M2 Junction Analysis Technical Note

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M2 Junction Analysis Technical Note

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1. Introduction

1.1 Foreword

As Kent Transport Model (KTM) custodian to Kent County Council (KCC), Jacobs have developed the Medway Transport Model (MTM) to develop the required strategic modelling necessary to provide the evidence base for the Regulation 19 (Reg19) Local Plan (LP) consultation for Medway Council (MC). The MTM follows a standard sufficient for this purpose, with due regard to Transport Analysis Guidance (TAG) and was accepted by National Highways (NH), further details of the model development can be found in the supporting "Local Model Validation Report".

NH have requested further analysis of the proposed LP allocations impact on the junctions within and bordering Medway that are on the strategic road network (SRN); this considers M2 Junctions 1-5. This document seeks to analyse the junctions in terms of Base Year Validation and Forecast Year performance.

2. Model Assessment

2.1 Introduction

There are five M2 junctions (on the SRN) within the Medway Area of Detailed Modelling (AODM) which have been discussed further within this report in terms of Base Year performance and Forecast Year assessment.

2.2 Base Year Performance

2.2.1 Base Model

KCC commissioned Jacobs on behalf of Medway Council to develop the Medway Transport Model (MTM), inherited from the KTM. The KTM was built to help KCC understand how people currently travel strategically around the region and how this might change with future growth and as major schemes and strategic interventions are implemented. The KTM was built with the following objectives:

- To help to develop countywide transport strategies;
- To help to assess the combined strategic impact of major highway schemes;
- To help to provide evidence for early appraisal and sifting of strategic major scheme options and to support the development consent order and town and country planning process on key schemes;
- To help to assess the combined strategic impact of Local Plans on the network, including providing evidence for Local Plan development and hearings (and cumulative impacts once Local Plans are in place);
- To provide evidence and robust, responsive, and persuasive arguments to a range of internal and external stakeholders, including responses to Government department or company consultations;
- The ability to help understand and mitigate the impact of external influences, e.g. Brexit, Housing allocations, National Highways schemes;
- To help to understand suitable phasing of maintenance and utilities work to manage congestion impacts;
- To provide a potential platform for a suite of strategic town/sub-area models or scheme-specific models requiring greater detail;
- To provide a potential basis for highway corridor micro-simulation models in the PTV VISSIM software platform; and
- To provide a potential platform for future dynamic and/or real-time predictive modelling solutions that could help optimise the performance of the existing Kent transport network using technology.

The Medway Transport Model (MTM) is based on the KTM and uses the same model cordon area as the Gravesham Transport Model; the 2019 Base Model has been developed as the primary transport evidence base to inform the Regulation 18 (Reg 18) and Regulation 19 (Reg 19) consultation and mitigation development for the emerging Medway Local Plan.

2.2.2 Base Validation

TAG Unit M3.1 provides guidelines on the validation criteria for individual links. As a check on the quality of the assignment, the assigned flows on individual links were compared against observed counts and the GEH Statistic was obtained to measure the difference between modelled and observed flows.

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

$$GEH = \sqrt{\frac{2\,(M-C)^2}{M+C}}$$

Where:

GEH is the GEH statistic;

M is the modelled flow; and

C is the observed flow.

Whilst further information on the MTM validation can be found in the "Medway Local Model Validation Report", this Technical Note details the specific link performance on the M2 junctions within the Medway Area of Detailed Modelling (AODM).

Link GEH at each junction of interest has further been presented within this note, green bars represent links which pass flow criteria or have a GEH less than 5; the amber bars represent links which do not meet flow criteria and have a GEH just outside criteria between 5-10; the red bars represent links with a GEH greater than 10.

2.3 Forecast Year Assessment

2.3.1 Forecast Models

After the Reg18 consultation in Autumn 2023, refinements were made to the LP strategy, and the following scenarios were developed as part of the Reg19 LP allocations and used to assess the transport impact:

1. 2041 Reference Case (RC): includes completions and consented development and infrastructure planned for the 2019-2041 growth period within Medway; outside of the Area of Detailed Modelling, 'near certain' developments have been modelled in adjoining authorities (Gravesham, Tonbridge & Malling, Maidstone and Swale) and background growth for cars comes from TEMPro v8 (using alternative assumptions tool for adjoining authorities to ensure no double counting). The growth of good vehicles across the model is provided by Road Traffic Forecasts (RTF).

2. 2041 Refined Reference Case (rRC): The rRC was developed as a baseline to assess the Reg19 LP development. The only difference between the RC and rRC is the full build out at the MedwayOne development site, and the consideration of reduced trip rates at consented sites that may benefit from more sustainable transport methods (detailed further in "Medway LP2041 TEB Mode Share Strategy Stage 3_Draft").

3. 2041 Interim Do Something (iDS): built upon the rRC scenario, with the inclusion of proposed interim Reg19 LP allocations and associated infrastructure (where appropriate). The only difference between the rRC and the iDS is the proposed LP demand and infrastructure. The purpose of the iDS scenario was to determine "hot spots" on the Medway network that may require potential junction mitigations.

4. 2041 Final Do Something (fDS): built upon the iDS with the addition of junction mitigations identified in the iDS and the final Reg19 LP site allocations. This scenario also considers the revised trip rates at consented and LP sites that may have provisions for more sustainable transport methods.

The models used to assess the final Reg19 LP allocations with the inclusion of the junction mitigation strategy and potential modal shift opportunities (at consented and LP sites) within Medway are the 2041 fDS models. As such the impact on the M2 Junctions 1-5 detailed within this note has been analysed using the 2041 fDS in comparison to the 2041 rRC.

2.3.2 Forecast Year Performance

The impact of the LP allocations on the SRN was assessed using the 2041 fDS strategic models in comparison to the 2041 rRC. Metrics such as worst turn and link volume over capacity have been obtained at each of the M2 junctions within the Medway AODM, alongside relative queue lengths in locations where link delays are evidenced.

Volume Over Capacity

Volume over Capacity assessment (V/C) has been undertaken to understand link and worst turn performance at the five M2 junctions within Medway AODM. This considers the volume of vehicles divided by the available capacity on the road and is summarised in one of the four categories detailed in Table 2-1.

Table 2-1: Link Volume Over Capacity Assessment Criteria

Volume over Capacity Thresholds	Impact Assessment
V/C <75	Operating within capacity
75 <= V/C <85	Operating within capacity but approaching 85%
85 <= V/C <100	Operating close to capacity
V/C >= 100	Over capacity

Whilst the strategic model offers a useful indicator of performances of junctions or roads that are impacted, further Merge/ Diverge assessment has been undertaken using the modelled flows to ascertain whether the existing junction alignment is sufficient in accommodating the traffic growth. The outputs of this assessment are further detailed in Medway LP Merge/ Diverge Assessment TN.

Relative Queues

In addition to V/C plots, relative queues have been obtained for those junctions on the network where queues are evidenced in at least one peak or scenario. Relative queue illustrates queue as a percentage of the total link length; i.e. if the relative queue is 20% on a 100m link, there are 20m of queues in that locality.

3. M2 Junctions

The five junctions managed by National Highways within the Medway AODM are commented on throughout this report in terms of the 2019 Base Year validation, 2041 forecast alignment and performance. This report seeks to identify any areas on the network that may be subject to delays or capacity constraints with the additional Reg19 Local Plan growth and should be read in conjunction with the Medway LP Merge/ Diverge Assessment TN.

3.1 M2 Junction 1

3.1.1 Context

M2J1 is the western most junction within the Medway AODM and sits on the Medway/ Gravesham border, forming connections with A289 Hasted Road and A2 Watling Street. With no proposed mitigations in this locality the coding remains same in the 2019 Base Year Model and the 2041 Forecast Models, as illustrated in Figure 3-1.

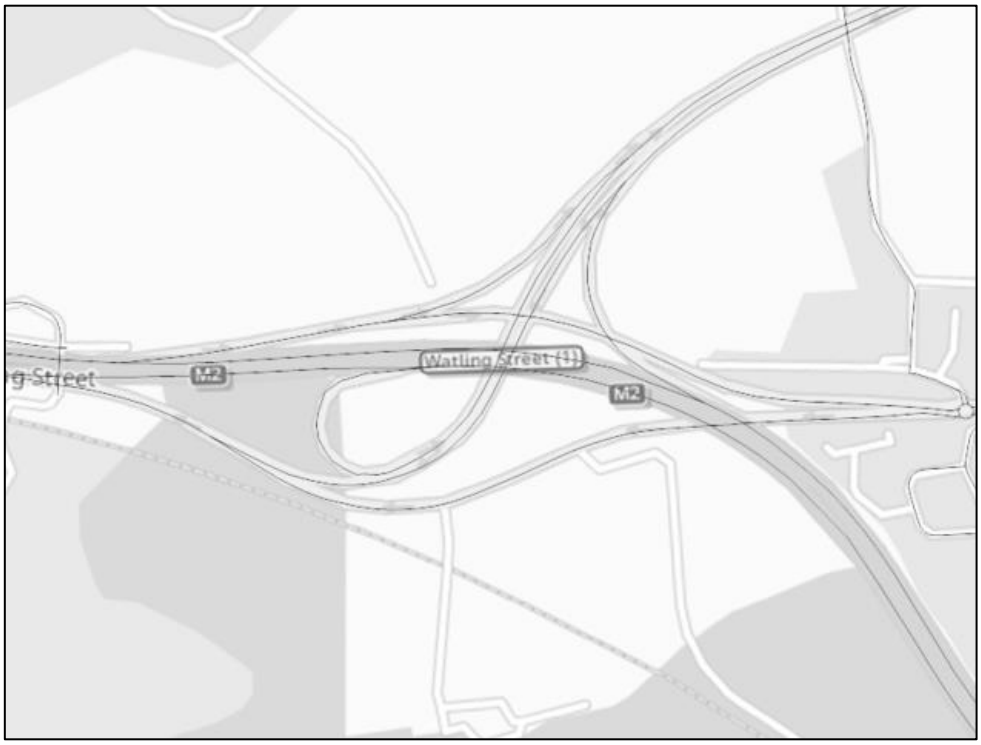

Figure 3-1: M2J1 Network Coding

3.1.2 Base Year Validation

The levels of validation at the M2J1 in the 2019 Base Model are illustrated in Figure 3-2; this identifies that the junctions is well validated with five of the six links illustrated to have a GEH <2 in the AM Peak and all links GEH <2.5 in the PM Peak.

During the AM Peak the A289 Hasted Road southbound approach to the junction has a GEH of 5.5, with the model overestimating flows by 261. The junction captures all flows, with those links sitting just outside of TAG criteria due to an overestimation of link flows, suggesting a worst-case scenario is modelled.

Figure 3-2: M2J1 2019 Base Year Validation (AM Peak left, PM Peak right)

3.1.3 Forecast Performance

The model forecast performance has been analysed in terms of link V/C and queues (where evidenced) in the AM and PM Peak for the rRC Scenario and the fDS Scenario. The purpose of this analysis is to identify any junctions nearing or exceeding capacity with the committed and completed growth between 2019 Base Year and 2041 Forecast year, alongside identifying junctions that the Reg19 Local Plan will have an adverse impact on.

It is important to note that the VISUM model does not include the proposed mitigation at the M2J1, and it is assumed that the junction alignment remains unchanged to the 2019 Base Year.

Reference Case

The V/C of the mainline and merge/ diverge link at the M2J has been obtained for the 2041 rRC and is illustrated in Figure 3-3. This has been summarised below for those links where operation conditions are flagging as 75% or above:

- M2 eastbound off-slip (71% AM, 86% PM)
- M2 eastbound on-slip (87% AM, 74% PM)
- M2 westbound off-slip (72% AM, 63% PM)
- M2 westbound on-slip (78% AM, 62% PM)
- A289 Hasted Road southbound, approaching eastbound on-slip (84% AM, 70% PM)

During the AM Peak, the M2 eastbound on-slip is nearing capacity in both the AM and PM Peak (87% and 74% respectively), with the committed forecast growth only.

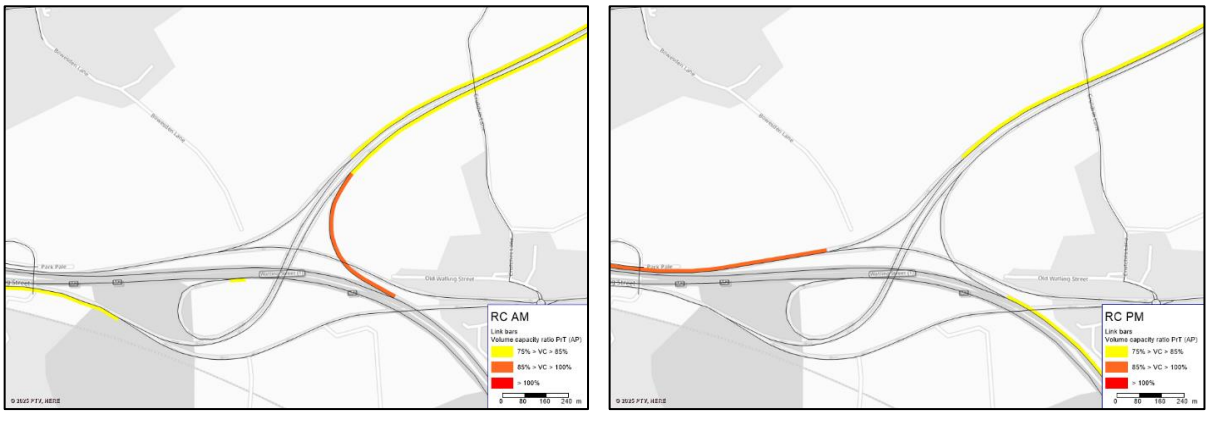

Figure 3-3: M2J1 2041 Reference Case Link V/C Performance (AM Peak left, PM Peak right)

Do Something

The information obtained from the fDS models is detailed in Figure 3-4, with those links noted to have a change in V/C performance summarised in Table 2.

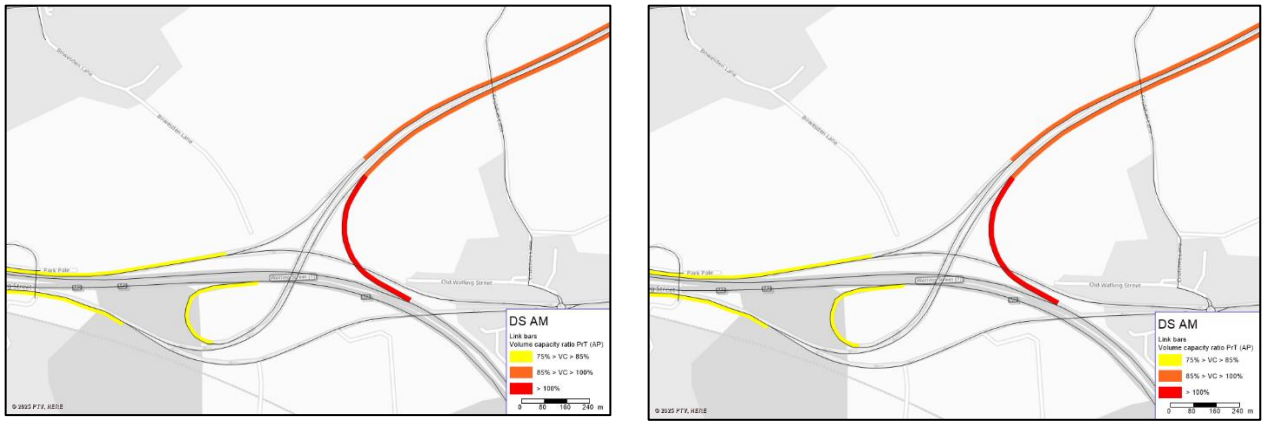

Figure 3-4: M2J1 2041 Do Something Link V/C Performance (AM Peak left, PM Peak right)

Table 2: M2J1 Merge/ Diverge VC (fDS vs rRC)

	VC Ratio					
Link Name	rRC AM	fDS AM	Diff	rRC PM	fDS PM	Diff
M2 eastbound off-slip	71%	78%	7%	86%	98%	12%
M2 eastbound on-slip	87%	110%	23%	74%	100%	26%
M2 westbound off-slip	72%	82%	10%	63%	76%	13%
M2 westbound on-slip	78%	82%	4%	62%	64%	2%
A289 Hasted Road southbound, approaching eastbound on-slip	84%	93%	9%	70%	82%	12%

The M2 eastbound on-slip is over capacity in both the AM and PM Peak of the fDS scenario (110% and 100% respectively). This is a deterioration compared to the rRC whereby these links are nearing capacity (87% in the AM and 74% in the PM).

All other links at the junction are within or approaching capacity. The greatest deterioration of the available capacity when comparing the fDS to the rRC is noted on the M2 eastbound on-slip (23% AM and 26% PM), M2 westbound off-slip (10% AM, 13% PM) and M2 eastbound off-slip (7% AM, 12% PM).

Further analysis of all M2 junctions within the area of detailed modelling (AODM) has been undertaken using CD 122 Merge/ Diverge assessment to ascertain the potential need for mitigation. This assessment identified that the M2 J1 eastbound merge and A289 Hasted Road diverge requires mitigation as a result of the Local Plan. This analysis is detailed in Medway LP Merge/ Diverge Assessment TN.

3.2 M2 Junction 2

M2 J2 is entirely within the Medway boundary, formed of a dumbbell junction connecting the M2 to A228 Sundridge Hill and A228 Cuxton Road via Merrals Shaw Interchange to the south. As with M2 J1, there are no mitigations proposed in this location, as such the 2019 Base Year coding is consistent with the 2041 Forecast Year coding, as illustrated in Figure 3-5.

Figure 3-5: M2 J2 Network Coding

3.2.1 Base Year Validation

Link count performance at M2J2 (illustrated in Figure 3-6) shows all M2 links meeting TAG criteria with a GEH <5 in the AM Peak. During the PM Peak, the M2 northbound off-slip sits just outside criteria with a GEH of 8.29 where the model under-estimates flow by 161 vehicles.

A228 Sundridge Hill between Merrals Shaw Interchange and the western dumbbell roundabout fall just outside TAG criteria in the PM Peak with a GEH of <8.1 in both directions. Overall, the junction is considered a close match to observed conditions and will accurately model behaviours in this locality.

Figure 3-6: M2J2 2019 Base Year Validation (AM Peak left, PM Peak right)

3.2.2 Forecast Performance

Reference Case

The link V/C at the junction in the 2041 rRC is illustrated in Figure 3-7 and a summary is listed below of the mainline and merge/ diverge links where their operation conditions are flagging as 75% or above:

- M2 mainline northbound (78% AM, 55% PM)
- M2 mainline southbound (63% AM, 83% PM)
- M2 southbound off-slip (71% AM, 92% PM)
- A228 Sundridge Hill northbound approaching Merrals Shaw Interchange (102% AM, 92% PM)
- A228 Sundridge Hill southbound exiting Merrals Shaw Interchange (94% AM, 107% PM)

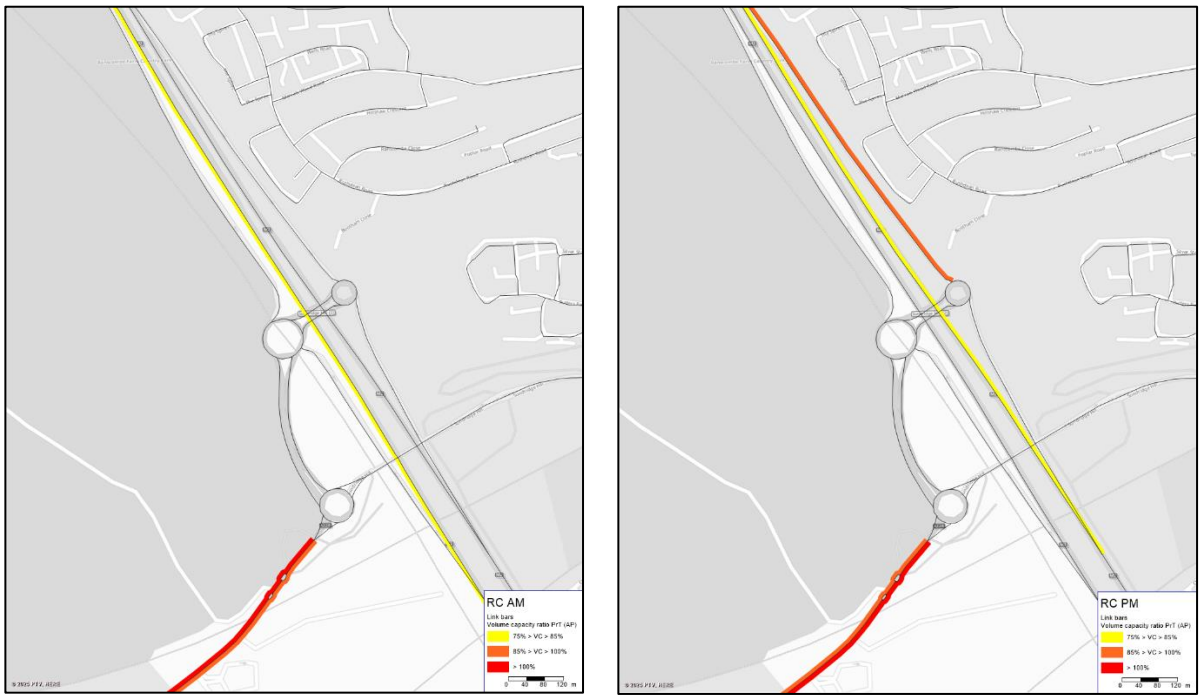

Figure 3-7: M2J2 2041 Reference Case Link V/C Performance (AM Peak left, PM Peak right)

During the AM Peak, the M2 mainline northbound link approaches nearing capacity (78%) and the southbound direction is approaching capacity in the PM Peak (83%), reflecting the tidality of flow in each peak.

Do Something

The information obtained from the fDS models is detailed in Figure 3-8 and the links nearing or exceeding capacity are summarised in Table 3

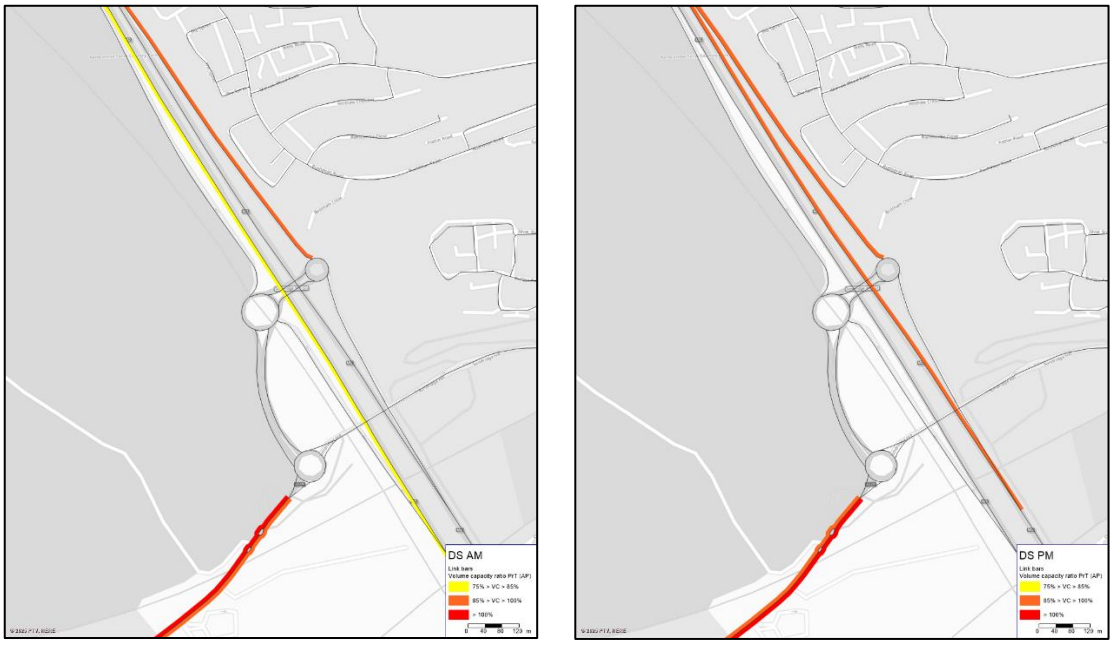

Figure 3-8: M2J2 2041 Do Something Link V/C Performance (AM Peak left, PM Peak right)

Table 3: M2J2 Merge/ Diverge VC (fDS vs rRC)

	VC Ratio					
Link Name	rRC AM	fDS AM	Diff	rRC PM	fDS PM	Diff
M2 mainline northbound	78%	79%	1%	55%	59%	4%
M2 mainline southbound	63%	66%	3%	83%	85%	2%
M2 southbound off-slip	71%	86%	15%	92%	98%	6%
A228 Sundridge Hill northbound approaching Merrals Shaw Interchange	102%	103%	1%	92%	94%	2%
A228 Sundridge Hill southbound exiting Merrals Shaw Interchange	94%	95%	1%	107%	107%	0%

Most of the M2 links note minimal changes in V/C ratios (<3%) in fDS when compared to the rRC, remaining in the same V/C performance category, suggesting that the proposed LP allocations will have minimal impacts on the junction performance. An exception to this is M2 southbound off-slip which notes with a deterioration of 15% in AM and 6% in the PM, with these links approaching capacity.

The A228 Sundridge Hill southbound exiting Merrals Shaw interchange notes similar capacity in the rRC and fDS scenarios during both peaks (maximum change of 2% noted).

3.3 M2 Junction 3

The M2J3 Bluebell Hill junction sits within the Medway/ Maidstone border and is formed of two roundabouts; Taddington Roundabout connects M2 with A2045 Walderslade Woods and Lords Leeds Roundabout connects with A229 Maidstone Road.

There is no change in the model coding at this junction between the 2019 existing base year and the 2041 forecast year. With the model coding in this locality is presented in Figure 3-9.

There are proposed upgrades to this junction to improve the junction capacity and performance, however, at the time of model development this was not a consented scheme (April 2024) and as such the existing network is retained.

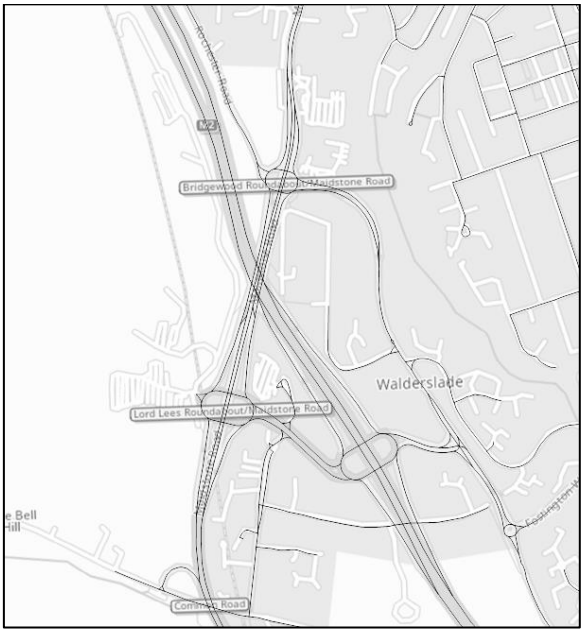

Figure 3-9: M2J3 Network Coding

3.3.1 Base Year Validation

Figure 3-10 presents the GEH statistics at M2J3 in the AM (left) and PM (right) Peak. During the AM Peak, all M2 links (mainline and off/on-slips) are within TAG criteria (GEH <5) and the surrounding links approaching the Taddington Roundabout all within TAG criteria.

The PM Peak model sees the M2 mainline flow and northbound on-slip/ off-slip within TAG criteria with GEH 4.8 or less. The southbound on-slip sits just outside of TAG criteria with a GEH 8.1, where the model is underestimating flow in this locality by approximately 200 flows.

The A229 northbound and southbound off-slip approaches to the Taddington Roundabout sit just outside TAG criteria with GEH of 8.0 (-376 vehicles) and 8.7 (-203 vehicles).

Whilst not all flows meet TAG criteria, it is considered that the model is a good indicator of future performance.

Figure 3-10: M2J3 2019 Base Year Validation (AM Peak left, PM Peak right)

3.3.2 Forecast Performance

Reference Case

The link and turn VC at the junction in the 2041 rRC is illustrated in Figure 3-11 and a summary is listed below of the mainline and merge/ diverge links where their operation conditions are flagging as 75% or above:

- Lord Lees Roundabout circulatory flow approaching A229 Maidstone Road southbound exit (78% AM, 61% PM)
- Taddington Roundabout circulatory flow approaching A229 Maidstone Road exit (78% AM, 61% PM)
- A229 Maidstone Road Southbound, south of on-slip (103% AM, 64% PM)

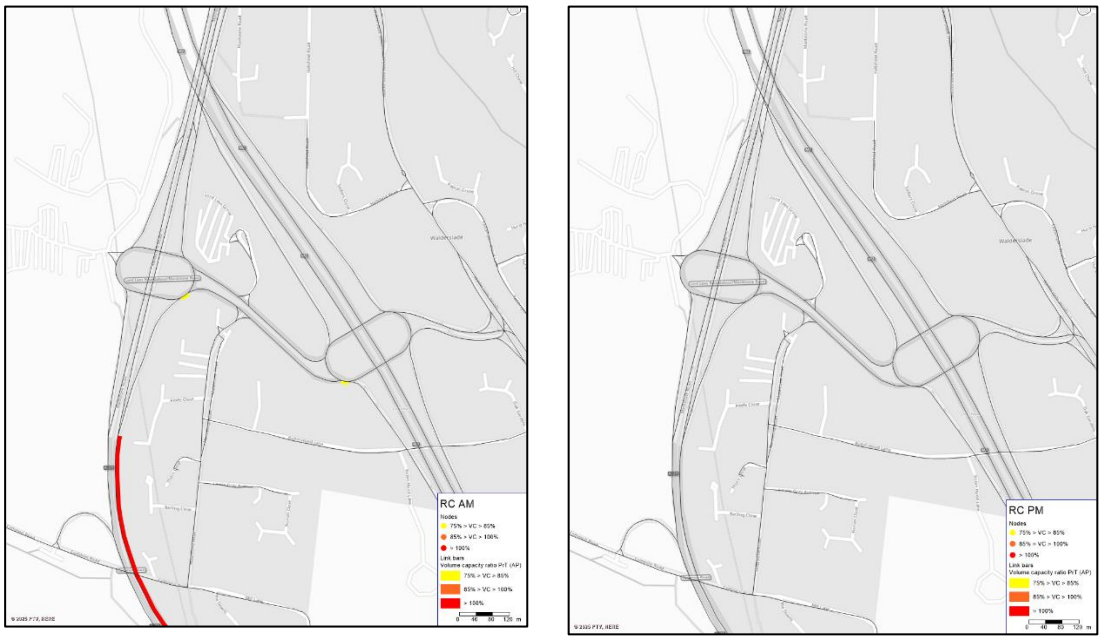

Figure 3-11: M2J3 2041 Reference Case Link V/C Performance (AM Peak left, PM Peak right)

The M2J3 sees most links well within capacity, this is due to the lengthy queues at the junction and surrounding area, which holds flow elsewhere on the network. As a result, vehicles are unable to access the junction, resulting in relatively fewer capacity restraints.

Further local junction modelling has been undertaken for this junction to better understand the junction performance; it is recommended that this report is read in conjunction with the Local Junction Modelling Mitigation Technical Note (December 2025).

Queues

The M2J3 is identified to be heavily congested in both peaks, with queues extending from the A229 Maidstone Road eastbound approach to the Taddington Roundabout beyond the Lord Lees Roundabout (relative queues of 100% noted on A229 northbound off-slip, A229 southbound off-slip and A229 westbound approach to Lord Lees Roundabout).

Additionally, queues are evidenced on the M2 southbound off-slip approaching Taddington Roundabout and extend onto the M2 mainline. With the AM and PM Peak presenting similar levels of queues at the junction.

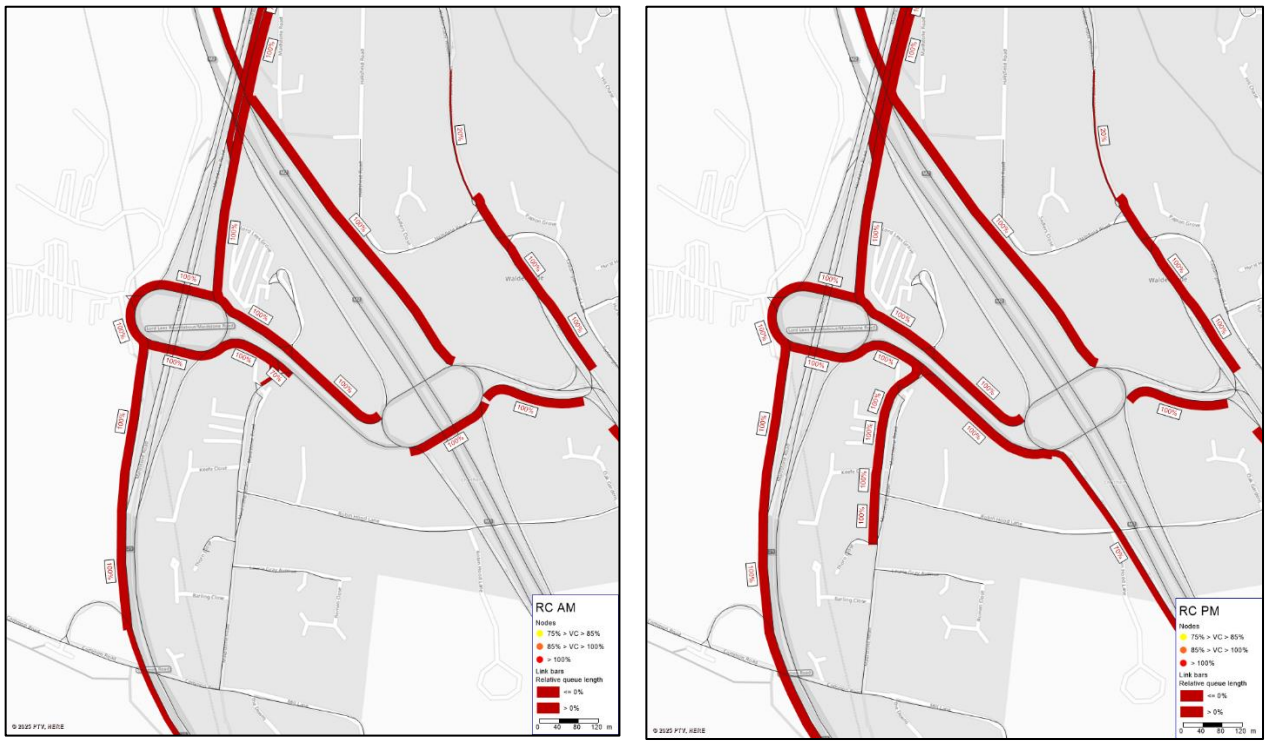

Figure 3-12: M2J3 2041 Reference Case Link Relative Queues (AM Peak left, PM Peak right)

Do Something

The information obtained from the fDS models is detailed in Figure 3-13. The links with a change in capacity greater than 10% when compared to the rRC model are summarised in Table 4.

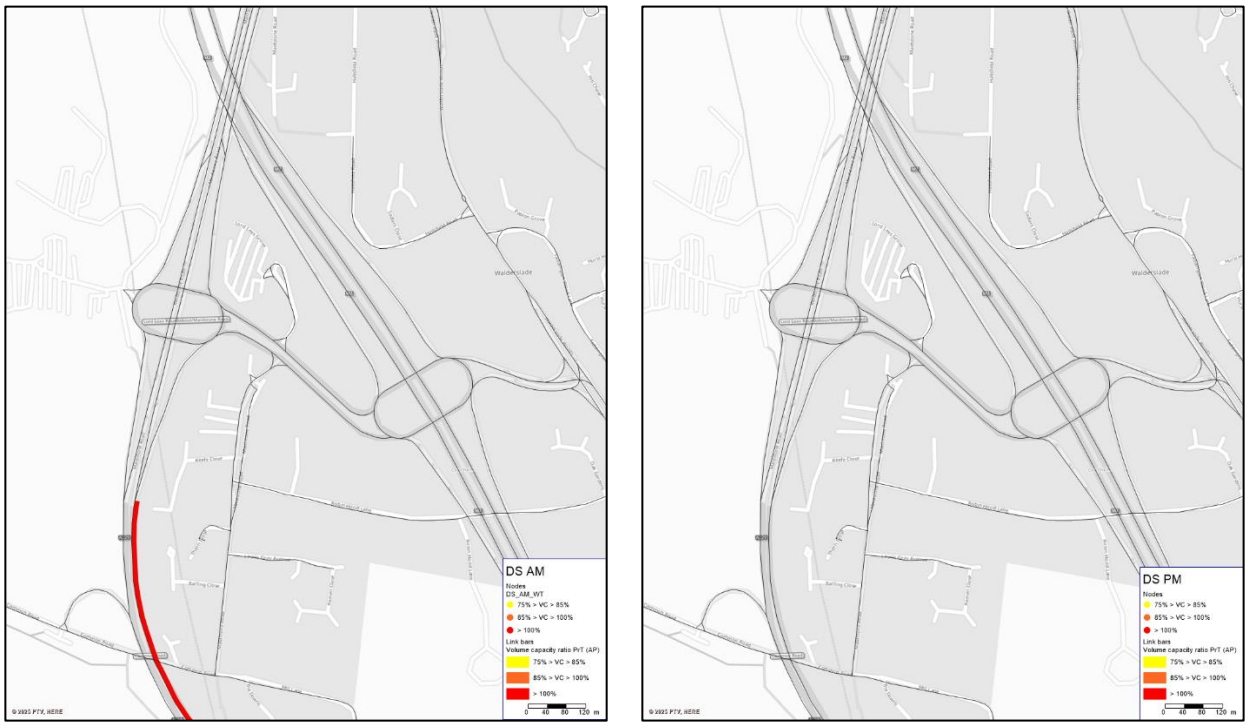

Figure 3-13: M2J3 2041 Do Something Link V/C Performance (AM Peak left, PM Peak right)

Table 4: M2J3 Slip Road VC in DS Compared to RC

Link Name	VC Performance					
	rRC AM	fDS AM	Diff	rRC PM	fDS PM	Diff
M2 northbound off slip	40%	27%	13%	24%	22%	2%
A229 Northbound approach to junction	51%	62%	11%	50%	63%	13%
A2045 westbound approach to junction	30%	21%	9%	32%	15%	17%
A229 Eastbound approach to junction	32%	42%	10%	32%	46%	14%

Most links operate at a similar VC in the fDS models compared to the rRC models. Any changes in link capacity greater than 10% is listed in the table above, this identifies the M2 northbound off-slip and A2045 westbound approach to the junction with improved capacity. The improved capacity on these links is due to the reduced flows in the fDS scenario (-40 and -700 respectively in the PM Peak).

The A229 northbound approach to the junction and A229 eastbound approach to the junction see reduced capacity of up to 14%, however, this both links still operate within capacity (62% and 46% respectively).

Queues

During the AM Peak the queues at the junction remain unchanged to the rRC, with queues anticipated to extend on the A229 northbound mainline, M2 southbound mainline and the A229 between Lord Lees Roundabout and Taddington Roundabout.

During the PM Peak, relative queue lengths of 100% are noted on all approaches to the Taddington Roundabout and the Lord Lees Roundabout. This is unchanged from the rRC scenario. However, the A229 westbound approach to the Maidstone Road signalised junction sees a reduction of queues compared to the rRC due to the change in balance of flow.

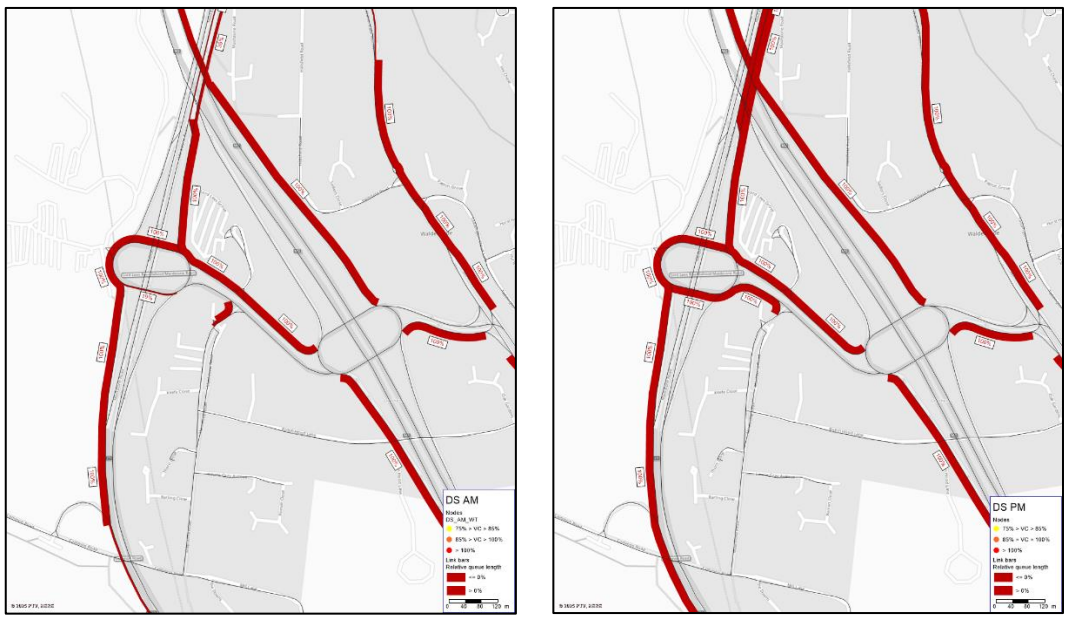

Figure 3-14: M2J3 2041 Do Something Link Relative Queues (AM Peak left, PM Peak right)

The M2J3 has been modelled in detail using local junction modelling (LJM) software, for a more granular analysis of the junction performance. LJM provide detailed, analysis of flows, delays, and capacity that

strategic models cannot capture. Further information on the outcome of this analysis is detailed in the Local Junction Modelling Mitigation Technical Note (June 2025).

3.4 M2 Junction 4

The M2J4 also sits on the Medway/ Maidstone border and forms connections with A278 Hoath Way and The Street. As part of the Lidsing Garden Village application, improvements at the junction are anticipated and were included in the modelling.

At the time of the Regulation 18 modelling (Reg18 RC and DS), the latest available junction alignment from the development masterplan (as discussed with the developers) at this location assumed the following:

- New link road forming connections between North Dane Way and Hoath Way
- Addition of a 1 lane link approach to the south of M2 J4 roundabout
- Realignment of Maidstone Road to connect with the new link road
- Realignment of the Street/ Maidstone Road to connect with the new link road.

The model coding assumed is illustrated in Figure 3-15. This junction alignment was assumed in the Regulation 18 RC, DS models and the Regulation 19 iDS and rRC models as this was the latest available information at the time of the model development.

Figure 3-15: M2J4 Network Coding (rRC)

The initial design (provided in 2024 and presented in Figure 3-15) illustrated that the junction would be over theoretical capacity in both the rRC and iDS scenarios, as such a further conversation between the developer, MC and Jacobs was undertaken.

The proposed junction alignment in this location had progressed and the developer provided an updated design (Spring 2025) which was assessed in Local Junction Modelling software; this identified that the proposed junction could accommodate the proposed growth on the Medway network. The details of the network assumptions are below and presented in Figure 3-16:

1. Proposed signalisation of the circulatory at A278 / Hoath Way, along with a segregated left turn onto the slip lane.

2. A new proposed link road to the south of the roundabout featuring a segregated left turn onto the slip lane.

3. A proposed segregated left turn lane that merges onto the new link road from the M2 westbound slip lane.

4. The number of circulatory lanes will be increased to two, and the white markings will be updated.

5. A proposed segregated left turn from the M2 off-slip eastbound to Hoath Way.

It is important to reiterate that the design and model outputs originate from a third party: Charles and Associates, the developers.

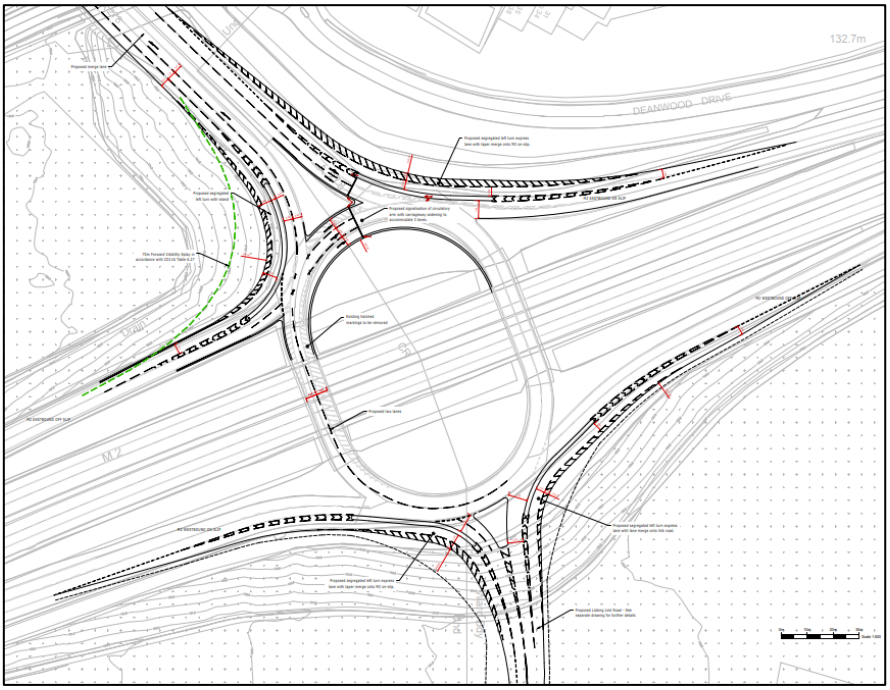

Figure 3-16 -Proposed Layout by Charles and Associates – M2J4

The assumed network coding of the revised M2J4 drawing coded in the VISUM model of the fDS is presented in Figure 3-17.

Figure 3-17: M2J4 Network Coding – fDS

Additionally, whilst the methodology has been agreed, the design drawings of the proposed junction are not finalised and as such revision may be required as the Local Plan is adopted.

3.4.1 Base Year Validation

The 2019 Base Year validation of flows at the existing junction alignment is detailed in Figure 3-18, this indicates that the junction is a close match to observed conditions in both peaks.

The figures identify that all links at the junction have a GEH of 6.8 or less in the AM Peak and 5.3 or less in the PM Peak, therefore all links at the junction have an acceptable GEH with the modelled flows a close match to observed, creating a basis for robust forecasting in this locality.

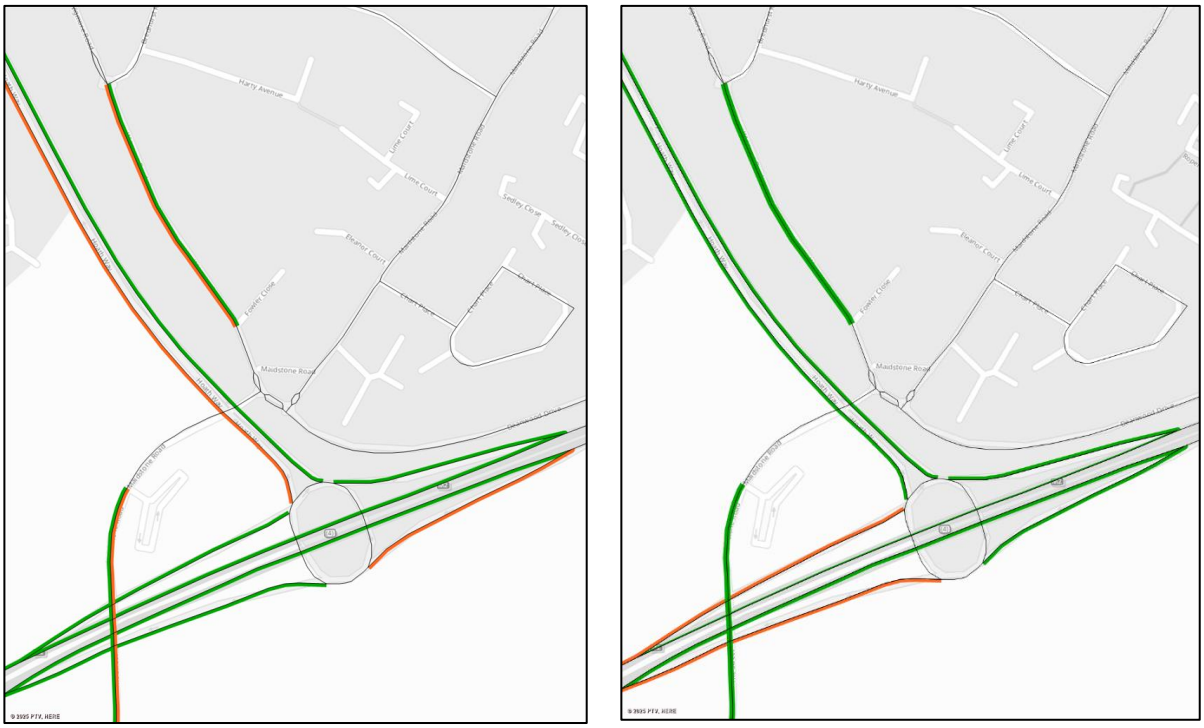

Figure 3-18: M2J4 2019 Base Year Validation (AM Peak left, PM Peak right)

3.4.2 Forecast Performance

Reference Case

The rRC junction performance presented in Figure 3-19 identifies that all links approaching the junction operate within capacity. The M2 mainline link east of the westbound off-slip present V/C value of 106% in the AM Peak. The PM Peak evidence the reverse trend whereby the eastbound mainline east of the eastbound on-slip nears capacity with a VC ratio of 93%.

Figure 3-19: M2J4 2041 Reference Case Link V/C Performance (AM Peak left, PM Peak right)

Queues

The M2J4 junction in the 2041 rRC AM exhibits queuing on the new link road extending to The Street, and on A278 Hoath Way southbound (40%), with delays of up to 40 seconds and 1 minute respectively.

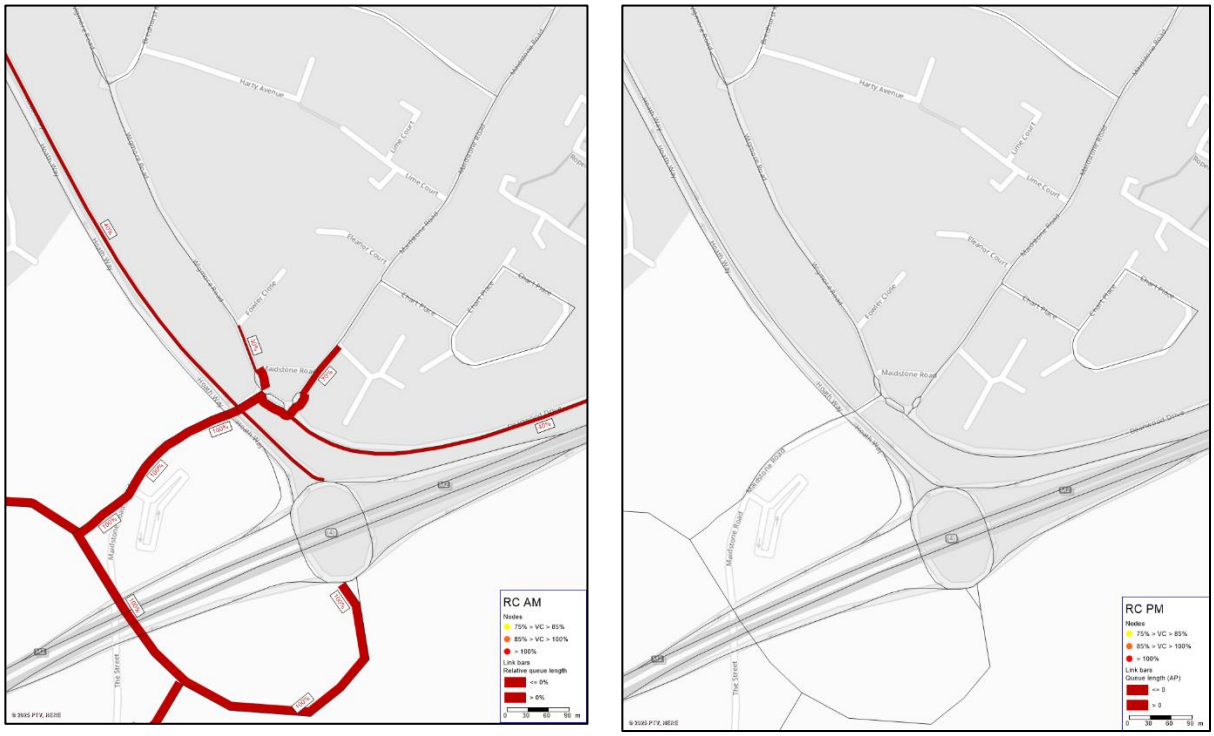

Figure 3-20: M2J4 2041 Reference Case Link Relative Queues (AM Peak left, PM Peak right)

An additional sensitivity test was conducted to ascertain whether inputting the latest design for the M2J4 junction (provided in Spring 2025) into the rRC VISUM model would reduce the queues identified in the AM Peak. This sensitivity test illustrated reduced queues on the proposed fourth arm and the new link road, with minimal impact on the wider network.

Do Something

The information obtained from the fDS models is detailed in Figure 3-21 and the links nearing or exceeding capacity are summarised in Table 5.

Figure 3-21: M2J4 2041 Do Something Link V/C Performance (AM Peak left, PM Peak right)

Table 5: M2J4 VC in DS Compared to RC

Link Name	VC Ratio					
	rRC AM	fDS AM	Diff	rRC PM	fDS PM	Diff
M2 westbound mainline approach to off slip	106%	107%	+1%	77%	80%	-3%
M2 westbound mainline between westbound off slip / westbound on slip	81%	77%	-4%	50%	49%	-1%
Maidstone Road eastbound	43%	72%	+29%	79%	80%	+1%
M2 eastbound on-slip	44%	34%	-10%	82%	41%	-41%
M2 Eastbound, east of on-slip	60%	68%	+8%	93%	94%	+1%

When comparing the rRC scenario with the fDS scenarios, there are similar patterns in available capacity on the M2 links with most of the links nearing capacity seen to have less than 5% change in the AM and less than 4% in the PM.

The M2 westbound mainline flow is exceeding capacity in the AM peak in both the rRC and fDS, this is due to the demand using this route. The M2 eastbound on-slip is seen to have improved capacity, particularly in the PM peak whereby the link is nearing capacity in the rRC (V/C of 82%) to well within capacity in the fDS (41%).

Queues

The queuing conditions at M2J4 DS scenarios are displayed in Figure 3-22. When compared the rRC (Figure 3-20), there is an improvement in junction performance noted. These improvements of queues are due to the revised junction design included in the fDS models which is a more efficient alignment and removes queues.

Figure 3-22: M2J4 2041 Do Something Link Relative Queues (AM Peak left, PM Peak right)

3.5 M2 Junction 5

The M2J5 is just east of Medway district, bordering Maidstone and Swale districts and this forms connections with A249 Sittingbourne Road. Junction improvements were completed in early 2025 and aimed to reduce congestion and improve safety at the Stockbury Roundabout. Key features to these improvements included:

- Stockbury Flyover: A nearly mile-long flyover allowing traffic to bypass the roundabout entirely.
- New Slip Roads: Dedicated slip roads provide direct access from the A249 to the M2, easing traffic flow.
- Enhanced Safety: The redesign addressed the junction's status as one of the top 50 national casualty locations

These changes to the junction have been included in all forecast models, with the junction improvements illustrated in Figure 3-23.

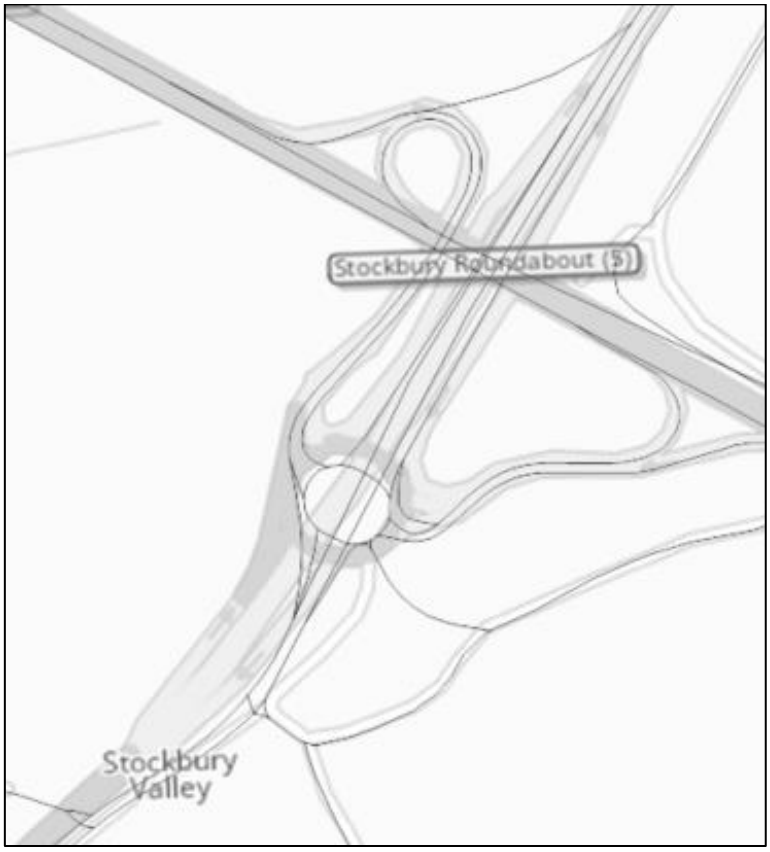

Figure 3-23: M2J5 Network Coding

3.5.1 Base Year Validation

The Base Year validation of flows at the junction are presented in Figure 3-24, this indicates that the junction is a close match to observed conditions in both peaks, with all links indicating a GEH <6. Although, it is important to note that the junction has not been validated to the improvements completed in early 2025.

Figure 3-24: M2J5 2019 Base Year Validation (AM Peak left, PM Peak right)

3.5.2 Forecast Performance

Reference Case

The model indicates that in the 2041 Forecast Year the following links will be over capacity in one or both peaks (as illustrated in Figure 3-25):

- M2 westbound mainline, west of on-slip (106% AM, 77% PM)
- M2 eastbound mainline, approaching off-slip (60% AM, 93%PM)
- M2 eastbound on-slip (107% AM, 125% PM)
- M2 eastbound off-slip to A249 Sittingbourne Road northbound (92% AM, 150% PM)
- M2 westbound off-slip (95% AM, 83% PM)
- A249 Sittingbourne Road southbound slip road to M2 westbound on-slip (135% AM, 105% PM)
- A249 Sittingbourne Road southbound, south of Stockbury Roundabout (89% AM, 61% PM)

Figure 3-25: M2J5 2041 Reference Case Link V/C Performance (AM Peak left, PM Peak right)

The junction improvements in this vicinity were implemented to improve safety and journey time reliability; whilst the junction presents capacity constraints, no queues are indicated in the VISUM model in the vicinity of the junction with the forecast growth. Local Junction Modelling of this location should be undertaken if detailed analysis on queues is required.

During the AM Peak, the M2 eastbound on-slip, M2 westbound mainline flow and slip road from A249 Sittingbourne Road to M2 westbound are forecast to be considerably over capacity (VC ratio of 107%, 106% and 135%, respectively). These constraints result in actual travelled speeds of 20mph despite of a 40mph speed limit on the M2 eastbound slip to A249 Sittingbourne Road.

In the PM Peak, the constrained capacity intensifies, particularly on the M2 eastbound on-slip, which reaches 125% in V/C with link delays over 1 minute and 51 seconds and reduced travel speeds to 15mph. The M2 eastbound off-slip to A249 Sittingbourne Lane northbound is also severely impacted with 150% of V/C and associated link delay and travel time impacts.

Do Something

The information obtained from the fDS models is detailed in Figure 3-26 and the main links causing concern are summarised in Table 6.

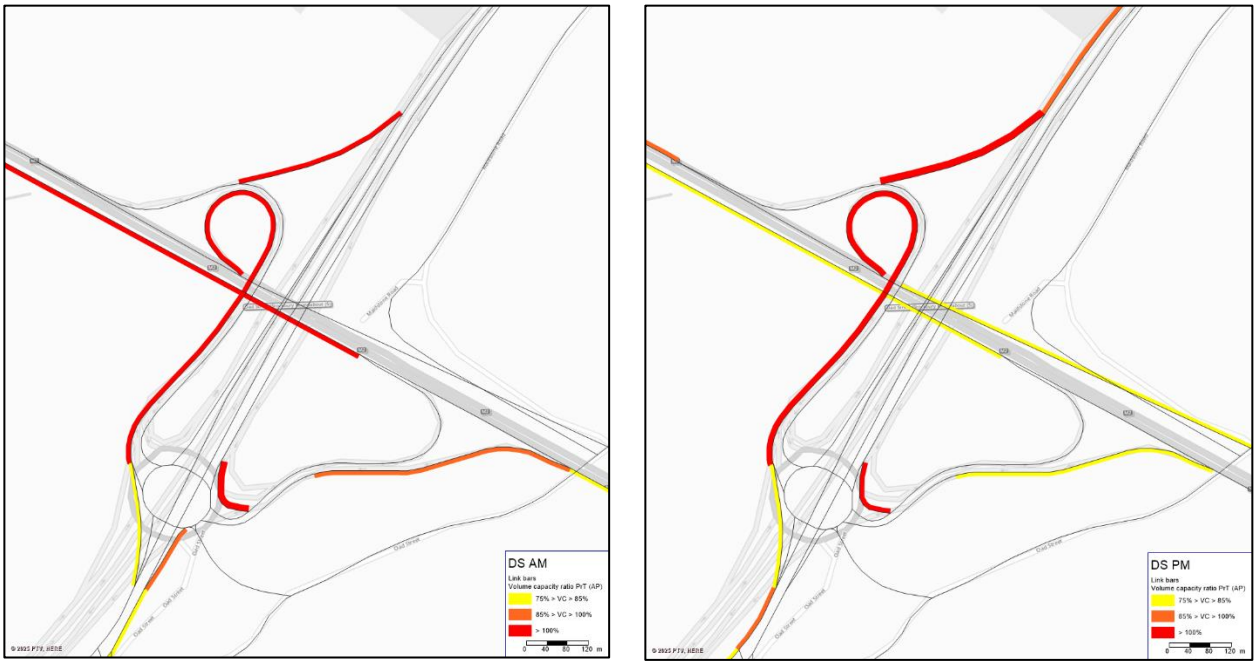

Figure 3-26: M2J5 2041 Do Something Link V/C Performance (AM Peak left, PM Peak right)

Table 6: M2J5 Links of Interest; VC in DS Compared to RC

Link Name	VC Ratio					
	RC AM	DS AM	Diff	RC PM	DS PM	Diff
M2 westbound mainline, west of on-slip	106%	107%	1%	77%	80%	3%
M2 eastbound mainline, approaching off-slip	60%	68%	8%	93%	94%	1%
M2 eastbound on-slip	107%	106%	1%	125%	125%	0%
M2 eastbound off-slip to A249 Sittingbourne northbound	92%	103%	11%	150%	154%	4%
M2 westbound off-slip	95%	96%	1%	83%	83%	0%
A249 Sittingbourne Road southbound slip road to M2 westbound on-slip	135%	142%	7%	105%	106%	1%
A249 Sittingbourne Road southbound, south of Stockbury Roundabout	79%	82%	3%	61%	62%	1%

There are no major changes between the rRC scenarios and the fDS scenarios, with the biggest difference in VC capacity noted at 11%, as shown in Figure 3-26. During the AM peak, the 11% change in capacity is noted on the M2 eastbound off-slip to A249 Sittingbourne northbound where the link becomes over capacity (V/C 103%).

As summarised in Table 6, there are four links exceeding capacity in the AM Peak and three links exceeding capacity in the PM Peak. The M2 eastbound on-slip displays a V/C ratio of 125% in the PM Peak, however this is unchanged between the rRC and fDS.

Another concerning link is A249 Sittingbourne southbound slip road to M2 westbound on-slip which sees its VC reach 142% in the AM Peak, leading to 12 seconds of link delay (200% increase compared to an uncongested network) and 15mph travel speeds.

This analysis shows that this junction significantly over capacity in the rRC scenario, and the forecast LP allocations will have minimal impacts on the overall junction performance.

3.6 Summary

The available capacity at each of the M2 junctions within the AODM is largely unchanged when comparing the fDS and rRC (<5% in most cases), with the exception of the M2J1 whereby the M2 eastbound on-slip which notes a decreased capacity of 23% in the AM (from 87% in rRC to 110% in fDS), and 26% in the PM (from 74% in RC and 100% in DS). It is important to note that the VISUM model at this location does not include the proposed mitigation at the M2J1 and it is assumed that the junction alignment remains unchanged to the 2019 Base Year.

The M2J3 has been modelled in detail using local junction modelling (LJM) software, for a more granular analysis of the junction performance. The LJM provided a detailed, analysis of flows, delays, and capacity at the junction. Further information on the outcome of this analysis is detailed in the Local Junction Modelling Mitigation Technical Note (December 2025).

All other junctions present limited change on the SRN in terms of link and turn V/C when comparing the fDS and the rRC, further supporting the conclusions from the M2 Medway LP Merge/ Diverge Assessment TN.