M5 Junction 10 Improvements Scheme

Traffic Modelling Sensitivity Tests Technical Note

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M5 Junction 10 Improvements Scheme

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Technical Note

Project:	M5 Junction 10 Improvements Scheme		
Subject:	Traffic Modelling Sensitivity Models		
Author:	HF	Reviewed by:	SK
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1. Introduction

1.1.1. National Highways (NH) has undertaken a review of the traffic models submitted by Gloucestershire County Council (GCC) to support the proposed M5 J10 Scheme. AtkinsRéalis on behalf of GCC provided responses and additional information to the comments arising from this review which were all but one found to be satisfactory by NH. The outstanding comment which NH has asked for additional information on relates to two journey times routes (208A and 209B), that share a common section along A4019 between Kingsditch Roundabout and M5 J10, which lies slightly outside of the TAG threshold for journey time validation in west/northbound direction only.

1.1.2. National Highways has requested that the applicant (GCC) make the necessary changes to the current base year model so that the two northbound Journey Time Routes (JTR) 208A and 209B meet the TAG criteria and investigate if these changes lead to wider impacts on other aspects of the base year model used for the assessment of the Scheme.

1.1.3. This Technical note presents details of the work undertaken to develop a sensitivity test model with JTRs 208 and 209 meeting the TAG criteria in both directions and provides comparisons against the current DCO base year model.

2. Base Year Model Sensitivity Test

2.1.1. The current base year model used for the DCO submission is compliant with TAG and meets the key performance criteria including screenlines, link flows and journey times as well as impact of Matrix Estimation (ME) process within the tolerances recommended by TAG. There are 52 Journey Time Route (JTR) by direction used to validate the current base year model, out of which over 94% meet the TAG criteria across the three modelled time periods.

2.1.2. JTRs 208 and 209 meet the TAG acceptability criteria in the southbound direction in all modelled time periods. In the northbound direction these two routes lie outside the recommended threshold.

2.1.3. It is worth noting that the JTRs 208A and 209B are about 11km to 12km long and it is only along a short section of the A4019 (0.8kms) between Kingsditch Roundabout and Gallagher Retail Park junction where the modelled journey times do not meet the TAG criteria.

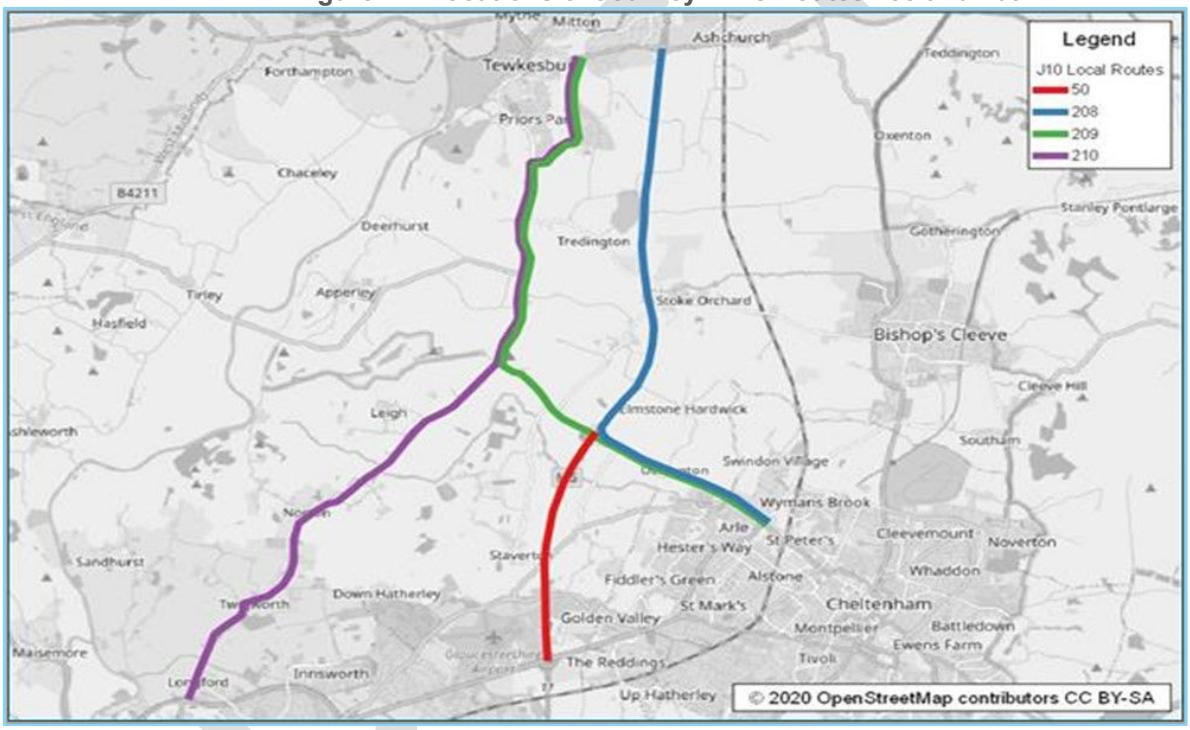
2.1.4. The divergence of the modelled and observed journey times along Routes 208A and 209B occur mainly along 800m section of the A4019 between Kingsditch and Gallagher

Junction. The model attributes along this section were therefore reviewed and appropriate adjustments made to reduce the differences between the modelled and observed journey so routes 208A and 209B meet the TAG criteria, which are defined as modelled journey times lying within +/-15% or 1 minute of the observed time.

2.1.5. National Highways in their review of the base year model recommended revisiting the current coding of the signals for Gallagher and Manor Road junctions with A4019. This recommendation was taken on board and the intergreen values at these two junctions were reduced as suggested by NH. The revised networks were then used to produce the sensitivity test model.

2.1.6. Th journey times produced by the sensitivity test model were compared against the current base year model used for DCO and showed that journey times for Routes 208A and 209B did not still meet the TAG criteria. Figure 2- 1 below shows the locations of routes 208 and 209 whilst Table 1 shows the comparison of modelled and observed journey times along these two routes.

Figure 2-1 Locations of Journey Time Routes 208 and 209



2.1.7. The results in Table 1 show that adjustment of the intergreen values at Gallagher and Manor Road junctions with A4019, whilst moderately reduces the differences between the modelled and observed journey times, does not lead to northbound routes 208A and 209B meet the TAG criteria.

Table 1 – Comparison of DCO and Sensitivity Test (1) Journey Times for Routes 208 and 209

Time Period	Route ID	Direction	Route Description	Observed Journey Time (min)	DCO Base Year Model			Sensitivity Test 1 (Adjustment of Intergreens)		
					Modelled JT (min)	% Diff	Criteria	Modelled JT (min)	% Diff	Criteria
AM	208A	NB	Cheltenham to M5J J9 (via A4019 & M5)	7.64	9.21	20.6%	Fail	9.13	19.5%	Fail
	208B	SB	M5J J9 to Cheltenham (via M5 & A4019)	8.84	10.00	13.1%	Pass	9.91	12.1%	Pass
	209A	SB	Tewkesbury to Cheltenham via A38/A4019	13.03	14.83	13.8%	Pass	14.74	13.1%	Pass
	209B	NB	Cheltenham to Tewkesbury via A4019/ A38	11.68	14.05	20.2%	Fail	13.97	19.6%	Fail
IP	208A	NB	Cheltenham to M5J J9 (via A4019 & M5)	7.88	9.27	17.6%	Fail	9.20	16.8%	Fail
	208B	SB	M5J J9 to Cheltenham (via M5 & A4019)	8.56	9.07	5.9%	Pass	8.98	4.9%	Pass
	209A	SB	Tewkesbury to Cheltenham via A38/A4019	12.63	13.39	6.1%	Pass	13.31	5.4%	Pass
	209B	NB	Cheltenham to Tewkesbury via A4019/ A38	11.82	13.70	15.9%	Fail	13.64	15.4%	Fail
PM	208A	NB	Cheltenham to M5J J9 (via A4019 & M5)	8.04	10.00	24.4%	Fail	9.88	22.8%	Fail
	208B	SB	M5J J9 to Cheltenham (via M5 & A4019)	8.41	9.26	10.1%	Pass	9.17	9.1%	Pass
	209A	SB	Tewkesbury to Cheltenham via A38/A4019	12.70	13.61	7.2%	Pass	13.53	6.5%	Pass
	209B	NB	Cheltenham to Tewkesbury via A4019/ A38	12.31	15.00	21.9%	Fail	14.88	20.9%	Fail

2.1.8. Given the magnitude of the difference between the modelled and observed journey times along northbound routes 208A and 209B in sensitivity test (1), other adjustments were required to produce a sensitivity test model that meets the TAG criteria for validation of JTRs 208A and 209B against observed median journey times.

2.1.9. Several measures were therefore considered for the development of a sensitivity test model where JTRs 208A and 209 meet the TAG criteria to enable comparison with the current base year model.

2.1.10. Having tested a number of options it was found that using a Speed Flow Curve (SFC) along the short section of A4019 between Kingsditch Roundabout and Gallagher junction, that is consistent with the rest of A4019 to M5 J10, in combination with optimising the signal timings at both the Manor Road and Gallagher junctions resulted in journey times along northbound routes 208A and 209B meet the TAG criteria (Details of this comparison are given in Section 2.1 of this note).

2.1.11. It is worth noting that the SFC used for this purpose in sensitivity test (2) has the same capacity (3540 pcu) and minimum speed (35kph) as the SFC used in the current model for A4019, with only higher free flow speeds (78 kph) which the model uses as the starting point to determine the minimum cost routes.

2.1.12. The performance of key criteria for the current and sensitivity test (2) models have been compared including journey times along JTRs 208A and 209B which are reported in Section 2.2 of this note.

2.1. Journey Times Along Routes 208 and 209

2.1.1. The journey times along routes 208 and 209 by direction in sensitivity test (2) have been compared against observed. The results of these comparisons are shown in Table 2 below.

Table 2 – Sensitivity Test (2) Journey Times Routes 208 and 209

Time Period	Route ID	Direction	Route Description	Observed Journey Time (min)	DCO Base Year Model			Sensitivity Test 2		
					Modelled JT (min)	% Diff	Criteria	Modelled JT (min)	% Diff	Criteria
AM	208A	NB	Cheltenham to M5J J9 (via A4019 & M5)	7.64	9.21	20.6%	Fail	8.61	12.6%	Pass
	208B	SB	M5J J9 to Cheltenham (via M5 & A4019)	8.84	10.00	13.1%	Pass	9.39	6.2%	Pass
	209A	SB	Tewkesbury to Cheltenham via A38/A4019	13.03	14.83	13.8%	Pass	14.24	9.3%	Pass
	209B	NB	Cheltenham to Tewkesbury via A4019/ A38	11.68	14.05	20.2%	Fail	13.25	13.4%	Pass
IP	208A	NB	Cheltenham to M5J J9 (via A4019 & M5)	7.88	9.27	17.6%	Fail	8.65	9.9%	Pass
	208B	SB	M5J J9 to Cheltenham (via M5 & A4019)	8.56	9.07	5.9%	Pass	8.58	0.3%	Pass
	209A	SB	Tewkesbury to Cheltenham via A38/A4019	12.63	13.39	6.1%	Pass	12.91	2.3%	Pass
	209B	NB	Cheltenham to Tewkesbury via A4019/ A38	11.82	13.70	15.9%	Fail	12.94	9.5%	Pass
PM	208A	NB	Cheltenham to M5J J9 (via A4019 & M5)	8.04	10.00	24.4%	Fail	9.16	13.9%	Pass
	208B	SB	M5J J9 to Cheltenham (via M5 & A4019)	8.41	9.26	10.1%	Pass	8.59	2.2%	Pass
	209A	SB	Tewkesbury to Cheltenham via A38/A4019	12.70	13.61	7.2%	Pass	12.95	2.0%	Pass
	209B	NB	Cheltenham to Tewkesbury via A4019/ A38	12.31	15.00	21.9%	Fail	13.96	13.4%	Pass

2.1.2. The results in Tables 2 show that overall journey times along routes 208 and 209 in sensitivity test (2) model meet TAG criteria (modelled time being between either +/-15% or 1 minute of the observed journey time) in both directions and across all the three modelled time periods.

2.1.3. It is worth noting that the adjustments made to the network coding as part of developing sensitivity test (2) model did not adversely affect the overall journey time validation reported for the current base year model. Further details of journey time validation are provided in Section 2.2.

2.2. Comparison of Key performance Criteria and Statistics

Key Performance Criteria

2.2.1. The performance of traffic models is measured against observed data based on several key criteria including screenlines, link flows and journey times. Table 3 below provides details of the performance for the current and sensitivity test (2) models against the same observed data and the differences between the models.

2.2.2. The differences in Table 3 show that the two models overall correlate closely in performance of screenlines and also the number of calibration and validation site. The number of validating journey time routes for the sensitivity test (2) model is shown to increase by two routes which is expected as northbound JTRs routes 208A and 209B meet the criteria under this scenario.

Table 3 – Comparison of DCO and Sensitivity Test (2) - Key Model Performance Indicators

DCO Model Key Performance Statistics					
Metric	**Criteria**		**AM**	**IP**	**PM**
Screenlines within 5%	All or nearly all	Calibration	97%	97%	92%
			35/36	35/36	33/36
		Validation	88%	88%	88%
			7/8	7/8	7/8
		Total	96%	96%	91%
			42/44	42/44	40/44
Screenlines GEH <4	DMRB Criteria	Calibration	97%	100%	97%
		Validation	100%	100%	100%
		Total	98%	100%	98%
Flows passing GEH or flow criteria	>85%	Calibration	94%	97%	94%
			285/304	296/304	285/304
		Validation	89%	98%	92%
			116/130	51/52	119/130
		Total	92%	98%	93%
Journey Time Routes (52 Routes by direction)	>85%	Number	50	50	49
		%	96%	96%	94%

Sesnsitivity Test (2) Model Key Performance Statistics					
Metric	**Criteria**		**AM**	**IP**	**PM**
Screenlines within 5%	All or nearly all	Calibration	97%	100%	94%
			35/36	36/36	34/36
		Validation	88%	88%	88%
			7/8	7/8	7/8
		Total	96%	98%	93%
			42/44	43/44	41/44
Screenlines GEH <4	(DMRB criteria)	Calibration	100%	100%	100%
		Validation	100%	100%	100%
		Total	100%	100%	100%
Flows passing GEH or flow criteria	>85%	Calibration	94%	97%	94%
			285/304	295/304	285/304
		Validation	89%	98%	92%
			116/130	51/52	119/130
		Total	92%	97%	93%
Journey Time Routes (52 Routes by direction)	>85%	Number	52	52	51
		%	100%	100%	98%

Difference(%)					
Metric	**Criteria**		**AM**	**IP**	**PM**
Screenlines within 5%	All or nearly all	Calibration	0%	3%	2%
			N/A	N/A	N/A
		Validation	0%	0%	0%
			0	0	0
		Total	0%	2%	2%
			N/A	N/A	N/A
Screenlines GEH <4	(DMRB criteria)	Calibration	3%	0%	3%
		Validation	0%	0%	0%
		Total	2%	0%	2%
Flows passing GEH or flow criteria	>85%	Calibration	0%	0%	0%
			N/A	N/A	N/A
		Validation	0%	0%	0%
			N/A	N/A	N/A
		Total	0%	-1%	0%
Journey Time Routes (52 Routes by direction)	>85%	Number	2	2	2
		%	4%	4%	4%

Traffic Flows Differences

2.2.3. The traffic flows across the highway network were compared between sensitivity test (2) and current base year model for the three modelled time periods. The results of these comparisons are shown in Figures 2-2 to 2-4 by differences in flows and 2-5 to 2-7 by percentage differences.

2.2.4. Comparison of flow difference plots shows that there are generally modest increases along A4019 between Kingsditch Roundabout and M5 J10 reported by sensitivity test (2). These increases are in the range of about 30 to 80 vehicles reported between M5 J10 and Gallagher junction across the three modelled time periods.

2.2.5. There are larger increases in flows reported by sensitivity test (2) scenario along the A4019 between Kingsditch Roundabout and Gallagher junction across the three modelled time periods. Given this section is where the changes to the network attributes have been implemented to reduce the modelled journey times, the larger increases in flow in this location is expected.

2.2.6. The changes in flows in this section of the A4019 is quite local and mainly constrained to the traffic in the westbound direction from Kingsditch Roundabout, which in the current model exits A4019 through Hayden Ave to avoid delay at Manor Road junction for accessing Old Gloucester Road. In sensitivity test (2) model, where delays at Gallagher Junction are reduced by optimisation of the signal timings, this traffic travels a bit further along A4019 to Gallager Road junction for turning into Old Gloucester Road. The amount of traffic accessing the Old Gloucester Road from the A4019, which uses Gallagher junction in the sensitivity test (2) model as opposed to Manor Road junction via Hayden Ave under the current model, ranges from about 160 and 185 vehicles in the modelled periods.

2.2.7. In the eastbound direction, the traffic travelling between A4019 at Gallagher junction to the north of Kingsditch Roundabout which uses Manor Road and Runnings Road in the current model switches route to using the A4019 and access Kingsditch Lane via the roundabout. The volume of traffic which makes this switch ranges from about 65 to 140 vehicles across the three modelled time periods in sensitivity test (2) model.

2.2.8. The reported impact on other key roads in the network is generally modest. Along M5 at either side of M5 J10 i.e. between J9 to 10 and J12 and 11 there is a range of increase in flows of less than 50 vehicles whilst between J11 and 10 there is a similar amount of reduction reported in sensitivity test (2) model compared to the current base year.

2.2.9. The reported changes in flows across the key roads of A38 and A40 are also modest with increases of less than 50 vehicles along A38 southbound and similar decreases of between 25 to 50 vehicles along A40.

Figure 2-2 - Traffic Flow Differences in Vehicles - AM Peak

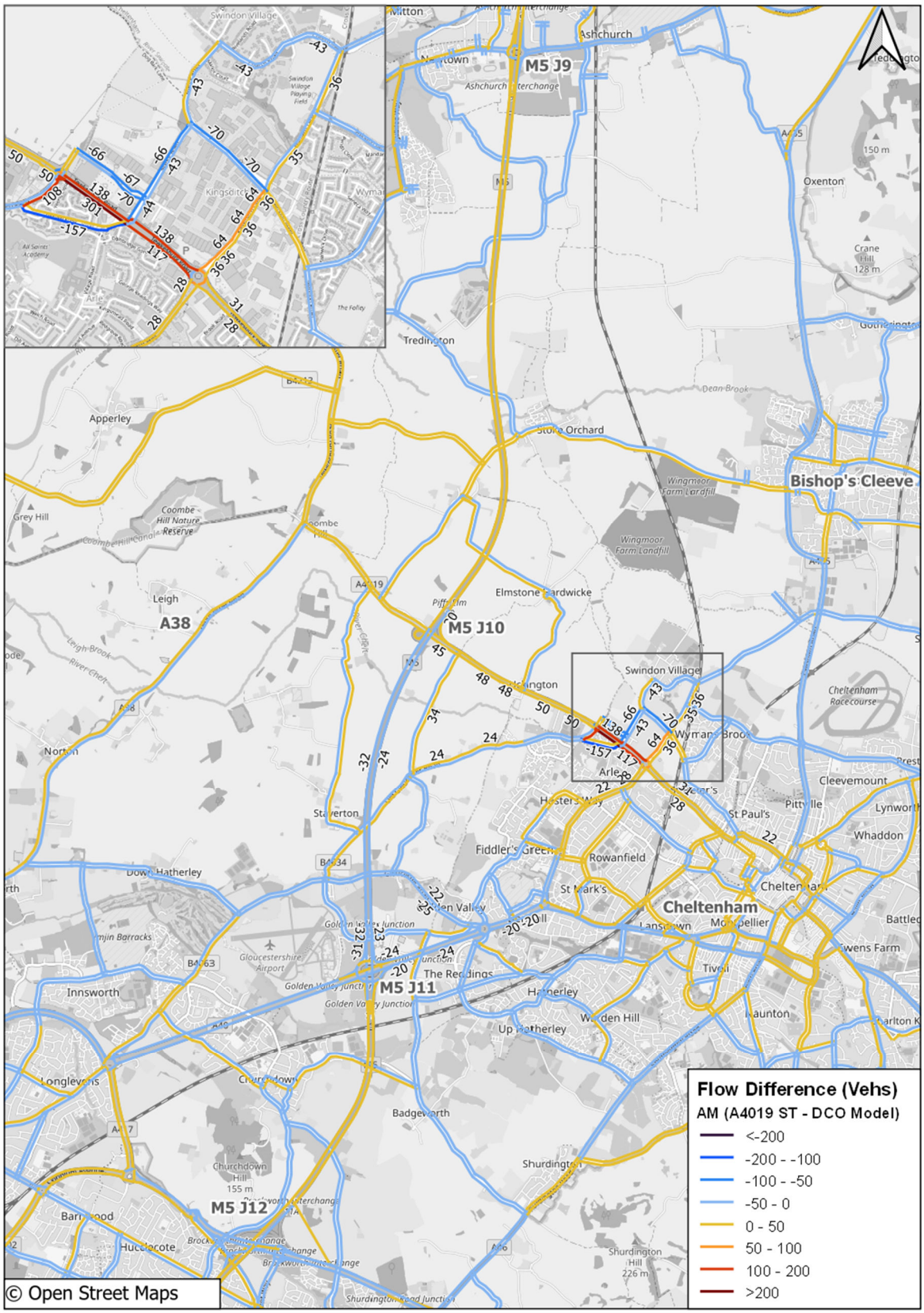


Figure 2-3 - Traffic Flow Differences in Vehicles - Inter Peak

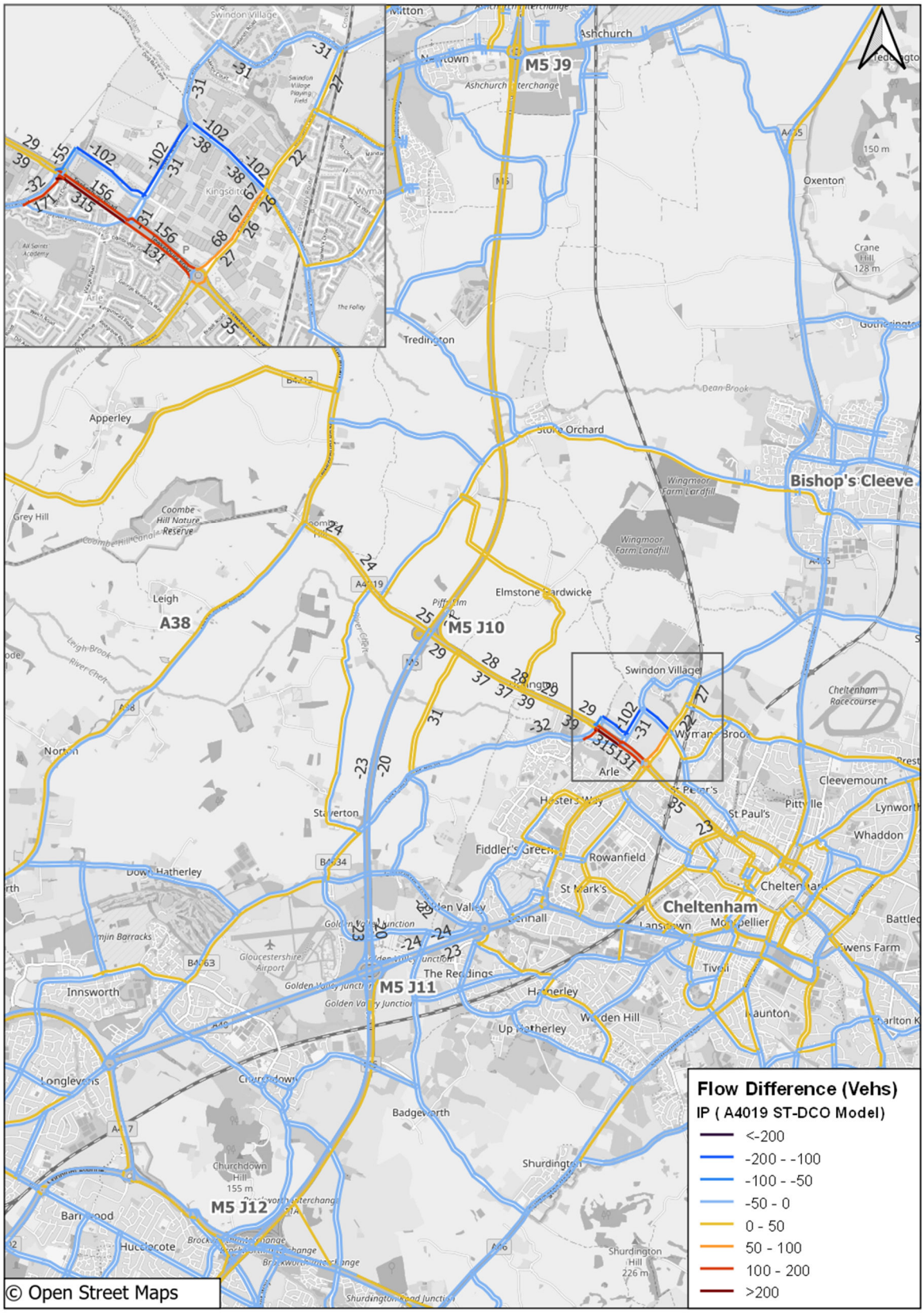


Figure 2-4 - Traffic Flow Differences in Vehicles – PM Peak

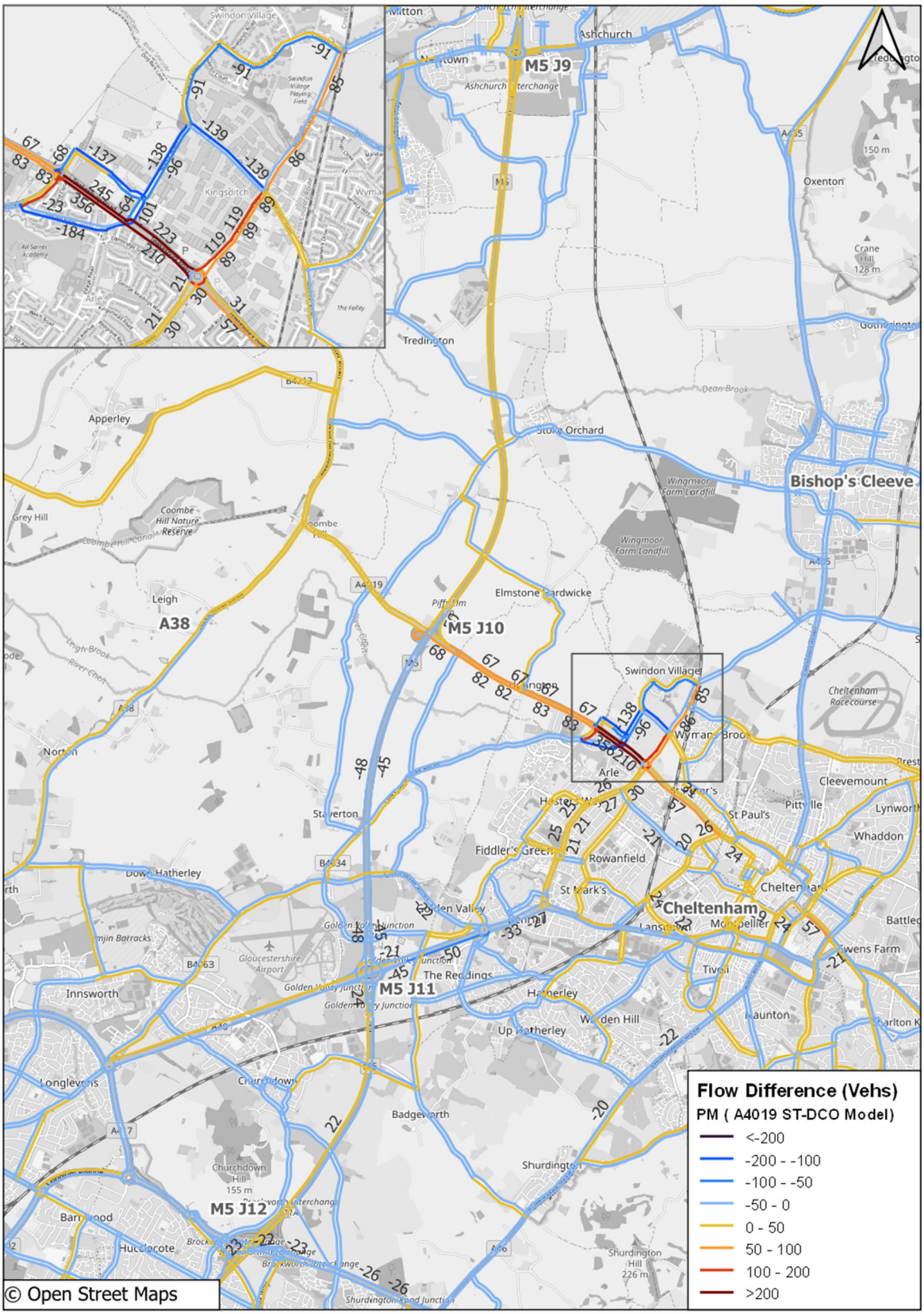


Figure 2-5 - Traffic Flow Difference by Percentage – AM Peak

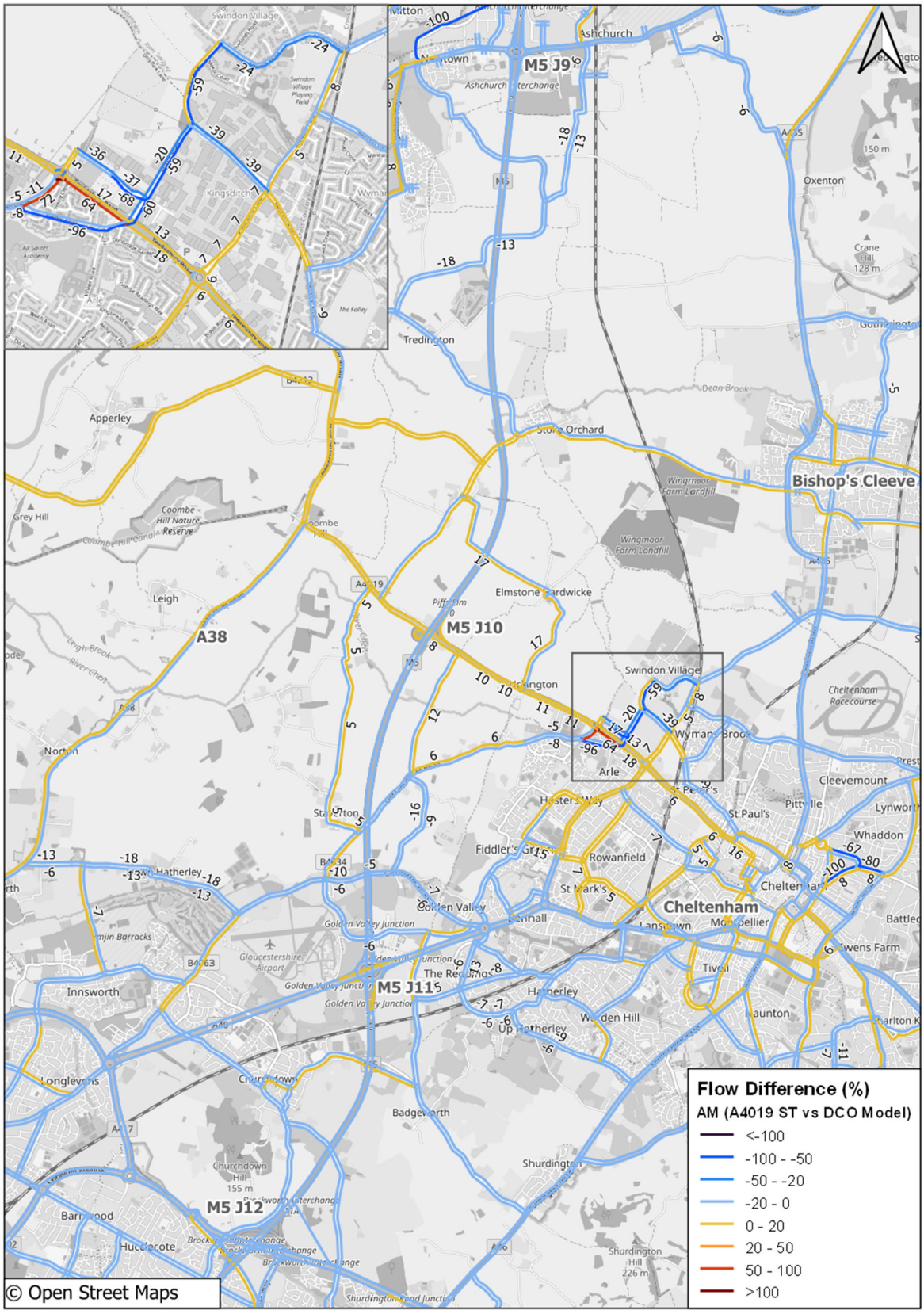


Figure 2-6 - Traffic Flow Difference by Percentage – Inter Peak

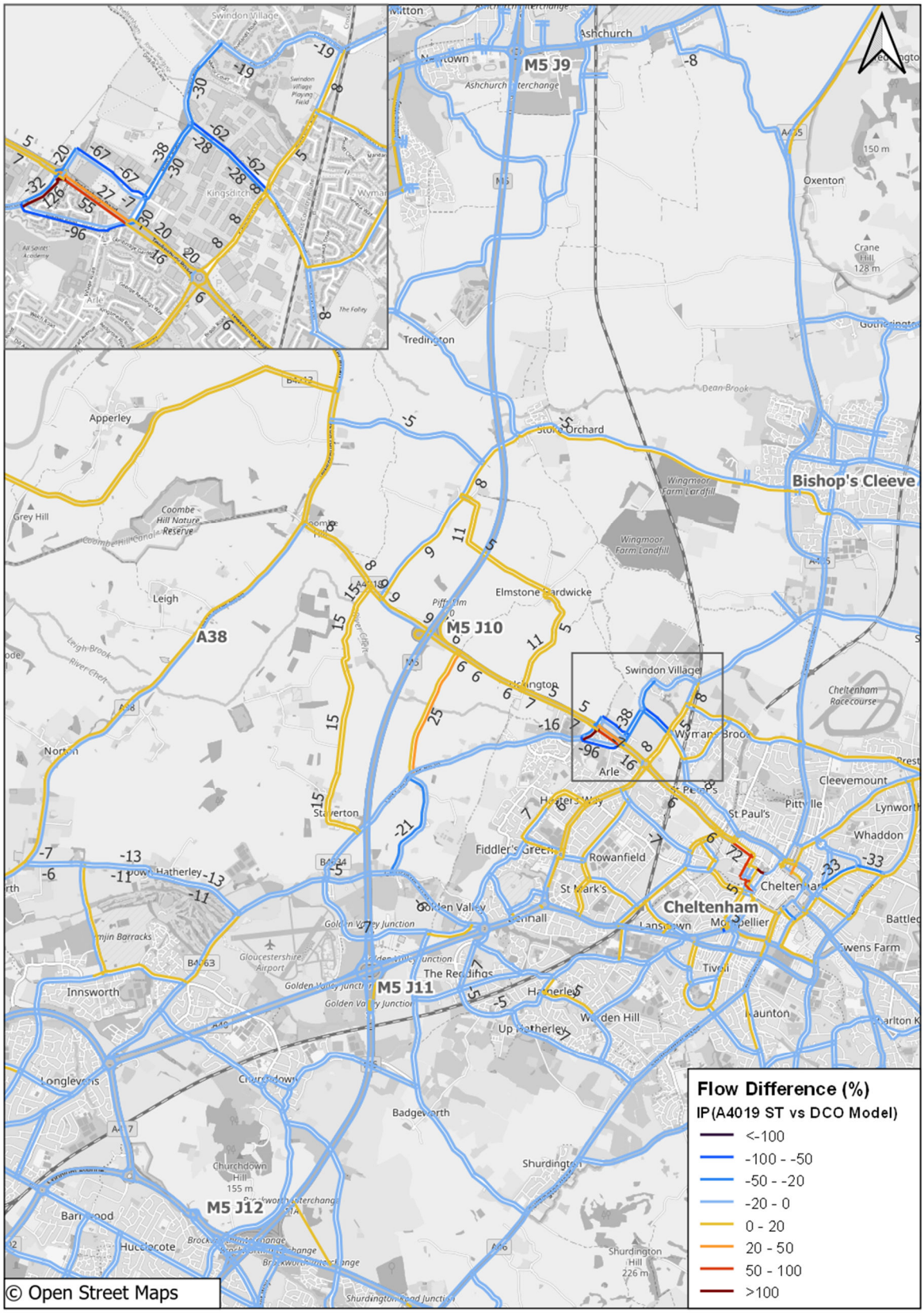
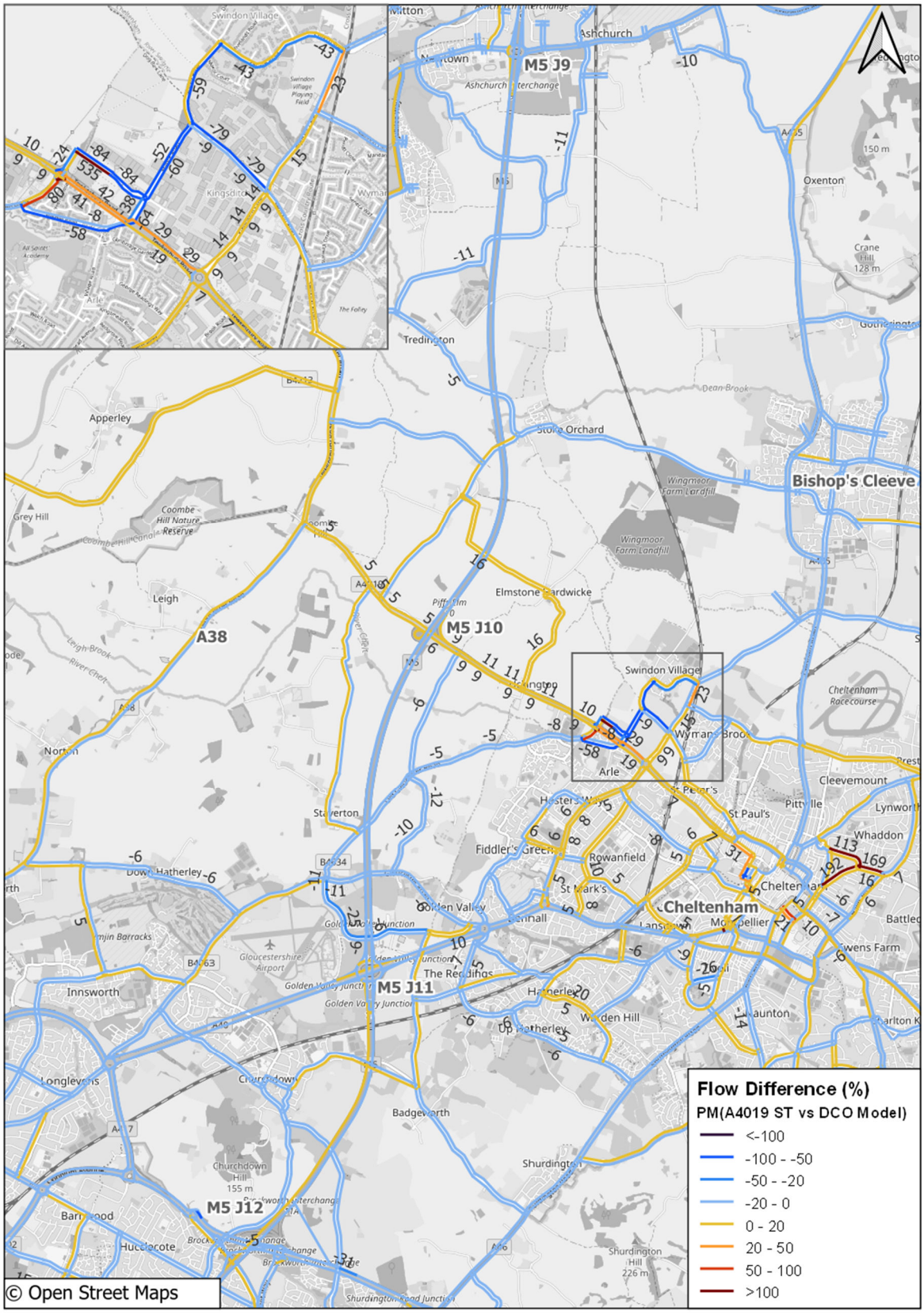


Figure 2-7 - Traffic Flow Difference by Percentage – PM Peak



Model Development Process

2.2.10. The base year model for the M5 J10 Scheme has been developed through the standard process of producing an initial demand based on the observed trip data collected for this purpose, which is then enhanced through the Matrix Estimation (ME) process with the aid of observed count data that has not been used in building the initial demand. The extent of changes to the initial (prior matrices) is controlled by TAG criteria to avoid excessive disturbance of the observed distribution of trips in the prior matrices.

2.2.11. The sensitivity test (2) model was developed using the demand from the current base year matrices without use of the ME. Whilst this was considered a proportionate approach for developing sensitivity test (2), it was deemed appropriate to ensure that the adjustments made to the highway network would not lead to material changes in trip distribution of the current base year matrices.

2.2.12. For this purpose, the ME process was used to develop a set of demand matrices for sensitivity test (2) model using the same prior matrices as the current base year model with no additional demand or traffic data. The impacts of ME on the adjusted network in sensitivity test (2) on demand matrices were then compared against that of the current model.

- Matrix Estimation Measures
- Trip Length Distribution
- Matrix Totals

Matrix Estimation Measures

2.2.13. The impact on cell values and trip ends of the post ME trip matrices are measured in terms of Slope, Intercept and R square and compared against defined thresholds by TAG. Table 4 shows the differences between these measures for the two base year models.

2.2.14. The results in Table 4 display that there are no statistical differences at matrix cell values and negligible differences for both trip ends (origins and destinations) between the two base year models. This provides further indication of high correlation in demand between the current and sensitivity test (2) models.

Table 4 – Differences between the Matrix Cells and Trip Ends

Difference in Cell values							
Time Period	Criteria	User Classes					
		Employer's Business	Commute	Other	LGV	HGV	Total
AM Peak							
Slope	Within 0.99 and 1.01	0	0	0	0	0	0
Intercept	Near Zero	0	0	0	0	0	0
R square	in excess of 0.98	0	0	0	0	0	0
Inter Peak							
Slope	Within 0.99 and 1.01	0	0	0	0	0	0
Intercept	Near Zero	0	0	0	0	0	0
R square	in excess of 0.98	0	0	0	0	0	0
PM Peak							
Slope	Within 0.99 and 1.01	0	0	0	0	0	0
Intercept	Near Zero	0	0	0	0	0	0
R square	in excess of 0.98	0	0	0	0	0	0
Difference in Trip Ends (Origins)							
Time Period	Criteria	User Classes					
		Employer's Business	Commute	Other	LGV	HGV	Total
AM Peak							
Slope	Within 0.99 and 1.01	0	0	0	0	0	0
Intercept	Near Zero	-0.001	-0.013	-0.018	0.001	0.005	-0.005
R square	in excess of 0.98	0	0	0	0	0	0
Inter Peak							
Slope	Within 0.99 and 1.01	0	0	0	0	0	0
Intercept	Near Zero	-0.001	0	-0.012	0.001	-0.004	-0.003
R square	in excess of 0.98	0	0	0	0	0	0
PM Peak							
Slope	Within 0.99 and 1.01	0	0	0	0	0	0
Intercept	Near Zero	-0.002	-0.003	-0.004	0.004	0.003	0
R square	in excess of 0.98	0	0	0	0	0	0
Difference in Trip Ends (Destinations)							
Time Period	Criteria	User Classes					
		Employer's Business	Commute	Other	LGV	HGV	Total
AM Peak							
Slope	Within 0.99 and 1.01	0	0	0	0	0	0
Intercept	Near Zero	-0.001	-0.013	-0.018	0	0.004	-0.027
R square	in excess of 0.98	0	0	0	0	0	0
Inter Peak							
Slope	Within 0.99 and 1.01	0	0	0	0	0	0
Intercept	Near Zero	-0.001	0	-0.011	0.002	-0.004	-0.015
R square	in excess of 0.98	0	0	0	0	0.0001	0
PM Peak							
Slope	Within 0.99 and 1.01	0	0	0	0	-0.001	0
Intercept	Near Zero	-0.001	-0.003	-0.003	0.004	0.003	0
R square	in excess of 0.98	0	0	0	0	0	0

Trip Length Distribution

2.2.15. The impacts of ME process regarding Trip Length Distribution (TLD) on prior matrices have been compared between the two base year models and reported in Table 5. The results of this comparison which are based on the differences across the three modelled time periods show that the TLDs between the two base year models remain consistent and stable.

Table 5 – Differences in Trip Length Distribution

Std Deviation					
Time Period	**Matrix**	**Total Vehicles**	**Car**	**LGV**	**Heavies**
AM Peak	Prior	0.00	0.00	0.00	0.00
	Post	0.00	0.00	0.00	0.00
Inter-Peak	Prior	0.00	0.00	0.00	0.00
	Post	0.00	0.00	0.00	0.01
PM Peak	Prior	0.00	0.00	-0.01	0.00
	Post	-0.01	-0.01	0.00	0.00
Average Trip Length (km)					
Time Period	**Matrix**	**Total Vehicles**	**Car**	**LGV**	**Heavies**
AM Peak	Prior	0.00	0.00	0.00	0.01
	Post	0.01	0.01	0.00	-0.06
Inter-Peak	Prior	0.00	0.00	0.00	-0.01
	Post	0.01	0.01	0.00	0.02
PM Peak	Prior	0.00	0.00	0.00	-0.01
	Post	0.00	0.00	0.00	-0.04

Matrix Sectors and Totals

2.2.16. The trip matrices for the two base year models developed by use of ME have been compared by sectors and by totals across the three modelled time periods. The results of these comparisons, which are reported as differences in Tables 6 and 7, show that the two sets of demand have high correlation with each other, providing further evidence of the current base year model remains suitable as basis for forecasting and assessment of the proposed M5 J10 scheme.

Full Matrix excluding Intra-Zonals Trips	Time Period	No. Cells with >100 trips in prior	5% change	10% change	No. cells with GEH < 5	% of cells with <5% change (Prior trips >100)	% of cells with <10% change (Prior trips >100)	% cells with GEH < 5 (Prior trips >100)
Car	AM	0	0	0	0	0%	0%	0%
	IP	0	0	0	0	0%	0%	0%
	PM	0	0	0	0	0%	0%	0%
LGV	AM	0	0	0	0	0%	0%	0%
	IP	0	0	0	0	0%	0%	0%
	PM	0	0	0	0	0%	0%	0%
HGV	AM	0	0	0	0	0%	0%	0%
	IP	0	0	0	0	0%	0%	0%
	PM	0	0	0	0	0%	0%	0%
Total	AM	0	0	0	0	0%	0%	0%
	IP	0	1	0	0	1%	0%	0%
	PM	0	1	0	0	1%	0%	0%

Table 6 – Differences in Matrix Totals by Sector

	Absloulte Diffeernces (PCU)						% Diffeernces					
Full Model Area	**AM Peak**		**Inter Peak**		**PM Peak**		**AM Peak**		**Inter Peak**		**PM Peak**	
User Class	**Prior Matrices**	**Post ME Matrices**	**Prior Matrices**	**Post ME Matrices**	**Prior Matrices**	**Post ME Matrices**	**Prior Matrices**	**Post ME Matrices**	**Prior Matrices**	**Post ME Matrices**	**Prior Matrices**	**Post ME Matrices**
UC1 - Car Employers Business	0	-6	6	0	-4	4	0.000%	-0.001%	0.153%	0.000%	-0.001%	1.227%
UC2 - Car Commute	0	-34	34	0	-1	1	0.000%	-0.002%	0.164%	0.000%	0.000%	0.080%
UC3 - Car Other	0	-45	45	0	-33	33	0.000%	-0.002%	0.340%	0.000%	-0.001%	1.083%
UC4 - Light Goods vehicles	0	2	-2	0	3	-3	0.000%	0.000%	0.036%	0.000%	0.000%	0.059%
UC5 - heavy Goods vehicles	0	10	-10	0	-9	9	0.000%	0.003%	0.099%	0.000%	-0.003%	-0.106%
Total	0	-73	73	0	-44	44	**0.000%**	**-0.001%**	**0.320%**	**0.000%**	**-0.001%**	**-0.471%**
Simulation Area	**AM Peak**		**Inter Peak**		**PM Peak**		**AM Peak**		**Inter Peak**		**PM Peak**	
User Class	**Prior Matrices**	**Post ME Matrices**	**Prior Matrices**	**Post ME Matrices**	**Prior Matrices**	**Post ME Matrices**	**Prior Matrices**	**Post ME Matrices**	**Prior Matrices**	**Post ME Matrices**	**Prior Matrices**	**Post ME Matrices**
UC1 - Car Employers Business	0	-3	3	0	-1	1	0.000%	-0.004%	0.154%	0.000%	-0.003%	0.512%
UC2 - Car Commute	0	-28	28	0	0	0	0.000%	-0.008%	0.404%	0.000%	0.000%	-0.121%
UC3 - Car Other	0	-41	41	0	-26	26	0.000%	-0.011%	0.924%	0.000%	-0.005%	3.769%
UC4 - Light Goods vehicles	0	1	-1	0	4	-4	0.000%	0.002%	0.063%	0.000%	0.004%	0.160%
UC5 - heavy Goods vehicles	0	9	-9	0	-11	11	0.000%	0.028%	0.259%	0.000%	-0.033%	-0.314%
Total	0	-60	60	0	-34	34	0.000%	-0.007%	0.839%	0.000%	-0.004%	-0.782%

Table 7 – Differences in Matrix Totals by User Class

3. Summary and Conclusion

3.1.1. National Highways (NH) undertook a review of the traffic models submitted to support the proposed M5 J10 Scheme. AtkinsRéalis on behalf of GCC provided responses to the comments made by NH regarding the base year model which satisfactorily addressed all but one issue relating to the northbound journey times routes 208A and 209B that lie slightly outside of the TAG validation threshold. National Highways requested that changes to the current base year model are made so that JTRs 208A 209B meet the TAG criteria and investigate if these changes would lead to wider impacts on other aspects of the base year model used for the assessment of the Scheme.

3.1.2. National Highways recommended revisiting the current signal coding at Gallagher and Manor Road junctions with A4019. This suggestion was taken on board and sensitivity test models were developed using demand from the current base year for the three modelled time periods. However, the journey times reported for JTRs 208A and 209B by this sensitivity test mode did not still meet the TAG criteria.

3.1.3. Having tested a number of options it was found that using a Speed Flow Curve (SFC) along A4019 between Kingsditch Roundabout and Gallagher junction, that is consistent with the rest of A4019 to M5 J10, in combination with optimising the signal timings at both the Manor Road and Gallagher junctions resulted in journey times along northbound routes 208A and 209B meeting TAG criteria.

3.1.4. Sensitivity test (2) model was developed using the demand from the current base year model and the two models then compared using key performance indicators to demonstrate how well they correlate. Comparison of the two base year models showed close correlation regarding key performance criteria including screenlines and calibration/validation link flows. With journey time routes 208A and 209B passing the TAG criteria in sensitivity test (2), there were as expected, two additional journey routes times meeting TAG criteria in this model compared to the current base year model.

3.1.5. The comparison of flow difference plots for the two models showed that there were generally modest increases along A4019 between Kingsditch Roundabout and M5 J10 reported by sensitivity test (2) model. There were differences reported ranging from about 30 to 80 vehicles between M5 J10 and Gallagher Junction across the modelled time periods. There were larger increases reported in the flows between Kingsditch Roundabout and Gallagher Junction which is expected as this is the section where modelled journey times have reduced. However, the change in flows in this section is mainly due to local re-routing of traffic between Manor Rod junction and Old Gloucester Road in the westbound direction and between Gallagher junction and Kingsditch Lane in the eastbound direction.

3.1.6. The reported impact on other key roads in the network was generally modest. Along M5 at either side of M5 J10 i.e. between J9 to 10 and J12 and 11 there was a range of increase reported in flows of less than 50 vehicles whilst between J11 and 10 there was a similar amount of reduction reported in sensitivity test (2) model compared to the current base year model. The changes in flows across the key roads of A38 and A40 were also reported to be modest with increases of less than 50 vehicles along A38 southbound and similar decreases of between 25 to 50 vehicles along A40.

3.1.7. The sensitivity test (2) model was developed using the demand from the current base year matrices. To ensure that the adjustments made to the highway network in sensitivity test (2) would not lead to material changes in distribution of trips in the current base year matrices, the ME process was used to develop a set of demand matrices for sensitivity test (2) model using the same prior matrices as the current base year model with no additional demand or traffic data.

3.1.8. The comparison of impacts of ME process on the two sets of demand matrices showed slight differences which is indicates the changes made to the network in sensitivity test (2) model have not affected distribution of the trips in the current base year model matrices.

3.1.9. It can be concluded from the results of this exercise that the current and sensitivity test (2) base year models are closely correlated and the changes in the traffic flows arising from routes 208A and 209B meeting the TAG criteria do not materially impact the base year model submitted for the DCO process which in turn has been used as basis for developing traffic forecast models.

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