M5 Junction 9

Updated Committed Developments Technical Note

Client name	Project name	Date	Project number
National Highways	M5 Junction 9	11 February 2025	
Prepared by	**Approved by**	**Checked by**	**Verified by**
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Revision History

Revision	Revision date	Details	Name	Position
1	11/04/2025	Appendix B Update	Matthew Rainsford	Principal Engineer
2	10/07/2025	Assessment of PJA Mitigation Measures	Dmitrijs Stepanovs	Senior Consultant
3	15/07/2025	Updated tests and client comments	Dmitrijs Stepanovs	Senior Consultant

1 Introduction

Background

National Highways commissioned AECOM to undertake a forecasting assessment for the validated M5 J9 Paramics model to identify congestion hot spots as part of the traffic evidence base for the South Worcestershire Development Plan (SWDP) Examination. The aim of the study was to develop forecast demand matrices and to update the existing Paramics Discovery model by reflecting the future developments in the model to highlight any potential areas of congestion which may require future mitigation. As part of the Do-Something scenario modelling, solutions were identified in areas where significant congestion was noted.

Further to this, AECOM has been commissioned to identify and include additional committed developments that were not previously included in the modelling.

The location of the study area is shown in Figure 1 below.

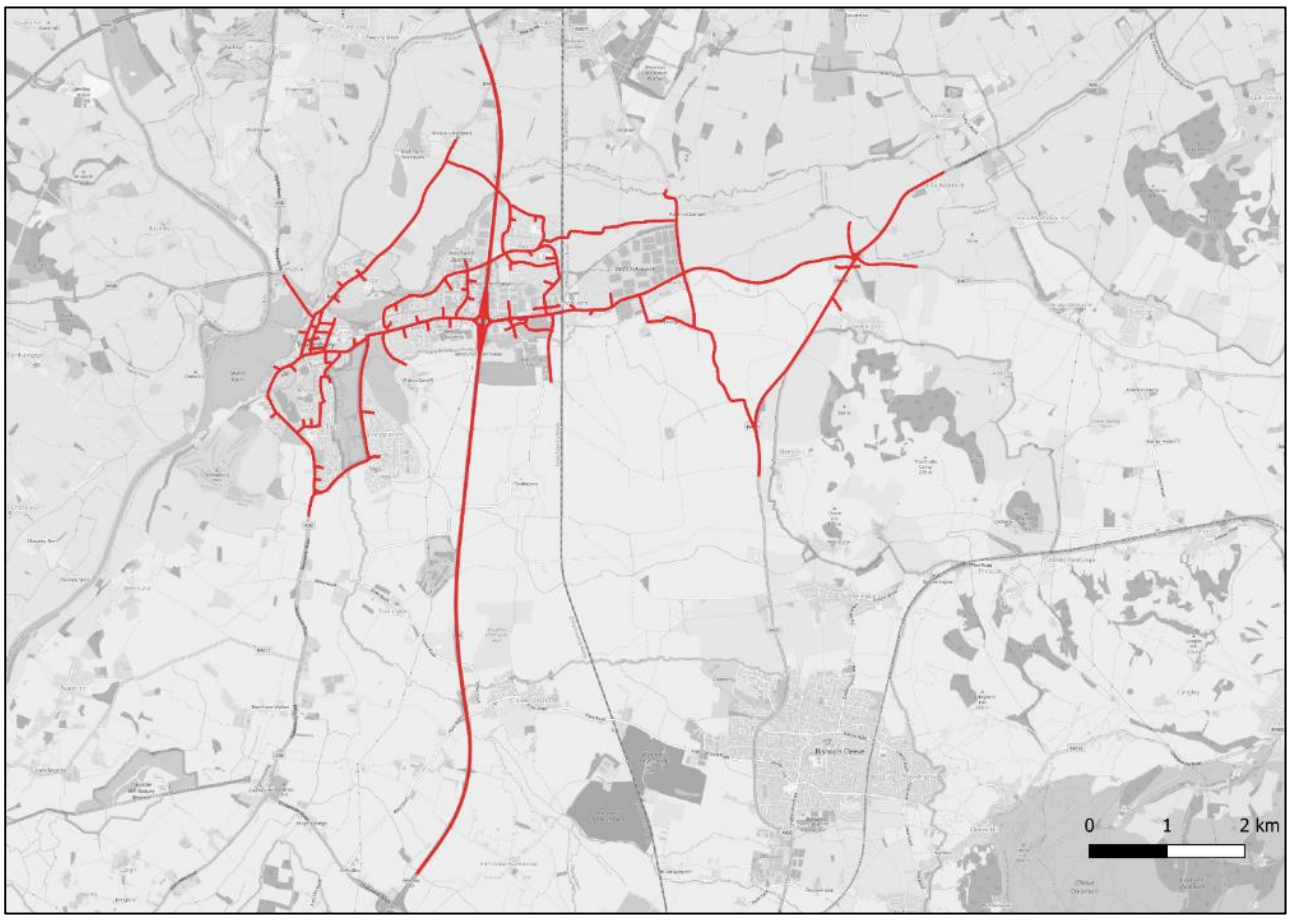


Figure 1: Study Area

Assessment Models

The assessment has been prepared using information from two traffic models, namely:

The Worcestershire Strategic Transport Model (WSTM), which was developed using VISUM software; and

The M5 Junction 9 model, which was developed by AtkinsRealis using Paramics Discovery software.

The WSTM is a strategic demand model which has been used to develop South Worcestershire Development Plan. The M5 Junction 9 Paramics Discovery model has been largely used to assess the impact on the strategic and local road network. It should be noted that a cordon from the WSTM was provided to AECOM to estimate forecast demands. The extents of the Paramics Discovery network have been used to estimate this cordon.

The existing models received from AtkinsRealis included a validated Base model and a Do-Nothing model which included all committed network improvements. These models were developed using the microsimulation software Paramics

Discovery, which allows for the simulation of traffic patterns in great detail, displaying all road users and their interactions in one single model. The Paramics Discovery version used for this study is 26.03.

Project Summary

This assessment covers both weekday morning and evening peak periods and considers the following scenarios:

2041 Do-Something – A cordon model of the Worcestershire Strategic Traffic Model (WSTM) representing the Do-Something scenario that includes committed developments, capacity enhancement schemes and mitigation measures addressing the previously identified "hotspot" locations. This model will be referred to as the 2041 Do-Something without Mitton model.

2041 Do-Something with Mitigation measures – As above with the inclusion of mitigation schemes and the Mitton Development. This model will be referred to as the 2041 Do-Something with Mitton model.

The Mitton Development is a proposed residential development of up to 1,000 dwellings, located to the north-east of Tewkesbury Town centre adjacent to the existing urban residential area along the Bredon / Tewkesbury Road.

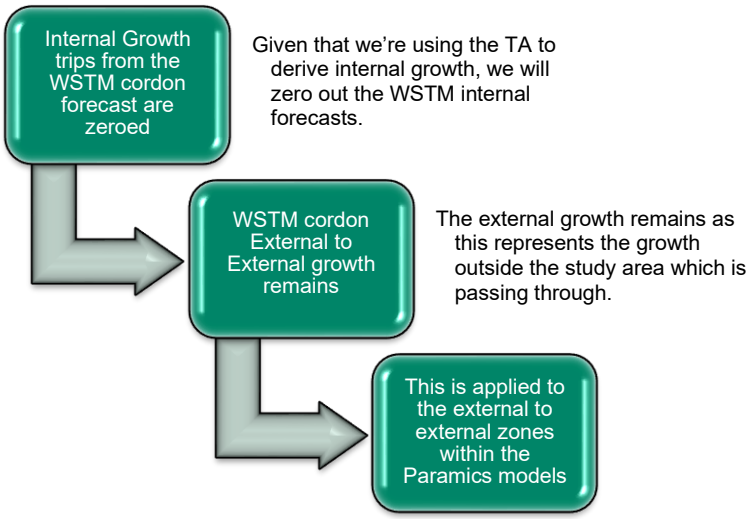
The purpose of this Technical Note is to present the results of the micro-simulation modelling undertaken to assess the impacts of the committed developments on the M5 Junction 9 and surrounding road network.

Further to completion of the initial assessment undertaken in February 2025 as discussed above and presented in Chapter 6, AECOM were provided with revised mitigation measures by PJA aimed at addressing congestion in Tewkesbury. AECOM were commissioned to model these measures with the analysis presented in Chapter 7.

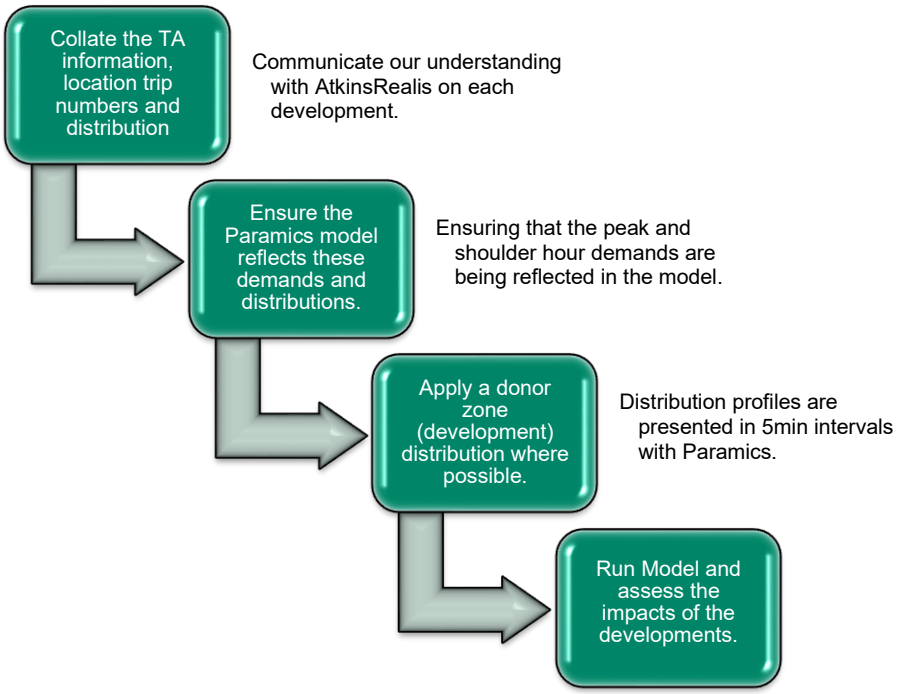
2 Modelling Methodology

The following presents a summary of the modelling methodology adopted for this assessment.

Stage 1: Apply the WSTM growth to the Paramics Discovery model.



Stage 2: Apply the committed development trips to the Paramics Discovery model and assess the impact.



3 Review of Committed Developments

The Transport Assessments (TAs) for each of the committed developments to be included in the modelling have been reviewed and information on the type of development, trip rates, estimated traffic generation and distributions has been extracted. The committed developments that have been included in the model are shown in Figure 2 below.

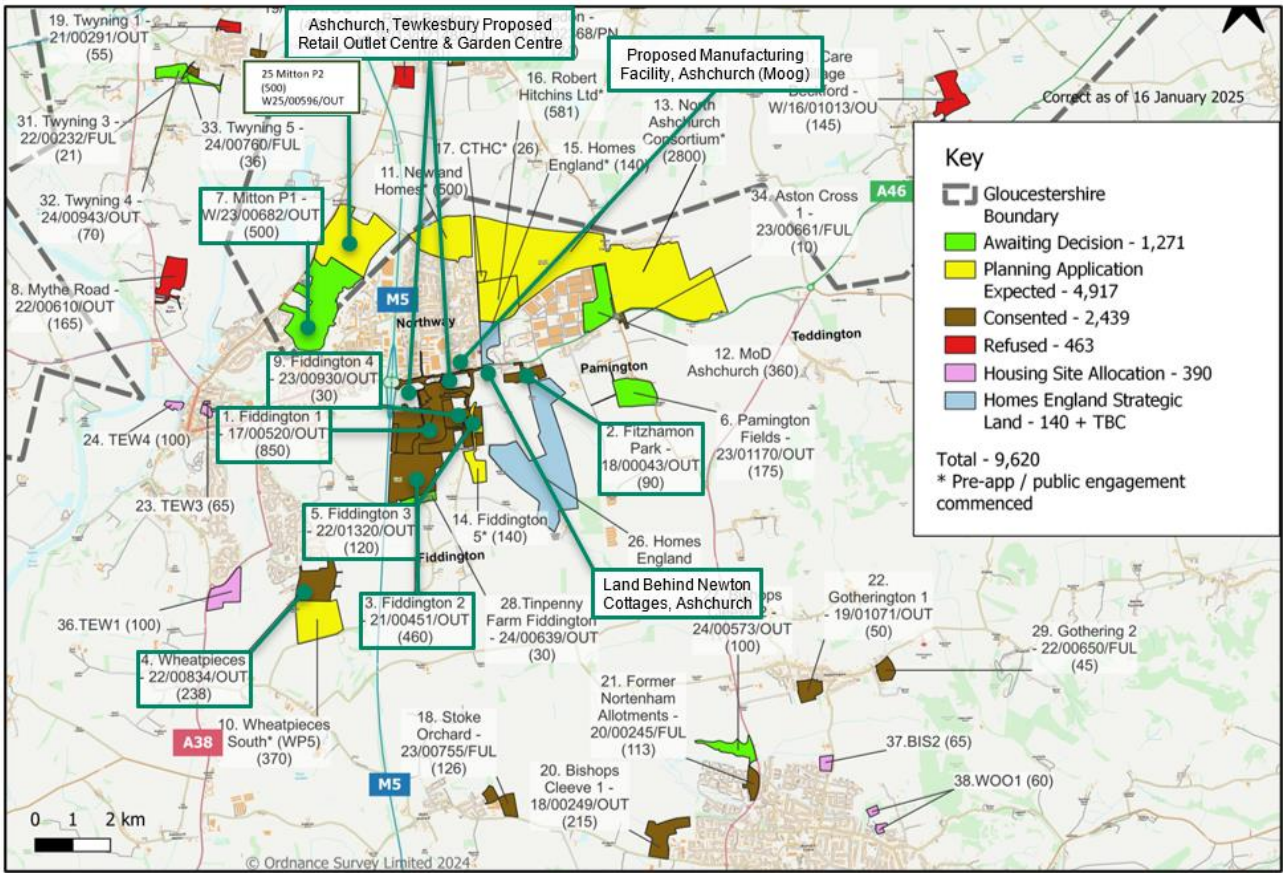


Figure 2: Location of Committed Developments

Table 1 below lists the committed developments that are being considered within the model and their location within the Paramics Discovery model, as well as the estimated traffic generation being added to the model for each of the developments.

Table 1: Committed Developments included within the Model

Proposed Development	Paramics Zone	Description	Peak Hour				3-Hour Peak Period			
			AM Peak		PM Peak		AM Peak		PM Peak	
			Arrival	Departure	Arrival	Departure	Arrival	Departure	Arrival	Departure
Land Behind Newton Cottages	Zone 60	44 dwellings	7	20	19	12	19	53	52	33
Wheatpieces	Zone 61	238 dwellings	40	95	90	38	108	254	249	105
Fiddington 3	Zone 62	120 dwellings	16	46	42	19	40	101	112	58
Fiddington 4	Zone 63	30 dwellings	4	11	10	5	16	46	42	19
Moog Site	Zone 64	Manufacturing Facility	51	8	5	62	310	49	24	310
Retail Outlet Centre & Garden Centre	Zone 70	8,000m^2 Garden Centre + 17,545m^2 Retail Outlet	119	24	176	286	431	87	532	864
Fitzhamon Park	Zone 71	90 dwellings + 66 bed Care Home + 495m^2 Community Centre	18	36	32	21	48	96	88	58
Fiddington 2	Zone 72	460 dwellings + 210 pupil Primary School	120	211	169	81	234	438	457	256
Fiddington 1	Zone 73	850 dwellings + Primary School (or 900 dwellings)	116	309	310	185	305	692	771	529
Mitton Development	Zone 444	1,000 dwellings	166	389	327	231	390	893	897	678
Total, excluding Mitton Development			**371**	**760**	**853**	**709**	**1,511**	**1,816**	**2,327**	**2,232**
Total, including Mitton Development			**537**	**1149**	**1180**	**940**	**1,901**	**2,709**	**3,224**	**2,910**

In terms of additional external to external trips being placed on the model based on the proposed local plan, there are 1,200 light vehicles in the AM peak hour and 1179 light vehicles in the PM peak. The majority of these trips are traveling along the M5, with 1,025 light vehicles (2-way) during the AM peak and 925 light vehicles during the PM peak (2-way), therefore the remaining external movements through the study area are minimal.

Further information on each of the committed developments listed above, as well as the trips rates and distributions associated with each of the developments, can be found in Appendix A.

4 Modelling Assumptions

As part of this updated modelling task, route choice within the Mitton development has been incorporated into the model. Following consultation with PJA, the consultants who are leading the modelling for the Mitton development, connectivity between the two parts of the development was discussed. It was noted that connectivity between the two parts of the development has been assumed and, whilst the internal design would not encourage rat-running to avoid the Hardwick Bank Road / Tewkesbury Road junction, it would allow development traffic to by-pass this junction. Therefore, the models have been updated to reflect this connectivity which provides route choice for vehicles travelling to / from the Mitton development.

5 Mitigation Measures

Committed Infrastructure Changes applied to Models

As noted earlier in this Technical Note, the Paramics Discovery models received from AtkinsRealis included a validated Base model and a Do-Nothing model which included all committed network improvements. The following network improvements have therefore been applied to the Do-Something scenario models:

New signalised junction on the A46 providing access to the new Moog site development, as shown in Figure 3 below; and

Sections of the circulating carriageway at M5 Junction 9 widened, as shown in Figure 4.

It should be noted that an additional change was required to the models, which was the removal of the traffic signals on the westbound approach to M5 Junction 9. This was discussed with National Highways who confirmed that there was no commitment to upgrade this approach. This change has therefore not been applied to the models.

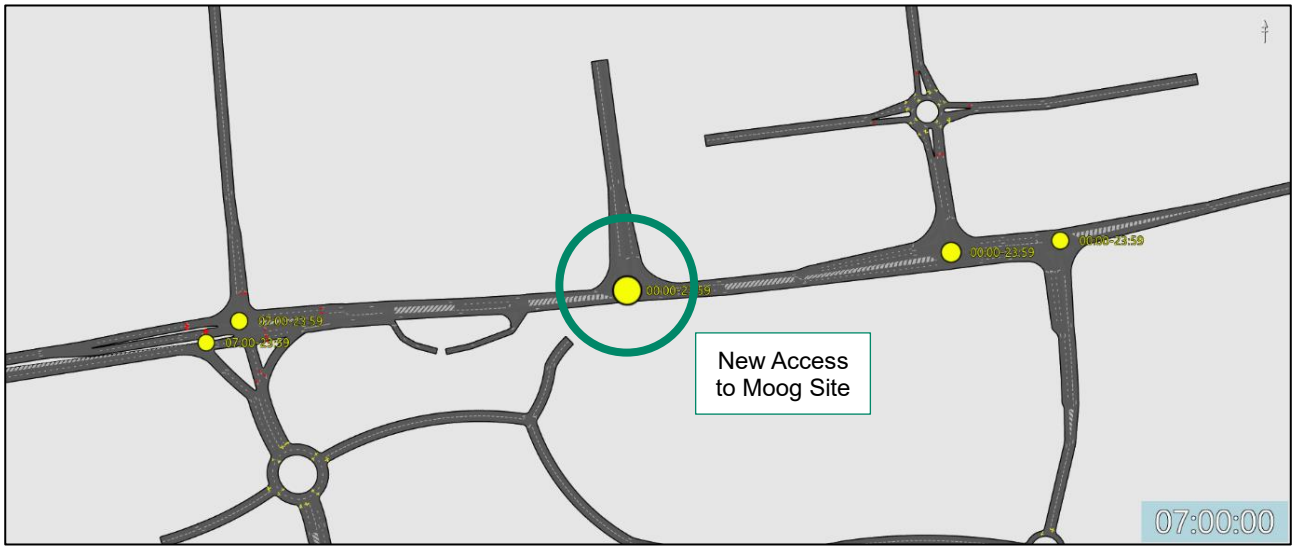


Figure 3: Access to the Moog Site Development

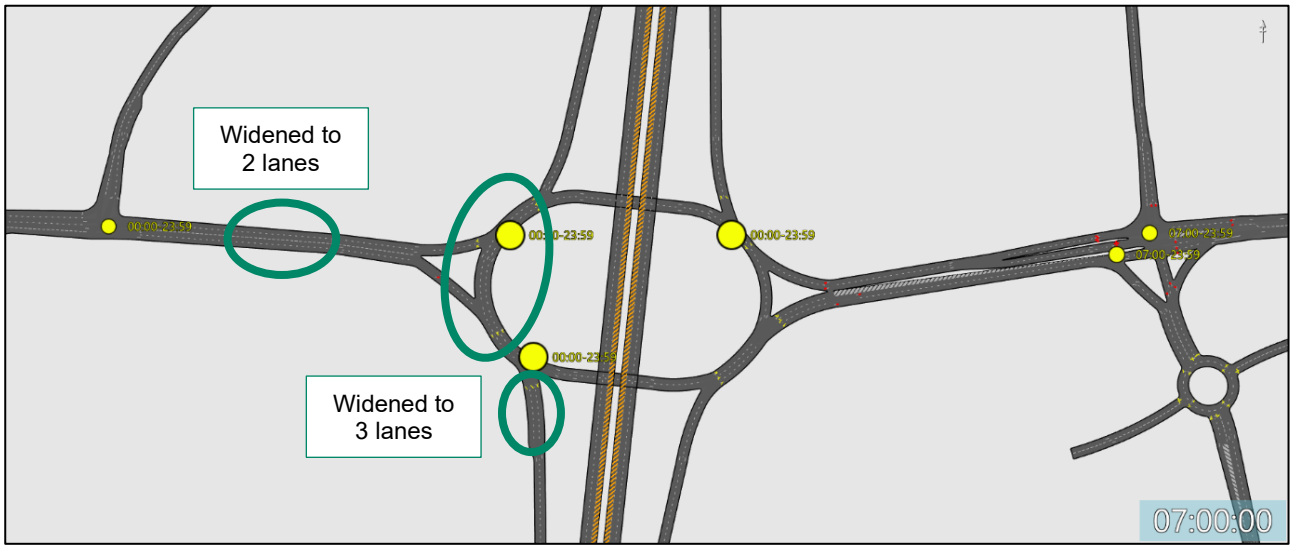


Figure 4: Improvements to M5 Junction 9

Further network changes have been applied to the Do-Something models in this assessment as mitigation measures. These network changes are summarised in Table 2 below.

Table 2: Network Changes

No.	Description of Mitigation Measure	2041 Do-Something without Mitton	2041 Do-Something with Mitton
1	Removed give way to oncoming traffic on Northway Lane, nearby Shannon Way / Northway Lane junction.	X	X
2	Signalisation of Sun St / High St and Oldbury Rd / B4080 junctions.		X
3	Increased junction capacity to allow 2 lanes WB at the A438 / A38 junction. Increased Green Time for WB approach.		X
4	Removed give way to oncoming traffic on Northway Lane in the residential area.	X	X
5	Increased green time on SB approach at Shannon Way / Northway Lane junction.		X
6	Increased junction capacity to allow 2 lanes on the Hardwick Bank Road approach to the Hardwick Bank Road / Tewkesbury Road junction.		X

Note: It should be noted that mitigation measures 1 and 4 are not recommendations in the physical world, but are instead used within the model to allow smoother operation in order to produce sensible model outputs.

Signalisation of Sun Street / High Street and Oldbury Road / B4080 Junctions

As part of the proposed mitigation measures for the Do-Something scenario, the junctions at Sun St / High St and Oldbury Rd / B4080 were identified as benefiting from signalisation (Network Change No. 2). The locations of these junctions are shown below in Figure 5.

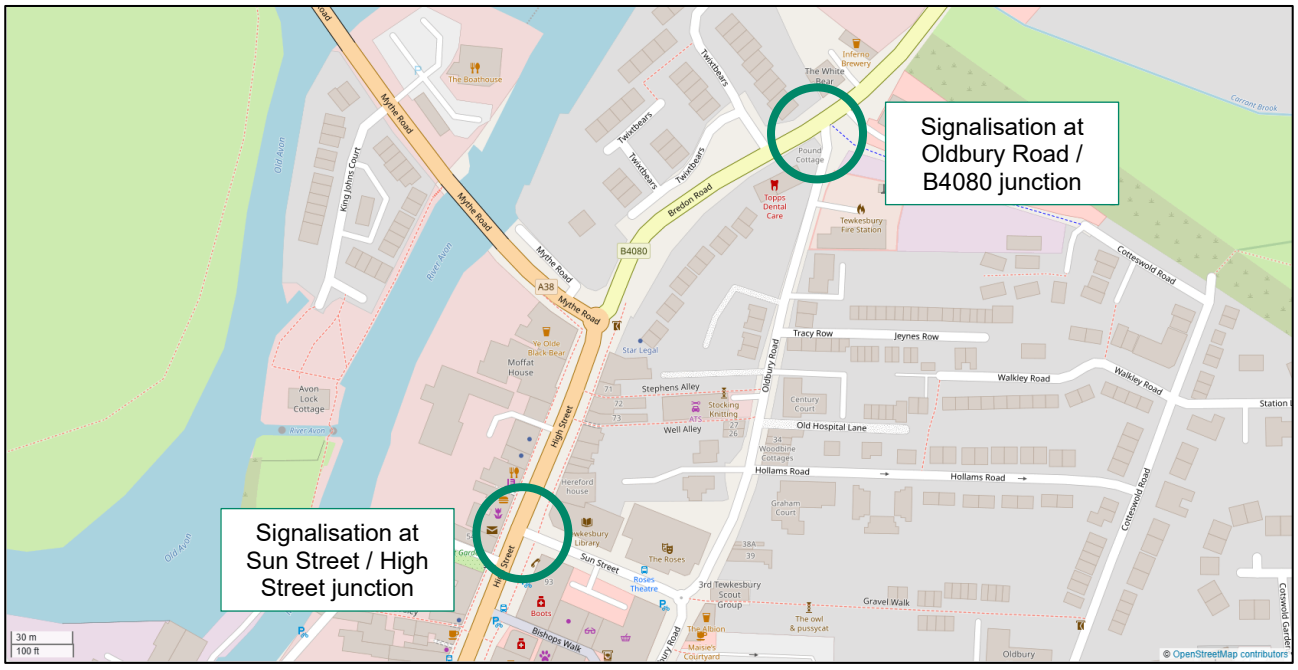


Figure 5: Location of New Signals at the Sun Street / High Street and Oldbury Road / B4080 Junctions

These junctions incorporate a pedestrian stage which is activated once every second cycle at the Oldbury Road / B4080 junction and every cycle at the Sun Street / high Street junction given the higher perceived pedestrian activity.

In terms of the Oldbury Road / B4080 junction, a short flare lane (approximately 20m) has been added to facilitate left turning vehicles from the B4080 into Oldbury Road, as shown in Figure 6. It should be noted that a business access is located close to this junction and may require a demand dependant stage, however this access road is not present within the model, furthermore there no traffic count data is available.

It should also be noted that no detailed engineering drawings have been prepared and therefore the feasibility of these proposed junctions would require a further review by a traffic engineer.

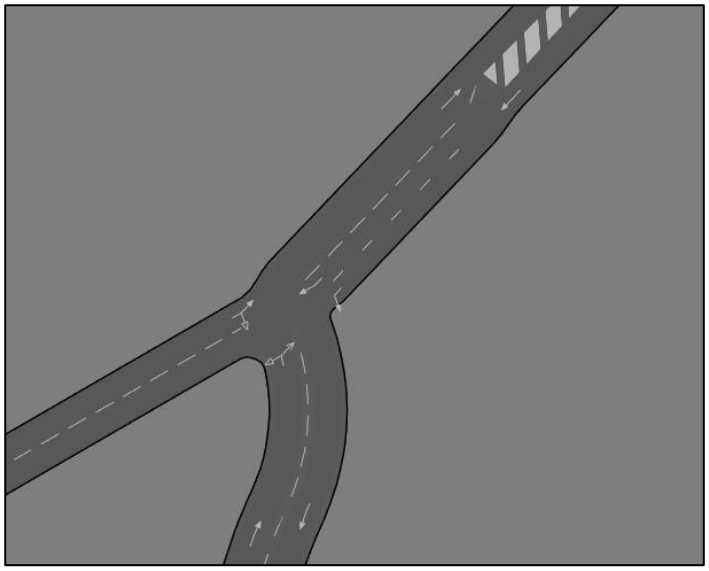


Figure 6: Proposed Layout for B4080 / Oldbury Road Junction

A438 Widening between the A438 / A38 junction and Morrisons Petrol Station

The proposed widening of the A438 between the A438 / A38 junction and Morrisons Petrol Station (Network Change No. 3) would require land to the south of A438 to be purchased to accommodate the additional lane for the westbound traffic. The introduction of the additional westbound lane would allow westbound traffic to pass through the junction using both lanes on the eastern approach to A438 / A38 junction. The location of this widening is shown in Figure 7 below.

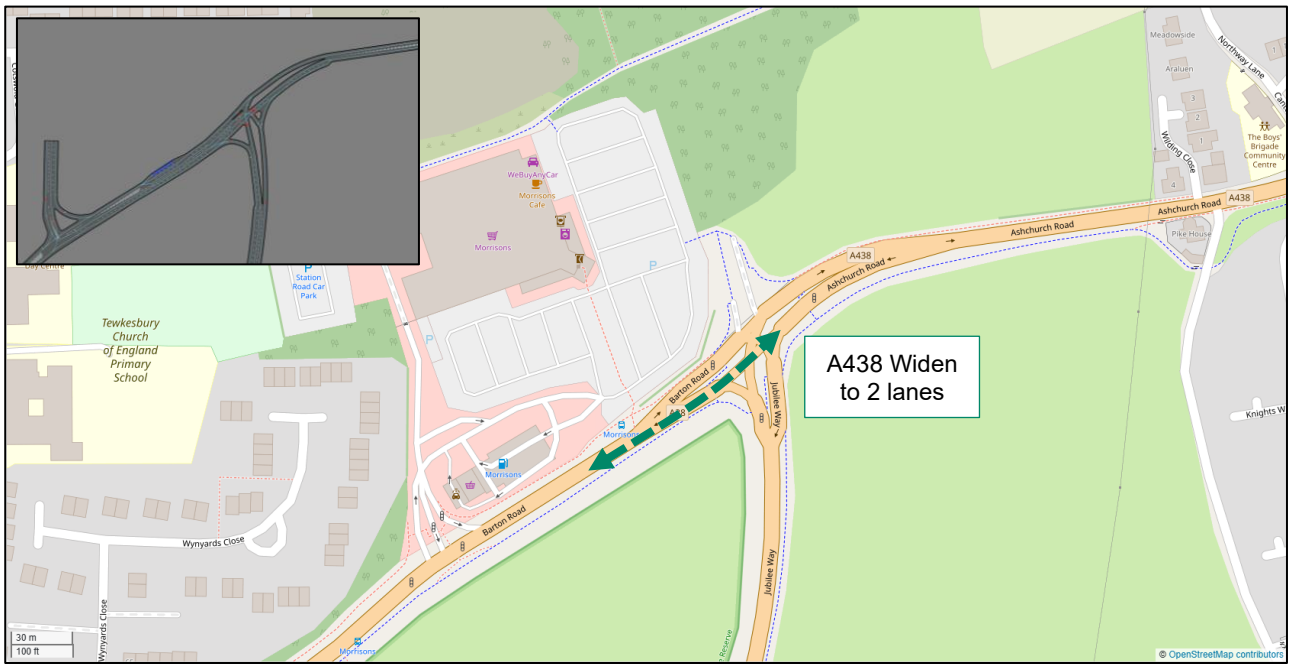


Figure 7: Proposed Widening of the A438 between the A438 / A38 and Morrisons Petrol Station

Increased Junction Capacity at the Hardwick Bank Road / Tewkesbury Road Junction

As a measure to mitigate the congestion that may occur at the Hardwick Bank Road / Tewkesbury Road junction as a result of the Mitton development, the Hardwick Bank Road approach to the junction has been increased from one lane to two lanes in the model, approximately 30m back from the junction (Network Change No. 6). This proposed junction improvement is shown in Figure 8 below.

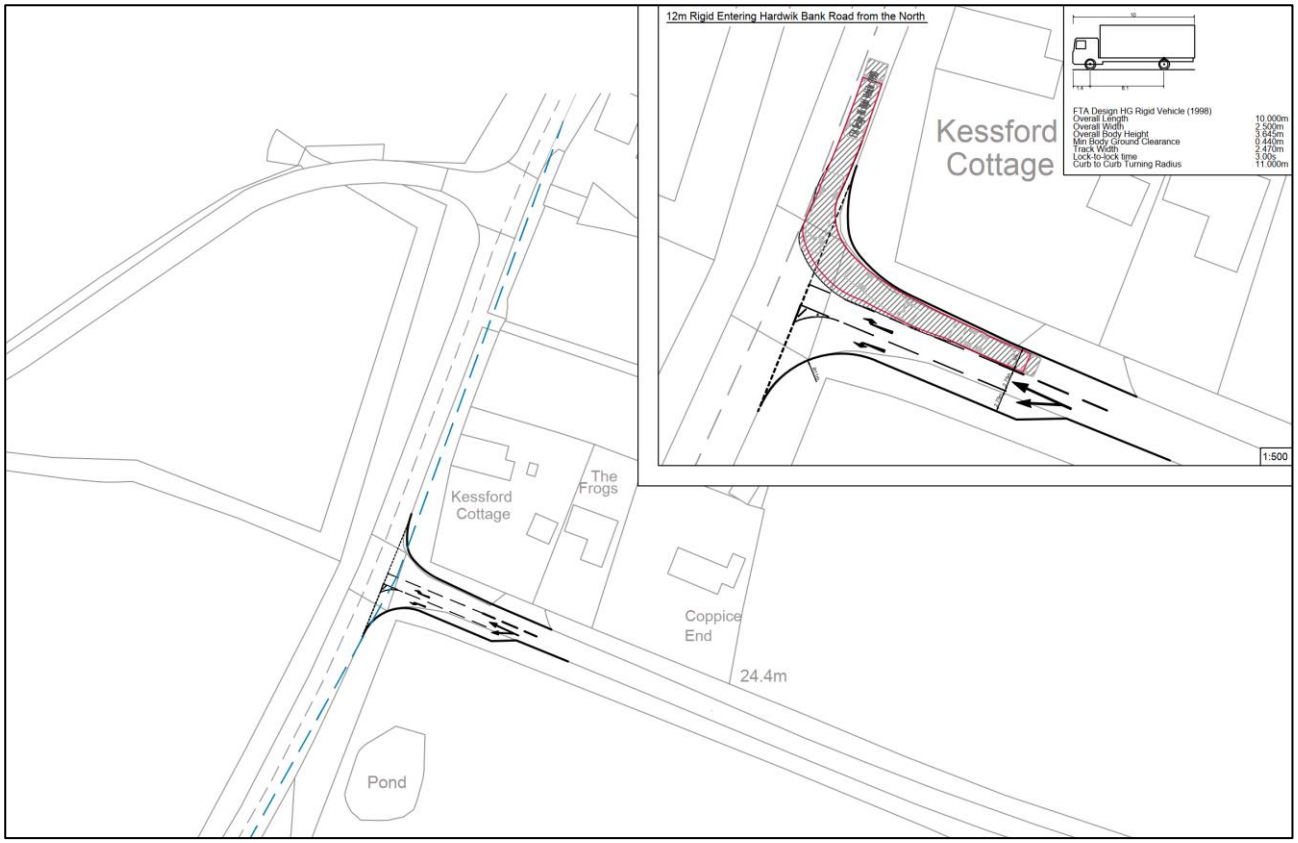


Figure 8: Proposed Hardwick Bank Road / Tewkesbury Road Junction Improvements

6 Models Observations and Results

All scenario models have been simulated 10 times (seed runs) to obtain the following results for the AM peak period (07:00 – 10:00 hours) and for the PM peak period (16:00 – 19:00 hours) for each of the modelled time periods:

Journey Time statistics; and

Queue Length statistics.

The results of each of the 10 simulation runs were then analysed to identify any “outlier seeds”, i.e. seed runs which perform outside the normal range. An average of the outputs of each suitable simulation run for all scenario models were used to compare the impacts of the construction traffic on the surrounding road network.

The journey time results were collected for the following four routes in all scenario models:

Route 1 is around 7.5 kilometres in length and covers the road section between Teddington Hands roundabout and the A438/High St roundabout on the A46 and A438 respectively;

Route 2 is around 10 kilometres in length and covers M5 sections to the south and to the north of M5 Junction 9;

Route 3 is around 1.7 kilometre in length and covers the section of Hardwick Bank Road / The Park between The Park / Northway Lane junction and Tewkesbury Road / Hardwick Bank Road; and

Route 4 is along the B4080, is around 5 kilometres in length and covers Tewkesbury Road between the A438/High St roundabout and Hardwick Band Rd/ Tewkesbury Rd junction.

These journey time routes are shown in Figure 9 below.

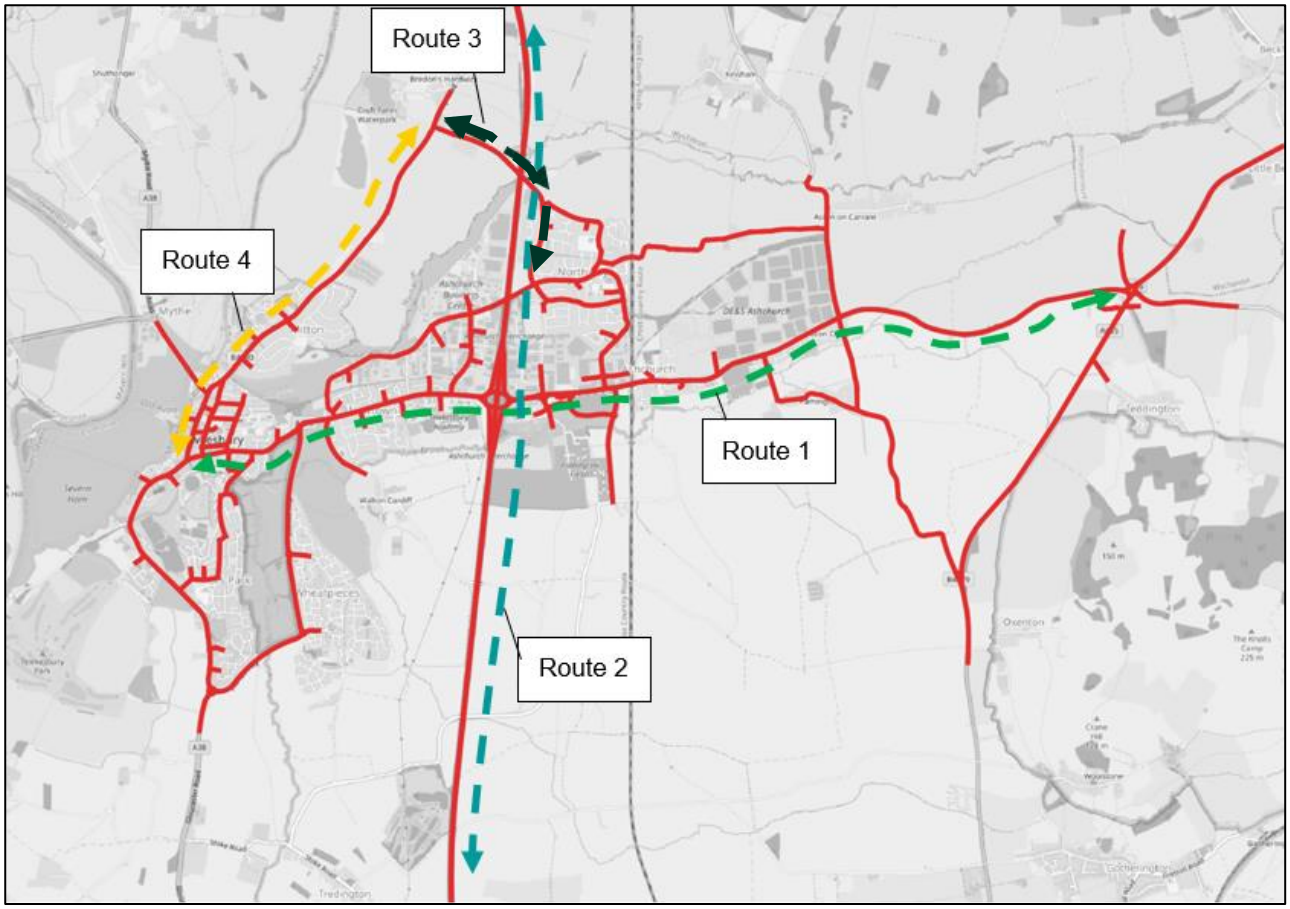


Figure 9: Journey Time Routes

Queue length data was obtained for all approaches to the key junctions along the A46, A438, M5 and Tewkesbury Road.

Journey Time Results

Route 1 – A46 / A438

Figure 10 and Figure 11 below present the journey time results for Route 1 – A46 / A438 for the 2041 Do-Something without Mitton and 2041 Do-Something with Mitton scenarios for the AM peak and PM peak hours respectively.

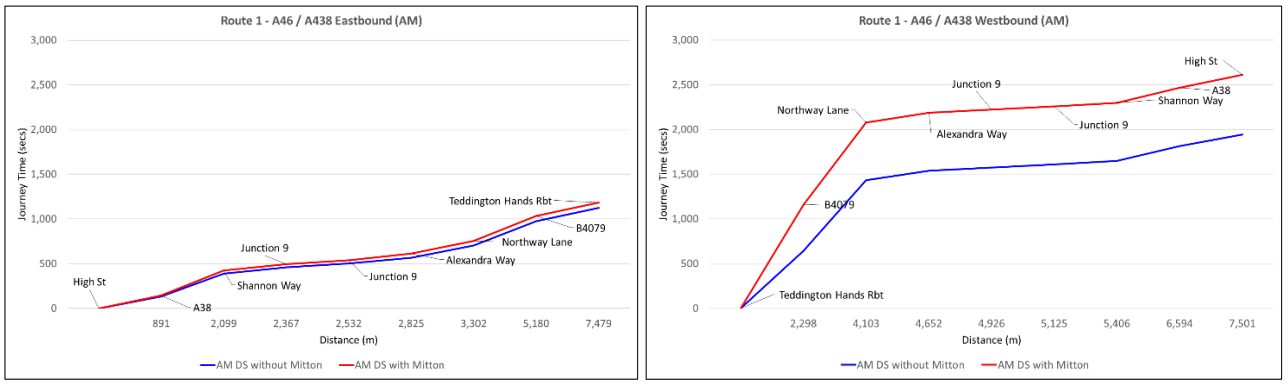


Figure 10: AM Peak Period Journey Times, Route 1 – A46 / A438

The above information for the AM peak hour indicates that end to end journey times increase by around 1 minute (from 18 minutes 43 seconds to 19 minutes 43 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model in the eastbound direction.

In the westbound direction, end to end journey times increase by around 11 minutes 6 seconds (from 32 minutes 23 seconds to 43 minutes 29 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model. The largest increase in journey times in the westbound direction occurs between Teddington Hands

Roundabout and the B4079 and between the B4079 and the Northway Lane. Further analysis indicates that an increase in traffic using the Northway Lane southbound, is a results of traffic displacement due to Mitton development (approximately 60 vehicles turning right), these additional vehicles result in a longer queue / journey time along the A46 westbound. To the west of Northway Lane, the journey times along the A46 / A48 remain generally consistent between the two scenarios.

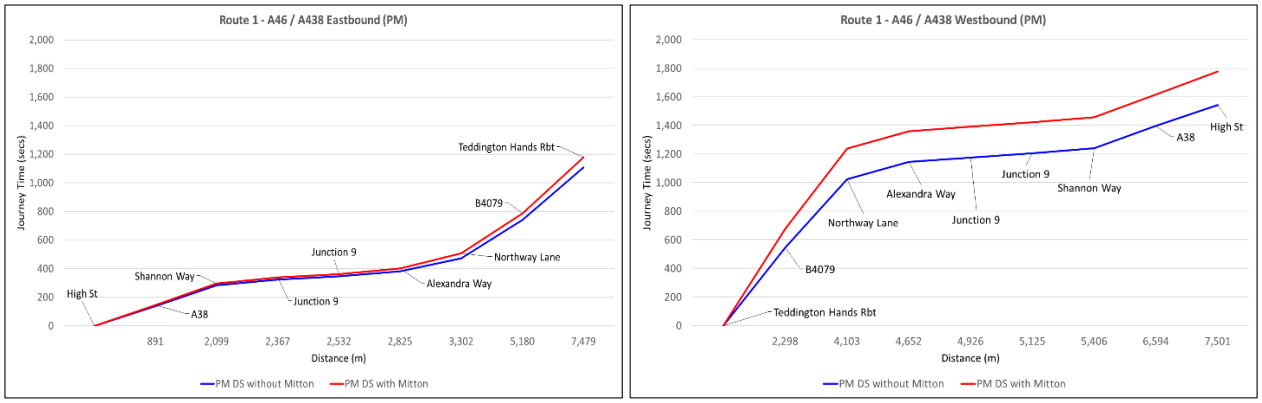


Figure 11: PM Peak Period Journey Times, Route 1 – A46 / A438

The above information for the PM peak hour indicates that end to end journey times increase by around 1 minute 8 seconds (from 18 minutes 29 seconds to 19 minutes 37 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model in the eastbound direction.

In the westbound direction, end to end journey times increase by around 3 minutes 53 seconds (from 25 minutes 44 seconds to 29 minutes 37 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model. Similar to the AM peak hour, the largest increase in journey times in the westbound direction during the PM peak occurs between Teddington Hands Roundabout and the B4079 and between the B4079 and the Northway Lane, again this is due to the increase in traffic entering the A46 via Northway Lane (approximately 50 vehicles) displacing the westbound queue. To the west of Northway Lane, the journey times along the A46 / A48 remain generally consistent between the two scenarios.

Route 2 – M5 Mainline

Figure 12 and Figure 13 below presents the journey time results for Route 2 – M5 Mainline for the 2041 Do-Something without Mitton and 2041 Do-Something with Mitton scenarios for the AM peak and PM peak hours respectively.

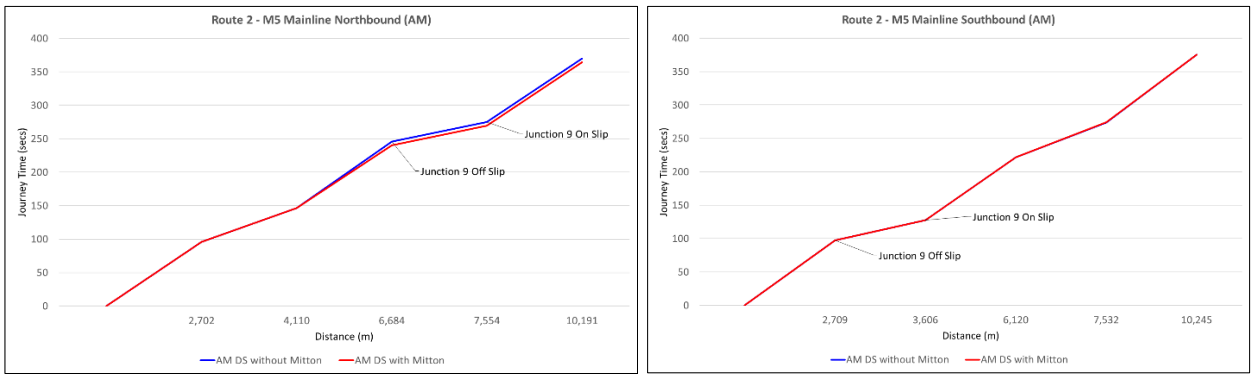


Figure 12: AM Peak Period Journey Times, Route 2 – M5 Mainline

The above information for the AM peak hour indicates that end to end journey times are generally consistent between the Do-Something with Mitton model and the Do-Something without Mitton model in both the northbound and southbound directions, with the model estimating it would take around 6 minutes 4 seconds and 6 minutes 15 seconds respectively to travel along the 10km section of the M5 motorway. This marginal change in speed is a result of queueing extending onto the M5 northbound off slip, this is discussed in greater detail within the Queue Length analysis section.

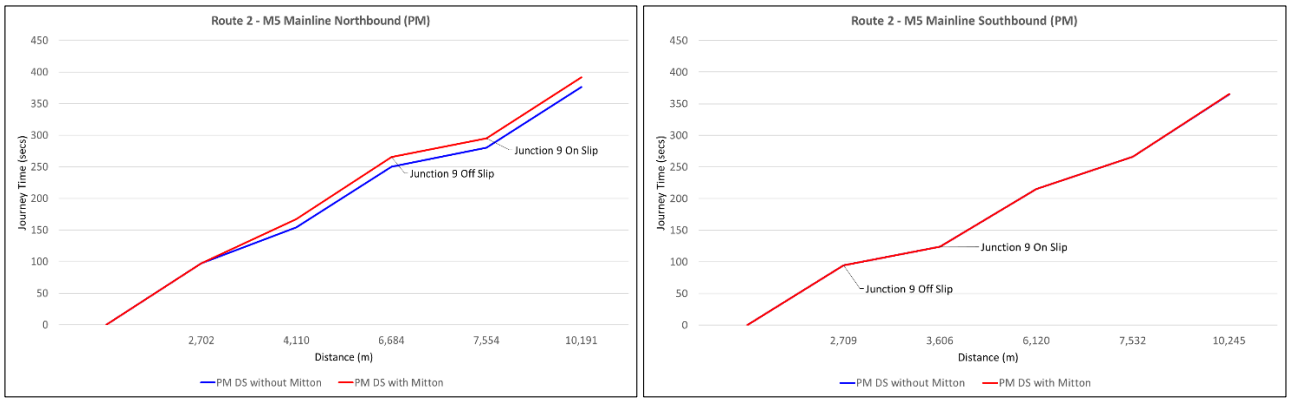


Figure 13: PM Peak Period Journey Times, Route 2 – M5 Mainline

The above information for the PM peak hour indicates that end to end journey times increase slightly by around 15 seconds (from 6 minutes 16 seconds to 6 minutes 31 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model in the northbound direction. This slight difference in journey time has been attributed to the additional Mitton development trips which may cause increased weaving issues on the approach to Junction 9, however this must be viewed with caution as the model might be overly sensitive with regards to weaving behaviour. In the southbound direction, end to end journey times are consistent between the Do-Something with Mitton model and the Do-Something without Mitton model, with the model estimating it would take around 6 minutes 5 seconds to travel along the 10km section of the M5 motorway.

This information indicates that the Mitton development does not have any significant impact on the M5 motorway during the PM peak hour.

Route 3 – Hardwick Bank Road / The Park

Figure 14 and Figure 15 below present the journey time results for Route 3 – Hardwick Bank Road for the 2041 Do-Something without Mitton and 2041 Do-Something with Mitton scenarios for the AM peak and PM peak hours respectively.

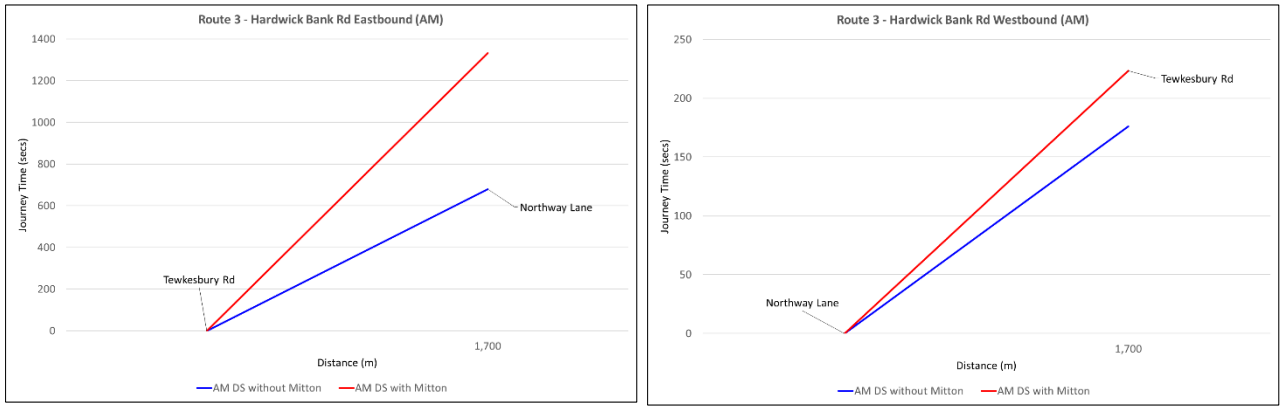


Figure 14: AM Peak Period Journey Times, Route 3 – Hardwick Bank Road

The above information for the AM peak hour indicates that end to end journey times increase significantly by around 10 minutes 28 seconds (from 11 minutes 19 seconds to 22 minutes 11 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model in the eastbound direction. This is a result of the Mitton development traffic using the Hardwick Bank Road route as an alternative to travelling through Tewkesbury.

In the westbound direction, end to end journey times increase by around 47 seconds (from 2 minutes 56 seconds to 3 minutes 43 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model.

The recorded increases in journey time are attributed to the additional traffic generated by the Mitton development.

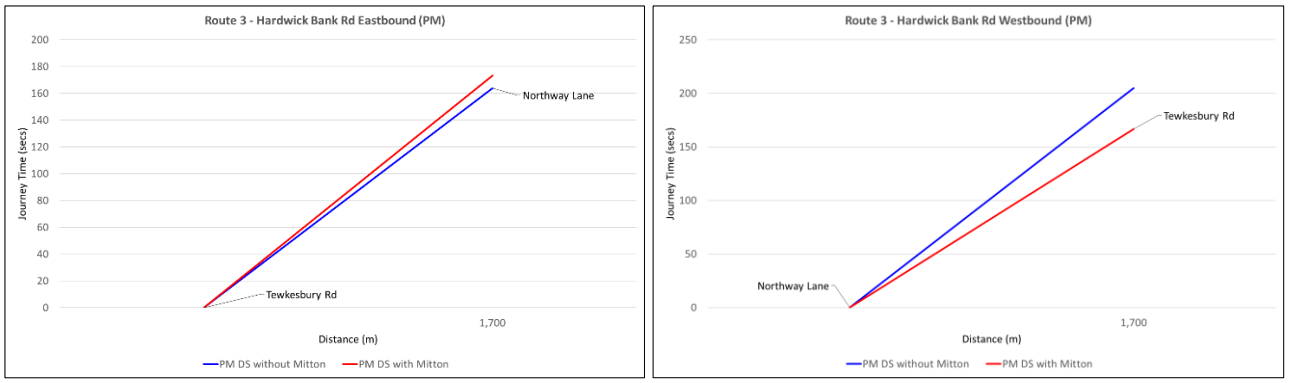


Figure 15: PM Peak Period Journey Times, Route 3 – Hardwick Bank Road

The above information for the PM peak hour indicates that end to end journey times increase marginally by around 9 seconds (from 2 minutes 44 seconds to 2 minutes 53 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model in the eastbound direction. In the westbound direction, end to end journey times reduce slightly by around 38 seconds (from 3 minutes 25 seconds to 2 minutes 47 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model.

This information indicates that the additional mitigation measures implemented within the Do-Something with Mitton model have contributed to reducing journey times in the westbound direction on Harwick Bank Road with the Mitton development in place during the PM peak hour.

Route 4 – B4080

Figure 16 and Figure 17 below present the journey time results for Route 4 – B4080 for the 2041 Do-Something without Mitton and 2041 Do-Something with Mitton scenarios for the AM peak and PM peak hours respectively.

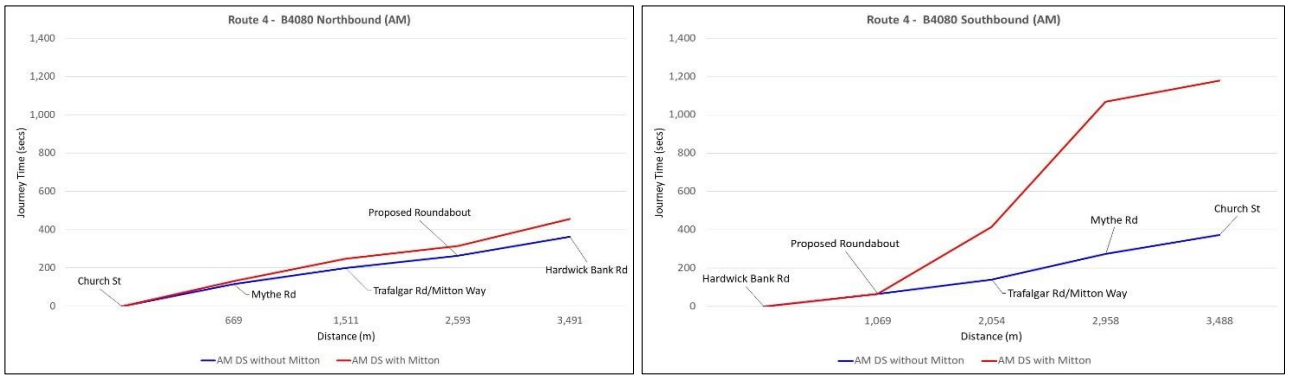


Figure 16: AM Peak Period Journey Times, Route 4 – B4080

The above information for the AM peak hour indicates that end to end journey times increase by around 1 minute 34 seconds (from 6 minutes 3 seconds to 7 minutes 37 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model in the northbound direction.

In the southbound direction, end to end journey times increase by around 13 minutes 25 seconds (from 6 minutes 14 seconds to 19 minutes 39 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model. Journey times along the B4080 in the southbound direction remain generally consistent between the two scenarios until the proposed new roundabout at the Mitton development, after which southbound journey times increase significantly between the proposed new roundabout and the junction with Mythe Road. The inclusion of the proposed signals at the B4080 / Oldbury Road and High Street / Sun Street restricts / manages traffic entering Tewkesbury from the north to ensure the Tewkesbury network is not over saturated which could create a grid lock situation within the town.

This information indicates that the additional mitigation measures implemented within the Do-Something with Mitton model have a significant impact on the southbound journey times along the B4080 with the Mitton development in place, however through Tewkesbury the journey times remains similar as a result of holding traffic back on the B4080.

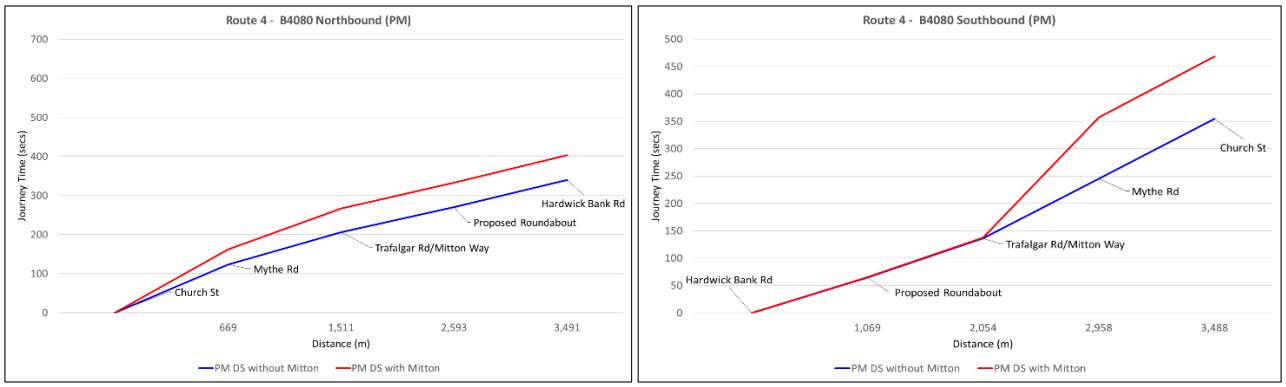


Figure 17: PM Peak Period Journey Times, Route 4 – B4080

The above information for the PM peak hour indicates that end to end journey times increase by around 1 minute 3 seconds (from 5 minutes 40 seconds to 6 minutes 43 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model in the northbound direction. The largest increase in journey times along the B4080 in the northbound direction occurs between Church Street and Mythe Road and between Mythe Road and Trafalgar Road / Mitton Way, after which journey times along the B4080 remain generally consistent between the two scenarios.

In the southbound direction, end to end journey times increase by around 1 minutes 53 seconds (from 5 minutes 55 seconds to 7 minutes 48 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model. Journey times along the B4080 in the southbound direction remain generally consistent between the two scenarios until the Trafalgar Road / Mitton Way, after which southbound journey times increase significantly between Trafalgar Road / Mitton Way and the junction with Mythe Road.

The journey time analysis indicates that, similar to the AM peak hour, the additional mitigation measures implemented within the Do-Something with Mitton model have an impact on journey times especially in the southbound direction, however these mitigation measures are necessary to restrict traffic entering Tewkesbury to ensure the network operates within the capacity and does not gridlock.

Queue Lengths

In addition to the journey time results, queue lengths were also analysed to determine if the change in demand would cause additional queueing. Queue length results were collected for both the AM and PM peak periods. The average maximum queue results presented below represent the maximum queue length observed during each 5-minute time interval.

The queue length results extracted from both the 2041 Do-Something without Mitton and 2041 Do-Something with Mitton scenarios for AM and PM peak periods are presented below. The queue length figures are primarily focussed on the approaches to the M5 Junction 9 to provide evidence on the impact on the Strategic Road Network (SRN).

M5 Junction 9 Southbound Off-Slip

Figure 18 below presents queue length results for the southbound off-slip to M5 junction 9 for the AM peak and PM peak periods.

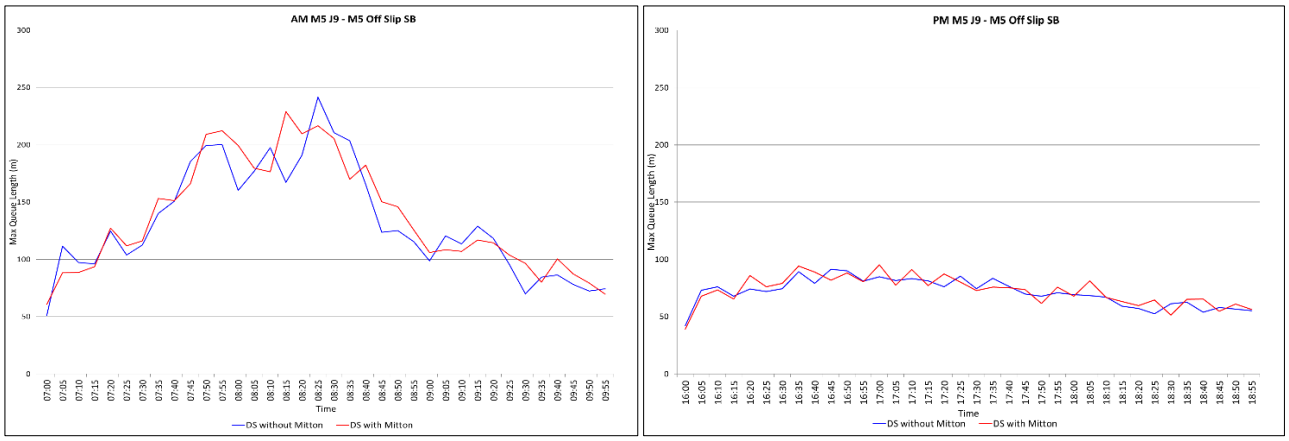


Figure 18: AM and PM Maximum Queue Lengths (m) – M5 Junction 9 Southbound Off-Slip

The above information indicates that the queue profile is generally the same for both the Do-Something without Mitton and Do-Something with Mitton scenarios during the AM peak period, where queue lengths reach a maximum of 229m (approximately 38 vehicles). During the PM peak period, the queue profile is generally the same for both the Do-Something without Mitton and Do-Something with Mitton scenarios, with a queue length of around 95m (approximately 15 or 16 vehicles) at its peak.

There is no evidence that the queuing at this location extends back onto the M5 main carriageway during the AM and PM peak periods, given that the slip road taper is between 500m (start) and 360m (end) from the stop line.

Figure 19 below highlights the level of queuing on the M5 Junction 9 Southbound Off-Slip in both the Do-Something without Mitton and Do-Something with Mitton scenarios during the AM peak period.

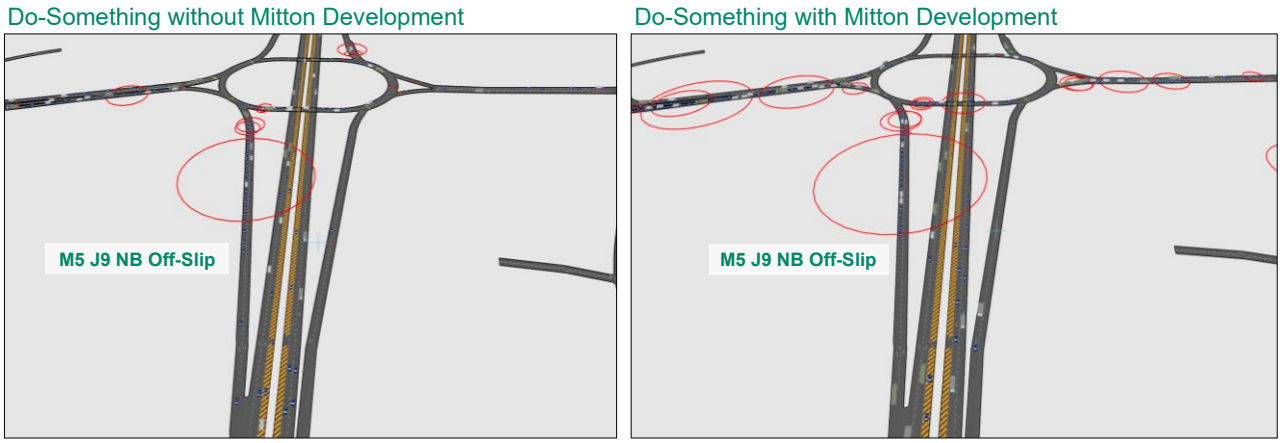


Figure 19: Model Snapshots of the M5 Junction 9 Southbound Off-Slip, AM Peak Period (08:20 hours)

In terms of impact from the wider local plan on the slip roads, this is negligible with only 40 vehicles using the southbound off-slip during the AM peak hour.

M5 Junction 9 Northbound Off-Slip

Figure 20 below presents queue length results for the northbound off-slip to M5 junction 9 for the AM peak and PM peak periods.

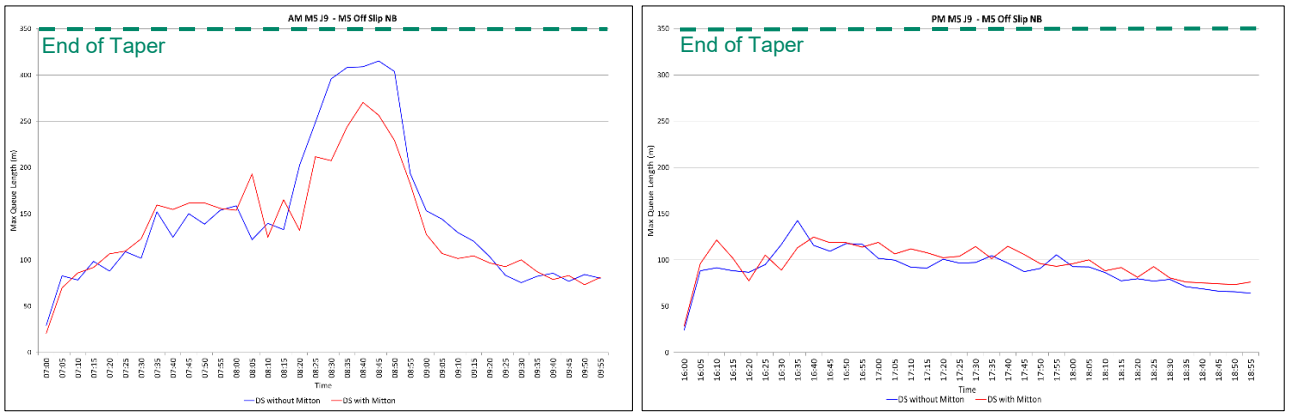


Figure 20: AM and PM Maximum Queue Lengths (m) – M5 Junction 9 Northbound Off-Slip

The above information indicates that the queue profile is generally the same for both the Do-Something without Mitton and Do-Something with Mitton scenarios during the AM peak period, with queue lengths being generally shorter in the Do-Something with Mitton model during the AM peak hour. Queue lengths in the Do-Something without Mitton model reach a maximum of 315m (approximately 53 vehicles) at 08:45 hours, whilst queue lengths in the Do-Something with Mitton model reach a maximum of 270m (approximately 45 vehicles) at 08:45 hours. Based on the taper end distance of around 350m from the stop line, there is sufficient capacity to contain the maximum average queueing on the slip road.

With the above stated, the results must be viewed with caution as the models present large variability given the high levels of congestion within the study area. As such, queue lengths can and do vary significantly by seed run which is demonstrated in Figure 21 below. Figure 21 highlights the results of one model seed run which indicates that queuing on the M5 Junction 9 Northbound Off-Slip extends back onto the M5 main carriageway, whilst another seed run indicates significantly shorter queuing on the northbound off-slip which does not extend back onto the M5 main carriageway. On average both scenarios, with and without Mitton, sees queues stretching back onto the M5 three times out of the ten seeds used in the queue length outputs, furthermore the queueing onto the motorway lasts around 5 minutes.

Figure 21: Model Snapshot of the M5 Junction 9 Northbound Off-Slip within the Do-Something with Mitton Model, AM Peak Period (08:45 hours)

Taking the above into account and using professional judgement, it is expected that queue length / profile at this location during the AM peak period in the Do-Something with Mitton model would be more in line with the results of the Do-Something without Mitton model with possible marginal increase given that demands during the AM peak increase by around 37 vehicles (less than 1 vehicle per minute) during the AM peak hour. The concerns raised regarding queueing onto the M5 have been previously noted by AtkinsRealis, who quoted: "*At peak times queuing from M5 Junction 9 can reach back to the M5 motorway, with queuing vehicles on the hard shoulder creating a safety hazard*"[1].

To address the above, a further sensitivity test has been undertaken which increases the flare length from 55m to 130m on the northbound off-slip approach to the M5 Junction 9 to mitigate the potential queuing back onto the M5 main carriageway at this location. Details of the sensitivity test can be found in Appendix B.

[1] M5 Junction 9 and A46 (Ashchurch) Transport Scheme, dated 7th October 2024.

During the PM peak period, the queue profile is generally the same for both the Do-Something without Mitton and Do-Something with Mitton scenarios. In addition, there is no evidence that the queuing at this location extends back onto the M5 Motorway main carriageway during the PM peak period.

It should be highlighted that no adjustments to the signals have been made to mitigate against the M5 Junction 9 Northbound Off-Slip queueing, however it is envisaged that adjustments could be made to the MOVA signals to minimise traffic extending back from the A46 onto the M5 northbound off-slip.

In terms of impact from the wider local plan on this slip road, this is negligible with only 13 vehicles (9 of which are committed development trips) using the northbound off slip during the AM peak hour.

M5 Junction 9 Westbound from A46

Figure 22 below presents queue length results for the M5 Junction 9 westbound from A46 for the AM and PM peak periods.

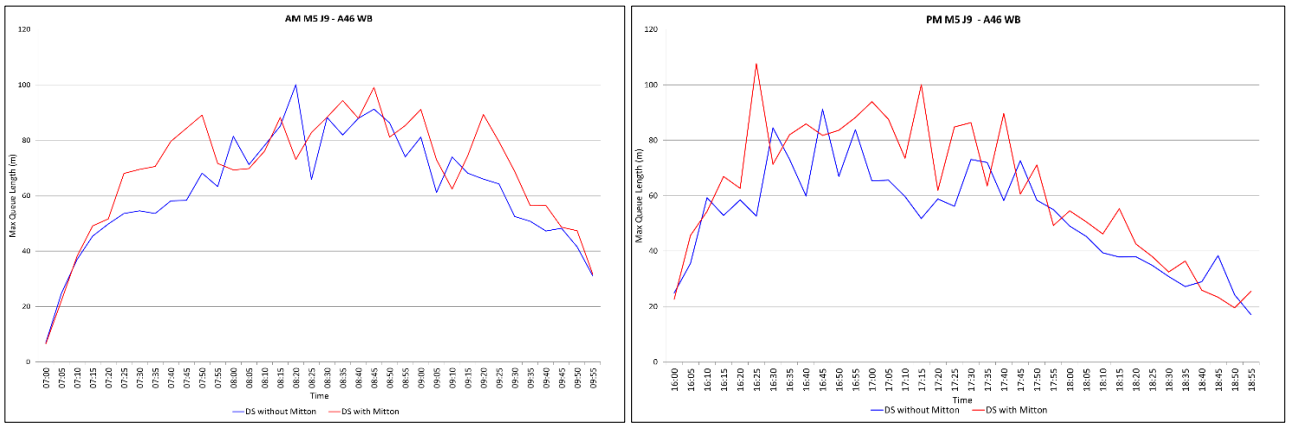


Figure 22: AM and PM Maximum Queue Lengths (m) – M5 Junction 9 Westbound from A46

The above information indicates that the queue profiles are similar for both the Do-Something without Mitton and Do-Something with Mitton scenarios during the AM peak period, with the Do-Something with Mitton model queue lengths being generally longer than in the Do-Something without Mitton model. Queue lengths in the Do-Something with Mitton model reach a maximum of 99m (approximately 16 or 17 vehicles) at 08:45 hours.

Similarly, the queue profiles during the PM peak period are similar for both the Do-Something without Mitton and Do-Something with Mitton scenarios, with the Do-Something with Mitton model queue lengths being generally longer than in the Do-Something without Mitton model. Queue lengths in the Do-Something with Mitton model reach a maximum of 108m (approximately 18 vehicles) at 16:25 hours.

Figure 23 below highlights the level of queuing on the A46 westbound approach to the M5 Junction 9 in both the Do-Something without Mitton and Do-Something with Mitton scenarios during the AM peak period.

Do-Something without Mitton Development | Do-Something with Mitton Development

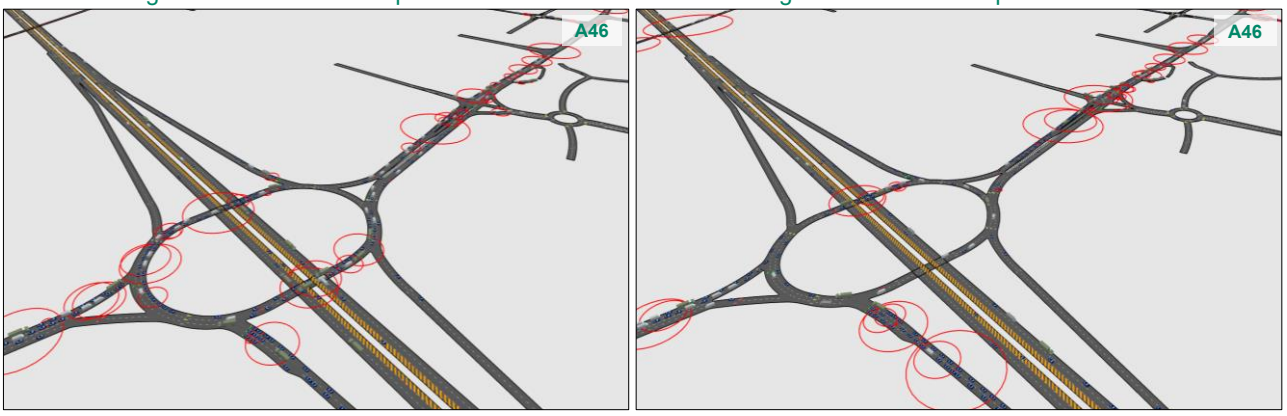


Figure 23: Model Snapshots of the M5 Junction 9 Westbound from A46, AM Peak Period (08:45 hours)

It should be highlighted that the above queue lengths are constrained by the signalised junctions to the east limiting the number of vehicles arriving at the M5 Junction 9. The full extent of the delays along the A46 is better represented by the journey time analysis.

M5 Junction 9 Eastbound from A438

Figure 24 below presents queue length results for the M5 Junction 9 eastbound from A438 for the AM and PM peak periods.

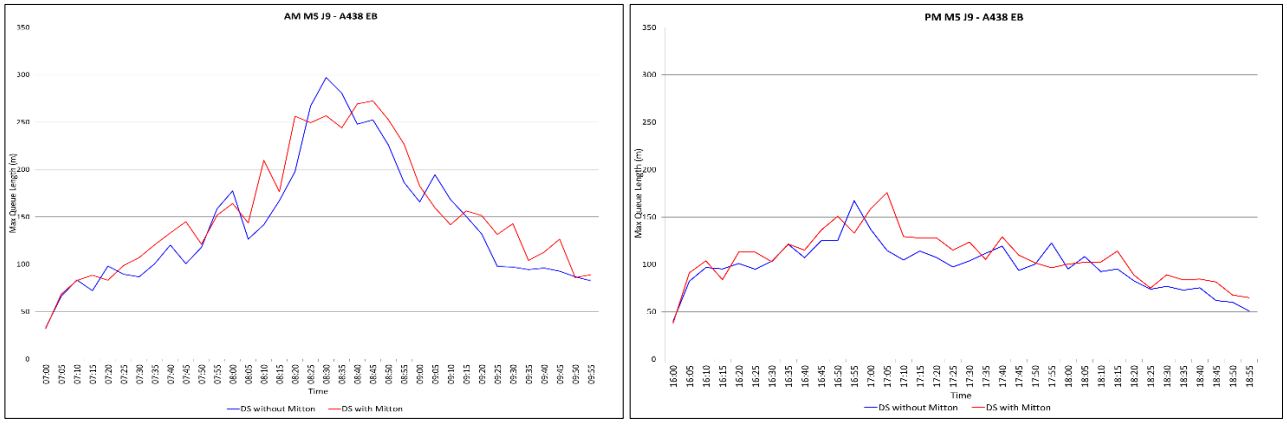


Figure 24: AM and PM Maximum Queue Lengths (m) – M5 Junction 9 Eastbound from A438

The above information indicates that the queue profile is generally the same for both the Do-Something without Mitton and Do-Something with Mitton scenarios during the AM peak period. Queue lengths in the Do-Something without Mitton model reach a maximum of 297m (approximately 50 vehicles) at 08:30 hours, whilst queue lengths in the Do-Something with Mitton model reach a maximum of 272m (approximately 46 vehicles) at 08:45 hours.

Similarly, the queue profiles and length during the PM peak period are generally the same for both the Do-Something without Mitton and Do-Something with Mitton scenarios, peaking at around 176m (approximately 29 or 30 vehicles).

The similar queueing on this approach in both scenarios, especially during the AM peak, can be attributed to the constraints placed within Tewkesbury, i.e. the proposed traffic signals which constrain the Mitton development traffic to the north of Tewkesbury, limiting the Mitton traffic from reaching the M5 Junction 9.

Figure 25 below highlights the level of queuing on the A438 eastbound approach to the M5 Junction 9 in both the Do-Something without Mitton and Do-Something with Mitton scenarios during the AM peak period.

Do-Something without Mitton Development

Do-Something with Mitton Development

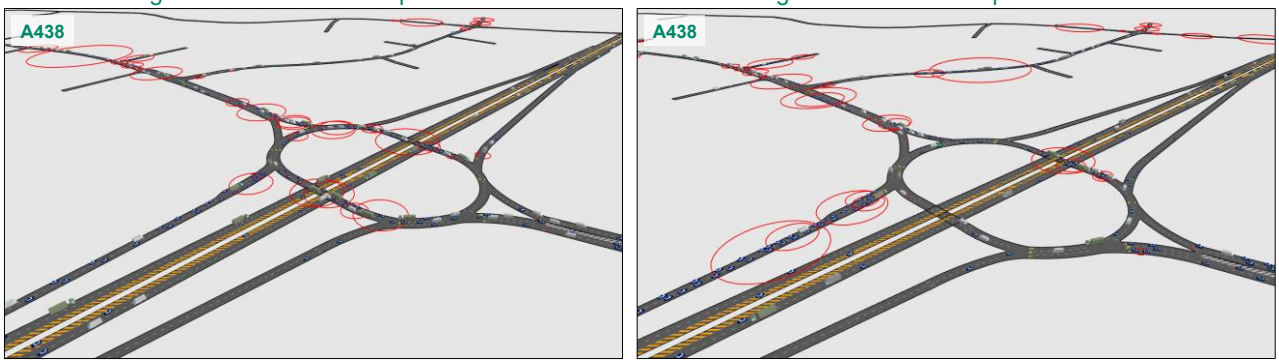


Figure 25: Model Snapshots of the M5 Junction 9 Eastbound from A438, AM Peak Period (08:45 hours)

Hardwick Bank Road

Figure 26 below presents queue length results for the Hardwick Bank Road at the Tewkesbury Road approach in the westbound direction for the AM and PM peak periods.

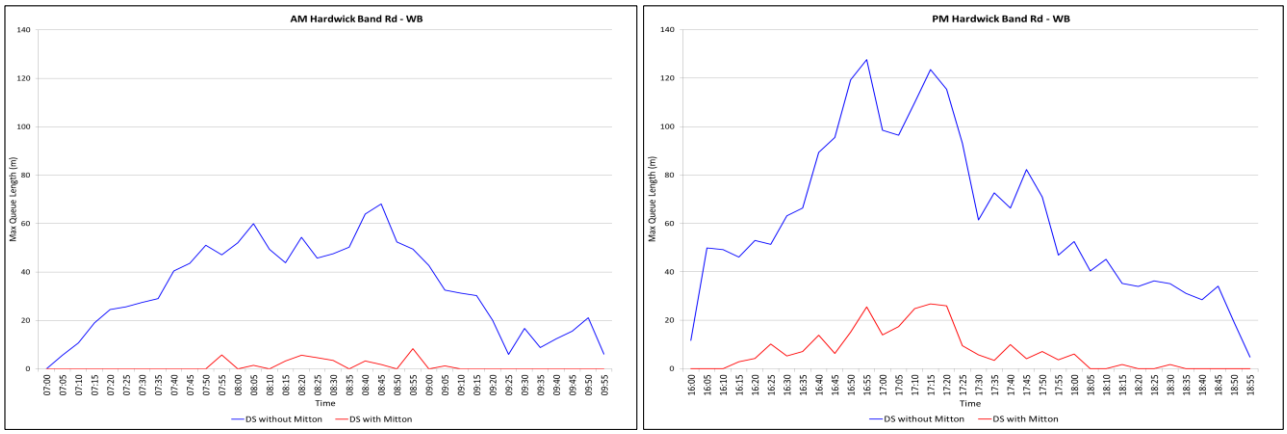


Figure 26: AM and PM Maximum Queue Lengths (m) – Hardwick Bank Road

The above information indicates that during the AM peak period, the queues along Hardwick Bank Road are estimated to be significantly shorter in the Do-Something with Mitton model in comparison to the Do-Something without Mitton model, with a maximum queue length of 8m (approximately 1 or 2 vehicles) at 09:00 hours.

Similarly, during the PM peak period, the recorded queue lengths are significantly shorter in the Do-Something with Mitton model in comparison to the Do-Something without Mitton model, with queue lengths reaching a maximum of 27m (approximately 4 or 5 vehicles) at 17:15 hours in the Do-Something with Mitton model.

Figure 27 below highlights the level of queuing on Hardwick Bank Road in both the Do-Something without Mitton and Do-Something with Mitton scenarios during the PM peak period.

Do-Something without Mitton Development

Do-Something with Mitton Development

Figure 27: Model Snapshots of the Hardwick Bank Road, PM Peak Period (16:55 hours)

The above indicates that the additional mitigation measures implemented within the Do-Something with Mitton model have reduced the queue on the Hardwick Bank Road approach to Tewkesbury Road / Hardwick Bank Road junction.

A46 Westbound

Figure 28 below presents queue length results for the A46 approach to the A46 / Loverose Way / Northway Lane signalised junction in the westbound direction for the AM and PM peak periods.

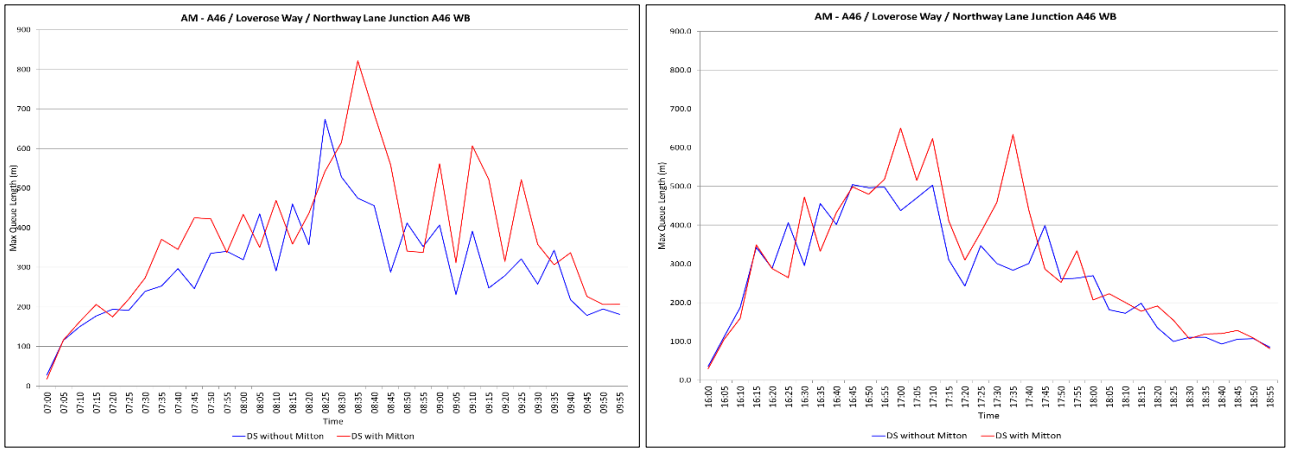


Figure 28: AM and PM Maximum Queue Lengths (m) – A46 Westbound

The above information indicates that during the AM peak period, the queue along the A46 is estimated to be longer in the Do-Something with Mitton model in comparison to the Do-Something without Mitton model, with a maximum queue length of 800m (approximately 130 vehicles) at 08:40 hours.

Similarly, during the PM peak period, the recorded queue lengths are longer in the Do-Something with Mitton model in comparison to the Do-Something without Mitton model, with queue lengths reaching a maximum of 651m (approximately 108 or 109 vehicles) at 17:00 hours in the Do-Something with Mitton model.

Figure 29 below highlights the level of queuing at the A46 approach to the A46 / Loverose Way / Northway Lane signalised junction in the westbound direction in both the Do-Something without Mitton and Do-Something with Mitton scenarios during the AM peak period.

Do-Something without Mitton Development | Do-Something with Mitton Development

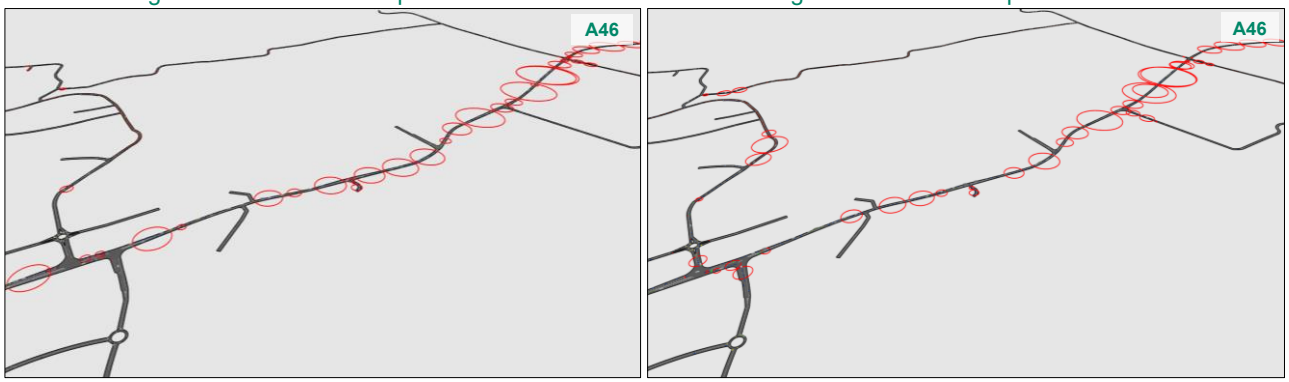


Figure 29: Model Snapshots of the A46 approach to the A46 / Loverose Way / Northway Lane signalised junction, AM Peak Period (08:40 hours)

The observed increase in queuing on the A46 approach to the A46 / Northway Lane junction in the Do-Something with Mitton development model leads to the increase in journey time in the westbound direction shown previously in Figure 10 and Figure 11 above.

A38 Mythe Road

Figure 30 below presents queue length results for the A38 Mythe Road approach to the A38 / High Street mini roundabout in eastbound direction for the AM and PM peak periods.

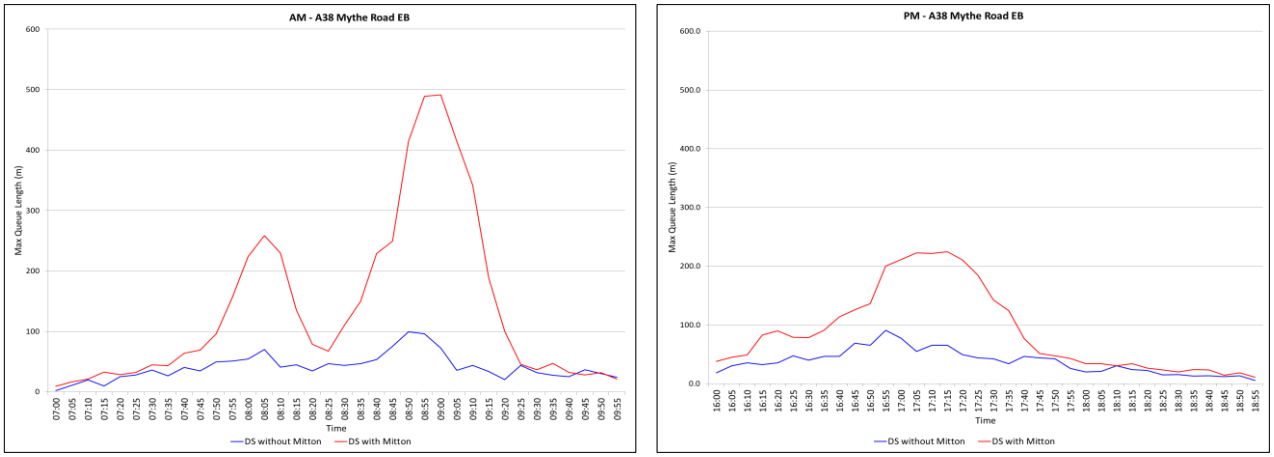


Figure 30: AM and PM Maximum Queue Lengths (m) – A38 Mythe Road Eastbound

The above information indicates that during the AM peak period, queuing along the A38 Mythe Road is estimated to be significantly longer in the Do-Something with Mitton model in comparison to the Do-Something without Mitton model, with a maximum queue length of around 492m (approximately 82 vehicles) at 09:00 hours.

Similarly, during the PM peak period, queuing along the A38 Mythe Road is estimated to be significantly longer in the Do-Something with Mitton model in comparison to the Do-Something without Mitton model, with a maximum queue length of around 225m (approximately 37 or 38 vehicles) at 17:15 hours.

Figure 31 below highlights the level of queuing along the A38 Mythe Road in both the Do-Something without Mitton and Do-Something with Mitton scenarios during the AM peak period.

Do-Something without Mitton Development

Do-Something with Mitton Development

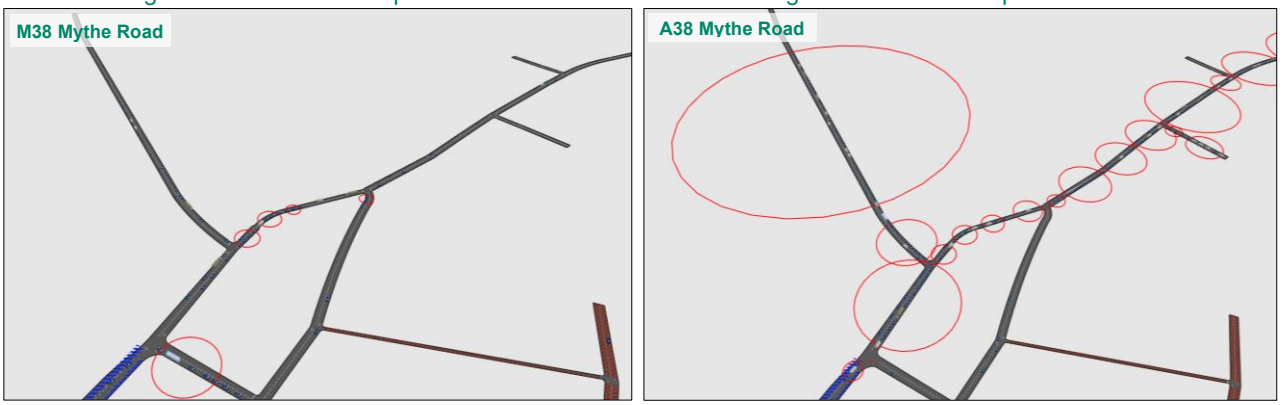


Figure 31: Model Snapshots of the A38 Mythe Road, AM Peak Period (09:00 hours)

The observed increase in queuing on the A38 Mythe Road can be attributed to the limited capacity of the mini roundabout that is taken by the traffic generated by the Mitton development, which passes through Tewkesbury town centre during both the AM and PM peak periods.

7 Assessment of PJA Mitigation Measures

Upon completion of the Local Plan and Mitton development assessment conducted in February 2025, PJA, who is developing the Transport Assessment for the Mitton development, provided a modified list of mitigation measures aimed at addressing congestion in Tewkesbury. The packages of mitigation measures are summarised in Table 3 and detailed in the following section. AECOM was commissioned to model these measures within the Do Something scenario and assess their effectiveness.

Table 3: PJA mitigation measures

No.	Description of Mitigation Measure	2041 Do-Something without Mitton	2041 Do-Something with Mitton PJA
1	M5 Junction 9 northbound off slip extension of the 3rd lane to 130 metres.	X	X
2	Introduction of a mini roundabout at High Street/Sun Street		X
3	Introduction of a mini roundabout at High Street/Quay Street		X
4	Increased junction capacity to allow 2 lanes WB at the A438 / A38 junction. Increased Green Time for WB approach.		X
5	Increased junction capacity to allow 2 lanes on the Hardwick Bank Road approach to the Hardwick Bank Road / Tewkesbury Road junction.		X
6	Signalisation of High Street / Oldbury Road junction and right turn banning from High Street to Oldbury Road.		X
7	Introduction of the 35 meters long flare lane on the A438 westbound approach to the A438 / Nelson Street junction		X
8	Allocated more green time to the westbound approach to M5 Junction 9.		X
9	Signalisation of The Park / Northway Lane / Kingston Road junction		X

In addition to the mitigation measures in Table 3, some of the previously tested mitigation measures / model adjustments from Table 2 were kept in the 2041 Do-Something models to allow smoother operation in order to produce sensible model outputs. These mitigations are:

- Removed give way to oncoming traffic on Northway Lane, nearby Shannon Way / Northway Lane junction in both 2041 Do-Something with and without Mitton scenarios.
- Removed give way to oncoming traffic on Northway Lane in the residential area in both 2041 Do-Something with and without Mitton scenarios.
- Increased green time on SB approach at Shannon Way / Northway Lane junction in the PM peak period in 2041 Do-Something with Mitton scenario.

The following section describes the additional mitigation measures which were added to the model.

PJA Mitigation Measures Description

M5 Junction 9 Northbound Off-slip Extension of the 3rd Lane to 130 Metres

The previous assessment noted instances of excessive queuing on the off-slip extending back onto the M5 main carriageway; therefore, the 3-lane section of the northbound slip road was extended from 55m to 130m in both option models as shown in Figure 32. This improvement is required due to the committed developments and to a lesser extent local development plan, therefore this mitigation was included in the Do Something with Mitton and Do Something without Mitton scenarios.

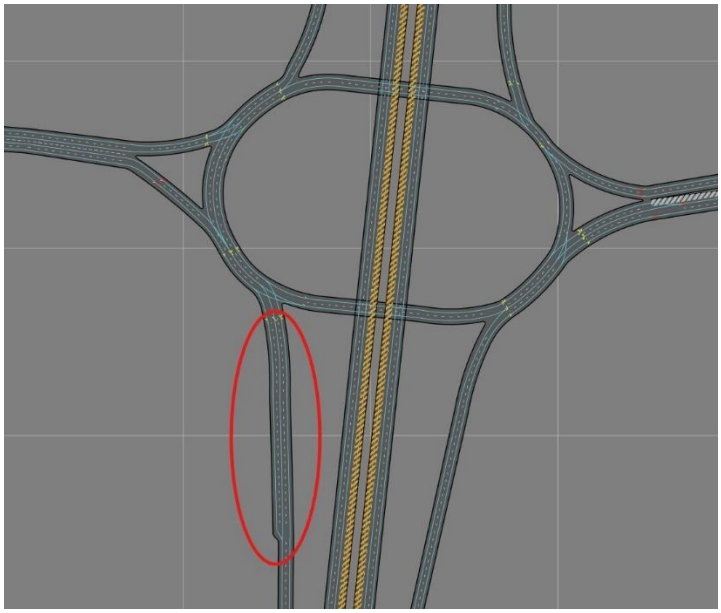


Figure 32: Extension of the Northbound Off-slip

Introduction Of Mini Roundabout at High Street/Sun Street & High Street/Quay Street

As part of the mitigation measures proposed by PJA, the existing T-junctions at High Street / Sun Street and High Street / Quay Street were suggested to be converted into mini roundabouts. The location of these junctions is shown in Figure 33 below. The aim of this mitigation measure is to reduce the delay in Tewkesbury city centre and reduce the queuing on the High Street, while removing the need for signalisation as requested by Gloucestershire County Council.

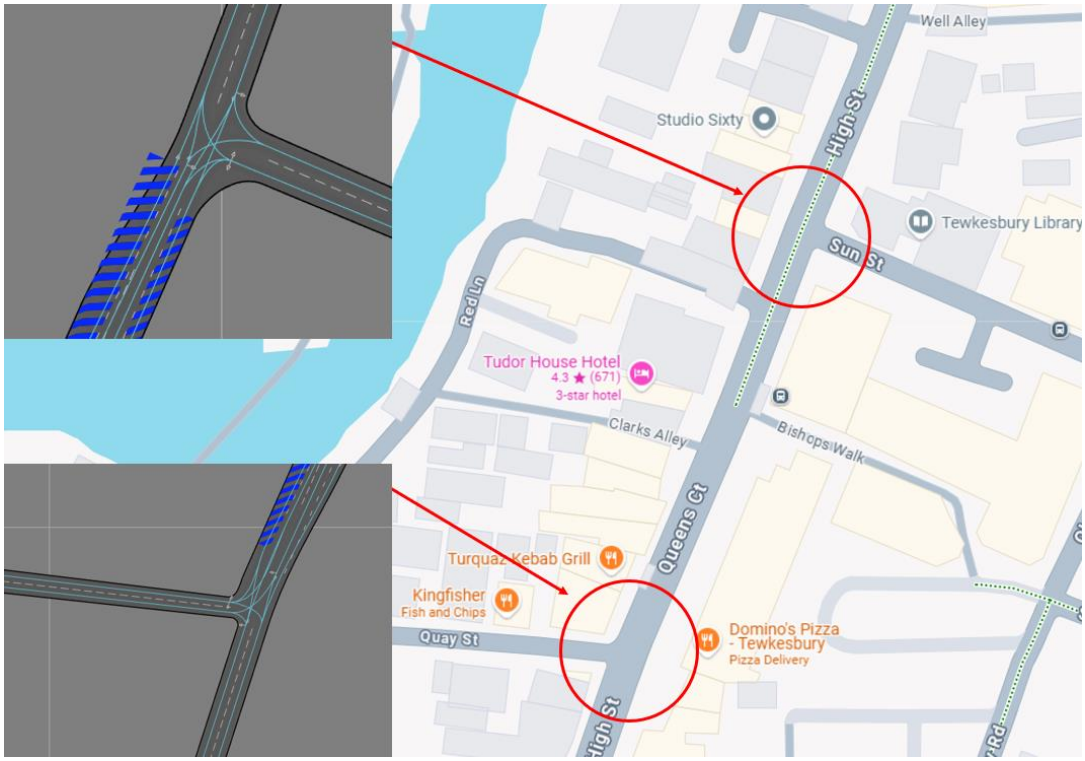


Figure 33: Location of the Mini Roundabouts

Increased Junction Capacity to Allow 2 Lanes WB At the A438 / A38 Junction and increased Green Time for WB Approach. Increased Junction Capacity to Allow 2 Lanes on the Hardwick Bank Road Approach to The Hardwick Bank Road / Tewkesbury Road Junction

These mitigation measures are unchanged from that applied previously in the 2041 Do-Something with Mitton model, described as mitigation measures 3 and 6 in Table 2.

Signalisation Of High Street / Oldbury Road Junction

As part of the mitigation measures proposed by PJA, the High Street / Oldbury Road Junction was identified as benefiting from signalisation. The proposed signal stage diagram is shown in Figure 34 below. As part of the proposed signalisation, the right turn movement from High Street to Oldbury Road was removed.

In comparison to the previously tested signalisation of this junction, described in Table 2, the proposed signalisation measure by PJA does not include the southbound left turn flare lane as presented in Figure 6.

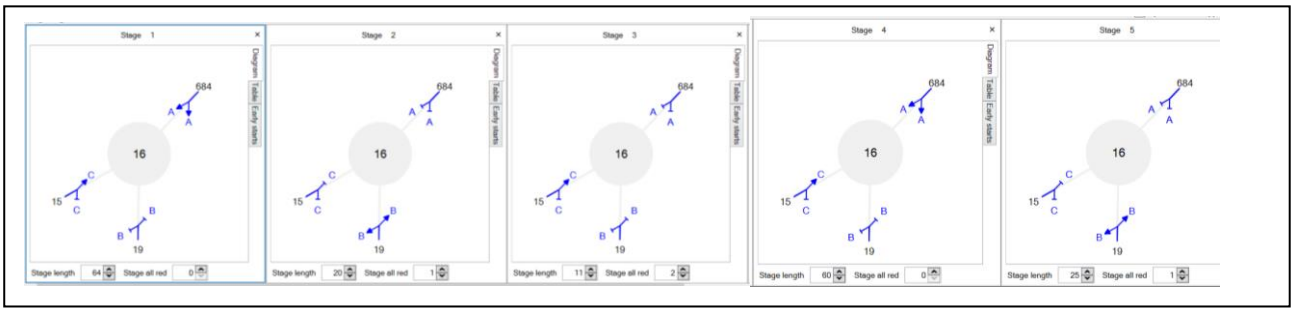


Figure 34: Signal Stage Diagrams at High Street / Oldbury Road Junction

Introduction Of The 35 Meters Long Flare Lane on the A438 Westbound Approach to the A438 / Nelson Street Junction

The single lane A438 on approach to the Nelson Lane T junction was identified to benefit from a 35-metre-long flare lane to provide increased westbound capacity for the right turn lane. The location of this junction is shown in Figure 35 below.

Figure 35: Location of the A438 Westbound Approach to the A438 / Nelson Street Junction

Allocated More Green Time to the Westbound Approach to M5 Junction 9

Based on the results of the preliminary tests, it was identified that increasing the green time for the eastbound approach to M5 Junction 9 would help reduce queuing along the A438, thereby reducing congestion in Tewkesbury town centre.

As a result, the MOVA configuration file for M5 Junction 9 was modified to increase the weight factor for the eastbound approach.

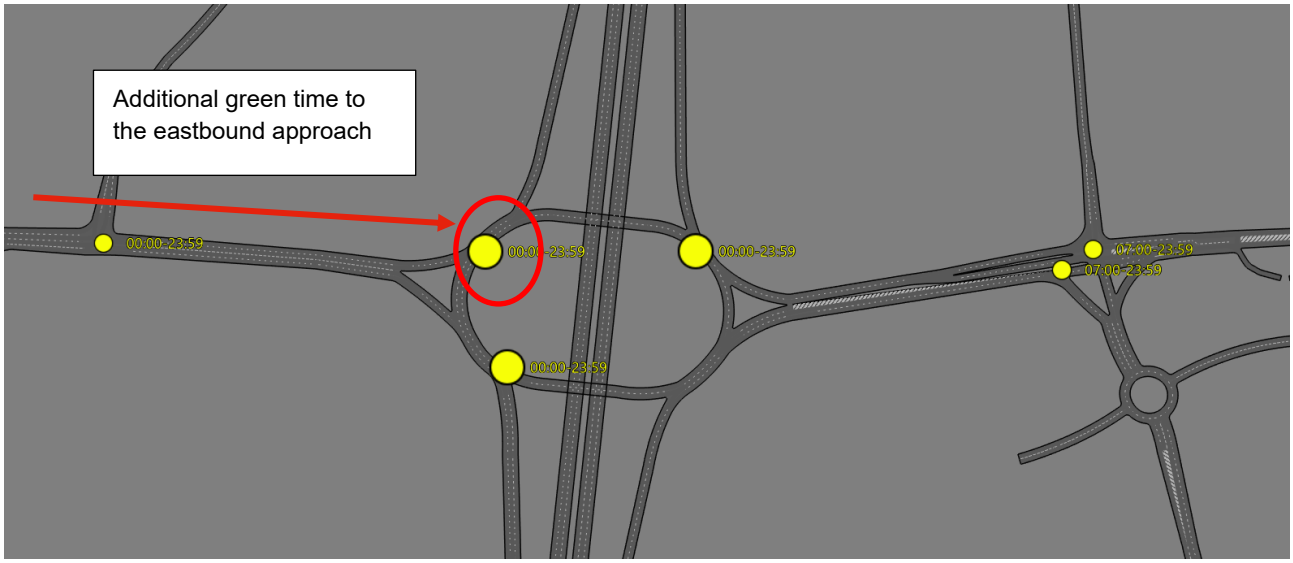


Figure 36: Location of the signal head at M5 Junction 9 that receives increased green time.

Signalisation of The Park / Northway Lane / Kingston Road junction

Furthermore, the previous results, demonstrated the significant increase in journey time on Hardwick Road (Route 3) of around 10 minutes during the AM peak period, as shown in Figure 14 above. The increase in journey time was attributed to the increased queue on The Park approach to the Park / Northway Lane junction.

To reduce the delay on Route 3 during the AM peak period, signalisation of the Park / Northway Lane junction was proposed for assessment. The proposed signal stage diagram is shown in below.

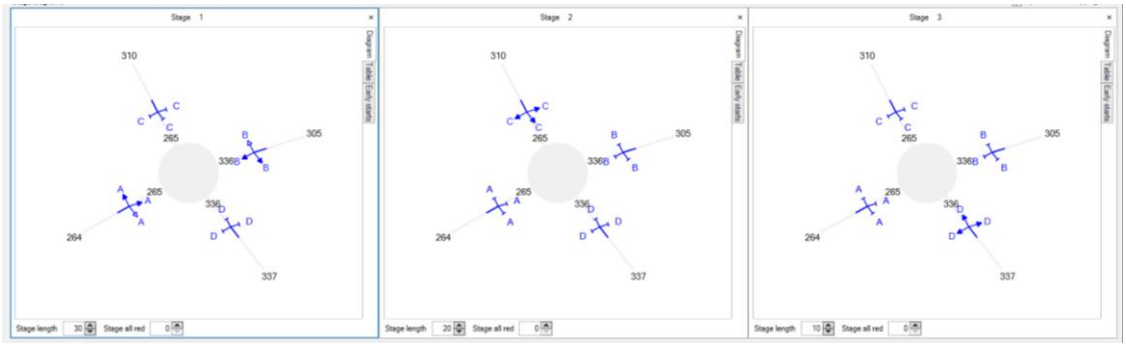


Figure 37: Signal Stage Diagrams at The Park / Northway Lane / Kingston Road junction

PJA Model Observation and Results

For the analysis presented in this chapter, both scenario models have been simulated 10 times (seed runs) to obtain average journey time and queue length statistics for the AM peak period (07:00 – 10:00 hours) and for the PM peak period (16:00 – 19:00 hours).

Journey time results have been collected and reported across 4 routes shown in Figure 38 below. In addition, the average maximum queue results were also collected to present the maximum queue length observed during each 5-minute time interval on approaches to junctions.

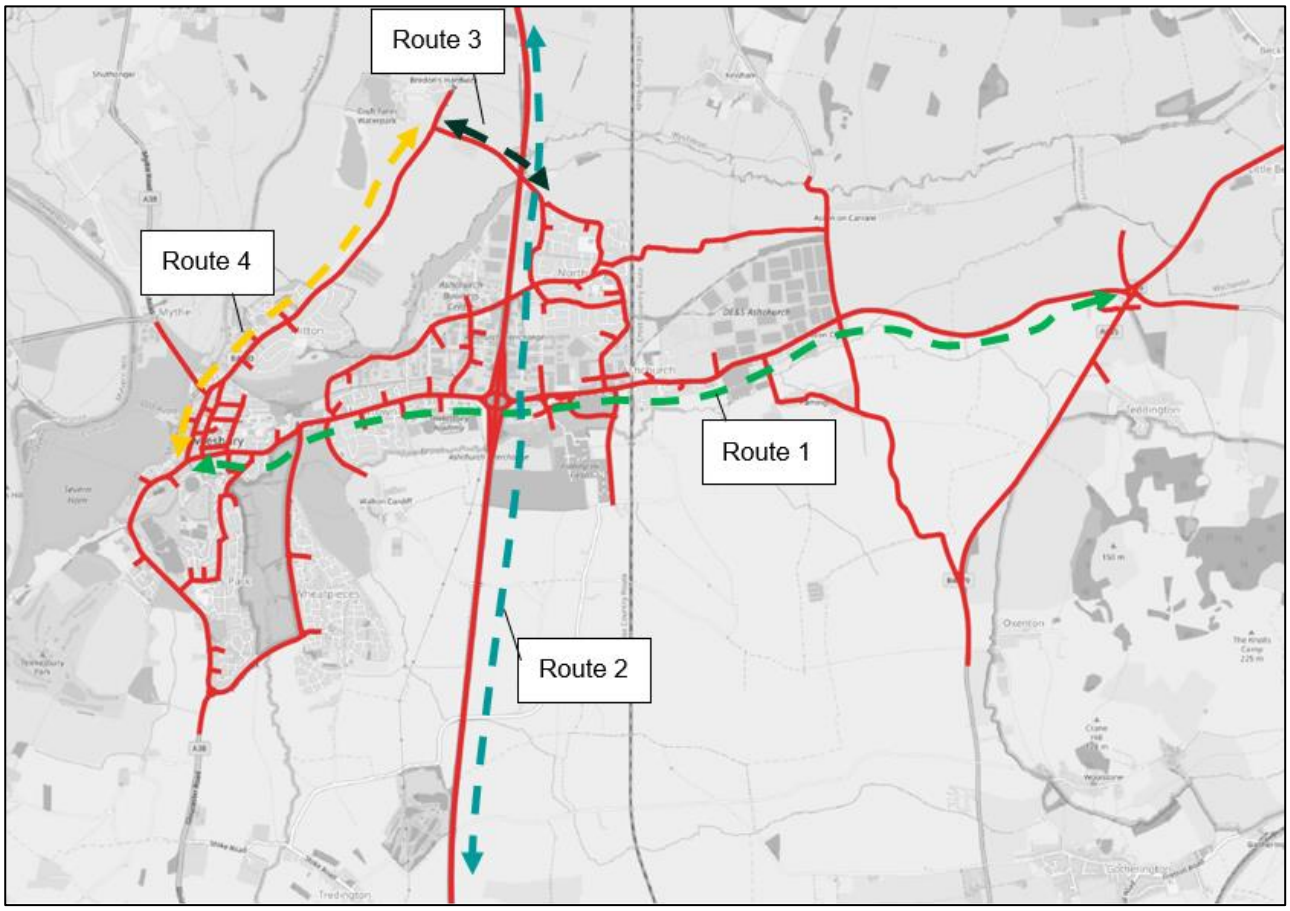


Figure 38: Route 1 – A46 / A438

The primary aim of this analysis is to assess the impact of the additional traffic generated by the Mitton development on the road network, and to evaluate the effectiveness of the proposed PJA mitigation measures in minimising these impacts.

Journey Time Results

Figure 39 and Figure 40 below present the journey time results for Route 1 – A46 / A438 for the 2041 Do-Something without Mitton and 2041 Do-Something with Mitton PJA scenarios for the AM peak and PM peak hours respectively.

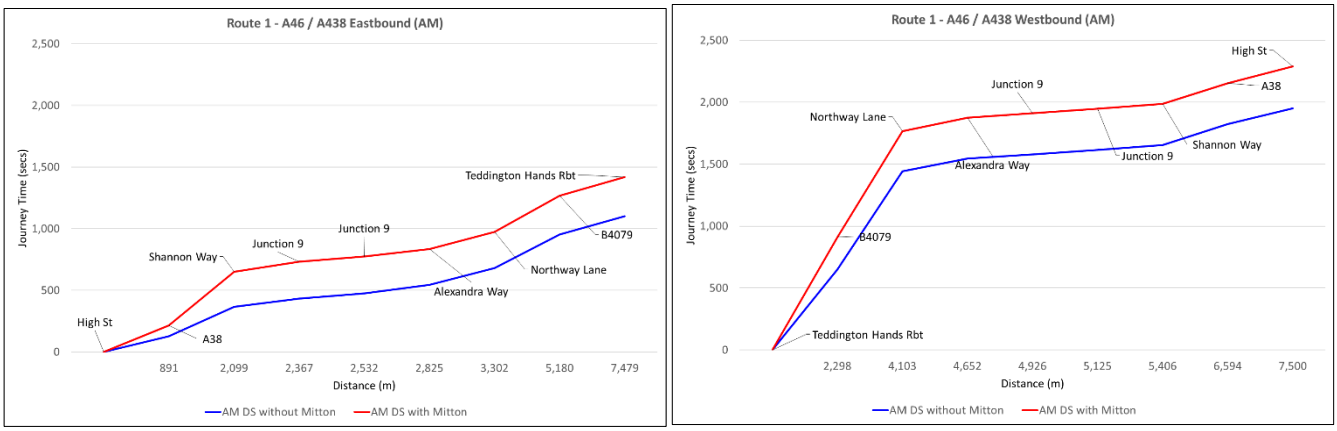


Figure 39: AM Peak Period Journey Times, Route 1 – A46 / A438

The above information for the AM peak hour indicates that end to end journey times increase by 5 minutes 17 seconds (from 18 minutes 20 seconds to 23 minutes 37 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model in the eastbound direction.

In the westbound direction, end to end journey times increase by 5 minutes 37 seconds (from 32 minutes 31 seconds to 38 minutes 8 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model.

Comparing the performance of the Do Something with Mitton scenario with PJA mitigation measures against the previously reported Do Something with Mitton scenario, presented in Figure 10, indicates an increase in journey time of 3 minutes and 54 seconds and a reduction of 5 minutes and 21seconds for the eastbound and westbound directions respectively.

The increase in journey time eastbound has been attributed to the proposed mitigation measures within Tewksbury which has allowed higher traffic volumes to access the A438 compared to the previous assessment. This additional traffic has increased the queueing at the A428 / Shannon Way signalised junction resulting in a spike in the journey time profile. With regards to the westbound direction, there is a reduction in overall queueing along the A46 westbound on the approach to the M5 Junction 9, this has been attributed to the changes in the signals at the M5 junction 9 which allows greater opportunities for traffic to exit from the priority approach onto junction 9 westbound.

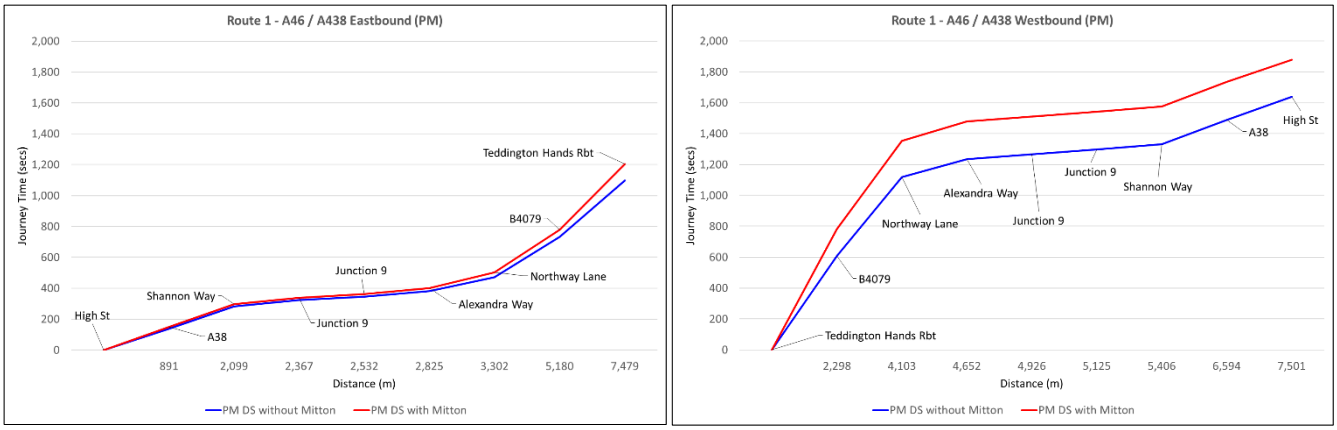


Figure 40: PM Peak Period Journey Times, Route 1 – A46 / A438

The above information for the PM peak hour indicates that end to end journey times increase by 1 minute 47 seconds (from 18 minutes 17 seconds to 20 minutes 4 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model in the eastbound direction.

In the westbound direction, end to end journey times increase by 4 minutes (from 27 minutes 18 seconds to 31 minutes 18 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model.

Comparing the performance of the Do Something with Mitton scenario with PJA mitigation measures against the previously reported Do Something with Mitton scenario, presented in Figure 11, indicates marginal increases in eastbound and westbound journey times of 38 seconds and 8 seconds respectively.

The observed differences in end-to-end journey times between the two Do Something with Mitton scenarios are marginal and could be attributed to statistical variability, rather than to the impact of PJA mitigation measures.

Route 2 – M5 Mainline

Figure 41 and Figure 42 below presents the journey time results for Route 2 – M5 Mainline for the 2041 Do-Something without Mitton and 2041 Do-Something with Mitton PJA scenarios for the AM peak and PM peak hours respectively.

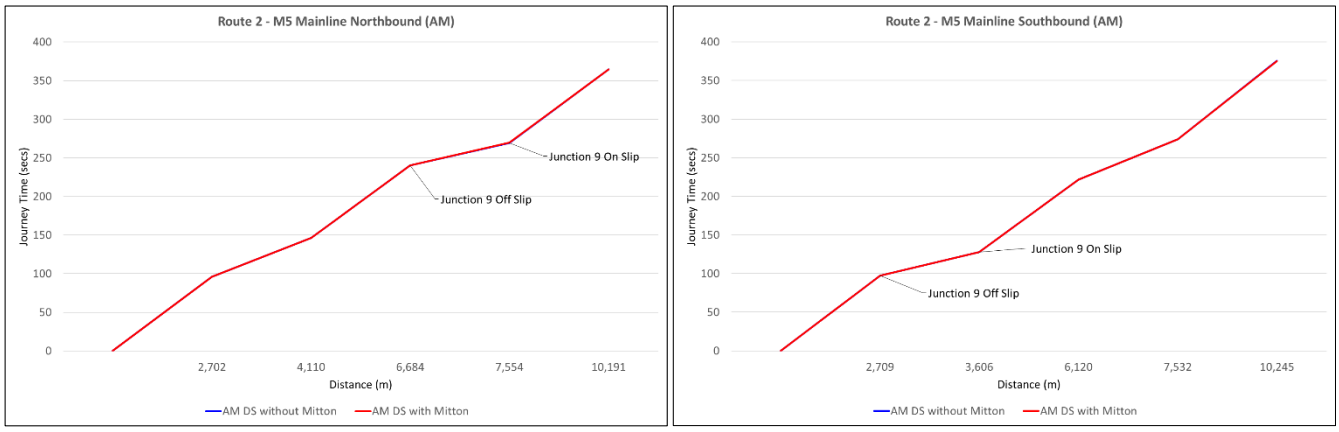


Figure 41: AM Peak Period Journey Times, Route 2 – M5 Mainline

The above information for the AM peak hour indicates that end to end journey times are generally consistent between the Do-Something with Mitton model and the Do-Something without Mitton model in both the northbound and southbound directions, with the model estimating it would take around 6 minutes 4 seconds and 6 minutes 15 seconds respectively to travel along the 10km section of the M5 motorway.

Comparing the performance of the Do Something with Mitton scenario with PJA mitigation measures against the previously reported Do Something with Mitton scenario, presented in Figure 12, indicates marginal differences between the end to end journey times in both the northbound and southbound. This demonstrates the PJA mitigation measures did not have an impact on the M5 journey times.

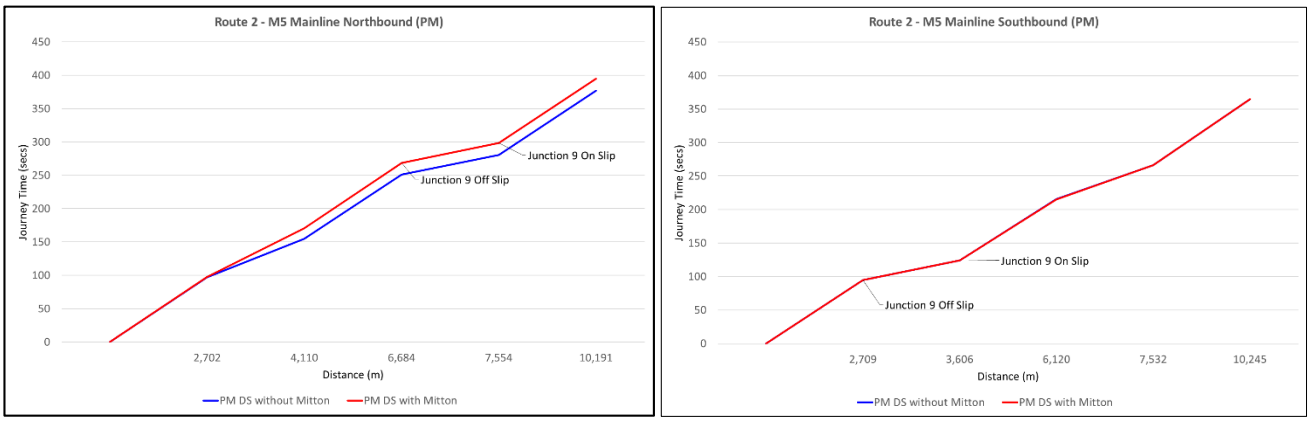


Figure 42: PM Peak Period Journey Times, Route 2 – M5 Mainline

The above information for the PM peak hour indicates that end to end journey times increase slightly by 17 seconds (from 6 minutes 17 seconds to 6 minutes 34 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model in the northbound direction. This slight difference in journey time has been attributed to the additional Mitton development trips which may cause increased weaving issues on the approach to Junction 9, however this must be viewed with caution as the model might be overly sensitive with regards to weaving behaviour.

Comparing the performance of the Do Something with Mitton scenario with PJA mitigation measures against the previously reported Do Something with Mitton scenario, presented in Figure 13, indicates marginal differences between the end to end journey times in both the northbound and southbound directions. This demonstrates that the proposed PJA mitigation measures are not having any impact on the operation on the M5.

Route 3 – Hardwick Bank Road / The Park

Figure 43 and Figure 44 below present the journey time results for Route 3 – Hardwick Bank Road for the 2041 Do-Something without Mitton and 2041 Do-Something with Mitton PJA scenarios for the AM peak and PM peak hours respectively.

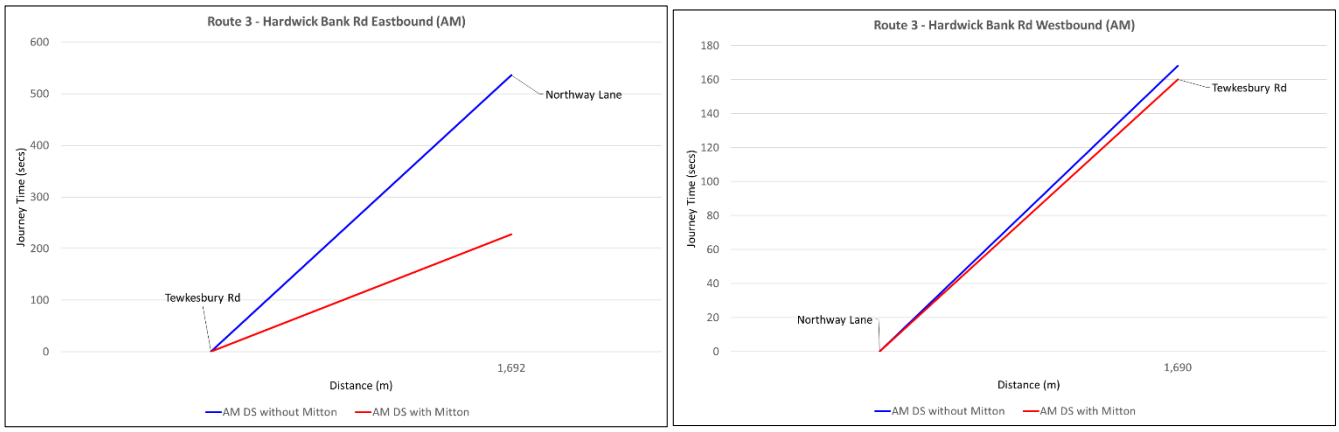


Figure 43: AM Peak Period Journey Times, Route 3 – Hardwick Bank Road

The above information for the AM peak hour indicates that end to end journey times reduce significantly by 5 minutes 8 seconds (from 8 minutes 55 seconds to 3 minutes 47 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model in the eastbound direction.

In the westbound direction, end to end journey times marginally reduce by 8 seconds (from 2 minutes 48 seconds to 2 minutes 40 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model.

Comparing the performance of the Do Something with Mitton scenario with PJA mitigation measures against the previously reported Do Something with Mitton scenario, presented in Figure 14, indicates a noticeable reduction in journey times due to the introduction of the traffic signals which manage conflicting movements more efficiently than the current priority junction configuration.

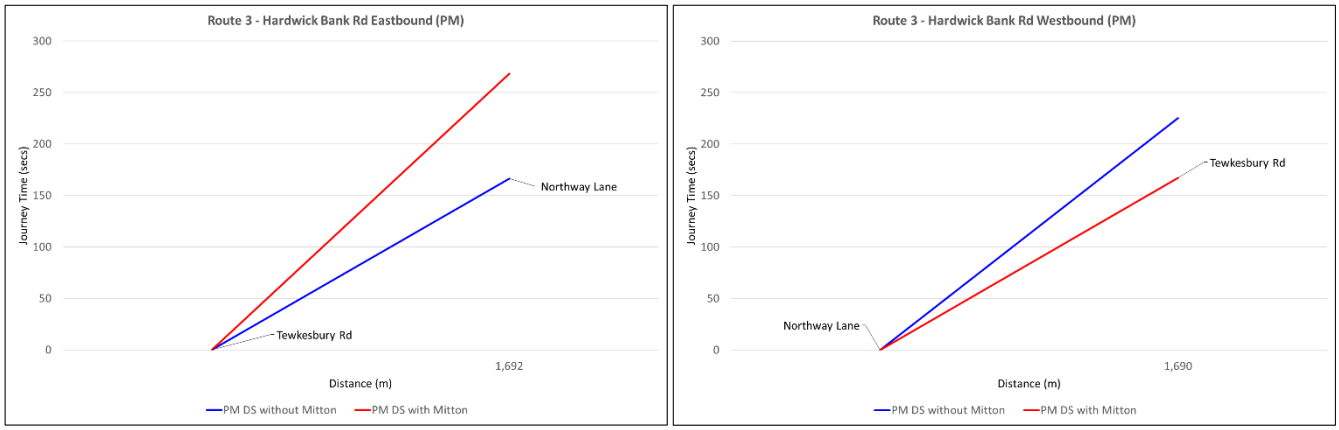


Figure 44: PM Peak Period Journey Times, Route 3 – Hardwick Bank Road

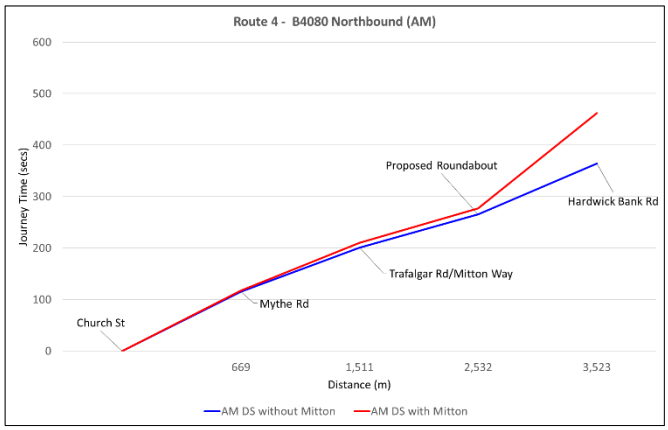
The above information for the PM peak hour indicates that end to end journey times increase by 1 minute 42 seconds (from 2 minutes 46 seconds to 4 minutes 28 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model in the eastbound direction.

In the westbound direction, end to end journey times reduce by 58 seconds (from 3 minutes 45 seconds to 2 minutes 47 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model, that is attributed to the introduced mitigation measure on Hardwick Bank Road.

Comparing the performance of the Do Something with Mitton scenario with PJA mitigation measures against the previously reported Do Something with Mitton scenario, presented in Figure 15, indicate that the journey times increase in the eastbound direction due to the introduction of the traffic signals, which have been introduced to aid the operation during the AM period.

Route 4 – B4080

Figure 45 and Figure 46 below present the journey time results for Route 4 – B4080 for the 2041 Do-Something without Mitton and 2041 Do-Something with Mitton PJA scenarios for the AM peak and PM peak hours respectively.



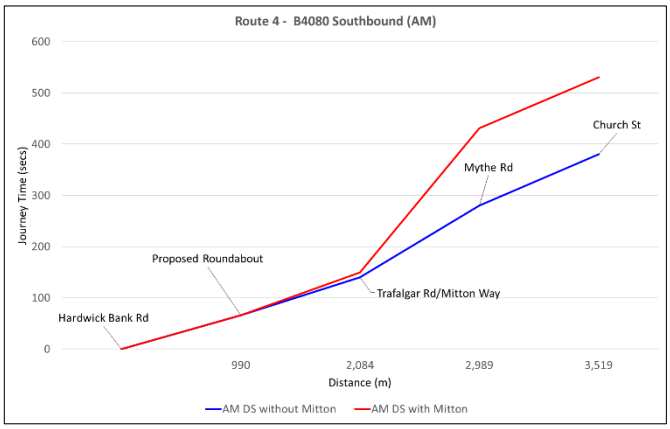


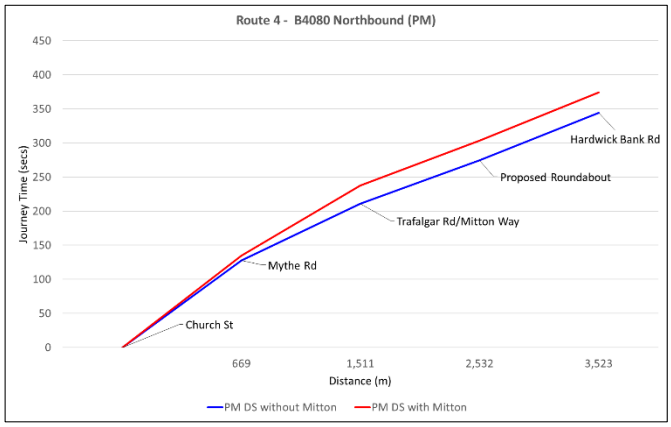
Figure 45: AM Peak Period Journey Times, Route 4 – B4080

The above information for the AM peak hour indicates that end to end journey times increase by 1 minute 37 seconds (from 6 minutes 4 seconds to 7 minutes 41 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model in the northbound direction.

In the southbound direction, end to end journey times increase by 2 minutes 30 seconds (from 6 minutes 20 seconds to 8 minutes 50 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model.

Comparing the performance of the Do Something with Mitton scenario with PJA mitigation measures against the previously reported Do Something with Mitton scenario, presented in Figure 16, indicates a marginal increase in northbound journey time of 4 seconds and a substantial decrease in southbound journey time by 10 minutes and 48 seconds.

The observed differences in end-to-end journey times between the two Do Something with Mitton scenarios are attributed to the introduction of mini roundabouts at the existing T junctions at High Street / Sun Street and High Street / Quay Street rather than the previously proposed signalisation of High Street / Sun Street.



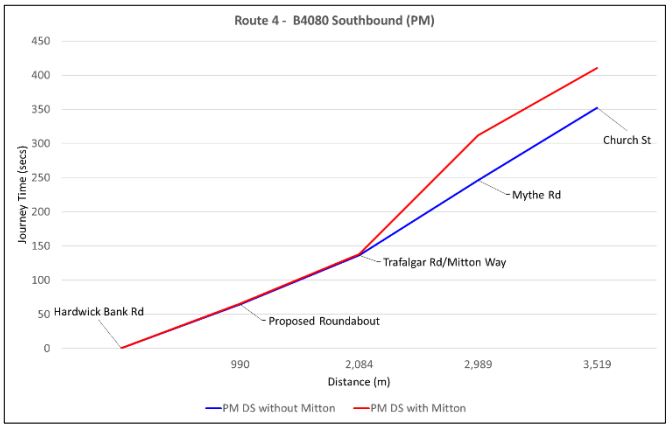


Figure 46: PM Peak Period Journey Times, Route 4 – B4080

The above information for the PM peak hour indicates that end to end journey times increase by 30 seconds (from 5 minutes 44 seconds to 6 minutes 14 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model in the northbound direction.

In the southbound direction, end to end journey times increase by 58 seconds (from 5 minutes 52 seconds to 6 minutes 50 seconds) in the Do-Something with Mitton model when compared with the Do-Something without Mitton model.

Comparing the performance of the Do Something with Mitton scenario with PJA mitigation measures against the previously reported Do Something with Mitton scenario, presented in Figure 17, indicate decrease in northbound journey time of 29 seconds and in southbound journey time of 58 seconds.

As per the AM period, the differences in end-to-end journey times between the two Do Something with Mitton scenarios are attributed to the introduction of mini roundabouts at the existing T junctions at High Street / Sun Street and High Street / Quay Street rather than the previously proposed signalisation of High Street / Sun Street.

Queue Lengths

The following section presents the queue length analysis at key junctions within the study area as per the previous assessment. The average maximum queue results presented below represent the maximum queue length observed during each 5-minute time interval. The following assumptions should be considered while analysing the queue results:

- Queue length values for each 5-minute interval demonstrate the maximum queue length recorded during that interval. This does not imply that the queue remained at that length for the entire 5 minutes.
- The average maximum queue refers to the maximum queue length recorded during each 5 minutes interval across 10 different simulation runs. The values presented are the averages of 10 maximum values for each 5 minutes interval.

B4080 Bredon Road

Figure 47 below presents queue length results for the B4080 Bredon Road approach to the B4080 Bredon Road / Mythe Road mini roundabout in the southbound direction for the AM and PM peak periods.

Figure 47: AM and PM Maximum Queue Lengths (m) – B4080 Bredon Road Southbound

The above information indicates that during the AM peak period, queuing along the B4080 Bredon Road is estimated to be significantly longer in the Do-Something with Mitton model in comparison to the Do-Something without Mitton model, with a maximum queue length of around 520m (approximately 86 vehicles) at 08:55 hours.

During the PM peak period, queuing along the B4080 Bredon Road is also longer in the Do-Something with Mitton model in comparison to the Do-Something without Mitton model, with a maximum queue length of around 180m (approximately 30 vehicles) at 17:05 hours.

The observed increase in queue length supports the increase journey time of around 2 minutes 30 seconds during the AM peak period and 58 seconds during the PM peak period, presented in Figure 45 and Figure 46 above. These increases in queue lengths and journey times may be further mitigated through changes in travel behaviour (i.e. earlier departure time or change in transport mode), thereby leading to the reduced increase in queue and journey time.

Comparing the performance of the Do Something with Mitton scenario with PJA mitigation measures against the previously reported Do Something with Mitton scenario, indicates a significant decrease in queue lengths, up to around 300 metres during the AM peak period and a slight reduction of up to around 20 metres in the PM peak period.

M5 Junction 9 Northbound Off-Slip

Figure 48 below presents queue length results for the northbound off-slip to M5 junction 9 for the AM peak and PM peak periods.

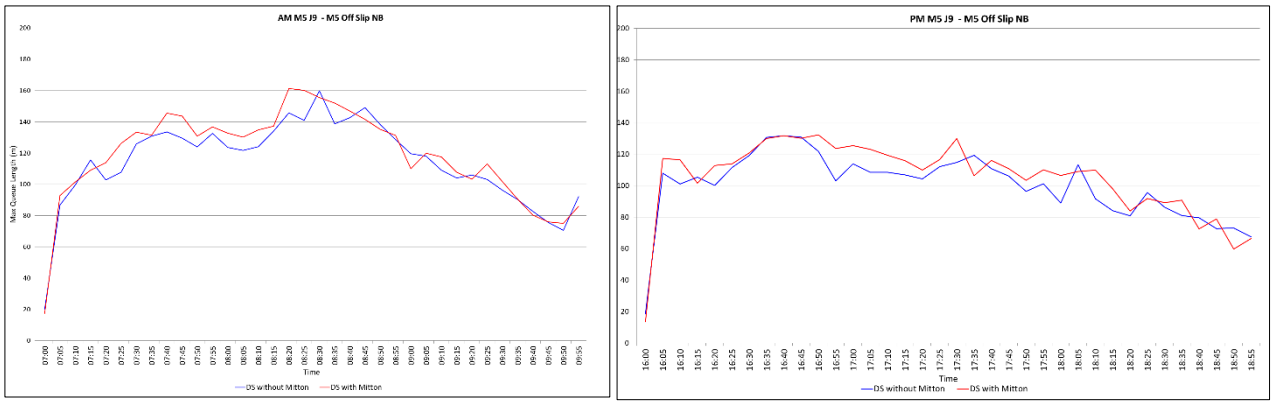


Figure 48: AM and PM Maximum Queue Lengths (m) – M5 Junction 9 Northbound Off-Slip

The above information indicates that the queue profile is generally the same for both the Do-Something without Mitton and Do-Something with Mitton scenarios during the AM peak period, with queue lengths being generally shorter in the Do-Something without Mitton. Queue lengths reach a maximum length at around 08:30 with a maximum of queue length of around 160m (approximately 27 vehicles) in the Do-Something with Mitton.

These queues are approximately 155m and 90m shorter than those presented in the previous analysis in Figure 20. This demonstrates that the mitigation measure of extending the flare lane on the M5 Junction 9 northbound off-slip has reduced the possibility of queuing extending onto the M5.

During the PM peak period, the queue patterns are generally similar for both the Do-Something without Mitton and Do-Something with Mitton scenarios. However the PM with Mitton model displays shorter queues than those observed during the AM period.

With the above stated, the results must be viewed with caution as the models present large variability given the high levels of congestion within the study area, that might lead to queueing reaching the M5 mainline on occasion. On average Do Something with Mitton with PJA mitigation measures scenario, sees queues reaching the M5 one time out of the ten seeds used in the queue length outputs, furthermore the queueing onto the motorway during this seed lasts between 5 to 10 minutes.

In comparison to the previously reported Do Something with Mitton scenario, presented in Figure 20, the risk of the queue extending back onto the M5 is reduced from 3 out of 10 model runs to 1 out of 10 model runs.

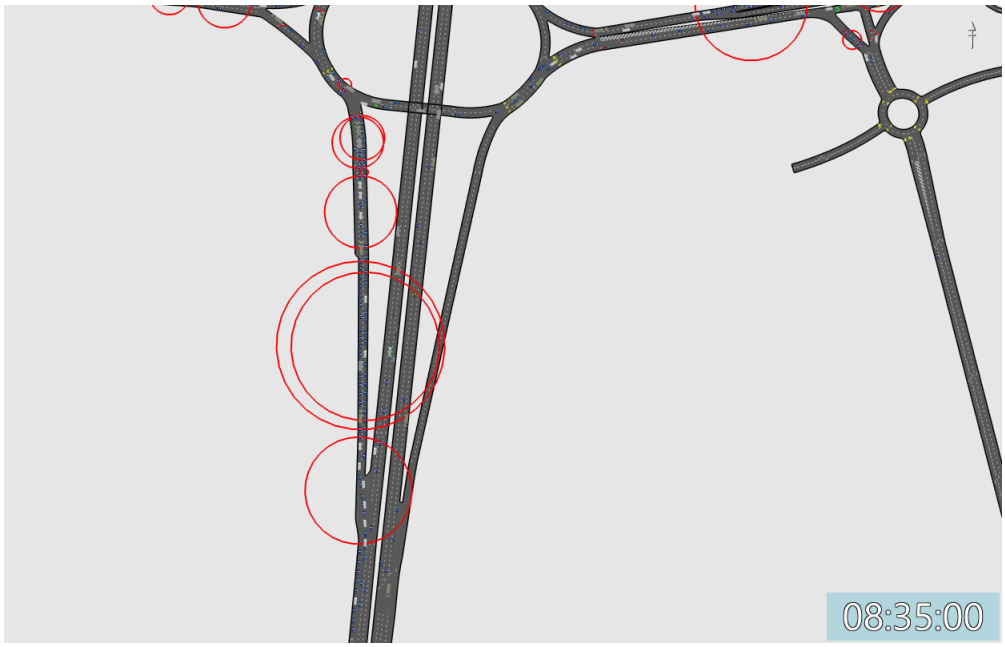


Figure 49: Screenshot of the queue stretching back onto M5.

Hardwick Bank Road

Figure 50 below presents queue length results for the Hardwick Bank Road at the Tewkesbury Road approach in the westbound direction for the AM and PM peak periods.

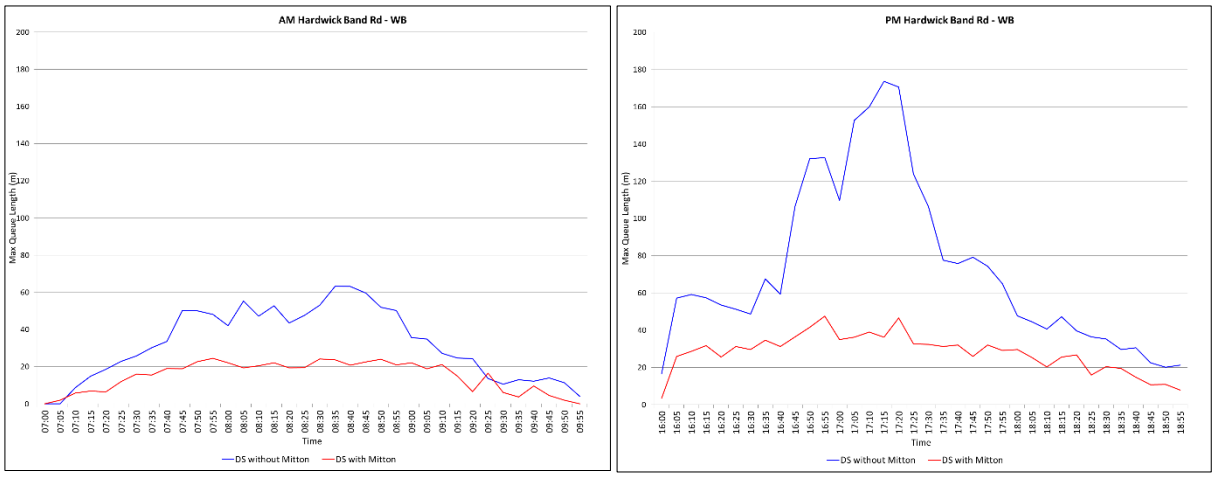


Figure 50: AM and PM Maximum Queue Lengths (m) – Hardwick Bank Road

The above information indicates that during the AM peak period, the queues along Hardwick Bank Road are estimated to be significantly shorter in the Do-Something with Mitton model in comparison to the Do-Something without Mitton model, with a maximum queue length of around 63m (approximately 11 vehicles) at 08:35 hours in the Do-Something without Mitton model.

Similarly, during the PM peak period, the recorded queue lengths are significantly shorter in the Do-Something with Mitton model in comparison to the Do-Something without Mitton model, with queue lengths reaching a maximum of around 175m (approximately 29 vehicles) at 17:15 hours in the Do-Something without Mitton model.

The decrease in journey times in the westbound direction, as seen in Figure 43 and Figure 44 align with the reduction in queue lengths presented above.

The observed reduction in queue in the Do Something with Mitton scenario is attributed to the introduction of the 2nd lane on Hardwick Bank Road. Comparing the performance of the Do Something with Mitton scenario with PJA mitigation measures against the previously reported Do Something with Mitton scenario, presented in Figure 26, these indicate a marginal increase in queue length up to 10 metres during the AM and PM peak periods.

The Park

Figure 51 below presents queue length results for The Park at the Northway Lane approach in the southbound direction for the AM and PM peak periods.

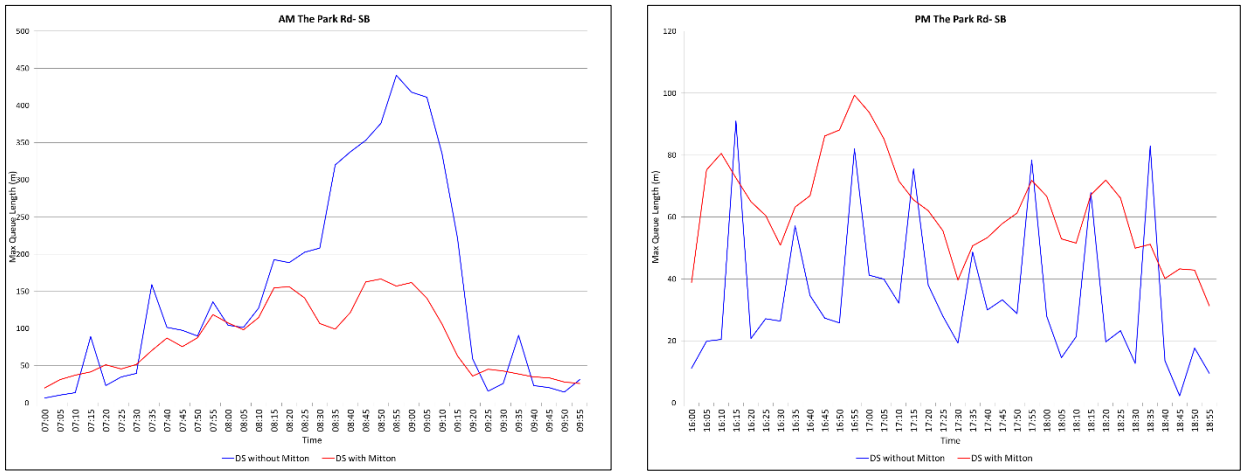


Figure 51: AM and PM Maximum Queue Lengths (m) – The Park

The above information indicates that during the AM peak period, the queues along The Park are estimated to be significantly smaller in the Do-Something with Mitton model in comparison to the Do-Something without Mitton model, with a maximum queue length of around 450m (approximately 117 vehicles) compared with 150m (approximately 25 vehicles) at around 09:10 hours.

During the PM peak period, the recorded queue lengths are slightly longer in the Do-Something with Mitton model in comparison to the Do-Something without Mitton model, with queue lengths reaching a maximum of around 100m (approximately 17 vehicles) compared with around 95m (approximately 16 vehicles).

Again similar to the AM period, the queue figures presented above align with the journey times, with the AM period seeing a reduction journey time whereas the PM sees an increase.

A46 Westbound

Figure 52 below presents queue length results for the A46 approach to the A46 / B4079 signalised junction in the westbound direction for the AM peak period for the with Mitton option with PJA mitigation measures and for the with Mitton option with AECOM mitigation measures, which were reported previously.

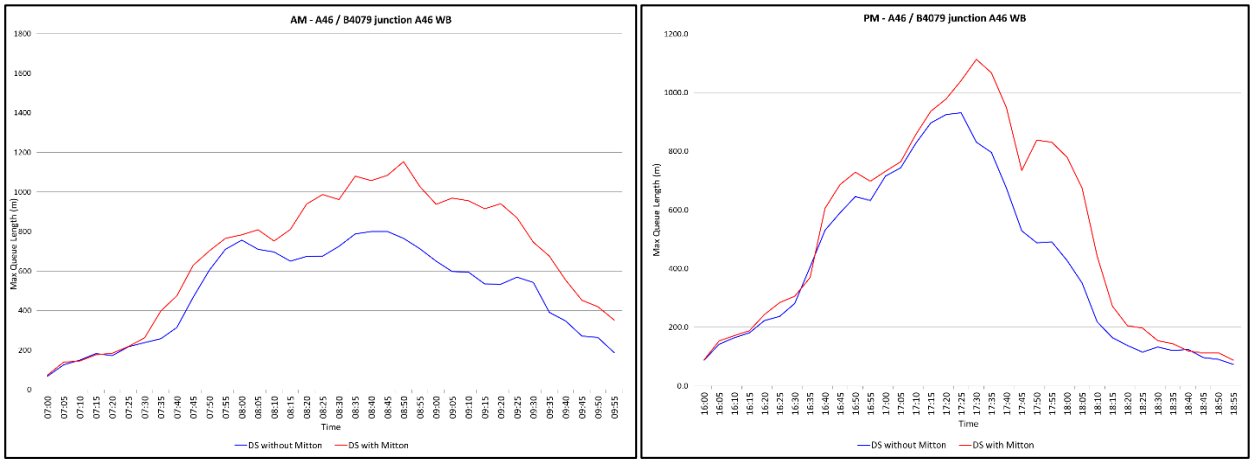


Figure 52: AM and PM Maximum Queue Lengths (m) – A46 Westbound

The above information indicates that during the AM peak period the westbound queue length increase at the A46 / B4079 junction to around 1100m (approximately 180 vehicles) in both periods, whereas the without Mitton models show a queue length of around 800m (approximately 133 vehicles) during the AM and 900m (approximately 150 vehicles) in the PM period.

Comparing the queue length with the previous Do Something models highlight a noticeable benefit along the A46 westbound with queues previously reaching a maximum length of 1550m (approximately 260 vehicles) during the AM period as shown in Figure 53.

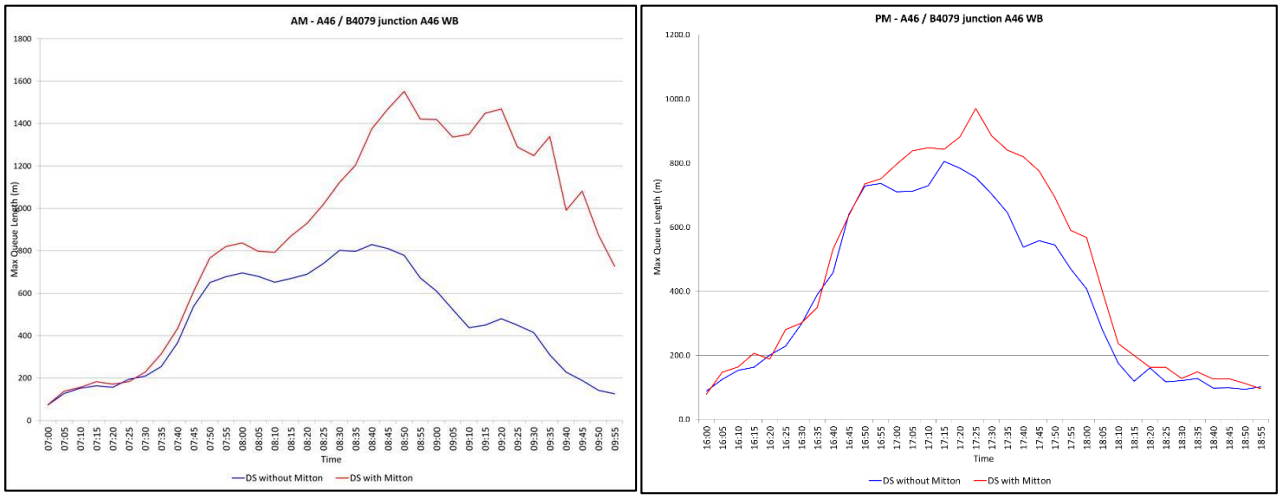


Figure 53: AM and PM Maximum Queue Lengths (m) – A46 Westbound (Previous Assessment)

8 Summary

Impact Assessment of Committed Developments and Mitton Development with AECOM Mitigation Measures

The significant increase in trips being presented by the committed developments will provide a challenging backdrop for the Mitton development, as the congestion levels on the A46 and M5 Junction 9 are of concern.

The modelling results from the M5 Junction 9 Paramics model clearly highlight that the inclusion of the Mitton development will have an impact on the local road network, in particular on the B4080 Bredon Road Southbound where signals have been required at the B4080 / Oldbury Road junction, and at the Sun Road / High Street junction to manage the additional Mitton traffic demands to ensure that Tewkesbury network does not become heavily congested, which could result in the network gridlocking.

Other areas of the local network experience higher levels of congestion, including The Park southbound approach to Northway Lane during the AM peak period where traffic from the Mitton development use this route as an alternative to Tewkesbury.

During the PM peak period, the local road network shows less signs of congestion with the Mitton development included, however there are still long queues observed on the B4080 southbound.

In terms of the Strategic Road Network (SRN), the inclusion of the Mitton development displaces background traffic onto Northway Lane approach to the A46, where increased delay is experienced on the A46 westbound by taking up road capacity. The impact of this is most acute during the AM peak period, however the PM peak period also displays these issues.

The M5 Junction 9 is a known hotspot area, highlighted previously by AtkinsRealis to suffer from congestion which can queue back onto the M5 Motorway main carriageway. The modelling reiterates this observation in both development scenarios (with and without Mitton development assessments) where queueing is observed extending back from the northbound off-slip onto the M5 Motorway on three out of the ten seed runs. Although the duration of this queue was observed for around 5 minutes, this safety concern must be acknowledged. The inclusion of the Mitton development has indicated that the average maximum queue length could possibly be lower, however professional judgement would argue that queuing would be marginally longer given the increase of 37 additional vehicles during the peak hour in the Do-Something with Mitton model.

Impact Assessment of Committed Developments and Mitton Development with PJA Mitigation Measures

Following the submission of the impact assessment for the Local Development Plan and Mitton Development conducted in February 2025 (summarised in Chapter 6), PJA provided a revised list of mitigation measures (Table 3) aimed at further addressing congestion within the study area. The assessment of committed developments and the Mitton development, incorporating the proposed PJA mitigation measures, demonstrated a reduction in congestion levels in specific parts of the study area.

For example, it was shown that the introduction of the Mitton development would lead to an increase in journey time for drivers on B4080 / High Street in Tewkesbury, when comparing the Do-Something with Mitton scenario against the Do-Something without Mitton scenario for both peak periods in both directions. The largest increase of 2 minutes and 30 seconds was observed during the AM peak heading southbound. However, in comparison to the previously reported Do-Something with Mitton scenario, the introduction of PJA mitigation measures - such as introduction of mini-roundabouts at High Street/Sun Street and High Street/Quay Street, helped to minimise the impact of the Mitton Development, reducing southbound journey times in the Do- Something with Mitton scenario by 10 minutes and 48 seconds during the AM peak period.

Furthermore, the adjustments to the signal timings at the M5 Junction 9, helped to minimise the impact of the Mitton Development along the A438, this has had a secondary benefit for the westbound movement along the A46 with a reduction in queueing and journey times compared to the previous mitigation measures.

The Hardwick Bank Road and The Park route between Northway Lane and Tewkesbury Road sees a reduction in journey time with the introduction of the signals at the Northway Lane / The Park / Kingston Road staggered junction and a flare lane on the approach to Tewkesbury Road. This route now sees a reduction of around 5 minutes during the AM period in the eastbound direction and marginal 8 seconds reduction in the westbound direction when compared to the no Mitton scenario. A more modest reduction is seen in the PM westbound direction with around 1 minute saving, however in the eastbound direction there is an increase of around 2 minutes.

In addition, the analysis showed that extension of the three-lane section on the northbound off-slip road from the M5 to Junction 9, helps to minimise the impact of increased queuing associated with the additional traffic generated by Mitton Development and Local Development Plan. Furthermore, it reduces the risk of the queue extending back onto the M5 from 3 out of 10 to 1 out of 10.

Conclusions and Recommendations

The assessments have identified that the wider local plan has little to no impact on the study area. This is given that the external-to-external growth, excluding the M5 through traffic, is around 180 light vehicles and 250 light vehicles during the AM and PM peak respectively and equates to around 1.2% and 1.5% of the overall peak hour demand for the study

area respectively. The impact on the SRN is more insignificant, with only 13 vehicles (9 of which are committed development trips) impacting the northbound slip roads during the critical AM peak. Therefore, local plan excluding Mitton Development is inconsequential within this study area.

With regards to the Mitton Development, it is anticipated that the development will have a significant impact on the local road network, especially southbound toward Tewkesbury on the A4080 and along the Hardwick Bank Road / The Park.

The mitigation measures developed by AECOM in January / February 2025 were designed to manage congestion levels through Tewkesbury and maintain a reasonable level of operation without overloading the finite capacity. The proposed improvements at the A38 / A438 signalised junction ensured that queueing did not extend back toward the M5 Junction 9 by allowing two lanes to travel westbound through the junction.

In terms of the northbound off-slip at Junction 9, it was unlikely that the inclusion of the Mitton development would have a noticeable impact at this location given the increase of 37 vehicles during the AM peak hour. However, concerns were raised by both this study and AtkinsRealis that queueing could extend back onto the M5 Motorway northbound carriageway, therefore further mitigation measures were considered such as increasing the flare length on the approach to Junction 9. A sensitivity test discussed in Appendix B, indicated that increasing the flare length to 130m could reduce the queue length and more importantly reduce the number of instances that queueing could extend onto the M5.

The revised mitigation measures, developed by PJA aimed to further ease the congestion level in Tewkesbury by replacing the existing T-junctions at High Street / Sun Street and High Street/Quay Street with mini roundabouts. These improvements combined with other mitigation measures in the wider area, helped to further reduce congestion in Tewkesbury and thereby minimise the impact of the Mitton Development.

Additionally, the mitigation measures included the extension of the three-lane section on the northbound off slip to Junction 9 and reduced queuing on this approach and lowered the risk of the queue extending back onto M5 from 3 out of 10 occurrences to 1 out of 10 occurrences.

Overall, the introduction of Mitton development with the proposed PJA mitigation measures may lead to the increase in journey time of up to around 6 minutes, however the recorded increases in queue lengths and journey times may be further mitigated through changes in travel behaviour (i.e. earlier departure time or change in transport mode), thereby leading to the reduced increase in queue and journey time.

Appendix A – Review of Committed Developments

Overview of Committed Developments within the Model

The committed developments that have been included in the model are shown in Figure 54 below.

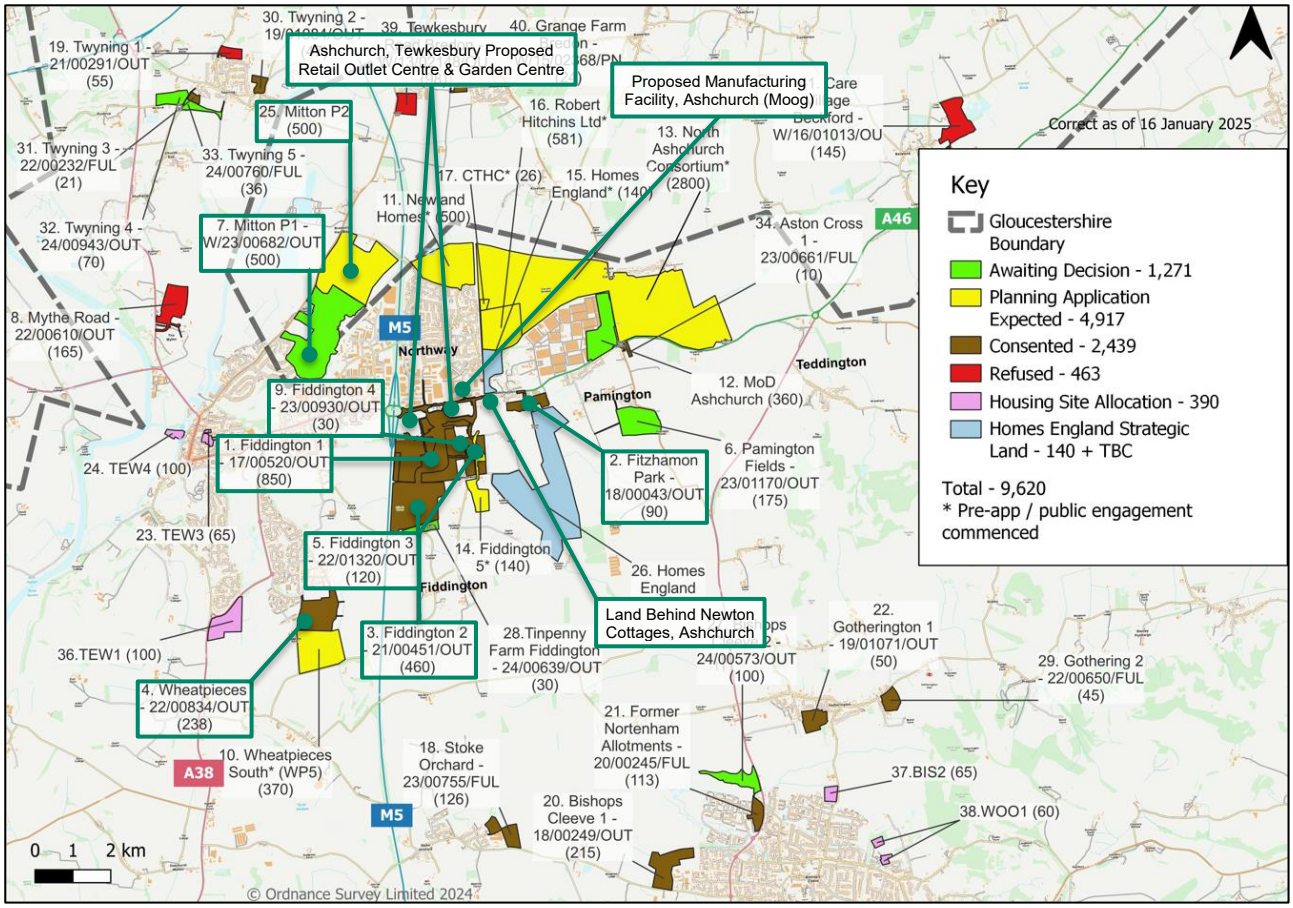


Figure 54: Location of Committed Developments

The following committed developments shown in Table 1 below are being considered within the model.

Table 4: Committed Developments included within the Model

Development Name and Reference	Paramics Discovery Zone	Description
Land Behind Newton Cottages, Ashchurch	Zone 60	44 dwellings
Land to the South-East of Bluebell Road and East of Rudgeway Lane, Wheatpieces – 22/00834/OUT	Zone 61	238 dwellings
Land off Fiddington Lane, Ashchurch – Fiddington 3 22/01320/OUT	Zone 62	120 dwellings
Land West of Fiddington Lane, Ashchurch – Fiddington 4 23/00930/OUT	Zone 63	30 dwellings
Moog Site	Zone 64	Manufacturing Facility
Ashchurch, Tewkesbury – Proposed Retail Outlet Centre and Garden Centre	Zone 70	8,000m^2 Garden Centre + 17,545m^2 Retail Outlet
Fitzhamon Park, Ashchurch – 18/00043/OUT	Zone 71	90 dwellings + 66 bed Care Home + 495m^2 Community Centre
Land North West of Fiddington – Fiddington 2 21/00451/OUT	Zone 72	460 dwellings + 210 pupil Primary School
Land at Fiddington – Fiddington 1 17/00520/OUT	Zone 73	850 dwellings

Development Name and Reference	Paramics Discovery Zone	Description
		+ Primary School (or 900 dwellings)
Mitton Development	Zone 444	1,000 dwellings

The above committed developments are located in the Paramics Discovery model as shown in Figure 55 below.

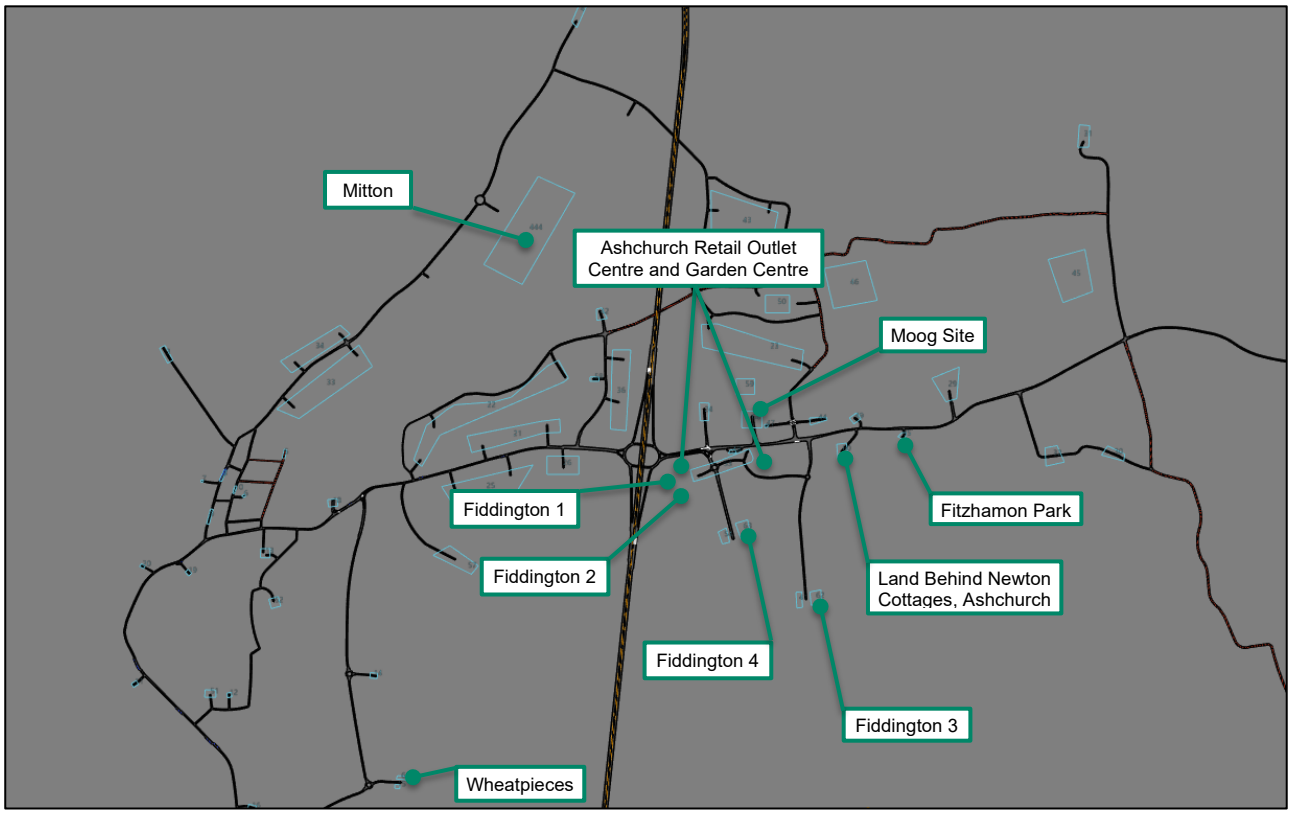


Figure 55: Location Committed Developments within the Paramics Discovery Model

The above committed developments are discussed in more detail below.

Land Behind Newton Cottages, Ashchurch

Background

The Land Behind Newton Cottages is a proposed residential development of up to 45 dwellings and is located within the village of Ashchurch, approximately 3.5km to the east of Tewksbury town centre. Site access is proposed from the service road running parallel to the A46(T). This road currently serves six dwellings, a primary school and village hall.

Paramics Discovery Model Zone

The Land Behind Newton Cottages proposed development is allocated to Zone 60 in the Paramics Discovery Model.

Trip Rates and Traffic Generation

The trip rates for the Land Behind Newton Cottages proposed development are shown in Table 5 below.

Table 5: Trip Rates for Land Behind Newton Cottages

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Land Behind Newton Cottages	0.15	0.44	0.42	0.27	-	-	-	-

The estimated traffic generation used in the model for the Land Behind Newton Cottages proposed development is shown in Table 6 below.

Table 6: Traffic Generation for Land Behind Newton Cottages

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Land Behind Newton Cottages	7	20	19	12	19	53	52	33

Trip Distribution

The TA for the proposed development does not provide information on trip distribution, therefore the trip distribution information from Zone 35 in the Discovery model was used for the Land Behind Newton Cottages proposed development.

Land to the South-East of Bluebell Road and East of Rudgeway Lane, Wheatpieces

Background

The Land to the South-East of Bluebell Road and East of Rudgeway Lane, Wheatpieces development is a proposal for up to 250 dwellings, community sports pavilion and outdoor sports pitches, with associated highway, drainage and green infrastructure including trim trail, outdoor play and community orchard' on land to the south-east of Bluebell Road and east of Rudgeway Lane, Wheatpieces, Tewkesbury.

Paramics Discovery Model Zone

The Wheatpieces proposed development is allocated to Zone 61 in the Paramics Discovery Model.

Trip Rates and Traffic Generation

The trip rates for the Wheatpieces proposed development are shown in Table 7 below.

Table 7: Trip Rates for Wheatpieces

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Wheatpieces	0.17	0.40	0.38	0.16	-	-	-	-

The estimated traffic generation used in the model for the Wheatpieces proposed development is shown in Table 8 below.

Table 8: Traffic Generation for Wheatpieces

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Wheatpieces	40	95	90	38	108	254	249	105

Trip Distribution

The trip distribution information extracted from the TA for the Wheatpieces proposed development is shown in Table 9 below.

Table 9: Trip Distribution for Wheatpieces

Route	Paramics Discovery Zone	Distribution
A38 (S)	Zone 2	38%
A438 (W)	Zones 3,6,7,8,9,10*	15%
Shannon Way	Zone 36	12%
M5 (N)	Zone 27	4%
A46 (E)	Zone 1	18%
M5 (S)	Zone 28	12%
Total		**100%**

* The demands at this location have been split proportionally between these zones based on the trip end information.

Land off Fiddington Lane, Ashchurch (Fiddington 3)

Background

The Land off Fiddington Lane, Ashchurch (Fiddington 3) development is for a proposed residential development up to 120 dwellings, associated works including infrastructure, open space and landscaping on 'Land off Fiddington Lane', Ashchurch, Tewkesbury, located to the north of Fiddington in Tewkesbury District, Gloucestershire. Vehicle access to the site will be from Fiddington Lane via a simple priority junction.

Paramics Discovery Model Zone

The Fiddington 3 proposed development is allocated to Zone 62 in the Paramics Discovery Model.

Trip Rates and Traffic Generation

The trip rates for the Fiddington 3 proposed development are shown in Table 10 below.

Table 10: Trip Rates for Fiddington 3

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Fiddington 3	0.13	0.38	0.35	0.16	0.34	0.84	0.93	0.48

The estimated traffic generation used in the model for the Fiddington 3 proposed development is shown in Table 11 below.

Table 11: Traffic Generation for Fiddington 3

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Fiddington 3	16	46	42	19	40	101	112	58

Trip Distribution

The trip distribution information extracted from the TA for the Fiddington 3 proposed development is shown in Table 12 below.

Table 12: Trip Distribution for Fiddington 3

Route	Paramics Discovery Zone	Distribution
A38	Zone 2	9%
A438	Zones 3,6,7,8,9,10*	18%
Hardwick Bank Rd	Zone 50	2%
B4079 (N)	Zone 31	2%
A46(T)	Zone 1	11%
B4079 (S)	Zone 40	9%
Fiddington Lane	Zone 41	2%
M5 (S)	Zone 28	34%
M5 (N)	Zone 27	13%
Total		**100%**

* The demands at this location have been split proportionally between these zones based on the trip end information.

Land West of Fiddington Lane, Ashchurch (Fiddington 4)

Background

The Land West of Fiddington Lane, Ashchurch (Fiddington 4) development is a proposed residential development of up to 30 dwellings, associated works (including demolition), open space and landscaping, located to the north of Fiddington in Tewkesbury District, Gloucestershire. Vehicular access is proposed from the A46(T), on 'Land West of Fiddington Lane', Ashchurch, Tewkesbury.

Paramics Discovery Model Zone

The Fiddington 4 proposed development is allocated to Zone 63 in the Paramics Discovery Model.

Trip Rates and Traffic Generation

The trip rates for the Fiddington 4 proposed development are shown in Table 13 below.

Table 13: Trip Rates for Fiddington 4

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Fiddington 4	0.14	0.38	0.35	0.16	0.34	0.84	0.93	0.48

The estimated traffic generation used in the model for the Fiddington 4 proposed development is shown in Table 14 below.

Table 14: Traffic Generation for Fiddington 4

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Fiddington 4	4	11	10	5	16	46	42	19

Trip Distribution

The trip distribution information extracted from the TA for the Fiddington 4 proposed development is shown in Table 15 below.

Table 15: Trip Distribution for Fiddington 4

Route	Paramics Discovery Zone	Distribution
A38	Zone 2	9%
A438	Zones 3,6,7,8,9,10*	18%
Hardwick Bank Rd	Zone 50	2%
B4079 (N)	Zone 31	2%
A46(T)	Zone 1	11%
B4079 (S)	Zone 40	9%
Fiddington Lane	Zone 41	2%
M5 (S)	Zone 28	34%
M5 (N)	Zone 27	13%
Total		**100%**

* The demands at this location have been split proportionally between these zones based on the trip end information.

Moog Site

Background

The Moog Site is a proposed manufacturing facility of up to 21,531m^2 in total, delivered in two phases together with outbuildings, service yard, car parking, hard and soft landscaping, plant, and associated works infrastructure, and is located immediately to the north of the A46(T) in Ashchurch to the east of M5 Junction 9 near Tewkesbury. To the north, east and west the site is bounded by existing industrial development.

Paramics Discovery Model Zone

Moog Site is allocated to Zone 64 in the Paramics Discovery Model.

Trip Rates and Traffic Generation

The TA for Moog Site does not provide information on trip rates. The TA does provide estimated 3-hour peak period flows, as well as flow information over a 24-hour day.

The estimated traffic generation used in the model for the Moog Site is shown in Table 16 below.

Table 16: Traffic Generation for Moog Site

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Moog Site	51	8	5	62	310	49	24	310

Trip Distribution

The trip distribution information extracted from the TA for Moog Site is shown in Table 17 below.

Table 17: Trip Distribution for Moog Site

Route	Paramics Discovery Zone	Distribution
East	Zone 1	25%
West – M5 (N)	Zone 27	13%
West – A438	Zones 3,6,7,8,9,10*	16%
West – M5 (S)	Zone 28	46%
Total		**100%**

* The demands at this location have been split proportionally between these zones based on the trip end information.

Ashchurch, Tewkesbury – Proposed Retail Outlet Centre and Garden Centre

Background

The Ashchurch, Tewkesbury development is for a proposed Retail Outlet Centre of up to 17,545m^2 gross external area and Garden Centre of up to 8,000m^2 gross external area, located in Ashchurch to the east of M5 Motorway Junction 9 and south of the A46(T), approximately 3km from Tewkesbury Town Centre.

The Proposed Development will involve highway works along the A46(T) to provide new points of access including modifications to the existing A46(T) / Alexandra Way junction, carriageway widening, the realignment of Fiddington Lane and its junction with the A46(T) and associated works to create vehicular, pedestrian and cyclist accesses.

Paramics Discovery Model Zone

The proposed Retail Outlet Centre and Garden Centre development is allocated to Zone 70 in the Paramics Discovery Model.

Trip Rates and Traffic Generation

The TA does not provide information on trip rates. The TA only provides estimated 3-hour peak period flows and does not provide any information on peak hour flows. In lieu of any other peak hour information, the 3-hour peak period flows have been proportioned into hourly flows using the 'Combined Parking Accumulation' information contained within Appendix T of the TA.

It should also be noted that the TA states that the development is anticipated to open at 10:00 hours daily, however the predicted 3-hour AM peak flows are provided for 07:00-10:00 hours.

The estimated traffic generation used in the model for the proposed Retail Outlet Centre and Garden Centre development is shown in Table 18 below.

Table 18: Traffic Generation for Retail Outlet Centre and Garden Centre

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Retail Outlet Centre and Garden Centre	119	24	176	286	431	87	532	864

Trip Distribution

The trip distribution information extracted from the TA for the proposed Retail Outlet Centre and Garden Centre development is shown in Table 19 below.

Table 19: Trip Distribution for Retail Outlet Centre and Garden Centre

Route	Paramics Discovery Zone	Distribution Retail Outlet	Distribution Garden Centre
B4079	Zone 31	3%	5%
M5 South	Zone 28	42%	45%
A38	Zone 2	1%	2%
A438	Zones 3,6,7,8,9,10*	1%	2%
M5 North	Zone 27	40%	26%
A46	Zone 1	8%	12%
B4077	Zone 37	1%	2%
A435	Zone 40	3%	5%
Total		**100%**	**100%**

* The demands at this location have been split proportionally between these zones based on the trip end information.

Given that the proposed Retail Outlet Centre and Garden Centre development is assigned to one zone within the Paramics Discovery model, the above information has been used to calculate a weighted average trip distribution for use in the model. This trip distributions that have been used in the model are shown in Table 20 below.

Table 20: Trip Distribution for Retail Outlet Centre and Garden Centre

Route	Paramics Discovery Zone	Distribution AM Peak	Distribution PM Peak
B4079	Zone 31	4%	4%
M5 South	Zone 28	43%	43%
A38	Zone 2	1%	1%
A438	Zones 3,6,7,8,9,10	1%	1%
M5 North	Zone 27	35%	37%
A46	Zone 1	10%	9%
B4077	Zone 37	1%	1%
A435	Zone 40	4%	4%
Total		**100%**	**100%**

Fitzhamon Park, Ashchurch

Background

The Fitzhamon Park, Ashchurch development is a proposed residential development of up to 90 residential dwellings containing a mix of house types and tenures with associated recreation and open space provision, a 66 bed care home and a 495m^2 community centre, located within Ashchurch, Gloucester, approximately 2.3km east of Newton and 14km north of Cheltenham. Vehicular access to the site will be provided via the existing A46 / Fitzhamon Park junction.

Paramics Discovery Model Zone

The Fitzhamon Park proposed development is allocated to Zone 71 in the Paramics Discovery Model.

Trip Rates and Traffic Generation

The trip rates for the Fitzhamon Park proposed development are shown in Table 21 below.

Table 21: Trip Rates for Fitzhamon Park

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Residential	0.14	0.35	0.31	0.15	-	-	-	-
Care Home	0.08	0.06	0.04	0.08	-	-	-	-
Community Centre	0.20	0.00	0.20	0.34	-	-	-	-

The estimated traffic generation used in the model for the Fitzhamon Park proposed development is shown in Table 22 below.

Table 22: Traffic Generation for Fitzhamon Park

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Fitzhamon Park	18	36	32	21	48	96	88	58

Trip Distribution

The trip distribution information extracted from the TA for the Fitzhamon Park proposed development is shown in Table 23 below.

Table 23: Trip Distribution for Fitzhamon Park

Route	Paramics Discovery Zone	Distribution AM Peak	Distribution PM Peak
M5 North	Zone 27	8%	10%
West	Zones 3,6,7,8,9,10*	53%	48%
M5 South	Zone 28	31%	29%
Aston Cross	Zone 45	3%	5%
East	Zone 1	6%	10%
Total		**100%**	**100%**

* The demands at this location have been split proportionally between these zones based on the trip end information.

Land North West of Fiddington – Fiddington 2

Background

The Land North West of Fiddington (Fiddington 2) development is a proposed residential development of up to 460 dwellings, a primary school, open space, landscaping and supporting infrastructure on 'Land North West of Fiddington' Tewkesbury.

Vehicular access to the site is proposed from the existing A46(T) at the Alexandra Way signal-controlled junction by means of a fourth arm to the junction. This modified junction will be the primary access. A second access from the A46(T), known as the eastern access, is proposed which incorporates a realignment of Fiddington Lane into a new signal-controlled junction to replace the existing priority junction. This would form part of a left-right staggered junction with Northway Lane.

Paramics Discovery Model Zone

The Fiddington 2 proposed development is allocated to Zone 72 in the Paramics Discovery Model.

Trip Rates and Traffic Generation

The trip rates for the Fiddington 2 proposed development are shown in Table 24 below.

Table 24: Trip Rates for Fiddington 2

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Residential	-	-	-	-	0.34	0.84	0.93	0.48
Primary School	-	-	-	-	0.38	0.24	0.14	0.17

The estimated traffic generation used in the model for the Fiddington 2 proposed development is shown in Table 25 below.

Table 25: Traffic Generation for Fiddington 2

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Fiddington 2	120	211	169	81	234	438	457	256

Trip Distribution

The trip distribution information extracted from the TA for the Fiddington 2 proposed development is shown in Table 26 below.

Table 26: Trip Distribution for Fiddington 2

Route	Paramics Discovery Zone	Distribution
A38	Zone 2	9%
A438	Zones 3,6,7,8,9,10*	18%
Hardwick Bank Rd	Zone 50	2%
B4079 (N)	Zone 31	2%
A46(T)	Zone 1	11%
B4079 (S)	Zone 40	9%
Fiddington Lane	Zone 41	2%
M5 (S)	Zone 28	34%
M5 (N)	Zone 27	13%
Total		**100%**

* The demands at this location have been split proportionally between these zones based on the trip end information.

Land at Fiddington – Fiddington 1

Background

The Land at Fiddington (Fiddington 1) development is a proposed residential development of up to 850 dwellings and a primary school, located in an area of approximately 55 hectares of land, bounded to the west by the M5 Motorway and to east by Fiddington Lane with the A46(T) to the north and open countryside to the south. Vehicular access to the site is proposed to be the same as for the Land North West of Fiddington development (Fiddington 2).

At the time of the assessment, it was not clear whether a primary school was required as part of the development proposals. Trip generation and traffic modelling was therefore undertaken assuming a development comprising 900 dwellings without a primary school as it was considered that this would generate more traffic off-site than 850 dwellings with a primary school and therefore provide a 'robust assessment'.

Paramics Discovery Model Zone

The Fiddington 1 proposed development is allocated to Zone 73 in the Paramics Discovery Model.

Trip Rates and Traffic Generation

The trip rates for the Fiddington 1 proposed development are shown in Table 27 below.

Table 27: Trip Rates for Fiddington 1

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Houses Privately Owned	-	-	-	-	0.37	0.91	1.00	0.67
Houses for Rent	-	-	-	-	0.26	0.44	0.52	0.41

The estimated traffic generation used in the model for the Fiddington 2 proposed development is shown in Table 28 below.

Table 28: Traffic Generation for Fiddington 1

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Fiddington 1	116	309	310	185	305	692	771	529

Trip Distribution

For the Fiddington 1 proposed development, the TA states that there are estimated to be **43% internal trips during the AM peak period and 51% internal trips during the PM peak period (we note that this seems high however we have accepted it).** This information is shown in Table 29 and Table 30 below.

Table 29: Trip Distribution for Fiddington 1 – AM Peak Period

Internal Trips	External Trips			Total
	Route	Paramics Discovery Zone	Trips	
Generations				
298 (43%)	A38	Zone 2	35	**692 (100%)**
	A438	Zones 3,6,7,8,9,10*	71	
	Hardwick Bank Rd	Zone 50	8	
	B4079 (N)	Zone 31	8	
	A46(T)	Zone 1	43	
	B4079 (S)	Zone 40	35	
	Fiddington Lane	Zone 41	8	
	M5 (S)	Zone 28	134	
	M5 (N)	Zone 27	51	
	Total		**393 (57%)**	
Attractions				
207 (68%)	A38	Zone 2	9	**305 (100%)**
	A438	Zones 3,6,7,8,9,10*	18	
	Hardwick Bank Rd	Zone 50	2	
	B4079 (N)	Zone 31	2	
	A46(T)	Zone 1	11	
	B4079 (S)	Zone 40	9	
	Fiddington Lane	Zone 41	2	
	M5 (S)	Zone 28	33	
	M5 (N)	Zone 27	12	
	Total		**98 (32%)**	
505			**492**	**997**

* The demands at this location have been split proportionally between these zones based on the trip end information.

Table 30: Trip Distribution for Fiddington 1 – PM Peak Period

Internal Trips	External Trips			Total
	Route	Paramics Discovery Zone	Trips	
Generations				
270 (51%)	A38	Zone 2	23	**529 (100%)**
	A438	Zones 3,6,7,8,9,10*	47	
	Hardwick Bank Rd	Zone 50	5	
	B4079 (N)	Zone 31	5	
	A46(T)	Zone 1	28	
	B4079 (S)	Zone 40	23	
	Fiddington Lane	Zone 41	5	
	M5 (S)	Zone 28	88	
	M5 (N)	Zone 27	34	
	Total		**259 (49%)**	
Attractions				
355 (46%)	A38	Zone 2	38	**771 (100%)**
	A438	Zones 3,6,7,8,9,10*	75	
	Hardwick Bank Rd	Zone 50	8	
	B4079 (N)	Zone 31	8	
	A46(T)	Zone 1	46	
	B4079 (S)	Zone 40	38	
	Fiddington Lane	Zone 41	8	
	M5 (S)	Zone 28	142	
	M5 (N)	Zone 27	54	
	Total		**416 (54%)**	
625			**675**	**1,300**

* The demands at this location have been split proportionally between these zones based on the trip end information.

Mitton Development

Background

The Mitton Development is a proposed residential development of up to 1,000 dwellings, located to the north-east of Tewkesbury Town centre adjacent to the existing urban residential area along the Bredon / Tewkesbury Road.

Paramics Discovery Model Zone

The Mitton proposed development is allocated to Zone 444 in the Paramics Discovery Model.

Trip Rates and Traffic Generation

The trip rates for the Mitton proposed development are shown in Table 31 below.

Table 31: Trip Rates for Mitton Development

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
07:00 – 08:00	0.08	0.29	0.32	0.23	-	-	-	-
08:00 – 09:00	0.17	0.39	0.33	0.23	-	-	-	-
09:00 – 10:00	0.15	0.22	0.25	0.22	-	-	-	-

The estimated traffic generation used in the model for the Mitton proposed development is shown in Table 32 below.

Table 32: Traffic Generation for Mitton Development

Proposed Development	Peak Hour				3-Hour Peak Period			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Mitton	164	284	338	246	437	757	1,070	678

Trip Distribution

The trip distribution information for the Mitton proposed development is shown in Table 33 below.

It should be noted that updated distributions have been requested.

Table 33: Trip Distribution for Mitton Development

Route	Paramics Discovery Zone	Distribution
A38 Mythe Road	Zone 3	5%
A38 Gloucester Road	Zone 2	22%
M5 (S)	Zone 28	21%
A46 (E)	Zone 1	6%
B4080 Tewkesbury Road	Zone 4	6%
Shannon Way	Zone 21	9%
Delta Drive	Zone 58	9%
Steward Road	Zone 50	9%
A38 High Street	Zone 9	14%
Total		**100%**

External to External Zone Demands

External zone to external zone demands have been extracted from the cordoned model of the Worcestershire Strategic Traffic Model (WSTM). These demands are shown below in Table 34 and Table 35.

Table 34: External to External Demands from WSTM – AM Peak Period

Zone		A46	A38 Gloucester Road	A38 Mythe Road	B4080 Tewkesbury Road	M5 (N)	M5 (S)	B4079	B4077	Teddington	A435	Total
	Zone No.	1	2	3	4	27	28	31	37	39	40	
A46	1	0	0	3	0	21	-53	0	0	0	62	**32**
A38 Gloucester Road	2	0	0	-41	9	0	0	0	0	0	0	**-32**
A38 Mythe Road	3	0	73	0	29	0	0	0	0	0	0	**101**
B4080 Tewkesbury Road	4	0	5	35	0	7	1	0	0	0	0	**48**
M5 (N)	27	67	0	0	0	0	1659	0	0	0	39	**1765**
M5 (S)	28	34	0	0	0	1065	0	0	0	0	0	**1098**
B4079	31	0	0	0	0	0	0	0	0	0	2	**2**
B4077	37	0	0	0	0	14	2	0	0	0	3	**20**
Teddington	39	0	0	0	0	0	0	0	0	0	0	**0**
A435	41	166	0	0	0	5	0	0	0	0	0	**171**
Total		**267**	**78**	**-2**	**38**	**1111**	**1609**	**0**	**0**	**0**	**106**	**3,207**

Table 35: External to External Demands from WSTM – PM Peak Period

Zone		A46	A38 Gloucester Road	A38 Mythe Road	B4080 Tewkesbury Road	M5 (N)	M5 (S)	B4079	B4077	Teddington	A435	Total
	Zone No.	1	2	3	4	27	28	31	37	39	40	
A46	1	0	0	0	0	7	-70	0	0	0	128	**66**
A38 Gloucester Road	2	0	0	166	6	0	0	0	0	0	0	**172**
A38 Mythe Road	3	0	4	0	4	0	0	0	0	0	0	**8**
B4080 Tewkesbury Road	4	0	7	87	0	21	-6	0	0	0	0	**108**
M5 (N)	27	34	0	0	0	0	1075	0	0	0	18	**1127**
M5 (S)	28	35	0	0	3	1477	0	0	0	0	0	**1514**
B4079	31	0	0	0	0	0	0	0	0	0	1	**1**
B4077	37	0	0	0	0	11	1	0	0	0	1	**14**
Teddington	39	0	0	0	0	0	0	0	0	0	0	**0**
A435	41	221	0	0	0	14	0	5	0	0	0	**240**
Total		**290**	**10**	**254**	**13**	**1529**	**1000**	**5**	**0**	**0**	**149**	**3,250**

Appendix B – M5 J9 Northbound Off-Slip Sensitivity Test

M5 Junction 9 Northbound Off-Slip Sensitivity Test

Given the concerns expressed earlier regarding the potential for queues to extend back onto the M5 Motorway main carriageway from the Northbound Off-Slip approach to the M5 Junction 9, a sensitivity test has been undertaken which increases the flare length from 55m to 130m on the northbound off-slip approach to the M5 Junction 9 to mitigate the potential queuing back onto the M5 main carriageway at this location.

Figure 56 below presents queue length results for the northbound off-slip to M5 junction 9, both with and without the increased flare length, during the AM peak period.

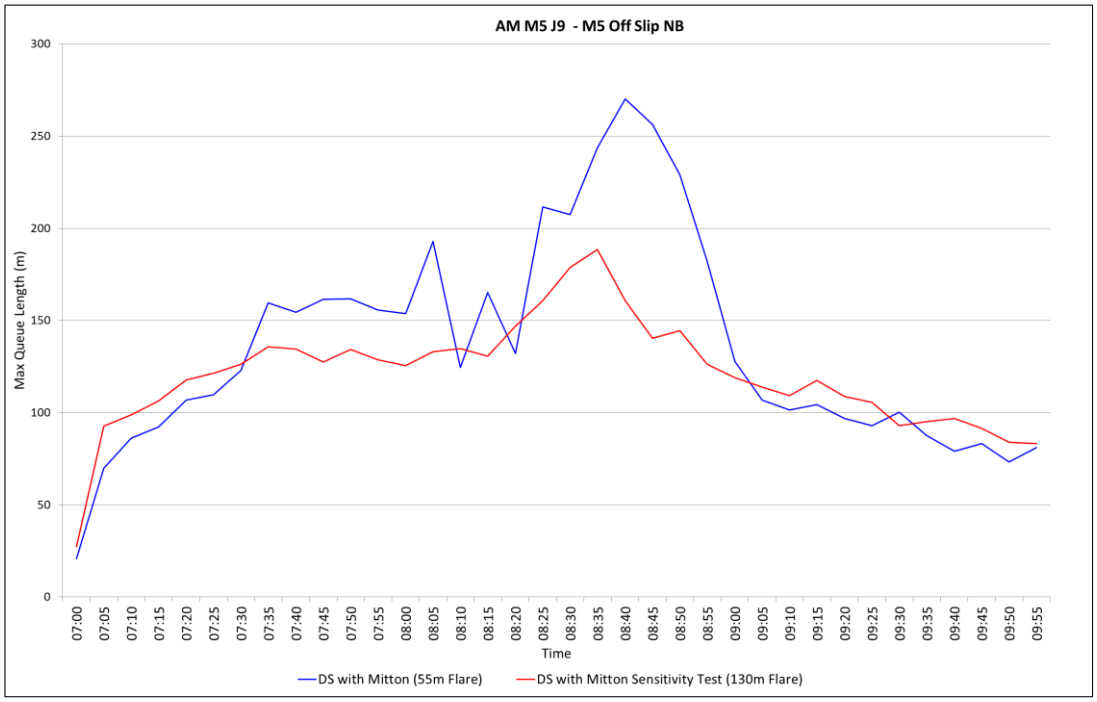


Figure 56: AM Maximum Queue Lengths (m) – M5 Junction 9 Northbound Off-Slip Sensitivity Test

The above information indicates that increasing the flare length from 55m to 130m could significantly reduce queuing on the Northbound Off-Slip approach to the M5 Junction 9, with queue lengths decreasing from a maximum of 270m (approximately 45 vehicles) in the main Do-Something with Mitton model, which has a 50m flare length on the northbound off-slip, to 190m (approximately 31 or 32 vehicles) in the sensitivity test model, which has the an increased 130m flare length on the northbound off-slip.

Analysis of the individual seed runs indicates that, based on the 10 seed runs, the number of instances in which queues extend back onto the M5 Motorway main carriageway has been reduced from three to one, which is less than in the Do-Something without Mitton model.

It is therefore reasonable to conclude that increasing the flare length on the Northbound Off-Slip approach to the M5 Junction 9 could reduce the queue lengths, however there is still the possibility of a queue extending back onto the M5, therefore this remains a concern.

M5 Junction 9 Northbound Off-Slip DMRB Assessment

In addition to the traffic modelling work, AECOM investigated the feasibility of extending the three-lane flare to accommodate the additional queue storage capacity. The outcomes of the study were summarised in the separate technical note [2] issued to Worcestershire County Council in April 2025.

The conducted feasibility study involved the comparison of the existing cross sections and long sections on the northbound off-slip against the DMRB standards that indicated two possible options for the flare lane extension. The existing dimensions of the off slip are shown in Figure 57 below.

[2] M5 Junction 9 Northbound Off-slip Desktop Feasibility Study (11th April 2025)

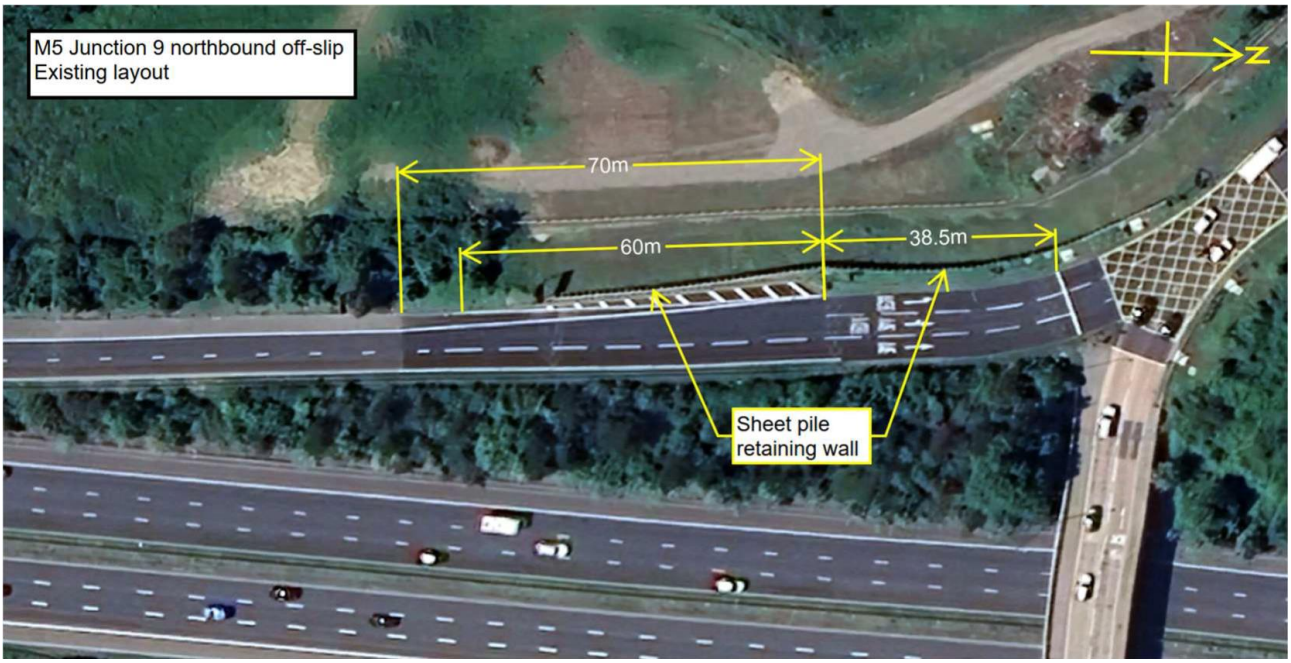


Figure 57: Existing M5 Northbound off-slip

Option 1 is to widen the existing off slip to enable the formation of an extra lane further in advance of the stop line whilst maintaining the end of hard shoulder arrangement. The alternative option (Option 2) is to remove the hard shoulder in advance of the junction and replace it with a 1m wide hard strip.

Based on the conducted investigation both Option 1 and Option 2 designs are feasible options and could increase the flare lane on the northbound off-slip approach to the M5 Junction 9, that will consequently reduce queuing on the northbound off-slip approach to the M5 Junction 9. However, the impact of the 20 metres flare lane extension identified option 2 would be smaller than the queue reduction recoded for the sensitivity test which included a flare lane extended by 75 metres as described in the *"M5 Junction 9 Northbound Off-Slip Sensitivity Test"* chapter above.

In addition, should Option 2 be explored, this would require the downgrade of the slip road from MG2C/DG2C to DG2A (CD127, Figure 2.1.1N1d) which may not be accepted by National Highways. Any further extension of the 3 lanes beyond 20m would require modifying and extending the constructed sheet pile retaining wall which is still a feasible solution.