A12 Chelmsford to A120 widening scheme

TR010060

7.2 Transport Assessment

Appendix F: Junction Modelling Technical Notes – A12 Junctions

APFP Regulation 5(2)(q)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Volume 7

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Infrastructure Planning

Planning Act 2008

A12 Chelmsford to A120 widening scheme

Development Consent Order 202[]

7.2 TRANSPORT ASSESSMENT

APPENDIX F: JUNCTION MODELLING TECHNICAL NOTES – A12 JUNCTIONS

Regulation Reference	Regulation 5(2)(q)
Planning Inspectorate Scheme Reference	TR010060
Application Document Reference	TR010060/APP/7.2
Author	A12 Project Team, National Highways

Version	**Date**	**Status of Version**
Rev 1	August 2022	DCO Application

CONTENTS

F.1. A12 junction 19: Junction Model Technical Note

F.1.1 Introduction

Overview

The purpose of this technical note is to describe the modelling assessment which has been undertaken for junction 19 on the A12 as part of the A12 Chelmsford to A120 widening project.

The new junction 19 layout will be constructed at the current location of the junction, located between Springfield and Boreham in Chelmsford. It will consist of a two-dumbbell roundabout arrangement with a bridge link connecting the two dumbbells positioned either side of the realigned A12 mainline carriageway. The dumbbell positioned to the west of the A12 carriageway, known as Generals Lane roundabout, will connect to Boreham Interchange roundabout located to the south of junction 19, and the dumbbell positioned to the east, known as Generals Farm roundabout, will connect to the B1137 Main Road.

Junction Location

Junction 19 is located to the north-east of Chelmsford between Springfield and Boreham in Chelmsford. It consists of a two-dumbbell roundabout arrangement; Generals Lane and Generals Farm roundabout and a bridge link connecting the two dumbbells positioned either side of the A12. There is a third roundabout located to the south of junction 19, Boreham Interchange roundabout which gives access to Boreham Services and various commercial and retail uses. The three roundabouts connect the A138, A130 and Main Road (Boreham) to the A12.

As part of the proposed scheme, the layout at Generals Lane and Generals Farm roundabouts will be upgraded to improve the operation of junction 19. There will be no network changes to Boreham Interchange roundabout.

F.1.2 Model Description

Modelled Scenarios

Junction 19 has been assessed using the industry standard Vissim software. The three traffic scenarios listed below have been modelled. AM refers to the modelled hour of 07:30-08:30, IP refers to the average inter-peak hour (10:00-16:00hrs) and PM refers to the modelled hour of 17:00-18:00:

1. Future operation with construction traffic 2025 (construction phase) – AM, IP, PM
2. Future operation without scheme 2027 & 2042 – AM, PM
3. Future operation with scheme 2027 & 2042 (operational phase) – AM, PM

Modelled Junction Layouts

The future operation with construction traffic (2025) and future operation without scheme (2027 & 2042) modelled scenarios, include a junction 19 layout which was developed by Mayer Brown Ltd on behalf of Countryside Zest. This layout was developed to accommodate traffic associated with Countryside Zest's large Beaulieu Park development located north/north west of junction 19. Junction 19 is currently being upgraded to reflect this development scheme layout.

The future operation with scheme (2027 & 2042) modelled scenarios have been developed to assess the operation of the proposed new junction layout developed and presented for the Development Consent Order (DCO) as part of the A12 Chelmsford to A120 widening project.

A base year model representing the current (2019) traffic operation of junction 19 has not been developed given that the junction is currently being upgraded to reflect the Beaulieu Park development scheme layout.

Without Scheme Vissim Model Extents

The extents of the Vissim model for the future operation with construction traffic (2025) and future operation without scheme (2027 & 2042) scenarios is shown in Plate F 1.1. Details of the junctions included in this model are described in Table F 1-1.

Plate F 1-1: Junction 19 Without Sceme Vissim Model Extents

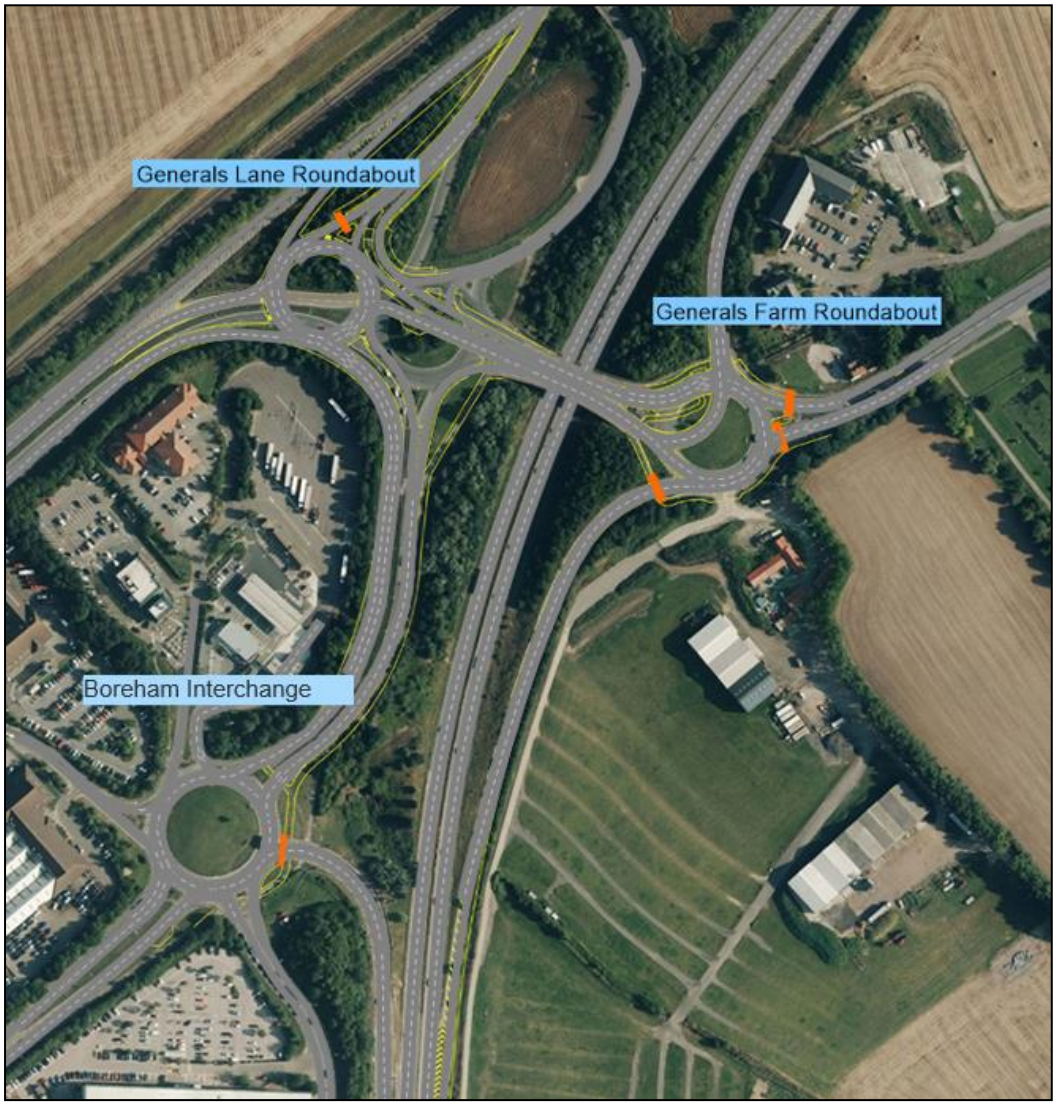


Table F 1-1: Without Sceme Vissim Model Junctions

▪ Junction	▪ Control type	▪ Entry Arms	▪ Junction Description
Generals Lane Roundabout (West)	Signalised	Chelmsford North East Bypass	Developer design (Mayer Brown Ltd)
		Bridge between dumbbells	
		A130 to Boreham Interchange	
		A138	
		A138 slip (to A12 NB)	
Generals Farm Roundabout (East)	Signalised	A12 SB off-slip	Developer design (Mayer Brown Ltd)
		B1137 Main Road	
		A12 SB on-slip	
		Bridge between dumbbells	
Boreham Interchange Roundabout (South)	Partly Signalised	A130 (N)	Developer design (Mayer Brown Ltd)
		A12 NB off-slip	
		Winsford Way	
		A130 Colchester Road (S)	
		Drovers Way	
		Boreham Services	

With Scheme Vissim Model Extents

The extents of the Vissim model for the future operation with scheme (2027 & 2042) scenarios is shown in Plate F 1-2. Details of the junctions included in this model are described in Table F 1-2.

Plate F 1-2: Junction 19 With Scheme Vissim Model Extents

Table F 1-2: With Scheme Vissim Model Junctions

▪ Junction	▪ Control type	▪ Entry Arms	▪ Junction Description
Generals Lane Roundabout (West)	Signalised	Chelmsford North East Bypass	Design submitted at DCO
		Bridge between dumbbells	
		A130	
		A138	
		A138 slip (to A12 NB)	
		A130 slip from Bridge	
Generals Farm Roundabout (East)	Signalised	A12 SB off-slip	Design submitted at DCO
		B1137 Main Road	
		A12 SB on-slip	
		Bridge between dumbbells	
Boreham Interchange Roundabout (South)	Partly Signalised	A130 (N)	Developer design (Mayer Brown Ltd)
		A12 NB off-slip	
		Winsford Way	
		A130 Colchester Road (S)	
		Drovers Way	
		Boreham Services	

F.1.3 Key Assumptions & Input Parameters

The Vissim models have been developed based upon the modelling approach set out in Appendix E of the Transport Assessment. In addition, specific assumptions and parameters associated with junction 19 have also been included in the model and these are discussed below.

Public Transport

Bus stops, routes, and associated bus stopping times have been input for bus services 40, 71, 73, 525 and 676. The bus stops are located on the A130 Colchester Road and B1137 Main Road and all services travel between Colchester Road and Main Road, via Boreham Interchange, Generals Lane roundabout and Generals Farm roundabout. The bus routes have been included in all Vissim modelled scenarios and are identifiable by the orange route marker in Plate F 1-3 and Plate F 1-4.

Plate F 1-3: Eastbound Modelled Bus Routes

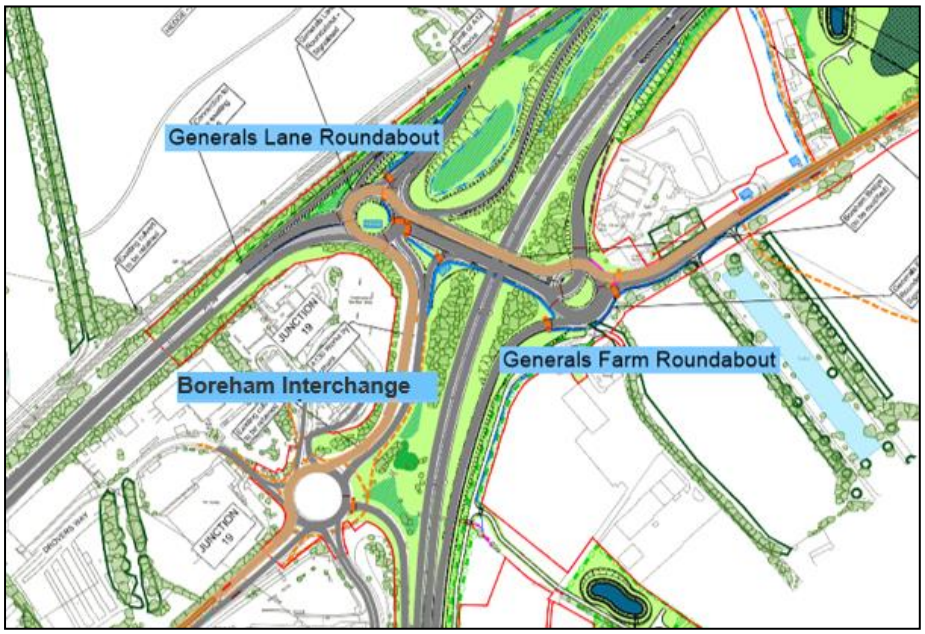
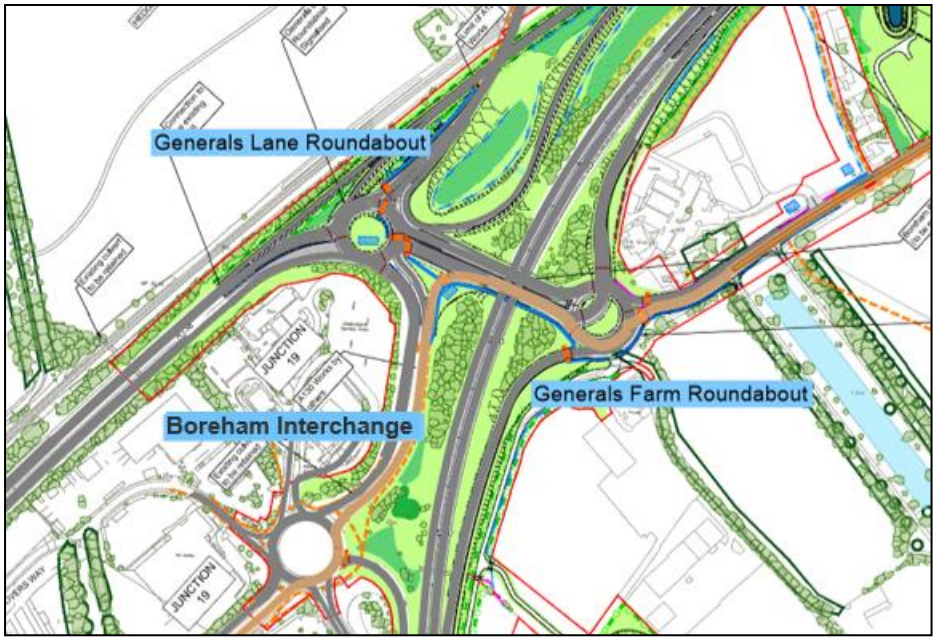


Plate F 1-4: Westbound Modelled Bus Routes



Signal Timings

Fixed signal timings have been developed in Vissim for all of the future operation modelled scenarios. These have been developed as high-level concept designs and they do not constitute detailed signal design.

The overall signal cycle time for the junctions has been modelled as 96 seconds and the traffic-to-traffic intergreen times have been calculated based upon the stage-stage distances.

F.1.4 Traffic Data

Construction Traffic

The future operation with construction traffic 2025 scenario has been developed to assess the impact of construction traffic on network operation at junction 19. The peak year of construction is 2025 and the traffic flows for this scenario are a combination of the forecast background traffic levels for 2025 and the anticipated volume of construction vehicles.

To generate the 2025 background traffic flows, negative growth factors were applied to the 2027 without scheme traffic demand which are shown in Table F 1-3.

Table F 1-3: 2027 to 2025 Negative Growth Factors

▪ Vehicle Type	▪ Factor	▪ Source
Car/LGV	0.985	Estimated from TEMPro 7.2 for Essex County for average weekday
HGV	0.988	Estimated from RTF 2018, July for trunk A category road type and for Eastern England region

Chapter 6 in the Transport Assessment provides further details of how the levels of construction traffic has been derived. For the extents of the junction 19 Vissim model, the Total and HGV without scheme and construction vehicles that are anticipated to pass directly through the junction are shown in Table F 1-4.

Table F 1-4: 2025 Construction Traffic

▪ Scenario	▪ AM		▪ PM		▪ IP	
	▪ Total	▪ HGV	▪ Total	▪ HGV	▪ Total	▪ HGV
Without Scheme 2025	12,215	656	12,605	349	9,554	735
Construction Traffic 2025	277	4	281	8	11	11

Future Operation with & without Scheme

A strategic traffic model has been developed for the appraisal of the A12 scheme using industry standard SATURN software, further details of this can be found in the ComMA report. The AM, IP and PM peak traffic outputs from the SATURN model have been used as the vehicle inputs for the Vissim modelling. These can be found in full in Annex A.

A cordon of the strategic model was made which matched the Vissim model network. Flows were then extracted from the strategic model. The Total and HGV flows from the cordon SATURN models are shown below in Table F 1-5. These flows include A12 traffic which passes through on the A12 mainline without using junction 19. The volume of vehicles using the dumbbells at junction 19 are provided in the modelling results tables.

Table F 1-5: Total Cordoned Flow from the SATURN Model (Vehicles)

Scenario	AM		PM	
	Total	HGV	Total	HGV
Without Scheme 2027	12,399	663	12,796	353
Without Scheme 2042	13,040	725	13,571	410
With Scheme 2027	12,966	664	13,682	361
With Scheme 2042	13,748	724	14,700	414

F.1.5 Junction Modelling Outputs

Vissim Error & Warning messages

Ten model simulation runs were carried out for each model scenario and peak period. Table F 1-6 shows the warnings output from the Vissim scenarios for all ten simulation runs.

Table F 1-6: Vissim Warnings from the Modelled Simulation Runs

Scenario	Time Period	Number of Vehicles Unable to Load into the Model	Number of Vehicles Removed after Waiting 60 Seconds
Without Scheme Construction 2025	AM	Modelled network becomes gridlocked with traffic	
Without Scheme Construction 2025	IP	Modelled network becomes gridlocked with traffic	
Without Scheme Construction 2025	PM	Modelled network becomes gridlocked with traffic	
Without Scheme 2027	AM	Modelled network becomes gridlocked with traffic	
Without Scheme 2027	PM	Modelled network becomes gridlocked with traffic	
Without Scheme 2042	AM	Modelled network becomes gridlocked with traffic	
Without Scheme 2042	PM	Modelled network becomes gridlocked with traffic	
With Scheme 2027	AM	5	19
With Scheme 2027	PM	16	19
With Scheme 2042	AM	17	24
With Scheme 2042	PM	17	27

For all ten of the simulation runs, the without scheme modelled scenarios result in a congested network whereby the traffic is unable to complete their journeys through junction 19, particularly traffic using Generals Lane Roundabout.

As an example, the vehicles unable to load into the model for one typical simulation run are shown in Table F 1-7. The vehicles shown in the table are the sum total of vehicles that are unable to load into the model network from a number of the vehicle inputs, including the A12 northbound, Winsford Way, A130, Drovers Way, CNEB, A12 southbound, and the retail park at Boreham Interchange.

Table F 1-7: Number of Vehicles Unable to Load into the Model – one simulation run

▪ Scenario	▪ AM	▪ PM
	▪ Total	▪ Total
Without Scheme Construction 2025	1,072	165
Without Scheme 2027	1,045	276

Due to these congested conditions, it is not possible to use the Vissim results for the without scheme scenarios with any degree of certainty. The junction 19 layout and subsequent operational characteristics modelled in these scenarios (Beaulieu Park junction layout developed by Mayer Brown Ltd) suggest the network provision is not adequate to cater for the level of traffic forecasted for the A12 Chelmsford to A120 widening project.

The with scheme modelled scenarios result in a small number of warnings associated with vehicles being removed from the network whilst awaiting lane changes and with vehicles not being able to enter the modelled network during the simulation period. In all instances, this was not due to the blocking back of traffic in the model (queueing preventing vehicles from entering the model) and these numbers of 'missing' vehicles is not considered significant given the volume of vehicles that use junction 19 during all the modelled periods.

Vissim Model Outputs

The Vissim outputs presented include a Level of Service (LOS) category for each junction approach arm as well as for the junction as a whole. LOS is based upon average vehicle delay and can be used as a guide for how well the junction operates. Table F 1-8 shows the bands used in the LOS calculation.

Table F 1-8: Level of Service Categories

▪ LOS	▪ Signalised Junction ▪ Delay (s/veh)	▪ Priority Junction ▪ Delay (s/veh)	▪ Description of Traffic Operation
A	≤10 sec	≤10 sec	Highly stable, free-flow condition with little or no congestion.
B	10–20 sec	10–15 sec	Stable, free-flow condition with little congestion.
C	20–35 sec	15–25 sec	Stable flow condition, with moderate congestion.
D	35–55 sec	25–35 sec	Less stable Approaching unstable condition with increasing congestion.
E	55–80 sec	35–50 sec	Unstable flow condition, volume at or slightly over capacity, considerable delays.
F	>80 sec	>50 sec	Forced flow condition, volumes exceed capacity; long delays with stop-and-go traffic.

Vehicle delay is presented in seconds and queue length results have also been collected from the models in five-minute intervals. The results presented for each model show the average queue length for the peak hour models, as well as the average of the maximum queue length output.

F.1.6 Junction Modelling Results

Future Operation with Construction (2025)

The future operation with construction traffic scenarios generate congested networks whereby traffic is unable to complete their journeys through junction 19. Due to these congested conditions, it is not possible to use the Vissim results for this scenario with any degree of certainty.

Based upon the levels of construction traffic and their routing through junction 19, it is anticipated that there would be little impact during the AM peak as most of the traffic avoids the main junction operation, heading north from Chelmsford to the A12. It is, however, anticipated that there would be additional queuing on the southbound A12 off-slip during the PM peak with all construction traffic using this approach to the Generals Farm roundabout, mostly returning to Chelmsford. There is only a negligible traffic increase in the IP.

The LOS, delay, and queue length results of the Vissim junction modelling are presented in Table F 1-9 and Table F 1-10. It should be noted that due to how the results from Vissim are collected, not all the vehicle delay from the queuing in this scenario has been recorded – this is due to the exceptionally long queues. Where queue lengths are long, the vehicle delay result will be an underestimate.

Table F 1-9: Vissim Outputs Future Operations with Construction 2025 AM & PM

Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Generals Lane Rbt (West)	Chelmsford North East Bypass	Signalised	F	1100	127	1008	1126	E	1495	62	789	1065
	Bridge between dumbbells	Signalised	D	1144	42	53	126	F	905	103	181	237
	A130	Signalised	F	1269	117	384	491	E	1677	74	299	414
	A138	Signalised	C	436	31	12	42	D	617	43	25	71
	A138 slip (to A12 NB)	Signalised	A	1029	3	0	0	A	1438	4	0	0
	A130 slip from Bridge	Signalised	A	615	2	0	1	B	479	13	0	0
	Total	**Signalised**	E	5593	63			D	6611	53		
Generals Farm Rbt (East)	A12 SB off-slip	Signalised	F	1449	167	2183	2294	F	1215	243	1799	1946
	B1137 Main Road	Signalised	D	399	48	8	35	F	163	86	5	23
	Bridge between dumbbells	Signalised	C	1117	30	46	153	C	1936	30	181	313
	Total	**Signalised**	F	2964	99			F	3315	111		
Boreham Inter-change (South)	A130 (N)	Signalised	D	652	55	23	64	D	552	38	9	40
	A12 NB off-slip	Signalised	F	1650	177	395	564	D	1572	42	53	154
	Winsford Way	Priority	F	93	453	123	153	F	303	52	20	56
	A130 Colchester Road (S)	Priority	F	434	328	182	212	F	745	100	87	139
	Drovers Way	Priority	F	19	1112	83	90	F	91	323	64	79
	Boreham Services	Priority	F	14	1097	111	119	F	78	474	72	87
	Total	**Signalised**	F	2861	191			E	3341	73		

Table F 1-10: Vissim Outputs Future Operations with Construction 2025 IP

Junction	Entry arm	Control	IP				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Generals Lane Rbt (West)	Chelmsford North East Bypass	Signalised	B	1149	19	11	42
	Bridge between dumbbells	Signalised	B	602	19	11	32
	A130	Signalised	F	1417	82	302	408
	A138	Signalised	C	294	28	7	30
	A138 slip (to A12 NB)	Signalised	A	633	2	0	0
	A130 slip from Bridge	Signalised	A	553	2	0	2
	Total	**Signalised**	C	4648	35		
Generals Farm Rbt (East)	A12 SB off-slip	Signalised	C	918	30	27	89
	B1137 Main Road	Signalised	D	251	51	5	24
	Bridge between dumbbells	Signalised	C	1441	32	86	222
	Total	**Signalised**	C	2611	33		
Boreham Inter-change (South)	A130 (N)	Signalised	B	593	17	4	35
	A12 NB off-slip	Signalised	D	1224	42	28	105
	Winsford Way	Priority	D	180	31	4	27
	A130 Colchester Road (S)	Priority	F	617	55	28	67
	Drovers Way	Priority	F	129	160	35	56
	Boreham Services	Priority	F	101	271	57	75
	Total	**Signalised**	D	2843	52		

The results show LOS for the roundabouts ranging between D-F.

Plate F 1-5 and Plate F 1-6 below illustrate the average queue lengths in the AM and PM peaks. The queue lengths are identifiable by the red blocks.

Plate F 1-5: 2025 AM Peak with Construction Traffic – Average Queue Lengths

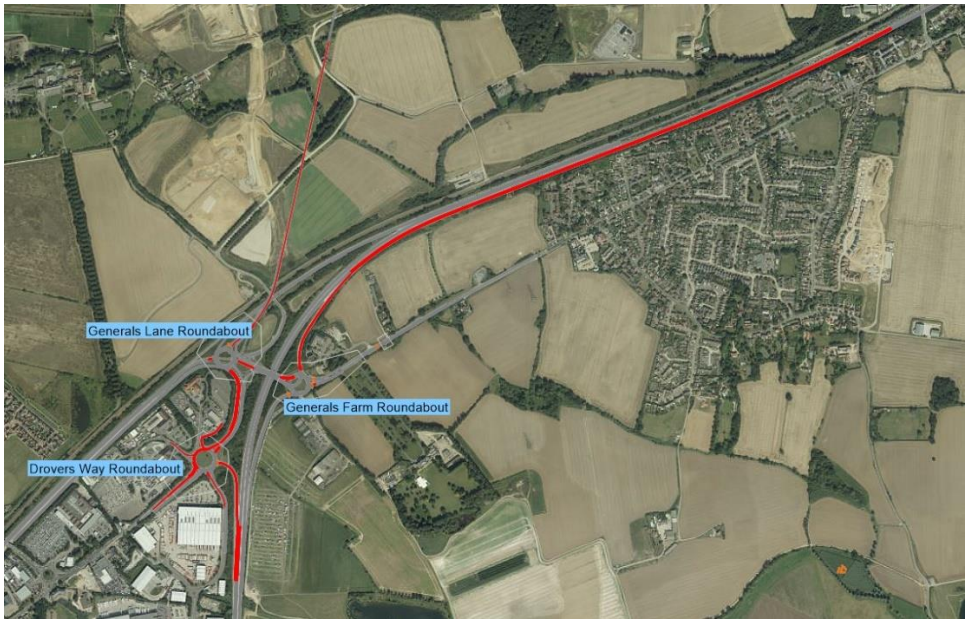
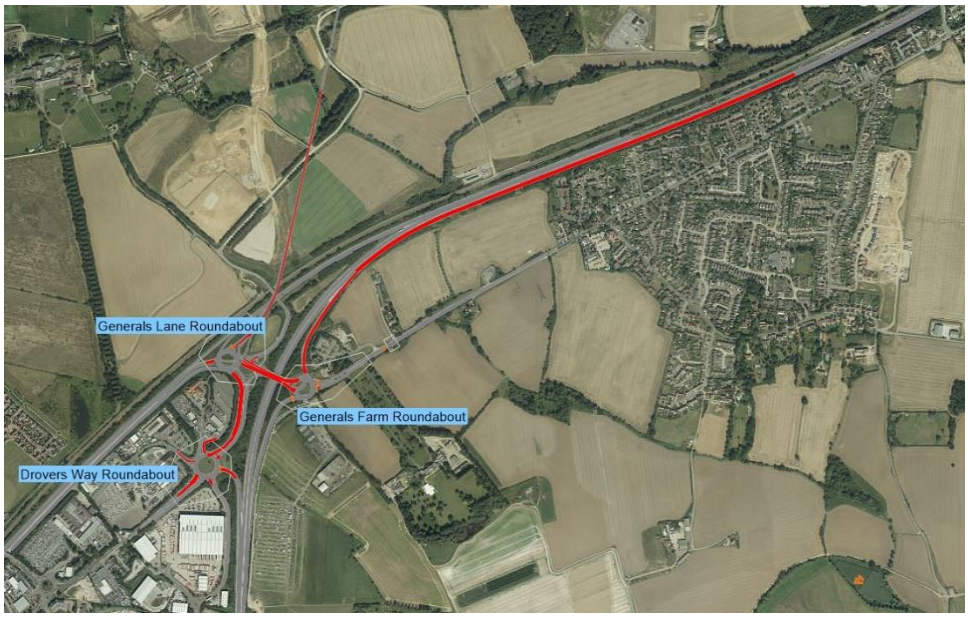


Plate F 1-6: 2025 PM Peak with Construction Traffic – Average Queue Lengths



There is significant queuing in both the AM and PM peaks.

Future Operation without Scheme (2027, 2042)

The future operation without scheme scenarios generate congested networks whereby traffic is unable to complete their journeys through junction 19. Due to these congested conditions, it is not possible to use the Vissim results for this scenario with any degree of certainty.

This indicates that the junction 19 layout associated with the Beaulieu Park development does not provide suitable provision for the various peak period traffic volumes forecasted and assessed as part of the A12 Chelmsford to A120 widening project.

The LOS, delay, and queue length results of the Vissim junction modelling for 2027 without the proposed scheme in place are presented in Table F 1-11. It should be noted that due to how the results from Vissim are collected, not all the vehicle delay from the queuing in this scenario has been recorded – this is due to the exceptionally long queues. Where queue lengths are long, the vehicle delay result will be an underestimate.

A significant proportion of the traffic cannot fit through the junction in 2027 and therefore the situation is even worse by 2042 as there is more traffic on the network. Results for 2042 without the proposed scheme in place have therefore not been presented.

Table F 1-11: Vissim Outputs Future Operation Without Scheme 2027

Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Generals Lane Rbt (West)	Chelmsford North East Bypass	Signalised	F	1100	127	1005	1128	E	1485	63	838	1101
	Bridge between dumbbells	Signalised	D	1151	42	53	123	E	872	58	60	139
	A130	Signalised	F	1280	115	382	490	E	1666	75	312	423
	A138	Signalised	C	443	31	12	42	D	623	44	27	74
	A138 slip (to A12 NB)	Signalised	A	779	2	0	0	A	1463	4	0	0
	A130 slip from Bridge	Signalised	A	623	2	0	2	A	606	3	0	1
	Total	**Signalised**	E	5376	66			D	6714	45		
Generals Farm Rbt (East)	A12 SB off-slip	Signalised	F	1455	166	2195	2301	F	1308	90	177	283
	B1137 Main Road	Signalised	D	405	47	8	35	E	167	69	5	24
	Bridge between dumbbells	Signalised	C	1129	31	49	154	C	1926	31	188	316
	Total	**Signalised**	F	2989	99			E	3400	55		
Boreham Inter-change (South)	A130 (N)	Signalised	E	662	61	28	72	B	673	19	5	38
	A12 NB off-slip	Signalised	F	1653	182	412	572	D	1591	44	56	156
	Winsford Way	Priority	F	94	429	119	148	F	304	60	25	64
	A130 Colchester Road (S)	Priority	F	452	310	178	210	F	728	133	124	171
	Drovers Way	Priority	F	18	927	83	90	F	92	376	69	83
	Boreham Services	Priority	F	16	1089	112	121	F	72	513	81	96
	Total	**Signalised**	F	2895	192			E	3460	78		

The results show LOS for the roundabouts ranging between D-F.

Plate F 1-7 and Plate F 1-8 below illustrate the average queue lengths in the AM and PM peaks. The queue lengths are identifiable by the red blocks.

Plate F 1-7: 2027 AM Peak Without Scheme – Average Queue Lengths

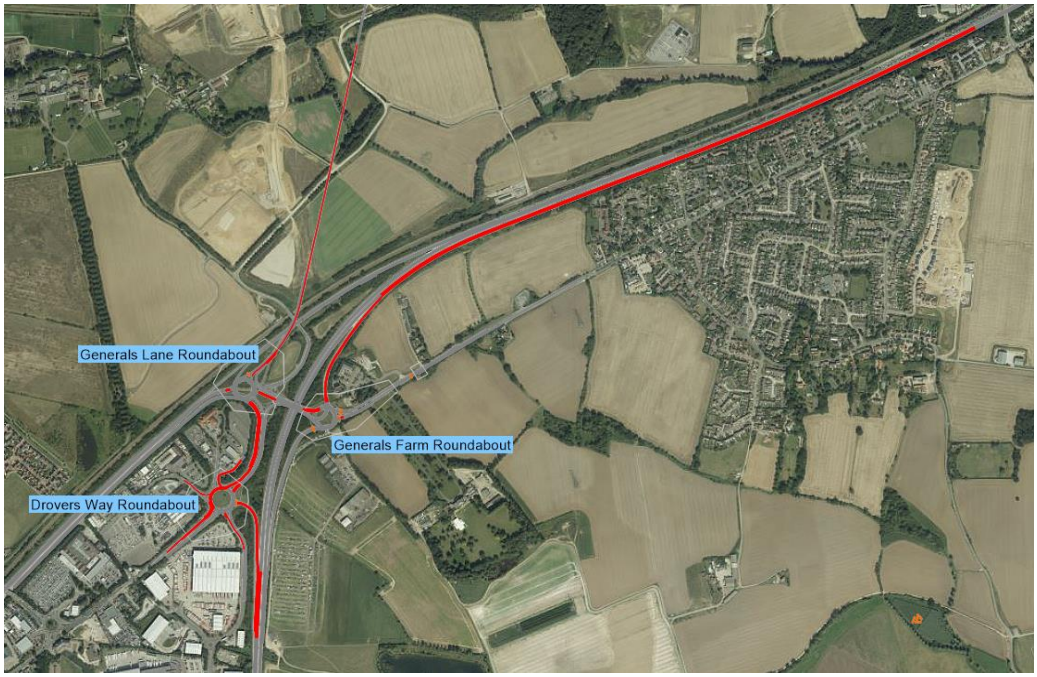
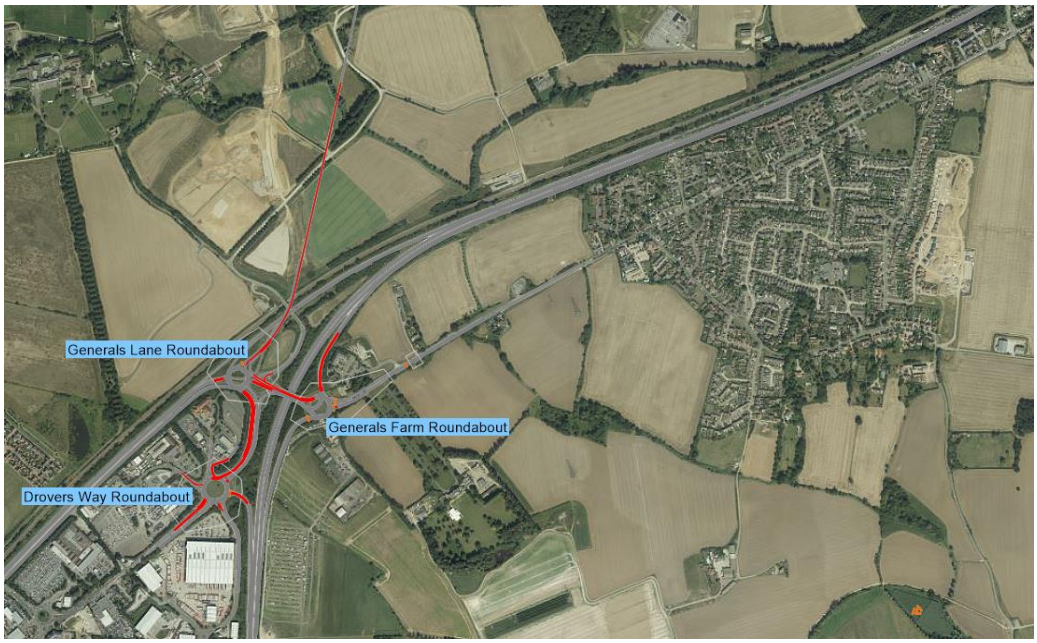


Plate F 1-8: 2027 PM Peak Without Scheme – Average Queue Lengths



There is significant queuing in both the AM and PM peaks.

Future Operation with Scheme (2027, 2042)

The LOS, delay, and queue length results of the Vissim junction modelling are presented in Table F 1-12 and Table F 1-13.

Table F 1-12: Vissim Outputs 2027 Future Operations with Scheme

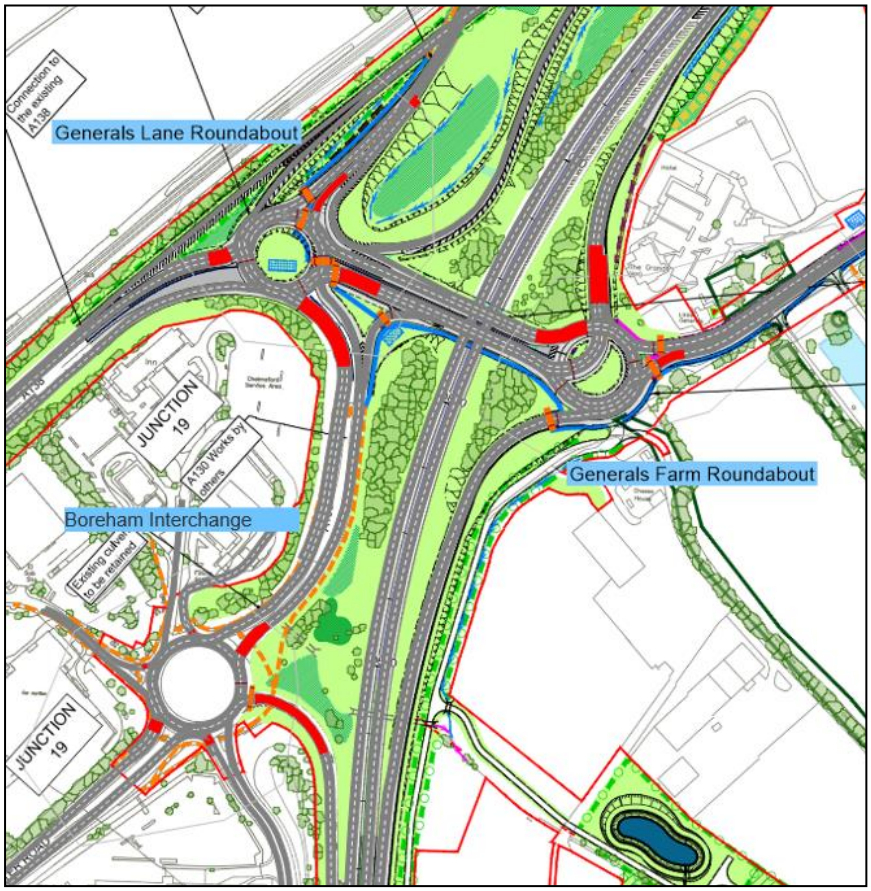
Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Generals Lane Rbt (West)	Chelmsford North East Bypass	Signalised	B	1410	19	18	52	B	1637	17	15	50
	Bridge between dumbbells	Signalised	C	1672	20	31	134	C	964	22	19	83
	A130	Signalised	D	1583	41	58	134	C	1789	31	45	124
	A138	Signalised	D	427	41	13	37	D	556	41	15	43
	A138 slip (to A12 NB)	Signalised	A	899	3	0	0	A	1857	7	1	11
	A130 slip from Bridge	Signalised	A	839	2	0	5	A	635	1	0	0
	Total	**Signalised**	**C**	**6830**	**21**	**-**	**-**	**B**	**7438**	**19**	**-**	**-**
Generals Farm Rbt (East)	A12 SB off-slip	Signalised	C	2046	33	40	115	C	1349	32	27	82
	B1137 Main Road	Signalised	D	608	46	15	50	D	306	50	7	33
	Bridge between dumbbells	Signalised	C	1375	31	40	115	C	1753	27	57	167
	Total	**Signalised**	**C**	**4029**	**35**	**-**	**-**	**C**	**3408**	**31**	**-**	**-**
Boreham Inter-change (South)	A130 (N)	Signalised	D	911	54	45	104	B	716	15	7	49
	A12 NB off-slip	Signalised	C	1690	29	60	171	C	1402	23	38	128
	Winsford Way	Priority	D	125	29	7	32	C	310	19	9	40
	A130 Colchester Road (S)	Priority	C	616	19	9	40	C	878	16	12	48
	Drovers Way	Priority	D	111	26	4	23	D	129	25	4	23
	Boreham Services	Priority	C	113	17	2	19	C	131	18	2	20
	Total	**Signalised**	**C**	**3566**	**33**	**-**	**-**	**B**	**3565**	**19**	**-**	**-**

Table F 1-13: Vissim Outputs 2042 Future Operations with Scheme

Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Generals Lane Rbt (West)	Chelmsford North East Bypass	Signalised	C	1418	26	34	86	B	1677	17	14	40
	Bridge between dumbbells	Signalised	B	1765	19	30	138	C	1127	25	24	94
	A130	Signalised	D	1487	41	58	130	C	1822	32	53	139
	A138	Signalised	D	501	44	15	43	D	599	41	16	47
	A138 slip (to A12 NB)	Signalised	A	1133	3	0	0	B	2012	15	78	128
	A130 slip from Bridge	Signalised	A	900	2	0	3	A	751	2	0	0
	Total	**Signalised**	**C**	**7203**	**22**	**-**	**-**	**C**	**7988**	**21**	**-**	**-**
Generals Farm Rbt (East)	A12 SB off-slip	Signalised	C	2169	33	42	121	D	1607	37	36	99
	B1137 Main Road	Signalised	D	709	47	20	66	D	300	54	7	32
	Bridge between dumbbells	Signalised	C	1299	32	38	109	C	1705	24	45	139
	Total	**Signalised**	**C**	**4177**	**35**	**-**	**-**	**C**	**3611**	**32**	**-**	**-**
Boreham Inter-change (South)	A130 (N)	Signalised	D	955	36	29	89	B	830	19	12	62
	A12 NB off-slip	Signalised	C	1550	33	68	177	C	1408	24	38	130
	Winsford Way	Priority	C	137	25	6	32	D	323	28	15	51
	A130 Colchester Road (S)	Priority	C	642	16	8	39	C	889	19	15	52
	Drovers Way	Priority	C	122	20	3	22	C	136	25	5	24
	Boreham Services	Priority	B	124	14	2	20	C	137	18	2	20
	Total	**Signalised**	**C**	**3530**	**29**	**-**	**-**	**C**	**3722**	**22**	**-**	**-**

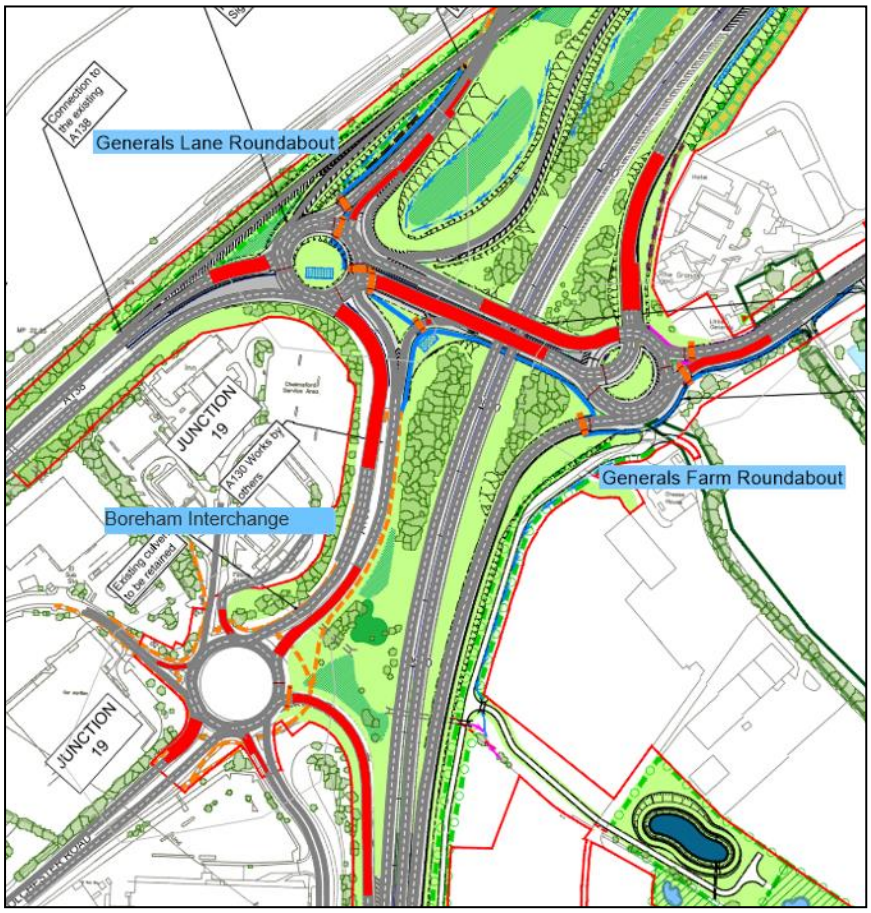
Plate F 1-9 below illustrates the 2042 AM peak with scheme average queue lengths on each roundabout approach at junction 19. Plate F 1-10 shows the 2042 AM peak maximum queues lengths on each roundabout approach. The queue lengths are identifiable by the red blocks.

Plate F 1-9: 2042 AM Peak with Scheme Average Queue Lengths



The longest average queue length during the 2042 AM peak simulation runs can be found on the A12 NB off-slip which feeds into the Boreham Interchange roundabout. The second longest average queue length can be found on the A130 approach to Generals Lane roundabout.

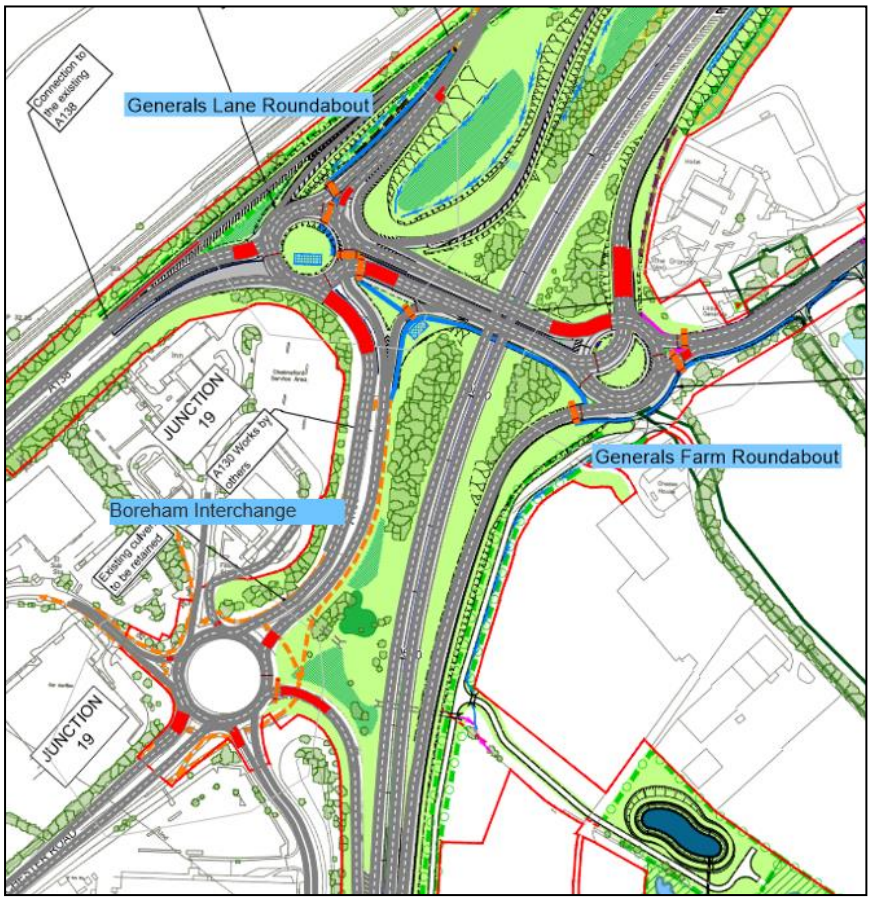
Plate F 1-10: 2042 AM Peak with Scheme Average Maximum Queue Lengths



The longest average maximum queue lengths during the 2042 AM peak simulation runs can be found on the A12 NB off-slip at the Boreham Interchange roundabout, the bridge and A130 approaches to Generals Lane roundabout, and on the A12 SB off-slip at Generals Farm Roundabout.

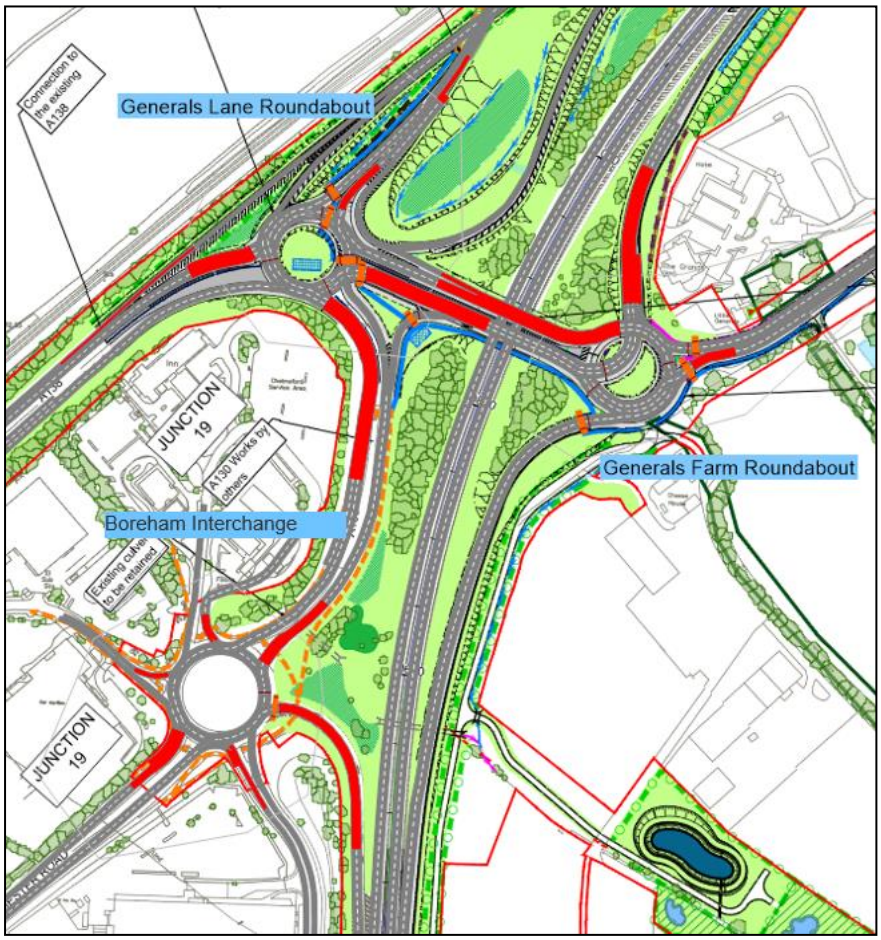
Plate F 1-11 below illustrates the 2042 PM peak with scheme average queue lengths on each roundabout approach at junction 19. Plate F 1-12 shows the 2042 PM peak maximum queues lengths on each roundabout approach.

Plate F 1-11: 2042 PM Peak with Sceme Average Queue Lengths



The longest average queue lengths during the 2042 PM peak simulation runs can be found on the A12 SB off-slip approach and bridge approach to Generals Farm roundabout and on the A130 approach to Generals Lane roundabout.

Plate F 1-12: 2042 AM Peak with Scheme Average Maximum Queue Lengths



The longest average maximum queue lengths during the 2042 PM peak simulation runs can be found on the A12 NB off-slip at the Boreham Interchange roundabout, the A130 and bridge approaches to Generals Lane roundabout and the bridge and A12 SB off-slip approaches to Generals Farm roundabout.

The queue Plate Fs above show similar levels of queuing in the AM and PM peaks. The longest queues can be seen on the A12 Off-slip Boreham Interchange, the A130 approach at Generals Lane roundabout, the link over the A12, and the A12 Off-slip towards Generals Farm roundabout.

F.1.7 Summary

The Vissim modelling results demonstrate that junction 19 can be expected to be over capacity in the 2027 and 2042 without A12 scheme scenarios. This demonstrates that the junction 19 layout associated with the Beaulieu Park development does not provide suitable provision for the various peak period traffic volumes forecasted and assessed as part of the A12 Chelmsford to A120 widening project.

The Vissim modelling results demonstrate that with the A12 scheme in place, junction 19 is anticipated to operate with a LOS C at all roundabouts in 2027 for the AM peak. In the PM peak, Generals Lane roundabout and Boreham Interchange roundabout can be expected to operate with a LOS B, whilst Generals Farm roundabout can be anticipated to operate with a LOS C. In 2042, all three of the roundabouts can be expected to operate with a LOS C during the AM and PM peaks.

Provision at junction 19 is deemed sufficient for the forecasted level of traffic in the operational years of 2027 and 2042.

F.1.8 Annex A

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation with Construction 2025:

AM Peak - Car

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	92	637	30	30	146	756	2107	0	**3798**
Winsford Way	19	0	18	1	1	15	20	13	1	**87**
A130	172	81	0	33	33	0	32	212	36	**601**
Drovers Way	19	1	15	0	0	26	19	16	1	**97**
Ind Est	19	1	15	0	0	26	19	16	1	**97**
A138	72	0	0	0	0	0	225	764	126	**1187**
CNEB	774	36	11	9	9	275	0	89	40	**1243**
From A12 NE	2267	69	526	22	22	993	160	0	0	**4058**
Main Road	94	7	87	2	2	161	36	0	0	**391**
Total	**3438**	**288**	**1308**	**97**	**97**	**1643**	**1267**	**3216**	**204**	**11560**

AM Peak - HGV

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	25	16	11	11	0	25	138	0	**227**
Winsford Way	4	0	2	0	0	17	7	6	0	**36**
A130	1	1	0	3	3	0	2	4	0	**14**
Drovers Way	1	0	0	0	0	6	2	2	0	**13**
Ind Est	1	0	0	0	0	6	2	2	0	**13**
A138	3	0	0	0	0	0	2	17	1	**22**
CNEB	73	10	0	2	2	5	0	0	10	**102**
From A12 NE	176	3	22	1	1	21	2	0	0	**226**
Main Road	2	0	0	0	0	0	0	0	0	**3**
Total	**262**	**39**	**42**	**17**	**17**	**55**	**42**	**169**	**11**	**656**

AM Peak - Construction Car

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	0	0	0	0	0	0	0	0	**0**
Winsford Way	0	0	0	0	0	0	0	0	0	**0**
A130	0	0	0	0	0	0	0	0	0	**0**
Drovers Way	0	0	0	0	0	0	0	0	0	**0**
Ind Est	0	0	0	0	0	0	0	0	0	**0**
A138	0	0	0	0	0	0	0	260	0	**260**
CNEB	0	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	0	0	**0**
Main Road	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**260**	**0**	**260**

AM Peak – Construction Minibus

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	0	0	0	0	0	0	0	0	**0**
Winsford Way	0	0	0	0	0	0	0	0	0	**0**
A130	0	0	0	0	0	0	0	0	0	**0**
Drovers Way	0	0	0	0	0	0	0	0	0	**0**
Ind Est	0	0	0	0	0	0	0	0	0	**0**
A138	0	0	0	0	0	0	0	0	0	**0**
CNEB	0	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	14	0	**14**
Main Road	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**14**

AM Peak – Construction HGV

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	0	0	0	0	0	0	0	0	**0**
Winsford Way	0	0	0	0	0	0	0	0	0	**0**
A130	0	0	0	0	0	0	0	0	0	**0**
Drovers Way	0	0	0	0	0	0	0	0	0	**0**
Ind Est	0	0	0	0	0	0	0	0	0	**0**
A138	0	0	0	0	0	0	0	0	0	**0**
CNEB	0	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	4	0	**4**
Main Road	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**4**

IP Peak - Car

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	32	406	35	35	0	633	1766	0	**2906**
Winsford Way	25	0	51	1	1	32	20	30	1	**161**
A130	131	44	0	56	56	0	17	214	87	**606**
Drovers Way	20	1	27	0	0	44	17	25	1	**134**
Ind Est	20	1	27	0	0	44	17	25	1	**134**
A138	47	0	0	0	0	0	117	619	113	**897**
CNEB	867	12	6	8	8	88	0	40	50	**1080**
From A12 NE	1803	29	314	32	32	396	53	0	0	**2660**
Main Road	17	1	105	2	2	107	7	0	0	**242**
Total	**2928**	**120**	**936**	**135**	**135**	**710**	**882**	**2719**	**254**	**8818**

IP Peak - HGV

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	15	11	6	6	0	44	246	0	**328**
Winsford Way	2	0	12	0	0	0	3	3	0	**19**
A130	6	0	0	1	1	0	1	8	0	**18**
Drovers Way	1	0	1	0	0	4	1	1	0	**7**
Ind Est	1	0	1	0	0	4	1	1	0	**7**
A138	4	0	0	0	0	0	6	22	1	**33**
CNEB	60	3	1	0	0	1	0	2	1	**68**
From A12 NE	208	1	21	0	0	19	2	0	0	**252**
Main Road	2	0	0	0	0	0	0	0	0	**2**
Total	**283**	**20**	**45**	**7**	**7**	**29**	**58**	**283**	**2**	**735**

IP Peak – Construction Car

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	0	0	0	0	0	0	0	0	**0**
Winsford Way	0	0	0	0	0	0	0	0	0	**0**
A130	0	0	0	0	0	0	0	0	0	**0**
Drovers Way	0	0	0	0	0	0	0	0	0	**0**
Ind Est	0	0	0	0	0	0	0	0	0	**0**
A138	0	0	0	0	0	0	0	0	0	**0**
CNEB	0	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	0	0	**0**
Main Road	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

IP Peak – Construction Minibus

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	0	0	0	0	0	0	0	0	**0**
Winsford Way	0	0	0	0	0	0	0	0	0	**0**
A130	0	0	0	0	0	0	0	0	0	**0**
Drovers Way	0	0	0	0	0	0	0	0	0	**0**
Ind Est	0	0	0	0	0	0	0	0	0	**0**
A138	0	0	0	0	0	0	0	0	0	**0**
CNEB	0	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	0	0	**0**
Main Road	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

IP Peak – Construction HGV

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	0	0	0	0	0	0	0	0	**0**
Winsford Way	0	0	0	0	0	0	0	0	0	**0**
A130	0	0	0	0	0	0	0	0	0	**0**
Drovers Way	0	0	0	0	0	0	0	0	0	**0**
Ind Est	0	0	0	0	0	0	0	0	0	**0**
A138	0	0	0	0	0	0	0	0	0	**0**
CNEB	0	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	11	0	**11**
Main Road	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**0**	**11**

PM Peak- Car

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	64	661	35	35	9	725	2045	0	**3573**
Winsford Way	58	0	77	1	1	57	42	41	14	**290**
A130	189	67	0	50	50	0	39	170	211	**777**
Drovers Way	24	1	17	0	0	38	19	17	6	**122**
Ind Est	24	1	17	0	0	38	19	17	6	**122**
A138	83	21	0	0	0	0	343	1432	157	**2035**
CNEB	1089	20	13	11	11	279	0	2	175	**1600**
From A12 NE	2285	49	413	34	34	642	121	0	0	**3578**
Main Road	4	3	61	1	1	79	11	0	0	**160**
Total	**3757**	**225**	**1260**	**132**	**132**	**1141**	**1318**	**3723**	**570**	**12256**

PM Peak - HGV

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	14	2	4	4	0	13	119	0	**157**
Winsford Way	1	0	6	0	0	0	3	2	0	**13**
A130	2	3	0	1	1	0	1	3	1	**11**
Drovers Way	0	0	0	0	0	2	1	1	0	**4**
Ind Est	0	0	0	0	0	2	1	1	0	**4**
A138	1	0	0	0	0	0	3	10	2	**16**
CNEB	15	1	0	0	0	0	0	0	1	**18**
From A12 NE	109	1	9	0	0	6	1	0	0	**127**
Main Road	0	0	0	0	0	0	0	0	0	**0**
Total	**129**	**19**	**18**	**6**	**6**	**9**	**22**	**135**	**4**	**349**

PM Peak – Construction Car

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	0	0	0	0	0	0	0	0	**0**
Winsford Way	0	0	0	0	0	0	0	0	0	**0**
A130	0	0	0	0	0	0	0	0	0	**0**
Drovers Way	0	0	0	0	0	0	0	0	0	**0**
Ind Est	0	0	0	0	0	0	0	0	0	**0**
A138	0	0	0	0	0	0	0	0	0	**0**
CNEB	0	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	260	0	0	0	**260**
Main Road	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**	**260**	**0**	**0**	**0**	**260**

PM Peak – Construction Minibus

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	0	0	0	0	0	0	0	0	**0**
Winsford Way	0	0	0	0	0	0	0	0	0	**0**
A130	0	0	0	0	0	0	0	0	0	**0**
Drovers Way	0	0	0	0	0	0	0	0	0	**0**
Ind Est	0	0	0	0	0	0	0	0	0	**0**
A138	0	0	0	0	0	0	0	0	0	**0**
CNEB	0	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	14	0	**14**
Main Road	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**14**

PM Peak – Construction HGV

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	0	0	0	0	0	0	0	0	**0**
Winsford Way	0	0	0	0	0	0	0	0	0	**0**
A130	0	0	0	0	0	0	0	0	0	**0**
Drovers Way	0	0	0	0	0	0	0	0	0	**0**
Ind Est	0	0	0	0	0	0	0	0	0	**0**
A138	0	0	0	0	0	0	0	0	0	**0**
CNEB	0	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	8	0	**8**
Main Road	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**0**	**8**

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation without scheme 2027:

AM Peak - Car

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	93	647	30	30	148	767	2140	0	**3856**
Winsford Way	19	0	18	1	1	15	21	13	1	**89**
A130	175	83	0	34	34	0	33	215	37	**610**
Drovers Way	20	1	15	0	0	27	19	16	1	**99**
Ind Est	20	1	15	0	0	27	19	16	1	**99**
A138	73	0	0	0	0	0	229	775	128	**1205**
CNEB	786	37	11	9	9	279	0	90	41	**1262**
From A12 NE	2302	70	534	22	22	1008	162	0	0	**4120**
Main Road	96	7	89	2	2	164	37	0	0	**397**
Total	**3491**	**292**	**1328**	**99**	**99**	**1668**	**1287**	**3265**	**207**	**11736**

AM Peak - HGV

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	26	16	11	11	0	25	140	0	**230**
Winsford Way	4	0	2	0	0	17	7	6	0	**37**
A130	1	1	0	3	3	0	2	4	0	**14**
Drovers Way	2	0	0	0	0	6	2	2	0	**13**
Ind Est	2	0	0	0	0	6	2	2	0	**13**
A138	3	0	0	0	0	0	2	17	1	**22**
CNEB	74	10	0	2	2	5	0	0	11	**104**
From A12 NE	178	3	23	1	1	21	2	0	0	**228**
Main Road	2	0	0	0	0	0	0	0	0	**3**
Total	**266**	**40**	**43**	**17**	**17**	**56**	**42**	**171**	**11**	**663**

PM Peak - Car

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	65	671	35	35	9	736	2076	0	**3627**
Winsford Way	59	0	78	1	1	58	42	41	15	**294**
A130	192	68	0	51	51	0	40	173	214	**789**
Drovers Way	25	1	18	0	0	39	19	17	6	**124**
Ind Est	25	1	18	0	0	39	19	17	6	**124**
A138	84	21	0	0	0	0	348	1453	159	**2066**
CNEB	1106	20	13	11	11	283	0	2	178	**1624**
From A12 NE	2320	50	420	34	34	652	123	0	0	**3632**
Main Road	4	3	62	1	1	80	11	0	0	**163**
Total	**3814**	**228**	**1279**	**134**	**134**	**1158**	**1338**	**3779**	**578**	**12443**

PM Peak = HGV

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	14	2	4	4	0	13	121	0	**159**
Winsford Way	1	0	7	0	0	0	3	2	0	**13**
A130	2	3	0	1	1	0	1	3	1	**11**
Drovers Way	0	0	0	0	0	2	1	1	0	**4**
Ind Est	0	0	0	0	0	2	1	1	0	**4**
A138	1	0	0	0	0	0	3	10	2	**16**
CNEB	15	1	0	0	0	0	0	0	1	**18**
From A12 NE	111	1	9	0	0	6	1	0	0	**128**
Main Road	0	0	0	0	0	0	0	0	0	**0**
Total	**131**	**19**	**18**	**6**	**6**	**9**	**23**	**136**	**4**	**353**

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation without scheme 2042:

AM Peak - Car

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	93	665	31	31	211	747	2125	0	**3903**
Winsford Way	20	0	12	1	1	25	23	15	1	**97**
A130	117	96	0	37	37	0	41	210	46	**585**
Drovers Way	21	2	14	0	0	32	21	18	1	**108**
Ind Est	21	2	14	0	0	32	21	18	1	**108**
A138	80	0	0	0	0	0	298	921	155	**1454**
CNEB	778	33	7	10	10	289	0	88	47	**1263**
From A12 NE	2432	72	546	23	23	1006	174	0	5	**4281**
Main Road	167	9	122	3	3	175	38	0	0	**518**
Total	**3637**	**305**	**1379**	**104**	**104**	**1770**	**1363**	**3396**	**255**	**12315**

AM Peak - HGV

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	27	17	12	12	0	25	146	0	**238**
Winsford Way	5	0	3	0	0	19	7	7	0	**41**
A130	1	1	0	3	3	0	2	5	0	**15**
Drovers Way	2	0	1	0	0	7	3	2	0	**14**
Ind Est	2	0	1	0	0	7	3	2	0	**14**
A138	4	0	0	0	0	0	2	19	1	**25**
CNEB	79	11	0	2	2	5	0	0	11	**110**
From A12 NE	209	3	24	1	1	23	2	0	0	**264**
Main Road	3	0	0	0	0	0	0	0	0	**3**
Total	**303**	**43**	**46**	**18**	**18**	**62**	**43**	**180**	**12**	**725**

PM Peak - Car

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	70	711	36	36	35	717	2176	0	**3781**
Winsford Way	56	0	72	1	1	68	53	41	16	**307**
A130	164	72	0	54	54	0	52	170	243	**810**
Drovers Way	23	1	17	0	0	43	23	17	7	**129**
Ind Est	23	1	17	0	0	43	23	17	7	**129**
A138	50	25	0	0	0	0	416	1375	325	**2192**
CNEB	1175	22	13	11	11	286	0	20	100	**1638**
From A12 NE	2569	54	475	36	36	689	123	0	21	**4004**
Main Road	1	3	70	2	2	83	11	0	0	**170**
Total	**4060**	**247**	**1374**	**141**	**141**	**1247**	**1417**	**3815**	**719**	**13161**

M Peak - HGV

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	16	2	5	5	0	14	134	0	**175**
Winsford Way	1	0	1	0	0	6	3	2	0	**14**
A130	1	3	0	1	1	0	1	2	1	**9**
Drovers Way	0	0	0	0	0	2	1	1	0	**4**
Ind Est	0	0	0	0	0	2	1	1	0	**4**
A138	1	0	0	0	0	0	3	9	2	**15**
CNEB	15	1	0	0	0	1	0	0	1	**18**
From A12 NE	147	2	10	1	1	7	1	0	0	**168**
Main Road	0	0	0	0	0	0	0	0	0	**0**
Total	**166**	**21**	**14**	**7**	**7**	**18**	**24**	**148**	**4**	**410**

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation with scheme 2027:

AM Peak - Car

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	90	629	29	29	109	700	2302	0	**3888**
Winsford Way	19	0	18	1	1	14	20	14	1	**89**
A130	170	82	0	34	34	0	32	209	47	**608**
Drovers Way	20	1	15	0	0	26	19	16	1	**99**
Ind Est	20	1	15	0	0	26	19	16	1	**99**
A138	76	0	0	0	0	0	198	894	149	**1317**
CNEB	741	37	10	9	9	290	0	196	17	**1310**
From A12 NE	2280	69	555	22	22	1067	270	0	12	**4299**
Main Road	156	13	127	5	5	239	50	0	0	**594**
Total	**3483**	**293**	**1371**	**99**	**99**	**1771**	**1309**	**3648**	**230**	**12302**

AM Peak - HGV

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	26	18	11	11	0	18	145	0	**228**
Winsford Way	5	0	2	0	0	17	7	5	0	**37**
A130	1	1	0	3	3	0	2	4	0	**14**
Drovers Way	2	0	1	0	0	6	2	2	0	**13**
Ind Est	2	0	1	0	0	6	2	2	0	**13**
A138	3	0	0	0	0	0	2	16	1	**22**
CNEB	66	10	0	2	2	7	0	9	1	**96**
From A12 NE	187	3	20	1	1	15	1	0	0	**229**
Main Road	3	0	2	0	0	4	0	0	0	**11**
Total	**269**	**40**	**44**	**17**	**17**	**56**	**35**	**183**	**2**	**664**

PM Peak - Car

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	63	623	34	34	8	609	2516	0	**3886**
Winsford Way	56	0	74	1	1	53	42	65	6	**296**
A130	180	66	0	49	49	0	38	371	118	**870**
Drovers Way	23	1	17	0	0	36	18	26	3	**124**
Ind Est	23	1	17	0	0	36	18	26	3	**124**
A138	62	19	0	0	0	0	341	1846	129	**2398**
CNEB	1068	19	12	10	10	269	0	195	39	**1624**
From A12 NE	2366	44	417	30	30	633	147	0	34	**3703**
Main Road	44	8	88	5	5	130	16	0	0	**296**
Total	**3823**	**221**	**1248**	**129**	**129**	**1164**	**1230**	**5046**	**332**	**13321**

PM Peak - HGV

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	14	2	4	4	0	12	127	1	**166**
Winsford Way	1	0	7	0	0	0	3	2	0	**13**
A130	1	3	0	1	1	0	1	3	1	**10**
Drovers Way	0	0	0	0	0	2	1	1	0	**4**
Ind Est	0	0	0	0	0	2	1	1	0	**4**
A138	1	0	0	0	0	0	3	10	3	**17**
CNEB	16	1	0	0	0	0	0	0	0	**18**
From A12 NE	110	1	8	0	0	5	1	0	0	**126**
Main Road	1	0	1	0	0	1	0	0	0	**3**
Total	**131**	**19**	**18**	**6**	**6**	**9**	**22**	**144**	**5**	**361**

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation with scheme 2042:

AM Peak - Car

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	85	624	28	28	129	558	2446	0	**3899**
Winsford Way	21	0	20	1	1	15	22	16	1	**97**
A130	138	97	0	36	36	0	42	224	53	**627**
Drovers Way	22	2	16	0	0	27	21	19	2	**108**
Ind Est	22	2	16	0	0	27	21	19	2	**108**
A138	84	0	0	0	0	0	283	1115	138	**1621**
CNEB	682	30	7	10	10	286	0	277	16	**1318**
From A12 NE	2408	72	582	23	23	1080	349	0	14	**4551**
Main Road	229	14	152	5	5	240	50	0	0	**695**
Total	**3605**	**302**	**1418**	**103**	**103**	**1804**	**1346**	**4116**	**227**	**13024**

AM Peak - HGV

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	26	17	11	11	0	20	149	0	**235**
Winsford Way	5	0	3	0	0	19	7	6	0	**41**
A130	1	7	0	3	3	0	2	5	0	**21**
Drovers Way	2	0	1	0	0	7	3	2	0	**14**
Ind Est	2	0	1	0	0	7	3	2	0	**14**
A138	4	0	0	0	0	0	2	18	1	**26**
CNEB	72	4	0	2	2	5	0	11	0	**96**
From A12 NE	216	4	22	2	2	17	2	0	0	**263**
Main Road	4	0	3	0	0	6	0	0	0	**14**
Total	**305**	**42**	**45**	**18**	**18**	**61**	**38**	**194**	**2**	**724**

PM Peak - Car

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	67	609	34	34	22	608	2616	0	**3989**
Winsford Way	49	0	76	1	1	56	47	73	6	**308**
A130	106	71	0	51	51	0	47	424	131	**882**
Drovers Way	21	1	16	0	0	40	20	30	2	**130**
Ind Est	21	1	16	0	0	40	20	30	2	**130**
A138	51	21	0	0	0	0	378	1999	145	**2594**
CNEB	1101	21	12	11	11	265	0	210	36	**1666**
From A12 NE	2714	48	495	32	32	691	236	0	50	**4298**
Main Road	0	10	107	6	6	141	17	0	0	**288**
Total	**4064**	**238**	**1329**	**135**	**135**	**1255**	**1375**	**5382**	**373**	**14286**

PM Peak - HGV

Origin / Destination	To A12 SW	Winsford Way	A130	Drovers Way	Ind Est	A138	CNEB	To A12 NE	Main Road	Total
From A12 SW	0	16	3	5	5	0	12	138	1	**178**
Winsford Way	1	0	1	0	0	6	3	2	0	**14**
A130	1	3	0	1	1	0	1	4	1	**11**
Drovers Way	0	0	0	0	0	2	1	1	0	**4**
Ind Est	0	0	0	0	0	2	1	1	0	**4**
A138	1	0	0	0	0	0	3	9	3	**16**
CNEB	10	1	0	0	0	1	0	1	0	**13**
From A12 NE	151	2	9	1	1	6	1	0	0	**170**
Main Road	1	0	1	0	0	1	0	0	0	**4**
Total	**165**	**21**	**14**	**7**	**7**	**18**	**23**	**154**	**6**	**414**

F.2. A12 junction 20a off-slip: Junction Model Technical Note

F.2.1 Introduction

Overview

The purpose of this technical note is to describe the modelling assessments which have been undertaken at the Junction 20a off-slip as part of the A12 Chelmsford to A120 widening project.

The junction is located in Hatfield Peverel and is currently a priority-junction with three approach arms; B1137 The Street (east and west major arms) and Bury Lane (minor arm).

Modelling scenarios

Junction 20a of the A12 has been assessed using the PICADY module within the industry standard junction modelling software Junctions 9. The analysis was performed to assess the current traffic conditions/operations during the weekday morning and evening peak hours.

The following traffic scenarios have been considered for both the AM (07:30-08:30) and PM (17:00 – 18:00) peak hours:

- Current operation scenario (2019) for the existing junction arrangement.

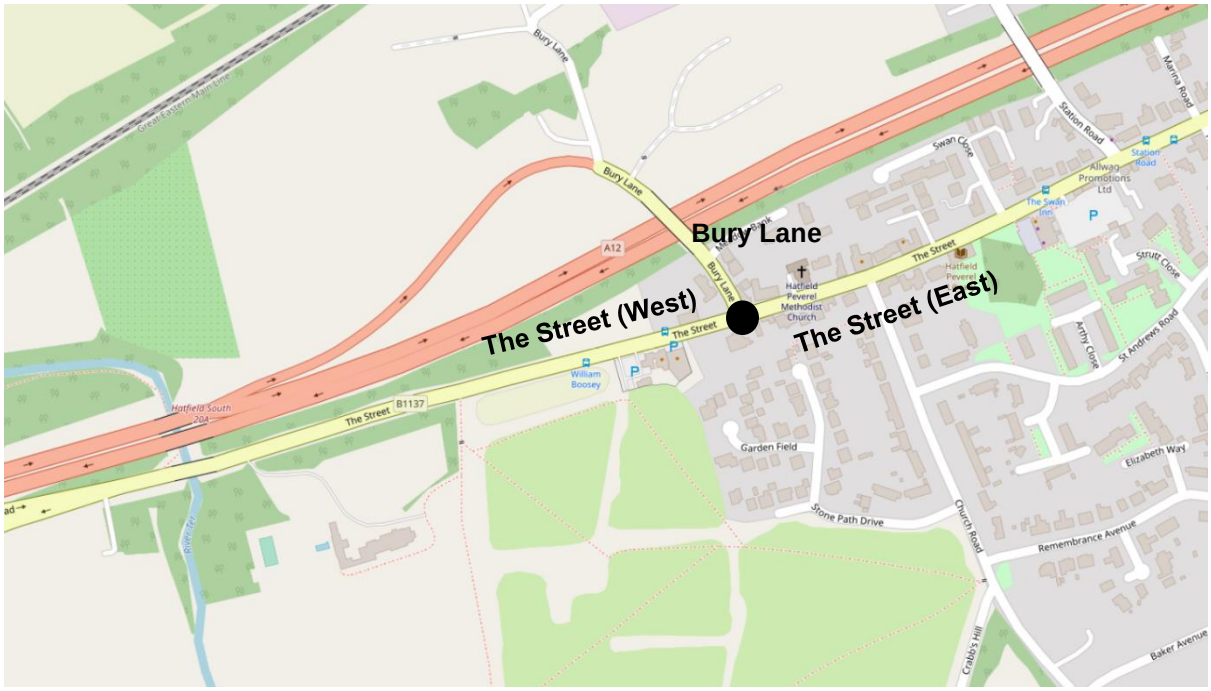
The 2025 Construction scenario has not been considered because there is unlikely to be significant volumes of construction traffic travelling through Hatfield Peverel. Also, this junction was not modelled in the future year scenarios because the J20a off-slip does not exist with the proposed scheme in place.

F.2.2 Model description

Junction location

The location of the 20a off-slip junction is shown in Plate F 2-1. Located in Hatfield Peverel, the eastbound off-slip joins the north-south Bury Lane leading into the village and forms the minor arm of the junction. The B1137 The Street runs east-west and is the major arm of the junction for traffic travelling through Hatfield Peverel.

Plate F 2-1: Junction 20a off-slip (Source: Open Street Map)



Key assumptions and input parameters

The PICADY model required several geometric parameters to be measured for the calculation of theoretical capacity. Junction geometric measurements were taken at the junction from AutoCAD drawings and measured in accordance with the PICADY user guide.

PICADY assigns traffic flows for every 15-minute period within the modelled peak hours. Traffic flows and HGV percentages have been extracted from the base year 2019 SATURN model.

Traffic volume has been input as vehicles with a 2.5 PCU factor for Heavy Goods Vehicles used.

Traffic data

A bespoke traffic model has been developed for the appraisal of the proposed scheme using industry standard SATURN software, for which further details can be found in the Combined Modelling and Appraisal report. The outputs from the strategic model formed the basis for the inputs into the junction modelling, using the Origin-Destination table function which synthesizes a peak within the peak hour. The Base Year (2019) traffic flows, along with HGV proportions are provided in Annex A.

The vast majority of the traffic travelling on the B1137 The Street passes straight through the junction without turning into Bury Lane. The vast majority of the traffic on Bury Lane turns left into Hatfield Peverel. Traffic flows on the off-slip are significantly higher in the weekday PM peak hour than the weekday AM.

F.2.3 Junction modelling results

Current operation (2019)

The results of the junction modelling are presented in Table 2-1.

Table F 2-1: Results for A12 Junction 20a off-slop PICADY model

	2019 AM					2019 PM				
Movements	**Max LOS**	**Average Demand (PCU/hr)**	**Max. Delay (s)**	**Max Queue (PCU)**	**Max RFC**	**Max LOS**	**Average Demand (PCU/hr)**	**Max. Delay (s)**	**Max Queue (PCU)**	**Max RFC**
Bury Lane to The Street (East)	B	256	12.31	1	0.49	F	435	54.65	7	0.90
Bury Lane to The Street (West)	A	0	0.0	0	0.0	A	0	0.0	0	0.00
From The Street (East)	A	1096	2.93	0	0.01	A	689	3.76	0	0.01

A key statistic produced by PICADY is the RFC (Reference Flow to Capacity). A value of 0.85 is desirable for all arms of new junctions and indicates that the junction is likely statistically to be under-capacity. In assessing an existing junction, for values below 0.85 a junction is considered to be under-capacity, for values between 0.85 and 1.00 a junction is considered to be approaching capacity, whereas values above 1.00 a junction is considered to be over-capacity.

The results show that the junction is significantly under-capacity in 2019 during the weekday AM peak hour and is slightly under-capacity in the PM peak hour. The queues on the Bury Lane arm in question are small and the delays are less than one minute.

Future operation with construction (2025)

The future operation with construction (2025) has not been considered because there is unlikely to be significant volumes of construction traffic travelling through Hatfield Peverel.

Future operation without scheme in place (2027, 2042)

As the J20a off-slip does not exist with the proposed scheme in place, there is no need to assess the junction without the proposed scheme in place as a comparator.

Future operation with scheme in place (2027, 2042)

The future operation with the proposed scheme in operation has not been considered because the J20a off-slip does not exist with the proposed scheme in place.

F.2.4 Summary

The results show that the junction is significantly under-capacity in 2019 during the weekday AM peak hour and is slightly under-capacity in the PM peak hour.

F.2.5 Annex A

Traffic Flows – Current Operation (2019)

AM Peak

Origin / Destination	The Street (West)	Bury Lane	The Street (East)	Total
The Street (West)	0	0	302	302
Bury Lane	0	0	256	256
The Street (East)	1094	2	0	1096
Total	1094	2	558	1654

PM Peak

Origin / Destination	The Street (West)	Bury Lane	The Street (East)	Total
The Street (West)	0	0	579	579
Bury Lane	0	0	435	435
The Street (East)	687	2	0	689
Total	687	2	1014	1703

HGV Proportions – Current Operations (2019)

AM Peak

Origin / Destination	The Street (West)	Bury Lane	The Street (East)	Average
The Street (West)	0%	0%	8%	3%
Bury Lane	0%	0%	4%	1%
The Street (East)	2%	0%	0%	1%
Average	1%	0%	4%	-

PM Peak

Origin / Destination	The Street (West)	Bury Lane	The Street (East)	Average
The Street (West)	0%	0%	1%	0%
Bury Lane	0%	0%	0%	0%
The Street (East)	1%	0%	0%	0%
Average	0%	0%	0%	-

F.3. A12 junction 20a on-slip: Junction Model Technical Note

F.3.1 Introduction

Overview

The purpose of this technical note is to describe the modelling assessments which have been undertaken at the Junction 20a on-slip as part of the A12 Chelmsford to A120 widening project.

The junction is currently a priority-junction, located around 1km west of Hatfield Peverel. It has two approach major arms (B1137 The Street to the east and B1137 Main Road to west) and one exit-only minor arm (A12 J20a on-slip).

Modelling scenarios

Junction 20a of the A12 has been assessed using the PICADY module within the industry standard junction modelling software Junctions 9. The analysis was performed to assess the current traffic conditions/operations during the weekday morning and evening peak hours.

The following traffic scenarios have been considered for both the AM (07:30-08:30) and PM (17:00 – 18:00) peak hours:

- Current operation scenario (2019) for the existing junction arrangement.

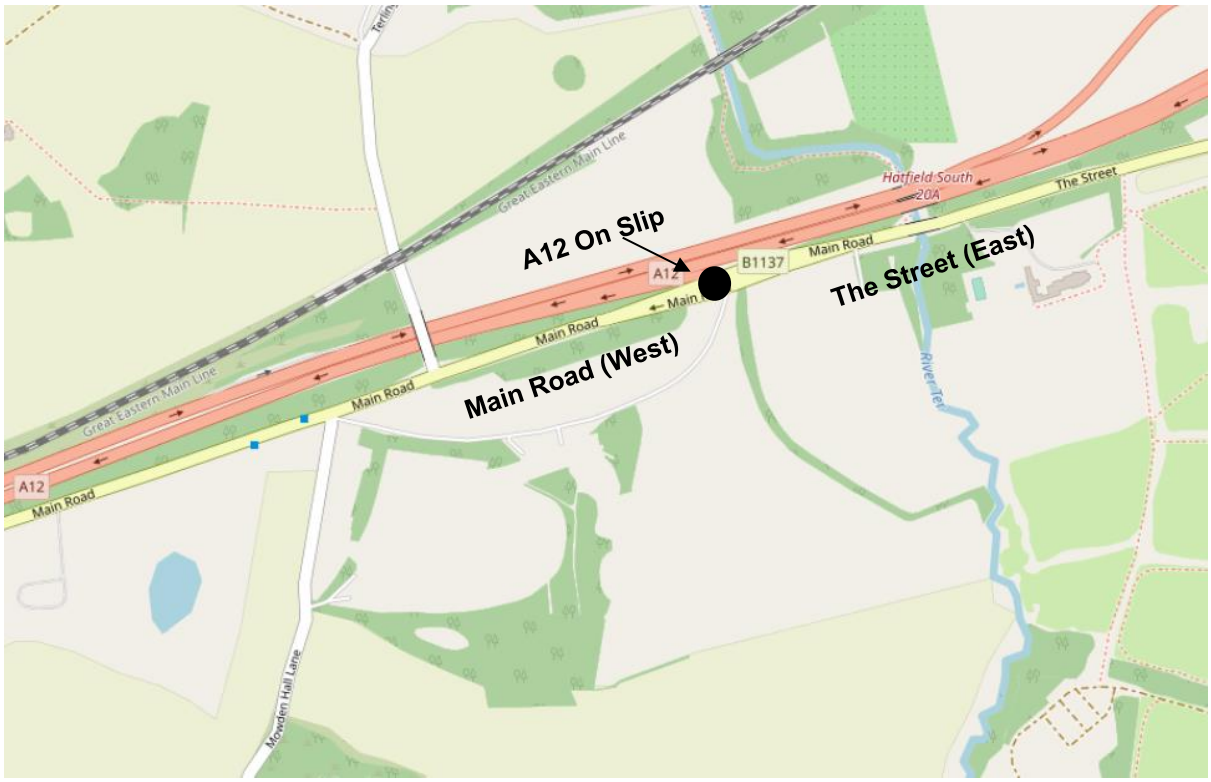
The 2025 Construction scenario has not been considered because there is unlikely to be significant volumes of construction traffic travelling through Hatfield Peverel. Also, this junction was not modelled in the future year scenarios because the J20a on-slip does not exist with the proposed scheme in place.

F.3.2 Model description

Junction location

The J20a on-slip junction (shown in Plate F 3-1) is located approximately one km west of Hatfield Peverel. B1137 The Street and Main Road form the east west major road approach arms of the junction, with A12 J20a on-slip forming an exit only minor arm at the junction. Access to the J20a on-slip is only allowed from The Street via a right turn lane with a kerbed central reserve capable of storing approximately 10 vehicles.

Plate F 3-1: Junction 20a on-slip (Source: Open Street Map)



Key assumptions and input parameters

The PICADY model required several geometric parameters to be measured for the calculation of theoretical capacity. Junction geometric measurements were taken at the junction from AutoCAD drawings and measured in accordance with the PICADY user guide.

PICADY assigns traffic flows for every 15-minute period within the modelled peak hours. Traffic flows and HGV percentages have been extracted from the base year 2019 SATURN model.

Traffic volume has been input as vehicles with a 2.5 PCU factor for Heavy Goods Vehicles used.

The right-turning vehicles from The Street arm onto the A12 J20a on-slip gives way to considerably lower volumes of through traffic from Main Road (west arm). As this movement will be used by regular commuters who will become familiar with there being low volumes of traffic to give way to and with good visibility straight ahead, the capacity of this right turn lane is likely to be slightly higher than the empirically calculated capacity. An intercept correction of +100PCU/hr has therefore been applied to the right turn movement to enable realistic results to be produced.

Traffic data

A bespoke traffic model has been developed for the appraisal of the proposed scheme using industry standard SATURN software, for which further details can be found in the Combined Modelling and Appraisal report. The outputs from the strategic model formed the basis for the inputs into the junction modelling, using the Origin-Destination table function which synthesizes a peak within the peak hour. The Base Year (2019) traffic flows, along with HGV proportions, are provided in Annex A.

Traffic entering the A12 J20a on-slip from The Street is significantly higher in the weekday AM peak hour than the PM peak hour. Traffic flows towards The Street from Main Road is significantly higher in the weekday PM peak hour than the AM peak hour. This indicates the likely presence of commuting traffic.

F.3.3 Junction modelling results

Current operation (2019)

The results of the junction modelling are presented in Table F 3-1.

Table F 3-1: Results for A12 Junction 20a on-slip PICADY model

	AM					PM				
Movements	**Max LOS**	**Average Demand (PCU/hr)**	**Max. Delay (s)**	**Max Queue (PCU)**	**Max RFC**	**Max LOS**	**Average Demand (PCU/hr)**	**Max. Delay (s)**	**Max Queue (PCU)**	**Max RFC**
From A12 On-slip	A	0	0	0	0	A	0	0	0	0
From The Street (E)	E	1094	47.84	10	0.93	B	687	10.20	1	0.55

A key statistic produced by PICADY is the RFC (Reference Flow to Capacity). A value of 0.85 is desirable for all arms of new junctions and indicates that the junction is likely statistically to be under-capacity. In assessing an existing junction, for values below 0.85 a junction is considered to be under-capacity, for values between 0.85 and 1.00 a junction is considered to be approaching capacity, whereas for values above 1.00 a junction is considered to be over-capacity.

The results show that the junction is slightly under-capacity in 2019 during the weekday AM peak hour and is significantly under-capacity in the PM peak hour, with the queue of right turning vehicles able to be accommodated within the storage space available.

Future operation with construction (2025)

The future operation with construction (2025) has not been considered because there is unlikely to be significant volumes of construction traffic travelling through Hatfield Peverel.

Future operation without scheme in place (2027, 2042)

As the J20a off-slip does not exist with the proposed scheme in place, there is no need to assess the junction without the proposed scheme in place as a comparator.

Future operation with scheme in place (2027, 2042)

The future operation with the proposed scheme in operation has not been considered because the J20a off-slip does not exist with the proposed scheme in place.

F.3.4 Summary

The results show that the junction is slightly under-capacity in 2019 during the weekday AM peak hour and is significantly under-capacity in the PM peak hour.

F.3.5 Annex A

Traffic Flows – Current Operation (2019)

AM Peak

Origin / Destination	Main Road (West)	A12 On-slip	The Street (East)	Total
Main Road (West)	0	0	302	302
A12 On-slip	0	0	0	0
The Street (East)	356	738	0	1094
Total	356	738	302	1396

PM Peak

Origin / Destination	Main Road (West)	A12 On-slip	The Street (East)	Total
Main Road (West)	0	0	579	579
A12 On-slip	0	0	0	0
The Street (East)	292	395	0	687
Total	292	395	579	1266

HGV Proportions – Current Operations (2019)

AM Peak

Origin / Destination	Main Road (West)	A12 On-slip	The Street (East)	Average
Main Road (West)	0%	0%	8%	3%
A12 On-slip	0%	0%	0%	0%
The Street (East)	4%	1%	0%	2%
Average	1%	0%	3%	-

PM Peak

Origin / Destination	Main Road (West)	A12 On-slip	The Street (East)	Average
Main Road (West)	0%	0%	1%	0%
A12 On-slip	0%	0%	0%	0%
The Street (East)	1%	1%	0%	1%
Average	0%	0%	0%	-

F.4. A12 junction 21 (existing): Junction Model Technical Note

F.4.1 Introduction

Overview

The purpose of this technical note is to describe the modelling assessments which have been undertaken at Junction 21 as part of the A12 Chelmsford to A120 widening project. The junction is currently a priority-junction, located south-west of Witham.

Modelling scenarios

Junction 21 of the A12 has been assessed using the PICADY module within the industry standard junction modelling software Junctions 9. The analysis was performed to assess the current traffic conditions/operations during the weekday morning and evening peak hours.

The following traffic scenarios have been considered for AM (07:30-08:30), IP (12:00-13:00) and PM (17:00 – 18:00) peak hours:

- Construction scenario (2025, the peak year of construction) for the existing junction arrangement.

The current operation of the existing junction layout, together with those for the future situation without the proposed scheme in place, has not been considered because the number of right turners is expected to be minimal. Any traffic which does turn right at this junction is either making a U-turn back onto the A12, or visiting the local animal kennels just off the B1389 and therefore the level of traffic is not expected to be significant.

Assessments for the future situation with the proposed scheme in place have been modelled using VISSIM and are discussed in separate technical notes included within the Transport Assessment report.

F.4.2 Model description

Junction location

The location of the A12 Junction 21 is shown in Plate F 4-1, south west of Witham. The major road is the B1389 Hatfield Road which is divided into two to form the on-slip and off-slip to / from the A12 towards Hatfield Peverel. A right turn lane, capable of storing approximately 6 vehicles, is present to allow north-eastbound traffic to turn right into local businesses located on the east side of Hatfield Road.

Plate F 4-1: Junction 21 (Source: Open Street Map)

Key assumptions and input parameters

The PICADY model required several geometric parameters to be measured for the calculation of theoretical capacity. Junction geometric measurements were taken at the junction from AutoCAD drawings and measured in accordance with the PICADY user guide.

PICADY assigns traffic flows for every 15-minute period within the modelled peak hours. Traffic flows and HGV percentages have been extracted from the base year 2019 SATURN model.

Traffic volume has been input as vehicles with a 2.5 PCU factor for Heavy Goods Vehicles used.

Traffic data

A bespoke traffic model has been developed for the appraisal of the proposed scheme using industry standard SATURN software, for which further details can be found in the Combined Modelling and Appraisal report. The outputs from the strategic model formed the basis for the inputs into the junction modelling, using the Origin-Destination table function which synthesizes a peak within the peak hour.

The construction year (2025) traffic flows, along with HGV proportions, are provided in Annex A. As part of the construction strategy, construction compounds and borrow pits will be located adjacent to the A12. A consequence of this is that the right turn lane at J21 would be used by construction vehicles to perform U-turns to access the construction compounds and / or borrow pits.

The vast majority of the traffic flows at the junction are along Hatfield Road from Witham towards Hatfield Peverel and the A12, with the highest flow observed in the weekday AM peak hours. As mentioned above, there is minimal non-construction traffic using the right turn lane to access the businesses on the east side of Hatfield Road, and there is only a small amount of construction traffic performing U-turns.

F.4.3 Junction modelling results

Current operation (2019)

The current operation of the existing junction layout has not been considered because the number of right turners is minimal.

Future operation with construction (2025)

The results of the junction modelling are presented in Table F 4-1.

A key statistic produced by PICADY is the RFC (Reference Flow to Capacity). A value of 0.85 is desirable for all arms of new junctions and indicates that the junction is likely statistically to be under-capacity. In assessing an existing junction, for values below 0.85 a junction is considered to be under-capacity, for values between 0.85 and 1.00 a junction is considered to be approaching capacity, whereas for values above 1.00 a junction is considered to be over-capacity.

Table F 4-1: Results for A12 Junction 21 PICADY model

	AM					IP					PM				
Movements	**Max LOS**	**Average Demand (PCU/hr)**	**Max. Delay (s)**	**Max Queue (PCU)**	**Max RFC**	**Max LOS**	**Average Demand (PCU/hr)**	**Max. Delay (s)**	**Max Queue (PCU)**	**Max RFC**	**Max LOS**	**Average Demand (PCU/hr)**	**Max. Delay (s)**	**Max Queue (PCU)**	**Max RFC**
Right turn lane from Hatfield Road (West)	B	146	13.48	1	0.38	C	22	19.26	0.3	0.11	B	168	12.95	1	0.40
From Hatfield Road (East)	0	1424	0	0	0	0	749	0	0	0	0	1112	0	0	0

The results show that the junction operates satisfactorily in 2025 with construction traffic during weekday AM, IP and PM peak hours with minimal queues/delays.

Future operation without scheme in place (2027, 2042)

The operation of the existing junction layout without the proposed scheme in place has not been considered because the number of right turners is likely to be minimal i.e. only those accessing the small number of businesses to the east of Hatfield Road.

Future operation with scheme in place (2027, 2042)

The operation of the existing junction layout with the proposed scheme in place has been modelled using VISSIM and is discussed in a separate technical note.

F.4.4 Summary

The junction operates satisfactorily in 2025, the peak year of construction.

F.4.5 Annex A

Traffic Flows – Without Scheme + Construction (2025)

AM Peak

Origin / Destination	Hatfield Road (West)	B1389	Hatfield Road (East)	Total
Hatfield Road (West)	0	0	0	0
B1389	146	0	0	146
Hatfield Road (East)	1424	0	0	1424
Total	1570	0	0	1570

IP Peak

Origin / Destination	Hatfield Road (West)	B1389	Hatfield Road (East)	Total
Hatfield Road (West)	0	0	0	0
B1389	22	0	0	22
Hatfield Road (East)	749	0	0	749
Total	771	0	0	771

PM Peak

Origin / Destination	Hatfield Road (West)	B1389	Hatfield Road (East)	Total
Hatfield Road (West)	0	0	0	0
B1389	168	0	0	168
Hatfield Road (East)	1112	0	0	1112
Total	1280	0	0	1280

HGV Proportions – Without Scheme + Construction (2025)

AM Peak

Origin / Destination	Hatfield Road (West)	B1389	Hatfield Road (East)	Average
Hatfield Road (West)	0%	0%	0%	0%
B1389	2%	0%	0%	1%
Hatfield Road (East)	1%	0%	0%	0%
Average	1%	0%	0%	-

IP Peak

Origin / Destination	Hatfield Road (West)	B1389	Hatfield Road (East)	Average
Hatfield Road (West)	0%	0%	0%	0%
B1389	100%	0%	0%	33%
Hatfield Road (East)	5%	0%	0%	2%
Average	35%	0%	0%	-

PM Peak

Origin / Destination	Hatfield Road (West)	B1389	Hatfield Road (East)	Average
Hatfield Road (West)	0%	0%	0%	0%
B1389	3%	0%	0%	1%
Hatfield Road (East)	1%	0%	0%	0%
Average	1%	0%	0%	-

F.5. A12 junction 21 (proposed): Junction Model Technical Note

F.5.1 Introduction

Overview

The purpose of this technical note is to describe the modelling assessment which has been undertaken for junction 21 on the A12 as part of the A12 Chelmsford to A120 widening project.

The new junction 21 will be constructed to the west of the existing junction 21 between Hatfield Peverel and Witham. The existing junction 21 and junction 20a will be removed, whilst the existing bridge structure at junction 20b will be maintained and used as part of the new junction 21 layout. The new junction 21 will consist of a two-dumbbell roundabout arrangement with a bridge link connecting the two dumbbells positioned either side of the A12 mainline carriageway.

Junction Location

The new junction 21 will be positioned between the existing junction 21 and junction 20b locations. The new junction will consist of a two-dumbbell roundabout arrangement with a bridge link connecting the two dumbbells positioned either side of the realigned A12 carriageway.

The northern dumbbell at junction 21 will provide on/off slips to and from the A12 northbound carriageway. Traffic from Hatfield Peverel will approach this roundabout via the bridge over the A12 mainline carriageway at the existing junction 20b. Traffic from Witham will access the roundabout via a new link road which will follow the alignment of the existing B1389 road.

As well as allowing traffic to access the A12, the northern dumbbell will also provide a non-strategic traffic route between Hatfield Peverel/Maldon and Witham.

The southern dumbbell at junction 21 will provide on/off slips to and from the A12 southbound carriageway.

F.5.2 Model Description

Modelled Scenarios

Junction 21 has been assessed using the industry standard Vissim software. The analysis was performed to assess the operation of the proposed new junction, based upon the design presented for the Development Consent Order (DCO). The following traffic scenarios have been modelled for the AM (07:30-08:30hr) and PM (17:00-18:00hr) peak periods:

- Future operation with scheme 2027
- Future operation with scheme 2042

Vissim Model Extents

The extents of the Vissim model are shown in

Plate F 5-1 and greater detail of the junction 21 dumbbells is shown in Plate F 5-2. Whilst the B1137 The Street/Maldon Road junction is included within the Vissim model extents, the performance of this junction is presented in a separate Technical Note.

Details of the junctions included in the model are described in Table F 5-1.

Plate F 5-1: Junction 21 Vissim Model Extents

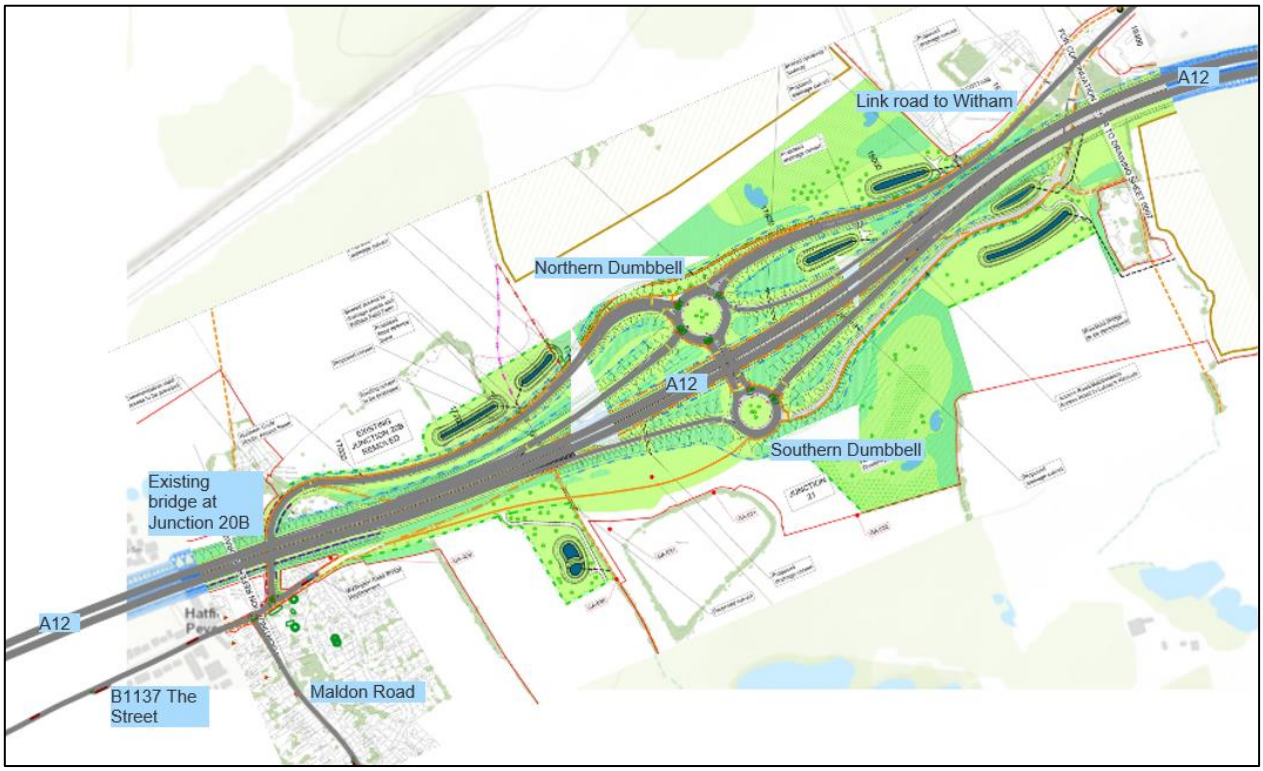


Plate F 5-2: Junction 21 Dumbbell Roundabouts

Table F 5-1: Vissim Model Junctions

Junction	Control type	Entry Arms	Junction Description
Northern Dumbbell	Priority control	A12 NB off-slip	New roundabout Design submitted at DCO
		Link road to Hatfield Peverel and Maldon	
		Link road to Witham	
		A12 NB on-slip	
		Bridge over A12	
Southern Dumbbell	Priority control	A12 SB off-slip	New roundabout Design submitted at DCO
		A12 SB on-slip	
		Bridge over A12	

F.5.3 Key Assumptions & Input Parameters

The Vissim models have been developed based upon the modelling approach set out in Appendix E of the Transport Assessment. In addition, specific assumptions and parameters associated with junction 21 have also been included in the models and these are discussed below.

Public Transport

Bus stops, routes, and associated bus stopping times have been input for bus services 71, 73, 505 and 676. The bus stops are concentrated on the B1137 The Street and Maldon Road.

Whilst considering the new layout and location of junction 21 and based upon the existing routes of these bus services, it is assumed that bus services 71 and 676 will run between the B1137, through the northern dumbbell and onto the existing B1389 road/ link road to Witham. Services 73 and 505 are assumed to travel between the B1137 The Street and Maldon Road.

The bus routes have been included in the 2027 and 2042 future operation with scheme models and are identifiable by the orange route marker in Plate F 5-3 and 5-4 below.

Plate F 5-3: Route for Bus Services 71 & 676

Plate F 5-4: Route for Bus Services 73 & 505

None of the bus services are anticipated to travel through the southern dumbbell or across the bridge link between the two dumbbells. The bus routes have been included in both the future operation with scheme (2027 and 2042)

F.5.4 Traffic Data

Future Operation with Scheme

A strategic traffic model has been developed for the appraisal of the A12 scheme using industry standard SATURN software, further details of this can be found in the ComMA report. The AM and PM peak traffic outputs from the SATURN model have been used as the vehicle inputs for the Vissim modelling. These can be found in full in Annex A.

A cordon of the strategic model was made which matched the Vissim model network. Traffic flows were then extracted from the strategic model. The Total and HGV flows from the cordon SATURN models are shown below in Table F 5-1. These flows include A12 traffic which passes through on the A12 mainline without using junction 21. The volume of vehicles using the dumbbells at junction 21 are provided in the modelling results tables.

Table F 5-1 Total Cordoned Flow from SATURN Model (Vehicles)

Scenario	AM Peak		PM Peak	
	Total	HGV	Total	HGV
With Scheme 2027	9,872	465	10,513	287
With Scheme 2042	10,898	511	11,829	340

F.5.5 Junction Modelling Outputs

Vissim Error & Warning Messages

Ten model simulation runs were carried out for each model scenario and peak period. There were no warnings or errors reported for the 2027 and 2042 AM peak models

The Vissim outputs illustrated two minor warnings for the PM peak models. Three vehicles did not enter the modelled network in the 2027 PM peak model and seven vehicles did not enter the modelled network in the 2042 PM peak model. In both instances, this was not due to the blocking back of traffic in the model (queueing preventing vehicles from entering the model) and these numbers of 'missing' vehicles is not considered significant.

Vissim Model Outputs

The Vissim outputs presented include a Level of Service (LOS) category for each junction approach arm as well as for the junction as a whole. LOS is based upon average vehicle delay and can be used as a guide for how well the junction operates. Table F 5-1 shows the categories used in the LOS calculation.

Table F 5-2 Level of Service Categories

LOS	Signalised Junction Delay (s/veh)	Priority Junction Delay (s/veh)	Description of Traffic Operation
A	≤10 sec	≤10 sec	Highly stable, free-flow condition with little or no congestion.
B	10–20 sec	10–15 sec	Stable, free-flow condition with little congestion.
C	20–35 sec	15–25 sec	Stable flow condition, with moderate congestion.
D	35–55 sec	25–35 sec	Less stable Approaching unstable condition with increasing congestion.
E	55–80 sec	35–50 sec	Unstable flow condition, volume at or slightly over capacity, considerable delays.
F	>80 sec	>50 sec	Forced flow condition, volumes exceed capacity; long delays with stop-and-go traffic.

Vehicle delay is presented in seconds and queue length results have also been collected from the models in five-minute intervals. The results presented for each model show the average queue length for the peak hour models, as well as the average of the maximum queue length output.

F.5.6 Junction Modelling Results

Future Operation with Scheme (2027, 2042)

The LOS, delay, and queue length results of the Vissim junction modelling are presented in Table F 5-2 and Table F 5-3.

Table F 5-2: Vissim Outputs 2027 Future Operations with Scheme

Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Northern Dumbbell	A12 NB off-slip	Priority	A	680	5	2	21	A	1434	6	4	34
	Link road from Hatfield Peverel	Priority	A	975	7	4	33	B	842	14	14	59
	Link road from Witham	Priority	C	1052	16	12	54	B	769	10	4	34
	Bridge over A12	Priority	A	411	2	0	12	A	340	2	0	7
	Total	**Priority**	**A**	**3118**	**9**	**-**	**-**	**A**	**3385**	**8**	**-**	**-**
Southern Dumbbell	A12 SB off-slip	Priority	C	413	20	8	33	A	340	7	1	16
	Bridge over A12	Priority	A	1214	4	0	6	A	734	2	0	2
	Total	**Priority**	**A**	**1626**	**8**	**-**	**-**	**A**	**1074**	**4**	**-**	**-**

Table F 5-3: Vissim Outputs 2042 Future Operations with Scheme

Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Northern Dumbbell	A12 NB off-slip	Priority	A	702	5	2	22	A	1445	7	6	36
	Link road from Hatfield Peverel	Priority	A	1104	8	5	40	E	1004	40	90	161
	Link road from Witham	Priority	C	1161	24	24	72	B	881	15	9	44
	Bridge over A12	Priority	A	458	2	0	14	A	425	2	0	9
	Total	**Priority**	**B**	**3425**	**12**	**-**	**-**	**C**	**3754**	**17**	**-**	**-**
Southern Dumbbell	A12 SB off-slip	Priority	C	457	21	9	35	A	426	7	2	19
	Bridge over A12	Priority	A	1228	4	0	4	A	785	2	0	2
	Total	**Priority**	**A**	**1685**	**8**	**-**	**-**	**A**	**1211**	**4**	**-**	**-**

Plate F 5-5 and Plate F 5-6 below illustrate the 2042 average queue lengths on each approach to the northern and southern dumbbells at junction 21 for the AM and PM peaks respectively. The average queue lengths are identifiable by the red blocks and the queue length distance is also reported (m).

Plate F 5-5: 2042 AM Peak with Scheme Average Queue Lengths

The longest average queue length during the 2042 AM peak simulation runs can be found on the link road from Witham approach to the northern dumbbell (24m) which enters the dumbbell from the north east. This equates to a traffic queue of approximately 5 vehicles.

The second longest average queue length can be found on the A12 southbound off-slip approach to the southern dumbbell (9m), which enters the dumbbell from the east. This equates to a traffic queue of approximately 2 vehicles.

The shortest average queue lengths are generally found at the southern dumbbell given there are fewer junction approaches when compared to the northern dumbbell.

Plate F 5-6: 2042 PM Peak with Scheme Average Queue Lengths

The longest average queue length during the 2042 PM peak simulation runs can be found on the link road from Hatfield Peverel/Maldon approach to the northern dumbbell (90m), which enters the dumbbell from the west. This equates to a traffic queue of approximately 16 vehicles.

The second longest average queue length can be found on the link road from Witham approach to the northern dumbbell (9m). This equates to a traffic queue of approximately 2 vehicles.

The shortest average queue lengths can be found at the southern dumbbell (under 2m) given there are fewer junction approaches when compared to the northern dumbbell.

F.5.7 Summary

The Vissim modelling results demonstrate that junction 21 can be anticipated to operate with a LOS A in 2027 during the AM and PM peaks. In 2042, the northern dumbbell can be expected to operate with a LOS B and C in the AM and PM peaks respectively, and the southern dumbbell can be anticipated to operate with a LOS A in both the AM and PM peaks.

Vehicle delay and average traffic queues would be negligible at the southern dumbbell for the 2027 and 2042 AM and PM peak modelled scenarios.

At the northern dumbbell, vehicle delay can be expected to be no greater than 40 seconds and the largest average traffic queues can be anticipated to be 90m (approximately 16 vehicles in length).

Provision at junction 21 is deemed sufficient for the forecasted level of traffic in the operational years of 2027 and 2042.

F.5.8 Annex A

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation with scheme 2027:

AM Peak - Car

Origin / Destination	A12 (N)	Maldon Road	B1137 The Street	A12 (S)	Link road Witham	Gleneagles Way	Total
A12 (N)	0	205	147	3093	43	1	**3489**
Maldon Road	173	0	144	438	36	1	**792**
B1137 The Street	203	133	0	0	75	1	**412**
A12 (S)	2973	123	10	0	538	2	**3646**
Link road Witham	99	69	113	760	0	2	**1043**
Gleneagles Way	4	5	2	12	2	0	**25**
Total	**3452**	**535**	**416**	**4303**	**694**	**7**	**9407**

AM Peak - HGV

Origin / Destination	A12 (N)	Maldon Road	B1137 The Street	A12 (S)	Link road Witham	Gleneagles Way	Total
A12 (N)	0	3	16	225	2	0	**246**
Maldon Road	5	0	1	0	3	0	**9**
B1137 The Street	15	2	0	0	3	0	**20**
A12 (S)	174	4	0	0	5	0	**183**
Link road Witham	1	1	1	4	0	0	**7**
Gleneagles Way	0	0	0	0	0	0	**0**
Total	**195**	**10**	**18**	**229**	**13**	**0**	**465**

PM Peak – Car

Origin / Destination	A12 (N)	Maldon Road	B1137 The Street	A12 (S)	Link road Witham	Gleneagles Way	Total
A12 (N)	0	153	141	2969	45	3	**3311**
Maldon Road	294	0	143	195	55	4	**691**
B1137 The Street	189	134	0	0	86	1	**410**
A12 (S)	3602	456	0	0	969	13	**5040**
Link road Witham	82	46	97	533	0	3	**761**
Gleneagles Way	2	3	1	5	2	0	**13**
Total	**4169**	**792**	**382**	**3702**	**1157**	**24**	**10226**

PM Peak - HGV

Origin / Destination	A12 (N)	Maldon Road	B1137 The Street	A12 (S)	Link road Witham	Gleneagles Way	Total
A12 (N)	0	1	2	123	0	0	**126**
Maldon Road	2	0	3	0	1	0	**6**
B1137 The Street	3	3	0	0	1	0	**7**
A12 (S)	139	0	0	0	5	0	**144**
Link road Witham	1	0	0	3	0	0	**4**
Gleneagles Way	0	0	0	0	0	0	**0**
Total	**145**	**4**	**5**	**126**	**7**	**0**	**287**

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation with scheme 2042:

AM Peak - Car

Origin / Destination	A12 (N)	Maldon Road	B1137 The Street	A12 (S)	Link road Witham	Gleneagles Way	Total
A12 (N)	0	242	133	3362	64	1	**3802**
Maldon Road	198	0	149	435	37	1	**820**
B1137 The Street	285	100	0	0	94	2	**481**
A12 (S)	3409	138	28	0	527	2	**4104**
Link road Witham	165	81	131	776	0	2	**1155**
Gleneagles Way	4	5	2	12	2	0	**25**
Total	**4061**	**566**	**443**	**4585**	**724**	**8**	**10387**

AM Peak - HGV

Origin / Destination	A12 (N)	Maldon Road	B1137 The Street	A12 (S)	Link road Witham	Gleneagles Way	Total
A12 (N)	0	4	18	256	3	0	**281**
Maldon Road	5	0	1	0	3	0	**9**
B1137 The Street	17	0	0	0	3	0	**20**
A12 (S)	182	7	0	0	5	0	**194**
Link road Witham	1	1	1	4	0	0	**7**
Gleneagles Way	0	0	0	0	0	0	**0**
Total	**205**	**12**	**20**	**260**	**14**	**0**	**511**

PM Peak - Car

Origin / Destination	A12 (N)	Maldon Road	B1137 The Street	A12 (S)	Link road Witham	Gleneagles Way	Total
A12 (N)	0	174	175	3521	77	3	**3950**
Maldon Road	334	0	150	186	55	4	**729**
B1137 The Street	308	136	0	0	110	2	**556**
A12 (S)	3927	461	0	0	968	13	**5369**
Link road Witham	122	49	108	589	0	3	**871**
Gleneagles Way	2	3	2	5	2	0	**14**
Total	**4693**	**823**	**435**	**4301**	**1212**	**25**	**11489**

PM Peak - HGV

Origin / Destination	A12 (N)	Maldon Road	B1137 The Street	A12 (S)	Link road Witham	Gleneagles Way	Total
A12 (N)	0	1	2	167	0	0	**170**
Maldon Road	2	0	4	0	1	0	**7**
B1137 The Street	4	0	0	0	1	0	**5**
A12 (S)	149	0	0	0	6	0	**155**
Link road Witham	1	0	0	2	0	0	**3**
Gleneagles Way	0	0	0	0	0	0	**0**
Total	**156**	**1**	**6**	**169**	**8**	**0**	**340**

F.6. A12 junction 22: Junction Model Technical Note

F.6.1 Introduction

Overview

The purpose of this technical note is to describe the modelling assessment which has been undertaken for junction 22 on the A12 as part of the A12 Chelmsford to A120 widening project.

The new junction 22 layout will be constructed close to the current location of junction 22, located between Witham, Rivenhall End and Little Braxted in the county of Essex. It will consist of a two-dumbbell roundabout arrangement with a bridge link connecting the two dumbbells positioned either side of the realigned A12 mainline carriageway. The dumbbell positioned to the west of the A12 carriageway will provide a new dual carriageway link road to a newly configured Colchester Road/Eastways junction in Witham.

Junction Location

Junction 22 currently consists of slip roads on/off the A12 mainline which connect to Colemans Bridge and Colchester Road. The existing bridge provides access between Witham and Little Braxted as well as providing access between the A12 northbound and southbound on/off slips.

The new junction layout will be constructed close to this location and will consist of a two-dumbbell roundabout arrangement with a bridge link connecting the two dumbbells positioned either side of the realigned A12 carriageway. A new bridge structure will be constructed between the dumbbells and the existing Colemans Bridge will be removed. Little Braxted Lane will also be realigned and will connect to the dumbbell positioned to the east of the A12 mainline.

The western dumbbell at junction 22 will provide a new dual carriageway link road to a newly configured Colchester Road/Eastways junction in Witham. This Eastways junction will be realigned to create a more compact junction with traffic signal control, including Toucan crossing facilities. This junction has been included in the junction 22 Vissim model as the junction approaches feed vehicular traffic into the modelled network. However, the main analysis of the Eastways junction is presented in a separate technical note *Eastways (near J22) DCO junction modelling results.*

F.6.2 Model Description

Modelled Scenarios

Junction 22 has been assessed using the industry standard Vissim software. The analysis was performed to assess the operation of the proposed new junction, based upon the design presented for the Development Consent Order (DCO). The following traffic scenarios have been modelled for the AM (07:30-08:30hr) and PM (17:00-18:00hr) peak hours:

- Future operation with scheme 2027
- Future operation with scheme 2042

Vissim Model Extents

The extents of the Vissim model are shown in Plate F 6-1 and greater detail of the junction 22 dumbbells is shown in Plate F 6-2. Details of the junctions included in the model are described in Table F 6-1.

Plate F 6-1: Junction 22 Vissim Model Extents

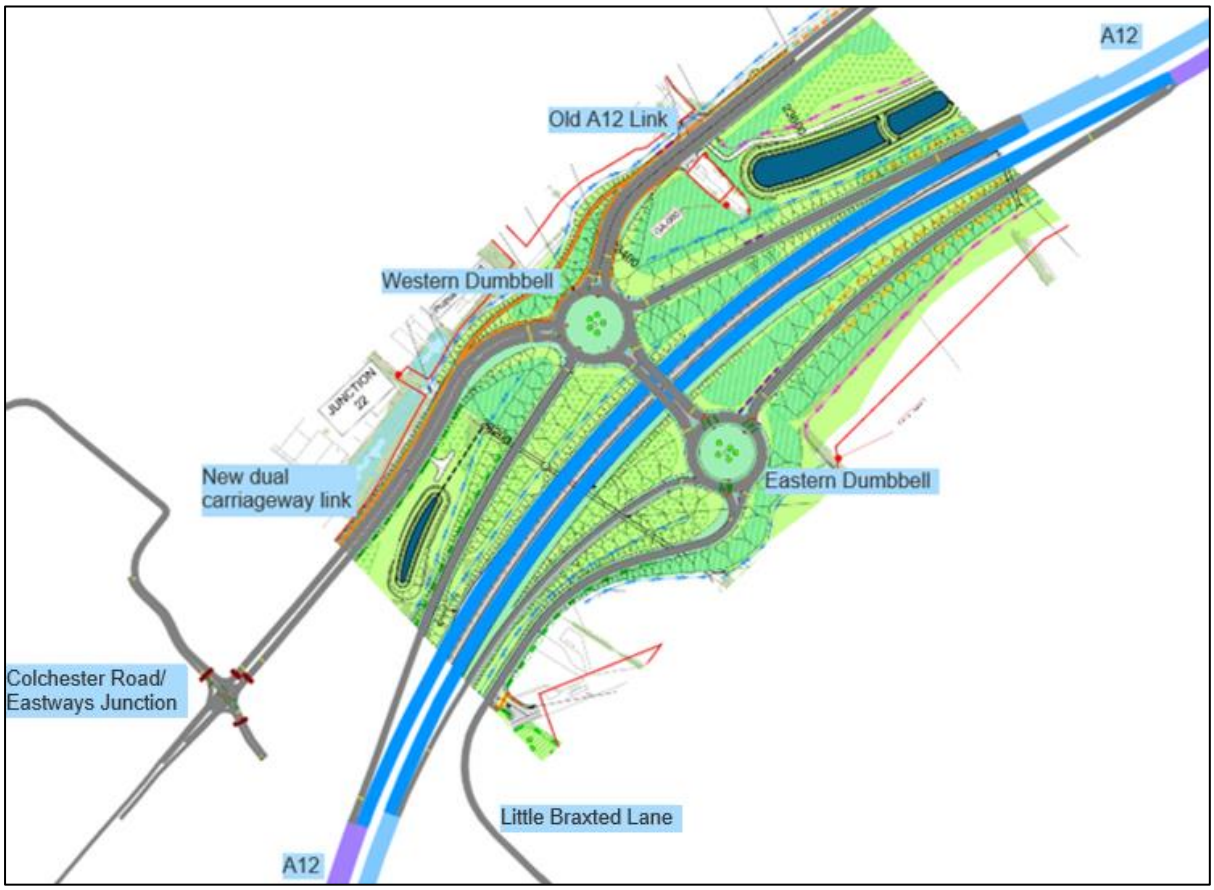


Plate F 6-2: Junction 22 Dumbbell Roundabouts

Table F 6-1: Vissim Model Junctions

Junction	Control type	Entry Arms	Junction Description
Western Dumbbell	Traffic signal control	A12 NB off-slip	New roundabout Design submitted at DCO
		Link road to Colchester Road / Eastways junction	
		Old A12 link road	
		A12 NB on-slip	
		Bridge over A12	
Eastern Dumbbell	Priority control	A12 SB off-slip	New roundabout Design submitted at DCO
		Little Braxted Lane	
		A12 SB on-slip	
		Bridge over A12	

F.6.3 Key Assumptions & Input Parameters

The Vissim models have been developed based upon the modelling approach set out in Appendix E of the Transport Assessment. In addition, specific assumptions and parameters associated with junction 22 have also been included in the models. These are discussed below.

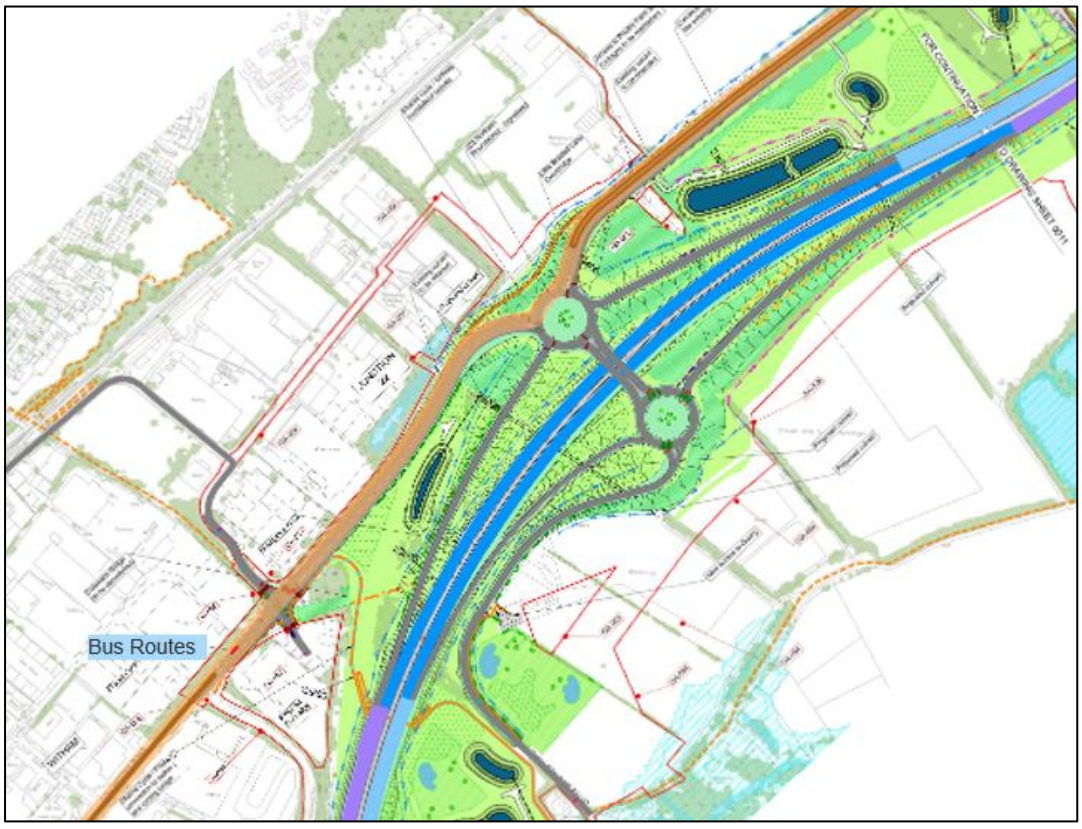
Public Transport

Bus routes and associated bus stopping times have been input for bus services 71, 91, 505 and 525. Whilst considering the new layout of junction 22 and based upon the existing routes of these bus services, it is assumed that these bus services will run between Colchester Road, to the western dumbbell and the old A12 link road.

Services 71 and 91 are also likely to operate in the opposite direction of travel as they do currently, from the old A12 link road through the western dumbbell and along Colchester Road.

None of the bus services are assumed to travel through the eastern dumbbell or across the bridge link between the two dumbbells given that the services don't currently travel to the eastern side of the existing junction 22. The bus routes have been included in the 2027 and 2042 future operation with scheme models and are identifiable by the orange route marker in Plate F 6-3.

Plate F 6-3: Modelled Bus Routes



Signal Timings for the Western Dumbbell

Fixed signal timings have been developed in Vissim for the western dumbbell of junction 22. These have been developed as high-level concept designs and they do not constitute detailed signal design.

The overall signal cycle time for the western dumbbell has been modelled as 66 seconds and the traffic-to-traffic intergreen times have been assumed to be 6 seconds for all models.

F.6.4 Traffic Data

Future Operation with Scheme

A strategic traffic model has been developed for the appraisal of the A12 scheme using industry standard SATURN software, further details of this can be found in the ComMA report. The AM and PM peak traffic outputs from the SATURN model have been used as the vehicle inputs for the Vissim modelling. These can be found in full in Annex A.

A cordon of the strategic model was made which matched the Vissim model network. Traffic flows were then extracted from the strategic model. The Total and HGV flows from the cordon SATURN models are shown below in Table F 6-2. These flows include A12 traffic which passes through on the A12 mainline without using junction 22. The volume of vehicles using the dumbbells at junction 22 are provided F.10.5in the modelling results tables.

Table F 6-2: Total Cordoned Flow from SATURN Model (Vehicles)

Scenario	AM Peak		PM Peak	
	Total	HGV	Total	HGV
With Scheme 2027	9,422	513	9,984	306
With Scheme 2042	10,626	565	11,367	366

F.6.5 Junction Modelling Outputs

Vissim Error & Warning Messages

Ten model simulation runs were carried out for each model scenario and peak hour. There were no warnings or errors reported for the 2027 and 2042 AM peak models, however the Vissim outputs illustrated warnings for the PM peak models.

In relation to the Colchester Road zone, thirteen vehicles were not able to enter the modelled network in the 2027 PM peak model in one simulation run. Forty-eight vehicles were not able to enter the modelled network in the 2042 PM peak model across five of the simulation runs. In both instances, this was the result of traffic queueing on the Colchester Road approach to the Eastways junction, with the queue extending back to the vehicle input.

Vissim Model Outputs

The Vissim outputs presented include a Level of Service (LOS) category for each arm as well as for the junction as a whole. LOS is based upon average vehicle delay and can be used as a guide for how well the junction operates. Table F 6-3 shows the categories used in the LOS calculation.

Table F 6-3: Level of Service Categories

LOS	Signalised Junction Delay (s/veh)	Priority Junction Delay (s/veh)	Description of Traffic Operation
A	≤10 sec	≤10 sec	Highly stable, free-flow condition with little or no congestion.
B	10–20 sec	10–15 sec	Stable, free-flow condition with little congestion.
C	20–35 sec	15–25 sec	Stable flow condition, with moderate congestion.
D	35–55 sec	25–35 sec	Less stable Approaching unstable condition with increasing congestion.
E	55–80 sec	35–50 sec	Unstable flow condition, volume at or slightly over capacity, considerable delays.
F	>80 sec	>50 sec	Forced flow condition, volumes exceed capacity; long delays with stop-and-go traffic.

Vehicle delay is presented in seconds and queue length results have also been collected from the models in five-minute intervals. The results presented for each model show the average queue length for the peak hour models, as well as the average of the maximum queue length output.

F.6.6 Junction Modelling Results

Future Operation with Scheme (2027, 2042)

The LOS, delay, and queue length results of the Vissim junction modelling are presented in Table F 6-4 and Table F 6-5.

Table F 6-4: Vissim Outputs 2027 Future Operations with Scheme

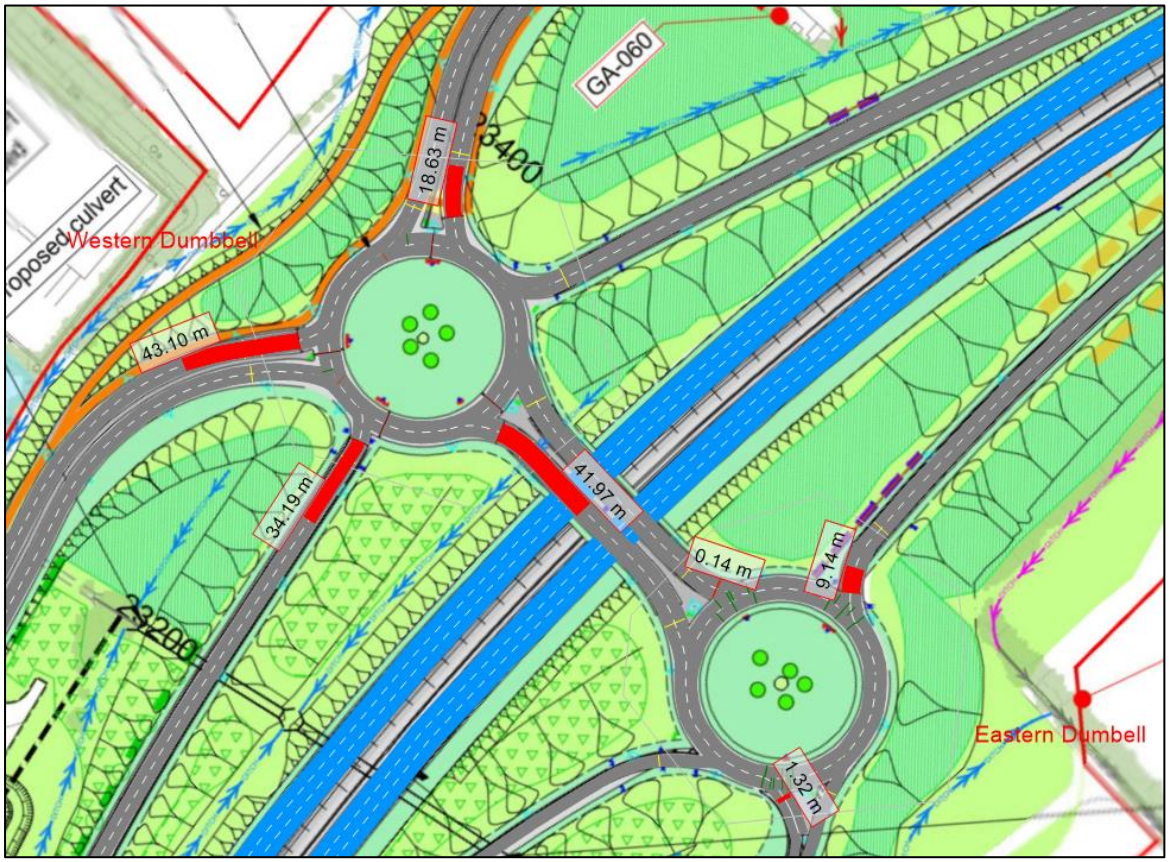
Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Eastern Dumbbell	A12 SB off-slip	Priority	A	788	8	5	34	A	536	8	4	27
	Little Braxted Lane	Priority	B	17	12	0	5	No traffic in Saturn PM model				
	Bridge over A12	Priority	A	729	3	0	4	A	868	3	0	3
	Total	**Priority**	**A**	**1534**	**6**			**A**	**1404**	**5**		
Western Dumbbell	Bridge over A12	Signalised	C	804	31	26	69	C	449	24	10	39
	A12 NB off-slip	Signalised	C	816	29	30	85	C	1002	30	29	80
	Colchester Road	Signalised	C	754	34	27	79	C	1770	24	49	144
	Old A12 Link	Signalised	B	997	20	17	67	D	601	36	23	58
	Total	**Signalised**	**C**	**3371**	**28**			**C**	**3821**	**27**		

Table F 6-5: Vissim Outputs 2042 Future Operations with Scheme

Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Eastern Dumbbell	A12 SB off-slip	Priority	B	903	12	9	44	B	611	10	6	34
	Little Braxted Lane	Priority	C	59	20	1	12	No traffic in Saturn model				
	Bridge over A12	Priority	A	837	4	0	8	A	947	3	0	5
	Total	**Priority**	**A**	**1799**	**9**	**-**	**-**	**A**	**1557**	**6**	**-**	**-**
Western Dumbbell	Bridge over A12	Signalised	D	958	40	42	92	C	505	25	11	45
	A12 NB off-slip	Signalised	C	858	31	34	91	D	1099	37	42	98
	Colchester Road	Signalised	D	866	46	43	99	C	1849	29	65	168
	Old A12 Link	Signalised	B	1050	20	19	71	D	664	49	35	73
	Total	**Signalised**	**C**	**3731**	**34**	**-**	**-**	**C**	**4118**	**34**	**-**	**-**

Plate F 6-4 and Plate F 6-5 below illustrate the 2042 average queue lengths on each approach to the western and eastern dumbbells at junction 22 for the AM and PM peaks respectively. The average queue lengths are identifiable by the red blocks and the queue length distance is also reported (m).

Plate F 6-4: 2042 AM Peak with Scheme Average Queue Lengths

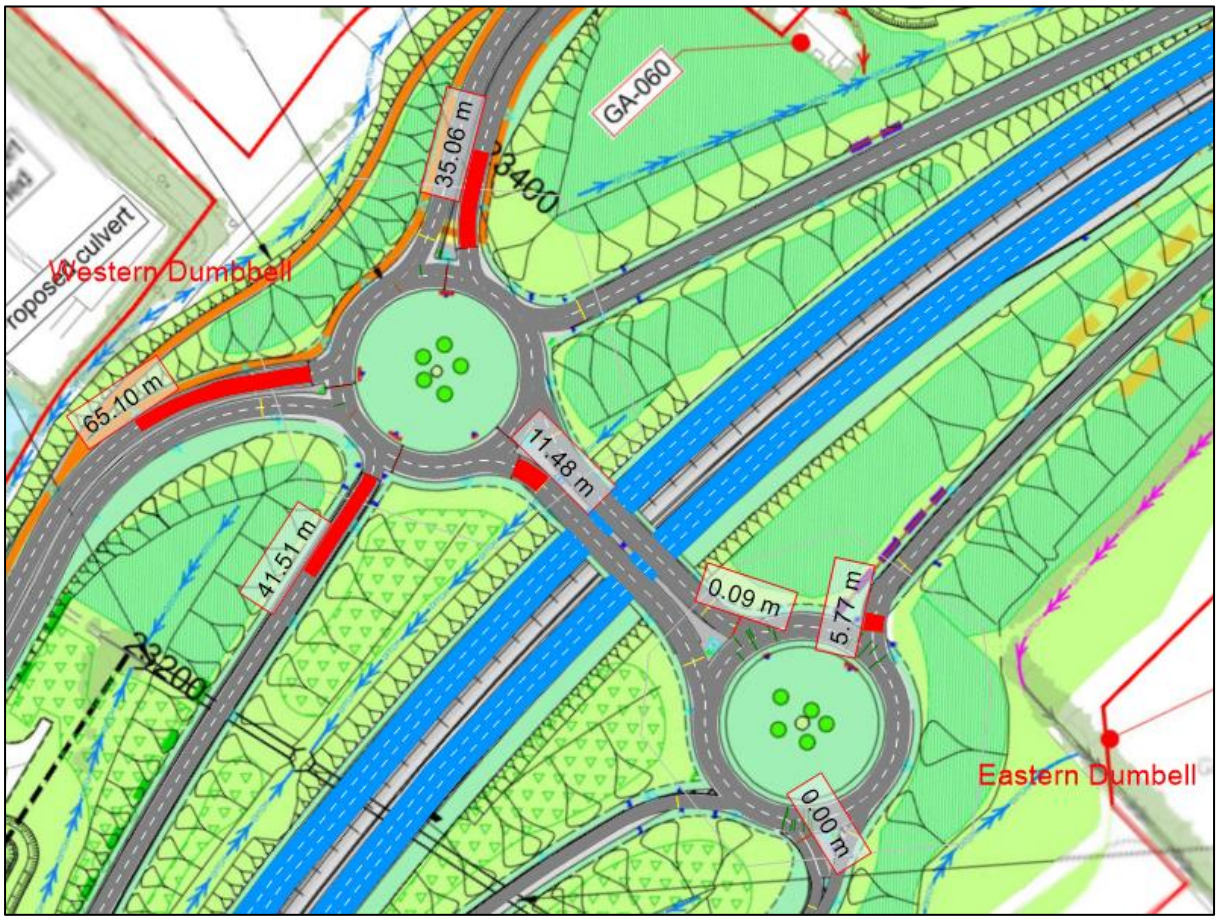


The longest average queue length during the 2042 AM peak simulation runs can be found on the link road approach to the western dumbbell (43m) from Colchester Road/Eastways junction which enters the western dumbbell from the west. This equates to a traffic queue of approximately eight vehicles.

The second longest average queue length can be found on the bridge approach to the western dumbbell (42m), which enters the western dumbbell from the east. This equates to a traffic queue of approximately seven vehicles.

The shortest average queue lengths can be found at the eastern dumbbell (under 10m) given there are fewer junction approaches when compared to the western dumbbell. This results in fewer opposing vehicular movements and traffic can enter the eastern dumbbell at a quicker rate with less delay.

Plate F 6-5: 2042 PM Peak with Scheme Average Queue Lengths



The longest average queue length during the 2042 PM peak simulation runs can be found on the link road approach to the western dumbbell (65m) from Colchester Road/Eastways junction. This equates to a traffic queue of approximately 11 vehicles.

The second longest average queue length can be found on the A12 northbound off-slip approach to the western dumbbell (42m), which enters the western dumbbell from the south. This equates to a traffic queue of approximately seven vehicles.

The shortest average queue lengths can be found at the eastern dumbbell (under 6m) given there are fewer junction approaches when compared to the western dumbbell.

F.6.7 Summary

The Vissim modelling results demonstrate that junction 22 can be anticipated to operate with a LOS of A and C for the eastern and western dumbbells respectively in both the 2027 and 2042 with scheme modelled scenarios.

Vehicle delay and queuing can be expected to be negligible at the eastern dumbbell for the 2027 and 2042 AM and PM peak modelled scenarios.

At the western dumbbell, vehicle delay can be expected to be less than one minute, and the largest average traffic queues can be anticipated to be 65m (approximately 11 vehicles in length). Given that the western dumbbell has signal traffic control, localised queuing on the junction approaches can be anticipated when the approach signal head is on red. Provision at junction 22 is deemed sufficient for the forecasted level of traffic in 2027 and 2042.

F.6.8 Annex A

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation with scheme 2027:

AM Peak - Car

Origin / Destination	A12 (E)	Little Braxted Lane	A12 (W)	Old A12 Link	Colchester Road	Eastways	Trade Park	Total
A12 (E)	0	7	2773	157	506	104	0	**3547**
Little Braxted Lane	12	0	0	0	0	5	0	**17**
A12 (W)	2657	0	0	361	233	200	0	**3451**
Old A12 Link	133	0	550	0	239	62	0	**984**
Colchester Road	362	0	101	106	0	145	0	**714**
Eastways	35	0	68	19	48	1	0	**171**
Trade Park	5	0	5	0	12	3	0	**25**
Total	**3204**	**7**	**3497**	**643**	**1038**	**520**	**0**	**8909**

AM Peak – HGV

Origin / Destination	A12 (E)	Little Braxted Lane	A12 (W)	Old A12 Link	Colchester Road	Eastways	Trade Park	Total
A12 (E)	0	0	232	1	12	4	0	**249**
Little Braxted Lane	0	0	0	0	0	0	0	**0**
A12 (W)	174	0	0	12	6	2	0	**194**
Old A12 Link	6	0	6	0	2	1	0	**15**
Colchester Road	25	0	7	7	0	1	0	**40**
Eastways	8	0	3	3	1	0	0	**15**
Trade Park	0	0	0	0	0	0	0	**0**
Total	**213**	**0**	**248**	**23**	**21**	**8**	**0**	**513**

PM Peak – Car

Origin / Destination	A12 (E)	Little Braxted Lane	A12 (W)	Old A12 Link	Colchester Road	Eastways	Trade Park	Total
A12 (E)	0	81	2460	45	360	31	0	**2977**
Little Braxted Lane	0	0	0	0	0	0	0	**0**
A12 (W)	3191	0	0	742	190	47	0	**4170**
Old A12 Link	166	0	309	0	88	22	0	**585**
Colchester Road	704	0	219	205	0	40	0	**1168**
Eastways	234	0	323	79	112	0	0	**748**
Trade Park	12	0	7	0	11	0	0	**30**
Total	**4307**	**81**	**3318**	**1071**	**761**	**140**	**0**	**9678**

PM Peak - HGV

Origin / Destination	A12 (E)	Little Braxted Lane	A12 (W)	Old A12 Link	Colchester Road	Eastways	Trade Park	Total
A12 (E)	0	0	118	1	13	4	0	**136**
Little Braxted Lane	0	0	0	0	0	0	0	**0**
A12 (W)	138	0	0	6	1	0	0	**145**
Old A12 Link	1	0	3	0	2	1	0	**7**
Colchester Road	7	0	4	2	0	0	0	**13**
Eastways	2	0	2	1	0	0	0	**5**
Trade Park	0	0	0	0	0	0	0	**0**
Total	**148**	**0**	**127**	**10**	**16**	**5**	**0**	**306**

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation with scheme 2042:

AM Peak – Car

Origin / Destination	A12 (E)	Little Braxted Lane	A12 (W)	Old A12 Link	Colchester Road	Eastways	Trade Park	Total
A12 (E)	0	13	3012	252	515	109	0	**3901**
Little Braxted Lane	55	0	0	0	0	6	0	**61**
A12 (W)	3218	0	0	392	222	223	0	**4055**
Old A12 Link	123	0	597	0	248	67	0	**1035**
Colchester Road	393	0	152	108	0	145	0	**798**
Eastways	39	0	74	28	44	1	0	**186**
Trade Park	5	0	5	0	12	3	0	**25**
Total	**3833**	**13**	**3840**	**780**	**1041**	**554**	**0**	**10061**

AM Peak – HGV

Origin / Destination	A12 (E)	Little Braxted Lane	A12 (W)	Old A12 Link	Colchester Road	Eastways	Trade Park	Total
A12 (E)	0	0	263	2	13	4	0	**282**
Little Braxted Lane	0	0	0	0	0	0	0	**0**
A12 (W)	187	0	0	10	6	3	0	**206**
Old A12 Link	7	0	7	0	2	1	0	**17**
Colchester Road	29	0	7	7	0	1	0	**44**
Eastways	9	0	3	3	1	0	0	**16**
Trade Park	0	0	0	0	0	0	0	**0**
Total	**232**	**0**	**280**	**22**	**22**	**9**	**0**	**565**

PM Peak – Car

Origin / Destination	A12 (E)	Little Braxted Lane	A12 (W)	Old A12 Link	Colchester Road	Eastways	Trade Park	Total
A12 (E)	0	99	3034	43	415	36	0	**3627**
Little Braxted Lane	0	0	0	0	0	0	0	**0**
A12 (W)	3617	0	0	829	193	52	0	**4691**
Old A12 Link	188	0	350	0	87	25	0	**650**
Colchester Road	747	0	205	187	0	42	0	**1181**
Eastways	255	10	366	73	118	0	0	**822**
Trade Park	12	0	7	0	11	0	0	**30**
Total	**4819**	**109**	**3962**	**1132**	**824**	**155**	**0**	**11001**

PM Peak – HGV

Origin / Destination	A12 (E)	Little Braxted Lane	A12 (W)	Old A12 Link	Colchester Road	Eastways	Trade Park	Total
A12 (E)	0	0	162	1	14	4	0	**181**
Little Braxted Lane	0	0	0	0	0	0	0	**0**
A12 (W)	148	0	0	7	1	0	0	**156**
Old A12 Link	2	0	3	0	3	1	0	**9**
Colchester Road	7	0	4	2	0	1	0	**14**
Eastways	2	0	2	1	0	1	0	**6**
Trade Park	0	0	0	0	0	0	0	**0**
Total	**159**	**0**	**171**	**11**	**18**	**7**	**0**	**366**

F.7. A12 junction 23: Junction Model Technical Note

F.7.1 Introduction

Overview

The purpose of this technical note is to describe the modelling assessments which have been undertaken at Junction 23 as part of the A12 Chelmsford to A120 widening project. The junction is currently a priority-junction, located south-west of Kelvedon

Modelling scenarios

Junction 23 of the A12 has been assessed using the PICADY module within the industry standard junction modelling software Junctions 9. The analysis has been undertaken to assess the current traffic conditions / operations during the weekday morning and evening peak hours for the following traffic scenarios:

- Construction scenario (2025, the peak year of construction) for the existing junction arrangement.

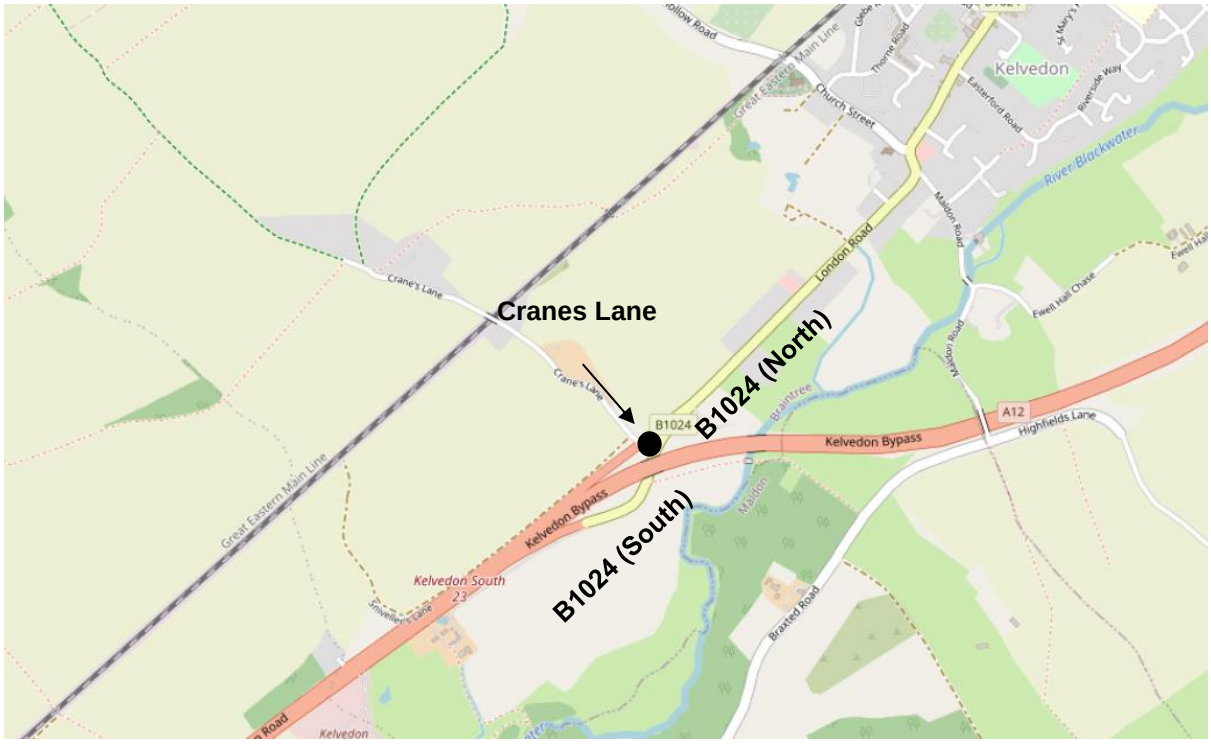
The current operation of the existing junction layout has not been considered because the number of right turners is expected to be minimal, i.e. only those from Cranes Lane (which is a narrow road with only a small number of dwellings located on it) to the A12 southbound. Assessments are not required for the future situation with the proposed scheme in place because the junction is removed.

F.7.2 Model description

Junction location

The location of the A12 Junction 23 is shown in Plate F 7-1and is located south west of Kelvedon. The major road is the B1024 London Road which is divided into two to form the on-slip and off-slip to / from the A12 from Kelvedon. A right turn lane, capable of storing approximately 4 vehicles, is present to allow traffic from the nearby Cranes Lane to turn right onto the A12 towards Witham.

Plate F 7-1: Junction 23 (Source: Open Street Map)



Key assumptions and input parameters

The PICADY model required several geometric parameters to be measured for the calculation of theoretical capacity. Junction geometric measurements were taken at the junction from AutoCAD drawings and measured in accordance with the PICADY user guide.

PICADY assigns traffic flows for every 15-minute period within the modelled peak hours. Traffic flows and HGV percentages have been extracted from the base year 2019 SATURN model.

Traffic volume has been input as vehicles with a 2.5 PCU factor for Heavy Goods Vehicles used.

Traffic data

A bespoke traffic model has been developed for the appraisal of the proposed scheme using industry standard SATURN software, for which further details can be found in the Combined Modelling and Appraisal report. The outputs from the strategic model formed the basis for the inputs into the junction modelling, using the Origin-Destination table function which synthesizes a peak within the peak hour.

The construction year (2025) traffic flows, along with HGV proportions, are provided in Annex A. As part of the construction strategy, construction compounds and borrow pits will be located adjacent to the A12. A consequence of this is that the right turn lane at J23 would be used by construction vehicles to perform U-turns to access the construction compounds and / or borrow pits.

The vast majority of the traffic flows at the junction are along B1024 London Road from Kelvedon towards Witham / the A12 (and vice versa), with the highest flow observed in the weekday AM peak hour. There is minimal non-construction traffic using the right turn lane because the only traffic that would be using it is traffic from Cranes Lane to the A12 southbound on-slip, and there is only a small amount of construction traffic performing U-turns.

F.7.3 Junction modelling results

Current operation (2019)

The current operation of the existing junction layout has not been considered because the number of right turners is minimal.

Future operation with construction (2025)

The results of the junction modelling are presented in Table F 7-1: Results for A12 Junction 23 PICADY Model.

A key statistic produced by PICADY is the RFC (Reference Flow to Capacity). A value of 0.85 is desirable for all arms of new junctions and indicates that the junction is likely statistically to be under-capacity. In assessing an existing junction, for values below 0.85 a junction is considered to be under-capacity, for values between 0.85 and 1.00 a junction is considered to be approaching capacity, whereas for values above 1.00 a junction is considered to be over-capacity.

Table F 7-1: Results for A12 Junction 23 PICADY Model

	AM					IP					PM				
Movements	**Max LOS**	**Average Demand (PCU/hr)**	**Max. Delay (s)**	**Max Queue (PCU)**	**Max RFC**	**Max LOS**	**Average Demand (PCU/hr)**	**Max. Delay (s)**	**Max Queue (PCU)**	**Max RFC**	**Max LOS**	**Average Demand (PCU/hr)**	**Max. Delay (s)**	**Max Queue (PCU)**	**Max RFC**
Right turn for traffic from Crane's Lane	B	14	10.34	0	0.04	C	8	18.07	0.1	0.04	C	240	16.52	1	0.55
From B1024 (North)	A	541	0	0	0	A	290	0	0	0	A	394	0	0	0

The results show that the junction operates satisfactorily in 2025 with construction traffic during weekday AM, IP and PM peak hours with minimal queues/delays.

Future operation without scheme in place (2027, 2042)

The operation of the existing junction layout without the proposed scheme in place has not been considered because the number of right turners is likely to be minimal i.e. only those from Cranes Lane to the A12 southbound.

Future operation with scheme in place (2027, 2042)

Assessments are not required for the future situation with the proposed scheme in place because the junction is removed.

F.7.4 Summary

The junction operates satisfactorily in 2025, the peak year of construction.

F.7.5 Annex A

Traffic Flows – Without Scheme + Construction (2025)

AM Peak

Origin / Destination	B1024 (South)	Crane's Lane	B1024 (North)	Total
B1024 (South)	0	0	0	0
Crane's Lane	14	0	0	14
B1024 (North)	541	0	0	541
Total	555	0	0	555

IP Peak

Origin / Destination	B1024 (South)	Crane's Lane	B1024 (North)	Total
B1024 (South)	0	0	0	0
Crane's Lane	8	0	0	0
B1024 (North)	290	0	0	290
Total	298	0	0	298

PM Peak

Origin / Destination	B1024 (South)	Crane's Lane	B1024 (North)	Total
B1024 (South)	0	0	0	0
Crane's Lane	240	0	0	240
B1024 (North)	394	0	0	394
Total	634	0	0	634

HGV Proportions – Without Scheme + Construction (2025)

AM Peak

Origin / Destination	B1024 (South)	Crane's Lane	B1024 (North)	Average
B1024 (South)	0%	0%	0%	0%
Crane's Lane	21%	0%	0%	7%
B1024 (North)	1%	0%	0%	0%
Average	7%	0%	0%	-

IP Peak

Origin / Destination	B1024 (South)	Crane's Lane	B1024 (North)	Average
B1024 (South)	0%	0%	0%	0%
Crane's Lane	100%	0%	0%	33%
B1024 (North)	3%	0%	0%	1%
Average	34%	0%	0%	-

PM Peak

Origin / Destination	B1024 (South)	Crane's Lane	B1024 (North)	Average
B1024 (South)	0%	0%	0%	0%
Crane's Lane	3%	0%	0%	1%
B1024 (North)	1%	0%	0%	0%
Average	1%	0%	0%	-

F.8. A12 junction 24 (existing layout during construction): Junction Model Technical Note

F.8.1 Introduction

Overview

The purpose of this technical note is to describe the modelling assessments which have been undertaken at Junction 24 as part of the A12 Chelmsford to A120 widening project. The junction is currently a priority-junction, located to the north east of Kelvedon

Modelling scenarios

Junction 24 of the A12 has been assessed using the PICADY module within the industry standard junction modelling software Junctions 9.

The following traffic scenarios have been considered for AM (07:30-08:30), IP (12:00-13:00) and PM (17:00 – 18:00) peak hours:

- Construction scenario (2025, the peak year of construction) for the existing junction arrangement.

The current operation of the existing junction layout, together with those for the future situation without the proposed scheme in place, has not been considered because the number of right turners is expected to be minimal i.e. travelling onto New Lane towards the small communities to the north of the junction. Assessments for the future situation with the proposed scheme in place have been modelled using VISSIM and are discussed in separate technical notes included within the Transport Assessment report.

F.8.2 Model description

Junction location

The location of A12 Junction 24 is shown in Plate F 8-1**,** north east of Kelvedon. The major road is the B1024 London Road which is divided into two to form the on-slip and off-slip to / from the A12 towards Marks Tey. A right turn lane, capable of storing approximately 7 vehicles, is present to allow north-eastbound traffic to turn right towards New Lane, located slightly further to the north, which provides access to the residential properties on New Lane and beyond.

Plate F 8-1: Junction 24 (Source: Open Street Map)

Key assumptions and input parameters

The PICADY model required several geometric parameters to be measured for the calculation of theoretical capacity. Junction geometric measurements were taken at the junction from AutoCAD drawings and measured in accordance with the PICADY user guide.

PICADY assigns traffic flows for every 15-minute period within the modelled peak hours. Traffic flows and HGV percentages have been extracted from the base year 2019 SATURN model.

Traffic volume has been input as vehicles with a 2.5 PCU factor for Heavy Goods Vehicles used.

Traffic data

A bespoke traffic model has been developed for the appraisal of the proposed scheme using industry standard SATURN software, for which further details can be found in the Combined Modelling and Appraisal report. The outputs from the strategic model formed the basis for the inputs into the junction modelling, using the Origin-Destination table function which synthesizes a peak within the peak hour.

The construction year (2025) traffic flows, along with HGV proportions, are provided in Annex A. As part of the construction strategy, construction compounds and borrow pits will be located adjacent to the A12. A consequence of this is that the right turn lane at J24 would be used by construction vehicles to perform U-turns to access the construction compounds and / or borrow pits.

The vast majority of the traffic flows at the junction are along B1024 London Road from Kelvedon towards the A12 and Marks Tey / Colchester, with the highest flow observed in the weekday AM peak hours. There is minimal non-construction traffic using the right turn lane to access New Lane further to the north, and there is only a small amount of construction traffic performing U-turns.

F.8.3 Junction modelling results

Current operation (2019)

The current operation of the existing junction layout has not been considered because the number of right turners is minimal.

Future operation with construction (2025)

The results of the junction modelling are presented in Table F 8-1.

A key statistic produced by PICADY is the RFC (Reference Flow to Capacity). A value of 0.85 is desirable for all arms of new junctions and indicates that the junction is likely statistically to be under-capacity. In assessing an existing junction, for values below 0.85 a junction is considered to be under-capacity, for values between 0.85 and 1.00 a junction is considered to be approaching capacity, whereas for values above 1.00 a junction is considered to be over-capacity.

Table F 8-1: Results for A12 Junction 24 PICADY Model

	AM					IP					PM				
Movements	**Max LOS**	**Average Demand (PCU/hr)**	**Max. Delay (s)**	**Max Queue (PCU)**	**Max RFC**	**Max LOS**	**Average Demand (PCU/hr)**	**Max. Delay (s)**	**Max Queue (PCU)**	**Max RFC**	**Max LOS**	**Average Demand (PCU/hr)**	**Max. Delay (s)**	**Max Queue (PCU)**	**Max RFC**
Right turn lane from B1024 to London Rd (NE)	B	8	12.97	0	0.02	B	29	14.51	0.1	0.06	B	12	13.80	0	0.03
From London Rd (SW)	A	510	0	0	0	A	326	0	0	0	A	461	0	0	0

The results show that the junction operates satisfactorily in 2025 with construction traffic during the weekday AM, IP and PM peak hours with minimal queues/delays.

Future operation without scheme in place (2027, 2042)

The operation of the existing junction layout without the proposed scheme in place has not been considered because the number of right turners is likely to be minimal i.e. only those accessing the small number of properties on New Lane and beyond.

Future operation with scheme in place (2027, 2042)

The operation of the existing junction layout with the proposed scheme in place has been assessed using VISSIM and discussed in a separate technical note.

F.8.4 Summary

The junction operates satisfactorily in 2025, the peak year of construction.

F.8.5 Annex A

Traffic Flows – Without Scheme + Construction (2025)

AM Peak

Origin / Destination	London Road (North-East)	B1024	London Road (South-West)	Total
London Road (North-East)	0	0	0	0
B1024	8	0	0	8
London Road (South-West)	510	0	0	510
Total	518	0	0	518

PM Peak

Origin / Destination	London Road (North-East)	B1024	London Road (South-West)	Total
London Road (North-East)	0	0	0	0
B1024	29	0	0	0
London Road (South-West)	326	0	0	326
Total	355	0	0	355

PM Peak

Origin / Destination	London Road (North-East)	B1024	London Road (South-West)	Total
London Road (North-East)	0	0	0	0
B1024	12	0	0	12
London Road (South-West)	461	0	0	461
Total	473	0	0	473

HGV Proportions – Without Scheme + Construction (2025)

AM Peak

Origin / Destination	London Road (North-East)	B1024	London Road (South-West)	Total
London Road (North-East)	0%	0%	0%	0%
B1024	63%	0%	0%	21%
London Road (South-West)	2%	0%	0%	1%
Average	22%	0%	0%	-

IP Peak

Origin / Destination	London Road (North-East)	B1024	London Road (South-West)	Total
London Road (North-East)	0%	0%	0%	0%
B1024	86%	0%	0%	29%
London Road (South-West)	3%	0%	0%	1%
Average	30%	0%	0%	-

PM Peak

Origin / Destination	London Road (North-East)	B1024	London Road (South-West)	Total
London Road (North-East)	0%	0%	0%	0%
B1024	75%	0%	0%	25%
London Road (South-West)	0%	0%	0%	0%
Average	25%	0%	0%	-

F.9. A12 junction 24 (proposed new layout): Junction Model Technical Note

F.9.1 Introduction

Overview

The purpose of this technical note is to describe the modelling assessment which has been undertaken for junction 24 on the A12 as part of the A12 Chelmsford to A120 widening project.

The new junction 24 will be located further south from the current location of the junction. It will be constructed between Kelvedon and Inworth in Colchester. The new junction 24 will consist of a two-dumbbell roundabout arrangement with a bridge link connecting the two dumbbells positioned either side of the A12 mainline carriageway. Via a new link road, the eastern dumbbell will connect to a new roundabout, known as Inworth Road roundabout, on the B1023 Inworth Road.

Junction Location

Junction 24 is currently located close to Feering, north-east of Kelvedon. It currently consists of slip roads linking to the A12 mainline carriageway and a single carriageway bridge link over the A12 (B1024 London Road) for access between the NB and SB A12 slips.

The new junction 24 will be positioned further south on the A12 between Kelvedon, which is north of the A12 mainline and Inworth, which is located south of the A12 mainline. The new junction will consist of a two-dumbbell roundabout arrangement with a bridge link connecting the two dumbbells positioned either side of the A12 carriageway.

The new junction 24 will be accessible to vehicles via the B1023 Inworth Road and a new roundabout will be created on the B1023 Inworth Road with a link road that connects to the eastern dumbbell at junction 24.

F.9.2 Model Description

Modelled Scenarios

Junction 24 has been assessed using the industry standard Vissim software. The analysis was performed to assess the operation of the proposed new junction, based upon the design presented for the Development Consent Order (DCO). The following traffic scenarios have been modelled for the AM (07:30-08:30) and PM (17:00-18:00) peak hours:

- Future operation with scheme 2027
- Future operation with scheme 2042

Vissim Model Extents

The extents of the Vissim model are shown in Plate F 9-1 and greater detail of the junction 24 dumbbells and Inworth Road roundabout are shown in Plate F 9-2 and Plate F 9-3. Details of the junctions included in the model are described in Table F 9-1.

Plate F 9-1: Junction 24 Vissim Model Extents

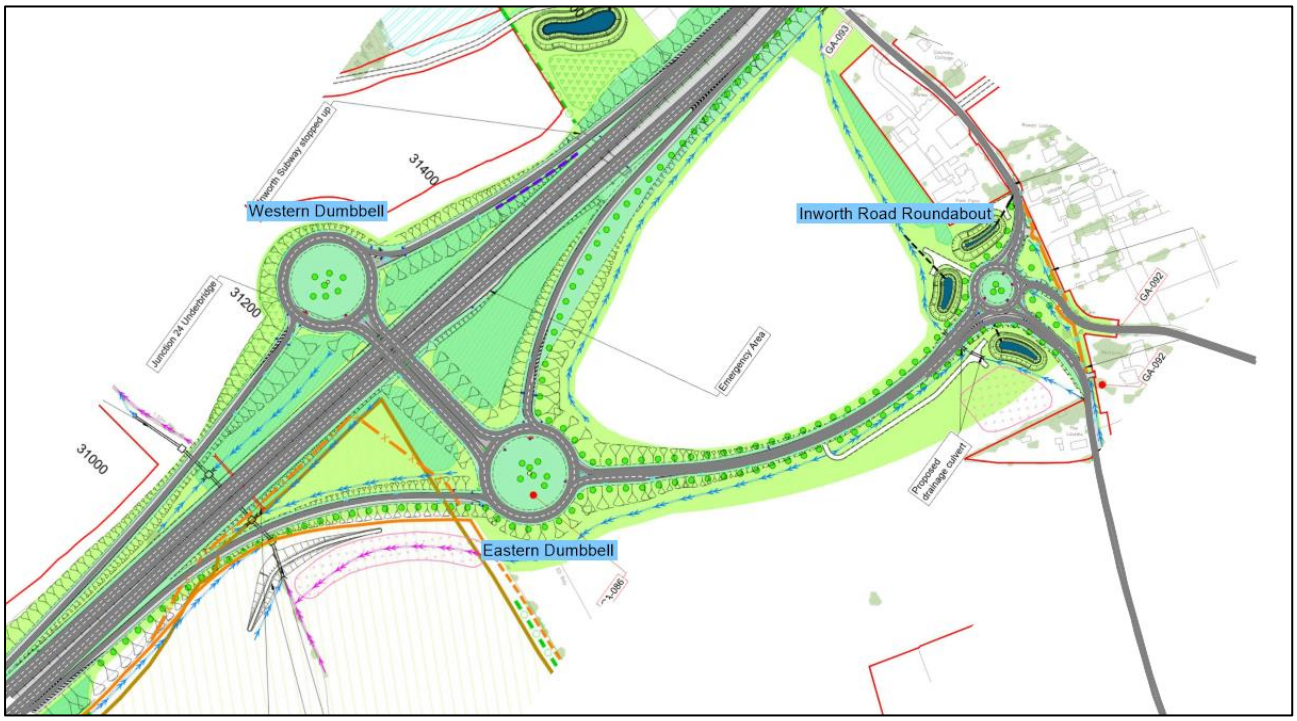


Plate F 9-2: Junction 24 Dumbbell Roundabouts

Plate F 9-3: Junction 24 Inworth Road Roundabout

Table F 9-1: Vissim Model Junctions

Junction	Control type	Entry Arms	Junction Description
Western Dumbbell	Priority control	A12 NB off-slip	New roundabout Design submitted at DCO
		Bridge over A12	
Eastern Dumbbell	Priority control	A12 SB off-slip	New roundabout Design submitted at DCO
		Link Road	
		Bridge over A12	
Inworth Road Roundabout	Priority control	Inworth Road SB	New roundabout Design submitted at DCO
		Kelvedon Road	
		Inworth Road NB	
		Link Road	

F.9.3 Key Assumptions & Input Parameters

The Vissim models have been developed based upon the modelling approach set out in Appendix E of the Transport Assessment.. In addition, specific assumptions and parameters associated with junction 24 have also been included in the models and these are discussed below.

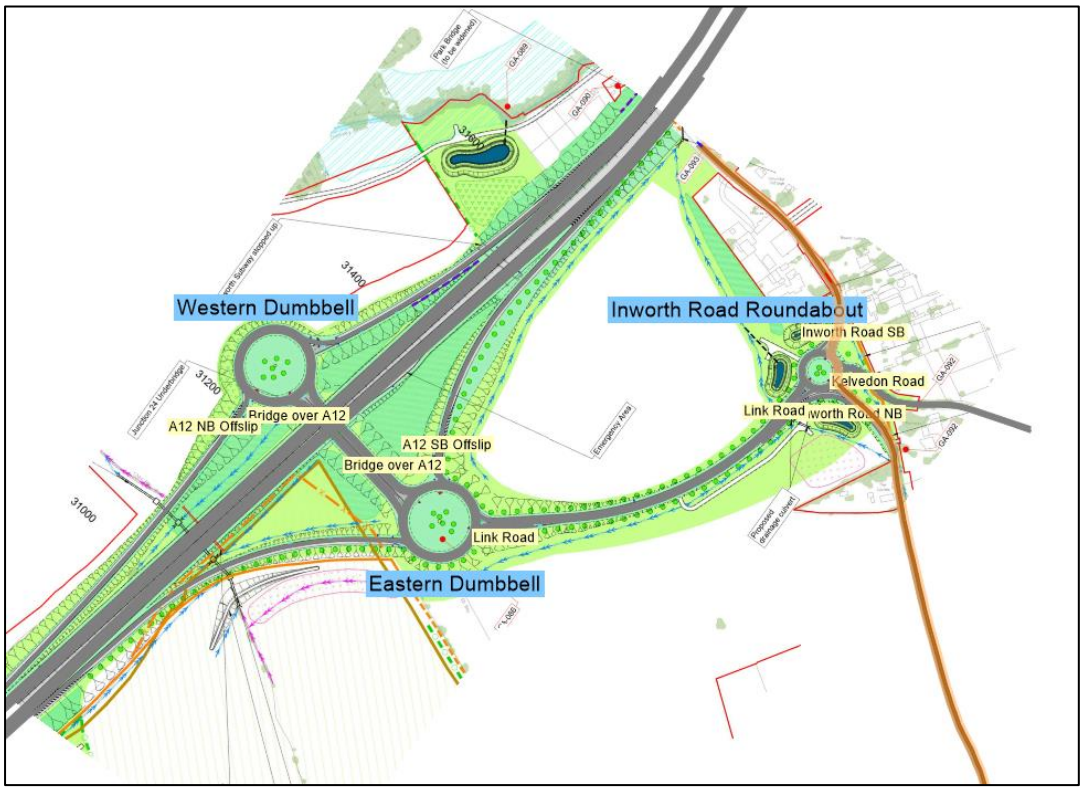
Public Transport

Bus stops, routes and associated bus stopping times have been input for bus services 91 and 506. The bus stops are located on the B1023 Inworth Road, north of the new Inworth Road roundabout.

Whilst considering the new layout and location of junction 24 and based upon the existing routes of these bus services, it is assumed that bus services 91 and 506 will continue to run NB/SB on the B1023 Inworth Road.

The bus routes have been included in the 2027 and 2042 future operation with scheme models and are identifiable by the orange route marker in Plate F 9-4 below.

Plate F 9-4: Route for Bus Services 91 & 506



F.9.4 Traffic Data

Future Operation with Scheme

A strategic traffic model has been developed for the appraisal of the A12 scheme using industry standard SATURN software, further details of this can be found in the ComMA report. The AM and PM peak traffic outputs from the SATURN model have been used as the vehicle inputs for the Vissim modelling. These can be found in full in Annex A.

A cordon of the strategic model was made which matched the Vissim model network. Traffic flows were then extracted from the strategic model. The Total and HGV flows from the cordon SATURN models are shown below in Table F 9-2. These flows include A12 traffic which passes through on the A12 mainline without using junction 24. The volume of vehicles using the dumbbells at junction 24 are provided F.10.5in the modelling results tables.

Table F 9-2: Total Cordoned Flow from SATURN Model (Vehicles)

Scenario	AM		PM	
	Total	HGV	Total	HGV
With Scheme 2027	8,270	486	8,761	289
With Scheme 2042	9,371	538	9,967	346

F.9.5 Junction Modelling Outputs

Vissim Error & Warning Messages

Ten model simulation runs were carried out for each model year and peak hour. There were no warnings or errors reported for the 2027 AM and PM peak models.

The Vissim outputs illustrated two minor warnings for the 2042 AM and PM peak models. Three vehicles did not enter the modelled network in both the 2042 AM simulation runs and 2042 PM simulation runs. In both instances, this was not due to the blocking back of traffic in the model (queueing preventing vehicles from entering the model) and these numbers of 'missing' vehicles was not considered significant.

Vissim Model Outputs

The Vissim outputs presented include a Level of Service (LOS) category for each junction approach arm as well as for the junction as a whole. LOS is based upon average vehicle delay and can be used as a guide for how well the junction operates. Table F 9-3 shows the categories used in the LOS calculation.

Table F 9-3: Level of Service Categories

LOS	Signalised Junction Delay (s/veh)	Priority Junction Delay (s/veh)	Description of Traffic Operation
A	≤10 sec	≤10 sec	Highly stable, free-flow condition with little or no congestion.
B	10–20 sec	10–15 sec	Stable, free-flow condition with little congestion.
C	20–35 sec	15–25 sec	Stable flow condition, with moderate congestion.
D	35–55 sec	25–35 sec	Less stable Approaching unstable condition with increasing congestion.
E	55–80 sec	35–50 sec	Unstable flow condition, volume at or slightly over capacity, considerable delays.
F	>80 sec	>50 sec	Forced flow condition, volumes exceed capacity; long delays with stop-and-go traffic.

Vehicle delay is presented in seconds and queue length results have also been collected from the models in five-minute intervals. The results presented for each model show the average queue length for the peak hour models, as well as the average of the maximum queue length output.

F.9.6 Junction Modelling Results

Future Operation with Scheme (2027, 2042)

The LOS, delay, and queue length results of the Vissim junction modelling are presented in Table F 9-4 and Table F 9-5.

Table F 9-4: Vissim Outputs 2027 Future Operations with Scheme

Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Western Dumbbell	A12 NB off-slip	Priority	A	239	2	0	13	A	439	3	1	20
	Bridge over A12	Priority	A	303	2	0	0	A	288	2	0	0
	Total	Priority	**A**	**542**	**2**	**-**	**-**	**A**	**727**	**3**	**-**	**-**
Eastern Dumbbell	A12 SB off-slip	Priority	A	261	3	0	10	A	386	4	1	17
	Link Road	Priority	A	833	2	0	8	A	563	2	0	7
	Bridge over A12	Priority	A	239	2	0	0	A	439	2	0	0
	Total	Priority	**A**	**1333**	**2**	**-**	**-**	**A**	**1387**	**3**	**-**	**-**
Inworth Road Roundabout	Inworth Road SB	Priority	A	482	4	1	15	A	543	5	2	19
	Kelvedon Road	Priority	A	91	5	0	12	A	21	6	0	6
	Inworth Road NB	Priority	A	238	7	1	18	A	173	5	1	14
	Link Road	Priority	A	500	4	1	19	A	825	4	1	22
	Total	Priority	**A**	**1842**	**5**	**-**	**-**	**A**	**1923**	**4**	**-**	**-**

Table F 9-5: Vissim Outputs 2042 Future Operations with Scheme

Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Western Dumbbell	A12 NB off-slip	Priority	A	285	2	0	14	A	537	4	2	27
	Bridge over A12	Priority	A	324	2	0	0	A	297	2	0	0
	Total	Priority	**A**	**609**	**2**			**A**	**834**	**3**		
Eastern Dumbbell	A12 SB off-slip	Priority	A	300	3	0	12	A	385	5	1	18
	Link Road	Priority	A	913	2	0	9	A	636	2	0	7
	Bridge over A12	Priority	A	286	2	0	0	A	537	3	0	0
	Total	Priority	**A**	**1498**	**2**			**A**	**1559**	**3**		
Inworth Road Roundabout	Inworth Road SB	Priority	A	546	4	1	17	A	586	5	2	20
	Kelvedon Road	Priority	A	95	5	1	12	A	32	8	0	8
	Inworth Road NB	Priority	A	242	7	1	19	A	156	6	1	14
	Link Road	Priority	A	585	4	1	20	A	925	4	1	22
	Total	Priority	**A**	**2021**	**5**			**A**	**2076**	**5**		

The Vissim outputs show that the junction 24 dumbbells and the Inworth Road roundabout all operate with a LOS A in the 2027 and 2042 future operation with scheme scenarios, for both the AM and PM peak hours.

Plate F 9-5 and Plate F 9-6 below illustrate the 2042 average queue lengths on each approach to the eastern and western dumbbells at junction 24 for the AM and PM peaks respectively. The average queue lengths are identifiable by the red blocks and the queue length distance is also reported (m).

Plate F 9-5: 2042 AM Peak with Scheme Dumbbell Average Queue Lengths

Plate F 9-6: 2042 PM Peak with Scheme Dumbbell Average Maximum Queue

The average queue length results for junction 24 demonstrate that there is negligible queueing in both the 2042 AM and PM peak models. The longest average queue during the AM peak is expected on the A12 NB off-slip approach to the western dumbbell (14m), which equates to a traffic queue of 3 vehicles. The longest average queue during the PM peak is anticipated on the A12 NB off-slip approach to the western dumbbell (28m), which equates to a traffic queue of 5 vehicles.

Plate F 9-7 and Plate F 9-8 below illustrate the 2042 average queue lengths on each approach to the Inworth Road roundabout for the AM and PM peaks respectively.

Plate F 9-7: 2042 AM Peak with Scheme Inworth Road Roundabout Average Queue Lengths

Plate F 9-8: 2042 PM Peak with Scheme Inworth Road Roundabout Average Queue Lengths

The average queue length results for the Inworth Road roundabout demonstrate that there is minimal queueing in both the 2042 AM and PM peak models. The longest average queue during the AM peak is expected on the link road approach to the roundabout (20m), which equates to a traffic queue of 4 vehicles. The longest average queue during the PM peak is anticipated on the same approach (22m), which equates to a traffic queue of 4 vehicles.

F.9.7 Summary

The Vissim modelling results demonstrate that junction 24 and Inworth Road roundabout can be anticipated to operate with a LOS A in 2027 and in 2042 during the AM and PM peaks.

Vehicle delay and traffic queueing can be anticipated to be negligible at all three of the junctions in 2027 and 2042 for the AM and PM peaks.

Therefore, provision at junction 24 is deemed sufficient for the forecasted level of traffic in the operational years of 2027 and 2042.

F.9.8 Annex A

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation with scheme 2027:

AM Peak - Car

Origin / Destination	To A12 (E)	Inworth Road (N)	Kelvedon Road	Inworth Road (S)	To A12 (W)	Total
From A12 (E)	0	0	6	239	3021	**3267**
Inworth Road (N)	0	0	16	231	232	**478**
Kelvedon Road	0	24	0	0	64	**88**
Inworth Road (S)	291	231	0	0	230	**752**
From A12 (W)	2966	161	36	36	0	**3198**
Total	**3257**	**416**	**58**	**506**	**3547**	**7784**

AM Peak - HGV

Origin / Destination	To A12 (E)	Inworth Road (N)	Kelvedon Road	Inworth Road (S)	To A12 (W)	Total
From A12 (E)	0	0	0	13	243	**256**
Inworth Road (N)	0	0	0	1	1	**2**
Kelvedon Road	0	1	0	0	3	**4**
Inworth Road (S)	9	0	0	0	3	**12**
From A12 (W)	208	0	3	2	0	**212**
Total	**216**	**2**	**3**	**16**	**249**	**486**

PM Peak - Car

Origin / Destination	To A12 (E)	Inworth Road (N)	Kelvedon Road	Inworth Road (S)	To A12 (W)	Total
From A12 (E)	0	92	11	280	2709	**3091**
Inworth Road (N)	0	0	33	318	188	**538**
Kelvedon Road	0	12	0	0	9	**20**
Inworth Road (S)	287	170	0	0	72	**529**
From A12 (W)	3859	215	57	162	0	**4294**
Total	**4146**	**489**	**101**	**760**	**2977**	**8472**

PM Peak - HGV

Origin / Destination	To A12 (E)	Inworth Road (N)	Kelvedon Road	Inworth Road (S)	To A12 (W)	Total
From A12 (E)	0	0	0	2	132	**134**
Inworth Road (N)	0	0	0	0	1	**1**
Kelvedon Road	0	0	0	0	1	**1**
Inworth Road (S)	2	0	0	0	2	**4**
From A12 (W)	145	0	2	1	0	**148**
Total	**148**	**0**	**2**	**3**	**136**	**289**

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation with scheme 2042:

AM Peak - Car

Origin / Destination	To A12 (E)	Inworth Road (N)	Kelvedon Road	Inworth Road (S)	To A12 (W)	Total
From A12 (E)	0	24	7	251	3321	**3603**
Inworth Road (N)	0	0	18	234	285	**537**
Kelvedon Road	0	24	0	0	68	**92**
Inworth Road (S)	312	234	0	0	231	**777**
From A12 (W)	3548	193	44	39	0	**3824**
Total	**3860**	**476**	**68**	**524**	**3904**	**8833**

AM Peak - HGV

Origin / Destination	To A12 (E)	Inworth Road (N)	Kelvedon Road	Inworth Road (S)	To A12 (W)	Total
From A12 (E)	0	0	1	13	273	**287**
Inworth Road (N)	0	0	0	1	1	**3**
Kelvedon Road	0	1	0	0	3	**4**
Inworth Road (S)	10	0	0	0	3	**14**
From A12 (W)	222	3	3	2	0	**231**
Total	**233**	**5**	**4**	**16**	**280**	**538**

PM Peak - Car

Origin / Destination	To A12 (E)	Inworth Road (N)	Kelvedon Road	Inworth Road (S)	To A12 (W)	Total
From A12 (E)	0	74	12	299	3299	**3684**
Inworth Road (N)	0	0	38	310	232	**580**
Kelvedon Road	0	12	0	0	19	**31**
Inworth Road (S)	295	155	0	0	78	**528**
From A12 (W)	4266	280	68	185	0	**4798**
Total	**4561**	**521**	**118**	**794**	**3628**	**9621**

PM Peak - HGV

Origin / Destination	To A12 (E)	Inworth Road (N)	Kelvedon Road	Inworth Road (S)	To A12 (W)	Total
From A12 (E)	0	0	0	2	177	**180**
Inworth Road (N)	0	0	0	0	1	**1**
Kelvedon Road	0	0	0	0	1	**2**
Inworth Road (S)	2	0	0	0	2	**5**
From A12 (W)	156	0	2	1	0	**159**
Total	**158**	**1**	**2**	**3**	**182**	**346**

F.10. A12 junction 25: Junction Model Technical Note

F.10.1 Introduction

Overview

The purpose of this technical note is to describe the modelling assessment which has been undertaken for junction 25 on the A12 as part of the A12 Chelmsford to A120 widening project.

The new junction 25 will be constructed at the current location of the junction at Marks Tey Interchange. It will consist of a signalised junction to the west of the A12 mainline and a priority roundabout to the east of the A12, the junctions connected by the existing A120 dual carriageway. The signalised western junction will connect to a new roundabout located to the south of junction 25, known as London Road roundabout. London Road roundabout will connect the A12 NB off-slip at junction J25.

Junction Location

Junction 25 is located at Marks Tey in south west Colchester and is known as Marks Tey Interchange. It currently consists of a two-dumbbell roundabout arrangement, with a dual carriageway link (A120) linking the two dumbbells. The western dumbbell is known as the Old Rectory and the eastern dumbbell is known as the Prince of Wales roundabout, and both of the dumbbells are positioned either side of the A12 mainline carriageway. The Old Rectory and Prince of Wales roundabouts at junction 25 connect the A120 Coggeshall Road, Station Road and B1408 (Copford) and London Road to the A12 carriageway.

As part of the A12 scheme, the layout at Old Rectory roundabout will be upgraded to a signalised crossroad junction to improve the operation of the western junction at junction 25. Signalised Toucan crossing facilities will also be provided at the junction. There will be no network changes to Prince of Wales roundabout.

F.10.2 Model Description

Modelled Scenarios

Junction 25 has been assessed using the industry standard Vissim software. The analysis was performed to assess the operation of the proposed new junction, based upon the design presented for the Development Consent Order (DCO). The following traffic scenarios have been modelled. AM refers to the modelled hour of 07:30-08:30, IP refers to the average inter-peak hour (10:00-16:00hrs) and PM refers to the modelled hour of 17:00-18:00:

1. Current operation 2019 – AM, PM
2. Future operation with construction traffic 2025 (construction phase) – AM, IP, PM
3. Future operation without scheme 2027 & 2042 – AM, PM
4. Future operation with scheme 2027 & 2042 (operational phase) – AM, PM

Without Scheme Vissim Model Extents

For the 2019, 2025, 2027 and 2042 without scheme scenarios, the current junction 25 layout has been modelled in Vissim. The Vissim network for these scenarios is shown in Plate F 9-1. Details of the junctions included in the model are given in Table F 10-1.

Plate F 10-1: Junction 25 Dumbbell Roundabouts

Table F 10-1: Without Scheme Vissim Model Junctions

Junction	Control type	Entry Arms	Junction Description
Western Junction (Old Rectory)	Priority	A12 NB off-slip	Current junction layout
		A120 Coggeshall Road	
		Station Road	
		Marks Tey interchange	
Eastern Junction (Prince of Wales)	Priority	A12 SB off-slip	Current junction layout
		B1408	
		London Road (A12 slip)	
		Marks Tey interchange	

With Scheme Vissim Model Extents

For the 2027 and 2042 with scheme scenarios, the Vissim model extents are shown in Plate F 10-2. Greater detail of the junction 25 junctions and the London Road roundabout are shown in Plate F 10-3 and Plate F 10-4. Details of the junctions included in the model are described in Table F 10-2.

Plate F 10-2: Junction 25 with Scheme Vissim Model Extents

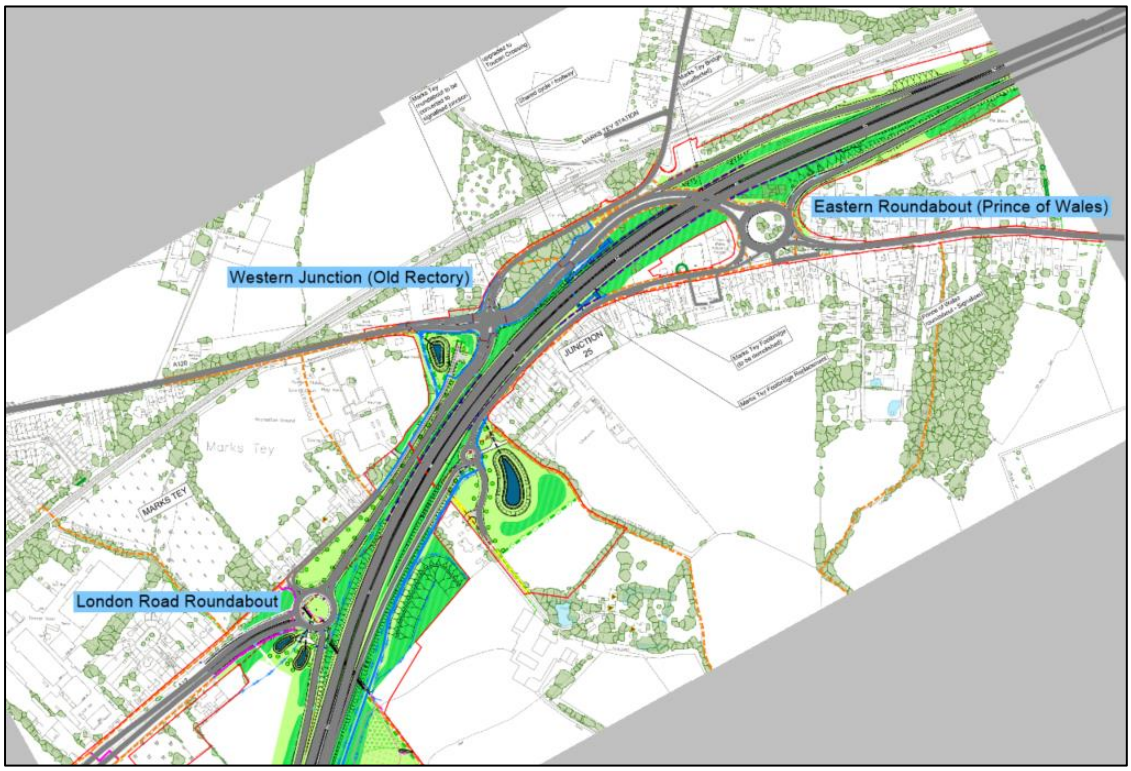


Plate F 10-3: Junction 25 with Scheme Eastern and Western Junctions

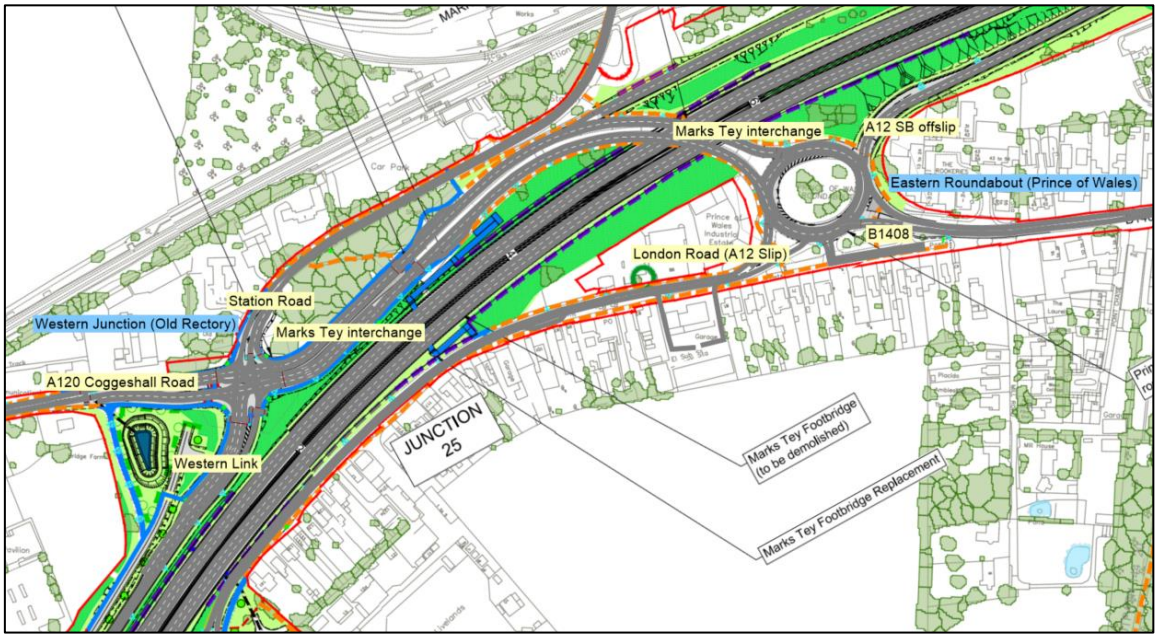


Plate F 10-4: Junction 25 with Scheme London Road Roundabout

Table F 10-2: With Scheme Vissim Model Junctions

Junction	Control type	Entry Arms	Junction Description
Western Junction (Old Rectory)	Signalised	Western Link	Design submitted at DCO
		A120 Coggeshall Road	
		Station Road	
		Marks Tey interchange	
Eastern Roundabout (Prince of Wales)	Priority	A12 SB Off slip	No change to the existing layout
		B1408	
		London Road (A12 Slip)	
		Marks Tey interchange	
London Road Roundabout	Priority	A12 Off slip	Design submitted at DCO
		Southern Link (Old A12)	
		Western Link	
		Old London Road	

F.10.3 Key Assumptions & Input parameters

The Vissim models have been developed based upon the modelling approach set out in Appendix E of the Transport Assessment.. In addition, specific assumptions and parameters associated with junction 25 have also been included in the models and these are discussed below.

Current Operation Calibration and Validation

A base model representing the current layout and current operation of junction 25 has been developed for the AM and PM peaks representing a base year of 2019. The model was calibrated and validated against observed traffic flows and journey time data and achieved the calibration and validation criteria outlined in TAG. The base model, therefore, reliably replicates the observed behaviour of traffic at junction 25 and as such was considered suitable for testing of the future 2027 and 2042 without and with scheme traffic scenarios.

Further details of the base model calibration and validation can be found in Annex A.

Public Transport

Bus stops, routes and associated bus stopping times have been input for bus services 70, 71, 506, 901, 903 and 910. Eight bus stops have been added to the network and these are located on the A130 Coggeshall Road, the link road between the Eastern and Western junctions, B1408 London Road, and the London Road A12 SB on-slip road.

The bus routes have been included in all four of the modelled scenarios for the AM, IP and PM peak models and are identifiable by the orange route marker in Plate F 10-5, Plate F 10-6 and Plate F 10-7. The services also travel in the opposite direction of the routes shown in Plate F 10-5 and Plate F 10-6.

Plate F 10-5: Route for Bus Services 70, 903 & 910

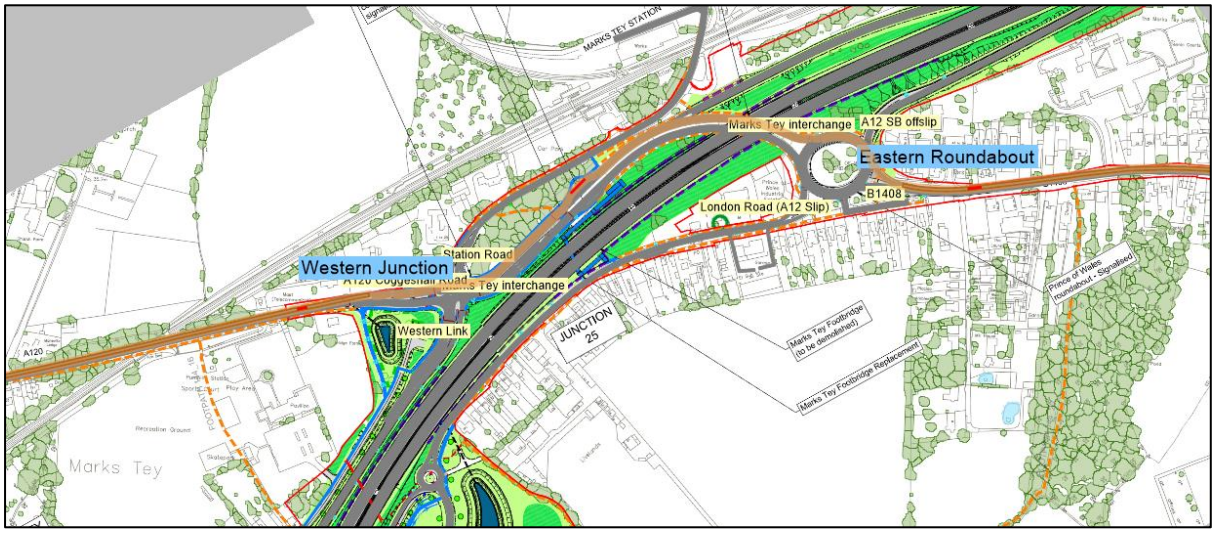


Plate F 10-6: Route for Bus Services 71 & 506

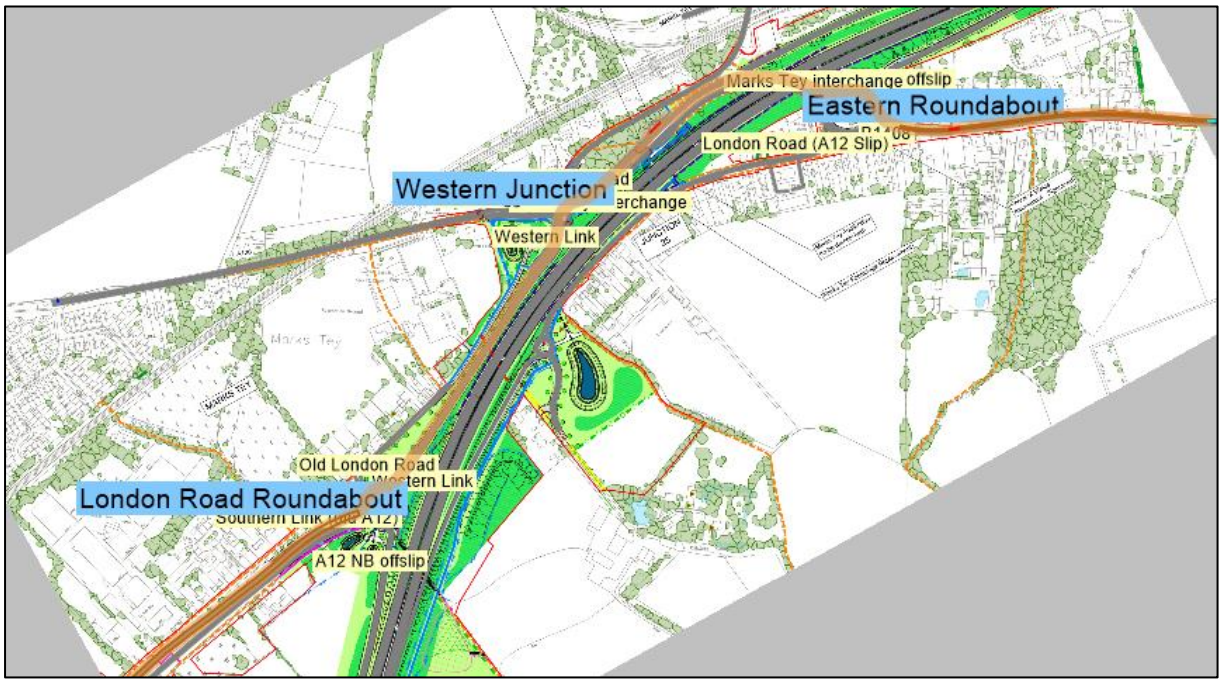
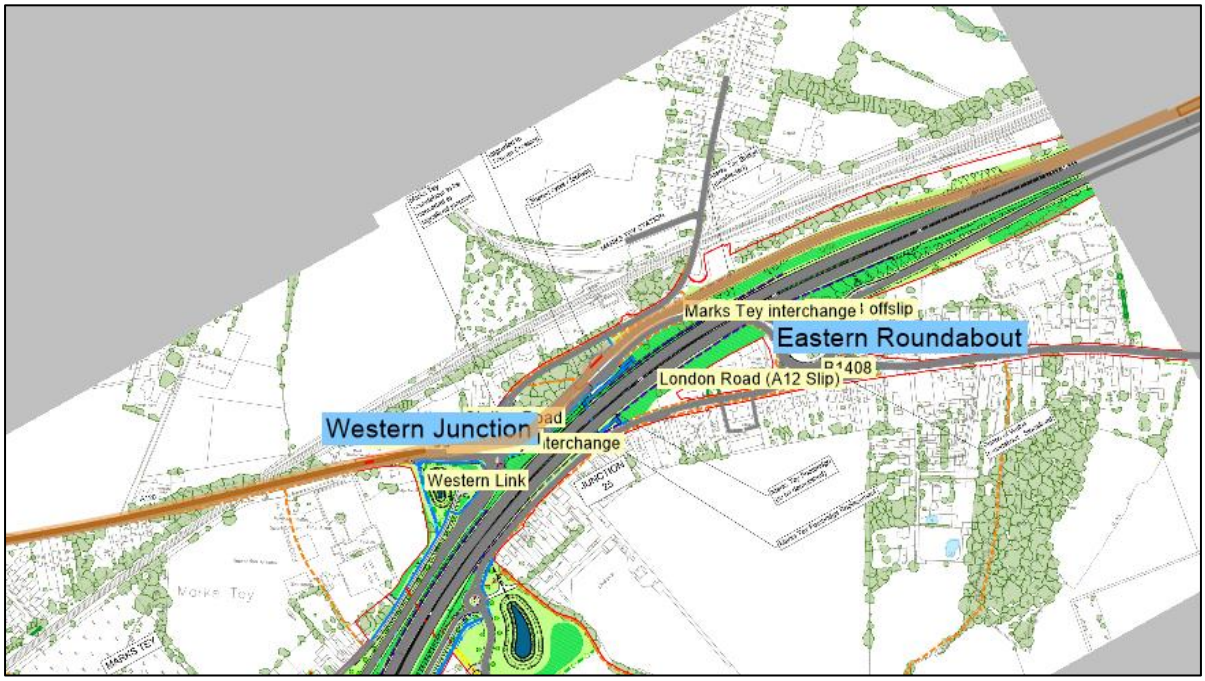


Plate F 10-7: Route for Bus Services 901



Signal Timings for the Western Junction

Fixed signal timings have been developed in Vissim for the western junction of junction 25. These have been developed as high-level concept designs and they do not constitute detailed signal design.

The overall signal cycle time for the western dumbbell has been modelled as 90 seconds and the traffic-to-traffic intergreen times have been calculated based on the stage-stage distances.

F.10.4 Traffic Data

Construction Traffic

The future operation with construction traffic 2025 scenario has been developed to assess the impact of construction traffic on network operation at junction 25. The peak year of construction is 2025 and the traffic flows for this scenario are a combination of the forecast background traffic levels for 2025 and the anticipated volume of construction vehicles.

To generate the 2025 background traffic flows, negative growth factors were applied to the 2027 without scheme traffic demand which are shown in Table F 10-3.

Table F 10-3: 2027 to 2025 Negative Growth Factors

Vehicle Type	Factor	Source
Car/LGV	0.985	Estimated from TEMPro 7.2 for Essex County for average weekday
HGV	0.988	Estimated from RTF 2018, July for trunk A category road type and for Eastern England region

Chapter 6 in the Transport Assessment provides further details of how the levels of construction traffic has been derived. For the extents of the junction 25 Vissim model, the Total and HGV without scheme and construction vehicles that are anticipated to pass directly through the junction are shown in Table F 10-4.

Table F 10-4: 2025 Construction Traffic

Scenario	AM		PM		IP	
	Total	HGV	Total	HGV	Total	HGV
Without Scheme 2025	9,028	621	9,211	328	7,255	679
Construction Traffic 2025	32	11	43	22	63	63

Future Operation with and without Scheme

A strategic traffic model has been developed for the appraisal of the A12 scheme using industry standard SATURN software, further details of this can be found in the ComMA report. The AM, IP and PM peak traffic outputs from the SATURN model have been used as the vehicle inputs for the Vissim modelling. These can be found in full in Annex B.

A cordon of the strategic model was made which matched the Vissim model network. Flows were then extracted from the strategic model. The Total and HGV flows from the cordon SATURN models are shown below in Table F 10-5. These flows include A12 traffic which passes through on the A12 mainline without using junction 25. The volume of vehicles using the junctions at junction 25 are provided F.10.5in the modelling results tables.

Table F 10-5: Total Cordoned Flow from SATURN Model (Vehicles)

Scenario	AM		PM	
	Total	HGV	Total	HGV
Current operation 2019	8,765	1,087	8,795	830
Without Scheme 2027	9,164	629	9,350	332
Without Scheme 2042	9,859	702	10,065	402
With Scheme 2027	10,176	655	10,607	344
With Scheme 2042	11,300	733	11,942	415

F.10.5 Junction Modelling Outputs

Vissim Error & Warning Messages

Ten model simulation runs were carried out for each model scenario and peak hour. Table F 10-6 below shows the warnings output from the Vissim scenarios for all ten simulation runs.

Table F 10-6: Vissim Warnings from the Modelled Simulation Runs

Scenario	Time Period	Number of Vehicles Unable to Load into the Model	Number of Vehicles Removed after Waiting 60 Seconds
Base 2019	AM	3	1
Base 2019	AM	0	3
Construction 2025	AM	0	0
Construction 2025	IP	3	0
Construction 2025	PM	21	35
Without Scheme 2027	AM	6	0
Without Scheme 2027	PM	25	44
Without Scheme 2042	AM	21	1
Without Scheme 2042	PM	160	44
With Scheme 2027	AM	0	0
With Scheme 2027	PM	6	2
With Scheme 2042	AM	0	3
With Scheme 2042	PM	10	5

In the future operation without the proposed scheme, particularly in the PM peak hour, there is a large amount of congestion in the models concentrated around the western junction, which results in vehicles being unable to load into the model network and vehicles being removed after waiting 60 seconds. Three vehicle inputs in the model are unable to load all traffic into the network in the PM peak models, including the A12 in the south, Marks Tey Parish Hall, and the A120. All three of these vehicle inputs directly feed traffic into the western junction.

The with scheme models have a few warnings and vehicles not able to access the model by the end of the time period, however, this is not caused by blocking back. The level of 'missing vehicles' from the network is not a concern given how many vehicles use the junction during the modelled period.

Vissim Model Outputs

The Vissim outputs presented include a Level of Service (LOS) category for each junction approach arm as well as for the junction as a whole. LOS is based upon average vehicle delay and can be used as a guide for how well the junction operates. Table F 10-7 shows the bands used in the LOS calculation.

Table F 10-7: Level of Service Categories

LOS	Signalised Junction Delay (s/veh)	Priority Junction Delay (s/veh)	Description of Traffic Operation
A	≤10 sec	≤10 sec	Highly stable, free-flow condition with little or no congestion.
B	10–20 sec	10–15 sec	Stable, free-flow condition with little congestion.
C	20–35 sec	15–25 sec	Stable flow condition, with moderate congestion.
D	35–55 sec	25–35 sec	Less stable Approaching unstable condition with increasing congestion.
E	55–80 sec	35–50 sec	Unstable flow condition, volume at or slightly over capacity, considerable delays.
F	>80 sec	>50 sec	Forced flow condition, volumes exceed capacity; long delays with stop-and-go traffic.

Vehicle delay is presented in seconds and queue length results have also been collected from the models in five-minute intervals. The results presented for each model show the average queue length for the peak hour models, as well as the average of the maximum queue length output.

Current Operation (2019)

The LOS, delay, and queue length Vissim results for the current operation 2019 scenario are presented in Table F 10-8.

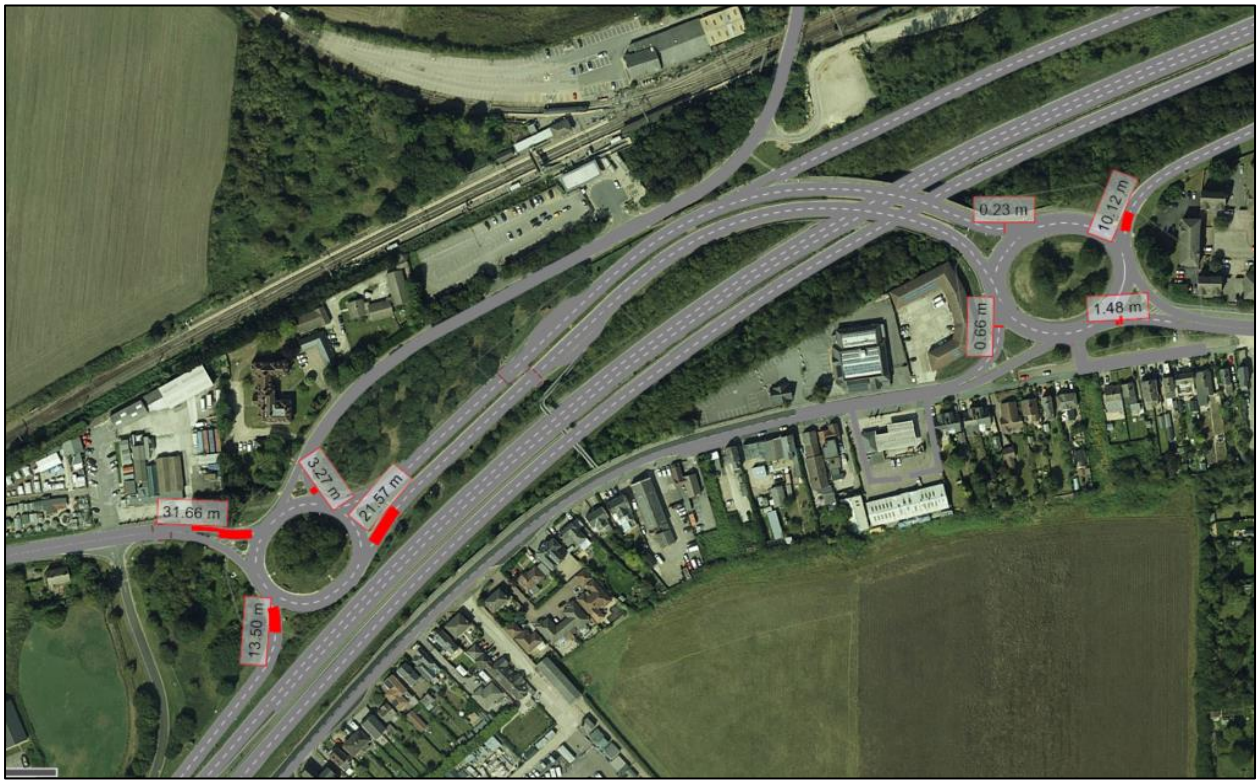
Plate F 10-8 and Plate F 10-9 illustrate the average queue lengths on each approach to the eastern and western junctions at junction 25 for the AM and PM peaks respectively. The average queue lengths are identifiable by the red blocks and the queue length distance is also reported (m).

Table F 10-8: Vissim Outputs 2019 Current Operation

Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Western Roundabout	A12 NB off-slip	Priority	D	193	26	5	25	D	375	35	14	44
	A120	Priority	C	1152	24	16	116	D	1178	31	32	162
	Station Road	Priority	B	161	12	2	20	C	171	15	3	23
	Marks Tey Interchange	Priority	C	1342	18	33	149	C	1286	16	22	106
	Total	**Priority**	**C**	**2848**	**21**	**-**	**-**	**C**	**3009**	**24**	**-**	**-**
Eastern Roundabout	A12 SB off-slip	Priority	A	1156	9	8	53	B	1011	12	10	52
	B1408 London Road	Priority	B	644	14	7	49	A	449	8	1	25
	London Road (A12 slip)	Priority	B	91	10	0	10	A	184	8	1	13
	Marks Tey Interchange	Priority	A	476	6	0	7	A	628	5	0	11
	Total	**Priority**	**A**	**2373**	**10**	**-**	**-**	**A**	**2279**	**9**	**-**	**-**

Plate F 10-8: 2019 AM Peak Current Operation Average Queue Lengths

Plate F 10-9: 2019 PM Peak Current Operation Average Queue Lengths



The results show that junction 25 experiences some level of traffic queuing in the current year of operation (2019). In both the AM and PM peaks, the western roundabout performs at a LOS C and the eastern roundabout at a LOS A. There is minimal queuing at the eastern roundabout in both peaks. The longest queue length at the western junction is present on the Marks Tey interchange approach (22m) in the AM and A120 Coggeshall Road approach in the PM (32m).

Future Operation with Construction (2025)

The LOS, delay, and queue length Vissim results for the future operation with construction 2025 scenario are presented in Table F 10-9 and Table F 10-10.

Plate F 10-10 to Plate F 10-12 illustrate the average queue lengths on each approach to the eastern and western junctions at junction 25 for the AM, IP and PM peaks respectively. The average queue lengths are identifiable by the red blocks and the queue length distance is also reported (m).

Table F 10-9: Vissim Outputs 2025 Future Operation with Construction AM & PM

Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Western Roundabout	A12 NB off-slip	Priority	D	280	25	8	36	F	492	90	56	105
	A120	Priority	E	1131	36	73	213	F	1173	54	201	369
	Station Road	Priority	B	191	13	3	23	C	193	18	4	26
	Marks Tey	Priority	C	1318	16	23	132	C	1319	19	31	141
	Total	**Priority**	**C**	**2920**	**24**	**-**	**-**	**E**	**3177**	**43**	**-**	**-**
Eastern Roundabout	A12 SB off-slip	Priority	C	1146	15	22	83	C	992	16	20	73
	B1408 London Road	Priority	C	432	23	14	57	C	388	15	6	40
	London Road (A12	Priority	A	94	10	0	10	A	126	10	1	12
	Marks Tey	Priority	A	533	7	0	5	A	628	5	0	5
	Total	**Priority**	**B**	**2205**	**14**	**-**	**-**	**B**	**2134**	**12**	**-**	**-**

Table F 10-10: Vissim Outputs 2025 Future Operation with Construction IP

Junction	Entry arm	Control	IP				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Western Roundabout	A12 NB Offslip	Priority	C	274	19	6	33
	A120	Priority	C	1028	22	11	83
	Station Road	Priority	A	87	8	1	12
	Marks Tey Interchange	Priority	B	1070	12	6	67
	Total	**Priority**	**C**	**2459**	**17**	**-**	-
Eastern Roundabout	A12 SB Offslip	Priority	A	868	10	9	57
	B1408 London Road (Copford)	Priority	B	379	13	5	38
	London Road (A12 slip)	Priority	A	131	7	0	11
	Marks Tey Interchange	Priority	A	438	6	0	5
	Total	**Priority**	**A**	**1816**	**9**	**-**	-

Plate F 10-10: 2025 AM Peak Future Operation with Construction Average Queue Lengths

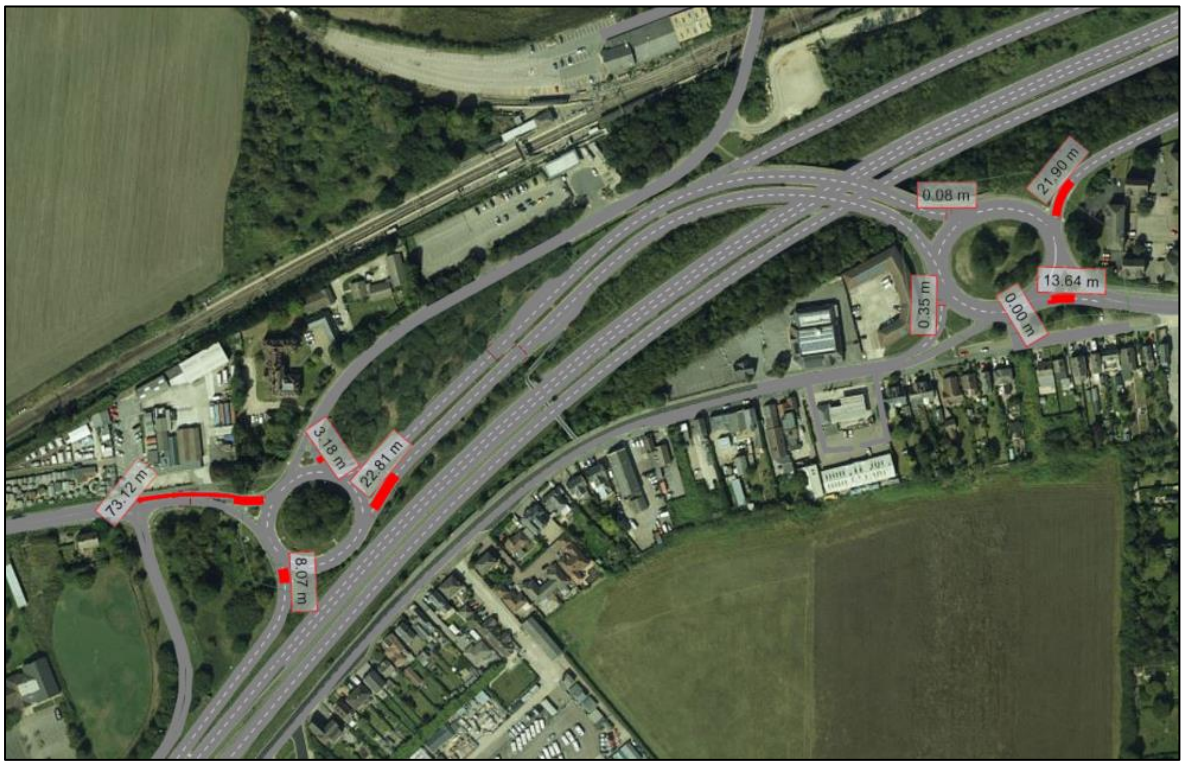
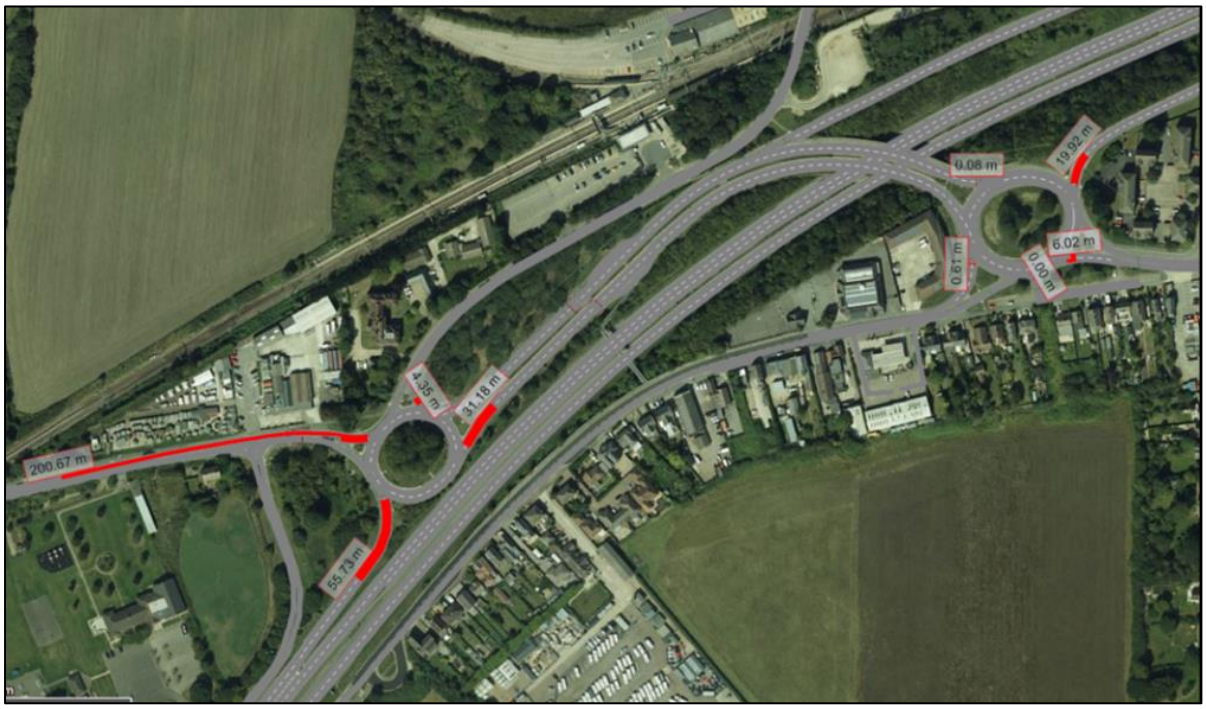


Plate F 10-11: 2025 IP Future Operation with Construction Average Queue Lengths

Plate F 10-12: 2025 PM Peak Future Operation with Construction Average Queue Lengths



In the AM peak future operation with construction (2025) models the western roundabout performs at a LOS C and the eastern roundabout with a LOS B. The largest queue is shown on the A120 Coggeshall Road approach arm with an average queue of 73m

In the PM peak hour the western roundabout performs at a LOS E and the eastern roundabout at a LOS B. The largest levels of queuing are shown on the A120 Coggeshall Road approach (201m) and the A12 NB off-slip (56m). When compared to the 2019 current operation results for the western roundabout, the junction performs significantly worse during the PM peak with construction traffic. The current operation generates a LOS C whereby the future operation with construction generates a LOS E.

In the IP period there is low levels of queueing at both roundabouts. The western roundabout performs at a LOS C and the eastern roundabout performs at a LOS A.

As shown in the following section, for the AM and PM peaks the modelled LOS is similar to that of the Vissim results for the 2027 future operation without scheme scenario. Therefore, additional queuing or delays in this scenario is a result of increased background traffic rather than the additional construction vehicles.

Future Operation without Scheme (2027, 2042)

The LOS, delay, and queue length Vissim results for the future operation without scheme scenarios for 2027 and 2042 are presented in Table F 10-11 and Table F 10-12 respectively.

Plate F 10-13 and Plate F 10-14 illustrate the average queue lengths on each approach to the eastern and western junctions at junction 25 for the AM and PM peaks respectively. The average queue lengths are identifiable by the red blocks and the queue length distance are also reported (m).

Table F 10-11: Vissim Outputs 2027 Future Operations without Scheme

Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Western Roundabout	A12 NB off-slip	Priority	C	252	24	6	28	F	453	113	58	98
	A120	Priority	E	1153	35	70	219	F	1186	56	214	377
	Station Road	Priority	B	196	12	3	22	C	196	18	4	26
	Marks Tey	Priority	C	1338	16	26	138	C	1342	20	40	170
	Total	**Priority**	**C**	**2938**	**24**	**-**	**-**	**E**	**3176**	**46**	**-**	**-**
Eastern Roundabout	A12 SB off-slip	Priority	B	1163	15	21	85	B	1007	14	17	71
	B1408 London Road	Priority	C	439	21	12	54	C	394	15	6	41
	London Road (A12	Priority	A	95	10	0	10	B	128	10	1	13
	Marks Tey	Priority	A	512	6	0	3	A	596	5	0	6
	Total	**Priority**	**B**	**2208**	**14**	**-**	**-**	**B**	**2125**	**12**	**-**	**-**

Table F 10-12: Vissim Outputs 2042 Future Operations without Scheme

Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Western Roundabout	A12 NB off-slip	Priority	C	269	21	5	28	F	463	165	117	189
	A120	Priority	E	1212	48	154	335	F	1207	76	377	548
	Station Road	Priority	C	218	17	6	28	C	200	20	5	27
	Marks Tey	Priority	B	1319	15	21	118	D	1406	26	77	214
	Total	**Priority**	**D**	**3018**	**29**	**-**	**-**	**F**	**3277**	**64**	**-**	**-**
Eastern Roundabout	A12 SB off-slip	Priority	C	1130	17	25	89	C	1041	18	24	81
	B1408 London Road	Priority	D	548	29	27	84	C	452	18	9	47
	London Road (A12	Priority	A	105	9	0	10	B	139	13	1	15
	Marks Tey	Priority	**A**	568	7	0	4	A	608	5	0	6
	Total	**Priority**	**C**	**2350**	**17**	**-**	**-**	**B**	**2241**	**14**	**-**	**-**

Plate F 10-13: 2042 AM Peak Future Operations without Scheme Average Queue Lengths

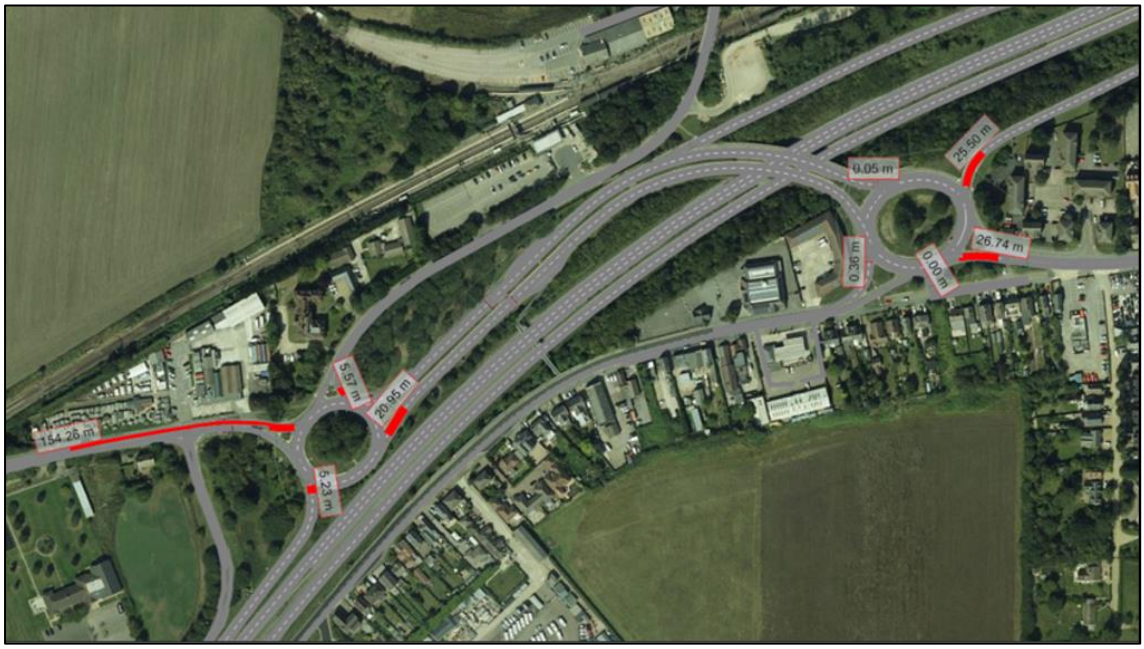
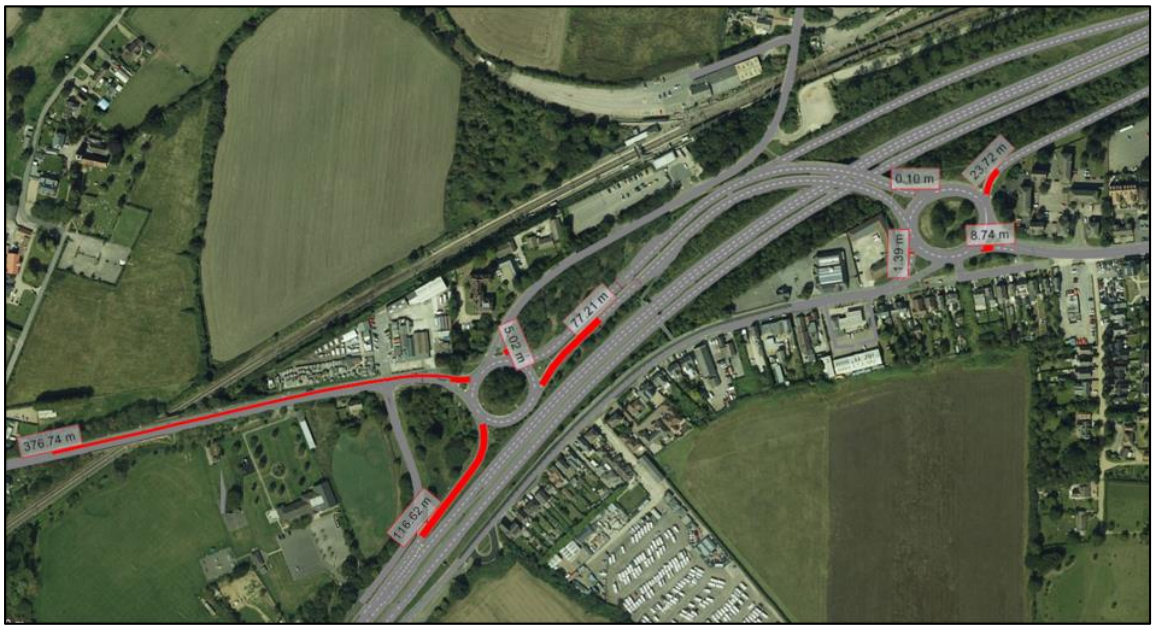


Plate F 10-14: 2042 PM Peak Future Operation without Scheme Average Queue Lengths



In the future operation without scheme (2042), the AM model shows that the western roundabout performs with a LOS D and the eastern roundabout with a LOS C. At the western roundabout, the longest traffic queue is on the A120 Coggeshall Road approach (154m) with an average of 48 seconds delay.

In the PM peak, the western roundabout performs with a LOS F and an average vehicle delay of 64 seconds. At the western roundabout there is significant traffic queueing on both the A120 Coggeshall Road approach (377m) and A12 NB off-slip approach (117m). The average vehicle delay on the A120 Coggeshall Road and A12 NB off-slip approaches is 76 seconds and 165 seconds respectively. The eastern roundabout performs with a LOS B with low levels of traffic queueing and delay.

It can be concluded that for the 2042 future operation without scheme PM peak hour, the current junction 25 layout and operation does not provide sufficient provision to cater for the level of traffic forecasted.

Future Operation with Scheme (2027, 2042)

The LOS, delay, and queue length Vissim results for the future operation with scheme scenarios for 2027 and 2042 are presented in Table F 10-13 and Table F 10-14 respectively.

Plate F 10-15 and Plate F 10-16 illustrate the average queue lengths on each approach to the eastern and western junctions at junction 25 for the AM and PM peaks respectively. The average queue lengths are identifiable by the red blocks and the queue length distance is also reported (m).

Table F 10-13: Vissim Outputs 2027 Future Operation with Scheme

Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Western Junction	Western Link	Signalised	D	575	39	19	51	D	864	40	31	77
	A120 Coggeshall Road	Signalised	D	1146	45	21	90	D	1133	44	25	100
	Station Road	Signalised	D	174	46	10	36	E	200	60	16	42
	Marks Tey Interchange	Signalised	C	1470	23	20	87	C	1463	33	33	92
	Total	**Signalised**	**C**	**3364**	**34**	**-**	**-**	**D**	**3659**	**39**	**-**	**-**
Eastern Roundabout	A12 SB off-slip	Priority	A	1264	8	8	55	A	1124	9	8	50
	B1408 London Road (Copford)	Priority	B	515	14	6	40	A	406	9	2	25
	London Road (A12 slip)	Priority	A	89	7	0	9	A	123	6	0	11
	Marks Tey Interchange	Priority	A	577	9	0	6	A	702	9	0	7
	Total	**Priority**	**A**	**2445**	**10**	**-**	**-**	**A**	**2355**	**9**	**-**	**-**
London Road Roundabout	A12 NB off-slip	Priority	A	250	6	0	10	A	565	6	0	0
	Southern Link - Old A12	Priority	A	308	2	0	12	A	274	3	0	0
	Western Link	Priority	A	300	3	0	4	A	266	3	0	0
	Old London Road	Priority	A	58	3	0	6	A	63	4	0	0
	Total	**Priority**	**A**	**916**	**3**	**-**	**-**	**A**	**1168**	**4**	**-**	**-**

Table F 10-14: Vissim Outputs 2042 Future Operations with Scheme

Junction	Entry arm	Control	AM					PM				
			LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)	LOS	Vehicles	Vehicle Delay (s)	Average Queue (m)	Average Maximum Queue (m)
Western Junction	Western Link	Signalised	D	683	42	24	59	D	953	46	47	105
	A120 Coggeshall Road	Signalised	D	1176	48	30	105	D	1193	49	40	132
	Station Road	Signalised	D	183	46	11	37	E	218	61	17	45
	Marks Tey Interchange	Signalised	C	1501	22	21	91	C	1616	29	35	111
	Total	**Signalised**	**D**	**3543**	**36**	**-**	**-**	**D**	**3981**	**41**	**-**	**-**
Eastern Roundabout	A12 SB Offslip	Priority	B	1240	11	12	66	B	1237	12	14	70
	B1408 London Road (Copford)	Priority	C	660	20	15	67	B	515	13	4	35
	London Road (A12 slip)	Priority	A	99	8	0	10	C	138	8	1	12
	Marks Tey Interchange	Priority	A	667	10	0	10	C	793	9	0	11
	Total	**Priority**	**B**	**2666**	**13**	**-**	**-**	**B**	**2684**	**11**	**-**	**-**
London Road Roundabout	A12 NB off-slip	Priority	A	321	6	0	12	A	647	7	1	19
	Southern Link - Old A12	Priority	A	361	2	0	15	A	286	4	1	18
	Western Link	Priority	A	429	4	0	8	A	481	4	0	9
	Old London Road	Priority	A	63	3	0	7	A	68	5	0	9
	Total	**Priority**	**A**	**1173**	**4**	**-**	**-**	**A**	**1481**	**6**	**-**	**-**

Plate F 10-15: 2042 AM Peak Future Operation with Scheme Average Queue Lengths

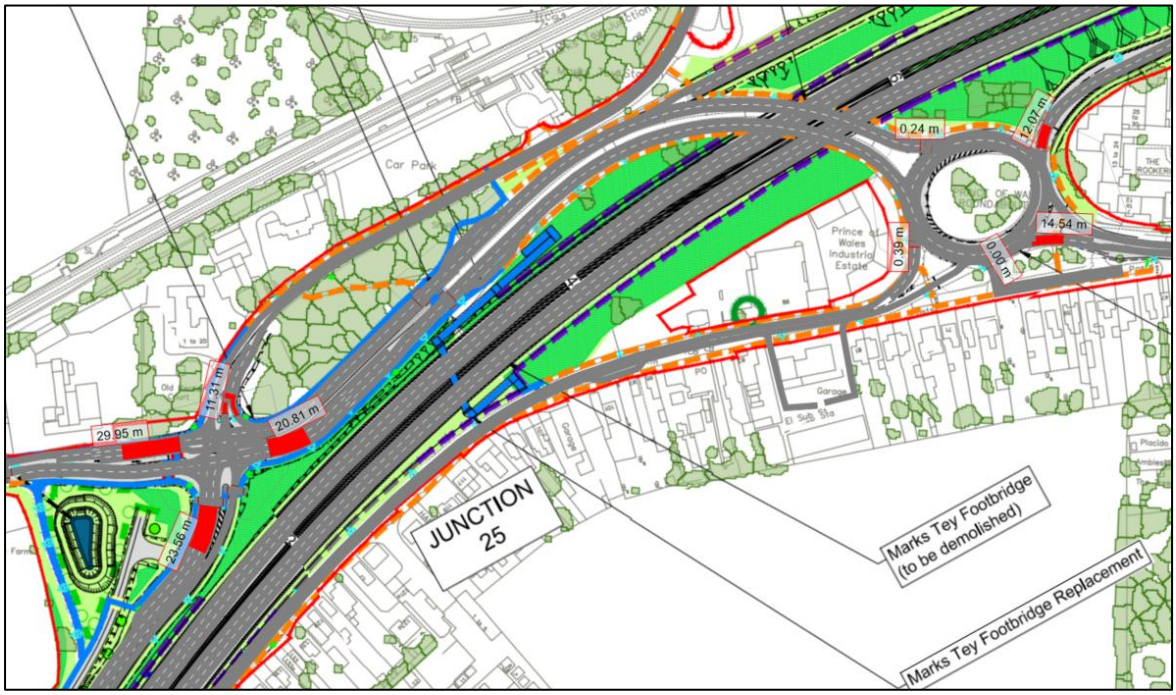
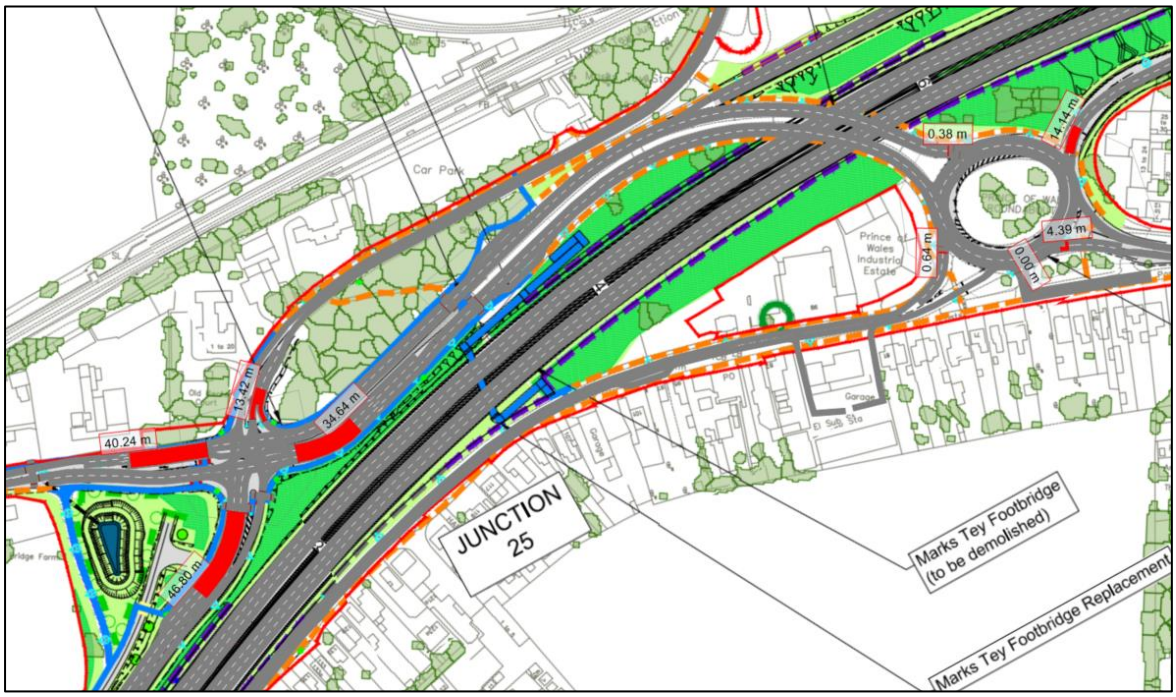


Plate F 10-16: 2042 PM Peak Future Operation with Scheme Average Queue Lengths



In the future operation with scheme (2042), the AM peak model shows that the western junction performs with a LOS D and the eastern roundabout with a LOS B. The longest traffic queue length at junction 25 is on the A120 Coggeshall Road approach to the western junction, with an average length of 30m. This presents a large improvement when compared to the AM peak 2042 without scheme scenario results.

In the PM peak, the western junction performs with a LOS D and the eastern roundabout performs with a LOS B. At the western junction, the largest levels of traffic queueing are present on the A120 Coggeshall Road approach (40m) and the Western Link approach arm (35m). Both of these queue lengths demonstrate a large improvement when compared to the 2042 without scheme scenario results.

F.10.6 Summary

The Vissim modelling results demonstrate that without the proposed scheme in place, the eastern roundabout will perform with low levels of delay and traffic queueing. However, by 2042 the western junction performs poorly, with a LOS F in the PM Peak. Vehicle delay and traffic queues are anticipated to be high at both the A120 Coggeshall Road and A12 NB off-slip approaches to the junction.

With the proposed scheme in place, the eastern roundabout still performs well. The western junction has a LOS D in both the AM and PM peaks. Although there is some traffic queuing and delay at the western junction, the results demonstrate a significant improvement on the A120 Coggeshall Road and A12 NB off-slip approaches when compared to the without scheme results.

The new London Road roundabout will perform with a LOS A and negligible queuing and delay in all of the modelled scenarios.

A summary of the LOS and delay results for each of the modelled junctions at junction 25 are shown in Table F 10-15, Table F 10-16 and Table F 10-17.

Table F 10-15: Western Junction LOS & Delay Summary

Scenario	Year	AM		PM		IP	
		LOS	Veh Delay (sec)	LOS	Veh Delay (s)	LOS	Veh Delay (sec)
Current operation	2019	C	21	C	24	-	-
With Construction	2025	C	32	E	43	C	17
Without Scheme	2027	C	24	E	46	-	-
	2042	D	29	F	64	-	-
With Scheme	2027	C	34	D	39	-	-
	2042	D	36	D	41	-	-

Table F 10-16: Eastern Roundabout LOS & Delay Summary

Scenario	Year	AM		PM		IP	
		LOS	Veh Delay (sec)	LOS	Veh Delay (s)	LOS	Veh Delay (sec)
Current operation	2019	A	10	A	9	-	-
With Construction	2025	B	14	B	12	A	9
Without Scheme	2027	B	14	B	12	-	-
	2042	C	17	B	14	-	-
With Scheme	2027	A	10	A	9	-	-
	2042	B	13	B	11	-	-

Table F 10-17: London Road Roundabout LOS & Delay Summary

Scenario	Year	AM		PM		IP	
		LOS	Veh Delay (sec)	LOS	Veh Delay (sec)	LOS	Veh Delay (sec)
With Scheme	2027	A	3	A	4	-	-
	2042	A	4	A	6	-	-

F.10.7 Annex A Junction 25 Base Model Validation Report

F.10.7.1. Introduction

Overview

A 2019 base year Vissim micro-simulation model has been developed for junction 25 on the A12 in Chelmsford. It will be used to assess the traffic impacts of the A12 Chelmsford to A120 widening scheme design for the junction.

The purpose of this technical note is to document the development of the base year Vissim traffic model for the AM and PM peak hours. The report details the calibration and validation of the model against observed datasets including traffic counts and journey time data.

Report structure

The remainder of the report is structured into the following sections:

- Section F.10.7.2 – Model Development, this section describes the various parameters and assumptions used in the development of the model network.
- Section F.10.7.3 – Traffic Demand, this section outlines the survey count data used within the model development process.
- Section F.10.7.4 – Journey Time Data, this section outlines the journey time data and routes used for the validation process
- Section F.10.7.5 – Model Calibration, this section explains the base model calibration process.

- Section F.10.7.6 – Model Validation, this section sets out the validation criteria employed and presents comparisons between modelled and observed data.
- Section F.10.7.7 – Summary, this section includes a summary of the base model development undertaken and a recommendation regarding whether the model is suitable for its intended purpose.

F.10.7.2. Model Development

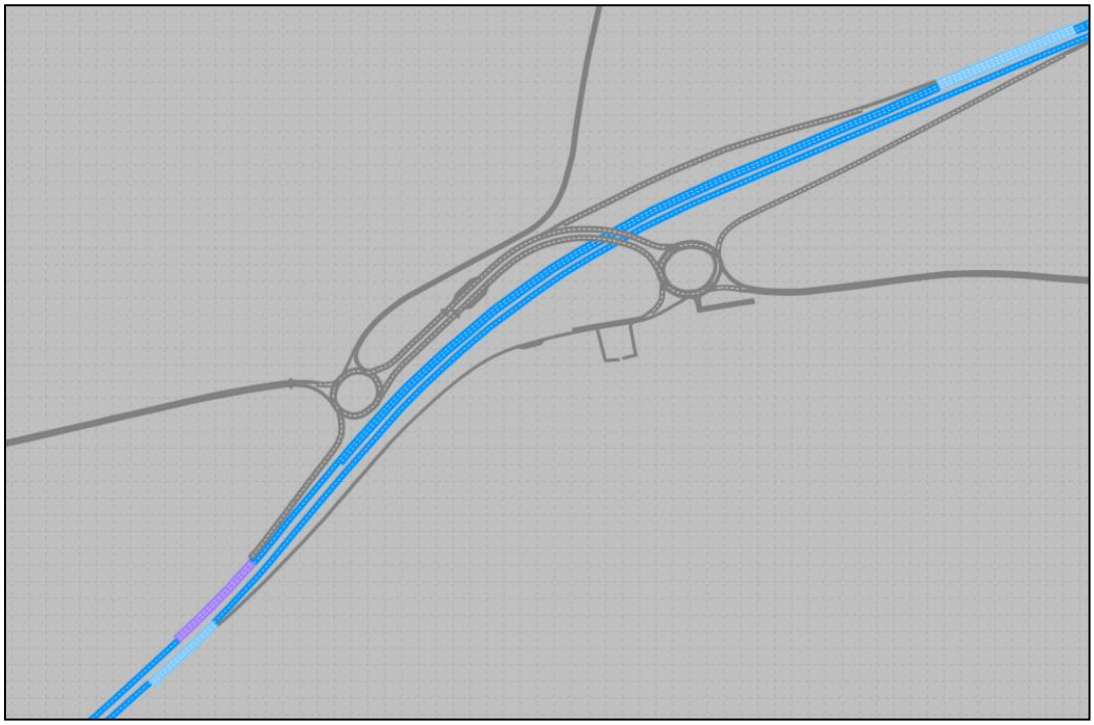
Software Specification

The 2019 base model of junction 25 has been developed using Vissim version 2020-08.

Model Extents

The Vissim model extents are shown in Plate F 10-17. The base model includes the A12 NB and A12 SB, and the existing eastern and western dumbbell roundabouts at junction 25, including all of the approach arms and exit arms at the roundabouts and the link road between the two.

Plate F 10-17: Vissim Model Extents



Model Periods

The peak hours modelled match those which are modelled in the strategic SATURN model and include the following:

- AM peak – 07:30 to 08:30
- PM peak – 17:00 to 18:00

The model has been validated for these peak hours and they also include a 15-minute ‘warm-up’ period, used to populate the network with traffic prior to the evaluation periods. It was considered that a ‘cool-down’ period would not be required for this study.

User Classes

The junction 25 Vissim model includes two vehicle types:

- Car
- HGV

Signal Timings

The model extents include the following signalised pedestrian crossings, the signal timings for which are shown in Table F 10-18:

- A120 Coggeshall Road Toucan crossing
- A120 Link Road staggered Toucan crossing

Table F 10-18: Toucan Crossing Signal Timings

Toucan Crossing	Frequency (s)	
	AM	PM
A120 Coggeshall Road	180	90
A120 Link Road	120	180

Signal timings have been estimated during the model calibration process as no signal data was available during the development of the base model.

Model Assignment

Static route assignment was used in the base model for all vehicle movements. There is no route choice for the movements through the model network.

Public Transport

Public Transport routes 70, 71, 82, 901, 903 and 910 are included in the modelled network. The frequencies for each of the services have been calculated using the service time tables. Frequencies are shown in Table F 10-19.

Table F 10-19: Public Transport Frequencies

Bus Service	Direction	Frequency	
		AM	PM
70	EB	1	2
	WB	2	3
71	EB	1	2
	WB	3	3
82	EB	0	1
	WB	0	0
506	EB	1	0
	WB	0	0
901	EB	1	0
	WB	0	0
903	EB	1	0
	WB	0	0
910	EB	1	0
	WB	0	0

Site Observations

No site observations have been undertaken as a result of the Covid-19 pandemic.

Desired Speed Distributions

Desired speed distributions have been created based upon Department for Transport (DfT) data - Table SPE0111: Free flow vehicle speeds by road type and vehicle type in Great Britain. The speed distributions within this model are based upon 2019 data.

Driving Behaviour Types

Within the junction 25 layout, one driving behaviour type has been used for all links - “Urban (motorized)”. The Vissim default parameter values have been maintained for this driving behaviour type. Motorway, Motorway Merge and Motorway Diverge link behaviours have been used for the A12 mainline.

F.10.7.3. Traffic Demand

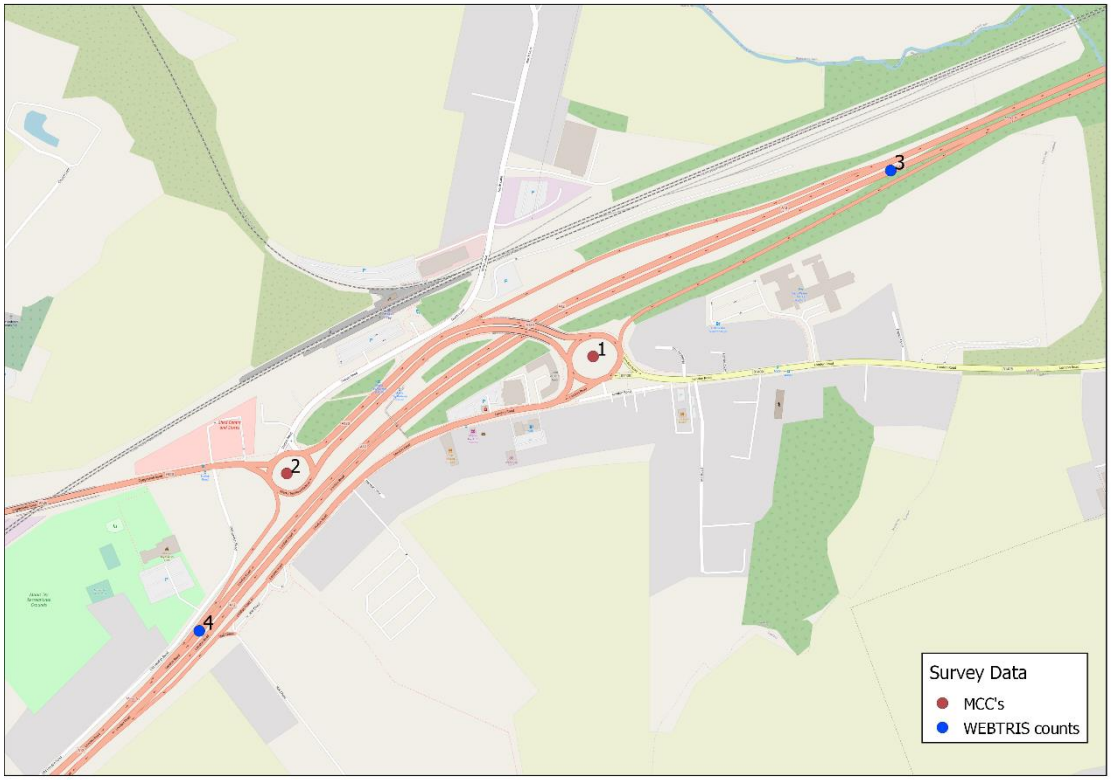
Traffic Survey Data

It was not possible to collect new traffic count data as part of this study in the timescales for the development of the junction 25 base model. The traffic count data available is shown in Table F 10-20 and graphically in Plate F 10-18.

Table F 10-20: Traffic Count Data

Site number	Location	Count Type	Date of survey
1	J25 Eastern Dumbbell	JCT	10/05/2016
2	J25 Western Dumbbell	JCT	10/05/2016
3	A12 NB	WEBTRIS	2019
4	A12 SB	WEBTRIS	2016

Plate F 10-18: Location of Traffic Count Data



The primary source of data for this model has come from a combination of the junction count data for the dumbbell roundabouts and the WEBTRIS data for the A12 mainline.

Traffic Survey Classification

Table F 10-21 shows how data from the MCTC survey was classified.

Table F 10-21: Survey Data Vehicle Classification

MCTC Classification	Vissim Vehicle Type
Cars	Car
LGV 1	
LGV2	
MGV	HGV
HGV 1	
HGV 2	
PSV (bus / coach)	
Motorbike & Cyclist	Not included

Factoring Traffic Data to 2019

The MCTC survey was undertaken in 2017, and therefore in order to be able to validate the model against 2019 journey time data the survey data was factored using RTF18 growth factors. This follows the same methodology adopted by the strategic modelling for the A12 project. Factors suitable for 'Principal A Road' were applied. To convert from 2017 to 2019 the following factors were used:

- Car 1.036
- HGV 0.996

F.10.7.4. Journey Time & Queue Data

Journey Time Data

The journey time data used for model validation is from the 2019 TrafficMaster database. This dataset was used to validate the representation of journey times and delays in the junction 25 model along key routes through the junction.

The TrafficMaster database contains journey time and speed information obtained from journeys made by vehicles fitted with TrafficMaster GPS tracking devices (SmartNav) and is available by date in 15-minute intervals and by vehicle type. The datasets are then mapped to the Ordnance Survey Integrated Transport Network (ITN) to provide speed and travel time information on a link by link basis.

Eighteen journey time routes have been defined in the Vissim model. Route descriptions are presented in Table F 10-22 and the location of the routes is presented in Annex A.

Table F 10-22: Journey Time Route Descriptions

Route no.	Description	Route length (m)
1	A12 NB	4083
2	A12 SB	4083
3	A120 to B1408 EB	707
4	B1408 to A120 WB	744
5	A12 to Station road NB (section 1)	245
6	A12 to Station road NB (section 2)	564
7	Station Road to A12 SB (section1)	564
8	Station Road to A12 SB (section 2)	638
9	Station Road to A12 SB (section 3)	635
10	A120 to A12 EB	869
11	A120 to A12 SB (section 1)	726
12	A120 to A12 SB (section 2)	636
13	A12 to B1408 EB	832
14	B1408 to A12 SB	816
15	A12 to A120 NB	262
16	A12 to A120 SB	1154
17	B1408 to A12 NB	1476
18	A12 to B1408 SB	571

The data was processed in SQL to provide AM, IP, and PM journey times for an average weekday in the neutral months of 2019. The data was 'cleaned' to avoid bank holiday and school holidays. The day to day variability was also monitored on each link by using the recorded mean and standard deviation travel times for each ITN link for all vehicles, and any daily outliers with standard deviations greater than 2 from the mean were removed from the data set.

Queue Data

No traffic queue data was available at the time of developing the junction 25 base model. Validation of the model has therefore, been undertaken using journey time data only.

F.10.7.5. Count Calibration and Validation

Criteria

TAG contains two sets of measures to assess link flow validation, as follows:

- The absolute and percentage differences between modelled flows and counts.

- The GEH statistic, which is a form of the Chi-squared statistic that incorporates both relative and absolute errors, and is defined as follows:

$$GEH = \sqrt{\frac{(M-O)2}{(M+O)/2}}$$

Where M is the modelled flow and O is the observed flow.

These two measures are broadly consistent and link flows that meet either criterion should be regarded as satisfactory.

The acceptability guidelines as outlined in TAG Unit M3.1 are shown in Table F 10-23 below.

Table F 10-23: Link Flow and Turning Movement Validation Criteria and Acceptability Guidelines

	Criteria and Measure	Acceptability Guideline	
Flow Criteria			
1	Observed flow < 700vph	Modelled flow within +/- 100vph	> 85% of links
	Observed flow 700 to 2700vph	Modelled flow within +/- 15%	
	Observed flow > 2700vph	Modelled flow within +/- 400vph	
GEH Criteria			
2	GEH statistic for individual links < 5		> 85% of links

Calibration Results

As the Vissim model has no allowance for route choice, all counts are effectively used as calibration counts. Turning flows have been calibrated in each modelled time period. A summary of the calibration achieved by the models based upon an average of 10 simulation seed runs can be seen in Table F 10-24 and Table F 10-25 for the AM and PM peaks respectively.

Table F 10-24: AM Peak Turning Flows (Vehicles)

Junction	From	To	Observed (vehs)	Modelled (vehs)	Difference (vehs)	GEH	Pass / Fail
Western Dumbbell	A12 NB off-slip	A120 Coggeshall Road	58	61	3	0.4	Pass
		Station Road	22	21	-1	0.2	Pass
		A120 Link Road	111	109	-2	0.2	Pass
	A120 Coggeshall Road	Station Road	27	26	-1	0.2	Pass
		A120 Link Road	1111	1123	12	0.4	Pass
		A120 Coggeshall Road	2	2	0	0.1	Pass
	Station Road	A120 Link Road	130	127	-3	0.3	Pass
		A120 Coggeshall Road	32	32	0	0.0	Pass
		Station Road	1	1	0	0.0	Pass
	A120 Link Road WB	A120 Coggeshall Road	1155	1139	-16	0.5	Pass
		Station Road	122	118	-4	0.4	Pass
		A120 Link Road	92	88	-4	0.4	Pass
Eastern Dumbbell	A120 Link Road EB	B1408 Copford	292	300	8	0.5	Pass
		London Road	2	2	0	0.1	Pass
		London Road (A12 on- slip)	165	167	2	0.1	Pass
		A120 Link Road	8	7	-1	0.5	Pass
	A12 SB off-slip	B1408 Copford	73	72	-1	0.2	Pass
		London Road	2	2	0	0.1	Pass
		London Road (A12 on- slip)	216	217	1	0.1	Pass
		A120 Link Road	871	866	-5	0.2	Pass
	B1408 Copford	London Road	0	0	0	0.0	Pass
		London Road (A12 on-slip)	227	230	3	0.2	Pass
		A120 Link Road	413	414	1	0.0	Pass
		B1408 Copford	0	0	0	0.0	Pass
	London Road	London Road (A12 on slip)	4	4	0	0.1	Pass
		A120 Link Road	2	2	0	0.1	Pass
		B1408 Copford	0	0	0	0.0	Pass
	London Road (A12 on-slip)	A120 Link Road	52	52	0	0.0	Pass
		B1408 Copford	38	38	0	0.0	Pass
		London Road	0	0	0	0.0	Pass
	All Movements		5229	5220	-9		

Table F 10-25: PM Peak Turning Flows (Vehicles)

Junction	From	To	Observed (vehs)	Modelled (vehs)	Difference (vehs)	GEH	Pass / Fail
Western Dumbbell	A12 NB off-slip	A120 Coggeshall Road	100	106	6	0.6	Pass
		Station Road	52	51	-1	0.1	Pass
		A120 Link Road	218	219	1	0.1	Pass
	A120 Coggeshall Road	Station Road	25	25	0	0.0	Pass
		A120 Link Road	1142	1154	12	0.4	Pass
		A120 Coggeshall Road	0	0	0	0.0	Pass
	Station Road	A120 Link Road	133	131	-2	0.1	Pass
		A120 Coggeshall Road	40	40	0	0.1	Pass
		Station Road	0	0	0	0.0	Pass
	A120 Link Road WB	A120 Coggeshall Road	1057	1065	8	0.2	Pass
		Station Road	80	78	-2	0.2	Pass
		A120 Link Road	147	143	-4	0.3	Pass
Eastern Dumbbell	A120 Link Road EB	B1408 Copford	433	467	34	1.6	Pass
		London Road	4	4	0	0.1	Pass
		London Road (A12 on- slip)	133	143	10	0.9	Pass
		A120 Link Road	15	14	-1	0.1	Pass
	A12 SB off-slip	B1408 Copford	113	113	0	0.0	Pass
		London Road	1	1	0	0.0	Pass
		London Road (A12 on-slip)	54	54	0	0.0	Pass
		A120 Link Road	848	843	-5	0.2	Pass
	B1408 Copford	London Road	5	7	2	0.7	Pass
		London Road (A12 on-slip)	134	132	-2	0.1	Pass
		A120 Link Road	303	309	6	0.3	Pass
		B1408 Copford	1	1	0	0.0	Pass
	London Road	London Road (A12 on- slip)	2	2	0	0.1	Pass
		A120 Link Road	3	3	0	0.1	Pass
		B1408 Copford	2	2	0	0.1	Pass
	London Road (A12 on-slip)	A120 Link Road	111	111	0	0.0	Pass
		B1408 Copford	73	70	-3	0.3	Pass
		London Road	1	1	0	0.0	Pass
	All Movements		5230	5289	59		

F.10.7.6. Journey Time Validation

Journey time routes located on the key roads within the modelled road network were coded into the model. Acceptability guidelines set out in TAG recommend that average modelled travel times should be within 15% of the corresponding observed values (or within one minute if 15% of the observed value is less than a minute) in at least 85% of cases. The observed mean journey time for each route has been used to validate against and is deemed to be sufficient to meet the requirements set out in the guidance.

Results were collected from the models for 10 simulation seed runs, and an average across vehicle categories was taken to give an average journey time for each route. The results can be seen in Table F 10-26 and Table F 10-27 for the AM and PM peaks respectively.

Table F 10-26: AM Peak Journey Time Validation

Ref.	Name	Observed (seconds)	Modelled (seconds)	Difference (seconds)	% Difference	Pass / Fail
1	A12 NB	150	150	0	0%	Pass
2	A12 SB	217	164	-53	-24%	Fail
3	A120 to B1408 EB	63	64	1	2%	Pass
4	B1408 to A120 WB	93	84	-10	-10%	Pass
5	A12 to Station road NB (section 1)	35	40	5	14%	Pass
6	A12 to Station road NB (section 2)	44	48	5	11%	Pass
A12 to Station road NB Total		79	88	10	12%	Pass
7	Station Road to A12 SB (section1)	48	49	1	2%	Pass
8	Station Road to A12 SB (section 2)	59	60	1	2%	Pass
9	Station Road to A12 SB (section 3)	54	42	-12	-22%	Fail
Station Road to A12 SB Total		161	151	-10	-6%	Pass
10	A120 to A12 EB	58	61	3	5%	Pass
11	A120 to A12 SB (section 1)	66	65	0	0%	Pass
12	A120 to A12 SB (section 2)	54	42	-11	-21%	Fail
A120 to A12 SB Total		119	108	-12	-10%	Pass
13	A12 to B1408 EB	81	84	3	4%	Pass
14	B1408 to A12 SB	77	68	-9	-12%	Pass
15	A12 to A120 NB	41	43	2	6%	Pass
16	A12 to A120 SB	119	101	-17	-15%	Pass
17	B1408 to A12 NB	129	112	-17	-13%	Pass
18	A12 to B1408 SB	46	40	-6	-14%	Pass

Table F 10-27: PM Peak Journey Time Validation

Ref.	Name	Observed (seconds)	Modelled (seconds)	Difference (seconds)	% Difference	Pass / Fail
1	A12 NB	163	152	-12	-7%	Pass
2	A12 SB	146	156	10	7%	Pass
3	A120 to B1408 EB	65	66	1	1%	Pass
4	B1408 to A120 WB	71	78	8	11%	Pass
5	A12 to Station road NB (section 1)	49	45	-4	-9%	Pass
6	A12 to Station road NB (section 2)	45	48	3	7%	Pass
A12 to Station road NB Total		94	93	-1	-1%	Pass
7	Station Road to A12 SB (section1)	57	49	-8	-14%	Pass
8	Station Road to A12 SB (section 2)	58	65	6	11%	Pass
9	Station Road to A12 SB (section 3)	41	41	0	0%	Pass
Station Road to A12 SB Total		156	155	-2	-1%	Pass
10	A120 to A12 EB	61	61	-1	-1%	Pass
11	A120 to A12 SB (section 1)	67	66	-1	-2%	Pass
12	A120 to A12 SB (section 2)	41	41	0	0%	Pass
A120 to A12 SB Total		108	107	-1	-1%	Pass
13	A12 to B1408 EB	94	90	-4	-4%	Pass
14	B1408 to A12 SB	60	61	2	3%	Pass
15	A12 to A120 NB	53	55	2	4%	Pass
16	A12 to A120 SB	105	103	-3	-3%	Pass
17	B1408 to A12 NB	108	107	-1	-1%	Pass
18	A12 to B1408 SB	51	43	-8	-15%	Pass

Three of the journey time routes in the AM peak do not meet TAG validation criteria whilst the remaining fifteen validation routes meet validation criteria. The journey time routes which do not pass include the A12 SB, Station Road to A12 SB (section 3), and A120 to A12 SB (section 2).

The AM peak base Vissim model does not have enough traffic delay on the A12 SB mainline carriageway between the off-slip and on-slip, which then results in insufficicent delay on the two routes leading onto the A12 using the SB on-slip. However, the focus of the Vissim models has been the assessment of the performance and operation of the A12 junctions and not the performance of the A12 mainline and the on/off-slips. Therefore, the lack of delay on the A12 SB carriageway does not have any impact on the ability of the junction 25 Vissim model in effectively assessing the junction performance in the future years.

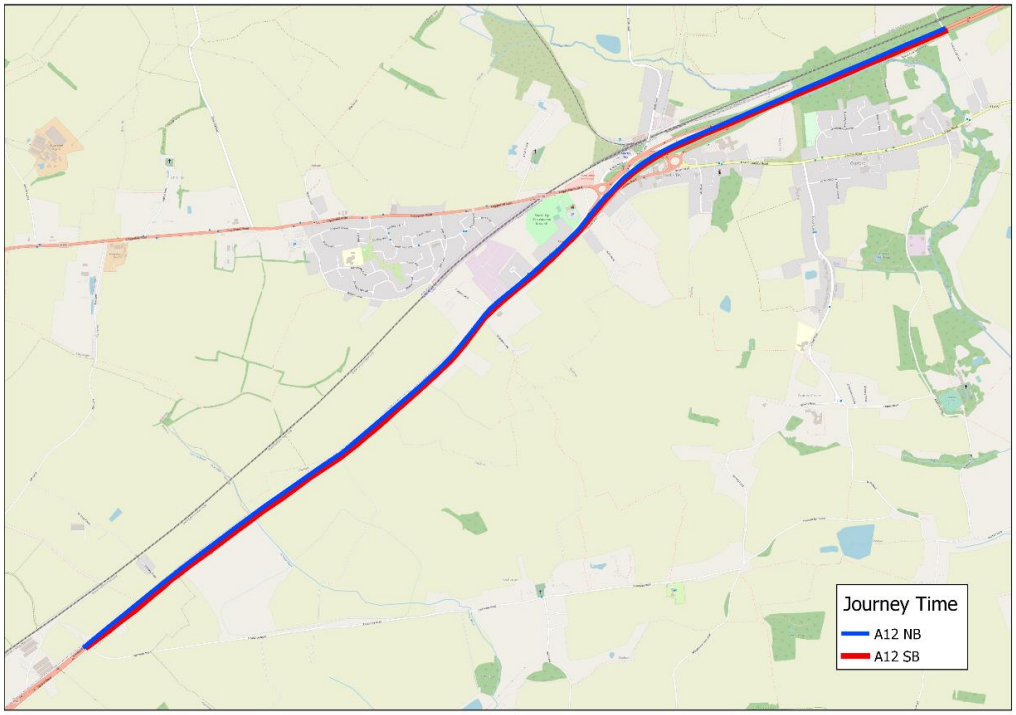
All eighteen of the journey time routes in the PM peak model meet TAG validation criteria.

F.10.7.7. Conclusion

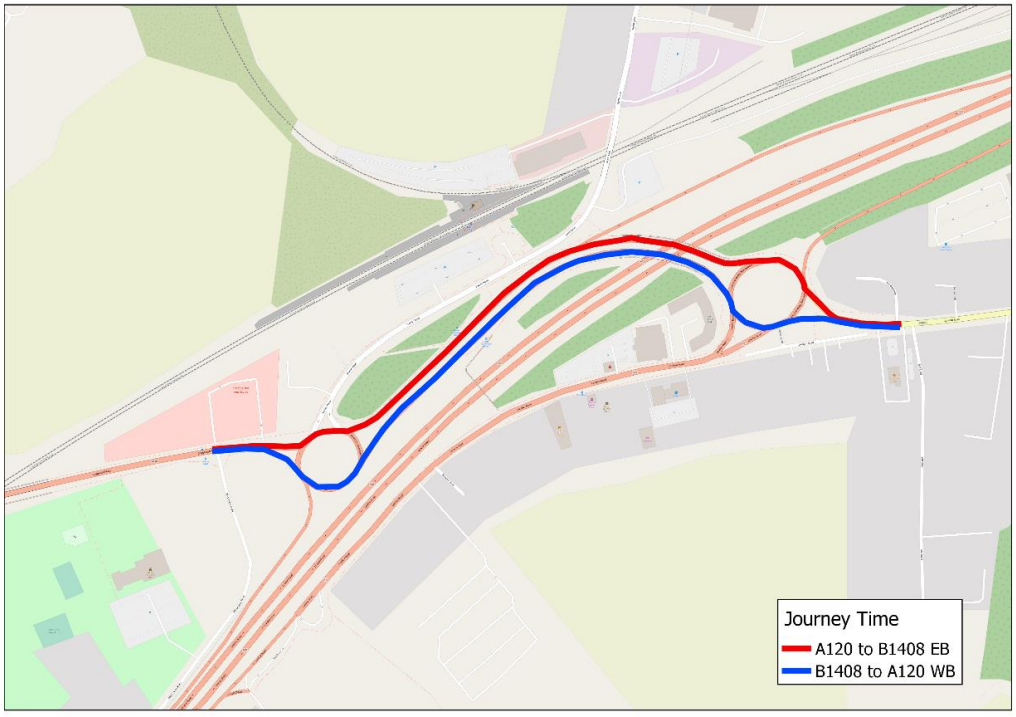
This report outlines the model development and calibration and validation of the junction 25 Vissim base year model, covering the peak hours in the AM and PM for a base year of 2019. The calibration and validation results achieved by the base models show that they offer a consistent and reliable approximation of observed baseline traffic conditions at junction 25. Journey time comparisons illustrate that all routes, with the exception of three routes in the AM peak, validated within acceptability criteria outlined in TAG. The base model is considered suitable for testing forecast future year traffic demand at junction 25 as part of the A12 scheme.

F.10.7.8. Annex A Journey Time routes

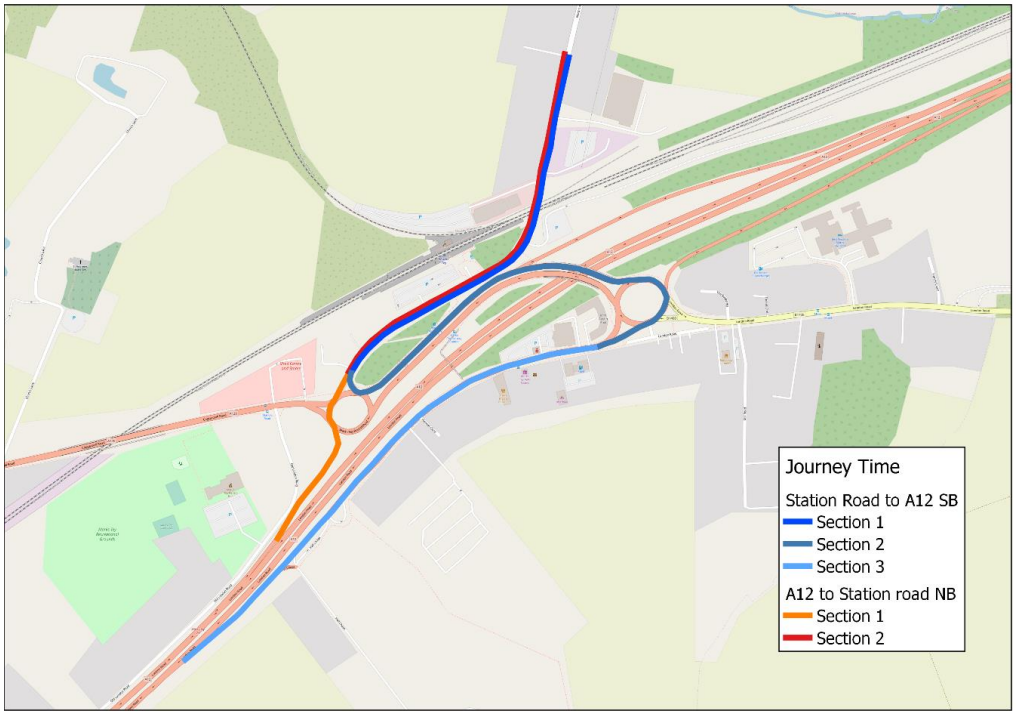
A12 NB and A12 SB



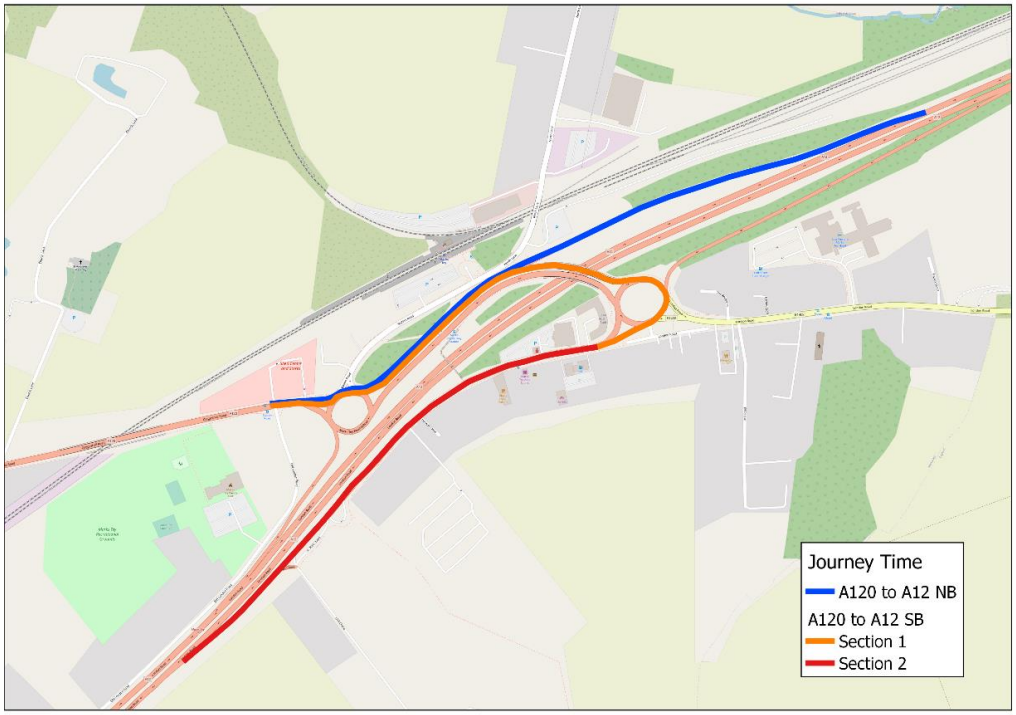
A120 – B1408



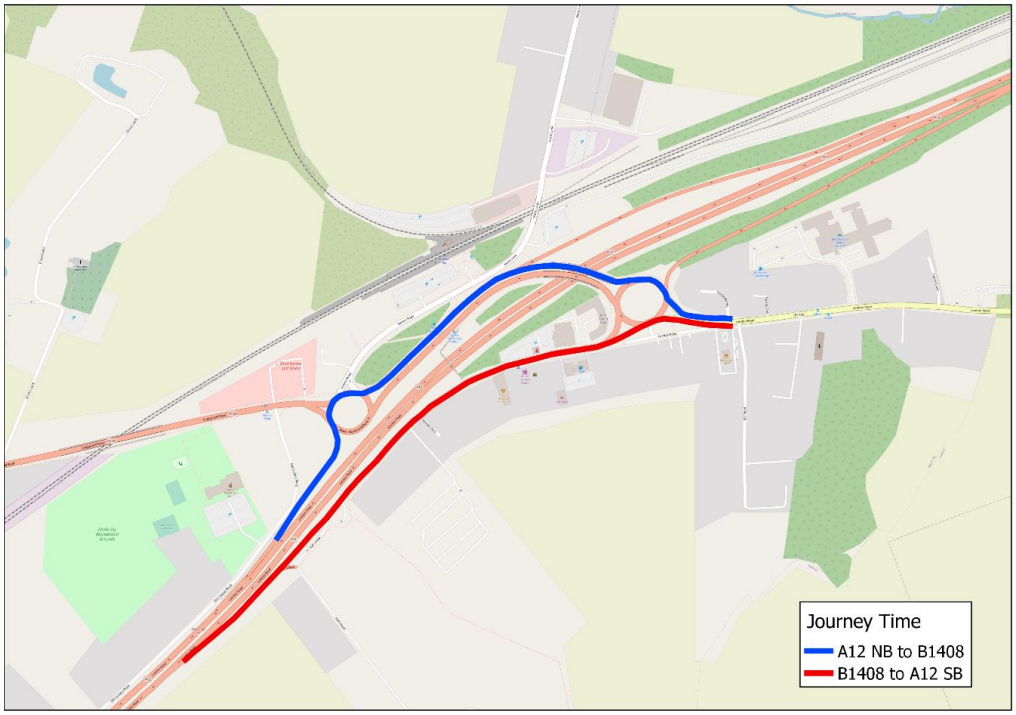
Station Road – A12



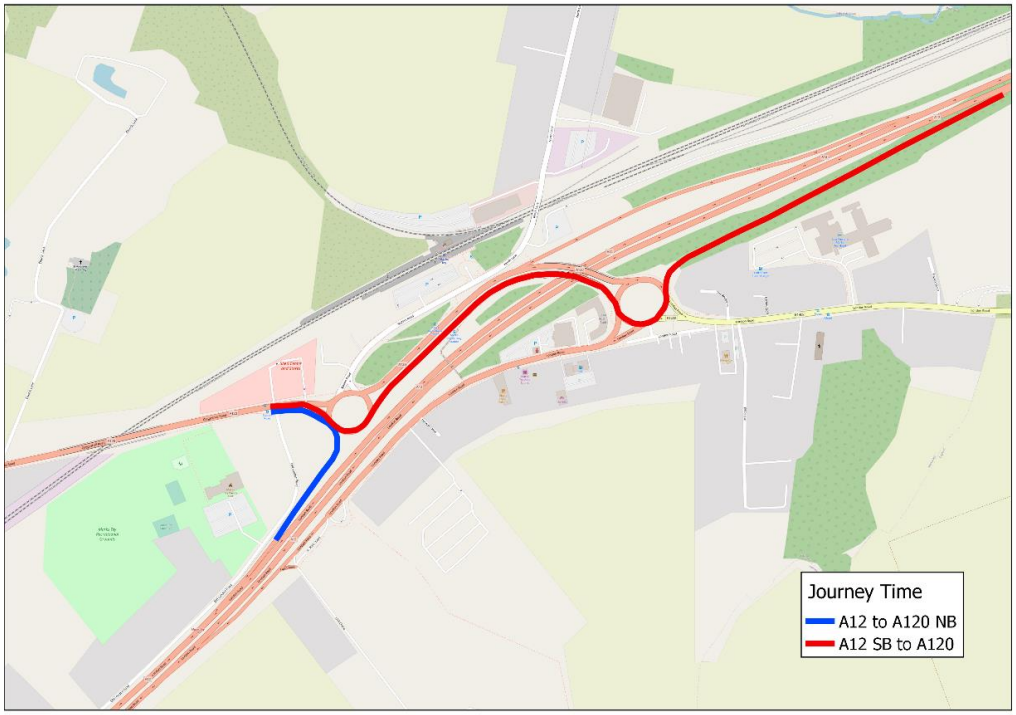
A120 – A12



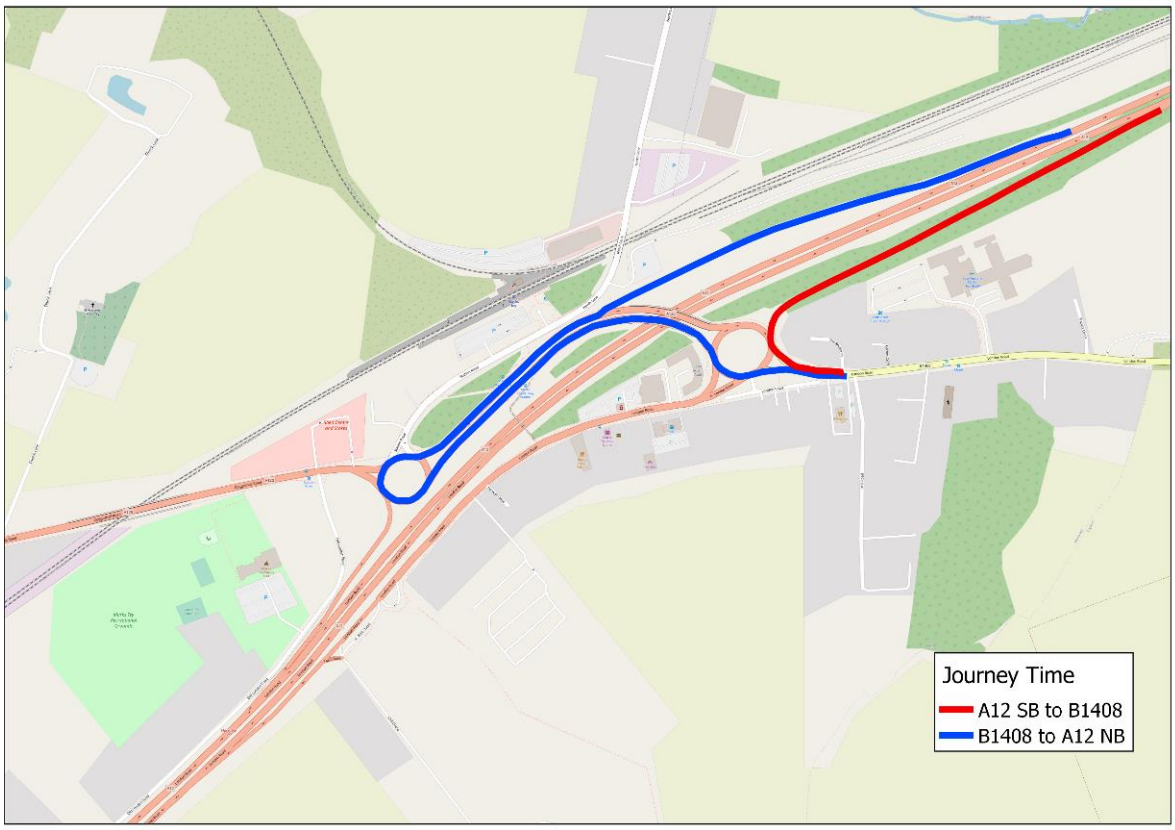
A12 NB – B1408



A12 – A120



A12 SB – B1408



F.10.7.9. Annex B Traffic Flows

Current Operation 2019 traffic flows. The traffic inputs have been calculated from traffic surveys and are presented in vehicles per hour:

AM Peak

Origin	Total Car	Total HGV
From A12 SW	2380	453
A120	1074	66
Station Road	163	1
From A12 NE	3338	552
B1408	629	11
London Road	6	0
Harvest Close	87	4
Total	**7678**	**1087**

PM Peak

Origin	Total Car	Total HGV
From A12 SW	2752	504
A120	1139	28
Station Road	173	0
From A12 NE	3268	296
B1408	441	2
London Road	7	0
Harvest Close	185	1
Total	**7965**	**830**

Traffic Flows in vehicles per hour from the strategic SATURN model. Future operation with Construction 2025:

AM Peak – Car

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	20	28	62	0	2751	101	27	**2989**
Marks Tey Parish Hall	19	0	18	2	0	16	3	0	**57**
A120	44	19	0	1	46	811	113	11	**1046**
Station Road	133	1	2	0	9	0	22	7	**173**
Marks Tey Station	0	0	9	4	0	11	7	0	**31**
From A12 NE	2554	28	734	0	84	0	122	58	**3579**
B1408	134	5	182	13	23	57	0	12	**427**
Harvest Close	11	0	13	4	0	65	13	0	**105**
Total	**2894**	**72**	**986**	**86**	**162**	**3711**	**382**	**115**	**8407**

AM Peak – HGV

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	4	0	0	196	6	2	**208**
Marks Tey Parish Hall	1	0	0	0	0	0	0	0	**1**
A120	5	0	0	0	0	59	2	1	**67**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	231	0	104	0	0	0	2	3	**340**
B1408	3	0	1	0	0	0	0	0	**4**
Harvest Close	0	0	0	0	0	0	0	0	**1**
Total	**240**	**1**	**110**	**0**	**0**	**255**	**10**	**6**	**621**

IP Peak – Car

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	15	53	69	0	1978	54	15	**2184**
Marks Tey Parish Hall	10	0	21	1	0	17	1	0	**50**
A120	27	14	0	2	4	705	161	17	**930**
Station Road	58	1	2	0	1	0	10	3	**75**
Marks Tey Station	0	0	5	2	0	6	3	0	**16**
From A12 NE	2019	13	623	0	7	0	111	42	**2815**
B1408	96	4	204	9	2	42	0	13	**371**
Harvest Close	7	0	42	3	0	50	34	0	**136**
Total	**2217**	**46**	**951**	**86**	**13**	**2799**	**374**	**90**	**6576**

IP Peak – HGV

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	5	0	0	289	5	2	**302**
Marks Tey Parish Hall	1	0	0	0	0	0	0	0	**2**
A120	7	0	0	0	0	62	4	2	**75**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	232	0	58	0	0	0	1	1	**292**
B1408	1	0	5	0	0	0	0	0	**6**
Harvest Close	0	0	1	0	0	1	0	0	**3**
Total	**242**	**1**	**69**	**0**	**0**	**352**	**10**	**5**	**679**

PM Peak – Car

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	14	92	141	2	2885	162	40	**3336**
Marks Tey Parish Hall	19	0	22	1	0	17	4	0	**63**
A120	52	9	0	2	6	861	173	18	**1121**
Station Road	57	0	1	0	1	0	9	2	**70**
Marks Tey Station	25	0	43	12	0	31	22	1	**134**
From A12 NE	2699	23	828	0	11	0	53	27	**3642**
B1408	75	6	191	42	3	55	0	9	**381**
Harvest Close	11	0	28	12	0	69	16	0	**137**
Total	**2938**	**52**	**1205**	**210**	**22**	**3920**	**439**	**97**	**8883**

PM Peak – HGV

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	1	0	0	128	2	1	**132**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	**0**
A120	1	0	0	0	0	24	0	0	**25**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	128	1	33	0	0	0	1	2	**165**
B1408	3	0	1	0	0	0	0	0	**5**
Harvest Close	0	0	0	0	0	1	0	0	**1**
Total	**132**	**1**	**36**	**0**	**0**	**152**	**4**	**3**	**328**

AM Peak – Construction Car

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	0	0	0	0	0	0	**0**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	**0**
A120	0	0	0	0	0	0	0	0	**0**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	0	**0**
B1408	0	0	0	0	0	0	0	0	**0**
Harvest Close	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

AM Peak – Construction Minibus

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	21	0	0	0	0	0	0	0	**21**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	**0**
A120	0	0	0	0	0	0	0	0	**0**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	0	**0**
B1408	0	0	0	0	0	0	0	0	**0**
Harvest Close	0	0	0	0	0	0	0	0	**0**
Total	**21**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**21**

AM Peak – Construction HGV

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	11	0	0	0	0	0	0	0	**11**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	**0**
A120	0	0	0	0	0	0	0	0	**0**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	0	**0**
B1408	0	0	0	0	0	0	0	0	**0**
Harvest Close	0	0	0	0	0	0	0	0	**0**
Total	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**

IP Peak – Construction Car

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	0	0	0	0	0	0	**0**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	**0**
A120	0	0	0	0	0	0	0	0	**0**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	0	**0**
B1408	0	0	0	0	0	0	0	0	**0**
Harvest Close	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

IP Peak – Construction Minibus

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	0	0	0	0	0	0	**0**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	**0**
A120	0	0	0	0	0	0	0	0	**0**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	0	**0**
B1408	0	0	0	0	0	0	0	0	**0**
Harvest Close	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

IP Peak – Construction HGV

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	46	0	8	0	0	0	0	0	**55**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	**0**
A120	8	0	0	0	0	0	0	0	**8**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	0	**0**
B1408	0	0	0	0	0	0	0	0	**0**
Harvest Close	0	0	0	0	0	0	0	0	**0**
Total	**55**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**63**

PM Peak – Construction Car

Origin / Destination	To A12 SW	Marks Tey	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total

		Parish Hall							
From A12 SW	0	0	0	0	0	0	0	0	**0**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	**0**
A120	0	0	0	0	0	0	0	0	**0**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	0	**0**
B1408	0	0	0	0	0	0	0	0	**0**
Harvest Close	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

PM Peak – Construction Minibus

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	21	0	0	0	0	0	0	0	**21**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	**0**
A120	0	0	0	0	0	0	0	0	**0**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	0	**0**
B1408	0	0	0	0	0	0	0	0	**0**
Harvest Close	0	0	0	0	0	0	0	0	**0**
Total	**21**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**21**

PM Peak – Construction HGV

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	22	0	0	0	0	0	0	0	**22**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	**0**
A120	0	0	0	0	0	0	0	0	**0**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	0	0	0	0	0	0	0	0	**0**
B1408	0	0	0	0	0	0	0	0	**0**
Harvest Close	0	0	0	0	0	0	0	0	**0**
Total	**22**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**22**

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation without scheme 2027:

AM Peak – Car

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	20	29	63	0	2793	103	27	**3035**
Marks Tey Parish Hall	19	0	18	2	0	16	3	0	**58**
A120	45	19	0	1	47	823	115	11	**1062**
Station Road	135	1	2	0	9	0	23	7	**176**
Marks Tey Station	0	0	9	4	0	11	7	0	**32**
From A12 NE	2593	28	745	0	85	0	124	58	**3633**
B1408	136	6	185	14	23	58	0	13	**433**
Harvest Close	11	0	13	4	0	66	13	0	**106**
Total	**2938**	**73**	**1001**	**87**	**165**	**3767**	**388**	**116**	**8535**

AM Peak – HGV

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	4	0	0	198	6	2	**211**
Marks Tey Parish Hall	1	0	0	0	0	0	0	0	**1**
A120	5	0	0	0	0	60	2	1	**68**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	233	0	105	0	0	0	2	3	**344**
B1408	3	0	1	0	0	0	0	0	**4**
Harvest Close	0	0	0	0	0	0	0	0	**1**
Total	**242**	**1**	**111**	**0**	**0**	**258**	**10**	**6**	**629**

PM Peak – Car

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	14	93	144	2	2929	164	41	**3386**
Marks Tey Parish Hall	19	0	23	1	0	17	4	0	**64**
A120	53	9	0	2	6	874	176	18	**1138**
Station Road	57	0	1	0	1	0	9	2	**71**
Marks Tey Station	26	0	43	12	0	32	22	1	**136**
From A12 NE	2741	23	841	0	11	0	54	28	**3697**
B1408	76	6	194	43	3	56	0	9	**387**
Harvest Close	11	0	29	13	0	70	16	0	**139**
Total	**2983**	**53**	**1224**	**214**	**22**	**3979**	**446**	**98**	**9018**

PM Peak – HGV

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	1	0	0	130	2	1	**134**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	**0**
A120	1	0	0	0	0	24	0	0	**25**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	129	1	34	0	0	0	1	2	**167**
B1408	3	0	1	0	0	0	0	0	**5**
Harvest Close	0	0	0	0	0	1	0	0	**1**
Total	**134**	**1**	**36**	**0**	**0**	**154**	**4**	**3**	**332**

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation without scheme 2042:

AM Peak – Car

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	24	26	68	0	3115	114	26	**3374**
Marks Tey Parish Hall	19	0	21	1	0	18	4	0	**63**
A120	41	16	0	1	48	839	133	13	**1092**
Station Road	137	1	2	0	10	7	32	8	**197**
Marks Tey Station	0	0	9	5	0	12	8	0	**35**
From A12 NE	2749	29	664	0	87	0	143	61	**3733**
B1408	215	6	195	18	28	65	0	16	**543**
Harvest Close	15	0	11	5	0	75	15	0	**120**
Total	**3177**	**76**	**928**	**98**	**173**	**4131**	**449**	**126**	**9157**

AM Peak – HGV

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	4	0	0	211	6	2	**224**
Marks Tey Parish Hall	1	0	0	0	0	0	0	0	**1**
A120	5	0	0	0	0	71	3	1	**78**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	260	0	127	0	0	0	3	3	**392**
B1408	3	0	1	0	0	0	0	0	**4**
Harvest Close	0	0	0	0	0	0	0	0	**1**
Total	**268**	**1**	**133**	**0**	**0**	**283**	**11**	**6**	**702**

PM Peak – Car

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	16	83	141	2	3100	200	43	**3585**
Marks Tey Parish Hall	18	0	21	5	0	19	6	0	**69**
A120	41	7	0	2	6	909	196	19	**1179**
Station Road	41	0	1	0	1	0	14	2	**60**
Marks Tey Station	20	0	60	13	0	33	24	0	**151**
From A12 NE	3049	26	840	0	12	0	61	33	**4021**
B1408	97	7	191	71	3	61	0	11	**443**
Harvest Close	16	0	23	19	0	78	20	0	**156**
Total	**3283**	**56**	**1220**	**251**	**24**	**4201**	**519**	**108**	**9663**

PM Peak – HGV

Origin / Destination	To A12 SW	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	1	0	0	139	1	1	**142**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	**0**
A120	1	0	0	0	0	26	0	0	**27**
Station Road	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	**0**
From A12 NE	170	1	51	0	0	0	2	2	**225**
B1408	4	0	2	0	0	0	0	0	**6**
Harvest Close	0	0	0	0	0	1	0	0	**1**
Total	**175**	**1**	**54**	**0**	**0**	**166**	**3**	**3**	**402**

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation with scheme 2027:

AM Peak – Car

Origin / Destination	To A12 SW	Old A12	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	18	32	0	78	3012	90	24	**3254**
Old A12	0	0	5	2	0	4	213	71	8	**303**
Marks Tey Parish Hall	19	19	0	0	0	3	14	3	0	**59**
A120	86	3	18	0	51	1	790	112	16	**1077**
Station Road	0	6	0	4	0	10	5	6	0	**32**
Marks Tey Station	116	27	1	2	29	0	0	3	3	**179**
From A12 NE	2837	154	27	771	58	0	0	100	52	**4000**
B1408	198	50	7	212	25	5	0	0	14	**511**
Harvest Close	13	3	0	13	0	1	35	39	0	**106**
Total	**3270**	**262**	**76**	**1037**	**163**	**103**	**4071**	**423**	**117**	**9521**

AM Peak – HGV

Origin / Destination	To A12 SW	Old A12	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	0	4	0	0	207	2	2	**216**
Old A12	0	0	0	1	0	0	2	0	0	**4**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	0	**1**
A120	6	1	0	0	0	0	55	2	1	**64**
Station Road	0	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	0	**0**
From A12 NE	248	7	0	104	0	0	0	2	3	**364**
B1408	2	1	0	2	0	0	0	0	0	**6**
Harvest Close	0	0	0	0	0	0	0	0	0	**1**
Total	**256**	**10**	**1**	**111**	**0**	**0**	**266**	**7**	**6**	**655**

PM Peak – Car

Origin / Destination	To A12 SW	Old A12	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	16	127	2	184	3592	180	45	**4145**
Old A12	0	0	3	0	0	7	185	68	8	**271**
Marks Tey Parish Hall	16	21	0	2	0	6	15	4	0	**64**
A120	65	14	7	0	6	2	816	181	17	**1109**
Station Road	23	7	0	41	0	12	30	21	1	**136**
Marks Tey Station	57	7	1	2	1	0	0	6	2	**76**
From A12 NE	2826	146	23	850	10	0	0	41	26	**3924**
B1408	92	47	7	210	3	30	0	0	9	**399**
Harvest Close	11	2	0	27	0	14	60	25	0	**139**
Total	**3091**	**245**	**57**	**1259**	**23**	**255**	**4699**	**526**	**107**	**10263**

PM Peak – HGV

Origin / Destination	To A12 SW	Old A12	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	0	2	0	0	143	1	1	**148**
Old A12	0	0	0	0	0	0	0	0	0	**1**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	0	**0**
A120	1	0	0	0	0	0	20	0	0	**22**
Station Road	0	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	0	**0**
From A12 NE	129	2	1	32	0	0	0	1	2	**166**
B1408	3	0	0	3	0	0	0	0	0	**7**
Harvest Close	0	0	0	0	0	0	1	0	0	**1**
Total	**134**	**3**	**1**	**37**	**0**	**0**	**164**	**2**	**3**	**344**

Traffic Flows in vehicles per hour from the strategic SATURN model used in the Vissim assessments. Future operation with scheme 2042:

AM Peak – Car

Origin / Destination	To A12 SW	Old A12	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	22	40	0	101	3542	119	29	**3852**
Old A12	0	0	17	3	0	5	234	89	9	**356**
Marks Tey Parish Hall	21	21	0	0	0	3	14	3	0	**63**
A120	92	3	6	0	55	2	799	127	18	**1101**
Station Road	0	8	0	3	0	12	5	7	0	**34**
Marks Tey Station	126	27	1	1	32	0	0	1	3	**190**
From A12 NE	3075	196	27	689	58	0	0	98	52	**4195**
B1408	298	132	8	170	29	2	0	0	16	**655**
Harvest Close	18	7	0	11	0	2	38	45	0	**120**
Total	**3630**	**393**	**80**	**917**	**173**	**126**	**4632**	**489**	**127**	**10567**

AM Peak – HGV

Origin / Destination	To A12 SW	Old A12	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	0	7	0	0	220	3	2	**233**
Old A12	0	0	0	1	0	0	3	0	0	**4**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	0	**1**
A120	7	1	0	0	0	0	64	2	1	**75**
Station Road	0	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	0	**0**
From A12 NE	276	8	0	124	0	0	0	2	3	**414**
B1408	3	1	0	2	0	0	0	0	0	**5**
Harvest Close	0	0	0	0	0	0	0	0	0	**1**
Total	**286**	**10**	**1**	**135**	**0**	**0**	**287**	**8**	**6**	**733**

PM Peak – Car

Origin / Destination	To A12 SW	Old A12	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	17	139	2	202	3923	226	49	**4559**
Old A12	0	0	3	0	0	16	184	72	8	**283**
Marks Tey Parish Hall	18	25	0	1	0	7	15	4	0	**69**
A120	79	15	7	0	7	3	841	195	19	**1167**
Station Road	21	23	0	40	0	16	28	22	0	**151**
Marks Tey Station	65	9	1	2	4	0	0	7	2	**90**
From A12 NE	3343	277	25	820	8	0	0	45	30	**4548**
B1408	143	112	8	213	4	13	0	0	11	**504**
Harvest Close	15	9	0	30	0	10	51	41	0	**156**
Total	**3684**	**470**	**62**	**1246**	**25**	**266**	**5042**	**612**	**120**	**11527**

PM Peak - HGV

Origin / Destination	To A12 SW	Old A12	Marks Tey Parish Hall	A120	Station Road	Marks Tey Station	To A12 NE	B1408	Harvest Close	Total
From A12 SW	0	0	0	2	0	0	154	1	1	**158**
Old A12	0	0	0	0	0	0	0	0	0	**1**
Marks Tey Parish Hall	0	0	0	0	0	0	0	0	0	**0**
A120	2	0	0	0	0	0	21	0	0	**24**
Station Road	0	0	0	0	0	0	0	0	0	**0**
Marks Tey Station	0	0	0	0	0	0	0	0	0	**0**
From A12 NE	174	2	1	43	0	0	0	1	2	**223**
B1408	4	0	0	3	0	0	0	0	0	**8**
Harvest Close	0	0	0	0	0	0	0	1	0	**1**
Total	**180**	**4**	**1**	**49**	**0**	**0**	**176**	**4**	**3**	**415**