Lower Thames Crossing

9.15 Localised Traffic Modelling Appendix L – LB Havering & TfL Junctions Forecasting Report

Infrastructure Planning (Examination Procedure) Rule 2010

Volume 9

DATE: August 2023
DEADLINE: 3

Planning Inspectorate Scheme Ref: TR010032
Examination Document Ref: TR010032/EXAM/9.15

VERSION: 2.0

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List of contents

Page number

1 Executive Summary ... 1
2 Introduction ... 3
2.1 Purpose of document ... 3
2.2 Modelling software ... 3
2.3 The Project ... 3
2.4 Structure of this report ... 5
3 Methodology ... 6
3.1 Local junction modelling ... 6
3.2 Data collection and analysis ... 9
3.3 LinSig modelling ... 9
3.4 Junctions 9 modelling ... 10
3.5 Merge analysis ... 10
4 Junction modelling results ... 11
4.1 A12 – Gubbins Lane ... 11
4.2 A12 – Harold Court Road ... 15
4.3 A12 – North Street ... 18
4.4 A12 – Pettits Lane ... 21
4.5 A127 – Ardleigh Green Road & Squirrels Heath Road ... 24
4.6 A13 – Marsh Way junction ... 26
4.7 A124 – Station Road ... 30
4.8 A127 – Wingletye Lane ... 33
4.9 A127 – Front Lane ... 37
4.10 Gallows Corner ... 41
4.11 A127 – Hall Lane ... 43
4.12 A13 – A1306 ... 46
5 Conclusions ... 49
References ... 53
Glossary ... 54

List of plates

Page number

Plate 1.1 Location of Junctions with possible capacity issues, with and/or without the Project....2
Plate 2.1 Lower Thames Crossing route....5
Plate 3.1 Junction locations by Modelling Software....8
Plate 4.1 A12 - Gubbins Lane LinSig model....12
Plate 4.2 A12 - Harold Court Road LinSig model....15
Plate 4.3 A12 - North Street LinSig model....18
Plate 4.4 A12 - Pettits Lane LinSig model....21
Plate 4.5 A127 - Ardleigh Green Road & Squirrels Heath Road LinSig model....24
Plate 4.6 Marsh Way Junction LinSig model....27
Plate 4.7 A124 - Station Road LinSig model....30
Plate 4.8 A127 - Wingletye Lane LinSig model....33
Plate 4.9 A127 - Wingletye Lane merge assessment....36
Plate 4.10 A127 - Front Lane LinSig model....37
Plate 4.11 A127 - Front Lane merge assessment....40
Plate 4.12 Gallows Corner roundabout....41
Plate 4.13 A127 - Hall Lane northern junction....43
Plate 4.14 A127 - Hall Lane southern junction....44
Plate 4.15 A13 - A1306 model layout....46
Plate 5.1 Junction locations with 2030 DM & DS AM performance....50
Plate 5.2 Junction locations with 2030 DM & DS PM performance....51

List of tables

Page number

Table 1.1 Results overview of junctions with possible capacity issues, with and/or without the Project....1
Table 4.1 A12 - Gubbins Lane 2030 O-D Matrices (Passenger Car Unit (PCUs))....13
Table 4.2 A12 - Gubbins Lane Results....14
Table 4.3 A12 - Harold Court Road O-D Matrices (PCUs)....16
Table 4.4 A12 - Harold Court Road Results....17
Table 4.5 A12 - North St O-D Matrices (PCUs)....19
Table 4.6 A12 - North Street results....20
Table 4.7 A12 - Pettits Lane O-D Matrices (PCUs)....22
Table 4.8 A12 - Pettits Lane Results....23
Table 4.9 A127 - Ardleigh Green Road & Squirrels Heath Road O-D Matrices (PCUs)....25
Table 4.10 A127 - Ardleigh Green Road & Squirrels Heath Road Results....26
Table 4.11 Marsh Way Junction O-D Matrices (PCUs)....28
Table 4.12 Marsh Way Junction Results....29
Table 4.13 A124 - Station Road O-D Matrices (PCUs)....31

Table 4.14 A124 - Station Road Results 32
Table 4.15 A127 - Wingletye Lane O-D Matrices (PCUs) 34
Table 4.16 A127 - Wingletye Lane Results 35
Table 4.17 A127 - Wingletye Lane Merge Flows (vehicles) 35
Table 4.18 A127 - Front Lane O-D Matrices (PCUs) 38
Table 4.19 A127 - Front Lane Results 39
Table 4.20 A127 - Front Lane merge flows (vehicles) 39
Table 4.21 Gallows Corner results 42
Table 4.22 A127 - Hall Lane Northern junction results 45
Table 4.23 A127 - Hall Lane Southern junction results 45
Table 4.24 A13 - A1306 results 47
Table 5.1 Results Overview 49

1 Executive Summary

This local junction modelling was carried out to assess the impact of the Lower Thames Crossing (the Project) on the operation of 12 junctions located in the London Borough of Havering.

1.1.1 The modelling consists of a combination of LinSig and Junctions 9 (PICADY & ARCADY) junction operational assessments for 2030 in the AM peak (07:00-08:00) and the PM peak (17:00-18:00).

1.1.2 The assessment indicated that there are five junctions with potential capacity issues. These are:

a. A12/ Gubbins Lane

b. A12/ North Street

c. A12/ Pettits Lane

d. A127/ Hall Lane (southern crossroads)

e. Gallows Corner

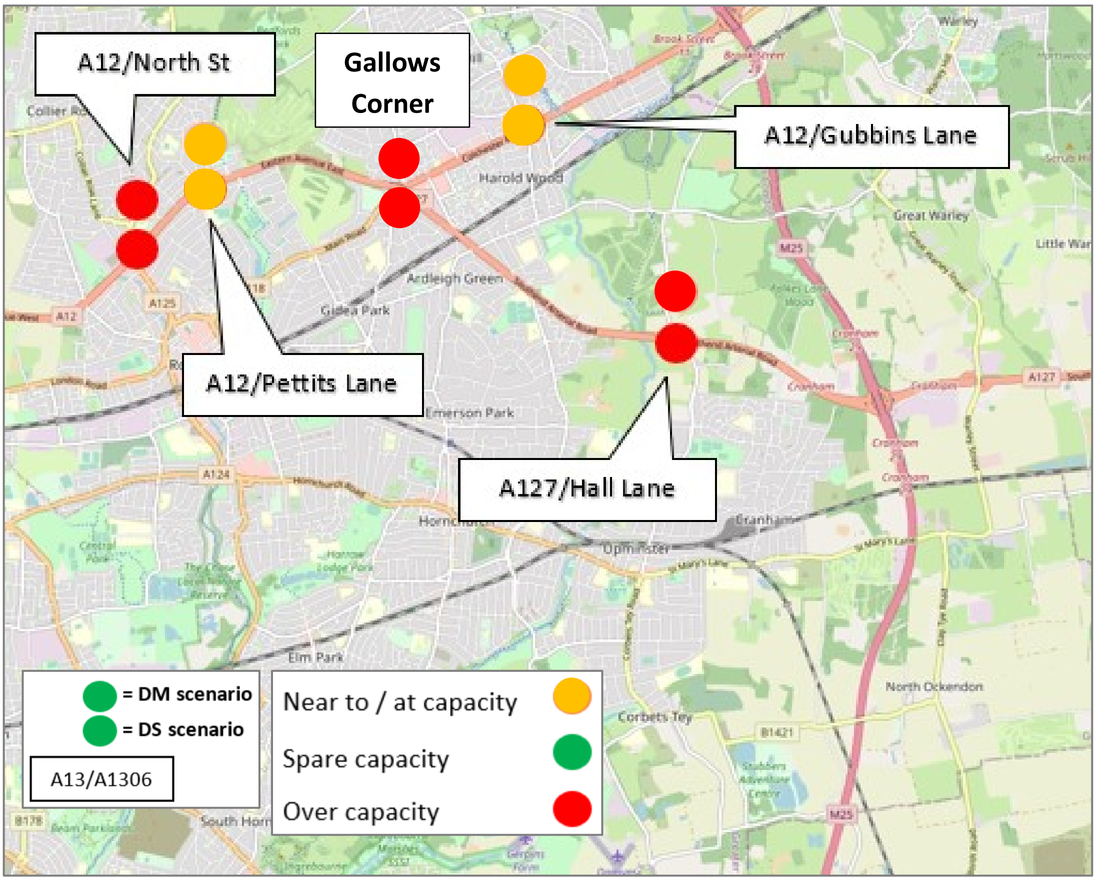
1.1.3 These five junctions have existing junction capacity issues (in the DM scenario without the Project), as highlighted in the modelling. A comparison of the modelling assessment for these five junctions is given in Table 1.1 below with comments drawing attention to existing capacity issues. Their location, with an overview of the respective DM and DS results, is shown on the map in Plate 1.1.

Table 1.1 Results overview of junctions with possible capacity issues, with and/or without the Project

Junction location / name	AM peak		PM peak		Comments
	DM	DS	DM	DS	
A12/ Gubbins Lane					DM capacity issues in the AM, with slightly reduced spare capacity in DS in the AM
A12/ North Street					DM capacity issues in both AM and PM hours, which remain in DS scenario
A12/ Pettits Lane					DM capacity issues in the PM, with slightly reduced spare capacity in DS in the PM
A127/ Hall Lane					DM capacity issues in the PM, with capacity issues in both the AM and PM in DS scenario
Gallows Corner					DM capacity issues in both AM and PM hours, which remain in DS scenario

Key:		
	Near to / at capacity	
	Spare capacity	
	Over capacity	

Plate 1.1 Location of Junctions with possible capacity issues, with and/or without the Project



2 Introduction

2.1 Purpose of document

2.1.1 This document presents findings from the traffic operation appraisal undertaken for the Lower Thames Crossing, of twelve junctions in London Borough of Havering.

2.2 Modelling software

2.2.1 The junction assessment has been undertaken using LinSig V3 software for signalised junctions and Junctions 9 software for priority junctions.

2.3 The Project

2.3.1 The A122 Lower Thames Crossing (the Project) would provide a connection between the A2 and M2 in Kent, south-east of Gravesend, crossing under the River Thames through a tunnel, before joining the M25 south of junction 29. The Project route is presented in Plate 2.1.

2.3.2 The A122 would be approximately 23km long, 4.25km of which would be in tunnel. On the south side of the River Thames, the Project route would link the tunnel to the A2 and M2. On the north side, it would link to the A13, M25 junction 29 and the M25 south of junction 29. The tunnel entrances would be located to the east of the village of Chalk on the south of the River Thames and to the west of East Tilbury on the north side.

2.3.3 Junctions are proposed at the following locations:

a. New junction with the A2 to the south-east of Gravesend

b. Modified junction with the A13/A1089 in Thurrock

c. New junction with the M25 between junctions 29 and 30

2.3.4 To align with the National Policy Statement for National Networks (Department for Transport, 2014) and to help the Project meet the Scheme Objectives, it is proposed that road user charges would be levied in line with the Dartford Crossing. Vehicles would be charged for using the new tunnel.

2.3.5 The Project route would be three lanes in both directions, except for:

a. link roads

b. stretches of the carriageway through junctions

c. the southbound carriageway from the M25 to the junction with the A13/A1089, which would be two lanes

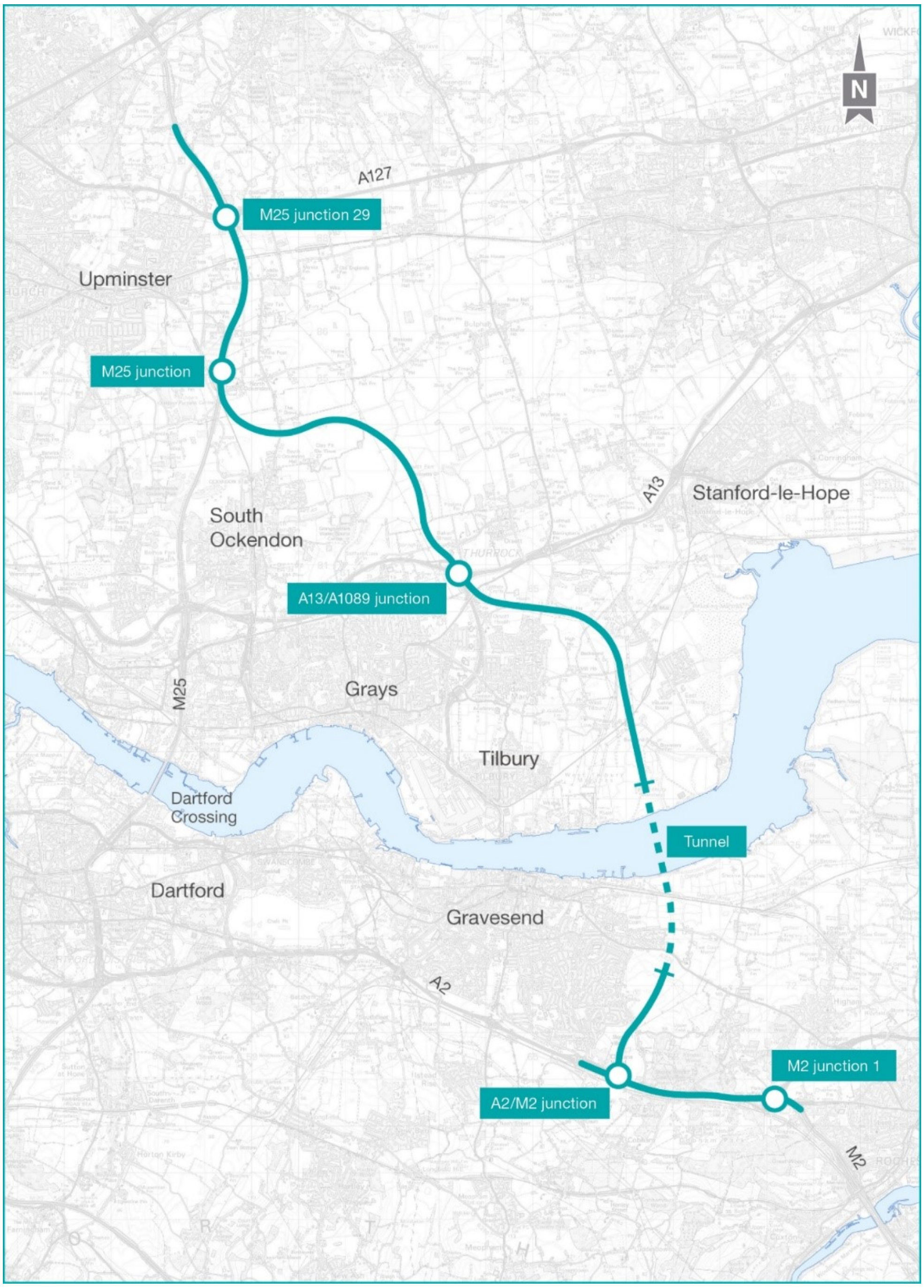
2.3.6 In common with most A-roads, the A122 would operate with no hard shoulder but would feature a 1m hard strip on either side of the carriageway. It would also feature technology including stopped vehicle and incident detection, lane control, variable speed limits and electronic signage and signalling. The A122 design outside of the tunnel would include emergency areas. The tunnel would include a range of enhanced systems and response measures instead of emergency areas.

2.3.7 The A122 would be classified as an 'all-purpose trunk road' with green signs. For safety reasons, walkers, cyclists, horse riders and slow-moving vehicles would be prohibited from using it.

2.3.8 The Project would include adjustment to a number of local roads. There would also be changes to a number of Public Rights of Way used by walkers, cyclists and horse riders. Construction of the Project would also require the installation and diversion of a number of utilities, including gas mains, overhead electricity powerlines and underground electricity cables, as well as water supplies and telecommunications assets and associated infrastructure.

2.3.9 The Project has been developed to avoid or minimise significant effects on the environment. Some of the measures adopted include landscaping, noise mitigation, green bridges, floodplain compensation, new areas of ecological habitat and two new parks.

Plate 2.1 Lower Thames Crossing route



2.4 Structure of this report

2.4.1 The report contains the following details:

a. Chapter 2 summarises the methodology

b. Chapter 3 provides the junction modelling results and associated summary notes

c. Chapter 4 sets out the conclusions reached based on the modelling results.

3 Methodology

3.1 Local junction modelling

3.1.1 The local junction modelling has been carried out using traffic flows extracted from the 2030 Lower Thames Area Model (LTAM) Do Minimum (without the Project – DM) run ID CM49; and Do Something (with the Project – DS) run ID CS72 models, for the AM and PM peak hours. The AM peak hour is 07:00–08:00 and the PM peak hour is 17:00–18:00.

3.1.2 The 2030 forecast DM scenario incorporates committed developments and infrastructure schemes that are planned for the area with a high degree of certainty of those plans being fulfilled. This is described in the Combined Modelling and Appraisal Report – Appendix C – Transport Forecasting Package [**APP-522**] and the Combined Modelling and Appraisal Report – Appendix C – Transport Forecasting Package Annexes [**APP-523**].

3.1.3 The 2030 forecast DS scenario incorporates the same committed developments and infrastructure schemes with the sole addition of the Project. It allows for change in the travel demand such as changes in the destination of a trip as a result of the introduction of the Project as well as changes in the routes used by traffic. This is described in more detail in the Traffic Forecasts Non-technical Summary [**APP-528**].

3.1.4 The traffic flows and turning movements at each junction were extracted from the LTAM and used directly in the local models. The junctions investigated in the assessment are a mixture of signalised and priority junctions, therefore both LinSig V3 and Junctions 9 modelling software was used in the study.

3.1.5 The local junction modelling assessment was conducted at the following twelve junctions, based on their existing layouts:

a. LinSig V3:

i. A12/ North Street

ii. A12/ Pettits Lane

iii. A12/ Harold Court Road

iv. A12/ Gubbins Lane

v. A127/ Ardleigh Green Road/ Squirrels Heath Road

vi. A127/ Wingletye Lane

vii. A127/ Front Lane

viii. A13/ Marsh Way Junction

ix. A124/Station Road/ B1421 (Bell Corner)

b. Junctions 9:

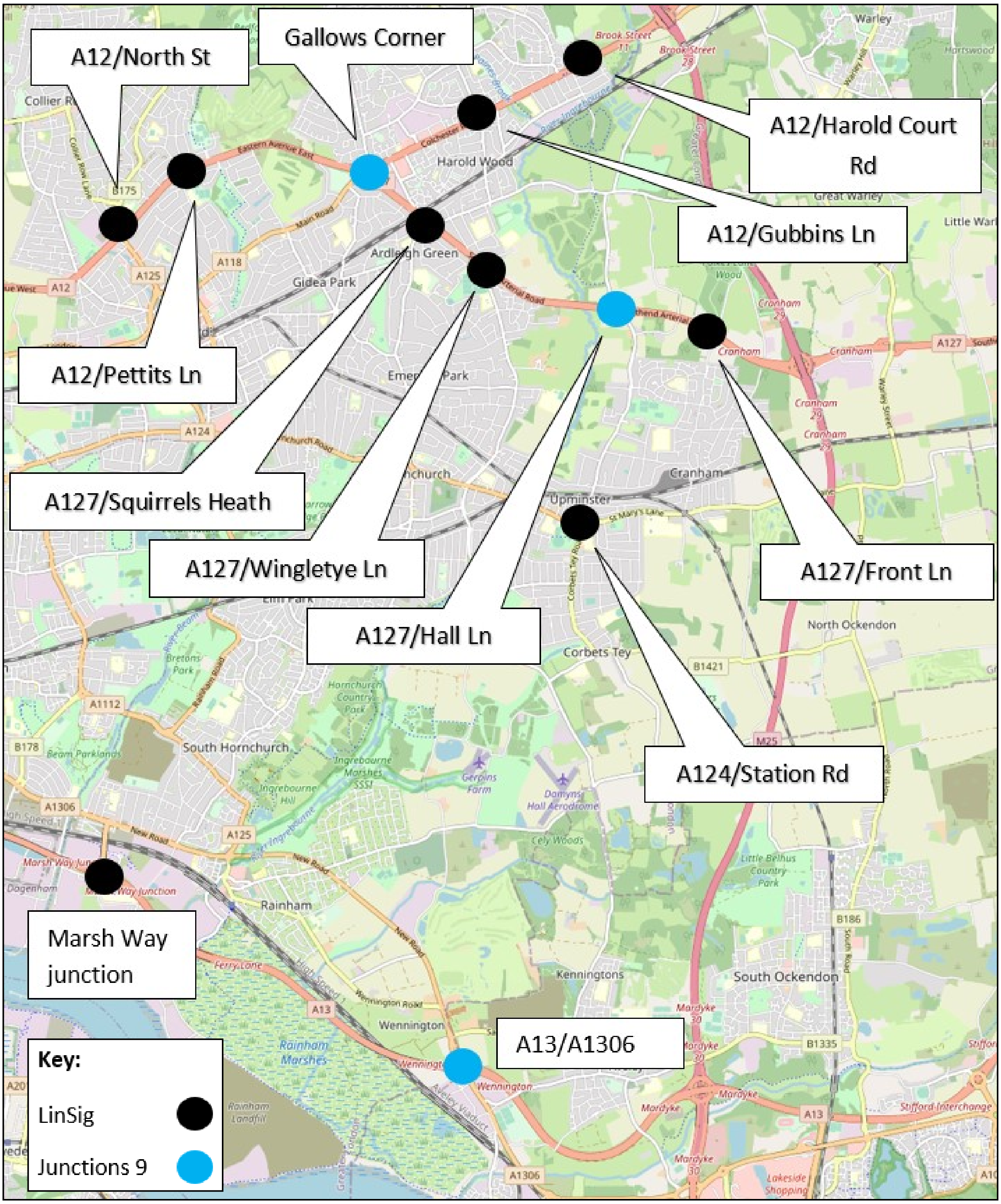
i. Gallows Corner

ii. A127 – Hall Lane

iii. A13 – A1306

3.1.6 The exact locations of the junctions and the respective modelling software used are shown in Plate 3.1.

Plate 3.1 Junction locations by Modelling Software



3.2 Data collection and analysis

3.2.1 Transport for London (TfL) provided signal data for each of the junctions which included site layout drawings, signal timing sheets, SCOOT timing plans (Split Cycle Offset Optimisation Technique – a type of traffic signal control) and demand dependency data.

3.2.2 Demand dependency data provides information on how many times a particular stage in the signal cycle is called during the hour. This is dependent on demand; for example a pedestrian stage is called when a pedestrian pushes the call button, or a right turn indicative arrow stage is called by a vehicle standing on the induction loop in the carriageway. These stages are not called every cycle but only when they are demanded.

3.2.3 Traffic flows were taken from the DM and DS 2030 scenarios of the LTAM (refer to the Traffic Forecasts Non-Technical Summary [APP-528] for more information) by extracting the turning flows from each arm at each junction and converting it into an origin-destination (O-D) matrix for the junction, by matching the LTAM link number to the corresponding junction arm, appropriately numbered.

3.3 LinSig modelling

3.3.1 The LinSig modelling was carried out using standard industry best practice and guidelines.

3.3.2 Traffic flows were coded using the LinSig default delay-based assignment whereby the model allocates traffic based on delay, sharing the traffic out across all valid routes.

3.3.3 Signal cycle times were taken from the SCOOT timing plans provided by TfL. The signal stage timings were initially coded using the stage change timings from the SCOOT data/plans. To accommodate any changes in traffic flow in the forecast year, the signal stage timings were optimised using a mixture of the software’s built-in optimiser and manual changes to ensure queue lengths did not exceed available storage space.

3.3.4 The LinSig models were not calibrated or validated against measured on-site parameters as current day traffic flows and observations on the current performance of each junction were not available. However, to ensure the models are valid and purposeful, saturation flows using site geometric data taken from the provided site layout drawings were calculated in accordance with the industry best practice RR67 method (DfT, 1986) and models coded based on the site layout plans and checked with online aerial mapping.

3.4 Junctions 9 modelling

3.4.1 Junctions 9 modelling was carried out using standard industry best practice and guidelines, with regard to (but not limited to) coding links and lanes, taking geometric measurements from plans or maps for calculating intercept and slope values and using default model parameters.

3.4.2 The geometric measurements used in the junction models were measured from OS mapping and checked with online aerial mapping.

3.4.3 The 'one-hour' traffic flow profile was used to replicate random arrival patterns throughout the peak hours. This sets the traffic to arrive evenly throughout the modelled hour.

3.5 Merge analysis

3.5.1 The A127/ Front Lane and A127/ Wingletye Lane junctions are at-grade merges onto the westbound A127. In addition to modelling the merges in LinSig, an assessment of the merge sections was also undertaken using the Design Manual for Roads & Bridges CD 122 suggested flow range graphs (DMRB, Jan 2022) and its assessment methodology.

3.5.2 This required an examination of the existing merge layout with standard layout types as referred to in CD 122 and then deriving the corresponding flow ranges for the mainline and merge flows and quantitatively assessing whether forecasted flows are within the DMRB recommended ranges.

4 Junction modelling results

The following section details the modelling assessment at each junction identified for the study. Base year models were not developed due to a lack of available data. The 2030 forecast flows were taken directly from the LTAM DM and DS models.

As part of the assessment, reference is made to the degree of saturation (DoS) of an arm. Saturation describes the maximum traffic flow which can be handled by an arm (or lane) at a junction. Degree of saturation is the level of demand (traffic flow) of an arm (or lane) relative to its total capacity (saturation). A DoS value of 100% means that demand and capacity are equal and very little additional traffic would be able to enter the junction on that arm or lane within the modelled time period.

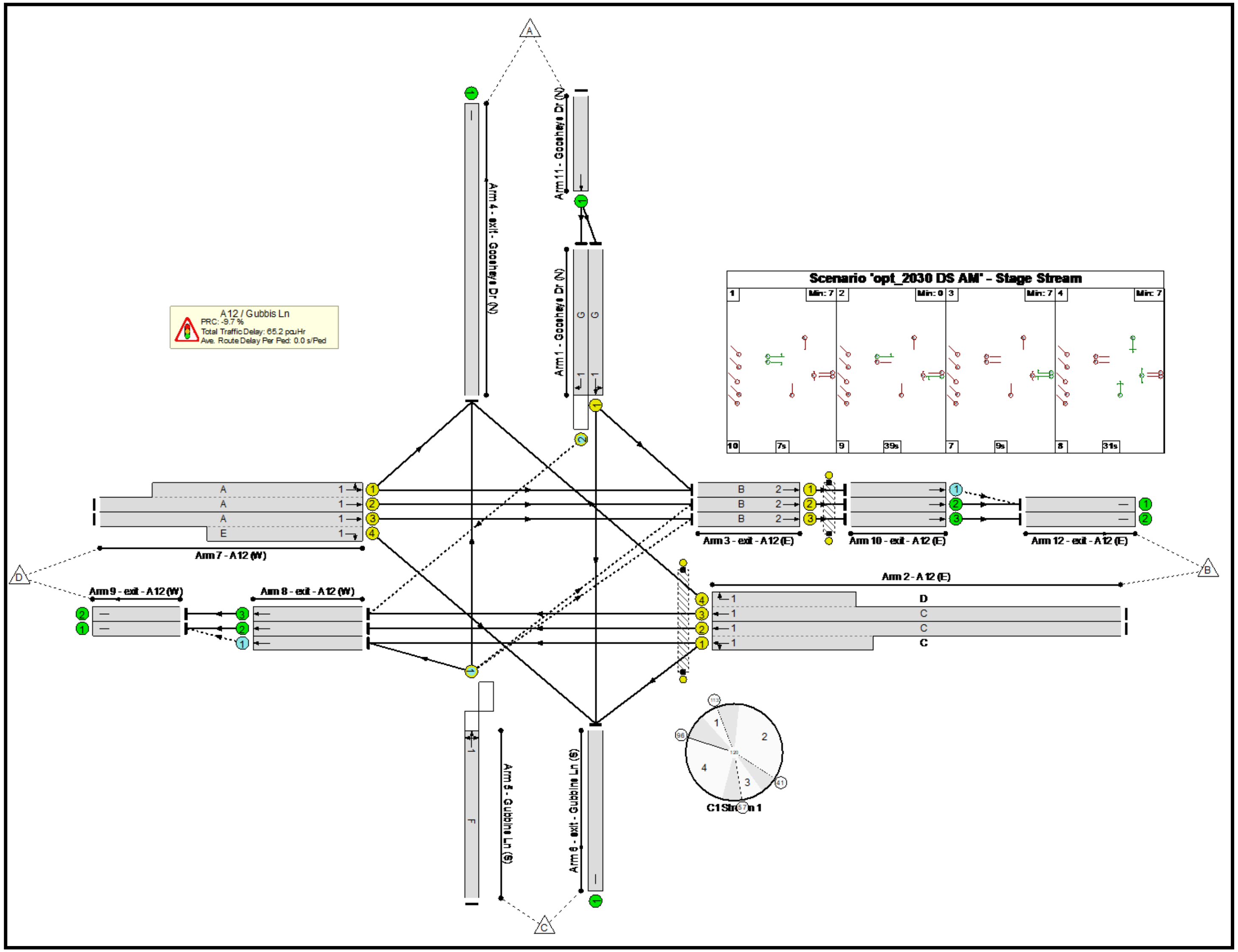
Generally, a DoS value of below 90% is considered to indicate that the arm/ lane/ junction is operating with spare capacity. If the DoS value is between 85% and 90% it is beginning to run out of spare capacity. A DoS value of between 90% and 100% indicates that the arm/lane/junction is operating near to or at capacity.

4.1 A12 – Gubbins Lane

4.1.1 This is a four-arm signalised junction that connects the A12 Colchester Road to Gooshays Drive in the north and Gubbins Lane in the south.

4.1.2 This junction was modelled in LinSig, as shown in Plate 4.1.

Plate 4.1 A12 - Gubbins Lane LinSig model



4.1.3 The junction turning flows extracted from the LTAM, expressed in the form of O-D (origin-destination) matrices are shown in Table 4.1. The matrices are created from the turning movements at each junction in the LTAM.

Table 4.1 A12 - Gubbins Lane 2030 O-D Matrices (Passenger Car Unit (PCUs))

Arm	2030 DM AM						2030 DS AM					
		A	B	C	D	Total		A	B	C	D	Total
Gooshays Dr (N)	A	0	183	88	92	363	A	0	224	70	94	388
A12 (E)	B	132	0	310	1,525	1,967	B	151	0	335	1,563	2,049
Gubbins Ln (S)	C	44	210	0	75	329	C	46	193	0	74	313
A12 (W)	D	2	1,749	55	0	1,806	D	2	1,528	55	0	1,585
	Total	178	2,142	453	1,692	4,465	Total	199	1,945	460	1,731	4,335

Arm	2030 DM PM						2030 DS PM					
		A	B	C	D	Total		A	B	C	D	Total
Gooshays Dr (N)	A	0	23	132	110	265	A	0	40	98	103	241
A12 (E)	B	157	0	321	1,435	1,913	B	158	0	298	1,437	1,893
Gubbins Ln (S)	C	63	142	0	57	262	C	72	155	0	45	272
A12 (W)	D	5	1,421	64	0	1,490	D	5	1,336	64	0	1,405
	Total	225	1,586	517	1,602	3,930	Total	235	1,531	460	1,585	3,811

4.1.4 The results are shown in Table 4.2.

Table 4.2 A12 - Gubbins Lane Results

Lane no.	Lane name	Optimised signal timings							
		2030 DM AM		2030 DM PM		2030 DS AM		2030 DS PM	
		Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)
1/1	Gooshays Dr (N) Left Ahead	8.4	56%	4.9	44%	9.4	61%	4.3	38%
1/2	Gooshays Dr (N) Right	2.6	28%	3.8	55%	2.6	28%	3.4	49%
2/2+2/1	A12 (E) Left Ahead	27.8	93%	17.6	81%	29.3	94%	17.6	81%
2/3+2/4	A12 (E) Right Ahead	26.9	90%	17.0	75%	28.4	91%	17.1	76%
5/1	Gubbins Ln (S) Right Ahead Left	17.7	97%	11.3	87%	18.2	99%	11.1	84%
7/2+7/1	A12 (W) Ahead Left	28.3	89%	15.5	64%	22.6	81%	14.6	61%
7/3+7/4	A12 (W) Ahead Right	27.6	88%	15.0	63%	22.0	81%	13.7	60%

4.1.5 The AM DS results show that the A12 (E) approach is operating near to capacity with DoS values above 90% (so very little additional demand traffic would be able to progress from this arm through the junction). These DS DoS values are higher than the DM scenario (without the Project) DoS values that are also above 90%. In the PM the A12 (E) approach operates with spare capacity in both the DM and DS scenarios, with a DoS value of 81%.

4.1.6 Gubbins Lane would operate nearly over capacity in both DM and DS in the AM and with spare capacity in the PM.

4.1.7 Both the A12 (W) and Gooshays Drive arms are operating with spare capacity in both the DM and DS in 2030.

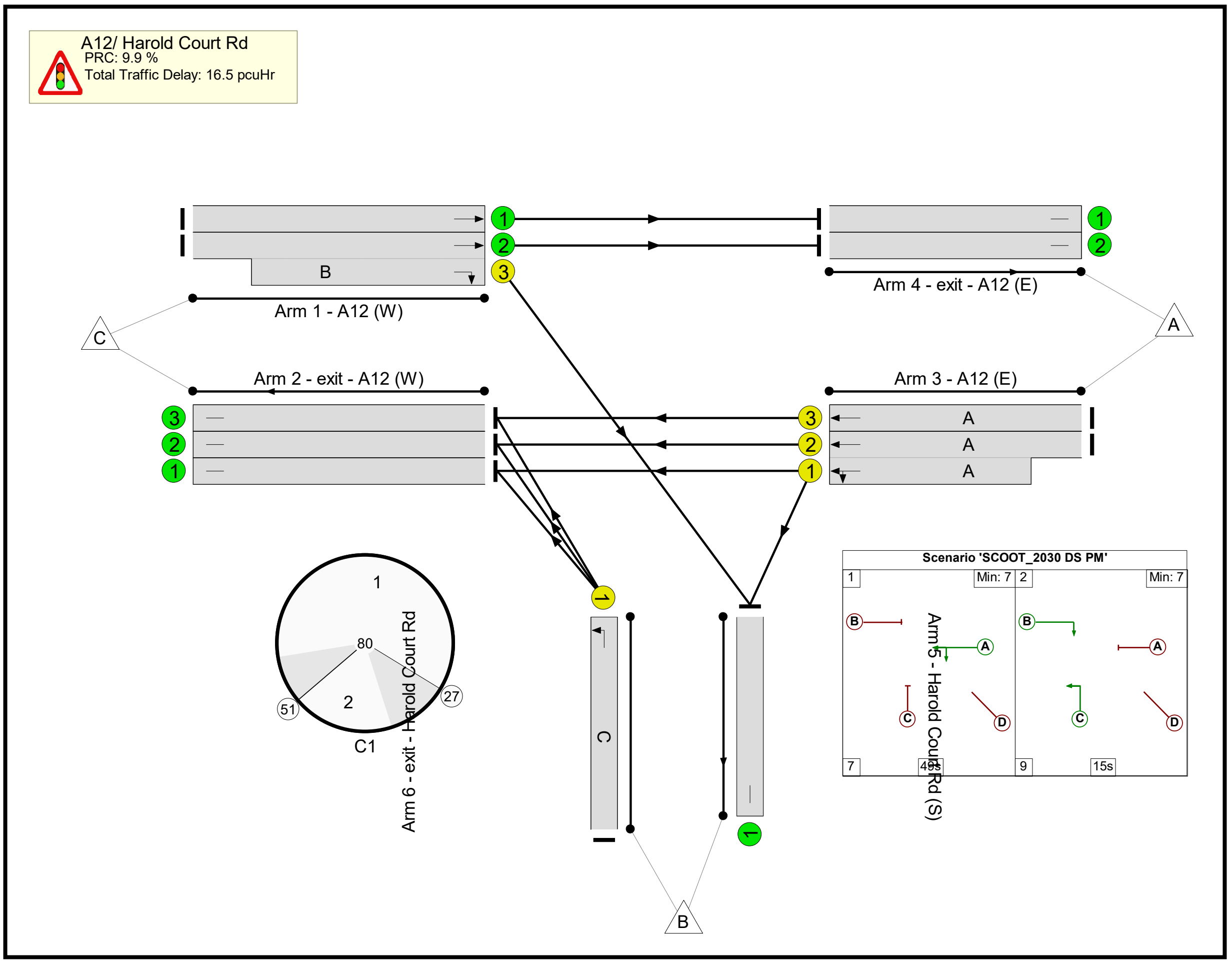
4.2 A12 – Harold Court Road

4.2.1 This junction is a T-junction on the A12 located approximately 1km west of M25 junction 28.

4.2.2 The A12 East, Harold Court Road and the right turn from A12 West to Harold Court Road are signalised. Harold Court Road is a left-turn-only single lane approach.

4.2.3 The junction is signalised so has been modelled in LinSig as shown in Plate 4.2.

Plate 4.2 A12 - Harold Court Road LinSig model



4.2.4 The junction turning flows extracted from the LTAM, expressed in the form of O-D (origin-destination) matrices are shown in Table 4.3.

Table 4.3 A12 - Harold Court Road O-D Matrices (PCUs)

Arm	2030 DM AM					2030 DS AM				
		A	B	C	Total		A	B	C	Total
A12 (E)	A	0	302	2,226	2,528	A	0	340	2,332	2,672
Harold Court Rd (S)	B	0	0	316	316	B	0	0	299	299
A12 (W)	C	2,719	112	0	2,831	C	2,416	112	0	2,528
	Total	2,719	414	2,542	5,675	Total	2,416	452	2,631	5,499

Arm	2030 DM PM					2030 DS PM				
		A	B	C	Total		A	B	C	Total
A12 (E)	A	0	256	2,181	2,437	A	0	256	2,152	2,408
Harold Court Rd (S)	B	0	0	317	317	B	0	0	326	326
A12 (W)	C	2,258	89	0	2,347	C	2,213	90	0	2,303
	Total	2,258	345	2,498	5,101	Total	2,213	346	2,478	5,037

4.2.5 The junction layout has been modelled using LinSig, and the results are shown in Table 4.4.

Table 4.4 A12 - Harold Court Road Results

Lane no.	Lane name	Optimised signal timings							
		2030 DM AM		2030 DM PM		2030 DS AM		2030 DS PM	
		Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)
1/1	A12 (W) Ahead	1.4	74%	0.8	62%	1.0	67%	0.8	61%
1/2+1/3	A12 (W) Ahead Right	3.6	74%	2.4	61%	3.2	66%	2.4	60%
3/2+3/1	A12 (E) Ahead Left	14.9	85%	14.4	83%	16.2	88%	13.9	82%
3/3	A12 (E) Ahead	14.7	73%	13.4	70%	16.9	78%	12.9	69%
5/1	Harold Court Road (S) Left	8.8	82%	8.3	78%	8.5	82%	8.7	80%

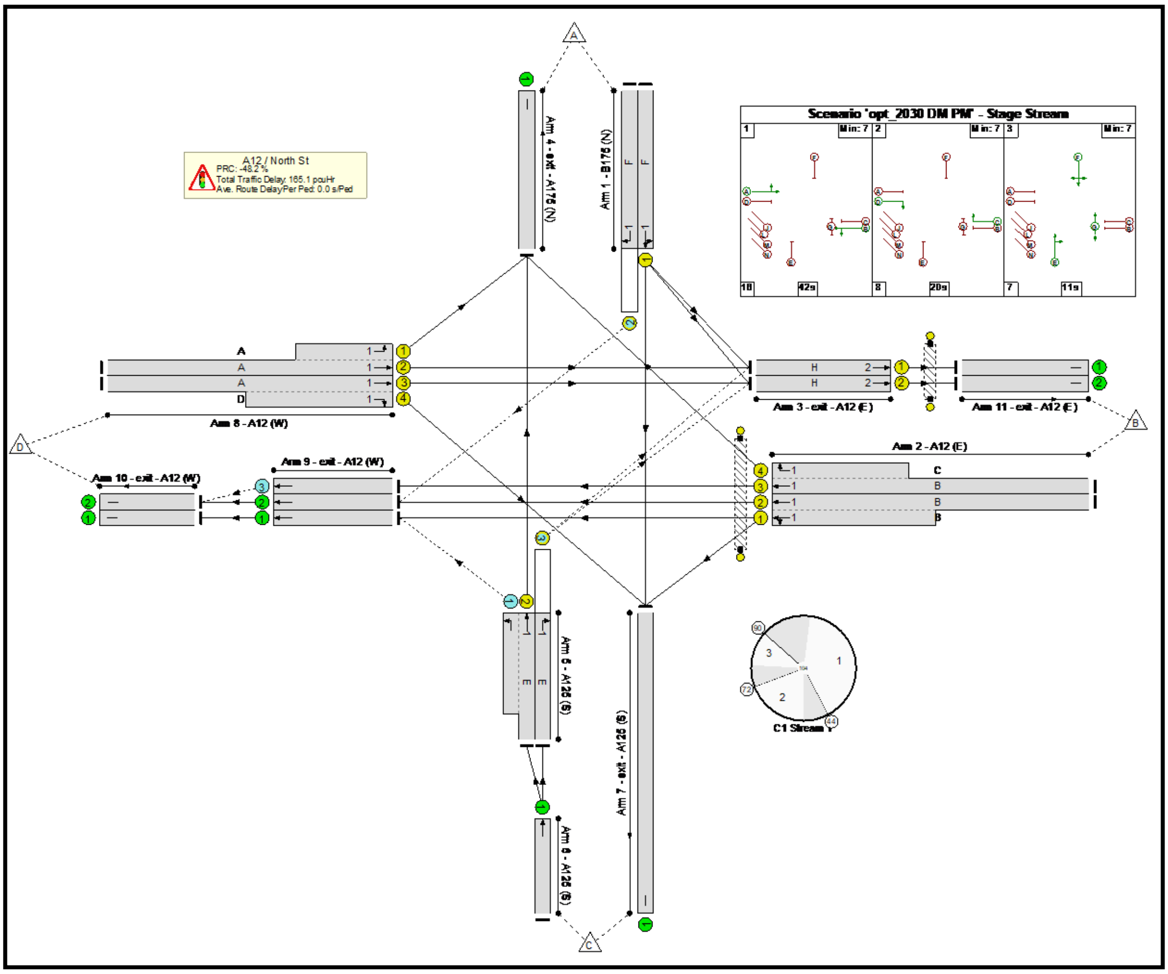
4.2.6 The results show that all approaches operate with spare capacity in both DM and DS scenarios in 2030 with some approaches performing slightly better in the DS due to small decreases in flows.

4.3 A12 – North Street

4.3.1 This is a four-arm signalised junction connecting the A12 (Eastern Avenue E) with B175 Havering Road to the north and North Street to the south.

4.3.2 This junction is signalised, so was modelled in LinSig as shown in Plate 4.3.

Plate 4.3 A12 - North Street LinSig model



4.3.3 The junction turning flows extracted from the LTAM, expressed in the form of O-D (origin-destination) matrices are shown in Table 4.5.

Table 4.5 A12 - North St O-D Matrices (PCUs)

Arm	2030 DM AM						2030 DS AM					
		A	B	C	D	Total		A	B	C	D	Total
B175 (N)	A	0	5	431	202	638	A	0	8	432	208	648
A12 (E)	B	278	0	360	1,261	1,899	B	281	0	363	1,264	1,908
A125 (S)	C	85	182	0	254	521	C	77	178	0	275	530
A12 (W)	D	131	1,345	111	0	1,587	D	145	1,350	98	0	1,593
	Total	494	1,532	902	1,717	4,645	Total	503	1,536	893	1747	4,679

Arm	2030 DM PM						2030 DS PM					
		A	B	C	D	Total		A	B	C	D	Total
B175 (N)	A	0	0	309	148	457	A	0	0	309	157	466
A12 (E)	B	442	0	322	1,037	1,801	B	445	0	313	1,039	1,797
A125 (S)	C	54	223	0	605	882	C	53	224	0	604	881
A12 (W)	D	133	1,182	215	0	1,530	D	126	1,196	211	0	1,533
	Total	629	1,405	846	1,790	4,670	Total	624	1,420	833	1,800	4,677

4.3.4 The junction layout has been modelled using LinSig. The results are shown in Table 4.6.

Table 4.6 A12 - North Street results

Lane no.	Lane name	Optimised signal timings							
		2030 DM AM		2030 DM PM		2030 DS AM		2030 DS PM	
		Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)
1/1	B175 (N) Left Ahead	46.0	115%	26.3	109%	48.2	116%	26.3	109%
1/2	B175 (N) Right	6.0	59%	4.6	57%	6.2	60%	5.0	61%
2/2+2/1	A12 (E) Left Ahead	52.6	102%	57.7	102%	187	121%	95.6	109%
2/3+2/4	A12 (E) Right Ahead	11.8	90%	75.2	133%	34.4	118%	37	109%
5/2+5/1	A125 (S) Ahead Left	2.2	23%	8.4	57%	2.0	27%	7.8	56%
5/3	A125 (S) Right	7.6	88%	19.1	107%	7.2	86%	19.5	108%
8/2+8/1	A12 (W) Ahead Left	23.8	91%	17.4	79%	21.7	86%	21.1	89%
8/3+8/4	A12 (W) Ahead Right	23.2	90%	15.8	80%	20.7	85%	19.7	89%

4.3.5 The results show that the junction is operating over capacity in the DM and most approaches will continue to operate at similar degrees of saturation in the DS scenario as the forecast changes in flows are small.

4.3.6 The AM results for the DS scenario show that the B175 (N) and the A12 (E) approaches are over capacity with DoS values above 100%. These DS DoS values are higher than the DM scenario DoS values, which are also above 100%, apart from the A12 (E) ahead and right turn movement which has a DM DoS of 90%. For the A12 (W) approach the DS DoS results are just below 90%, therefore some small amount of spare capacity, which is an improvement to the DM DoS results that are just over 90%.

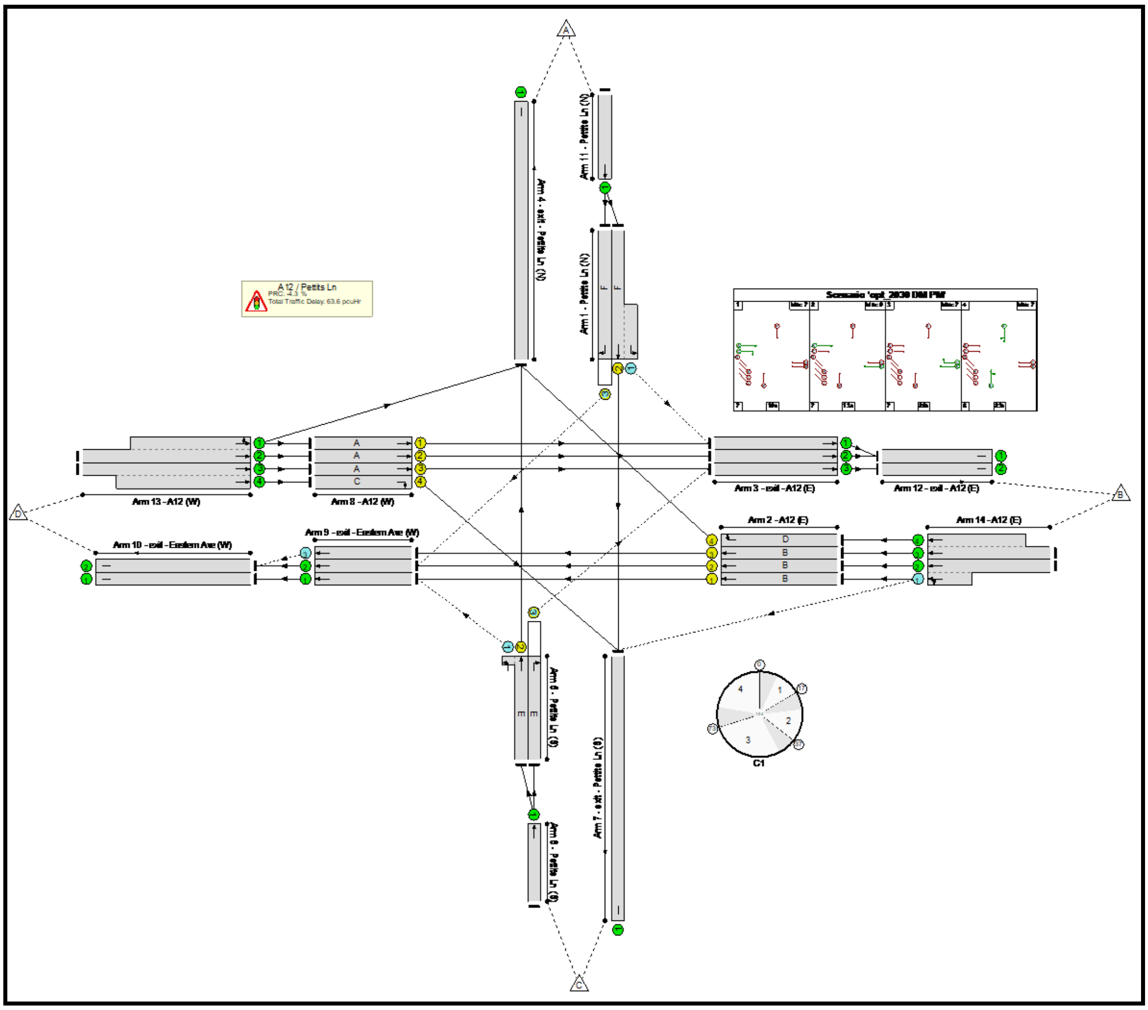
4.3.7 The PM results for the DS scenario show that the B175 (N), A12 (E) and the A125 (S) approaches are over capacity with DoS values above 100%. These DS DoS values are higher or similar to the DM scenario DoS values which are also above 100%, apart from the A12 (E) ahead and right turn movement which have a lower DS DoS value. For the A12 (W) approach the DS DoS results are just below 90%, therefore there is a small amount of spare capacity, which is less spare capacity than the DM DoS results, that are at 80%.

4.4 A12 – Pettits Lane

4.4.1 This is a four-arm signalised junction connecting the A12 (Eastern Avenue E) with Pettits Lane north and south.

4.4.2 As the junction is signalised, it was modelled in LinSig as shown in Plate 4.4.

Plate 4.4 A12 - Pettits Lane LinSig model



4.4.3 The junction turning flows extracted from the LTAM, expressed in the form of O-D (origin-destination) matrices are shown in Table 4.7.

Table 4.7 A12 - Pettits Lane O-D Matrices (PCUs)

Arm	2030 DM AM					
		A	B	C	D	Total
Pettits Ln (N)	A	0	275	93	82	450
A12 (E)	B	387	0	165	1,703	2,255
Pettits Ln (S)	C	147	184	0	113	444
A12 (W)	D	43	1,689	105	0	1,837
	Total	577	2,148	363	1,898	4,986

2030 DS AM					
	A	B	C	D	Total
A	0	337	92	68	497
B	426	0	166	1,727	2,319
C	159	189	0	113	461
D	42	1,725	90	0	1,857
Total	627	2,251	348	1,908	5,134

Arm	2030 DM PM					
		A	B	C	D	Total
Pettits Ln (N)	A	0	347	104	20	471
A12 (E)	B	460	0	234	1,584	2,278
Pettits Ln (S)	C	229	195	0	196	620
A12 (W)	D	59	1,432	133	0	1,624
	Total	748	1,974	471	1,800	4,993

2030 DS PM					
	A	B	C	D	Total
A	0	370	103	21	494
B	491	0	234	1,576	2,301
C	230	197	0	200	627
D	58	1,453	130	0	1,641
Total	779	2,020	467	1,797	5,063

4.4.4 The existing junction layout has been modelled using LinSig, and the results are shown in Table 4.8.

Table 4.8 A12 - Pettits Lane Results

Lane no.	Lane name	Optimised signal timings							
		2030 DM AM		2030 DM PM		2030 DS AM		2030 DS PM	
		Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)
1/2+1/1	Pettits Lane (N) Left Ahead	3.4	37%	3.6	37%	4.3	37%	4.0	37%
1/3	Pettits Lane (N) Right	2.6	50%	0.5	10%	2.0	42%	0.5	11%
2/1	A12 (E) Ahead	15.8	66%	17.7	75%	16.0	67%	17.3	73%
2/2	A12 (E) Ahead	15.8	66%	17.7	75%	16.1	67%	17.3	73%
2/3	A12 (E) Ahead	2.7	17%	3.3	21%	2.9	18%	3.2	20%
2/4	A12 (E) Right	12.6	82%	16	89%	14.1	85%	19.9	95%
5/2+5/1	Pettits Lane (S) Ahead Left	6.8	84%	15	90%	9.2	84%	15.5	91%
5/3	Pettits Lane (S) Right	6.7	77%	5.4	52%	6.6	74%	5.5	53%
8/1	A12 (W) Ahead	15.7	76%	17.2	90%	17.5	83%	18	91%
8/2	A12 (W) Ahead	14.8	73%	16.7	89%	16.7	81%	17.3	90%
8/3	A12 (W) Ahead	15.4	75%	16.8	89%	17.3	83%	17.6	91%
8/4	A12 (W) Right	4.2	72%	5.1	75%	3.6	69%	5.5	80%

4.4.5 The results show that all arms in the AM are operating with spare capacity for both DM and DS scenarios.

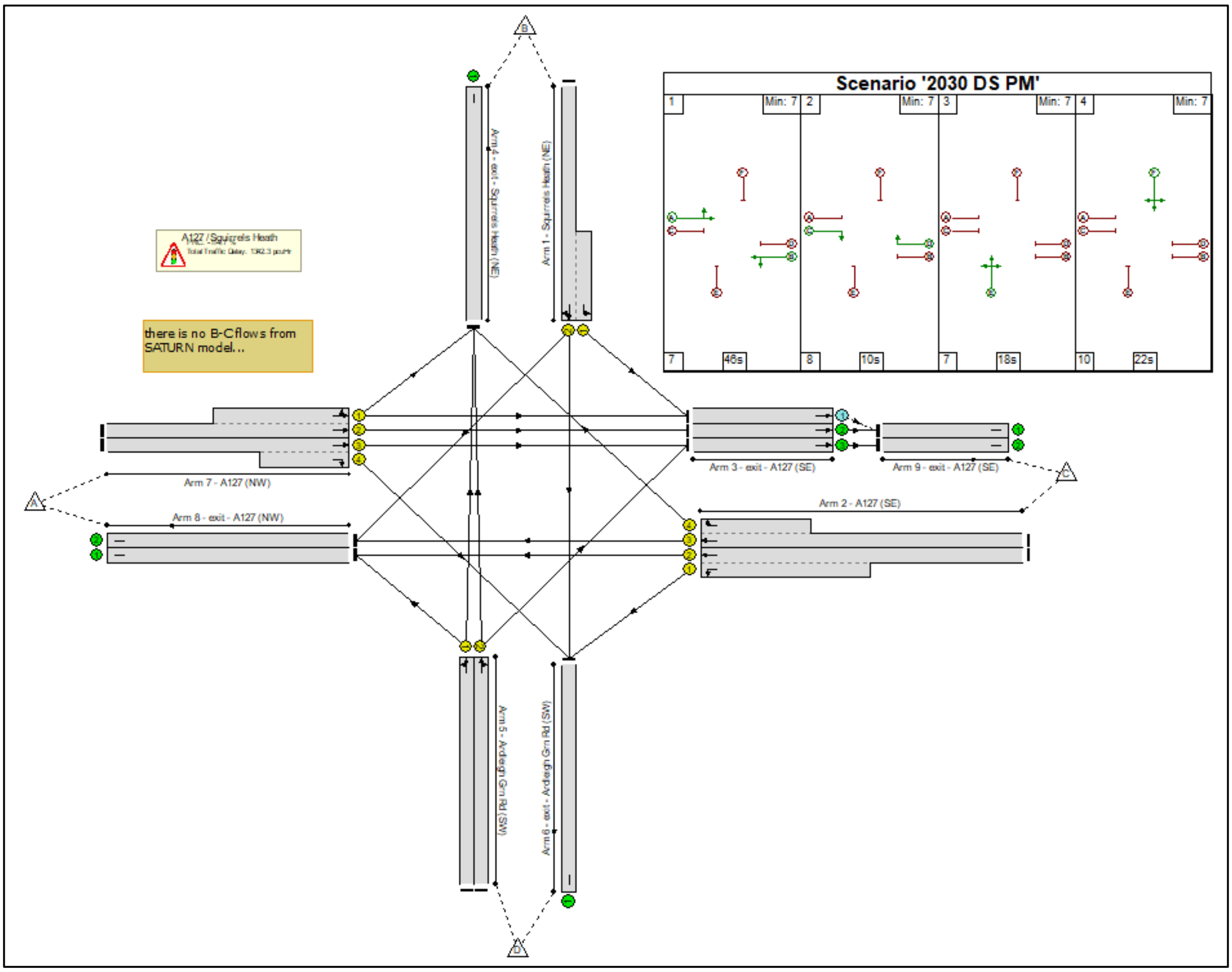
4.4.6 The PM results show that Pettits Lane (S) and A12 (E) are operating with spare capacity increasing to near capacity in some lanes in the DM scenario and similarly, with slightly more traffic, in the DS scenario. The A12 (W) connections are predicted to operate with minimal spare capacity in the DM, while in the DS traffic flows increase such that three lanes operate near capacity.

4.5 A127 – Ardleigh Green Road & Squirrels Heath Road

4.5.1 The junction is a four-arm signalised junction on the A127 (Southend Arterial Road) connecting with Ardleigh Road on the west and Squirrels Heath Road on the east.

4.5.2 As the junction is signalised it has been modelled in LinSig as shown in Plate 4.5.

Plate 4.5 A127 - Ardleigh Green Road & Squirrels Heath Road LinSig model



4.5.3 The junction turning flows extracted from the LTAM, expressed in the form of O-D (origin-destination) matrices are shown in Table 4.9.

Table 4.9 A127 - Ardleigh Green Road & Squirrels Heath Road O-D Matrices (PCUs)

Arm	**2030 DM AM**						**2030 DS AM**					
		A	**B**	**C**	**D**	**Total**		**A**	**B**	**C**	**D**	**Total**
A127 (NW)	**A**	0	91	1376	186	1,653	**A**	0	64	1,749	176	1,989
Squirrels Heath (NE)	**B**	212	0	0	297	509	**B**	183	0	0	323	506
A127 (SE)	**C**	1,331	178	0	484	1,993	**C**	1,375	199	0	515	2,089
Ardleigh Green Road (SW)	**D**	380	212	422	0	1,014	**D**	368	171	483	0	1,022
	Total	1,923	481	1,798	967	5,169	**Total**	1,926	434	2,232	1,014	5,606

Arm	**2030 DM PM**						**2030 DS PM**					
		A	**B**	**C**	**D**	**Total**		**A**	**B**	**C**	**D**	**Tot**
A127 (NW)	**A**	0	75	1,048	259	1,382	**A**	0	64	1,227	259	1,550
Squirrels Heath (NE)	**B**	237	0	0	385	622	**B**	245	0	0	378	623
A127 (SE)	**C**	1,227	239	0	444	1,910	**C**	1,255	251	0	474	1,980
Ardleigh Green Road (SW)	**D**	361	221	361	0	943	**D**	330	205	420	0	955
	Total	1,825	535	1,409	1,088	4,857	**Total**	1,830	520	1,647	1,111	5,108

4.5.4 The existing junction layout has been modelled using LinSig, and the results are shown in Table 4.10.

Table 4.10 A127 - Ardleigh Green Road & Squirrels Heath Road Results

Lane no.	Lane name	Optimised signal timings							
		2030 DM AM		2030 DM PM		2030 DS AM		2030 DS PM	
		Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)
1/2+1/1	Squirrels Heath (NE) Left Ahead Right	150.0	174%	184.1	185%	156.0	182%	185.0	178%
2/2+2/1	A127 (SE) Left Ahead	515.0	173%	483.3	188%	539.0	186%	513.1	175%
2/3+2/4	A127 (SE) Right Ahead	51.0	157%	66.3	172%	56.5	176%	73.5	166%
5/1	Ardleigh Green Road (SW) Ahead Left	140.7	169%	126.2	181%	151.4	146%	130.7	174%
5/2	Ardleigh Green Road (SW) Right Ahead	135.9	169%	139.7	182%	163.6	158%	141.3	174%
7/2+7/1	A127 (NW) Ahead Left	350.1	168%	197.3	134%	543.9	166%	301.5	163%
7/3+7/4	A127 (NW) Ahead Right	52.8	161%	74.0	183%	47.2	152%	74.0	168%

4.5.5 The model results show all arms of the junction are over capacity in 2030 for both the DM and DS scenarios.

4.5.6 In the AM, the DS (with the Project) shows increases in traffic on both the A127 approaches compared to the DM, and very similar levels of traffic on the minor road approaches of Ardleigh Green Road and Squirrels Heath Road. The same pattern is repeated in the PM.

4.5.7 The increased traffic on the A127 results in higher DoS results on the A127 (SE) approach in the AM for the DS scenario compared to the DM scenario. In the PM it is the A127 (NW) approach that has higher DoS results in the DS scenario compared to the DM scenario.

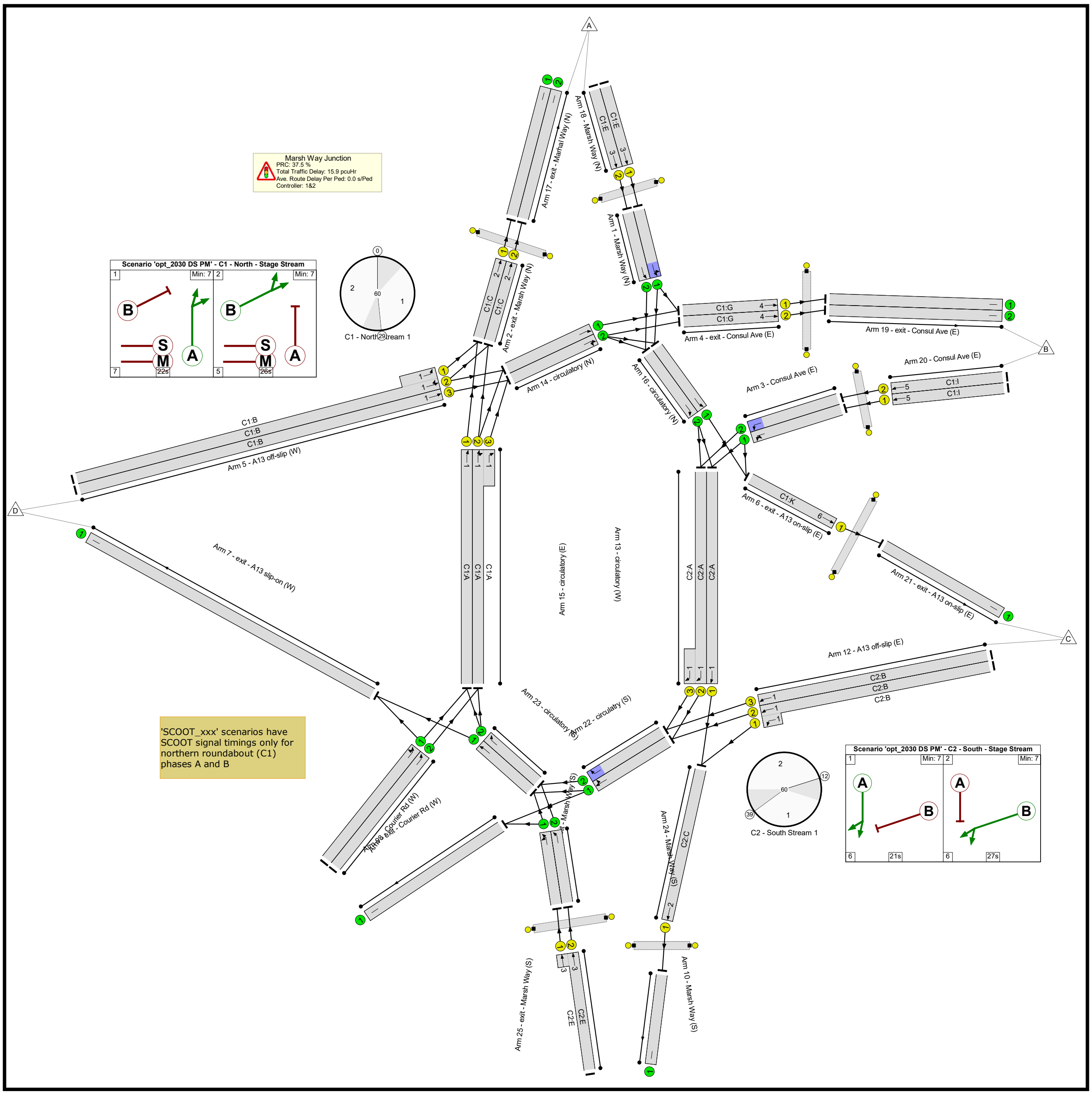
4.6 A13 – Marsh Way junction

4.6.1 This is a grade-separated dumbbell junction on the A13 connecting the A13 with Marsh Way and a number of business parks near the junction.

4.6.2 The model does not include the Marsh Way (S) and Courier Road arms to the south of the junction as no signal data from TfL was provided and it is not modelled in the LTAM.

4.6.3 As the junction is signalised it was modelled in LinSig as shown Plate 4.6.

Plate 4.6 Marsh Way Junction LinSig model



4.6.4 The junction turning flows extracted from the LTAM, expressed in the form of O-D (origin-destination) matrices are shown in Table 4.11. As mentioned above, the O-D matrices extracted from the LTAM contains only the trips to/from A13, Marsh Way (N) and Consul Avenue (E).

Table 4.11 Marsh Way Junction O-D Matrices (PCUs)

Arm	2030 DM AM					
		A	**B**	**C**	**D**	**Total**
Marsh Way (N)	**A**	0	166	269	304	739
Consul Avenue (E)	**B**	173	0	241	181	595
A13 (E)	**C**	360	205	0	0	565
A13 (W)	**D**	305	130	0	0	435
	Total	838	501	510	485	2,334

2030 DS AM					
	A	**B**	**C**	**D**	**Total**
A	0	162	268	297	727
B	172	0	245	178	595
C	351	215	0	0	566
D	302	130	0	0	432
Total	825	507	513	475	2,320

Arm	2030 DM PM					
		A	**B**	**C**	**D**	**Total**
Marsh Way (N)	**A**	0	145	427	252	824
Consul Avenue (E)	**B**	146	0	255	135	536
A13 (E)	**C**	324	206	0	0	530
A13 (W)	**D**	547	101	0	0	648
	Total	1,017	452	682	387	2,538

2030 DS PM					
	A	**B**	**C**	**D**	**Total**
A	0	143	431	251	825
B	146	0	259	134	539
C	330	212	0	0	542
D	550	100	0	0	650
Total	1026	455	690	385	2,556

4.6.5 The junction layout has been modelled using LinSig, and the results are shown in Table 4.12.

Table 4.12 Marsh Way Junction Results

Lane no.	Lane name	Optimised signal timings							
		2030 DM AM		2030 DM PM		2030 DS AM		2030 DS PM	
		Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)
5/2+5/1	A13 off-slip (W) Left Ahead	2.3	30%	3.3	45%	2.4	32%	3.3	46%
5/3	A13 off-slip (W) Ahead	1.8	18%	1.0	12%	1.9	20%	1.0	12%
13/1	Circulatory (W) Ahead	2.9	28%	2.2	33%	2.5	27%	2.5	33%
13/2+13/3	Circulatory (W) Ahead Right	2.1	46%	2.3	49%	1.8	43%	2.4	49%
1/1	Marsh Way (N) Left Ahead	0.1	22%	0.2	29%	0.1	22%	0.2	29%
1/2	Marsh Way (N) Ahead	0.1	16%	0.1	13%	0.1	15%	0.1	13%
3/2	Consul Ave (E) Left	0.1	19%	0.1	15%	0.1	19%	0.1	15%
12/2+12/1	A13 off-slip (E) Left Ahead	0.0	0%	0.0	0%	0.0	0%	0.0	0%
12/3	A13 off-slip (E) Ahead	10.5	71%	7.4	62%	10.5	71%	7.4	61%
15/1	Circulatory (E) Ahead	0.0	0%	0.0	0%	0.0	0%	0.0	0%
15/2+15/3	Circulatory (E) Right	6.4	70%	4.8	63%	6.3	69%	5.2	65%

4.6.6 The flows are very similar in both the DM and DS scenarios and the LinSig results show that the A13 approaches, Marsh Way (N), Consul Avenue (E) and the circulatory lanes are operating with spare capacity in both DM and DS scenarios.

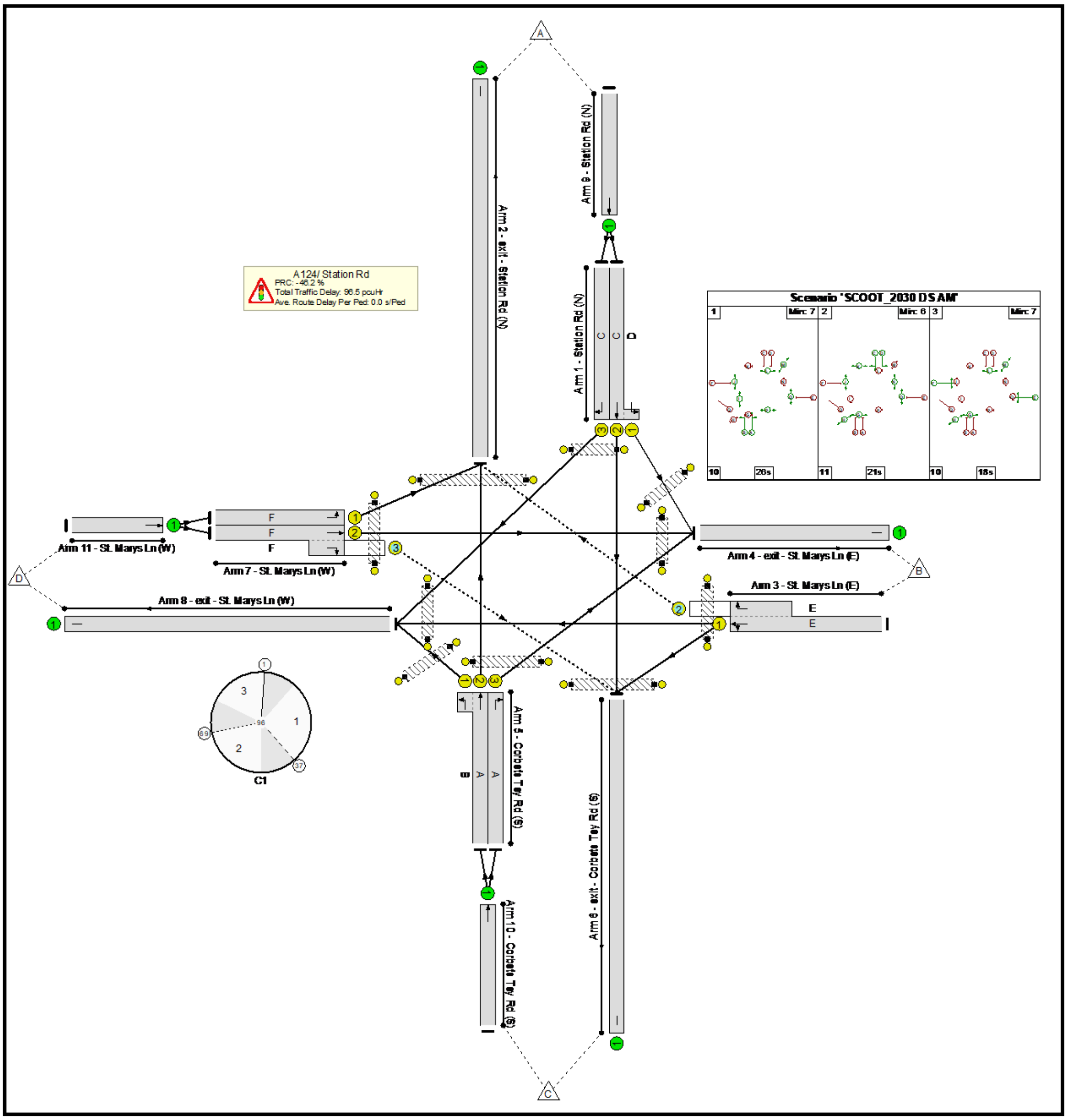
4.6.7 The degree of saturation on these approaches is likely to have been underestimated due to the lack of flow data for Marsh Way (S) and Courier Road. The exact impact from the two arms with no flows is unknown but based on the initial results, the junction has sufficient spare capacity to accommodate additional traffic.

4.7 A124 – Station Road

4.7.1 This is a four-arm signalised junction south of Upminster train station connecting the A124 (St. Mary's Lane) with Station Road in the north and the B1421 in the south.

4.7.2 As the junction is signalised it has been modelled in LinSig as shown in Plate 4.7.

Plate 4.7 A124 - Station Road LinSig model



4.7.3 The junction turning flows extracted from the LTAM, expressed in the form of O-D (origin-destination) matrices are shown in Table 4.13.

Table 4.13 A124 - Station Road O-D Matrices (PCUs)

Arm	2030 DM AM						2030 DS AM					
		A	B	C	D	Total		A	B	C	D	Total
Station Road (N)	A	0	42	169	166	377	A	0	21	139	169	329
St. Mary's Lane (E)	B	5	0	64	411	480	B	4	0	47	323	374
Corbets Tey Road (S)	C	178	14	0	150	342	C	206	19	0	148	373
St. Mary's Lane (W)	D	184	439	72	0	695	D	229	450	73	0	752
	Total	367	495	305	727	1,894	Total	439	490	259	640	1,828

Arm	2030 DM PM						2030 DS PM					
		A	B	C	D	Total		A	B	C	D	Total
Station Road (N)	A	0	38	243	223	504	A	0	35	198	256	489
St. Mary's Lane (E)	B	35	0	76	384	495	B	35	0	68	365	468
Corbets Tey Road (S)	C	152	23	0	177	352	C	162	55	0	179	396
St. Mary's Lane (W)	D	329	397	79	0	805	D	326	404	89	0	819
	Total	516	458	398	784	2,156	Total	523	494	355	800	2,172

4.7.4 The existing junction layout has been modelled using LinSig, and the results are shown in Table 4.14.

Table 4.14 A124 - Station Road Results

Lane no.	Lane name	Optimised signal timings							
		2030 DM AM		2030 DM PM		2030 DS AM		2030 DS PM	
		Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)
1/2+1/1	Station Road (N) Left Ahead	6.1	69%	7.9	70%	4.5	57%	6.2	61%
1/3	Station Road (N) Right	4.9	61%	6.2	61%	5.2	66%	7.8	74%
3/1+3/2	St. Mary's Lane (E) Right Left Ahead	10.3	59%	10.9	64%	7.5	47%	10.0	61%
5/2+5/1	Corbets Tey Road (S) Ahead Left	8.1	77%	8.1	80%	9.0	78%	8.3	80%
5/3	Corbets Tey Road (S) Right	0.3	4%	0.6	7%	0.4	5%	1.3	17%
7/1	St. Mary's Lane (W) Left	3.3	24%	7.0	47%	4.4	31%	6.9	47%
7/2+7/3	St. Mary's Lane (W) Ahead Right	10.9	63%	10.2	63%	11.6	66%	10.7	65%

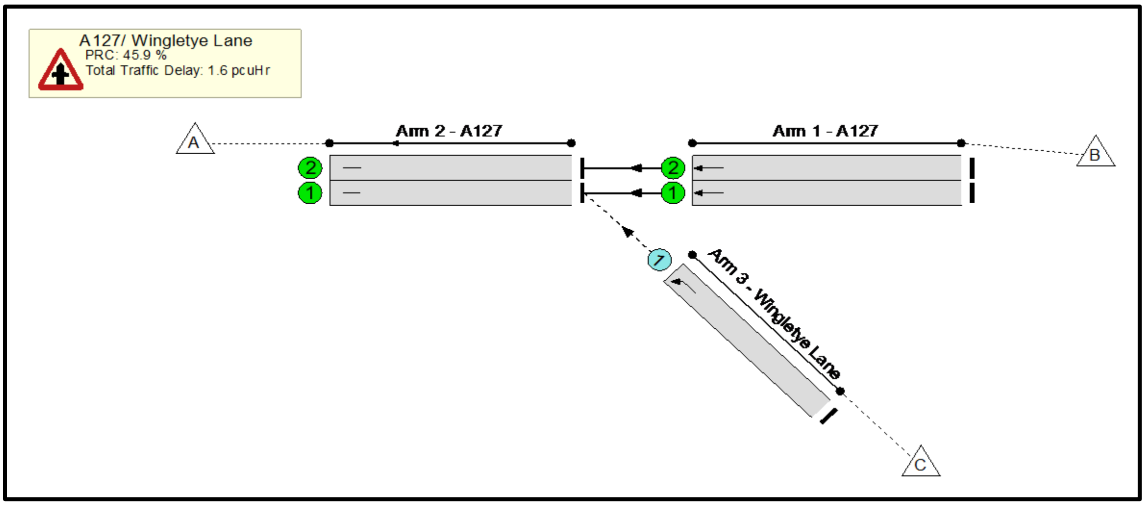
4.7.5 The flows are similar in both the DM and DS scenarios and the results show that all arms of the junction would be operating with spare capacity in 2030 for both the DM and DS scenarios.

4.8 A127 – Wingletye Lane

4.8.1 This is a junction on the A127 (Southend Arterial Road). Wingletye Lane is a single lane left turn only approach with a 70m long parallel merge onto the A127 westbound.

4.8.2 Considering the layout of the junction, it was decided to model it in LinSig despite it not being a signalised junction, but to include best practice guidance for give-way parameters. The layout is shown in Plate 4.8.

Plate 4.8 A127 - Wingletye Lane LinSig model



4.8.3 The junction turning flows extracted from the LTAM, expressed in the form of O-D (origin-destination) matrices are shown in Table 4.15.

Table 4.15 A127 - Wingletye Lane O-D Matrices (PCUs)

Arm	2030 DM AM					2030 DS AM				
		A	B	C	Total		A	B	C	Total
A127 (W)	A	0	0	0	0	A	0	0	0	0
A127 (E)	B	1,579	0	0	1,579	B	1,767	0	0	1,767
Wingletye Lane (S)	C	415	0	0	415	C	321	0	0	321
	Total	1,994	0	0	1,994	Total	2,088	0	0	2,088

Arm	2030 DM PM					2030 DS PM				
		A	B	C	Total		A	B	C	Total
A127 (W)	A	0	0	0	0	A	0	0	0	0
A127 (E)	B	1,547	0	0	1,547	B	1,680	0	0	1,680
Wingletye Lane (S)	C	363	0	0	363	C	301	0	0	301
	Total	1,910	0	0	1,910	Total	1,981	0	0	1,981

4.8.4 The junction layout has been modelled as a priority junction in LinSig, and the results are shown in Table 4.16.

Table 4.16 A127 - Wingletye Lane Results

Lane no.	Lane name	2030 DM AM		2030 DM PM		2030 DS AM		2030 DS PM	
		Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)
3/1	Wingletye Lane (S) Ahead	1.6	77%	1.0	67%	0.8	62%	0.8	62%

4.8.5 Comparing the DS and DM flows indicate that the flows increase on the A127 mainline and decreases on Wingletye Lane in the DS scenario for both AM and PM peak hours. The LinSig results show that the merge from Wingletye Lane to A127 westbound when modelled as a priority junction is operating with spare capacity in both DM and DS scenarios.

4.8.6 An assessment of the merge has also been considered using DMRB CD 122 for all-purpose roads. The assessment shows the forecast flows in both DM and DS are below the suggested range for the existing layout which is a Type B parallel merge with two upstream lanes and two downstream lanes on the mainline.

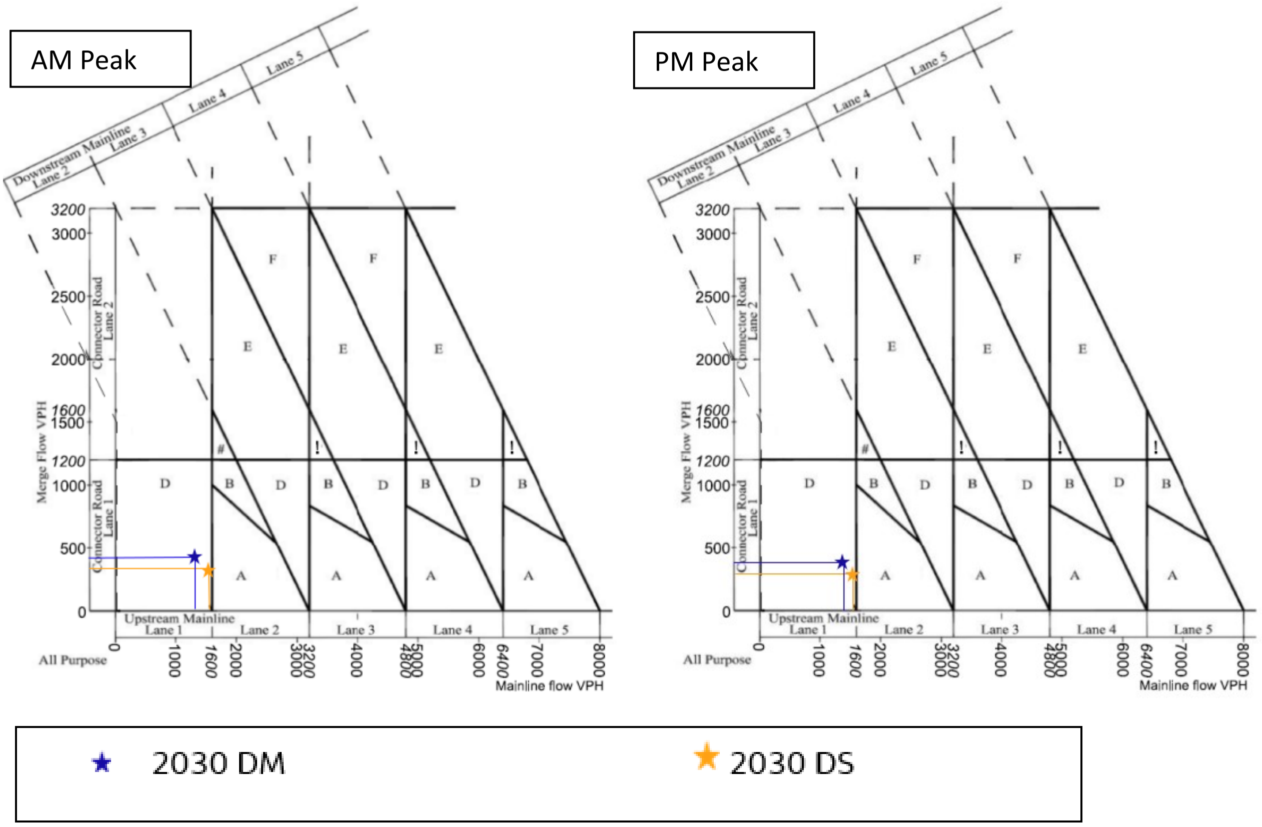
4.8.7 The 2030 forecast flows (in vehicles) for the A127 mainline and Wingletye Lane merge including the adjustment factors for large goods vehicles and uphill gradient are shown in Table 4.17.

Table 4.17 A127 - Wingletye Lane Merge Flows (vehicles)

	Mainline flow (veh)	Mainline HGV %	Mainline gradient	Mainline factor	Final mainline flow (veh)	Merge flow (veh)	Merge HGV %	Merge gradient	Merge factor	Final merge flow (veh)
2030 DM AM	1,430	6	<2%	1	1,430	400	2	<2%	1	400
2030 DM PM	1,472	3	<2%	1	1,472	351	2	<2%	1	351
2030 DS AM	1,577	7	<2%	1	1,577	308	3	<2%	1	308
2030 DS PM	1,586	4	<2%	1	1,586	289	3	<2%	1	289

4.8.8 The 2030 forecast flows are plotted on the suggested flow range graphs for different types of merge layout in Plate 4.9.

Plate 4.9 A127 - Wingletye Lane merge assessment

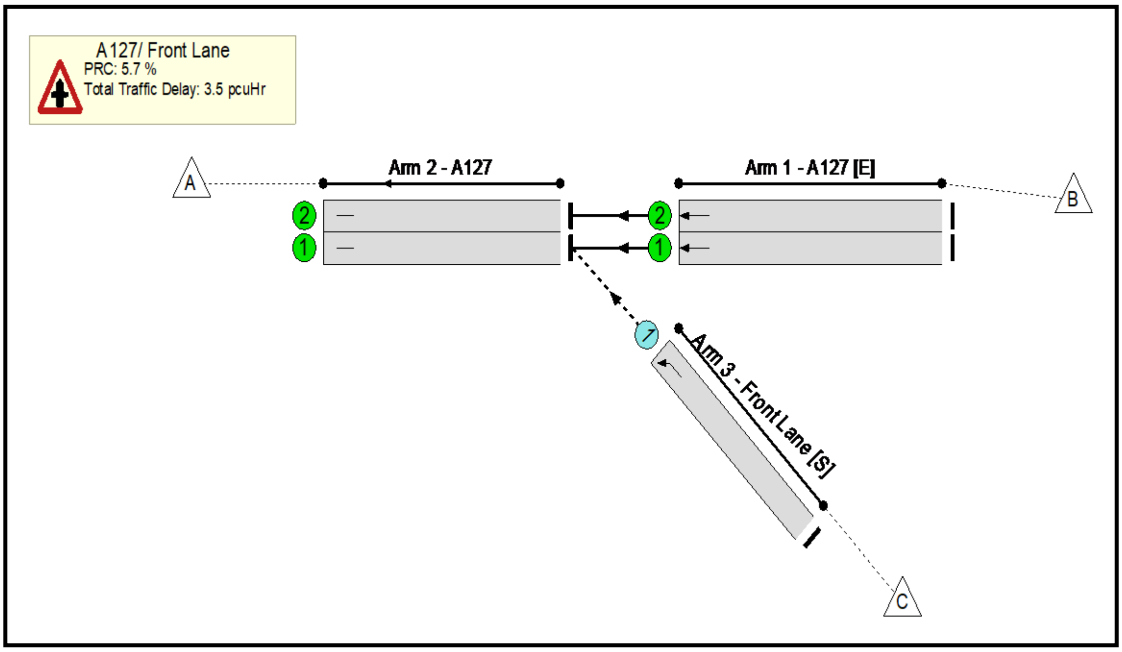


4.9 A127 – Front Lane

4.9.1 This is a junction on the A127 (Southend Arterial Road). Front Lane is a single lane left turn only approach with a 60m long merge onto the A127 westbound.

4.9.2 Considering the layout of the junction, it was decided to model it in LinSig despite it not being a signalised junction, but to include best practice guidance for give-way parameters. The layout is as shown in Plate 4.10.

Plate 4.10 A127 - Front Lane LinSig model



4.9.3 The junction turning flows extracted from the LTAM, expressed in the form of O-D (origin-destination) matrices are shown in Table 4.18.

Table 4.18 A127 - Front Lane O-D Matrices (PCUs)

Arm	**2030 DM AM**				
		A	**B**	**C**	**Total**
A127 (W)	**A**	0	0	0	0
A127 (E)	**B**	1,863	0	0	1,863
Front Lane (S)	**C**	434	0	0	434
	Total	2,297	0	0	2,297

2030 DS AM				
	A	**B**	**C**	**Total**
A	0	0	0	0
B	2,413	0	0	2,413
C	492	0	0	492
Total	2,905	0	0	2,905

Arm	**2030 DM PM**				
		A	**B**	**C**	**Total**
A127 (W)	**A**	0	0	0	0
A127 (E)	**B**	2,172	0	0	2,172
Front Lane (S)	**C**	430	0	0	430
	Total	2,602	0	0	2,602

2030 DS PM				
	A	**B**	**C**	**Total**
A	0	0	0	0
B	2,504	0	0	2,504
C	493	0	0	493
Total	2,997	0	0	2,997

4.9.4 The existing junction layout has been modelled as a priority junction in LinSig, and the results are shown in Table 4.19.

Table 4.19 A127 - Front Lane Results

Lane no.	Lane name	2030 DM AM		2030 DM PM		2030 DS AM		2030 DS PM	
		Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)	Mean max queue (pcu)	Deg sat (%)
3/1	Front Lane (S) Ahead	2.7	85%	4.0	90%	62.9	110%	62.9	110%

4.9.5 Comparing the DS and DM flows indicates that the flows on the A127 westbound mainline increase in the DS scenario and there is also a small increase in flow on Front Lane in the DS scenario.

4.9.6 The LinSig results show that the merge from Front Lane to the A127 westbound when modelled as a priority junction is operating at capacity in the DM scenario for the PM peak and is predicted to be over capacity due to the increase in flows in the DS scenario, with the degree of saturation increasing to over 100% for both AM and PM peak hours.

4.9.7 An assessment of the merge has also been considered using DMRB CD 122 for all-purpose roads. The assessment shows the forecast flows in both DM and DS are below the suggested range for the existing layout which is a Type B parallel merge with two upstream lanes and two downstream lanes on the mainline.

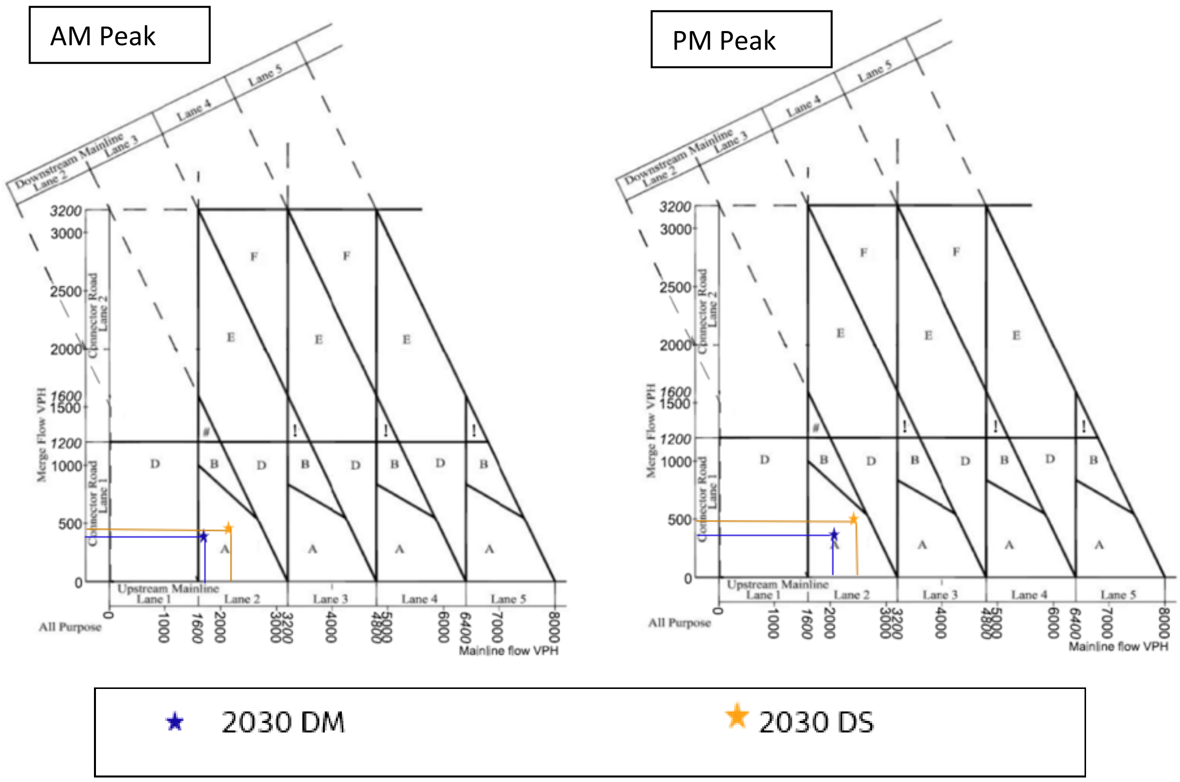
4.9.8 The 2030 forecast flows (in vehicles) for the A127 mainline and Front Lane merge, including the adjustment factors for large goods vehicles and uphill gradient, are shown in Table 4.20.

Table 4.20 A127 - Front Lane merge flows (vehicles)

	Mainline flow (veh)	Mainline HGV %	Mainline gradient	Mainline factor	Final mainline flow (veh)	Merge flow (veh)	Merge HGV %	Merge gradient	Merge factor	Final merge flow (veh)
2030 DM AM	1,666	7	<2%	1	1,666	411	4	<2%	1	411
2030 DM PM	2,059	4	<2%	1	2,059	423	1	<2%	1	423
2030 DS AM	2,163	7	<2%	1	2,163	467	3	<2%	1	467
2030 DS PM	2,368	4	<2%	1	2,368	492	0	<2%	1	492

The 2030 forecast flows are plotted on the suggested flow range graphs for different types of merge layout in Plate 4.11.

Plate 4.11 A127 - Front Lane merge assessment

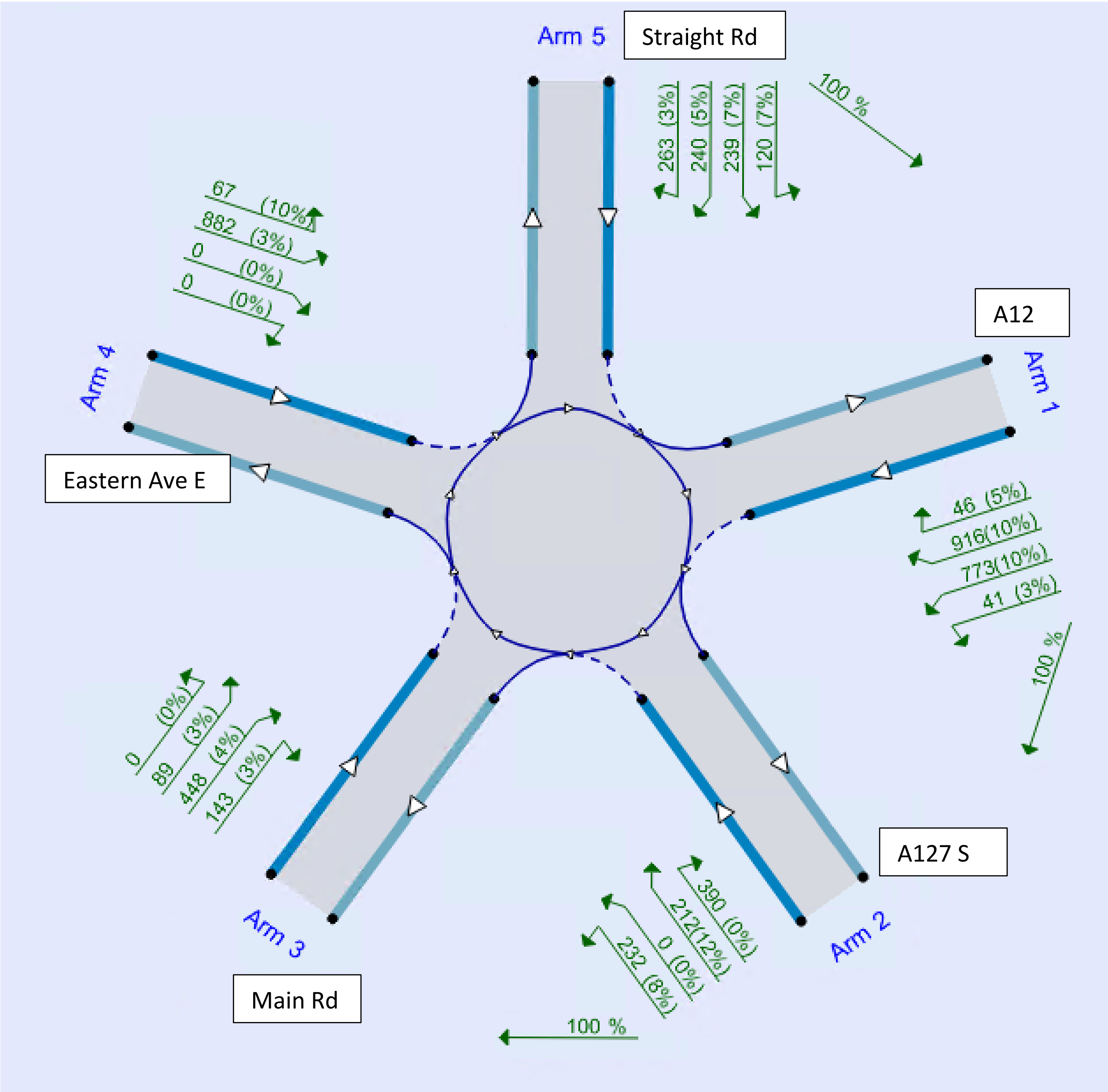


4.10 Gallows Corner

4.10.1 Gallows Corner is a priority control five-arm grade-separated roundabout on the A127 connecting the A127 and Eastern Avenue E with Straight Road in the north, A12 in the east and Main Road in the west.

4.10.2 The junction layout has been modelled using the ARCADY module in Junctions 9 as shown in Plate 4.12.

Plate 4.12 Gallows Corner roundabout



4.10.3 The model results are shown in Table 4.21.

Table 4.21 Gallows Corner results

Junction	Arm name	2030 DM										2030 DS									
		AM					PM					AM					PM				
		Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS	Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS	Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS	Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS
Gallows Corner	A12 (E)	1,776	22.3	43.65	0.98	E	1,732	9.1	18.65	0.91	C	1,872	53.1	89.9	1.04	F	1,730	9.8	20.4	0.91	C
	A127 (S-E)	894	2.2	10.97	0.68	B	727	1.3	7.53	0.57	A	815	1.5	8.69	0.59	A	652	1	6.31	0.50	A
	Main Road (S-W)	681	3.6	18.05	0.79	C	710	5.2	25.09	0.85	D	694	3.2	15.35	0.76	C	738	4.7	21.8	0.83	C
	Eastern Avenue (W)	949	1.2	4.32	0.55	A	914	1.1	4.02	0.52	A	855	1	3.69	0.48	A	884	1	3.72	0.50	A
	Straight Road (N)	863	1.4	6.2	0.57	A	726	0.8	4.04	0.44	A	899	1.3	5.55	0.56	A	764	0.9	4.03	0.46	A

4.10.4 The model results in Table 4.21 show the A12 (E) arm has the largest flows out of the five arms, and it suffers from capacity issues in both the DM and DS scenarios. In the AM, the A12 (E) arm is operating over capacity in the DM scenario and is predicted to operate with reduced capacity with the increase in flows in the DS scenario.

4.10.5 All other arms of the roundabout are operating within capacity in the DM scenario and are predicted to continue to operate within capacity in the DS scenario.

4.11 A127 – Hall Lane

4.11.1 The A127 / Hall Lane junction consists of two separate priority junctions connecting the A127 with Hall Lane north and south.

4.11.2 The junction layout has been modelled using the PICADY module in Junctions 9, as shown in Plate 4.13 for the northern junction and Plate 4.14 for the southern crossroads junction.

Plate 4.13 A127 - Hall Lane northern junction

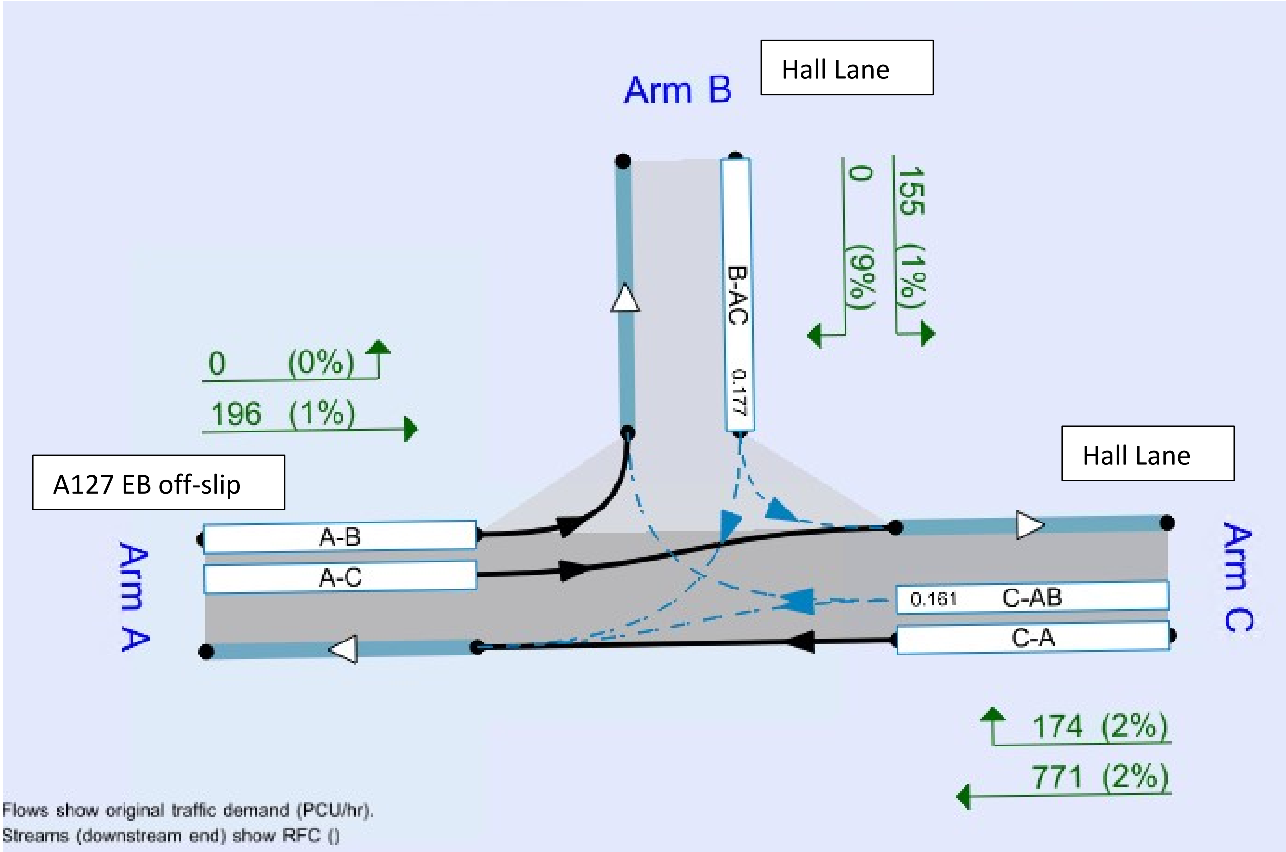


Plate 4.14 A127 - Hall Lane southern junction

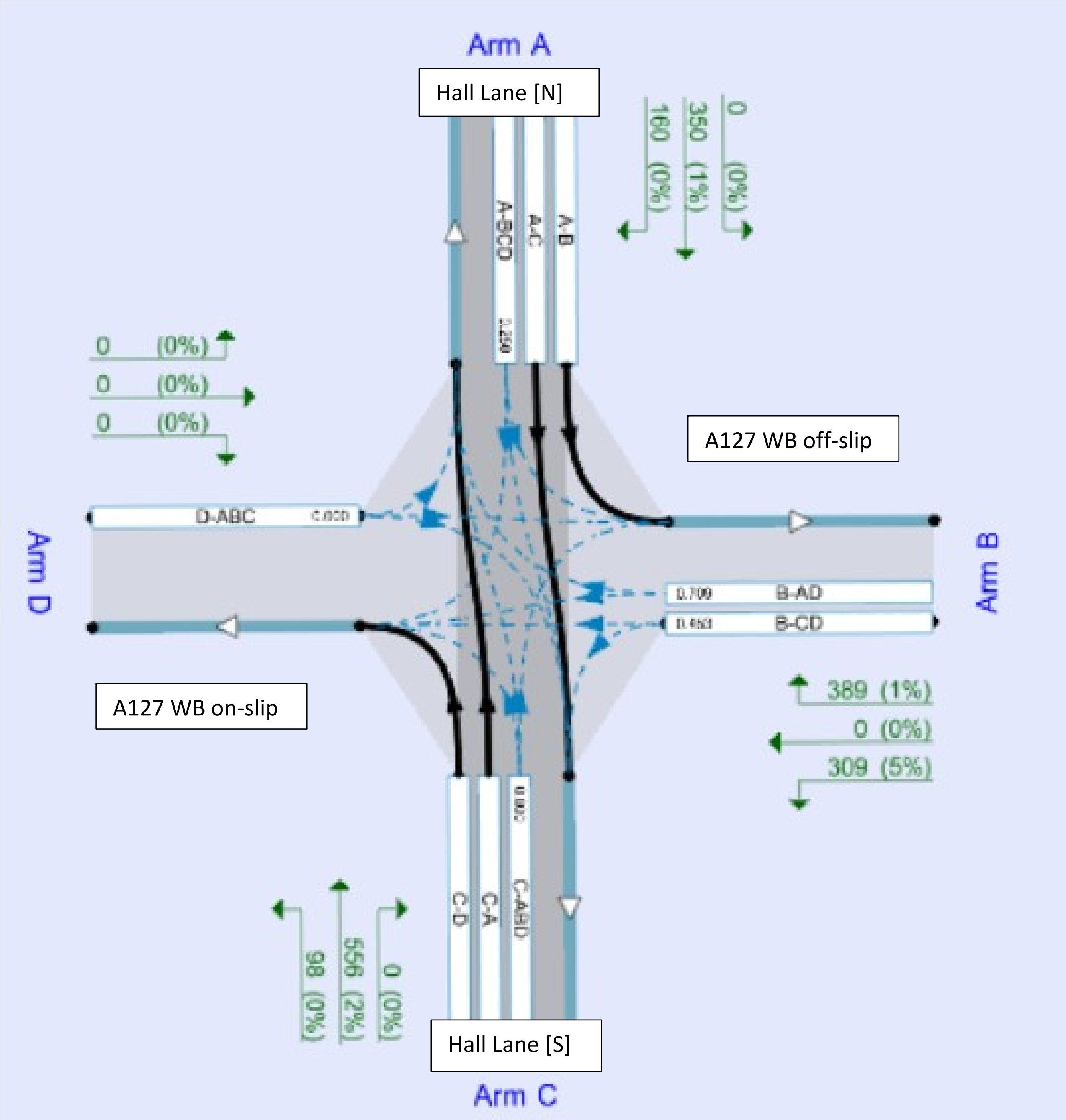


Table 4.22 A127 - Hall Lane Northern junction results

Junction	Stream	2030 DM										2030 DS									
		AM					PM					AM					PM				
		Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS	Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS	Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS	Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS
A127 - Hall Lane	B-AC	167	0.4	7.97	0.29	A	153	0.4	7.76	0.27	A	270	1.3	15.46	0.55	C	155	0.4	7.7	0.27	A
	C-AB	568	0.4	6.46	0.27	A	744	0.3	6.28	0.25	A	820	0.4	6.64	0.29	A	945	0.3	6.12	0.24	A

Table 4.23 A127 - Hall Lane Southern junction results

Junction	Stream	2030 DM										2030 DS									
		AM					PM					AM					PM				
		Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS	Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS	Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS	Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS
A127 - Hall Lane	B-C	202	1	17.22	0.49	C	282	2.5	29.97	0.71	D	247	1.7	22.61	0.61	C	309	3.2	35.47	0.77	E
	B-A	303	4.5	51.94	0.83	F	313	12.4	134.1	0.99	F	408	37.2	288.9	1.15	F	389	53	474.5	1.27	F
	A	461	0.5	5.37	0.21	A	552	1.3	7.87	0.45	A	407	0.4	5.52	0.18	A	510	1.2	8.33	0.44	A
	D	0	0	0	0	A	0	0	0	0	A	0	0	0	0	A	0	0	0	0	A
	C	0	0	0	0	A	0	0	0	0	A	0	0	0	0	A	0	0	0	0	A

4.11.3 The model results in Table 4.22 show all arms at the north junction operates well within capacity in the DM scenario and continue to operate within capacity with the increase in flows in the DS scenario.

4.11.4 At the south junction, the model results in Table 4.23 show the right turn movement from Arm B (A127 WB off-slip) to Hall Lane NB is operating with long delays in the DM scenario, particularly for the PM peak. This arm is predicted to operate with reduced capacity due to the increase in flows in the DS scenario with delays increasing.

4.12 A13 – A1306

4.12.1 This is a dumbbell priority control junction on the A13 connecting the A13 with the A1306.

4.12.2 The junction layout has been modelled using the ARCADY module in Junctions 9, as shown in Plate 4.15.

Plate 4.15 A13 - A1306 model layout

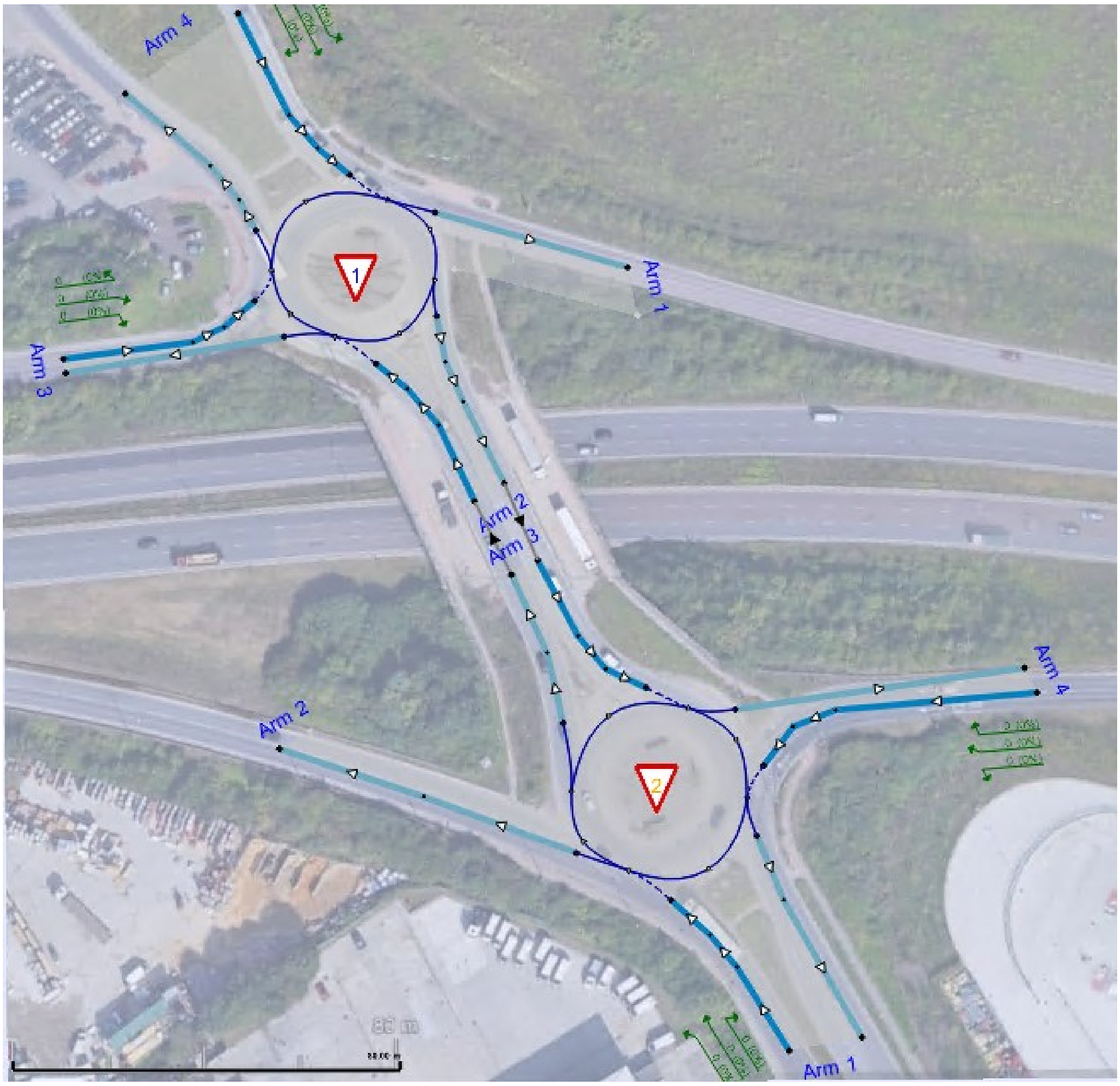


Table 4.24 A13 - A1306 results

Junction	Arm name	2030 DM										2030 DS									
		AM					PM					AM					PM				
		Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS	Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS	Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS	Flow (PCU)	Queue (PCU)	Delay (s)	RFC	LOS
1 - North roundabout	A1306 (S)	1,273	1.5	3.99	0.59	A	1,336	1.6	3.91	0.61	A	1,292	1.6	4.04	0.60	A	1,370	1.7	4.07	0.62	A
	A13 (W) off-slip	749	1.6	7.27	0.61	A	970	4	14.08	0.80	B	690	1.4	6.75	0.57	A	932	3.6	13.09	0.78	B
	A1306 (N)	1,605	2.7	5.66	0.73	A	1,524	3.3	7.31	0.77	A	1,607	2.6	5.27	0.71	A	1,547	3.4	7.35	0.77	A
2 - South roundabout	A1306 (S)	1,065	1.6	4.85	0.59	A	1,095	1.7	5.14	0.63	A	955	1.3	4.57	0.55	A	1,078	1.7	5.1	0.62	A
	A1306 (N)	1,294	1.8	4.47	0.63	A	1,510	3.2	7.05	0.75	A	1,220	1.5	4.09	0.59	A	1,363	2.2	5.35	0.68	A
	A13 (E) off-slip	726	1	4.53	0.48	A	900	2.5	9.2	0.71	A	805	1.1	4.48	0.51	A	996	2.6	8.53	0.71	A

4.12.3 The model results in Table 4.24 show all arms at the junction operate well within capacity in the DM scenario and continue to operate within capacity in the DS scenario with minimal delays and queues.

5 Conclusions

5.1.1 Table 5.1 provides a visual high-level overview of the modelling results at each junction for each peak for each scenario.

Table 5.1 Results Overview

Junction location/ Name	**AM peak**		**PM peak**		**Comments**
	DM	**DS**	**DM**	**DS**	
A12/ Gubbins Lane					DM capacity issues - AM
A12/ Harold Court Road					
A12/ North Street					DM capacity issues
A12/ Pettits Lane					DM capacity issues - PM
A127/ Ardleigh Green Road & Squirrels Heath Road					DM capacity issues
A13/ Marsh Way junction					
A124/ Station Road/ B1421 (Bell Corner)					
A127/ Wingletye Lane					Based on Merge Analysis
A127/ Front Lane					Based on Merge Analysis
Gallows Corner					DM capacity issues
A127/ Hall Lane					DM capacity issues - PM
A13/ A1306 Wennington Road					

Key:	Near to / at capacity	
	Spare capacity	
	Over capacity	

5.1.2 The results in Table 5.1 are illustrated on a location map for each of the junctions for the AM and PM peaks in Plate 5.1 and Plate 5.2 respectively, with the DM performance above the DS performance.

Plate 5.1 Junction locations with 2030 DM & DS AM performance

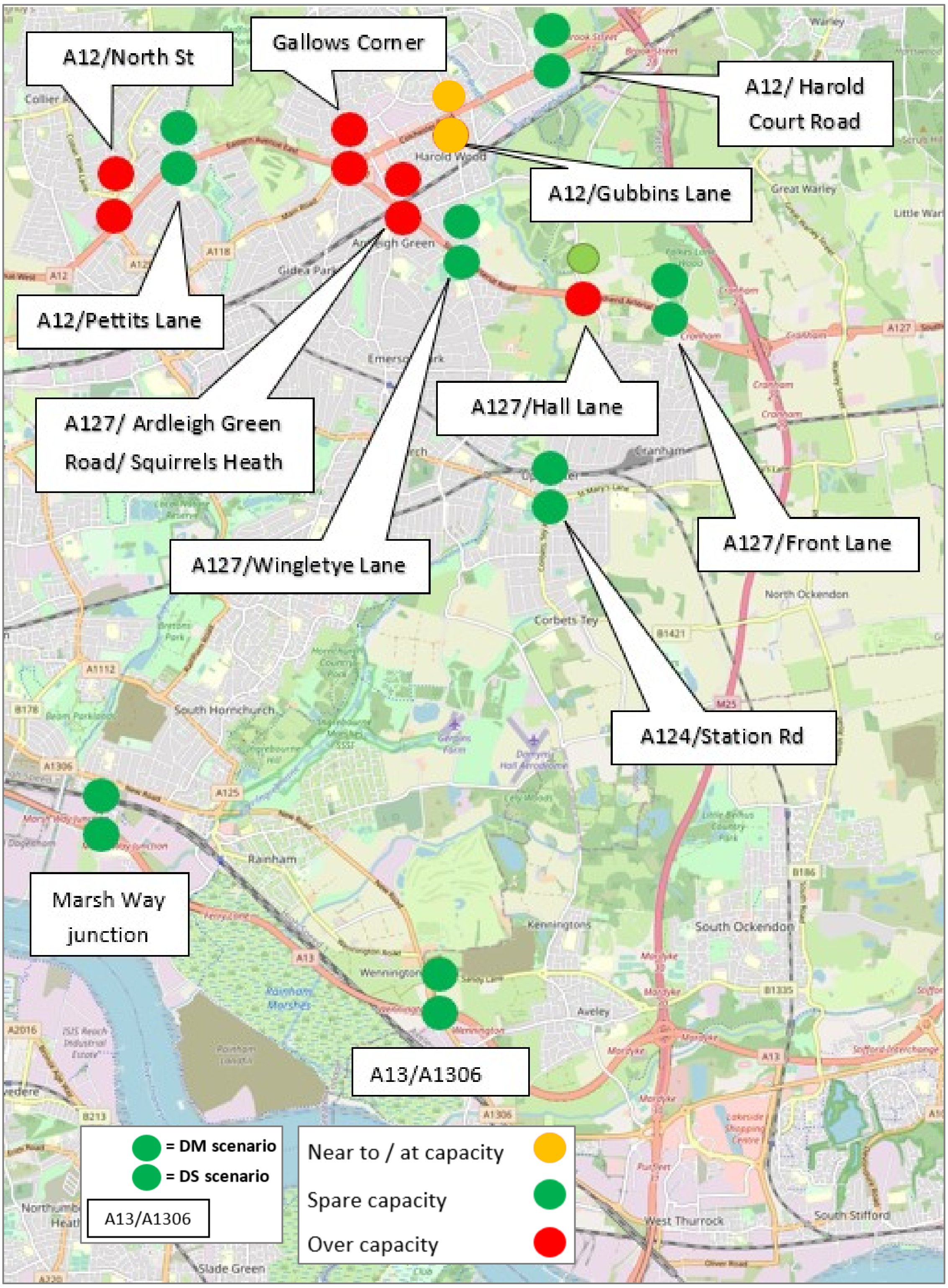
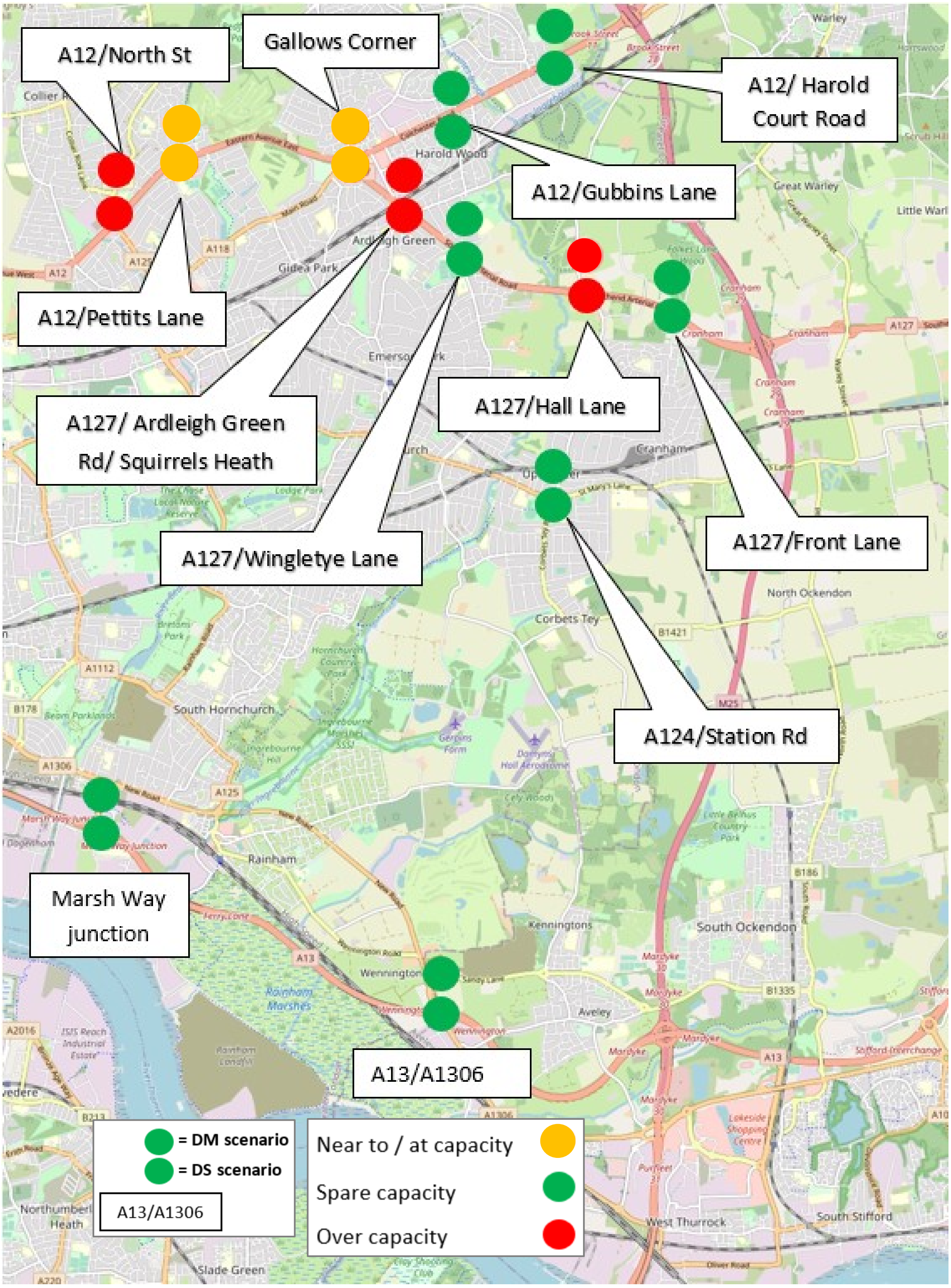


Plate 5.2 Junction locations with 2030 DM & DS PM performance



5.1.3 The initial assessment indicates that there are five junctions where there may be capacity issues with and/or without the Project. They are:

a. A12/ Gubbins Lane

b. A12/ North Street

c. A12/ Pettits Lane

d. A127/ Hall Lane (southern crossroads)

e. Gallows Corner

References

The Prediction of Saturation Flows for Road Junctions Controlled by Traffic Signals, Transport and Road Research Laboratory, Department of Transport, Research Report 67, 1986

DMRB CD 122 – Geometric design of grade separated junctions. Discipline: Road Layout. Lifecycle Stage: Design. Issued: Jan 2022. Version: 1.1.1.

Glossary

Term	Explanation
AM	Morning peak hour
ANPR	Automatic Number Plate Recognition
ARCADY	A design and assessment tool used to predict capacities and queues at roundabouts
ATC	Automatic Traffic Count
DCO	Development Consent Order - Means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects (NSIPs)
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges: A comprehensive manual which contains requirements, advice and other published documents relating to works on motorway and all-purpose trunk roads for which one of the Overseeing Organisations (National Highways, Transport Scotland, the Welsh Government or the Department for Regional Development (Northern Ireland)) is the highway authority. For the Lower Thames Crossing, the Overseeing Organisation is National Highways.
Do Minimum (DM)	A future year scenario which includes changes to the road network and planned development that is forecast to go ahead, but not the Lower Thames Crossing.
Do Something (DS)	A future year scenario which includes changes to the road network and planned development that is forecast to go ahead, and the Lower Thames Crossing.
EB	Eastbound
GEH	A formula used to compare two traffic volumes, named after its originator, Geoff E. Havers. It is similar to a chi-squared test.
HGV	Heavy Goods Vehicle
LGV	Light Goods Vehicle
LinSig	A Design and Assessment Tool for Traffic Signal Junctions and Urban Networks
LMVR	Local Model Validation Report
LTC	Lower Thames Crossing
NB	Northbound
OS	Ordnance Survey
PICADY	A design and assessment tool used to predict capacities and queues at priority junctions
PM	Evening paek hour
PTV	German for Planning Transport and Traffic Software package

Term	Explanation
SATURN	Simulation and Assignment of Traffic to Urban Networks
SCOOT	Traffic Signal Control tool to control and manage traffic in an urban environment – Split Cycle Offset Optimisation Technique
SB	Southbound
TAG	Transport Analysis Guidance published by DfT
TfL	Transport for London - The integrated body responsible for London's transport system
VISSIM	Micro-simulation software developed by PTV. Verkehr In Städten - SIMulationsmodell (German for "Traffic in cities - simulation model)
WB	Westbound

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