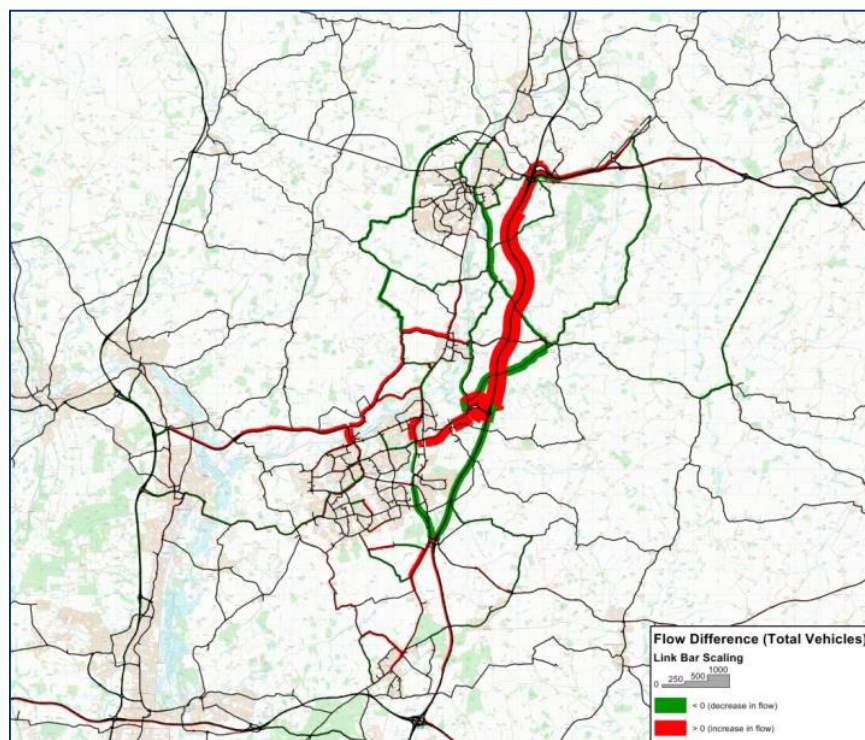


Figure 12.5 : Traffic Flow Difference between DM and DS models for High 2036 - PM



- 12.2.6 The key links identified in the previous section are also examined for the 2036 models in Table 12.2. The table shows how 2-way total vehicle flows have changed between the do-minimum and do-something 2036 situations.
- 12.2.7 The table below echoes findings from the 2021 analysis, with traffic re-routing to the SRN away from the local road network.
- 12.2.8 Reductions in traffic flow in 2036 are modelled on the following links. The reasons for traffic flow decreases are likely to be the same as explained in the previous 2021 section.
- A414 (west of J7); and
 - M11 (south of J7a)
- 12.2.9 Two links are affected differently in different time periods, however the changes are small in magnitude and probably represent that the scheme has little impact upon these sites in 2036. These links are as follows:
- A414 (west of Eastwick Roundabout)
 - A1184 Cambridge Road
- 12.2.10 As in 2021, traffic flow is modelled to increase significantly on some links as a result of the scheme and consequent re-routing. There are a number of links, which display small increases, these links are strategic and include the M11 (except between J7 and J7a), A120 and A414 (east of M11 J7).
- 12.2.11 As explained in the 2021 analysis the M11 north of J7a experiences a large increase in traffic as a result of better access to Harlow via the SRN.

- 12.2.12 The most significant traffic growth for any link is on the B183 Gilden Way near the M11 J7a scheme itself. This link sees a 43% increase in flow for both the AM and PM periods. This road is now a major link between Harlow and the SRN, and traffic has grown accordingly. The percentage increases are much smaller than those witnessed in 2021; this is due to traffic being constraint at this location due to limits on the capacity of this road.

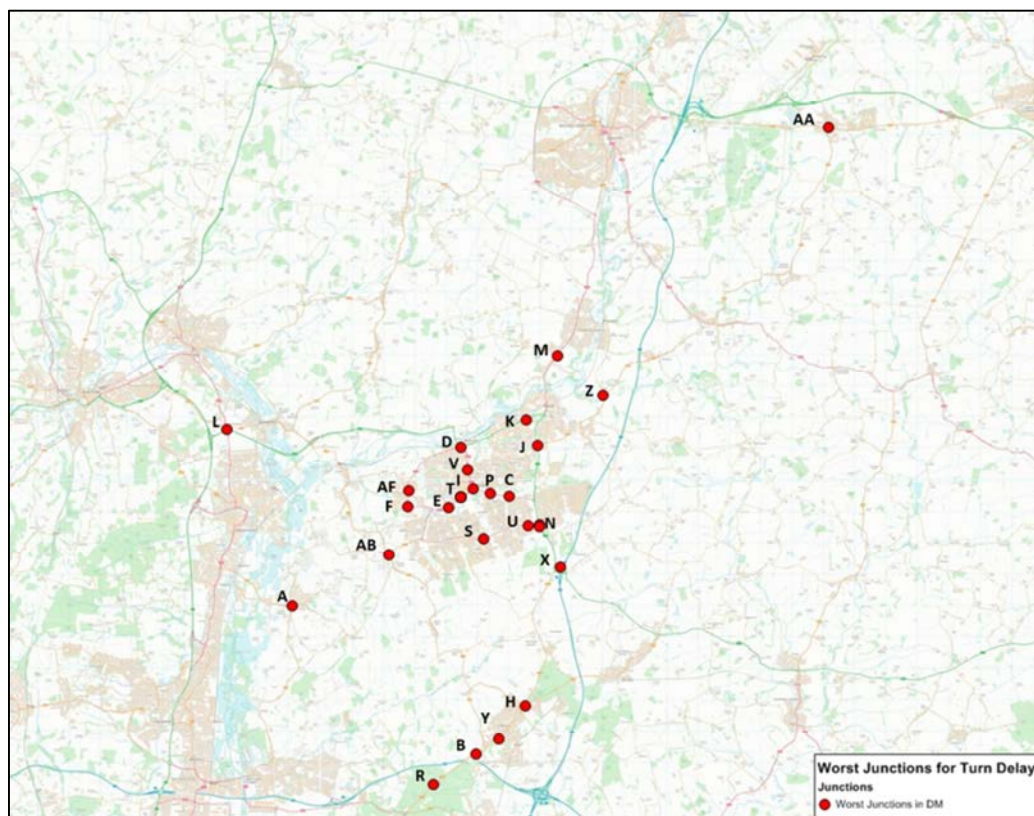
Table 12.2 : Key link traffic flows – DM and High DS 2036 Comparison

ID	Link Name	2-way Traffic Flow (All Vehicles)							
		DM		DS		Difference DS - DM		% Change from DM to DS	
		AM	PM	AM	PM	AM	PM	AM	PM
1	A120, west of M11 J8	5055	4841	5334	4883	279	42	6%	1%
2	A120, between M11 J8 and Stansted Airport	6299	7339	6883	7737	584	398	9%	5%
3	M11, north of J7a	8677	10105	10485	11449	1807	1343	21%	13%
4	M11, south of J7a			8626	9560	-51	-546	-1%	-5%
5	M11, south of J7	9867	10374	10182	10537	315	163	3%	2%
6	A414, east of M11 J7	2177	2063	2228	2120	51	57	2%	3%
7	A414, west of m11 J7	5104	5520	4715	4958	-389	-562	-8%	-10%
8	A414, west of Eastwick Roundabout	2864	2840	2836	3197	-29	357	-1%	13%
9	B183 Gilden Way, east of Harlowbury Roundabout	2463	2427	3524	3467	1060	1040	43%	43%
10	A1184 Cambridge Road, at the River Stort bridge	1969	1865	1952	1848	-17	-17	-1%	-1%

12.3 Impacts upon Delay from the M11 J7a Scheme in 2021 for High Growth

- 12.3.1 Section 11.4 describes the location of delay and capacity constraint across the detailed modelled area in 2021 in the High Growth scenario, but without the proposed scheme. The principle areas highlighted as congested were as follows:
- Lower Nazeing and Epping signalised junctions;
 - Key distributor routes in Harlow, including A414, A1025 Second Avenue, A1025 Third Avenue and Velizy Avenue; and
 - M11 J7.
- 12.3.2 Figure 12.6 shows the locations of the junctions identified as the worst for turn delay in 2021. Each junction has an individual ID and can also be found in Table 12.3, which displays the impact of the scheme upon these junctions.

Figure 12.6 : Location of Worst Junctions for delay in the High 2021 DS Models



- 12.3.3 The junctions shown below are in the same order as in the Table 11.3, therefore the junctions at the top of the list are those that suffer the worst turn delay in the do-minimum situation in 2021.
- 12.3.4 The key observations from the below values are that:
- Signalised junctions in Lower Nazeing and Epping experience small increases in turn delay decreasing between the do-minimum and do-something simulations.
 - Within Harlow, junctions that the model suggests will significantly benefit from the M11 J7a scheme are as follows:
 - Third Avenue / Haydens Road Roundabout;
 - A414 London Road Hamburger Roundabout; and
 - B183 Sheering Road / Sheering Lower Road, near Sheering.
 - Conversely there a number of junctions, all of which are in Harlow, where turn delay increases as a result of the introduction of the new motorway junction. The biggest increase is at the A414 London Road / B183 Gilden Way Roundabout, in the PM peak hour delay here increases by 2.47 minutes.
- 12.3.5 In addition to the above there are some junctions where the impact of the scheme is less clear, or changes between time periods.
- 12.3.6 Overall the scheme appears to have most positive impact on concentrated areas around the M11 J7 and the current connection to the SRN, as well as relieving some junctions where well used minor roads meet local A and B roads that have had some traffic re-routed away from them.
- 12.3.7 The M11 J7a increases strain at junctions in Harlow particularly along some of the key routes that are already suffering from high levels of turn delay.

Table 12.3 : Impact of the scheme upon the top 20 worst junctions in High DS 2021

ID	Location	Sum of turn delay (minutes)					
		AM		PM		Difference	
		DM	DS	DM	DS	AM	PM
A	Lower Nazeing Signals	11.36	11.48	8.85	9.33	0.12	0.48
D	Burnt Mill Roundabout, Harlow	10.15	9.97	4.13	4.09	-0.18	-0.04
F	A1169 Elizabeth Way / A1025 Third Avenue Roundabout (The Pinnacles)	7.26	7.57	3.71	3.79	0.31	0.08
C	Second Avenue / Howard Way Roundabout, Harlow	4.29	5.65	6.05	3.47	1.36	-2.58
B	High Road / Theydon Road Signals, Epping	4.41	4.82	4.61	4.71	0.41	0.10
J	A414 London Road / B183 Gilden Way Roundabout, Harlow	5.88	6.09	2.76	5.23	0.21	2.47
E	Third Avenue / Abercrombie Way Signals, Harlow	3.42	3.64	3.11	3.20	0.22	0.09
T	Third Avenue / Haydens Road Roundabout, Harlow	3.98	3.39	2.84	2.11	-0.59	-0.73
H	Thornwood Road / The Plain Signals, Epping	2.09	2.14	3.05	3.07	0.05	0.02
K	A414 Edinburgh Way / East Road Signals, Harlow	3.32	1.96	2.23	2.30	-1.36	0.07
N-1	A414 London Road Hamburger Roundabout (southern signals)	2.33	2.09	1.86	1.50	-0.24	-0.36
L	Great Amwell Roundabout	1.55	1.83	2.31	2.63	0.28	0.32
N-2	A414 London Road Hamburger Roundabout (northern signals)	1.80	1.52	1.95	1.52	-0.28	-0.43
X	M11 J7 - Signalised junction at NB On-slip	1.84	1.64	1.81	2.00	-0.20	0.19
P	Second Avenue / Tripton Road Roundabout	-	-	3.44	3.42	-	-0.02
AF	A1169 Elizabeth Way / Fourth Avenue, The Pinnacles	3.78	4.13	-	-	0.35	-
R	B1393 Epping Road / Crown Hill Junction, Epping	-	-	2.91	2.70	-	-0.21
S	Southern Way / Partidge Road, Harlow	2.18	2.20	-	-	0.02	-
M	A1184 Harlow Road / Hand Lane, Sawbridgeworth	2.17	1.94	-	-	-0.23	-
Y	B1393 Epping High Street / Tower Road, Epping	-	-	1.96	1.92	-	-0.04
Z	B183 Sheering Road / Sheering Lower Road, near Sheering	2.01	1.01	-	-	-1.00	-
U	A1169 Southern Way / Tracys Road, Harlow	-	-	1.93	1.71	-	-0.22
AB	B181 Epping Road / B1133 Water Lane, Broadly Common	-	-	1.88	1.32	-	-0.56
V	A1019 Velizy Avenue / First Avenue Roundabout, Harlow	1.66	1.81	-	-	0.15	-
AA	Takeley Cross, Takeley	-	-	1.83	1.28	-	-0.55
I	Crowngate Roundabout, Harlow	1.53	1.42	-	-	-0.11	-

- 12.3.8 The delay on Rye Hill Road, between Harlow and Epping varies between time periods, and as such this should be regarded as 'model noise'. This link is highly sensitive to small changes as it is such a minor road.
- 12.3.9 Figure 12.7 and Figure 12.8 found in this section of the report are for the AM peak and PM peak respectively, and show the difference in delays between the do-minimum and do-something networks. Thus, demonstrating the impact of the M11 J7a scheme upon congestion in the surrounding area. Plots for the inter-peak can be found in Appendix I.
- 12.3.10 Note that the magnitude of delay is represented by the width of the bars, and not by their length. The length is only representative of the length of the coded link and not the extent of queuing or delay.

- 12.3.11 The measure of delay used for these plots considers the maximum turn delay (in seconds) on each arm of every junction that is coded within the model. The maximum turn delay refers to the worst turn on that arm. The delay for each turn is calculated as an average turn delay for vehicles across the whole hour period being assessed. Within VISUM the maximum turn delay for arms must be displayed for a specific user class, it is not calculated across all classes. Consequently, it was decided to select Car Commute (CC). Checks were carried out to ensure that there was not a large variation between user classes and it was found that the variation was usually zero and always negligible.
- 12.3.12 The green link bars represent a decrease in delay for this link, which represents an arm of the junction it goes in to. Conversely red link bars display locations where there is an increase in delay. All delay values are in seconds.
- 12.3.13 Only links with a difference over 30 seconds are displayed. Any changes smaller than this are not included in these plots.
- 12.3.14 The area covered within the plots includes entire detailed modelled area as well as some additional network to the east and the west.
- 12.3.15 The figures below suggest some significant increases and decreases in delay associated with the introduction of a new junction on the M11. All observed changes are deemed logical, especially when examined alongside the observations on traffic flow difference. An explanation of each significant change in 2021 is provided below:
- There are decreases shown in turn delay affecting links between Bishop's Stortford / Stansted Airport and Harlow. These links represent some well used alternative routes to the M11 between these locations, a reduction in traffic on these routes as result of re-routing onto the M11 suggests significant improvements with regards delay. This is particularly evident along the B183 Dunmow Road, north of Hatfield Heath.
 - Sheering Lower Road is recognised to be a rat-run for traffic along the Harlow – Bishop's Stortford corridor. This road is modelled as having a marked decrease in turn delay for traffic joining the B183 as result of the scheme for the same reasons as above; this is especially evident in the AM.
 - There are some significant increases in modelled delay along B183 Gilden Way and First Avenue as a consequence of the scheme, and resulting from additional traffic in these locations.
 - The delay on Rye Hill Road, between Harlow and Epping varies between time periods, and as such this should be regarded as 'model noise'. This link is highly sensitive to small changes as it is such a minor road.

Figure 12.7 : Turn Delay Difference between DM and DS models for High 2021 – AM

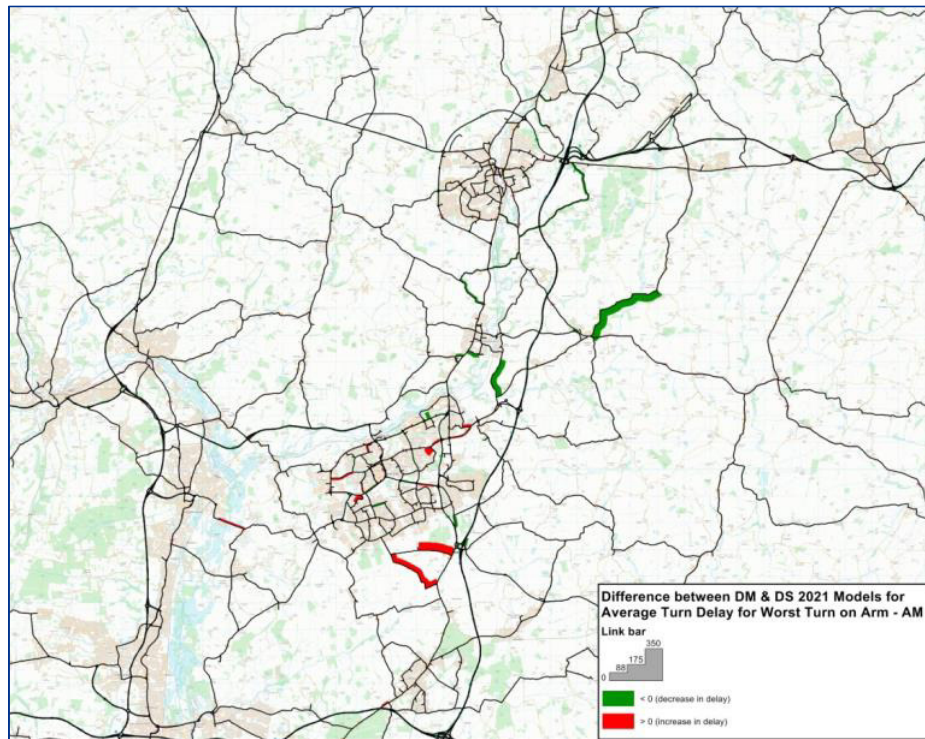
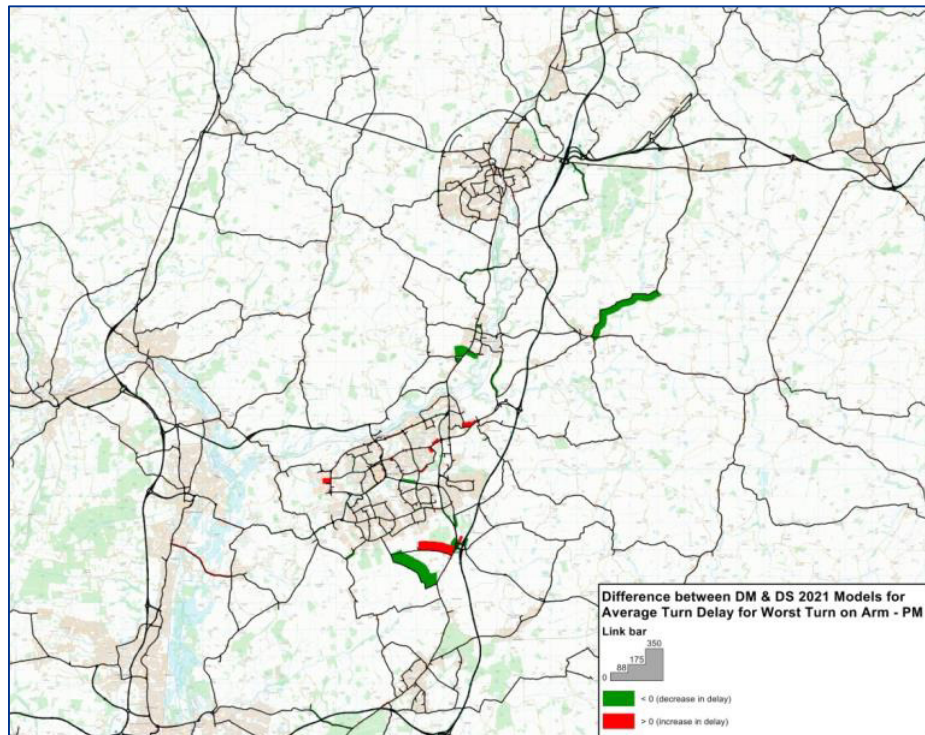


Figure 12.8 : Turn Delay Difference between DM and DS models for High 2021 - PM



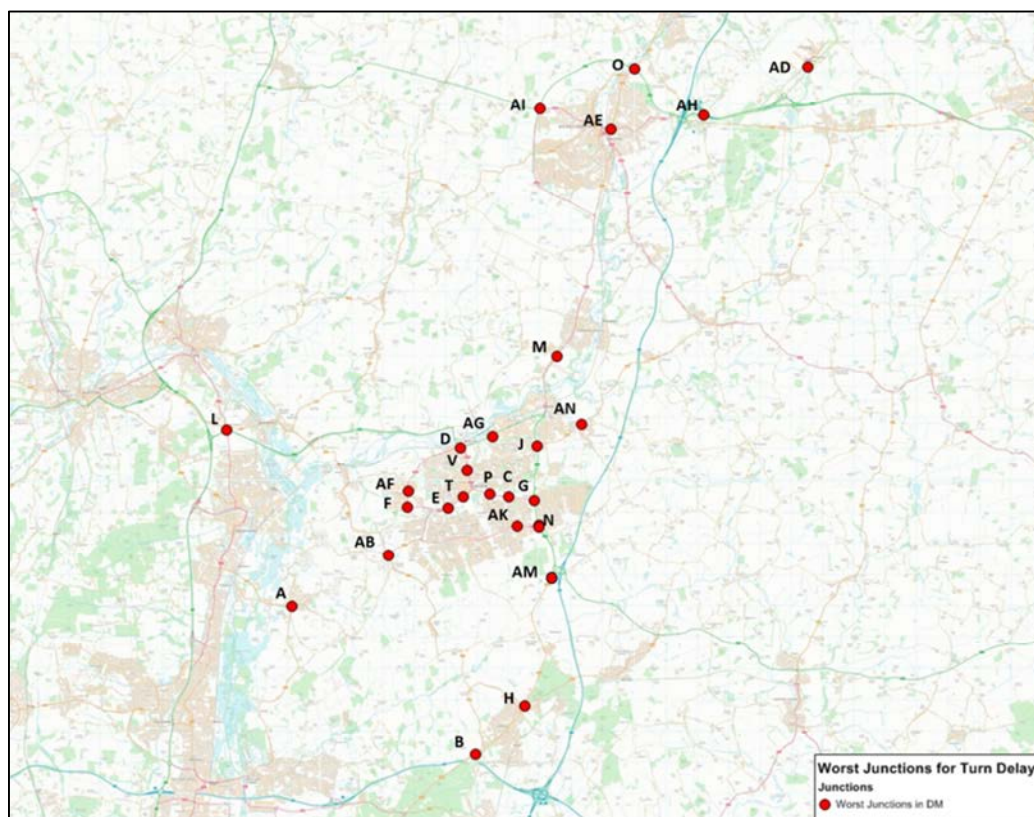
12.4 Impacts upon Delay from the M11 J7a Scheme in 2036 for High Growth

12.4.1 Section 11.5 describes the location of delay and capacity constraint across the detailed modelled area for 2036 in the High Growth scenario, but without the scheme. The principle areas highlighted as congested were as follows:

- Lower Nazeing and Epping signalised junctions;
- Key distributor routes in Harlow, including A414, A1025 Second Avenue, A1025 Third Avenue and Velizy Avenue;
- In the AM, some important junctions that allow access to large residential estates; and
- In the PM, some large junctions in Bishop's Stortford and Stansted Airport.

12.4.2 Figure 12.9 shows the locations of the junctions identified as the worst for turn delay in 2036. Each junction has an individual ID and can also be found in Table 12.4, which displays the impact of the scheme upon these junctions.

Figure 12.9 : Location of Worst Junctions for delay in the High 2036 DS Models



12.4.3 The junctions shown below are in the same order as in the Table 12.3, therefore the junctions at the top of the list are those that suffer the worst turn delay in the do-minimum situation in 2036.

12.4.4 The key observations from the below values are that:

- The signalised junctions in Epping are modelled to experience slight increases in turn delay between the do-minimum and do-something simulations.
- Within Harlow many junctions see an improvement from the M11 J7a scheme, the largest modelled improvements are as follows:
 - Clocktower Roundabout;

- A414 London Road Hamburger Roundabout; and
 - B181 Epping Road / B1133 Water Lane.
 - In the both AM and PM peak hours the junctions in Bishop's Stortford and Stansted Airport are modelled to significantly improve; conditions at the A1250 /A1060 Bishop's Stortford Cross in the PM peak hour improve most;
 - Conversely there a number of junctions in Harlow where turn delay is modelled to significantly increase, particularly in the PM peak hour, as a result of the introduction of the new motorway junction, this occurs at:
 - Burnt Mill Roundabout;
 - Second Avenue / Howard Way Roundabout; and
 - A1019 Velizy Avenue / First Avenue Roundabout.
- 12.4.5 In addition to the above there are some junctions where the modelling suggests that the impact of the scheme is less clear, or changes between time periods.
- 12.4.6 Overall the scheme appears to have a positive impact across most of the junctions that are severely congested in the do-minimum 2036 models. The junctions modelled to be most negatively affected are centred in the vicinity of the scheme, and are located on those roads which will experience the largest increases in traffic flow as a consequence of the M11 J7a scheme.

Table 12.4 : Impact of the scheme upon the top 20 worse junctions in High DM 2036

ID	Location	Sum of turn delay (minutes)					
		AM		PM		Difference	
		DM	DS	DM	DS	AM	PM
A	Lower Nazeing Signals	13.64	14.95	9.72	9.34	1.31	-0.38
J	A414 London Road / B183 Gilden Way Roundabout, Harlow	8.65	10.17	10.35	8.87	1.52	-1.48
D	Burnt Mill Roundabout, Harlow	10.81	10.87	5.44	7.44	0.06	2.00
F	A1169 Elizabeth Way / A1025 Third Avenue Roundabout (The Pinnacles)	7.03	6.82	7.93	8.78	-0.21	0.85
C	Second Avenue / Howard Way Roundabout, Harlow	7.80	8.66	6.41	7.85	0.86	1.44
B	High Road / Theydon Road Signals, Epping	5.23	5.39	3.94	4.06	0.16	0.12
AB	B181 Epping Road / B1133 Water Lane, Broadly Common	4.29	3.59	5.03	4.44	-0.70	-0.59
G	Clocktower Roundabout, Harlow	4.99	2.82	3.93	2.10	-2.17	-1.83
E	Third Avenue / Abercrombie Way Signals, Harlow	4.46	4.59	3.17	3.06	0.13	-0.11
AK	A1169 Southern Way / Trotters Road, Harlow	3.85	3.59	3.53	3.76	-0.26	0.23
AH	Priory Wood Roundabout, Stansted Airport	3.13	4.49	4.25	4.40	1.36	0.15
V	A1019 Velizy Avenue / First Avenue Roundabout, Harlow	4.17	4.19	3.28	3.83	0.02	0.55
H	Thornwood Road / The Plain Signals, Epping	3.13	3.14	3.34	3.56	0.01	0.22
AM	B1393 London Road / Latton Priory Link Road	10.19	10.19	-	-	0.00	-
AD	Thremhall Avenue Eastern Roundabout, Stansted Airport	-	-	7.55	7.00	-	-0.55
AE	A1250 /A1060 Bishop's Stortford Cross	-	-	7.17	4.58	-	-2.59
L	Great Amwell Roundabout	-	-	5.17	6.14	-	0.97
AF	A1169 Elizabeth Way / Fourth Avenue, The Pinnacles	5.16	4.96	-	-	-0.20	-
AG	A414 Edinburgh Way / Howard Way, Harlow	-	-	5.00	4.65	-	-0.35
T	Third Avenue / Haydens Road Roundabout, Harlow	4.22	3.79	-	-	-0.43	-
AI	A120 Hadham Road / A1184 Bishops Park Way, Bishop's Stortford	-	-	3.78	2.84	-	-0.94

ID	Location	Sum of turn delay (minutes)					
		AM		PM		Difference	
		DM	DS	DM	DS	AM	PM
N-1	A414 London Road Hamburger Roundabout (southern signals)	3.80	3.03	-	-	-0.77	-
O	A120 Bishop's Stortford Ring Road / B1383 Stansted Road Roundabout, Bishop's Stortford	3.46	2.18	-	-	-1.28	-
AN	Harlowbury Roundabout (B183 Gilden Way)	3.13	4.69	-	-	1.56	-
N-2	A414 London Road Hamburger Roundabout (northern signals)	-	-	3.10	2.44	-	-0.66
M	A1184 Harlow Road / Hand Lane, Sawbridgeworth	3.05	2.28	-	-	-0.77	-
P	Second Avenue / Tripton Road Roundabout	-	-	2.98	3.12	-	0.14

12.4.7 Figure 12.10 and Figure 12.11 found below are for the AM and PM peak hours respectively for 2036, and show the difference in delays between the do-minimum and do-something networks. Plots for the IP can be found in Appendix I.

12.4.8 Note that the magnitude of delay is represented by the width of the bars, and not by their length. The length is only representative of the length of the coded link and not the extent of queuing or delay.

12.4.9 The changes for most of the network are similar to 2021, see Section 12.3.

12.4.10 There are no major differences in the patterns of delay change observed for 2036 compared to 2021. However, where there are decreases in 2021, the decreases appear to be larger in 2036, and likewise with delay increases. This is likely to be because the volumes of traffic in the 2036 forecast year are significantly higher than in the modelled 2021 situation, therefore producing more delay.

12.4.11 There are a few locations at which the trends are different from 2021, these are described below.

- There are further modelled improvements with decreasing delay between Bishop's Stortford / Stansted Airport and Harlow. More roads in this area see delay reductions, particularly along the A1060 and the minor roads that feed it.
- Another area of modelled delay decrease is in the vicinity of the A414 London Road because of a reduction in traffic along this route. This major feeder road for the M11 J7 appears to be partially relieved by the building of M11 J7a.
- There is evidence of Edinburgh Way experiencing an increase in delay in 2036 at one location as a result of additional flow along this road.
- Rye Hill Road between Harlow and Epping experiences a large increase in delay due to modest increases in traffic using the M11 J7 and interacting with the B1393. This has the effect of increasing flow for Rye Hill Road and therefore producing more delay for traffic using this route. For this road the scheme appears to have the opposite impacts in 2021 and 2036.

Figure 12.10 : Turn Delay Difference between DM and DS models for High 2036 – AM

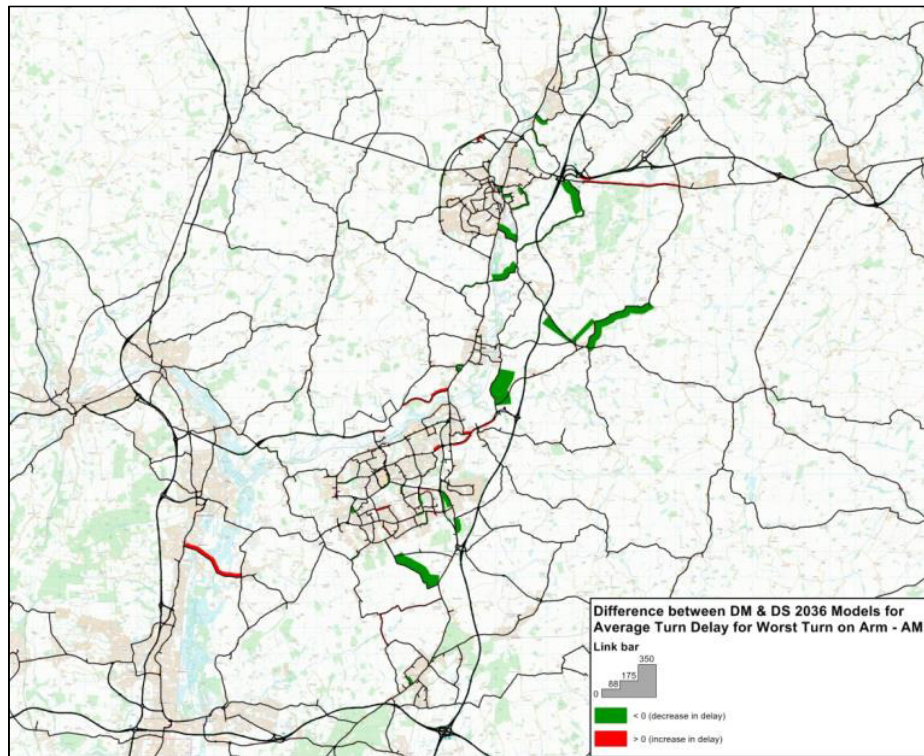
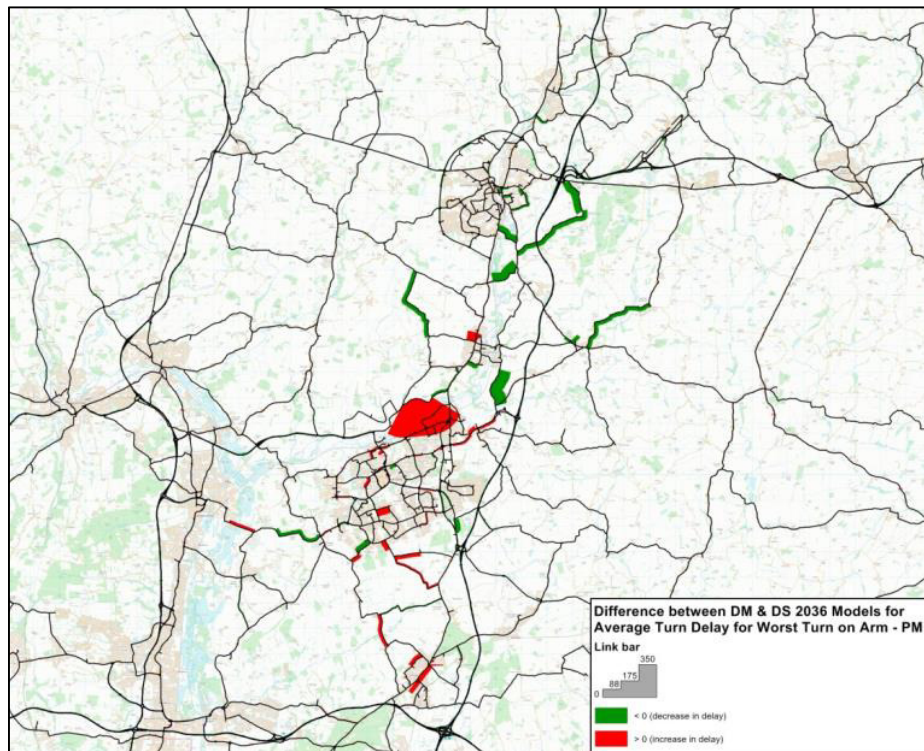


Figure 12.11 : Turn Delay Difference between DM and DS models for High 2036 - PM



13. Conclusions

- 13.1.1 The methodologies used in building the Harlow Transport Model forecast models have been developed to be consistent with the guidance set out in 'WebTAG Unit M4 Forecasting and Uncertainty'.
- 13.1.2 An uncertainty log has been created to identify all future housing and employment developments in the study area, and the appropriate developments were modelled explicitly in the forecast models. As discussed in Section 4 there are three growth scenarios modelled, with two future years being assessed. 'Do-minimum' models were produced, as well as 'do-something' models that include the M11 J7a scheme.
- 13.1.3 All forecast models achieved convergence within the parameters set; these are discussed in Section 5. The models reached a suitable level of stability and proximity, and consequently the forecast models can be seen as fit for purpose for appraising the proposed scheme. It should be noted that the models did not reach the same levels of convergence as the base year models.
- 13.1.4 The impacts of the three forecast scenarios (NTEM, Medium and High) have been shown to be logical in terms of both the projected increases in demand and schemes producing capacity improvements on the road network. The growth scenarios display similar trends with regard to the impacts of future growth and the potential impacts of the M11 J7a scheme. There was evidence of some subtle differences in the impacts between scenarios and the magnitude of impacts differed based upon the levels of growth predicted for each of the different scenarios.
- 13.1.5 The 'do-minimum' models all consistently show that there are large traffic flow increases as a result of the predicted additional housing and employment provided within the modelled area. Large growth in traffic is particularly seen around the largest housing sites at Harlowbury and New Hall in all scenarios and years. In the Medium and High scenarios in 2036 housing developments at Bishop's Stortford North, Bishop's Stortford South and Gilston Park generate large amounts of traffic.
- 13.1.6 Traffic growth is especially high on the SRN, especially the M11, and within Harlow itself. The A414 through Harlow is an important route for both local and through traffic; it is forecast to experience greater traffic flows. In Bishop's Stortford the most significant increase is shown to be on the ring road, particularly around the north of the town.
- 13.1.7 The delay analysis carried out also shows that the level of congestion is set to increase between the base year and the do-minimum scenario in both years. Harlow itself and particularly the A414 are affected the most by this. Additionally, there are significant increases in junction delays through Epping town centre and also around M11 J8.
- 13.1.8 The 'do-something' models demonstrate some major impacts of the M11 J7a scheme upon both traffic flow and delays. The main consequences of the scheme are that:
- Traffic re-routes off local roads and onto the SRN, particularly the M11 between J7a and J8;
 - There is a large decrease in flow approaching the M11 J7 from Harlow along the A414 London Road, relieving this heavily congested road; and
 - B183 Gilden Way experiences a large increase in traffic as a result of the M11 J7a scheme.
- 13.1.9 With regards junction delays the scheme is modelled to improve most of the junctions identified as most congested in the 'do-minimum' scenarios. There are a number of junctions in the vicinity of the M11 J7a and Gilden Way that suffer additional delay; however this is to be expected given the extra traffic attracted to these roads.

- 13.1.10 The suite of forecast models produced for the M11 J7a assessments have been demonstrated to be a vital tool in investigating the potential impacts of the scheme. A further set of forecast models has been developed to investigate the Northern Bypass Scheme and this is detailed within a separate addendum. This is entitled 'Northern Bypass Addendum' and has been issued alongside this report.

Appendix A. Connector Proportions

Appendix B. Uncertainty Log Developments

Appendix C. Base Year Matrices

Appendix D. Future Year Matrices – NTEM Growth Scenario

Appendix E. Future Year Matrices – Medium Growth Scenario

Appendix F. Future Year Matrices – High Growth Scenario

Appendix G. Convergence Statistics

Appendix H. Flow Difference Plots

Appendix I. Delay Difference Plots