national highways

Lower Thames Crossing

9.15 Localised Traffic Modelling Appendix H - Traffic Operational Appraisal - VISSIM Forecasting report

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Lower Thames Crossing

9.15 Localised Traffic Modelling Appendix H - Traffic Operational Appraisal - VISSIM Forecasting report

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1 Introduction

1.1 Purpose of document

1.1.1 The traffic operational appraisal undertaken at Preliminary Design is composed of:

a. The 9.15 Localised Traffic Modelling Appendix G - Traffic Operational Appraisal - VISSIM Local Model Validation Report (LMVR); and,

b. This report which details traffic operational appraisal VISSIM forecasting report.

1.1.2 The purpose of this report is to present the traffic operation appraisal report of the Lower Thames Crossing.

1.1.3 The operational analysis describes the traffic conditions of the Project's proposed highway layout using DMRB merge and diverge segment analysis as well as the assessment using the traffic microsimulation model of the Project.

1.1.4 The traffic operational appraisal has been undertaken for 2045 to remain consistent with the design year.

1.2 Modelling software

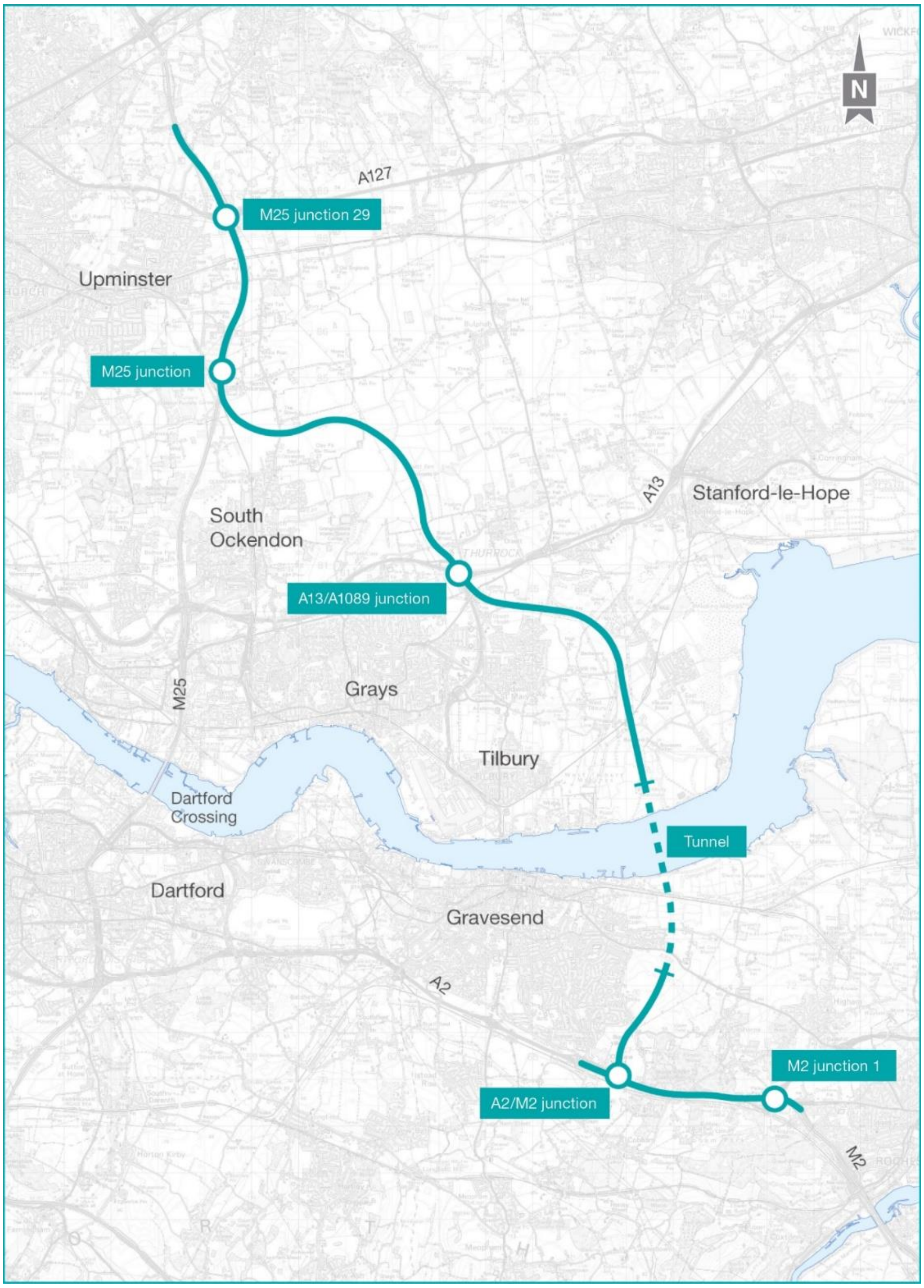
1.2.1 Road traffic microsimulation models represent individual vehicles travelling within the road network, providing realistic driver behaviour such as lane changing and overtaking.

1.2.2 Most microsimulation software packages are capable of generating graphics with animated individual vehicles, providing excellent visual aid when presenting complex traffic phenomena. The software selected for Lower Thames Crossing is VISSIM.

1.3 The Project

1.3.1 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 1.1.

Plate 1.1 Lower Thames Crossing route



1.3.2 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.

1.3.3 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

1.3.4 To align with NPSNN policy 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.

1.3.5 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

1.3.6 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.

1.3.7 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.

1.3.8 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.

1.3.9 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.

1.4 Report structure

1.4.1 The remaining chapters of this report is composed of:

a. Chapter 2, details the traffic analysis process using DMRB and VISSIM;

b. Chapter 3, presents the scheme development summary;

c. Chapter 4, presents the grade separated road network traffic analysis;

d. Chapter 5, presents the local traffic analysis;

e. Chapter 6, sets out the conclusions.

2 Traffic analysis process – DMRB & VISSIM

2.1 Data exchange process between disciplines

2.1.1 The data exchange process between different disciplines is detailed in, Chapter 2 of 9.15 Localised Traffic Modelling Appendix G – Traffic Operational Appraisal – VISSIM Local Model Validation Report (LMVR).

2.1.2 A complete corridor microsimulation VISSIM model for the Project was used during the final stages of the highway layout development to validate the design.

2.1.3 During the design process, the following analyses were typically undertaken:

a. Design Manual for Roads and Bridges (DMRB) and preliminary traffic calculations, focussing on merge, diverge and weaving segments; and,

b. If required, VISSIM modelling.

2.1.4 The traffic demand used for each assessment corresponded to the latest relevant strategic model run available from the Lower Thames Area Model.

2.2 DMRB merge and diverge calculations

2.2.1 The DMRB includes calculation diagrams to identify suitable merge or diverge types. All the DMRB calculations for both merge and diverge segments have been assessed using the following corridor classifications:

a. Lower Thames Crossing (All Purpose trunk road);

b. A2-M2 (mix of All Purpose trunk road and motorway);

c. A13 (All Purpose trunk road); and,

d. M25 (solely Mix of All Purpose trunk road and motorway).

2.2.2 Once a suitable segment type has been selected, further traffic analysis is necessary. The main reasons the follow-up operational modelling work is required are because the DMRB calculations:

a. Assumes the merge or diverge to be isolated. If other merges or diverges are in close proximity, it typically impacts traffic conditions;

b. Departures from standard that potentially impact traffic conditions need to have traffic analysis documentation; and,

c. The local road network traffic conditions and those on the strategic road network could impact each other.

2.3 VISSIM analysis

2.3.1 Road traffic microsimulation models represent individual vehicles travelling within the road network, providing realistic driver behaviour such as lane changing and overtaking.

2.3.2 Most microsimulation software packages are capable of generating graphics with animated individual vehicles, providing excellent visual aid when presenting complex traffic phenomena. The software selected for the Lower Thames Crossing is VISSIM.

VISSIM model calibration

2.3.3 The Lower Thames Crossing VISSIM model has been developed using the same network coding method and parameters calibrated and validated in the A13 base VISSISM model.

2.3.4 The 9.15 Localised Traffic Modelling Appendix G - Traffic Operational Appraisal - VISSIM Local Model Validation Report (LMVR) details the calibration and validation process for the A13 base VISSIM model.

VISSIM network background

2.3.5 The VISSIM background drawings used to code the VISSIM model are the traffic signs and road markings series (Series 1200).

Traffic demand

2.3.6 The VISSIM model traffic demand come from the 2045 LTAM (version CS72) for the following time periods:

a. AM peak (07:00 to 08:00); and,

b. PM was (17:00 to 18:00).

2.3.7 The LTAM SATURN model LR_CS72_2045 contains 10 user classes, as listed in Table 2.1. VISSIM breaks down vehicles into vehicle types, differentiated by the vehicle size and dynamic characteristics as opposed to the user classes used in Saturn. Therefore the user classes in the LTAM were aggregated into the vehicle types (Car, LGV, HGV) in VISSIM.

2.3.8 The LTAM CS72 SATURN vehicle matrices have been profiled using the A13 base model 15 min intervals. The time periods modelled are:

a. AM Peak: 07:00 to 08:00 (with an additional 30 min modelling traffic pre-load and cool-down before and after); and,

b. PM Peak: 15:00 to 19:00 (with an additional 30 min modelling traffic pre-load and cool-down before and after).

2.3.9 The PM peak period in VISSIM was taken as four hours to replicate the dynamics of congestion observed in the A13 VISSIM base model (see 9.15 Localised Traffic Modelling Appendix G - Traffic Operational Appraisal - VISSIM Local Model Validation Report (LMVR)).

Table 2.1 LTAM User Classes

User Classes	
Car Employer's Business	UC 1
Car Commute Low Income	UC 2
Car Commute Medium Income	UC 3
Car Commute High Income	UC 4
Car Other Low Income	UC 5
Car Other Medium Income	UC 6
Car Other High Income	UC 7
LGV	UC 8
HGV	UC 9
HGV (Port only Freight - OGV2)	UC 10

Strategic modelling consistency

2.3.10 To remain consistent with both the A13 base model and with the CS72 SATURN strategic model, the following model inputs were retained:

a. **Vehicle types:** Taxis, buses, pedestrians and cyclists have not been included in the VISSIM model;

b. **Assignment:** Traffic has been uploaded in VISSIM using the dynamic assignment module. However, the network has been developed to be run using an "all or nothing" assignment type. The shortest physical path has been retained. This assignment ensures consistency with the SATURN assignment;

c. **Traffic demand:** LTAM SATURN final model, LR_CS72_2045, AM and PM models were cordoned to produce the VISSIM matrix. A matrix split and profiling was performed (as detailed in 9.15 Localised Traffic Modelling Appendix G - Traffic Operational Appraisal - VISSIM Local Model Validation Report (LMVR)), but no matrix adjustment was undertaken; and,

d. **Zoning system:** The zoning numbering system in VISSIM is the same as in the SATURN cordon model.

2.3.11 Further information regarding the calibration and validation of the base model is available in 9.15 Localised Traffic Modelling Appendix G - Traffic Operational Appraisal - VISSIM Local Model Validation Report (LMVR).

VISSIM model outputs

2.3.12 Traffic assignment verification was undertaken by checking key network locations against the LTAM SATURN actual flow reading.

2.3.13 In this report, traffic conditions are reported for:

a. AM peak – 07:00 to 08:00; and,

b. PM peak – 17:00 to 18:00 (representing the most congested traffic conditions out of the four hours modelled in the afternoon peak.).

3 Scheme development summary

3.1 Key assessment principles

3.1.1 For the network within the Project's order limits, the key principles for the operational traffic assessment during scheme development were:

a. To ensure free-flowing traffic conditions at the design year (2045);

b. To ensure safe traffic conditions:

   i. With an easily understandable road network for the driver; and,

   ii. With the avoidance of blocking back queues from the local road network.

c. To account for known blocking back queue events.

3.2 Traffic investigations during design development

3.2.1 As set out in documents 7.4 Project Design Report Part B [**Application Document** APP-507]; 6.1 Environmental Statement Chapter 2 Project Description [**Application Document** APP-140] and 6.1 Statement Chapter 3 Assessment of Reasonable Alternatives [**Application Document** APP-141], the design process is iterative, with interplay between the environmental and design disciplines. A core element of this iteration has been the use of traffic modelling to develop and test highways design solutions.

3.2.2 Table 3.1 sets out the work undertaken as part of the highway layout development from May 2017. It shows the progressive development of the design, with the key stages being:

a. The preparation of suitable road layouts for the mainline weaving segments on the A2/M2, A13 and M25;

b. The review of the main interchanges, in particular, the merge and diverge segments within the M25/A122 junction, A13/A1089/A122 junction and the A2/M2/A122 junction;

c. The review of local connections, such as the Gravesend East interchange, Brewers Road junction, Orsett Cock junction, the connections to the A1089 and M25 junction 29 circulatory; and,

d. A series of assessment updates due to updated traffic forecasts from the Project's transport model or highway design changes.

3.2.3 The findings of the modelling work led to modifications in the highways layout, which in turn resulted in some of the key changes being set out at Statutory Consultation and the subsequent non-statutory consultations, which are also highlighted in Table 3.1.

3.2.4 Plate 3.1 shows a summary of key constraints that required multiple design iterations due to the complexity of balancing the need for free-flowing traffic conditions, preventing blocking back queues and the constraints of the geometric design.

Plate 3.1 Scheme Development Key Constraints

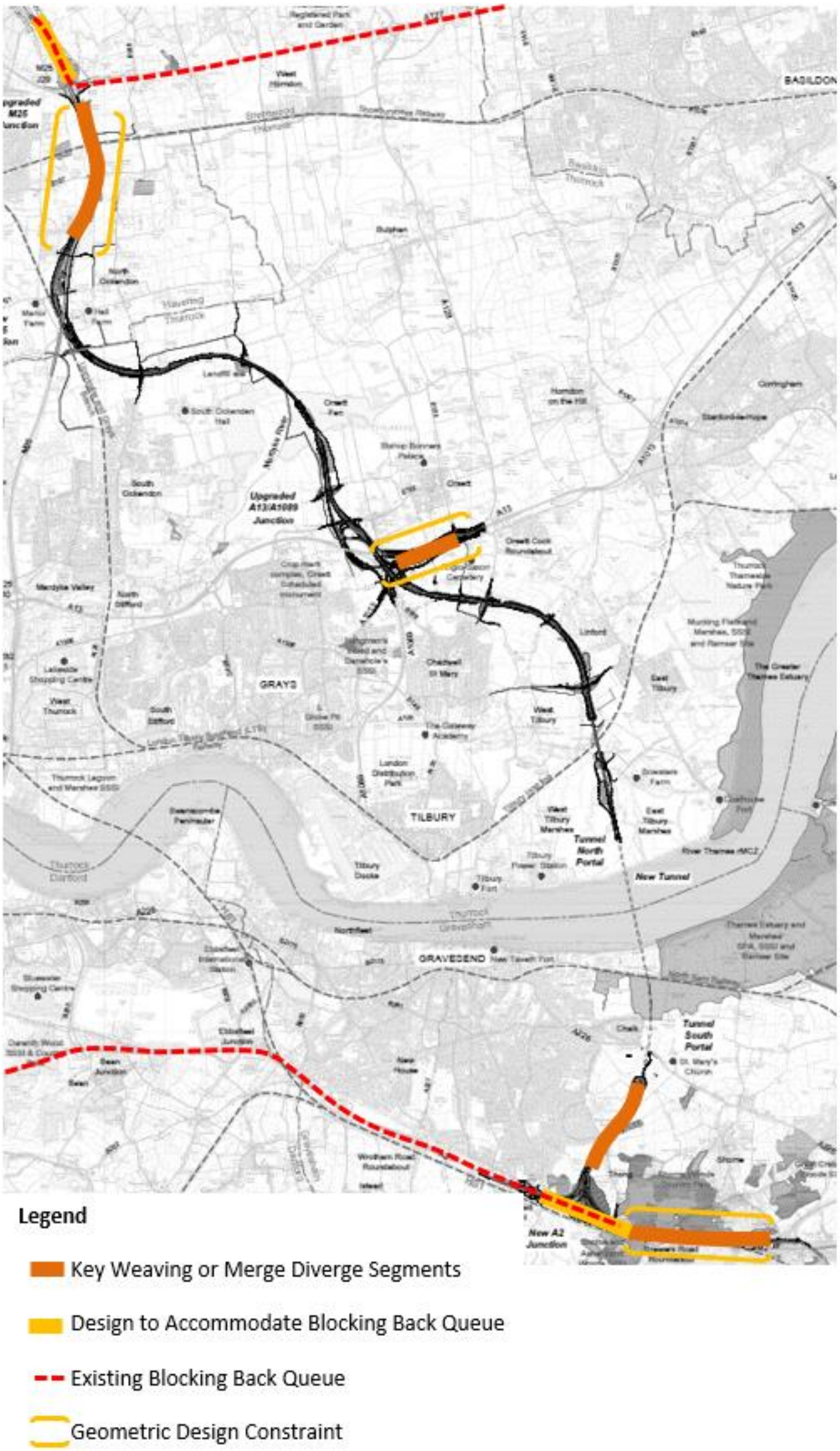


Table 3.1 Key Traffic Appraisal Assessments Undertaken

Assessment	Nature of assessment
2017 – 2018 – Design development between Preferred Route Announcement and Statutory Consultation	
1/ General corridor review	High-level review and preliminary capacity analysis
2/ A2 Gravesend east local road interchange	Capacity analysis using ARCADY, Excel, SATURN (R3 WSL (D3) D3 Min Cb)
3/ A13 Orsett Cock junction	Capacity analysis using ARCADY, Excel, SATURN (R3 WSL (D3) D3 Min Cb)
4/ A2/M2 weaving segments	Traffic weaving analysis using DMRB early assessments, VISSIM, SATURN (R3 WSL (D3) D3 Min Cb)
5/ A122 Southbound Exit diverge layout	Traffic Diverge Analysis using Excel, SATURN (R3 WSL (D3) D3 Min Cb), Highway Capacity Manual
6/ M25 junction 29 with the A127	Traffic weaving analysis using DMRB early assessments, VISSIM, SATURN (R3 WSL (D3) D3 Min Cb)
7/ A122 to A13 junction	Traffic weaving analysis using DMRB early assessments, VISSIM, SATURN (L2bC6v3_OptionC2sWSL_D3MinCb_2041)
8/ A2 Gravesend east local road interchange	Capacity analysis using DMRB early assessments, VISSIM, SATURN (L2bC6v3_OptionC2sWSL_D3MinCb_2041)
9/ A2/M2 weaving segments	Capacity analysis using DMRB early assessments, VISSIM, SATURN (L2bC6v3_OptionC2sWSL_D3MinCb_2041)
10/ M25 Junction 29 with the A127	Capacity analysis using DMRB early assessments, VISSIM, SATURN (R3 WSL (D3) D3 Min Cb)
11/ A122 cross-section between A13 and M25	Capacity analysis using DMRB early assessments, VISSIM, SATURN (LTCv3_CORE_DR2plusU1a_F2_VDM_B100)
12/ complete corridor review	Capacity analysis using DMRB early assessments, VISSIM, SATURN (LT_C3E_2041)
13/ complete corridor review	Capacity analysis using DMRB early assessments, VISSIM, SATURN (LT_C3J_2041)
14/ complete corridor review	Capacity analysis using DMRB early assessments, VISSIM, SATURN (LT_C8E_2041)
Design changes informed by modelling	• Increase of number of lanes from dual-2 lane to dual 3-lane carriageway • Changes to the A2 / M2 corridor, including the introduction of the connector roads • Changes to the configuration of the A2 / M2 / A122 junction • Changes to the configuration of the A13 A1089/A122 junction • Changes to the M25 junction and to M25 junction 29

Assessment	Nature of assessment
2018 – 2020 Design development between Statutory Consultation and Supplementary Consultation	
15/ A13 EB weaving	Traffic weaving analysis using DMRB early assessments, VISSIM, SATURN (LT_C8H_2026)
16/ ASDA roundabout	Capacity analysis using Excel early assessments, ARCADY, VISSIM, SATURN (LT_C8E_2026)
17/ Brewers Road	Capacity analysis using Excel early assessments, Picady, SATURN (LT_C9F_2041)
18/ Gravesend East junction	Capacity analysis using Excel early assessments, VISSIM, SATURN (LT_C9F_2041)
19/ A122 to A2 Interchange	Capacity analysis using DMRB early assessments, VISSIM, SATURN (LT_C9F_2041)
Design changes informed by modelling	• Further changes to the configuration of the A2 / M2 / A122 junction • Further changes to the configuration of the A13 A1089/A122 junction • Reduction in the number of lanes on the A122 from the M25 southbound to the A13 junction from three to two lanes
2020 – 2021 Design development between Supplementary Consultation and Community Impacts Consultation	
20/ Southbound tunnel exit	Capacity analysis using DMRB early assessments, VISSIM, SATURN (LT_C9F_2041)
21/ Orsett Cock junction	Capacity analysis using Excel, VISSIM, SATURN (LT_CS40_2044 and LR_CS67_2045)
22/ A13 link road weaving analysis	Capacity analysis and review of congestion risk using Excel, VISSIM, SATURN (LT_CS40_2044) and WebTris data
Design changes informed by modelling	• Additional capacity on one link of the A13/A1089/A122 junction
2020 – 2021 Design development between Supplementary Consultation and Community Impacts Consultation	
23/ Orsett Cock junction	Capacity analysis using Excel, VISSIM, SATURN
Design changes informed by modelling	• Further changes to the configuration of the A13 A1089/A122 junction

3.2.5 It should be noted that due to the iterative nature of the design development, and as is normal with the development of a project of this scale, many of the modelling assessments set out in this section were completed using design information that was superseded by subsequent changes, and traffic information that was superseded by updated forecasts.

4 Grade separated network traffic analysis

4.1 Background

4.1.1 The A122 corridor is a new all purpose trunk road. The constraints on the design were mostly located on the existing M25, A13 and A2/M2 corridors

4.2 Grade separated road network performance criteria

4.2.1 The analysis of traffic conditions detailed in 9.15 Localised Traffic Modelling Appendix G - Traffic Operational Appraisal - VISSIM Local Model Validation Report (LMVR) led to the selection of the following speed colour banding for traffic on the grade separated road network:

a. Grey = Insufficient traffic records;

b. Green >60 mph (free-flow traffic conditions);

c. Yellow = 60 to 45 mph (at capacity traffic conditions);

d. Red = 45 to 35 mph (saturated traffic conditions); and,

e. Dark Red < 35 mph (more saturated traffic conditions).

4.2.2 In VISSIM, the selection of the speed bands above means that on/off slips and the local road network appear yellow or red. This can be a reflection of low speeds due to geometric road constraints, such as a sharp turn, or the approach to a roundabout. When the local network is at capacity or saturated, remarks have been added to the figures.

4.3 2045 traffic conditions on the Project

4.3.1 Plate 4.1 to Plate 4.4 present the 2045 VISSIM speed profiles for the Project corridor. The key findings are:

a. The average travelling speed is forecast to always remain above 50mph, demonstrating free-flowing traffic conditions; and,

b. The variance between the minimum and maximum speed profiles is very narrow, indicating very consistent traffic conditions.

4.3.2 Overall, the Project corridor would be free-flowing in both the AM and PM peaks.

4.3.3 The analysis of traffic conditions of the A2/M2, A13 and M25 corridors are detailed in the following sections.

Plate 4.1 AM Peak Lower Thames Crossing SB Speed Profile, 2045

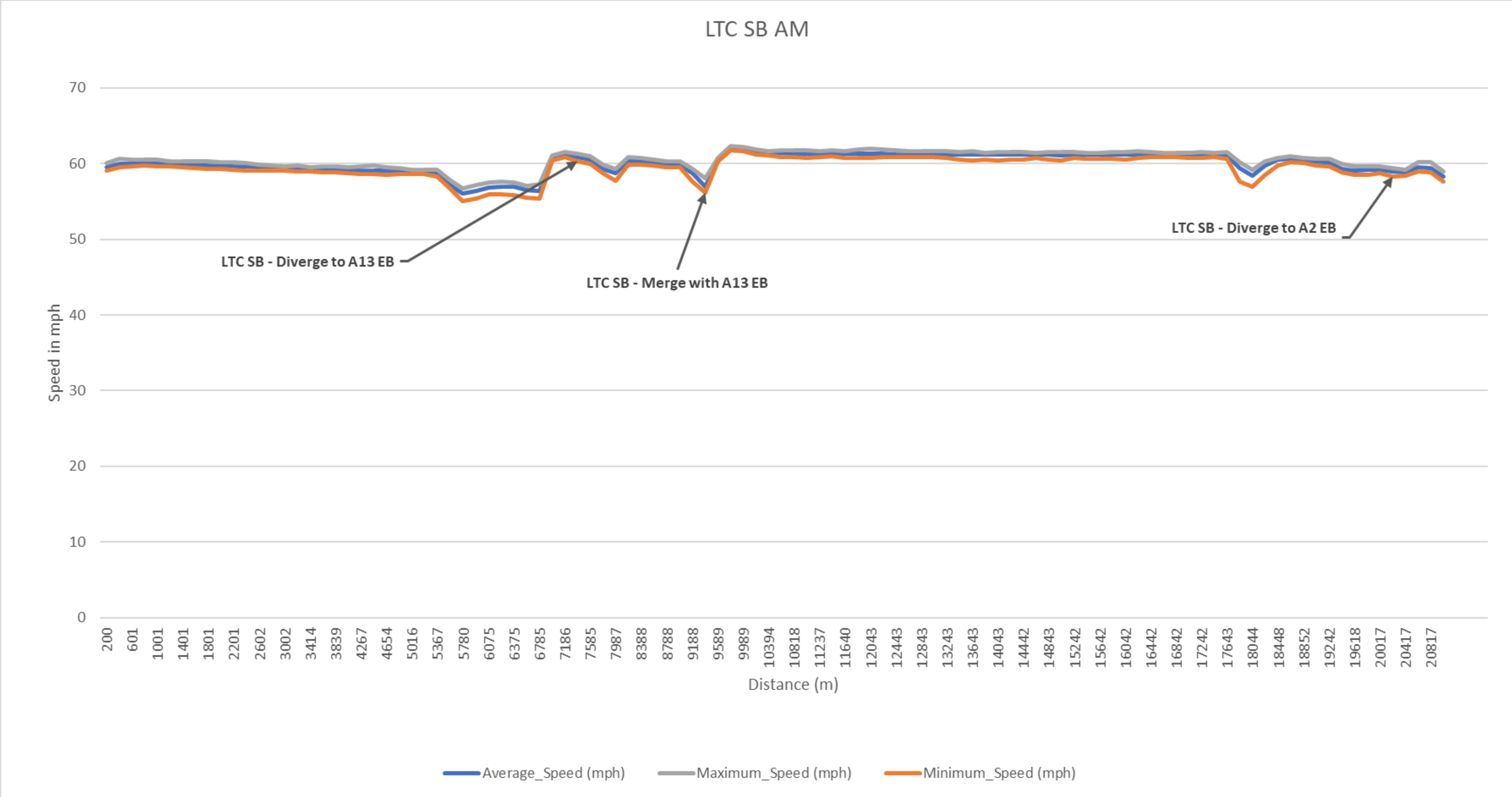


Plate 4.2 AM Peak Lower Thames Crossing NB Speed Profile, 2045

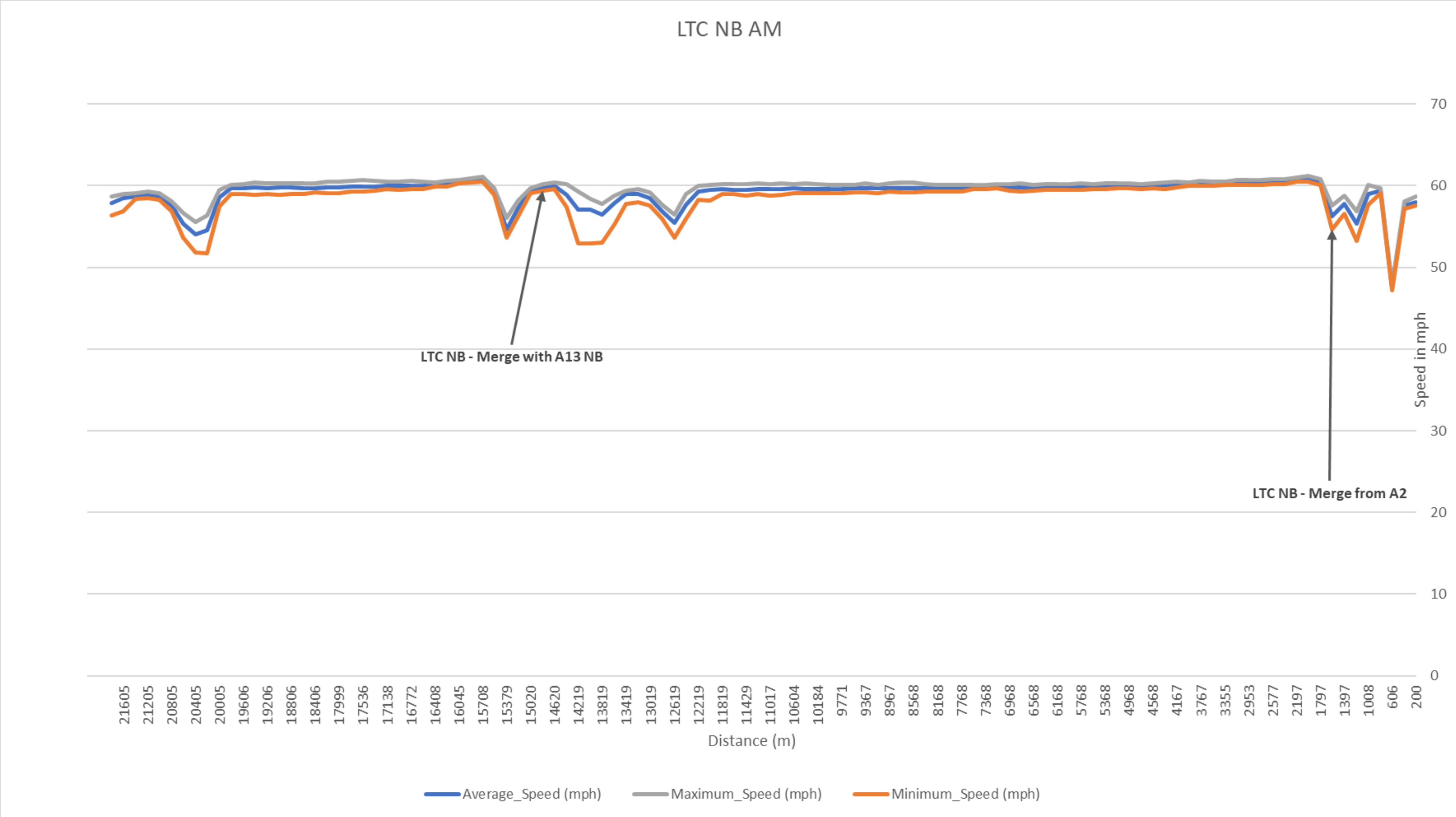


Plate 4.3 PM Peak Lower Thames Crossing SB Speed Profile,2045

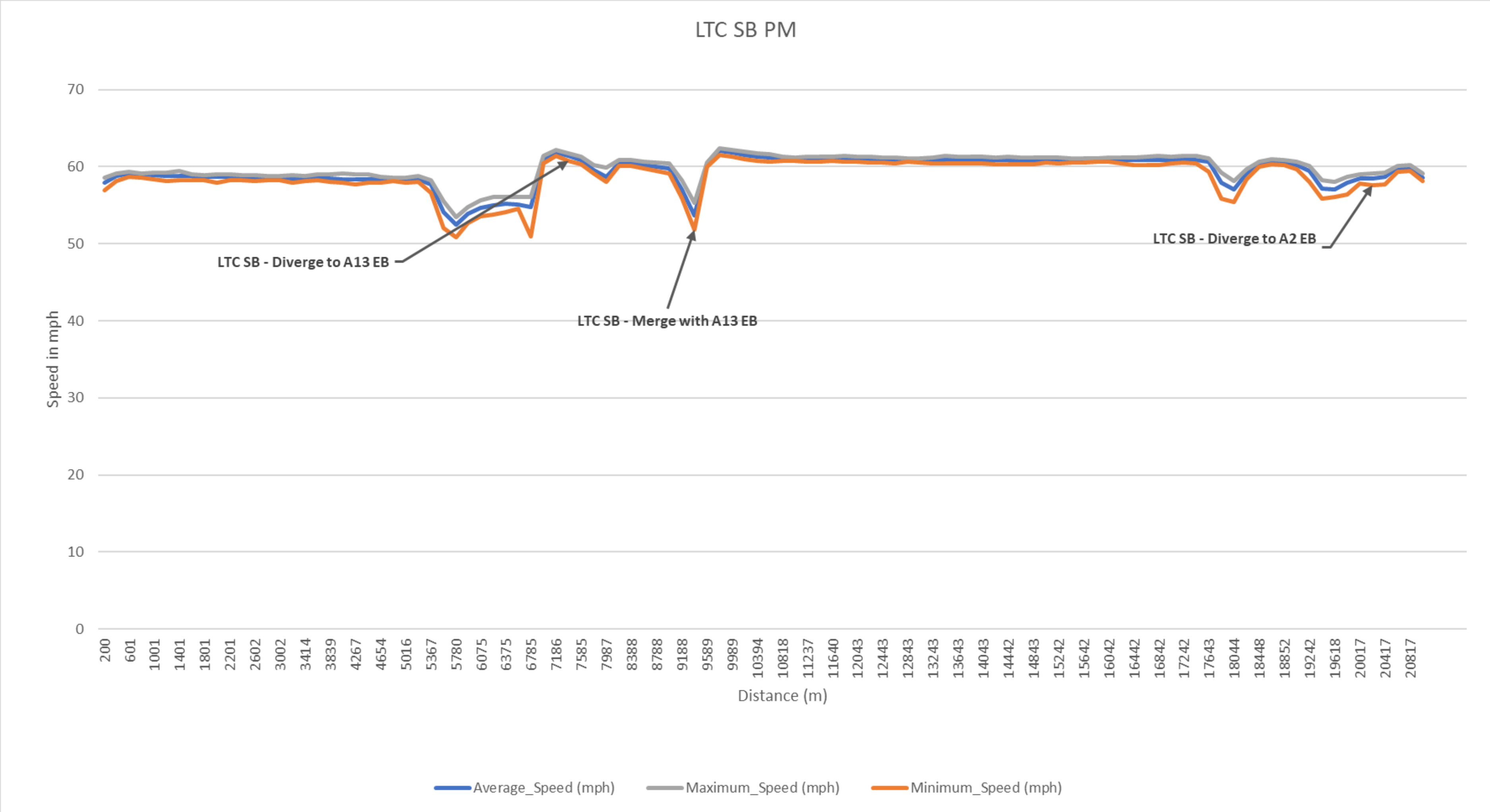
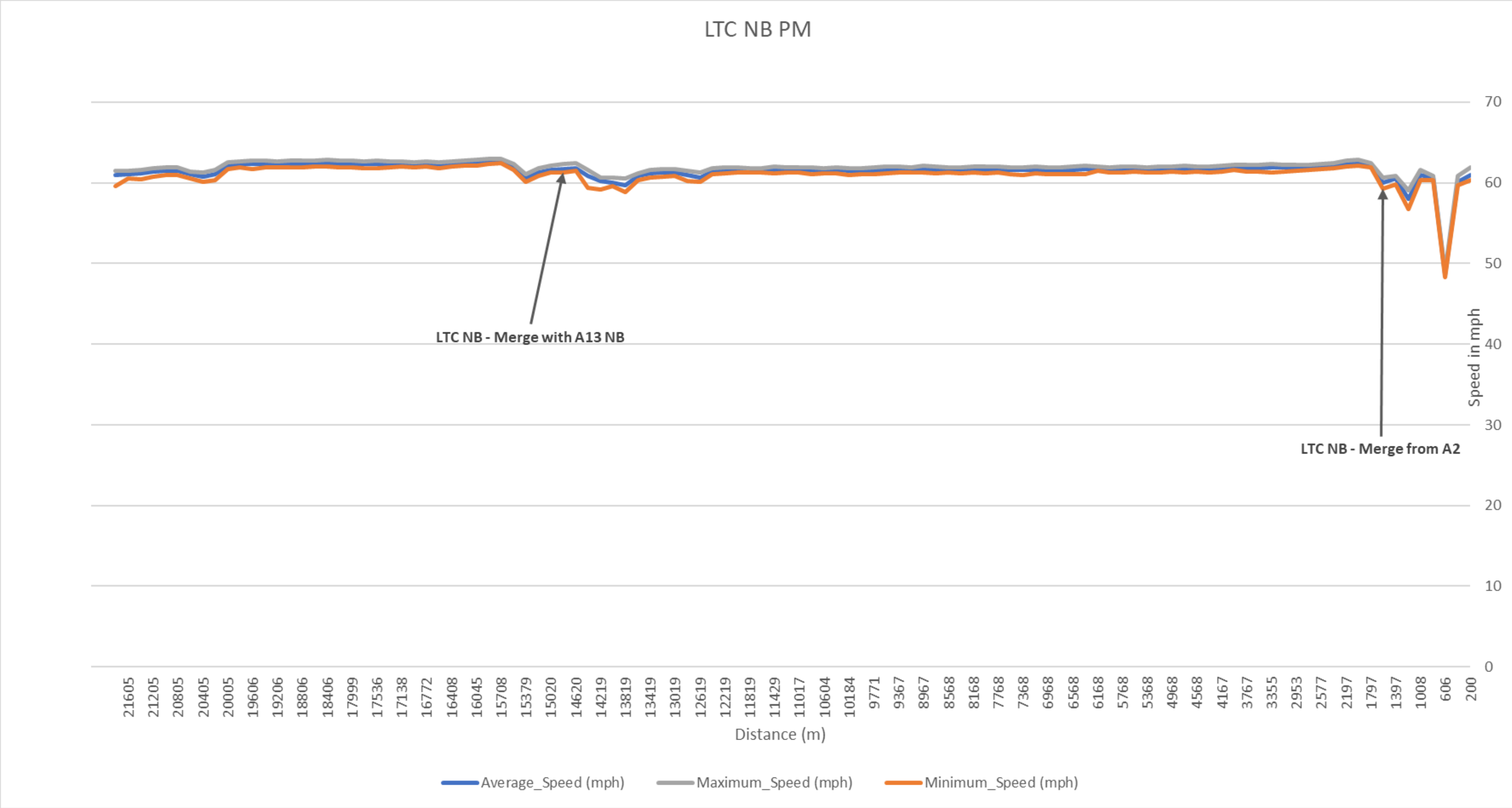


Plate 4.4 PM Peak Lower Thames Crossing Speed NB Profile, 2045



4.4 2045 traffic conditions on the A2/M2 corridor

4.4.1 Plate 4.5 to Plate 4.14 present traffic conditions on the A2/M2 corridor. The speed profiles correspond to hourly averages. The network speed colour codes correspond to the worst 15 minutes of the peak hour.

4.4.2 Overall, traffic conditions on the A2 are free-flowing, except for one merge westbound in the AM peak and two eastbound merges in the PM peak. One location relates to a known constraint with the merge design (see remarks 5 and 11).

4.4.3 The following remarks detail traffic conditions and key background information for each key location (see location indications on the plates below):

a. **Remark 1:** The westbound merge from the Gravesend Central interchange with the A2 in the AM peak is forecast to experience capacity issues. It is important to note that, in the existing situation, a queue on the A2 also blocks back into this merge segment;

b. **Remark 2:** The A122 merge with the A2 westbound in the AM peak is forecast to be free-flowing, with the two merge lanes having no adverse traffic conditions impact on one another;

c. **Remark 3:** The A2 merges with the A122 northbound and Valley Drive merge with the A122 northbound are forecast to be free-flowing in the AM peak. Nonetheless, these two close-by merge segments are reaching the upper limit of free-flow conditions. The distance to the tunnel portal entrance constrains the highway layout at this location;

d. **Remark 4:** The M2 merge with the A289 north-eastbound is forecast to experience capacity issues in the AM peak.;

e. **Remark 5:** The A289 merge with the M2 east-southbound is forecast to experience capacity issues in the AM peak. This merge existing constraints due to the existing bridge structure.

f. **Remark 6:** In contrast to remark 1, the PM peak westbound merge at the Gravesend Central interchange with the A2 is forecast to be free-flowing;

g. **Remark 7:** Similar to remark 2, the A122 merge with the A2 westbound in the PM peak is forecast to be free-flowing;

h. **Remark 8:** The PM peak eastbound merge of the Gravesend Central Interchange with the A2 is forecast to experience capacity issues. This location would experience similar congestion issues without the Project;

i. **Remark 9:** The A2 merges with the A122 northbound and the Valley Drive merge with the A122 northbound are forecast to be free-flowing in the PM peak.

j. **Remark 10:** Similar to remark 4, the M2 merge with the A289 north-eastbound is forecast to experience capacity issues in the PM peak.; and,

k. **Remark 11:** Similar to remark 5, the A289 merge with the M2 east-southbound is forecast to experience capacity issues in the PM peak. This merge geometry has a constraint due to the existing bridge structure.

Plate 4.5 AM Peak A2-M2 WB Speed Profile, 2045

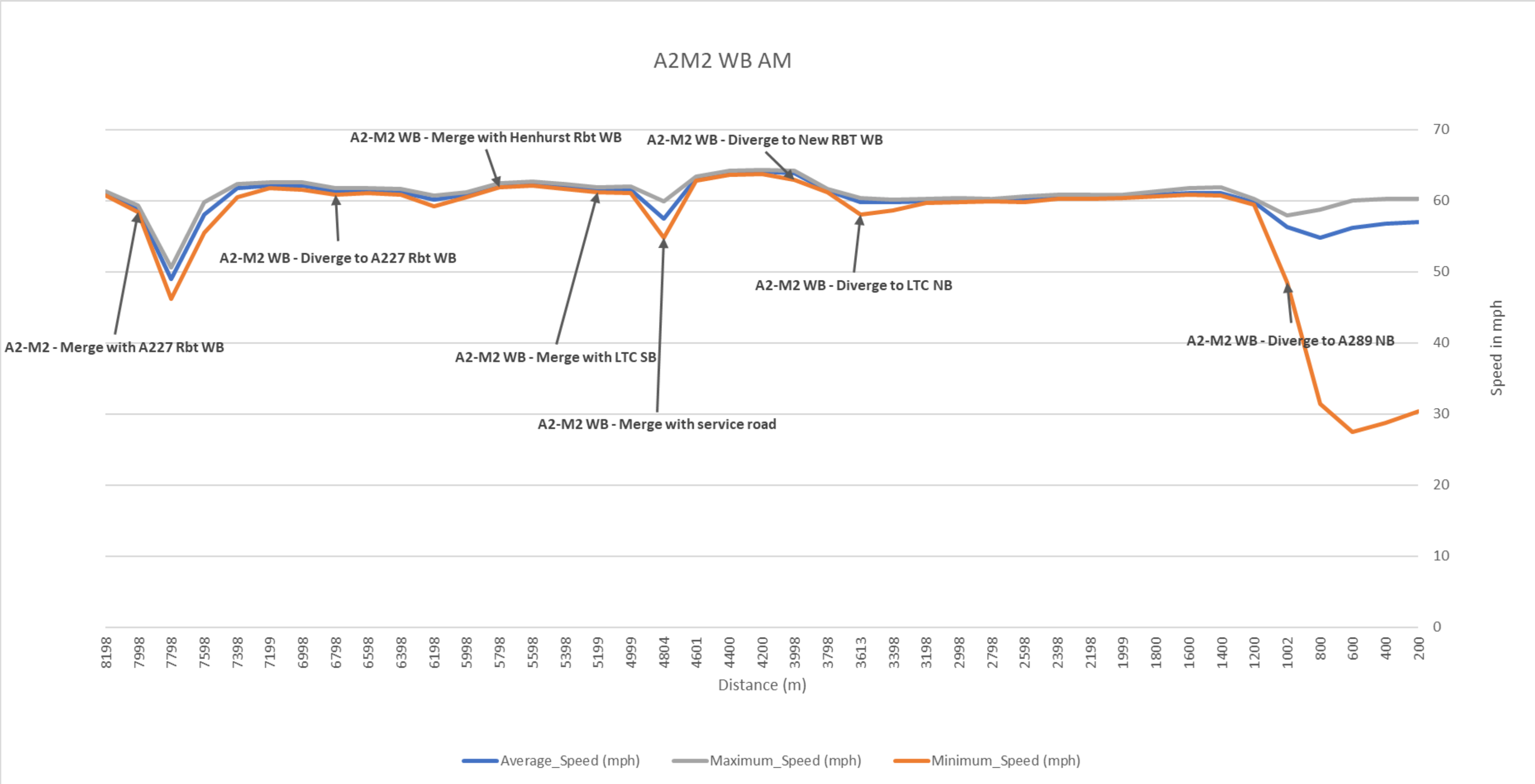


Plate 4.6 AM Peak A2-M2 EB Speed Profile, 2045

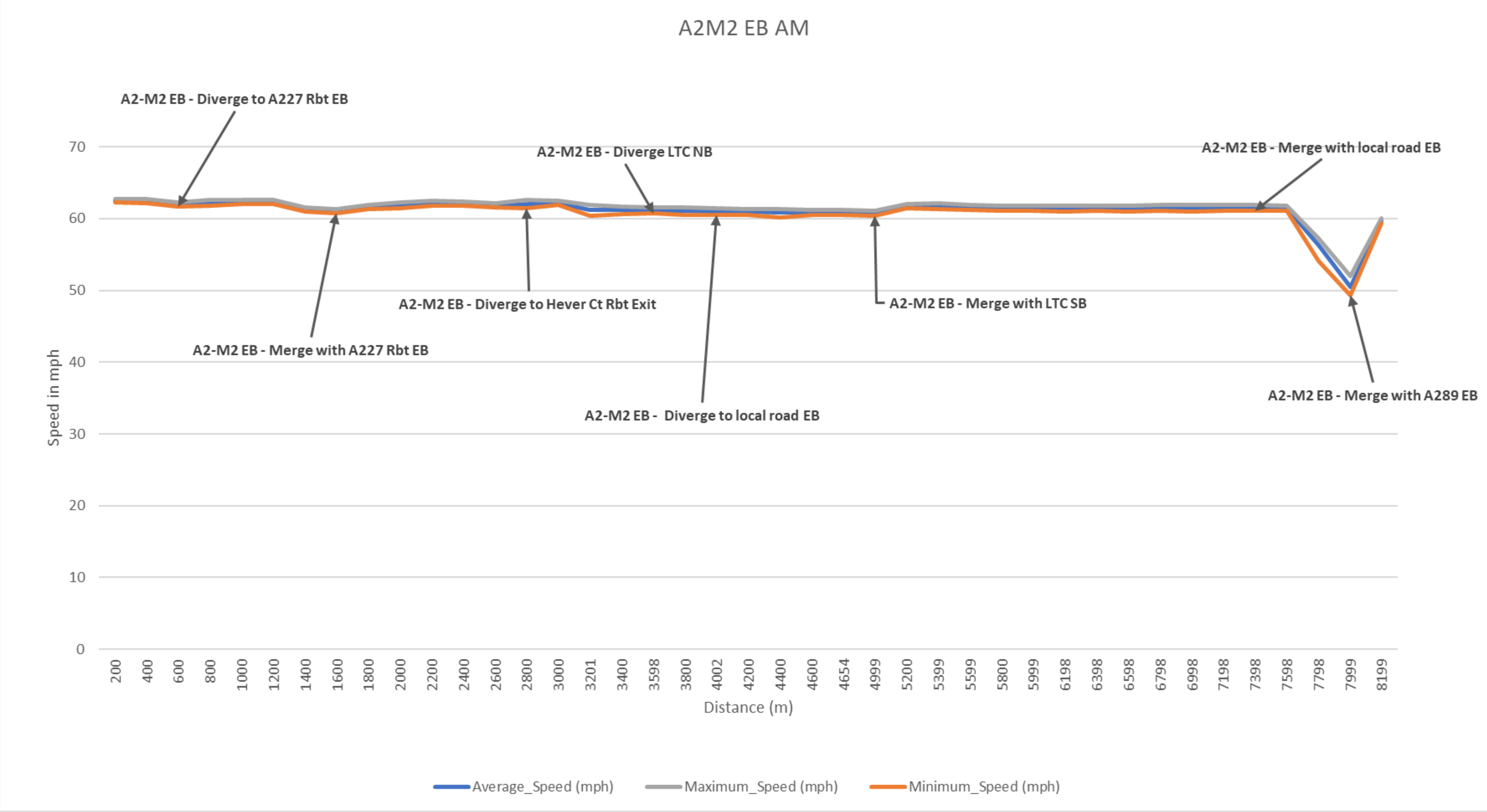


Plate 4.7 AM Peak A2 Speed Plots (West Section), 2045

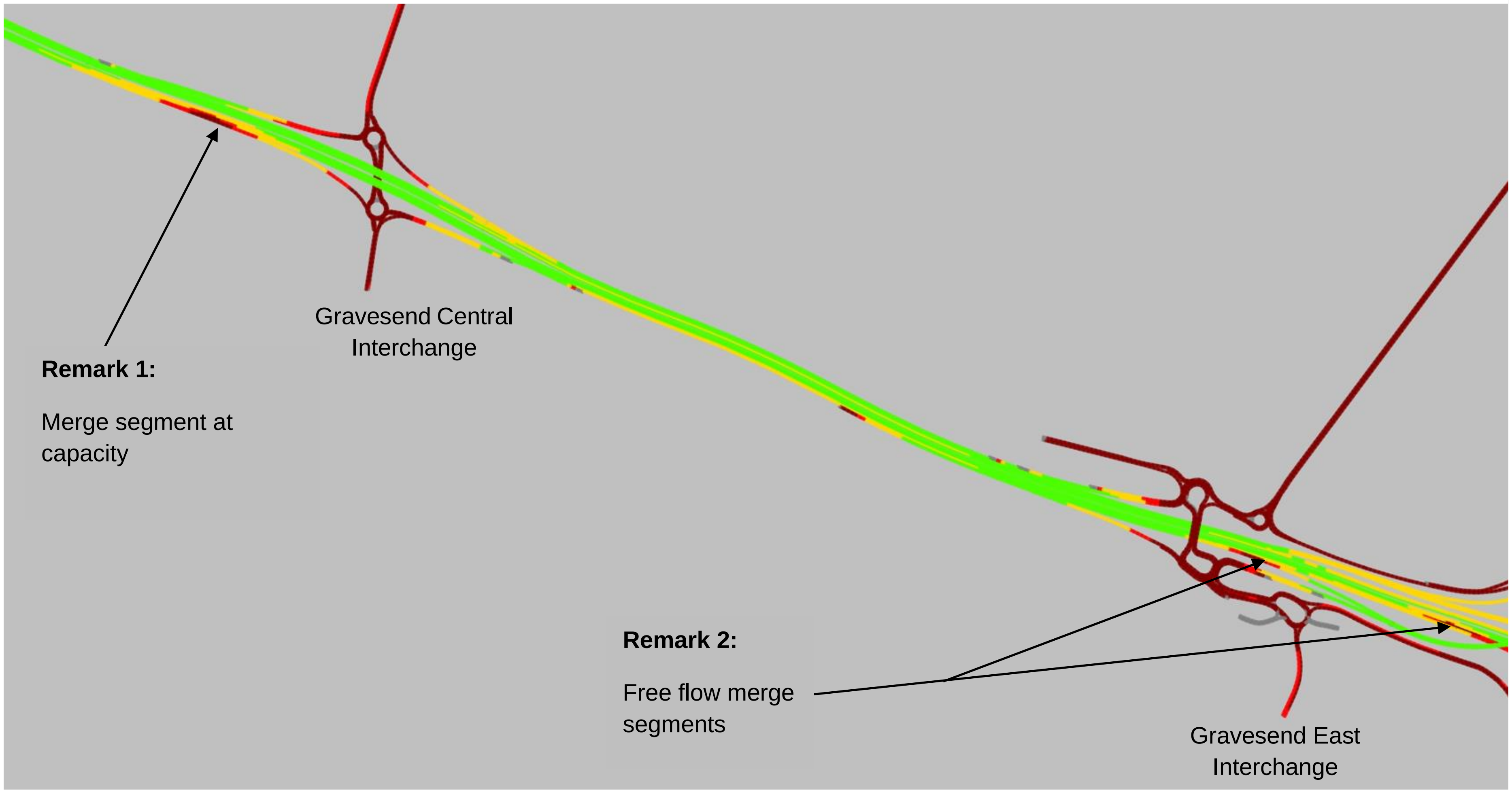


Plate 4.8 AM Peak A2 Speed Plots (Central Section), 2045

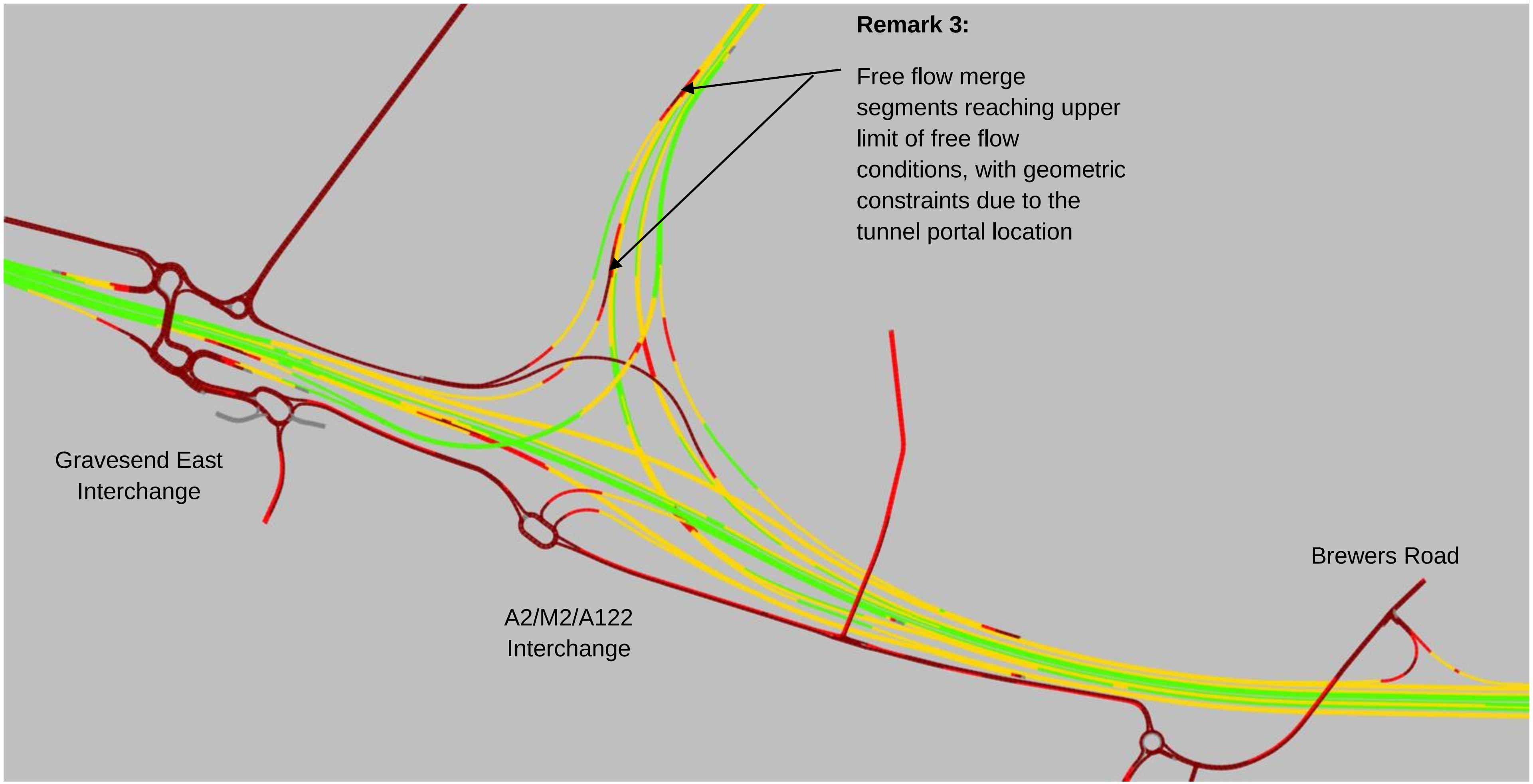


Plate 4.9 AM Peak A2 Speed Plots (East Section), 2045

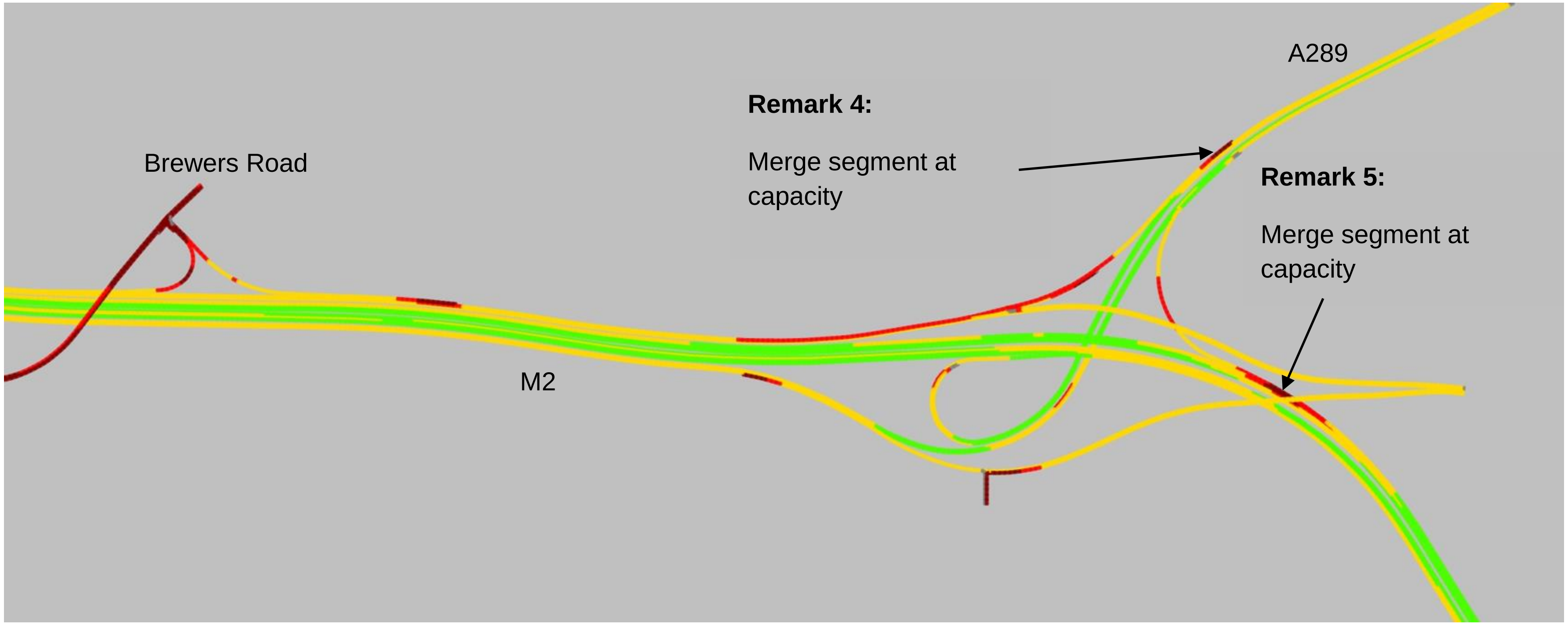


Plate 4.10 PM Peak A2-M2 Speed WB Profile, 2045

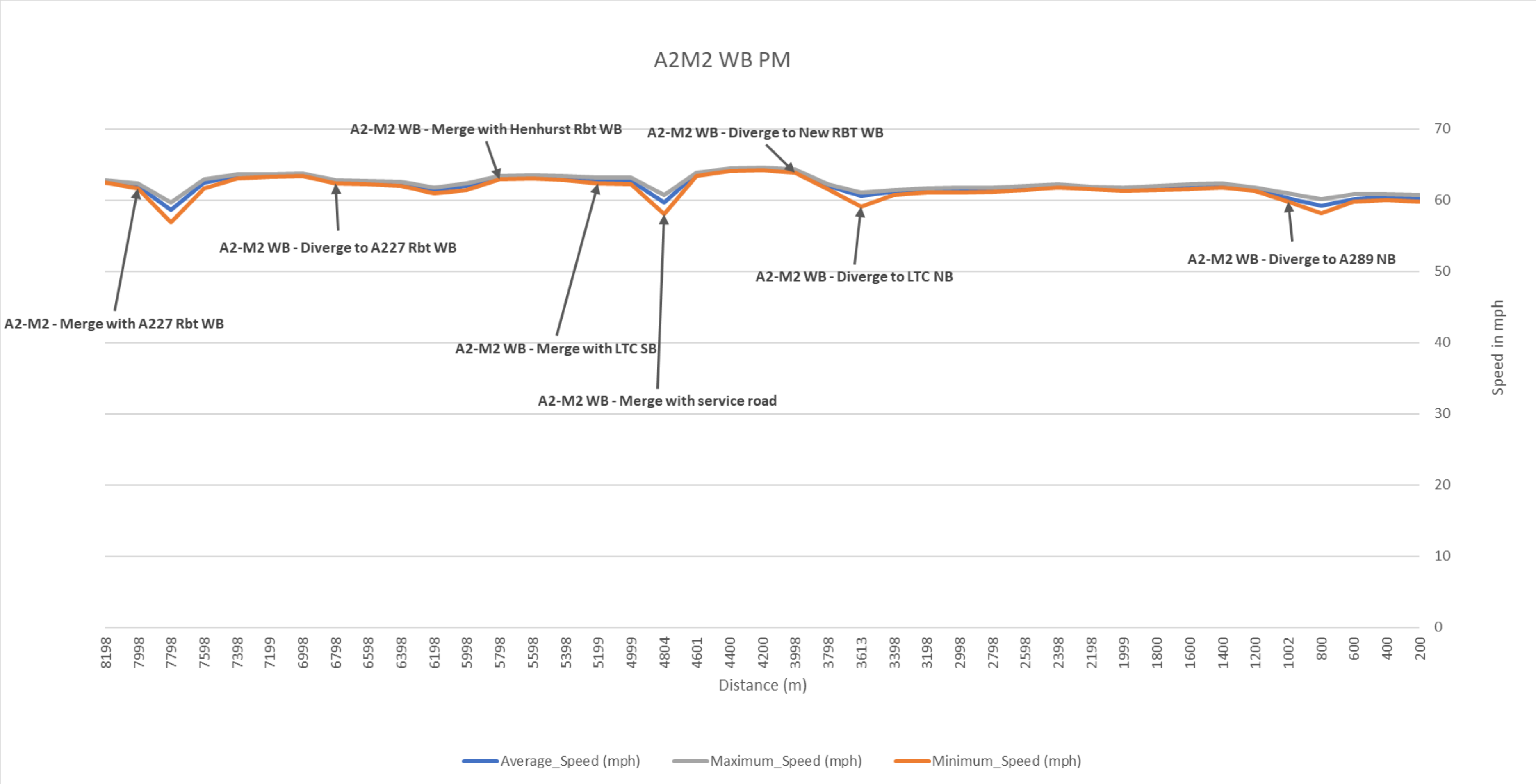


Plate 4.11 PM Peak A2-M2 EB Speed Profile, 2045

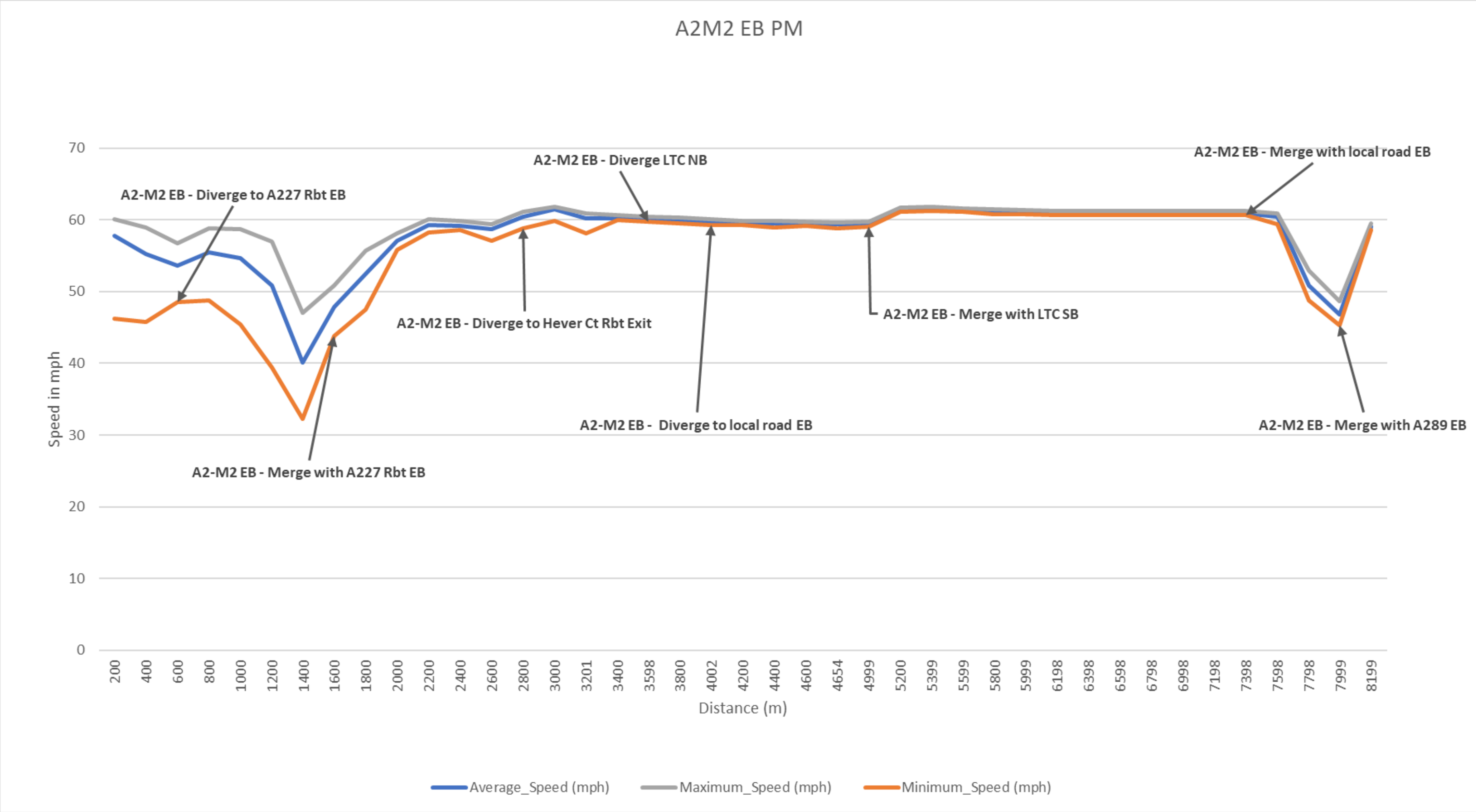


Plate 4.12 PM Peak A2 Speed Plots (West Section), 2045

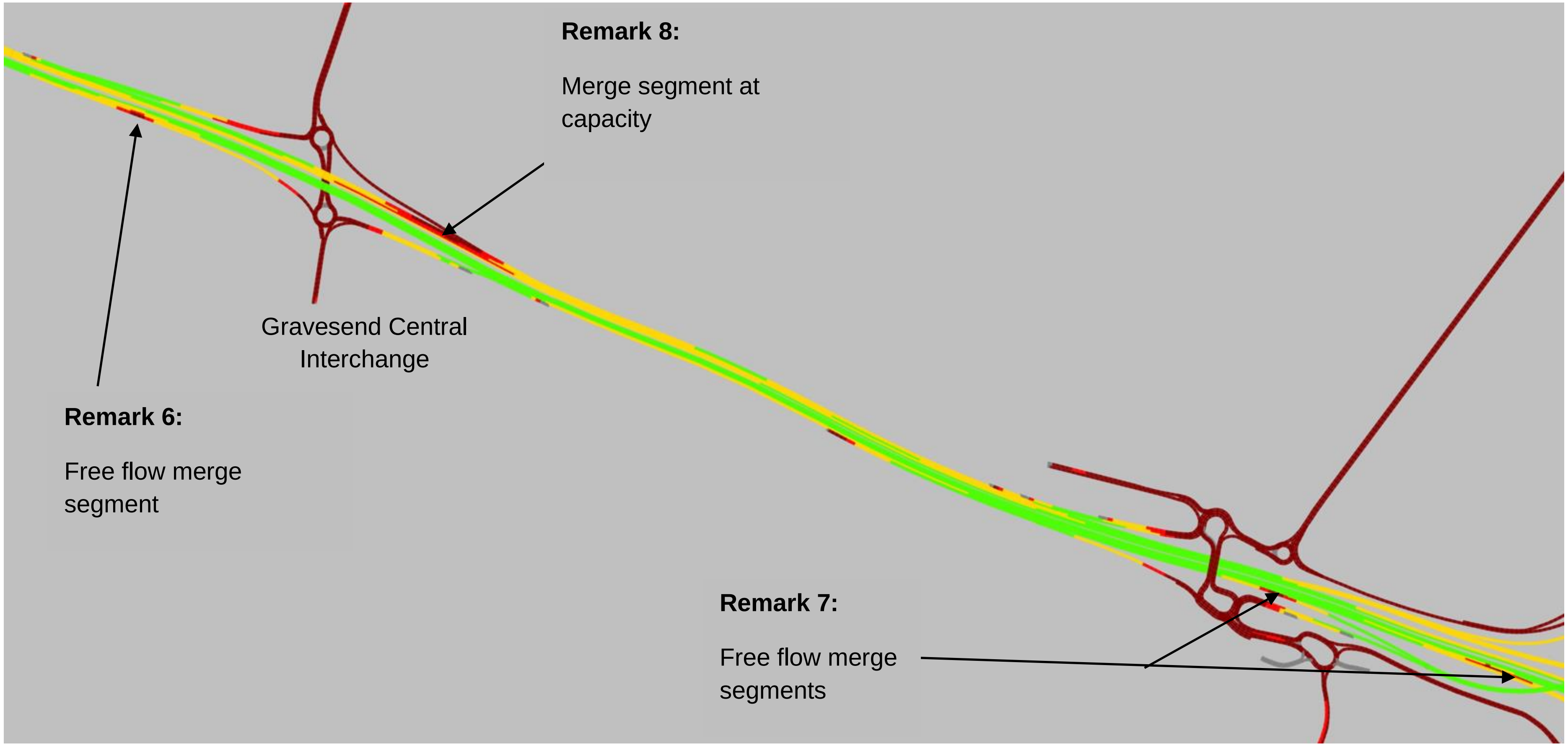


Plate 4.13 PM Peak A2 Speed Plots (Central Section), 2045

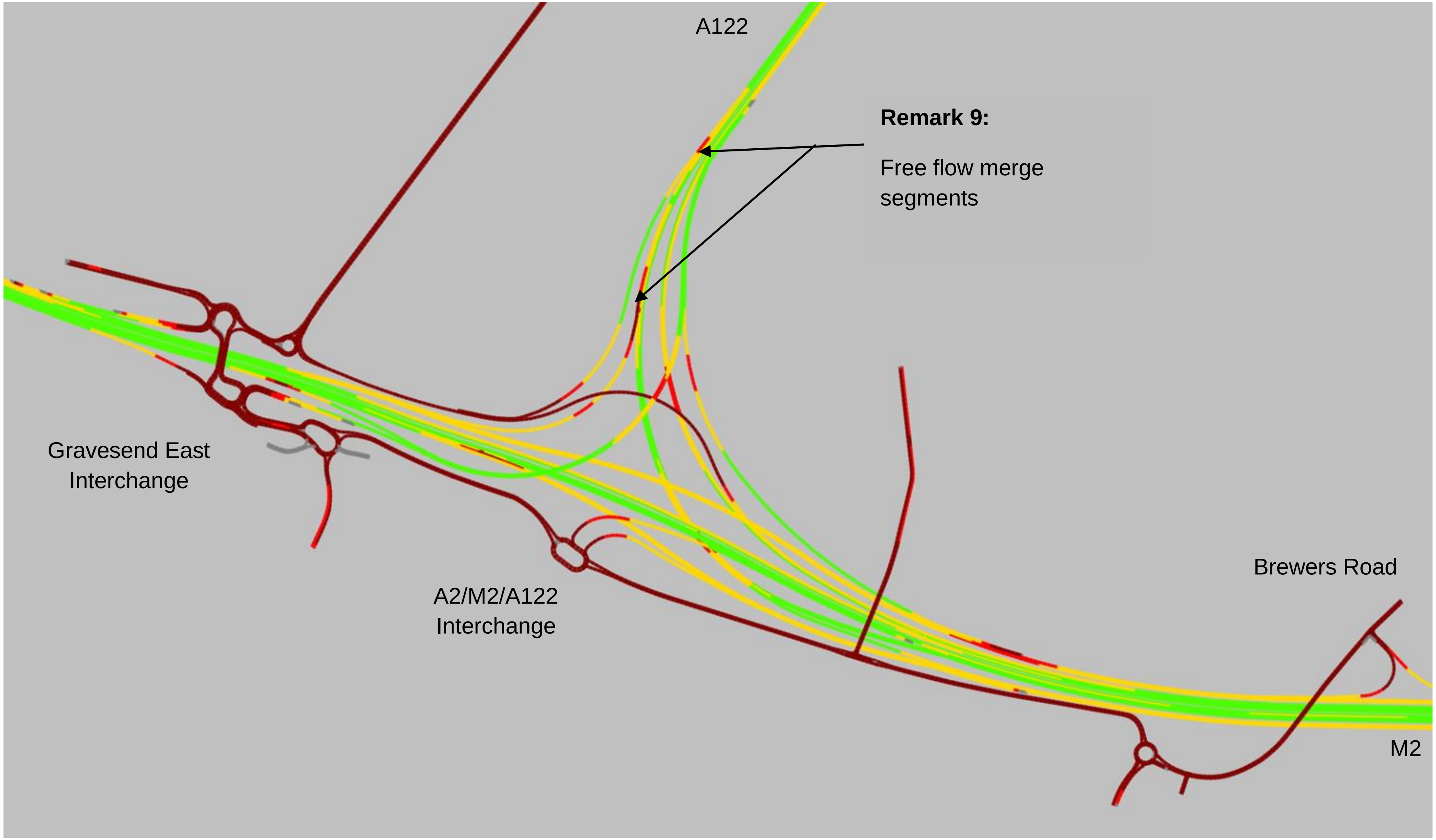
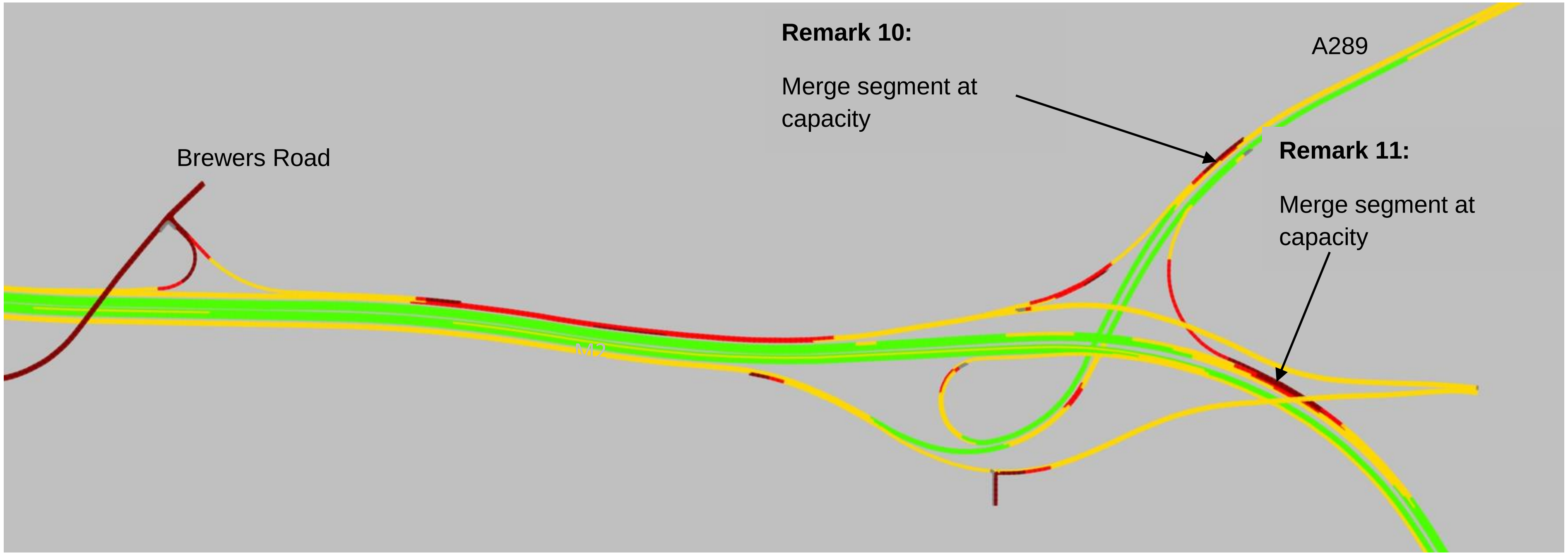


Plate 4.14 AM Peak A2 Speed Plots (East Section), 2045



4.5 2045 traffic conditions on the A13 corridor

4.5.1 Plate 4.15 to Plate 4.24 present the speed profiles and network speed colour codes for the A13 corridor.

4.5.2 Overall, traffic conditions on the A13 are free-flowing west of the Orsett Cock junction. The A13 network to the east of the Orsett Cock juncton, however, is forecast to experience capacity issues.

4.5.3 The following remarks detail traffic conditions and key background information for each key location (see location indications on figures below):

a. **Remark 12:** The merge segment from the Orsett Cock junction with the A13 eastbound occasionally experiences capacity issues in the AM peak. Traffic conditions are unstable but the development of congestion that would interact with the upstream merge with the Project was not observed.

   This location is a source of congestion in the existing situation, the widening of the A13 from two lanes each direction to three lanes each direction has a positive impact on traffic conditions;

b. **Remark 13:** The A13 diverge segment towards the Project westbound is forecast to occasionally experience capacity issues. This is the result of constraints at the Orsett Cock junction.

c. **Remark 14:** The A13 eastbound merge at the Manorway Interchange is forecast to occasionally be experiencing capacity issues in the AM peak.;

d. **Remark 15:** The A13 westbound merge at the Manorway Interchange is forecast to be saturated in the AM peak in 2045. Congestion leads to delays on the A13 mainline.

e. **Remark 16:** In common with remark 12, the merge segment from the Orsett Cock junction with the A13 eastbound is forecast to be occasionally experience capacity issues in the PM peak. Traffic conditions are unstable but the development of congestion that would interact significantly with the upstream merge with the Project was not observed; and,

f. **Remark 17 & 18:** In the PM peak, merge segments on the A13 at the Manorway Interchange are forecast to be free-flowing in both directions.

Plate 4.15 AM Peak A13 WB Speed Profile, 2045

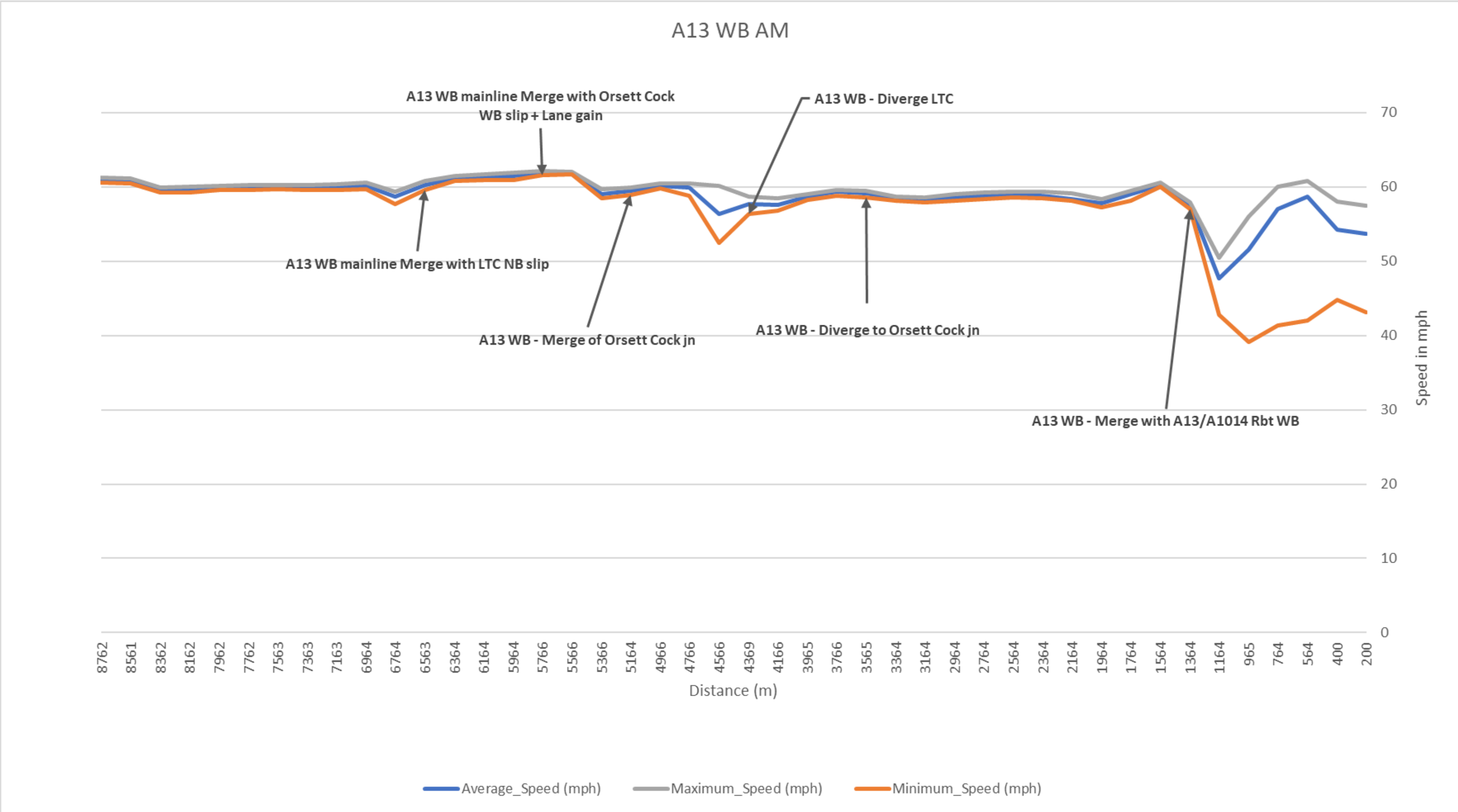


Plate 4.16 AM Peak A13 EB Speed Profile, 2045

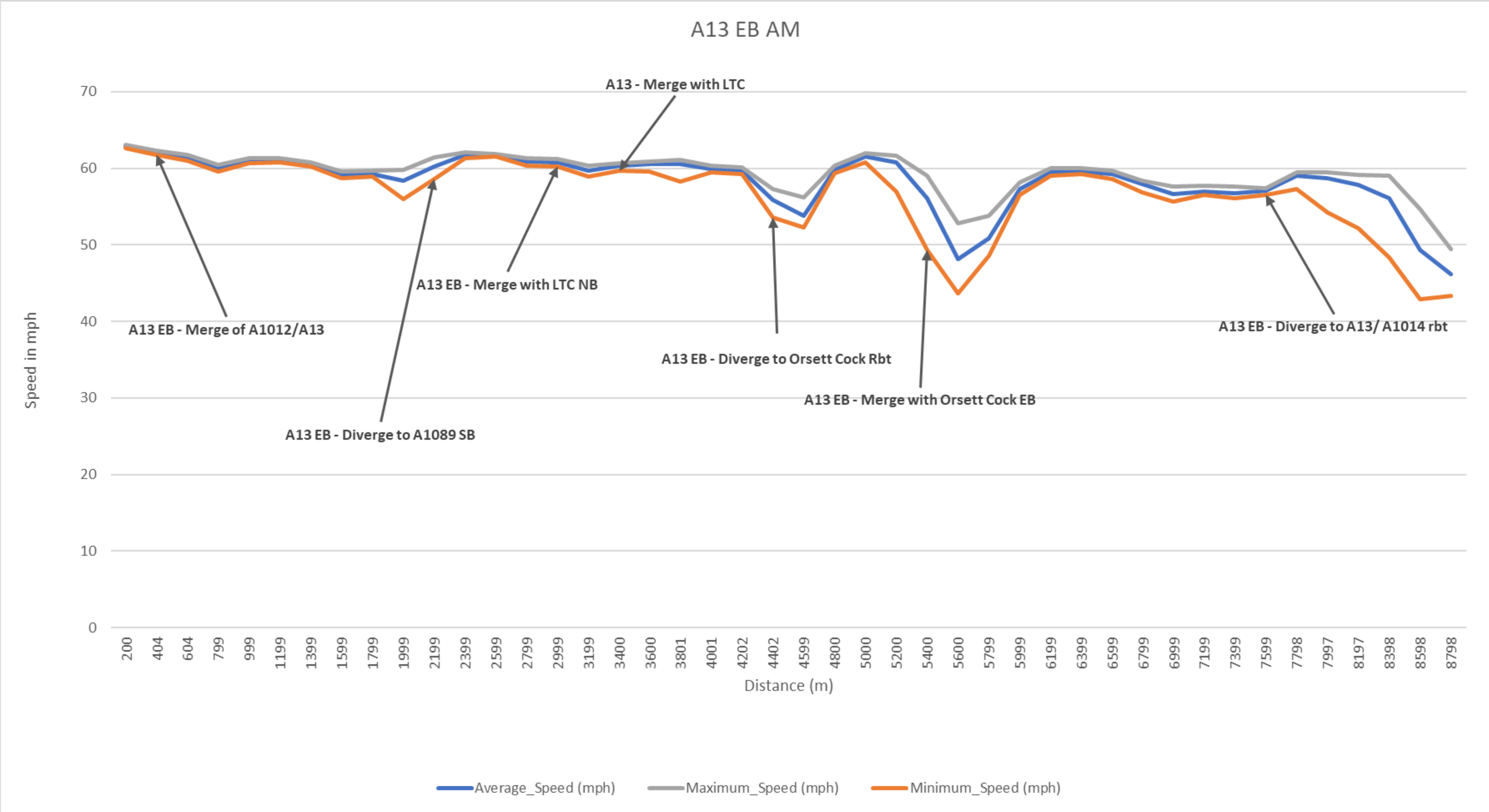


Plate 4.17 AM Peak A13 Speed Plots (West Section), 2045

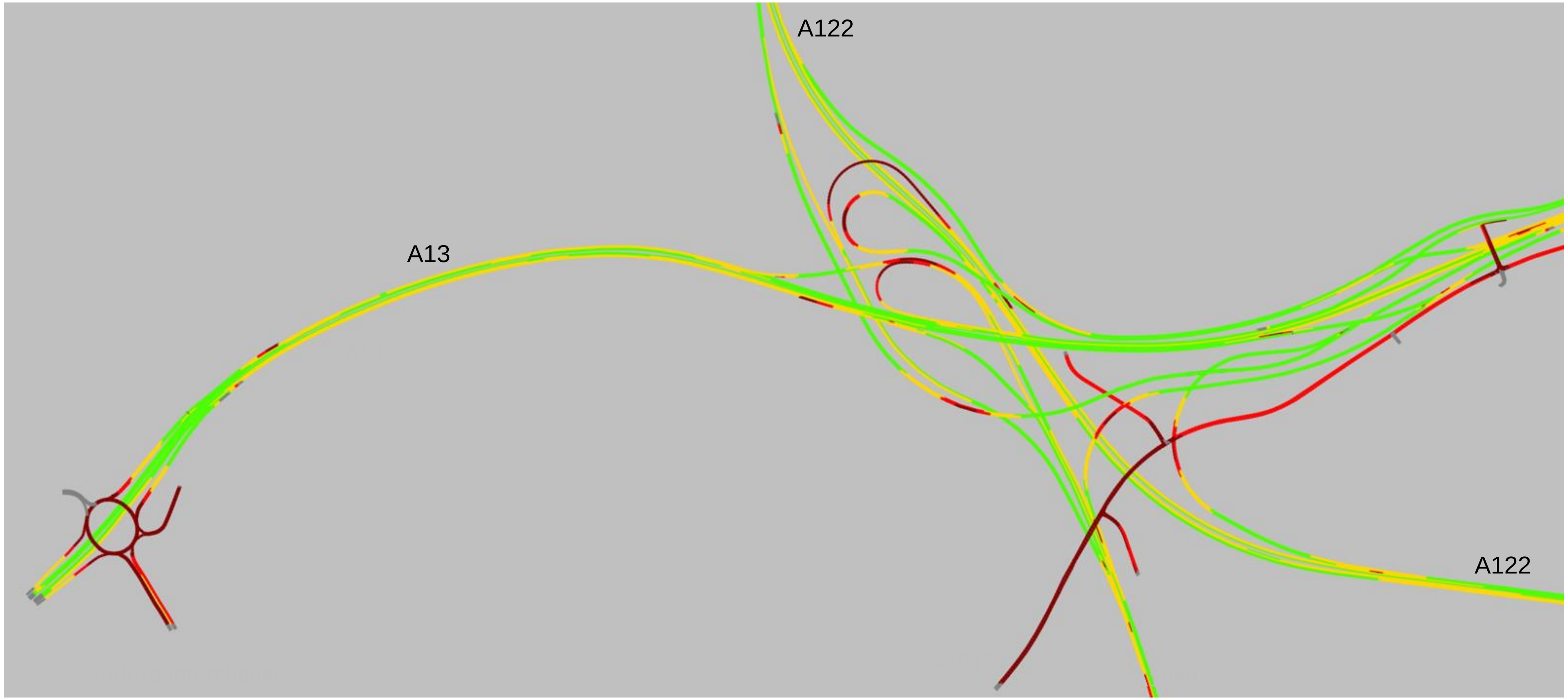


Plate 4.18 AM Peak A13 Speed Plots (Central Section), 2045

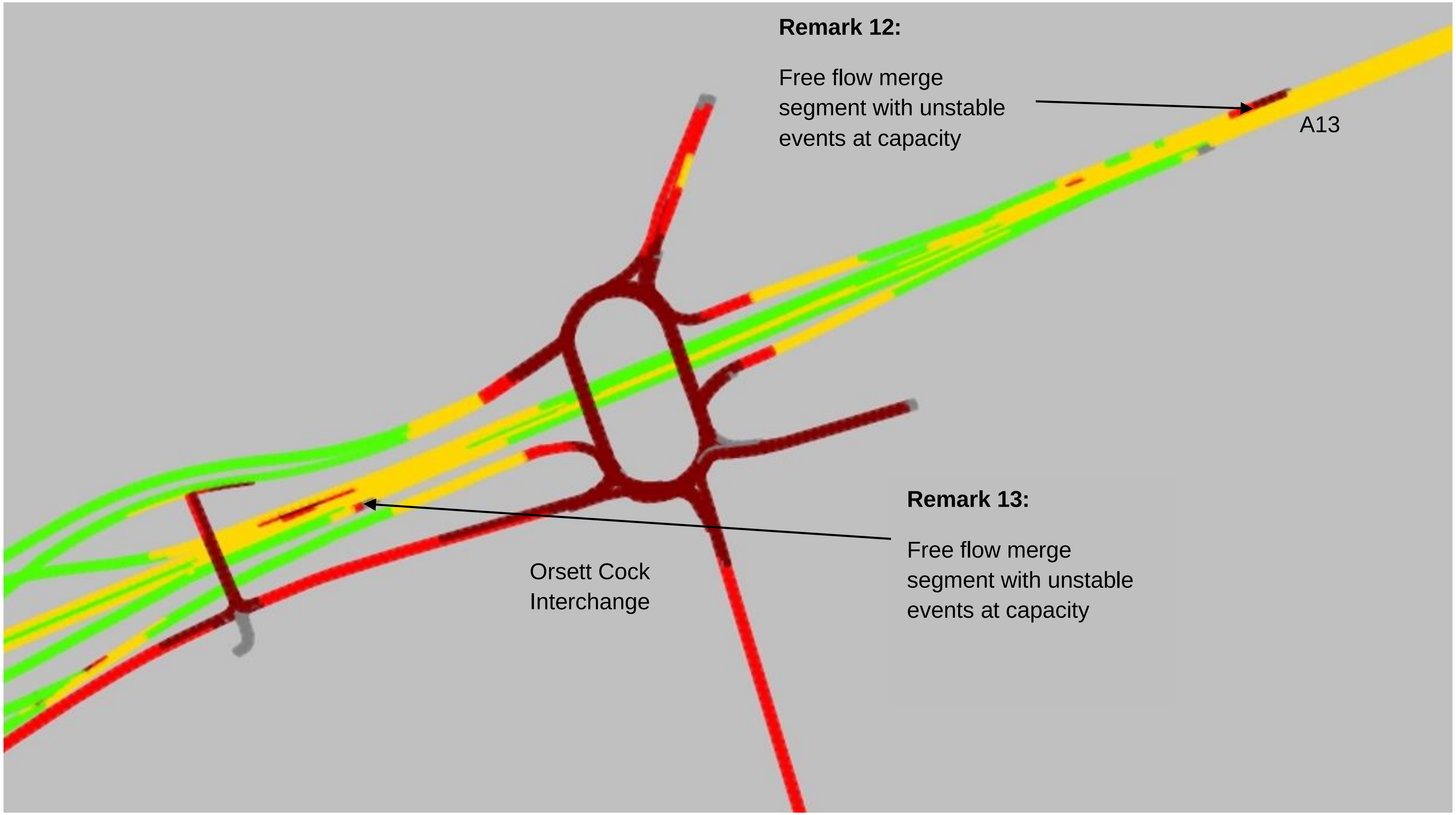


Plate 4.19 AM Peak A13 Speed Plots (East Section), 2045

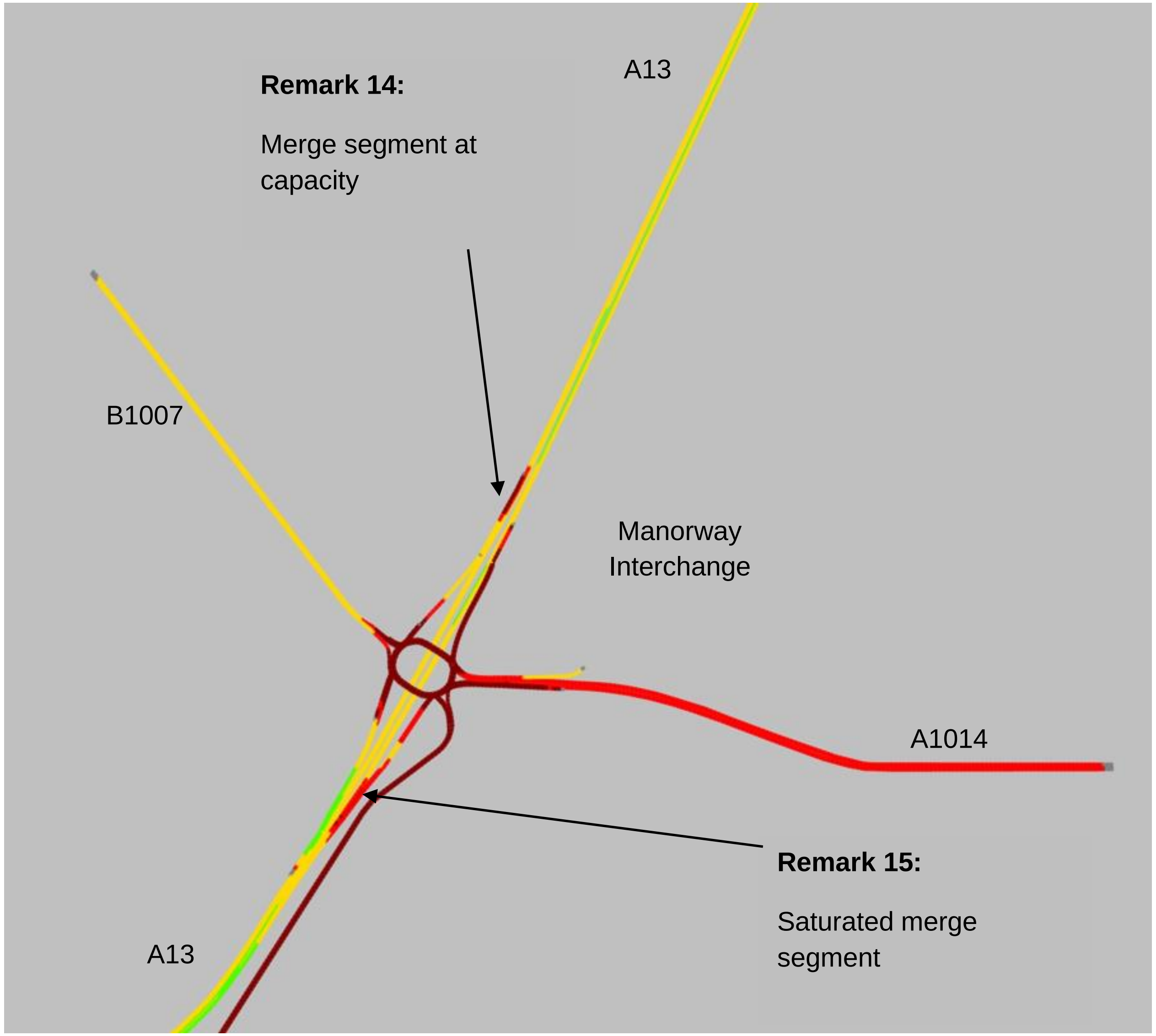


Plate 4.20 PM Peak A13 Speed WB Profile, 2045

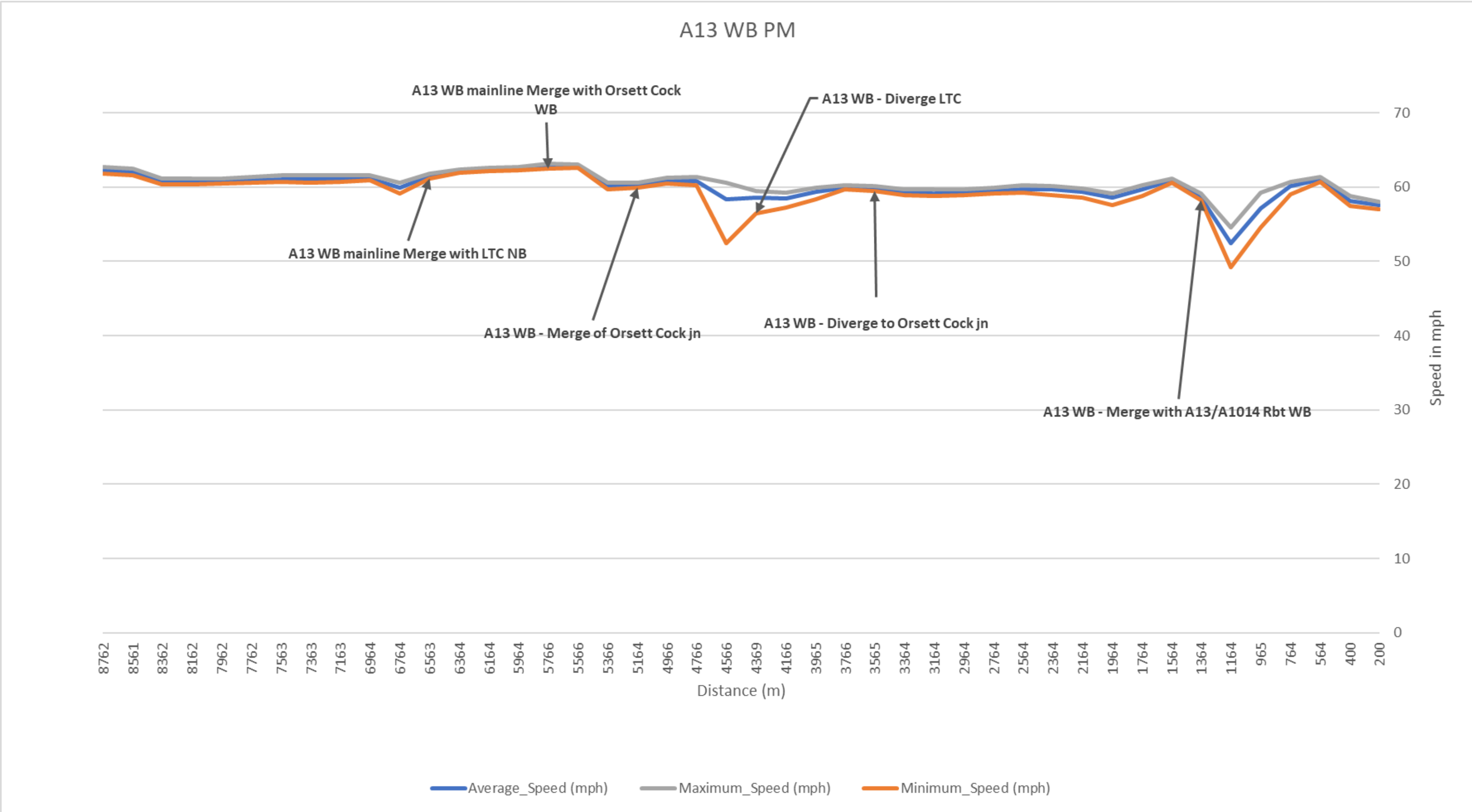


Plate 4.21 PM Peak A13 Speed EB Profile, 2045

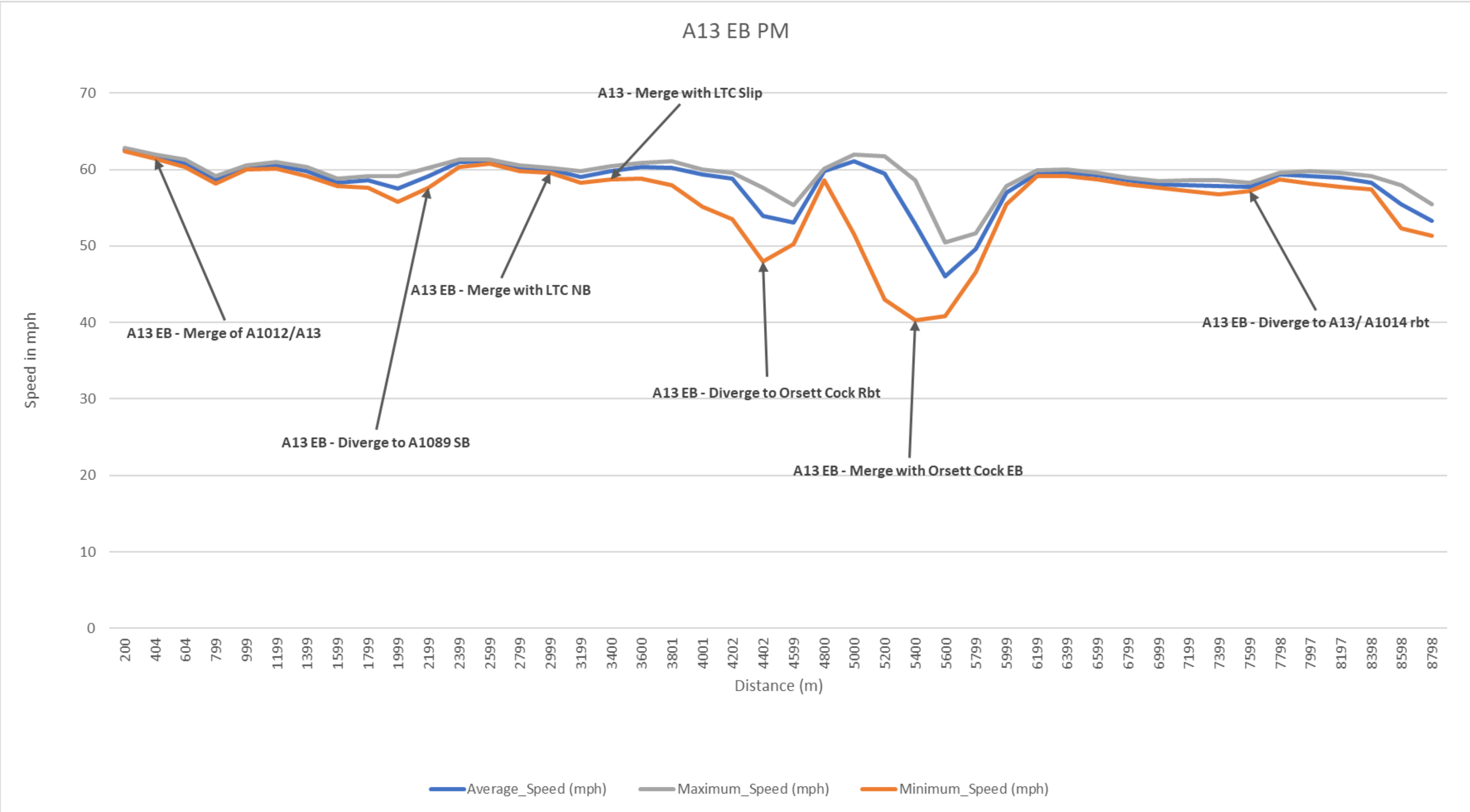


Plate 4.22 PM Peak A13 Speed Plots (West Section), 2045

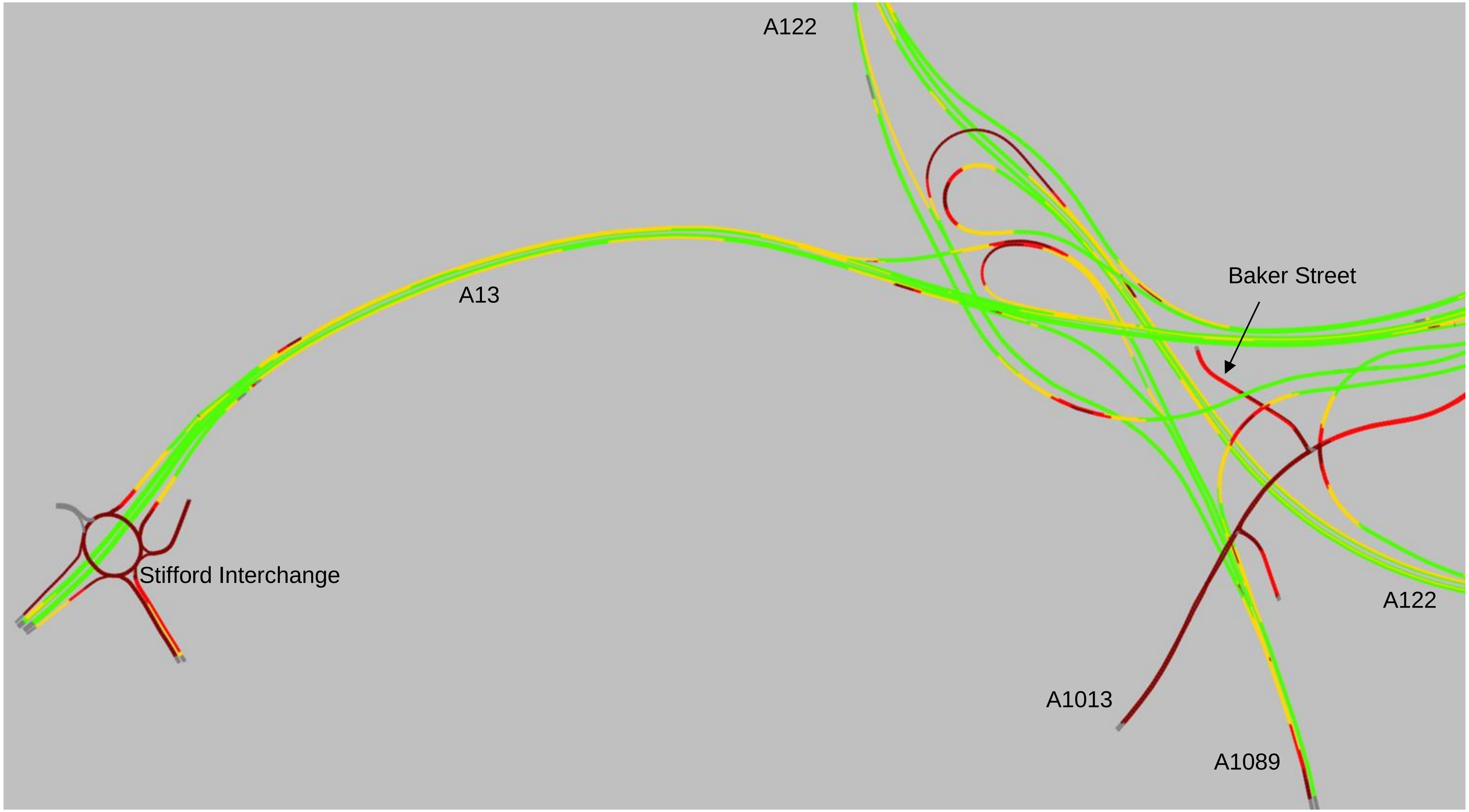


Plate 4.23 PM Peak A13 Speed Plots (Central Section), 2045

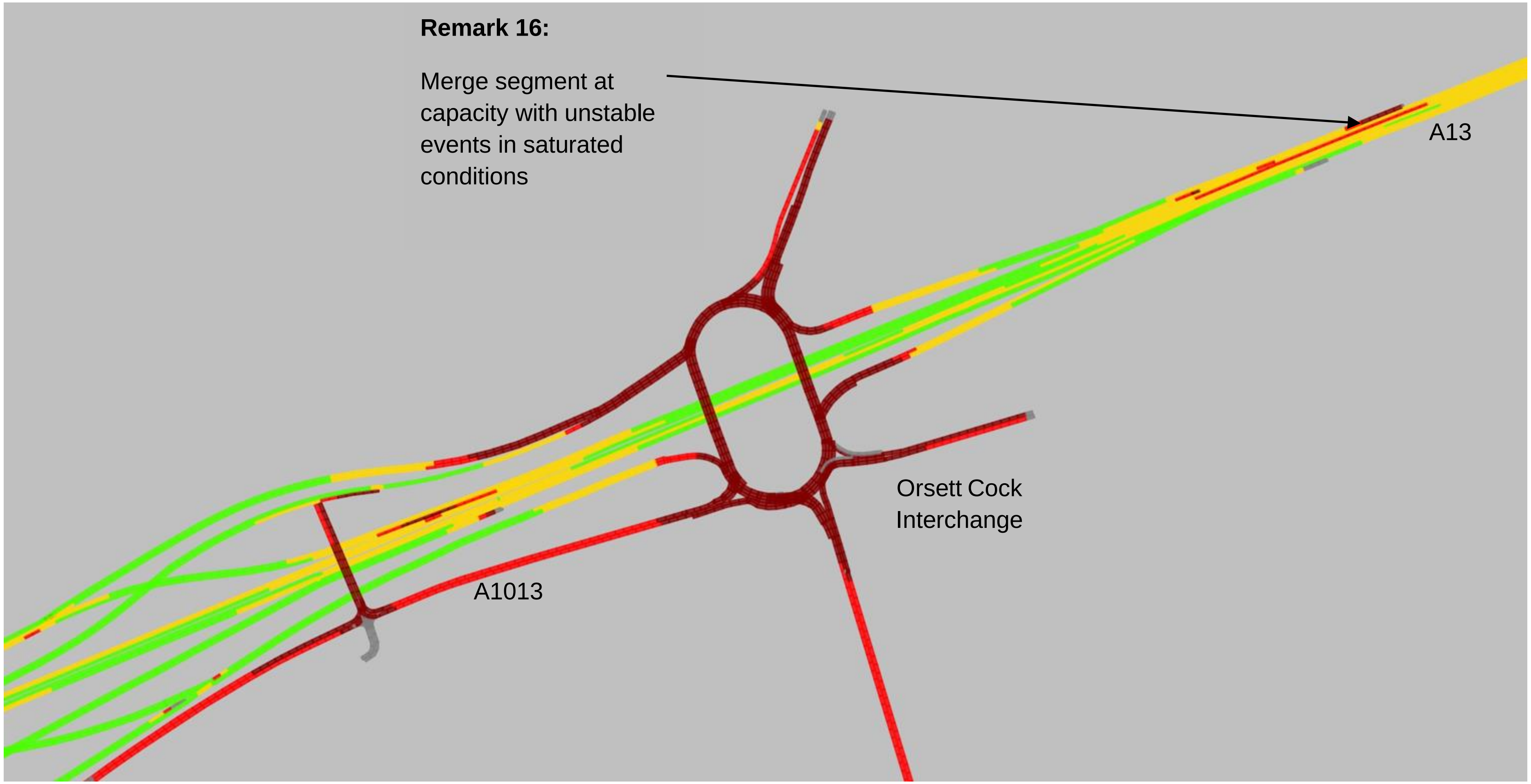
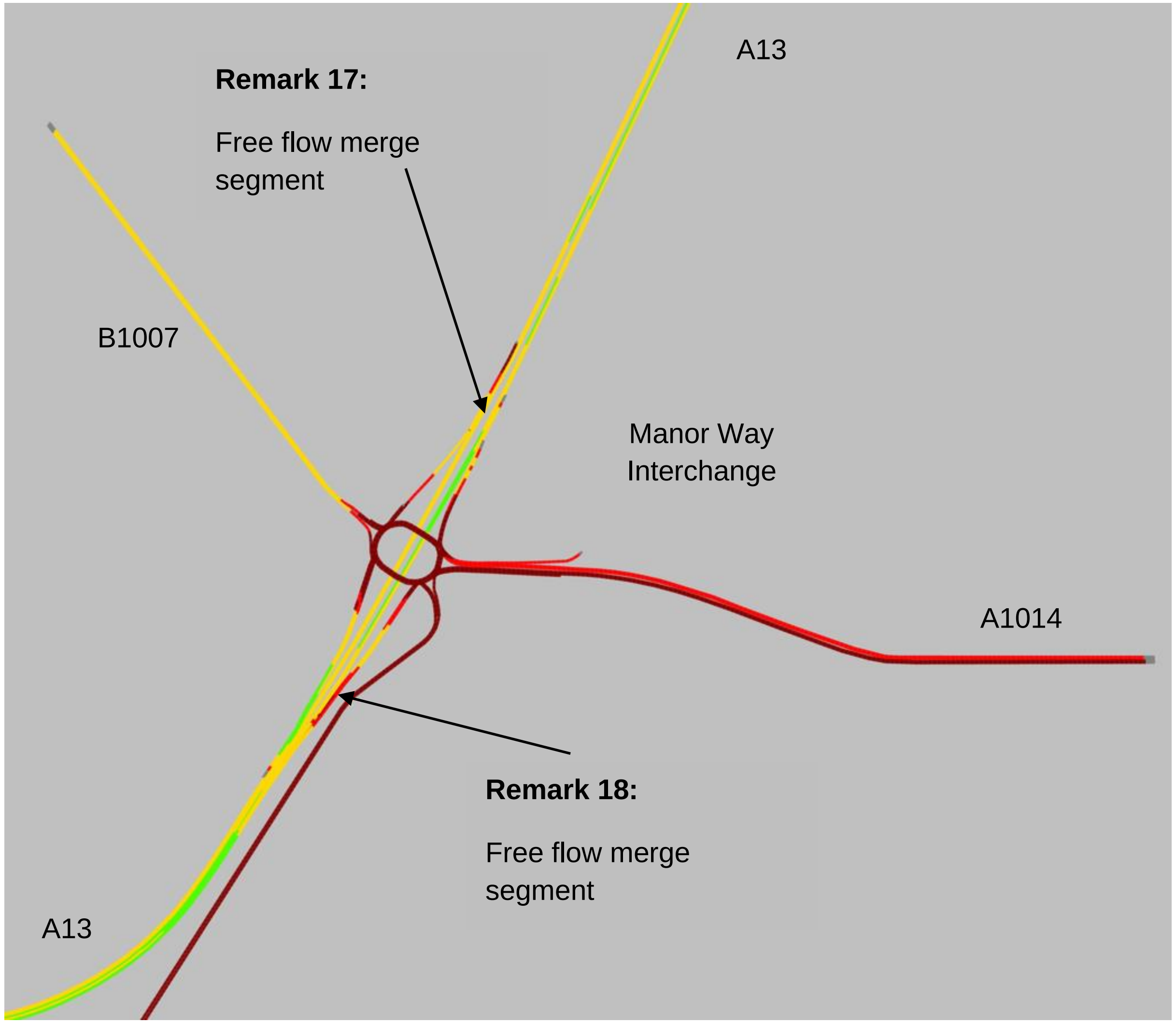


Plate 4.24 PM Peak A13 Speed Plots (East Section), 2045



4.6 2045 traffic conditions on the M25 corridor

4.6.1 Plate 4.25 to Plate 4.30 present the speed profiles and network speed colour codes for the M25 corridor.

4.6.2 Overall, the M25 corridor remains free-flowing, with one exception detailed in remark 19 below. The following remarks detail traffic conditions and key background information for each key location (see location indications on figures below):

a. **Remark 19:** The AM peak northbound M25 merge with the Project would be at the upper limit of free flow conditions; and,

b. **Remark 20:** In the PM peak, the northbound M25 merge with the Project would have free-flow traffic conditions.

4.7 Conclusion

4.7.1 In conclusion, the Lower Thames Crossing corridor is forecast to be free-flowing with stable traffic conditions. The M25, A13 and A2/M2 are also forecast to be generally free-flowing, with some merge and diverge segments experiencing capacity issues.

Plate 4.25 AM Peak M25 Speed NB Profile, 2045

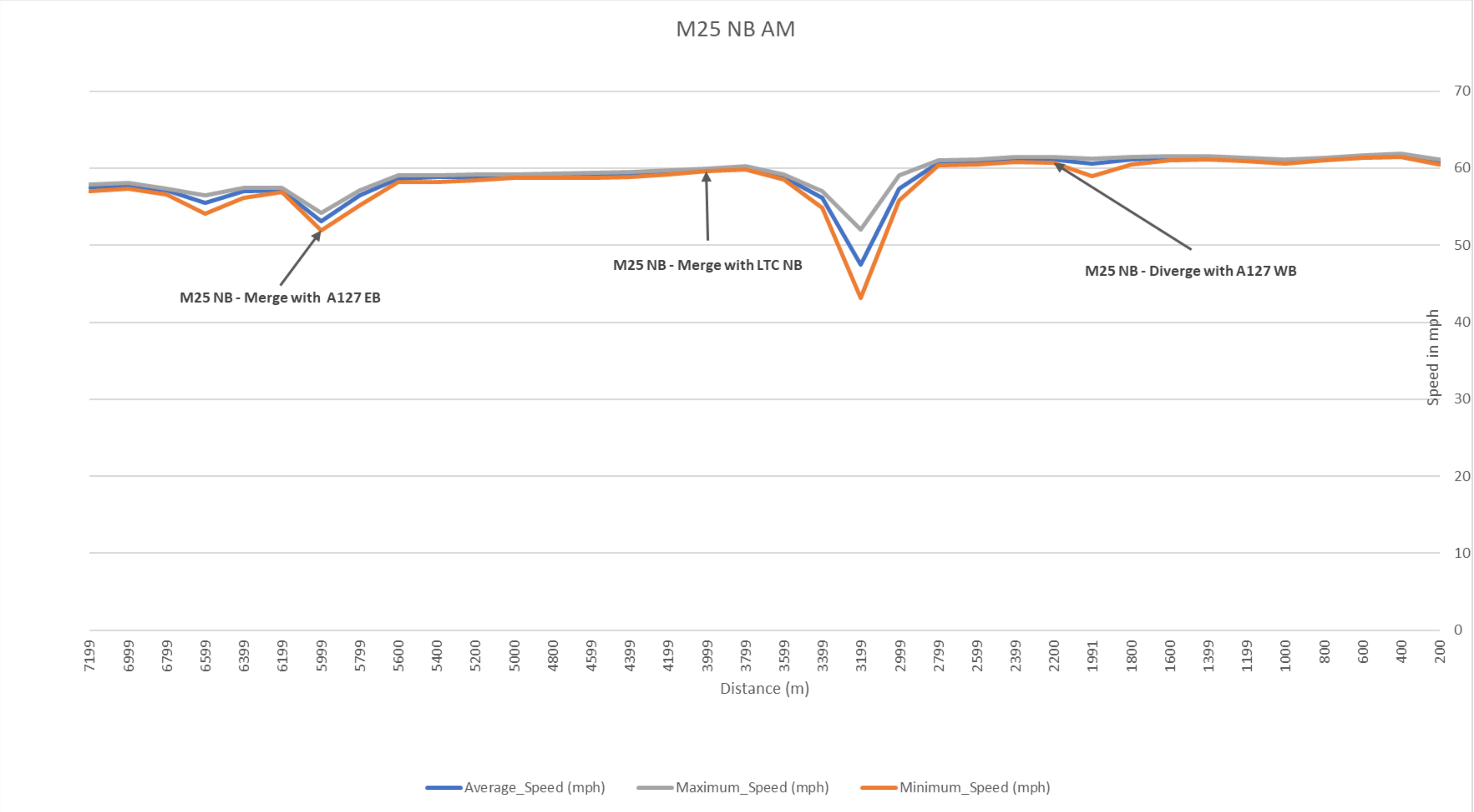


Plate 4.26 AM Peak M25 Speed SB Profile, 2045

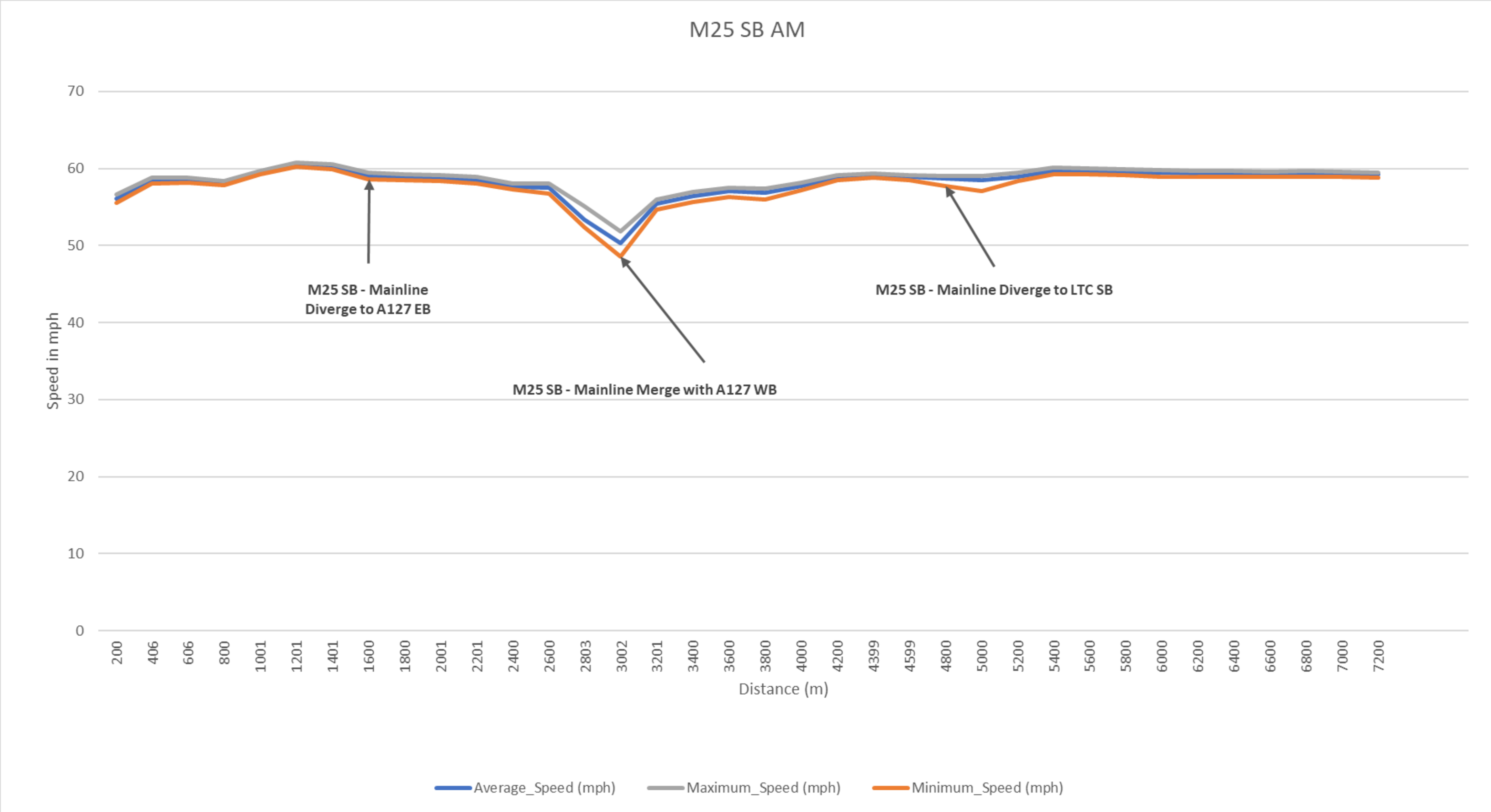


Plate 4.27 AM Peak M25 Speed Plots, 2045

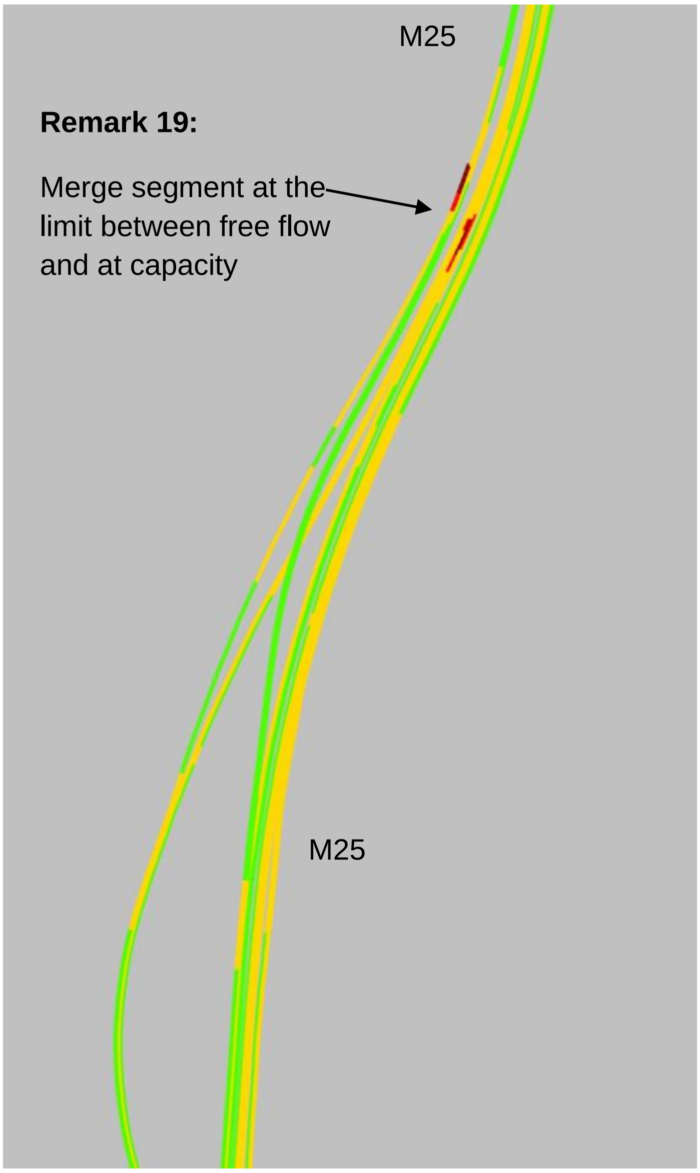


Plate 4.28 PM Peak M25 Speed NB Profile, 2045

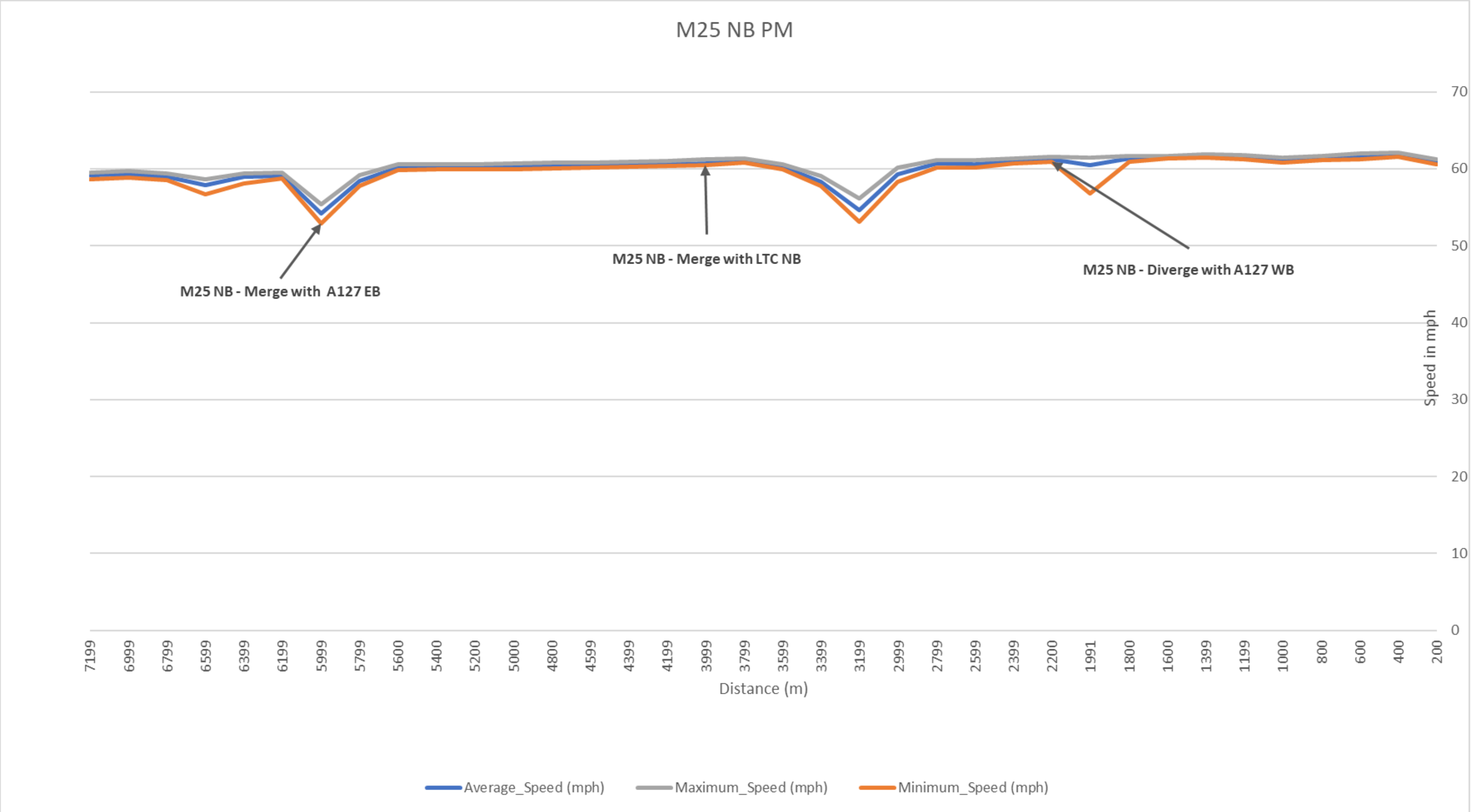


Plate 4.29 PM Peak M25 Speed SB Profile, 2045

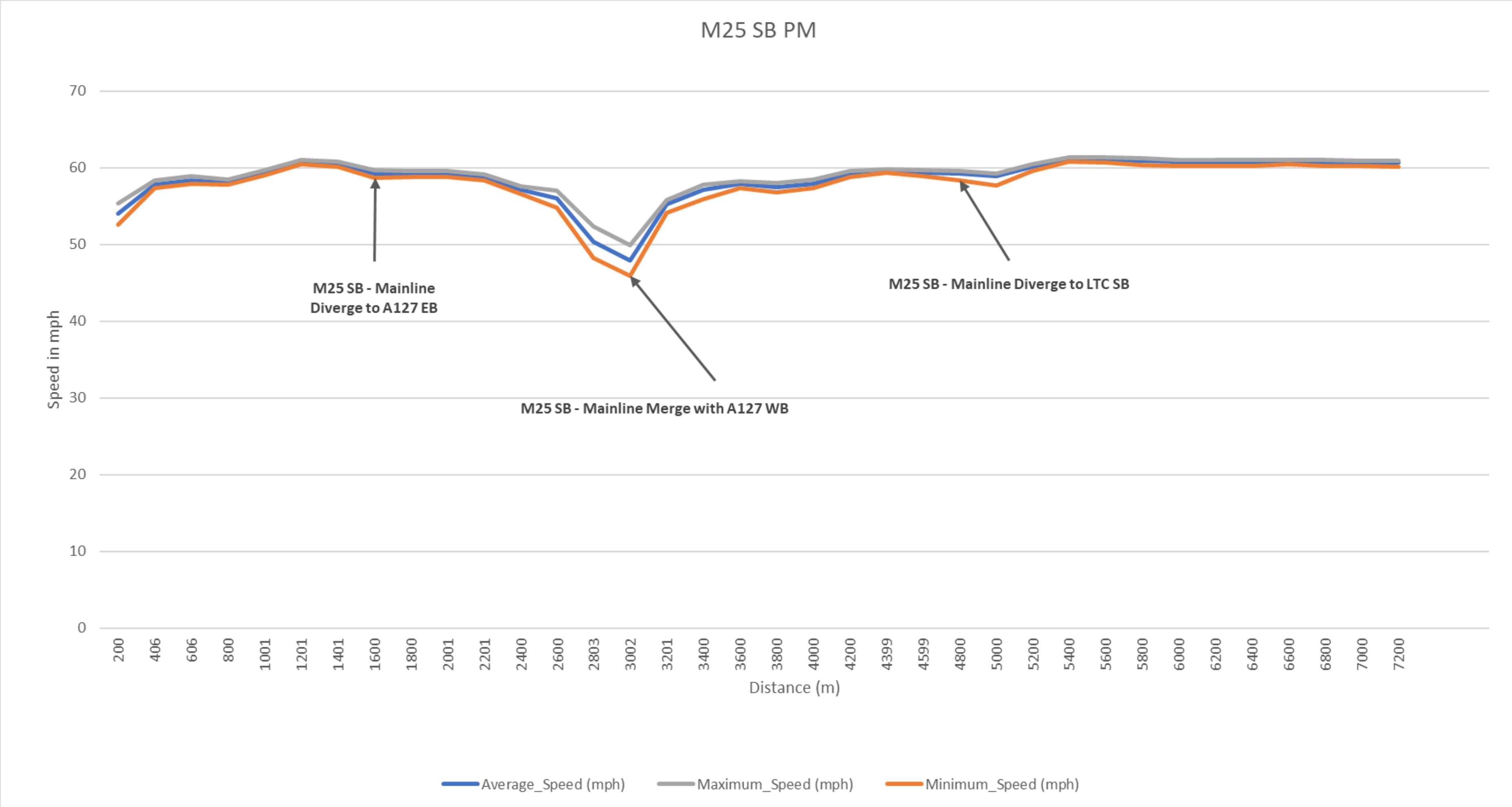
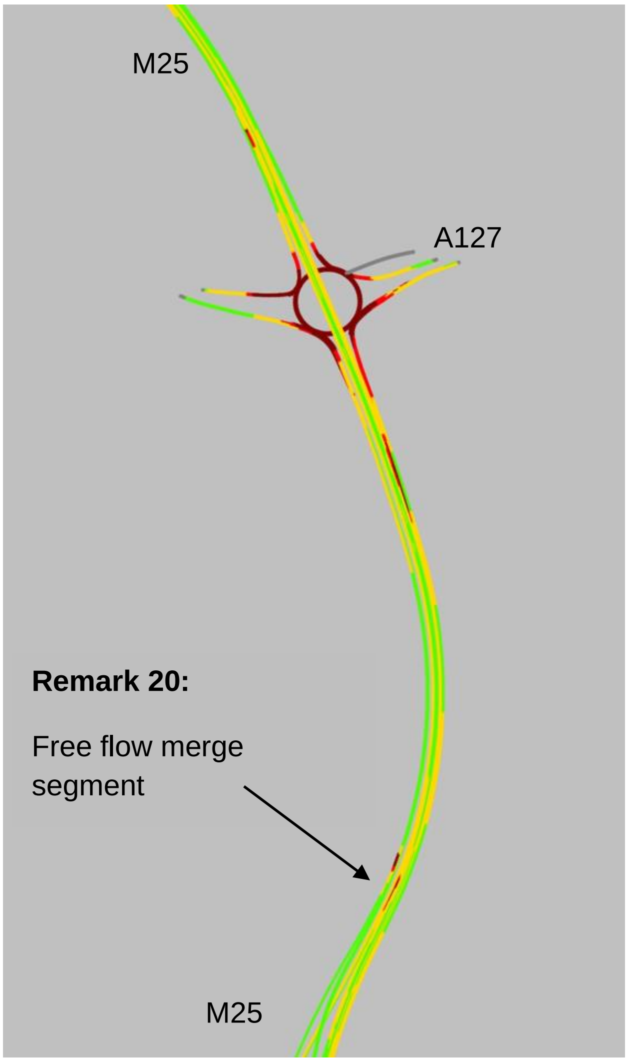


Plate 4.30 PM Peak M25 Speed Plots, 2045



5 Local roads traffic analysis

5.1 Background

5.1.1 Within the Project order limits, there are seven local at-grade junctions.

5.1.2 M25 junction 29 is a major interchange on the corridor with good SATURN existing traffic volume validation. All other junctions are either new, or their traffic structure has been significantly impacted by the scheme. To assess the design year traffic conditions, it was therefore decided to use the 2045 traffic volumes directly from SATURN. The assessment has been performed using VISSIM for consistency.

5.2 Junction performance criteria

5.2.1 The following junction performance criteria have been followed, which aligns with current industry best practice:

a. The local built environment must be characterised to establish the hierarchy of provision for road users. According to the Traffic Signs Manual, Chapter 6, if the environment can be characterised as a "place", active travel should be given priority, while a "link" should give priority to a mobility function;

b. In all cases, the junction must be safe for all users, this requires adequate provision for pedestrians, cyclists and buses;

c. Queues at dangerous locations, like opposed right-turning movements within a junction, or blocking back onto a mainline, must be avoided, or an adequate refuge provided; and,

d. The aim of the operational analysis is to minimise delays for road users, so free-flow traffic conditions should be considered the ideal outcome. However, an overall project balance should be achieved. Road safety, project cost, timeline, environmental considerations, or others, sometimes lead to queuing traffic being acceptable.

5.2.2 Based on the above, the following junction approach performance criteria have been selected:

a. Volume to Capacity Ratio target typically varies based on the variability of the traffic demand. The target is always below 1 because if a short-term queue develops, spare capacity is necessary for traffic conditions to recover and return to free-flowing conditions. The common industry ratios to identify free-flowing conditions are 0.85 for a non-signalised junction and long-term traffic forecast, 0.9 for an urban signalised junction with a short-term forecast, and sometimes up to 0.95 for an urban junction in a short-term forecast equipped with adaptative traffic signals. For the 2045 forecast, 0.85

has been considered a suitable statistic to indicate free-flow conditions. The colour range selected is:

i. <0.85 – free-flowing (green);

ii. 0.85 to 0.95 – at-capacity (yellow); and,

iii. >0.95 – Saturated (orange).

b. Delay in seconds per vehicle at a junction. Traffic delays come from three sources. First, geometric delays correspond to the time lost due to decelerating to perform a turning manoeuvre. Typically, a geometric delay does not exceed a couple of seconds. Second, control delays are the time lost to the respect of road marking, road signs and signals. Such a delay is small for non-signalised junctions. For traffic signals, 55 seconds is typically considered the upper limit of a control delay generated by traffic signals in at-capacity traffic conditions.

c. Junctions proposed as part of the Project that are forecast to have high traffic volumes would be signalised, therefore, the colour range selected is:

iv. <35 seconds – free-flowing (green);

v. 35 to 55 seconds – at-capacity (yellow); and,

vi. >55 seconds – Saturated (red).

d. Average and maximum queue length at a junction reflect the operation of the junction and the level of congestion. In free-flow conditions, non-signalised junctions will have shorter queues than signalised junctions. For the Project, both the average queue and the maximum queue are considered. The colour range selected for maximum queue is:

i. Smaller than the available safe storage space (green); and,

ii. Greater than the available safe storage space (orange).

5.3 Junction 1 - M25 junction 29

Junction context

5.3.1 M25 junction 29 is a major interchange between the M25 and the A127. The primary function of the junction is to enable long-distance vehicular traffic movement between these two corridors.

Junction description

5.3.2 Junction 1 shown in Plate 5.1 is currently a large roundabout with partial signalisation. It has a three-lane circulating carriageway, with the outer lane being either hatched, marked as a “works access only” or open to general traffic.

5.3.3 The western half of the junction includes connections to the local road network.

5.3.4 The key changes to the existing condition are:

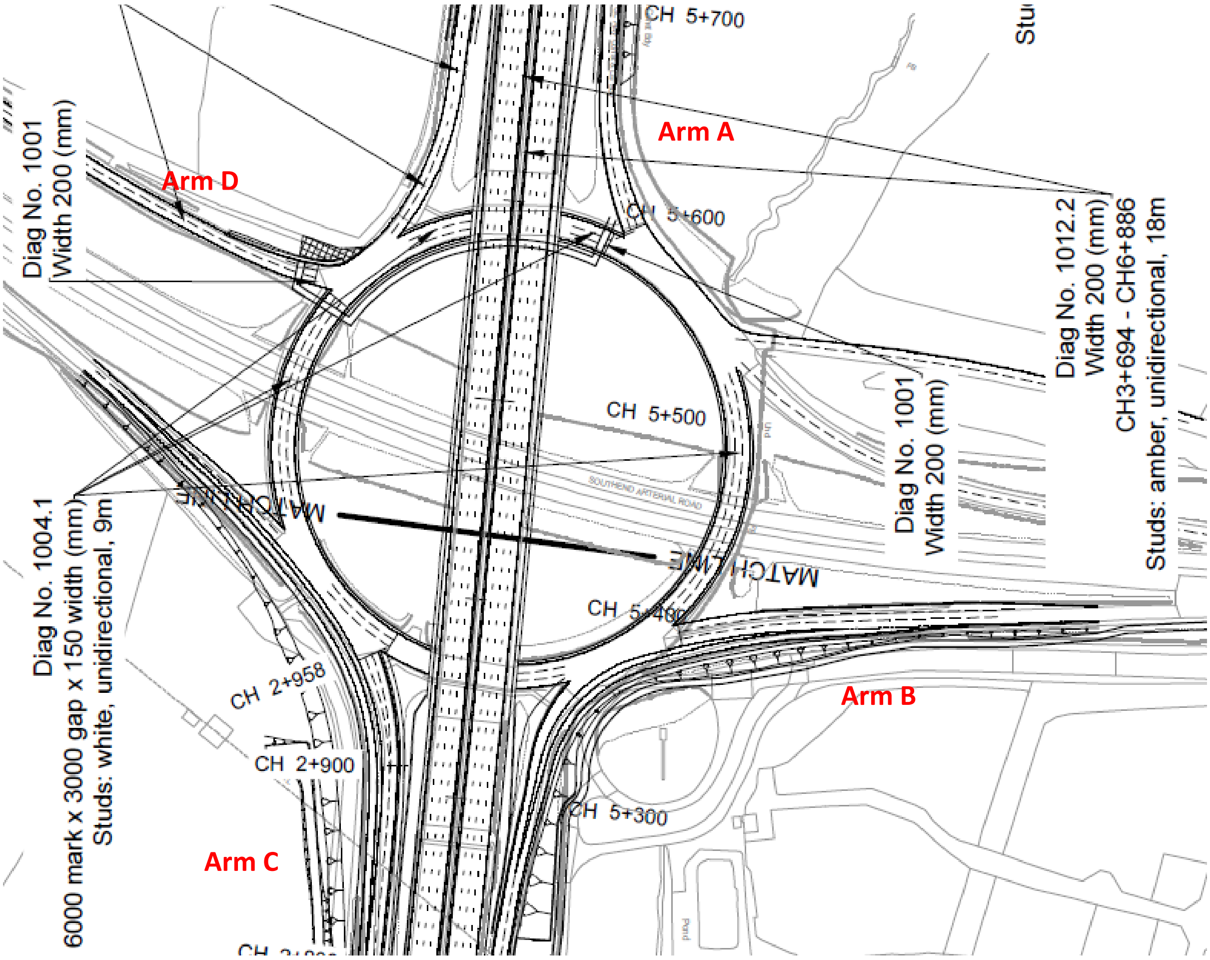
a. The change of the circulating carriageway road marking to three lanes, opened to all traffic at all times;

b. The change from a partially signalised junction to a fully signalised junction; and,

c. The addition of dedicated left turn lanes to the south of the junction.

5.3.5 There is a proposed development (Brentwood Enterprise Park) to the south-east of the junction, and the provision of an alternative access arrangement is being developed separately. Any changes relating to the access to this development have not been included.

Plate 5.1 Junction 1 – M25 junction 29



Active travel provision

5.3.6 In the existing situation, provision for non-motorised users is limited to dropped kerbs. The full signalisation of the junction would enable the provision of enhanced signalised crossing facilities.

Buses

5.3.7 There are no scheduled bus services transiting via M25 junction 29.

Junction traffic condition forecast

5.3.8 Plate 5.1Plate 5.1 shows M25 junction 29 with each entry arm marked as A, B, C and D.

5.3.9 Table 5.1Table 5.1 and Table 5.2Table 5.2 show the AM and PM peak traffic conditions at the junction for the 2045 forecast.

Table 5.1 Junction 1 – AM Peak Traffic Conditions, 2045

Approach	Volume (Veh/hr)	Number of lanes	V/C	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	1032	3	0.39	15	7	46
Arm B	808	3	0.34	29	5	41
Arm C	878	3	0.79	52	17	65
Arm D	1286	3	0.94	70	24	107

5.3.10 Table 5.1 shows junction 1 in the AM peak as forecast to be free-flowing, except for a long delay on Arm D due to a short green time on this approach. This short green time was required to enable the circulating carriageway to remain free-flowing.

Table 5.2 Junction 1 – PM Peak Traffic Conditions, 2045

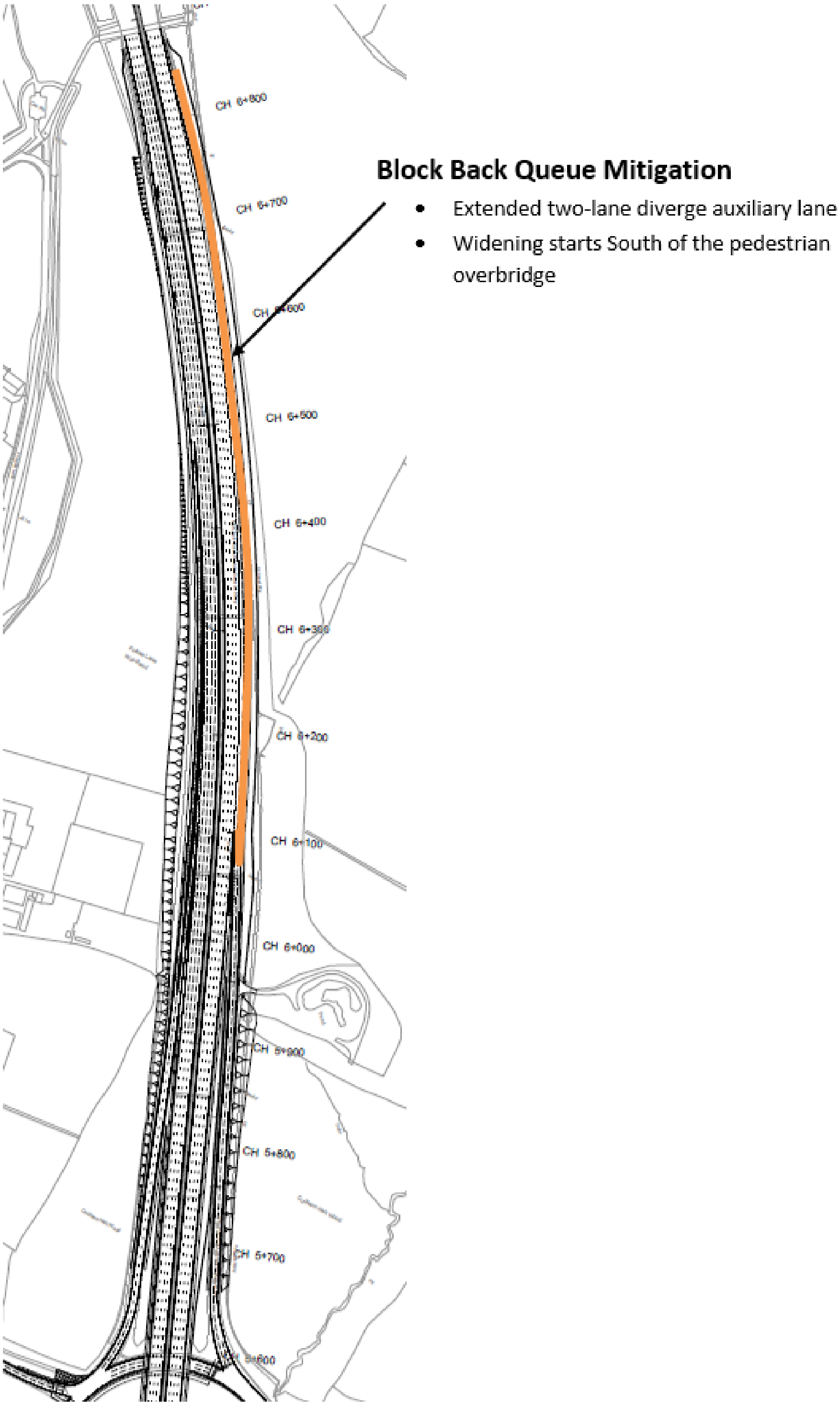
Approach	Volume (Veh/hr)	Number of lanes	V/C	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	1,177	3	0.44	16	7	51
Arm B	1,299	3	0.54	29	9	51
Arm C	604	3	0.54	46	11	46
Arm D	1,169	3	0.85	81	52	158

5.3.11 Table 5.2 shows junction 1 in the PM peak is forecast to be free-flowing except for Arm D. National Highways install MOVA systems as standard on grade separated interchanges, which will enable a much more adaptative management of signal timings at the junction. As such, the delay time is expected to be lower on site.

Existing A127 blocking back queue event

5.3.12 The above analysis corresponds to a traffic forecast free from a blocking back event from the A127. Such a blocking back situation is a regular occurrence in the existing situation, leading to queues on the M25 southbound. As indicated on Plate 5.2, an extended auxiliary lane was included into the design to account for this regular occurrence, as well as the loss of lane drop generated by the junction overbridge widening to four lanes.

Plate 5.2 Junction 1 – M25 junction 29



Junction conclusions

5.3.13 In conclusion, M25 junction 29 has been upgraded to accommodate the forecast 2045 traffic flows.

5.3.14 The junction is forecast to perform well from a traffic operational point of view. Delays on Arm D in the model would be expected to be reduced by the MOVA system.

5.3.15 The pedestrian and cycle facilities have been enhanced and the road safety risk of a blocking back queue from the A127 has been reduced.

5.4 Junction 2 – A2 Gravesend East interchange

Junction context

5.4.1 The A2 Gravesend East interchange is a three-lane roundabout, grade-separated intersection that connects the A2 to:

a. The local urban area to the north; and,

b. A collector road to the south crossing the HS1 railway line.

5.4.2 The primary function of the interchange is to provide access to and from the A2. The north side of the junction is within an urbanised environment.

Junction description

5.4.3 During the junction development process, several constraints had to be overcome. The key elements of the design are:

a. Dumbbell capacity: The two roundabouts on either side of the A2 had to be upgraded to three lanes roundabout because of capacity requirements;

b. Valley Drive capacity: Arm B of Junction 2.2 shown in Plate 5.3 did not have sufficient capacity and a left-turning free-flow slip had to be added;

c. Blocking back queues: The stacking capacity on the overbridge was insufficient and resulted in blocking back queues. The solution was to:

   i. amend the geometric layout to relocate the approach stoplines away from the bridge structure; and,

   ii. widen the bridge so that it can accommodate two lanes in each direction.

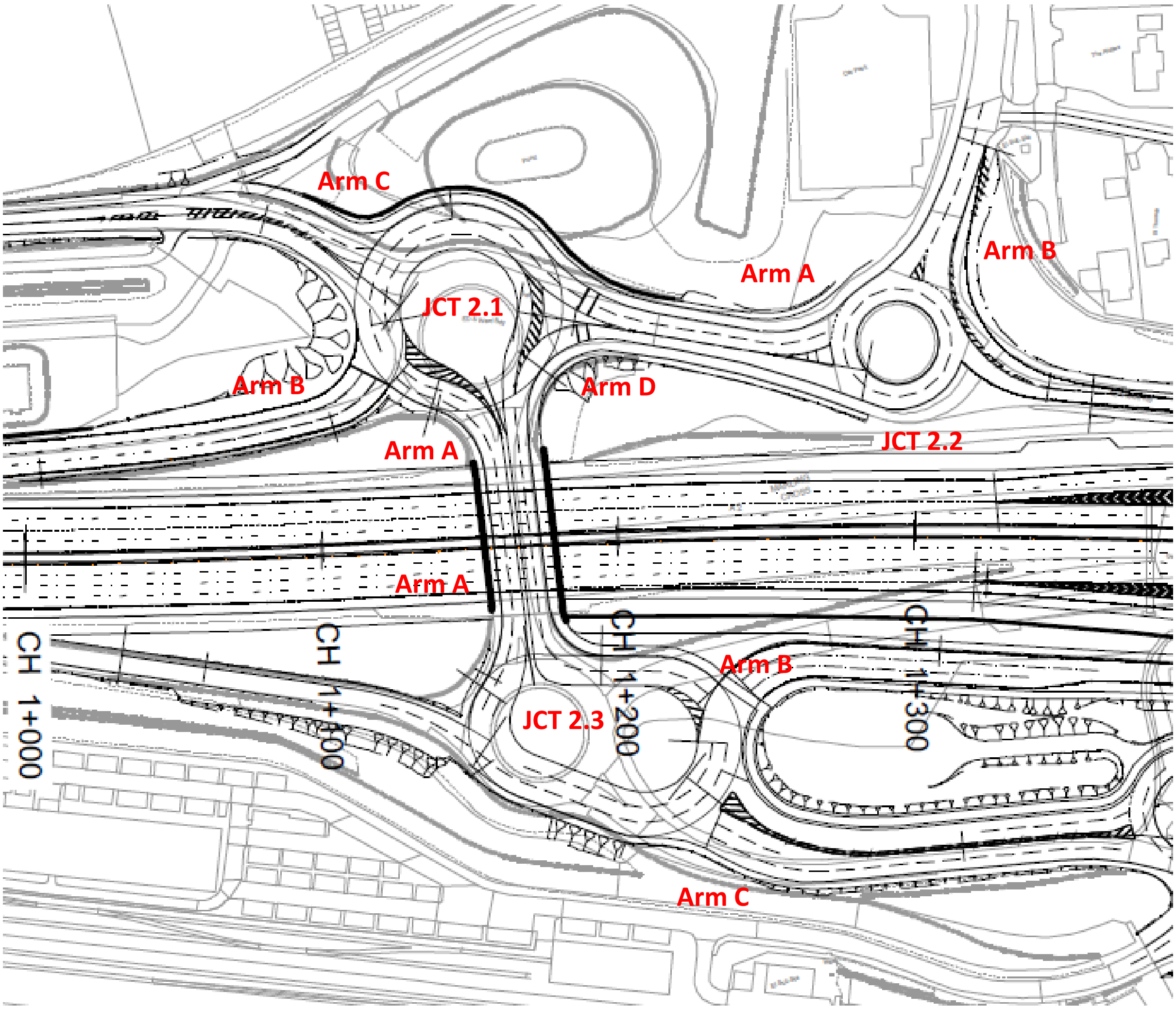
d. Signalise key approaches: The risk of blocking back queues onto the A2 as well as the three lanes road layout led to the decision to signalise approaches for the two roundabouts of the dumbbell.

5.4.4 The existing situation includes direct slips between the A2/M2 and the east side of the Gravesend East junction. In order to accommodate the new connection to the Project, the following connections were included in the design:

a. Eastbound on-slip: A direct slip was included in the design between Junction 2.2 and the A122 connection towards the M2 eastbound; and,

b. Westbound off-slip: The M2 off-slip is no longer connected into the Gravesend East interchange south junction, but, instead, is connected to Junction 3, Henhurst Road. It was not possible to merge this connection with Arm B of Junction 2.3 because of traffic capacity issues.

Plate 5.3 Junction 2 – Gravesend East Interchange



Active travel provision

5.4.5 Pedestrian and cyclist provisions are provided to enable safe crossing of the interchange.

Buses

5.4.6 There are no scheduled bus services transiting via the Gravesend East interchange.

Junction traffic condition forecast

5.4.7 Plate 5.3 shows the Gravesend East interchange with each entry arm of each junction marked as A, B, C, D and E.

5.4.8 Table 5.3 to Table 5.8 show the Gravesend East interchange would be free-flowing.

Table 5.3 Junction 2.1 – AM Peak Traffic Conditions, 2045

Approach	Volume (Veh/hr)	Number of lanes	V/C	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	803	3	0.34	6	2	55
Arm B	592	3	0.28	12	5	37
Arm C	432	2		9	3	36
Arm D	782	1		1	0	0

Table 5.4 Junction 2.1 – PM Peak Traffic Conditions, 2045

Approach	Volume (Veh/hr)	Number of lanes	V/C	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	814	3	0.34	7	3	61
Arm B	1,407	3	0.66	17	14	73
Arm C	566	2		32	20	73
Arm D	740	1		1	0	0

Table 5.5 Junction 2.2 – AM Peak Traffic Conditions, 2045

Approach	Volume (Veh/hr)	Number of lanes	V/C	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	922	2		2	0	28
Arm B	1,225	1		5	7	196

Table 5.6 Junction 2.2 – PM Peak Traffic Conditions, 2045

Approach	Volume (Veh/hr)	Number of lanes	V/C	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	1,512	2		5	2	56
Arm B	883	1		6	5	104

Table 5.7 Junction 2.3 – AM Peak Traffic Conditions,2045

Approach	Volume (Veh/hr)	Number of lanes	V/C	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	1,150	2		9	5	57
Arm B	278	3	0.23	24	4	29
Arm C	816	3	0.69	22	13	56

Table 5.8 Junction 2.3 – PM Peak Traffic Conditions, 2045

Approach	Volume (Veh/hr)	Number of lanes	V/C	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	1,288	2		9	7	78
Arm B	635	3	0.53	25	8	39
Arm C	628	3	0.53	20	9	41

Junction conclusions

5.4.9 In conclusion, Junction 2, the A2 Gravesend East interchange has been upgraded to accommodate forecast 2045 traffic flows.

5.4.10 The junction performs well from a traffic operations point of view, and each operational concern has been overcome.

5.4.11 Pedestrian crossing facilities have been provided and the risk of blocking back queues has been reduced.

5.5 Junction 3 – Henhurst Road

Junction context

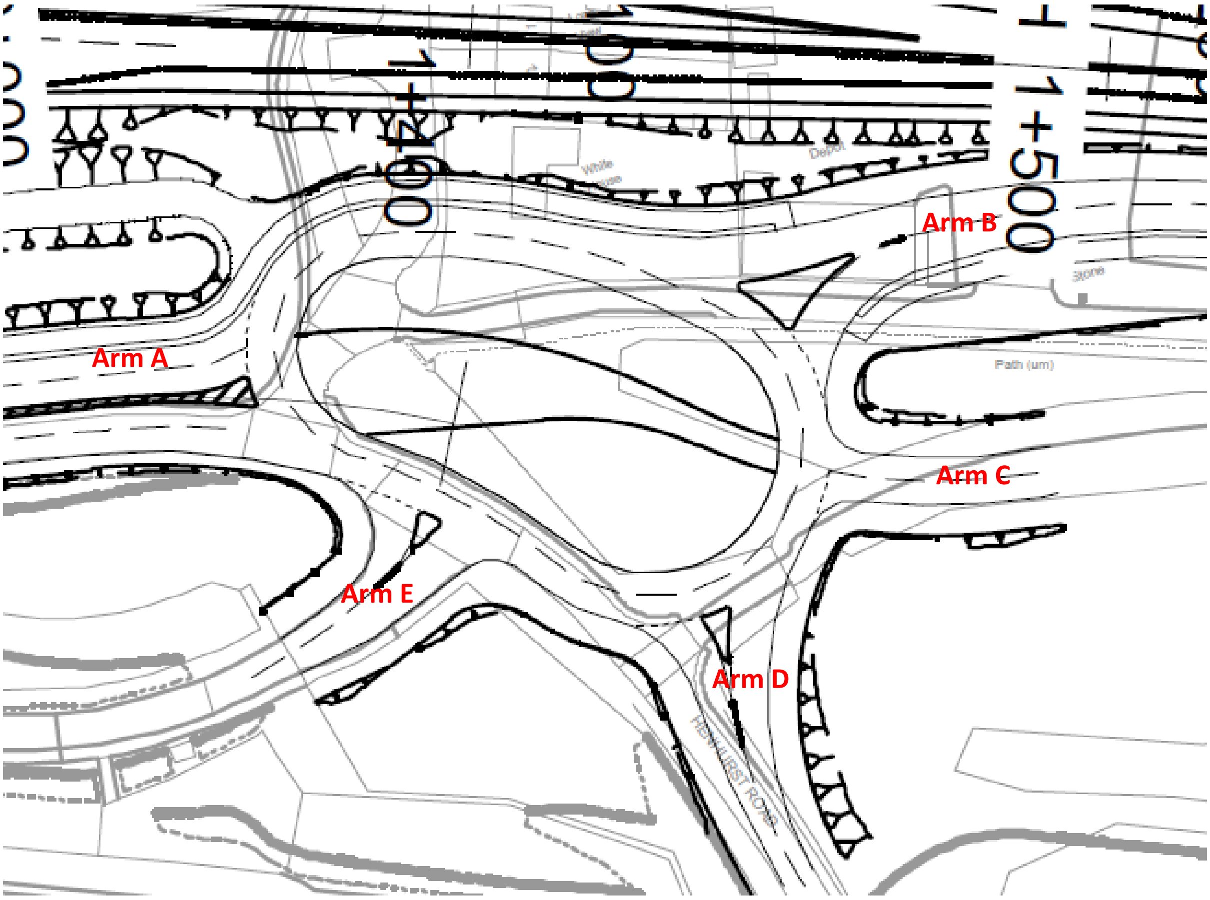
5.5.1 Junction 3, the Henhurst Road roundabout would provide a crossing point from Gravesend East interchange to the south side of the HS1 railway line. Local roads connections also provide access to a railway maintenance facility and an electrical sub-station.

5.5.2 The roundabout function is to provide a five-arm junction within a constrained space. The land use in the vicinity of the junction is expected to generate a low volume of active travel. A continuous pavement is available from the south of the HS1 railway line.

Junction description

5.5.3 Plate 5.4 shows the non-signalised roundabout.

Plate 5.4 Junction 3 – Henhurst Road



Active travel provision

5.5.4 Pedestrian and cyclists shared surface areas and dropped kerbs are provided to enable safe crossing of the junction.

Buses

5.5.5 There is no known bus service transiting via Henhurst Road in the existing situation.

2045 traffic forecasts at the junction

5.5.6 Plate 5.4 shows Henhurst Road roundabout with each entry arm of the junction marked as A, B, C, D and E.

5.5.7 Table 5.9 and Table 5.10 show the Junction 3, Henhurst Road roundabout, would be free-flowing.

Table 5.9 Junction 3 – AM Peak Traffic Conditions, 2045

Approach	Volume (Veh/hr)	Number of lanes	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	313	2	1	0	1
Arm B	726	1	4	0	0
Arm C	0	1	0	0	0
Arm D	146	1	2	0	0
Arm E	0	1	0	0	0

Table 5.10 Junction 3 – PM Peak Traffic Conditions, 2045

Approach	Volume (Veh/hr)	Number of lanes	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	633	2	2	0	1
Arm B	531	1	3	0	0
Arm C	0	1	0	0	0
Arm D	184	1	1	0	0
Arm E	0	1	0	0	0

Junction conclusions

5.5.8 In conclusion, Junction 3, Henhurst Road roundabout is forecast to operate with free-flow conditions, and blocking back queues are not forecast.

5.6 Junction 4 – Collector road junction

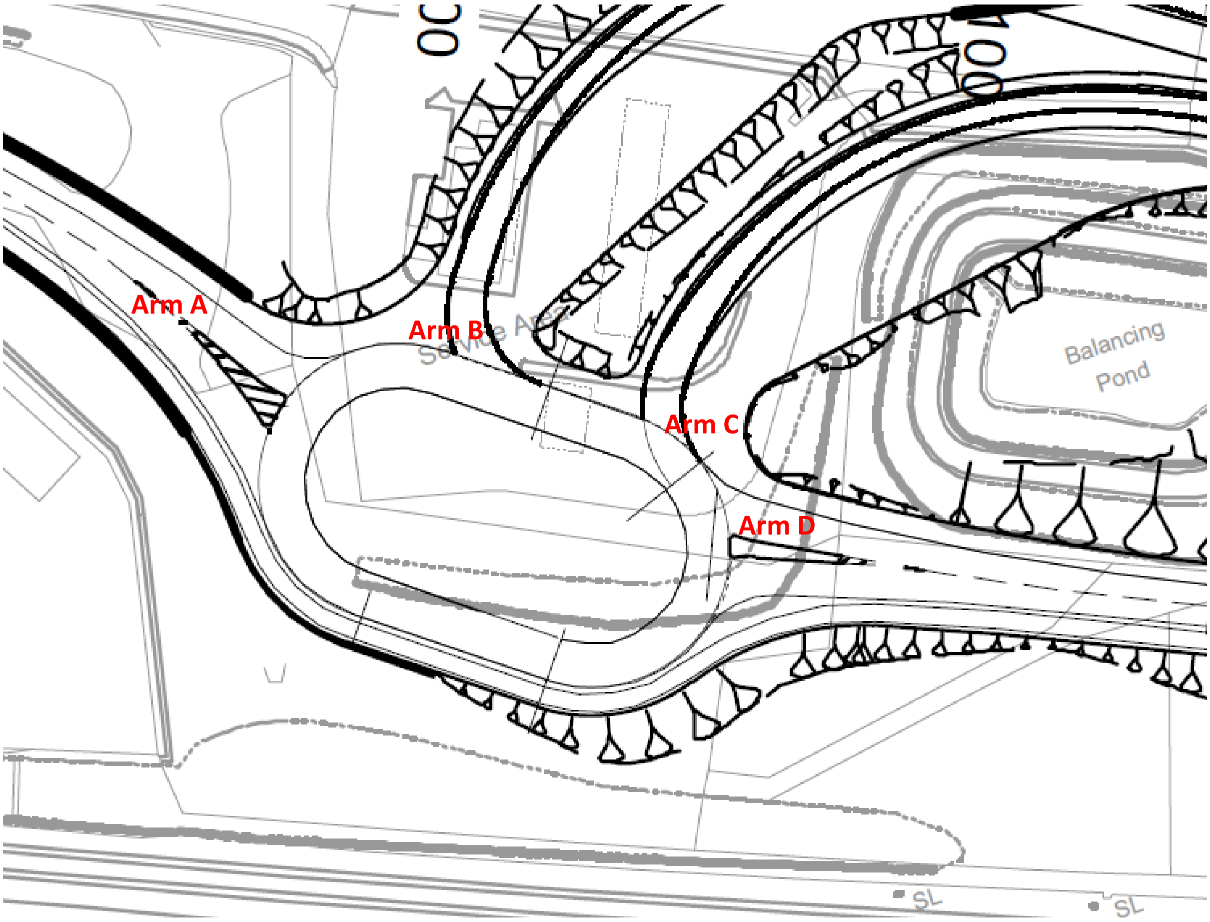
Junction context

5.6.1 Junction 4 would be located between the A2 and the HS1 railway line, on the collector link road. The purpose of this junction is to enable the connection of the A2 off-slips to the local road network. There is currently no active travel trip generator in the vicinity of the junction.

Roundabout description

5.6.2 Plate 5.5 shows the oblong non-signalised roundabout.

Plate 5.5 Junction 4 – Collector Road Junction



Active travel provision

5.6.3 A pedestrian/cycle track is located to the south of the junction.

Buses

5.6.4 No existing bus services would transit via junction 4.

2045 traffic forecasts at the junction

5.6.5 Plate 5.5 shows junction 4 with each entry arm of each junction marked as A, B, C and D.

5.6.6 Table 5.11 and Table 5.12 show junction 4 is free-flowing.

Table 5.11 Junction 4 – AM Peak Traffic Conditions, 2045

Approach	Volume (Veh/hr)	Number of lanes	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	80	1	1	0	0
Arm B	444	1	3	0	9
Arm C	223	1	4	0	19
Arm D	184	1	5	0	26

Table 5.12 Junction 4 – PM Peak Traffic Conditions, 2045

Approach	Volume (Veh/hr)	Number of lanes	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	406	1	3	0	4
Arm B	355	1	4	0	29
Arm C	190	1	5	1	23
Arm D	159	1	3	0	16

Junction conclusion

5.6.7 In conclusion, junction 4 would operate with free-flow conditions and blocking back queues are not forecast.

5.7 Junction 5 - Thong Lane new junction

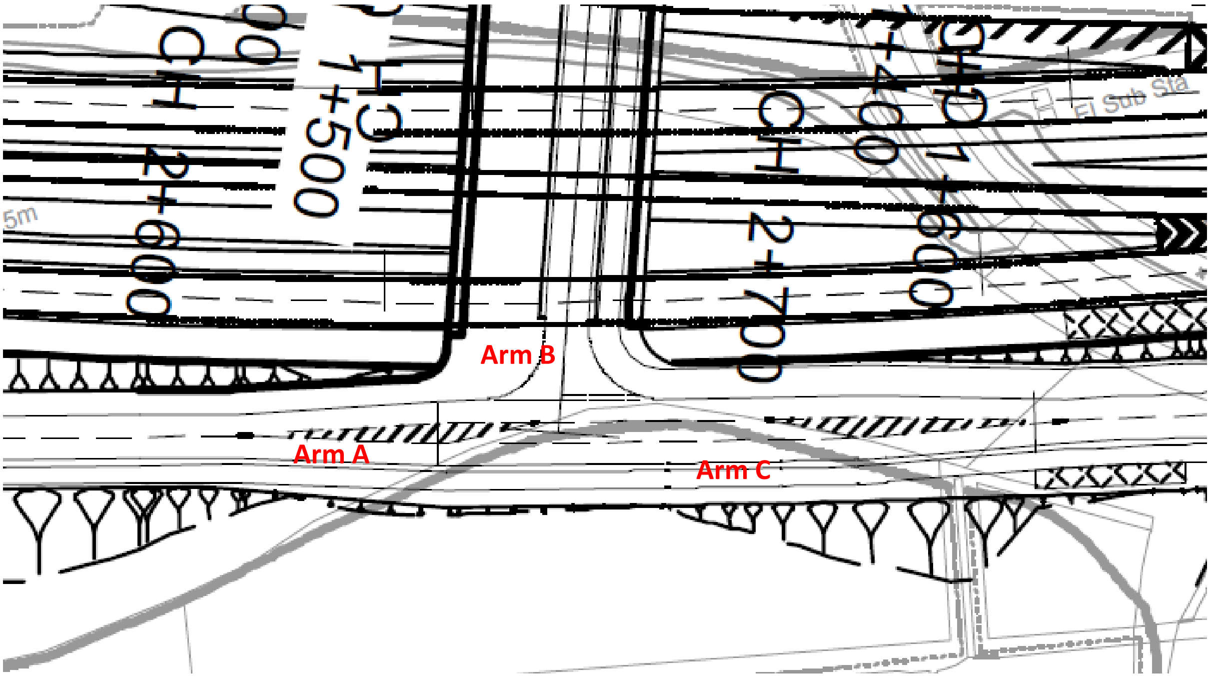
Junction Context

5.7.1 Junction 5 would be located between the A2 and the HS1 railway line, on the collector link road. The purpose of this junction is to enable a connection between Thong Lane (using the flyover link over the A2) and the collector link road. There is currently no active travel trip generator in the vicinity of the junction.

Junction description

5.7.2 Plate 5.6 shows the three-arm non signalised T-junction. A right-turning refuge has been included to limit the risk of collisions.

Plate 5.6 Junction 5 – Thong Lane New Junction



Active travel provision

5.7.3 A pedestrian/cycle would be located on the south side of the junction. On Thong Lane, a pedestrian/cycle/equestrian route would run on the eastern side of the carriageway.

Buses

5.7.4 No existing bus services are expected to transit via junction 5.

2045 traffic forecasts at the junction

5.7.5 Plate 5.6 shows junction 5 with each entry arm of each junction marked as A, B and C.

5.7.6 Table 5.13 and Table 5.14 show junction 5 is forecast to be free-flowing.

Table 5.13 Junction 5 – AM Peak Traffic Conditions, 2045

Approach	Volume (Veh/hr)	Number of lanes	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	116	1	1	0	0
Arm B	156	1	2	0	4
Arm C	156	1	1	0	0

Table 5.14 Junction 5 – PM Peak Traffic Conditions, 2045

Approach	Volume (Veh/hr)	Number of lanes	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	166	1	1	0	0
Arm B	164	1	2	0	10
Arm C	263	1	1	0	1

Junction conclusion

5.7.7 In conclusion, Junction 5 T-junction with Thong Lane would operate in free-flow conditions with blocking back queues not forecast. The risk of collisions for right-turning traffic from the east has been reduced by the provision of a central refuge.

5.8 Junction 6 – Thong Lane to Brewers Road

Junction context

5.8.1 Junction 6 would be located between the A2 and the HS1 railway line, on the collector link road. The purpose of this junction is to enable the connection between Thong Lane using the flyover the A2 and the collector link road. There is currently no active travel trip generator in the vicinity of the junction.

Junction description

5.8.2 shows the Thong Lane to Brewers Road junction. It would be a three-arm, non-signalised roundabout. The existing situation also has a three-arm roundabout, but the A2/M2 off-slip would no longer be present at this location with the Project.

Active travel provision

5.8.3 A pedestrian/cycle track would be located to the south of the junction. To the west, a pedestrian/cycle/equestrian track would be located.

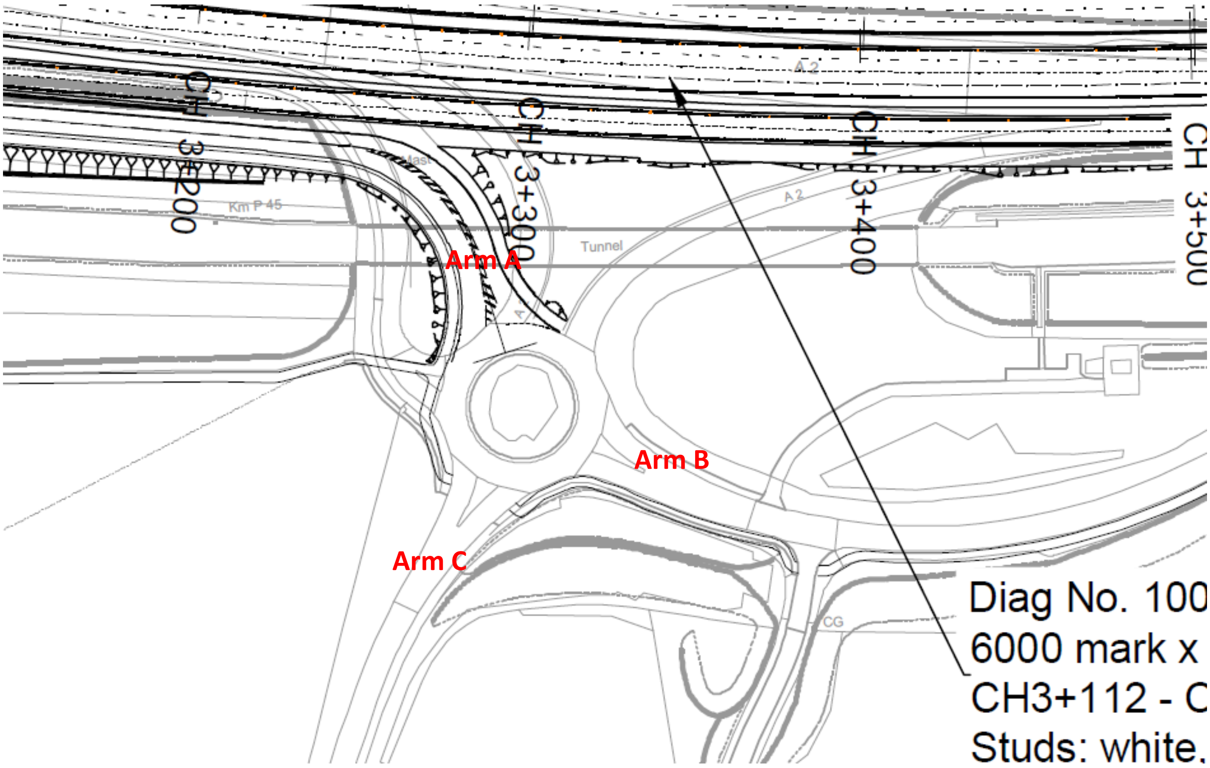
Buses

5.8.4 Bus route 416 transits via junction 6.

2045 traffic forecasts at the junction

5.8.5 Plate 5.7 shows junction 6 with each entry arm of each junction marked as A, B and C.

Plate 5.7 Junction 6 – Thong Lane to Brewer's Road



5.8.6 Table 5.15 and Table 5.16 show junction 6 would be free-flowing.

Table 5.15 Junction 6 – AM Peak Traffic Conditions, 2045

Approach	Volume (Veh/hr)	Number of lanes	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	209	1	1	0	8
Arm B	231	1	1	0	8

Approach	Volume (Veh/hr)	Number of lanes	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm C	101	1	1	0	3

Table 5.16 Junction 6 – PM Peak Traffic Conditions, 2045

Approach	Volume (Veh/hr)	Number of lanes	Delay (sec.)	Average Queue Length (m)	Maximum Queue Length (m)
Arm A	298	1	2	0	22
Arm B	188	1	1	0	9
Arm C	313	1	1	0	11

Junction conclusion

5.8.7 In conclusion, junction 6, Thong Lane to Brewers Road roundabout, operates in free-flow conditions, with no risk of blocking back queues and a pedestrian/cycle/equestrian track to the south side.

5.9 Junction 7 – Brewers Road Junction

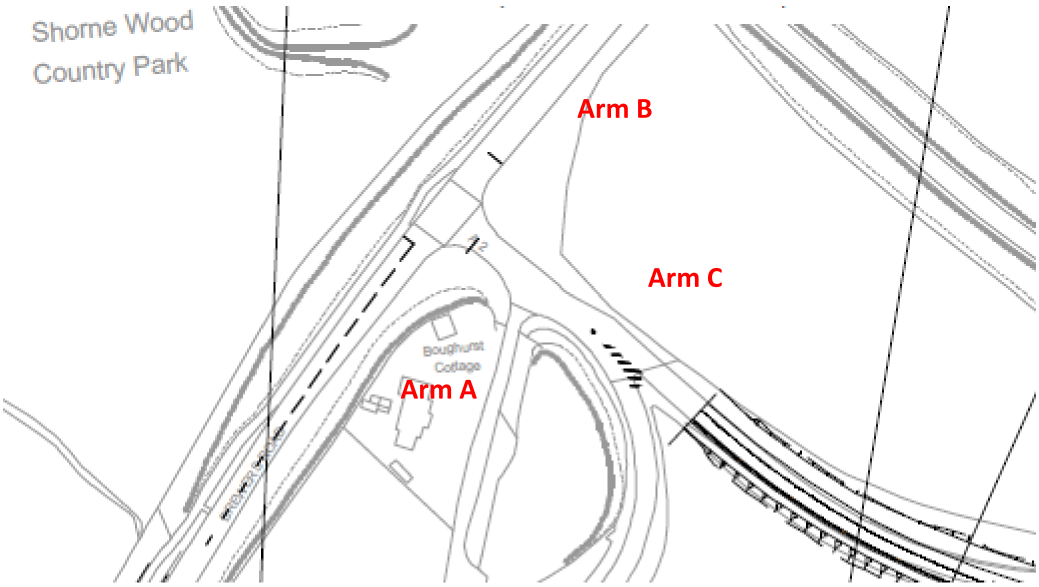
Junction Context

5.9.1 Junction 7 would be located on Brewers Road, at the intersection with the on and off slips to the auxiliary link road, north of the A2/M2 corridor. There is currently no active travel trip generator in the vicinity of the junction.

Junction description

5.9.2 Plate 5.8 shows junction 7 as a three-arm, signalised intersection. The junction is non-signalised in the existing situation. Ancient woodland is present on the northern side, severely limiting the opportunity to widen the junction footprint.

Plate 5.8 Junction 7 – Brewers Road junction



Active travel provision

5.9.3 A pavement is located to the north of the junction and would remain. Pedestrian crossing facilities would be on-demand.

Buses

5.9.4 Bus route 416 transit via junction 7, with a bus stop immediately to the north-east on Brewers Road. The signalised intersection would provide the opportunity for a safe pedestrian crossing.

2045 traffic forecasts at the junction

5.9.5 Plate 5.8 shows junction 7 with each entry arm of each junction marked as A, B and C.

5.9.6 Table 5.17 and Table 5.18 show junction 6 is forecast to be free flowing in the AM peak, but saturated on Arm C in the PM peak. Further junction timing optimisation would be required during detailed design, but in practice, a MOVA traffic signal optimisation system would be required. It is not possible to significantly widen the junction due to the presence of ancient woodland.

Table 5.17 Junction 7 – AM Peak Traffic Conditions, 2045

Approach	**Volume (Veh/hr)**	**Number of lanes**	**V/C**	**Delay** (sec.)	**Average Queue Length (m)**	**Maximum Queue** Length (m)
Arm A	118	1	0.23	20	3	32
Arm B	238	1	0.75	15	5	43
Arm C	90	1	0.19	13	2	25

Table 5.18 Junction 7 – PM Peak Traffic Conditions, 2045

Approach	**Volume (Veh/hr)**	**Number of lanes**	**V/C**	**Delay (sec.)**	**Average Queue Length (m)**	**Maximum Queue Length (m)**
Arm A	321	1	0.62	20	9	66
Arm B	159	1	0.50	19	4	32
Arm C	349	1	0.73	31	18	89

Junction conclusion

5.9.7 In conclusion, junction 7, on Brewers Road, a signalised T-junction would operate in free-flow conditions in the AM peak. In the PM peak, improvements to traffic signal timings would be required.

5.10 Local roads conclusion

5.10.1 Overall, the local road junctions are forecast to be free-flowing with no blocking back queues, with the exception of junction 7 where minor adjustments to signal timings on the saturated approach in the PM peak would be required.

6 Conclusions

6.1.1 In conclusion, extensive traffic operation analyses were developed throughout the design development process. The design progressed logically, starting with key weaving segments, followed by interchanges and then local roads.

6.1.2 2045 mainline forecasted traffic conditions are:

a. Project mainline – free-flowing;

b. M25 mainline – free-flowing, with localised merges experiencing capacity issues;

c. A13 mainline – free-flowing, with localised segments at experiencing capacity issues; and,

d. A2 mainline – free-flowing, with localised segments experiencing capacity issues.

6.1.3 Junctions on the local road network are also free-flowing, but the Brewer’s Road junction will require further signal timing optimisation as part of detailed design.

References

Transport for London (September 2010). Traffic Modelling Guidelines Version 3.0

Transport for London (March 2017). Model Auditing Process (MAP) Version 3.5. Engineer Guide for Design Engineer (DE), Checking Engineer (CE) and Model Auditing Engineer (MAE)

Highways Agency (July 2007) - Guidelines for the Use of Microsimulation Software

Transportation Research Board of the National Academies of Sciences, Engineering, and Medicine, United States (2010) – Highway Capacity Manual

Glossary

Term	Explanation
AADT	Annual Average Daily Traffic
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	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	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.
HCM	Highway Capacity Manual published by the Transportation Research Board of the National Academies of Sciences, Engineering, and Medicine in the United States
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
LTAM	Lower Thames Area Model
LTC	Lower Thames Crossing
MCC	Manual Classified Counts
NB	Northbound
OS	Ordnance Survey
PCU	Passenger car unit - A metric to allow different vehicle types within a traffic model to be assessed in a consistent manner
PICADY	A design and assessment tool used to predict capacities and queues at isolated priority junctions
PTV	German for Planning Transport and Traffic Software package
SATURN	Simulation and Assignment of Traffic to Urban Networks

Term	Explanation
SB	Southbound
TAG	Transport Analysis Guidance published by DfT
TfL	Transport for London - The integrated body responsible for London's transport system
UC	User Class
VDM	Variable Demand Model
VISSIM	Micro-simulation software developed by PTV. Verkehr In Städten - SIMulationsmodell (German for "Traffic in cities - simulation model)
WB	Westbound

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