

Stafford Growth Options Study

Further Initial Option Assessment and Additional
Information Report

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Stafford Growth Options Study

Further Initial Option Technical Note

April 2008

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1. Introduction

- 1.1 Atkins Transport Planning has been appointed by Staffordshire County Council (SCC), to carry out a technical study to understand the implications of proposed growth around Stafford on the transportation network as part of the 2003 Call on Commission.

Background

- 1.2 The key element of the commission was to develop a new transport model to identify the most sustainable locations, in transport terms, for new housing and employment development in Stafford.
- 1.3 The Stafford Model built was required to contain provisions to incorporate the emerging development sites identified from currently ongoing studies.
- 1.4 The Initial Options Assessment constitutes Task 13 and 14 of Phase IV of the overall study (see Atkins report “*Understanding the Transport Implications of New Developments in Stafford: Inception Report (July 2007)*” where:
- Phase IV is the Detailed Transport Option Assessment;
 - Task 13 is the Initial Options Report; and
 - Task 14 is the Key Growth Issues

The Further Initial Options Assessment Technical Note

- 1.5 The purpose of this technical note is to follow on from the previously reported “*Initial Options Assessment Report (December 2008)*” (**IOA Report**) and the subsequent “*Addendum to the Initial Options Assessment Report (February 2009)*” (**The Addendum**).
- 1.6 The IOA Report considered three growth scenarios (namely Options 1a, 1b and 1c) of 7000 additional housing in the Stafford area. The three scenarios differed in their positioning of the housing sites. These were assessed against Key Performance Indicators (KPIs) to provide a means of deciding which scheme should be taken forward. Further to presentation of these findings, the Steering Group decided that three new, higher growth, options should be tested.
- 1.7 The Addendum evaluated these higher growth options (namely Options 2, 3 and 4) against the same KPIs as used previously. These were also presented to the Steering Group who advised that these options should be taken forward and considered in conjunction with three road schemes against the same KPIs.
- 1.8 The study of these growth options along with the suggested road schemes is the subject of this technical note.

Report Structure

- 1.9 This Technical note follows on from the IOA Report and Addendum following the same methodology as described in these report to evaluate the new options.
- 1.10 Therefore, the sections contained in this technical report are as follows:
- Land Use and Road Scheme Options;
 - Initial Option Assessment; and,
 - Summary.

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2. Land Use and Road Scheme Options

- 2.1 The land use options considered in this technical note are identical to those considered in the Initial Options Assessment Report and associated Addendum.
- 2.2 This technical note considers 10 new scenarios that are based around testing the previous land use options with a combination of remedial road schemes. The road schemes under consideration are:
- Western Distributor Road;
 - Eastern Bypass; and
 - Southern Bypass.
- 2.3 The specific Land Use options being built upon are:
- Option 1a – the preferred option identified in the Initial Options Assessment Report; and
 - Options 2, 3 and 4 – from the Addendum to the Initial Options Assessment Report.

New Scenarios

- 2.4 In this technical note the 10 new scenarios will be compared to 5 of the previously considered scenarios from the first two IOA reports to quantify the effects of providing different road schemes.
- 2.5 Table 2.1 defines what each of the 10 new scenarios consists of with respect to the individual land use options and road schemes. The table also acts as a reminder of the 5 previously evaluated scenarios that are to be considered.

Table 2.1 – 10 Options with Road Schemes

Name	Land Use Option	Housing Distribution	Additional Housing	Associated Road Scheme		
				Western	Eastern	Southern
Do Minimum	-	-	2,500			
Option 1a		North, West	7,000			
Option 2		North, West, South	10,000			
Option 3		North, West, East	10,000			
Option 4		West, South, East	10,000			
Option 1 Western	Option 1a	North – West	7,000	Y	-	-
Option 2 Test 1	Option 2	North, West, South	10,000	Y	Y	-
Option 2 Test 2				Y	-	Y
Option 2 Test 3				Y	Y	Y
Option 3 Test 1	Option 3	North, West, East	10,000	Y	Y	-
Option 3 Test 2				Y	-	Y
Option 3 Test 3				Y	Y	Y
Option 4 Test 1	Option 4	West, South, East	10,000	Y	Y	-
Option 4 Test 2				Y	-	Y
Option 4 Test 3				Y	Y	Y

- 2.6 Figures 2.1 through to 2.15 show the locations of the land use and highway schemes that make up each Option tested in this report

Figure 2.1 – Do Minimum

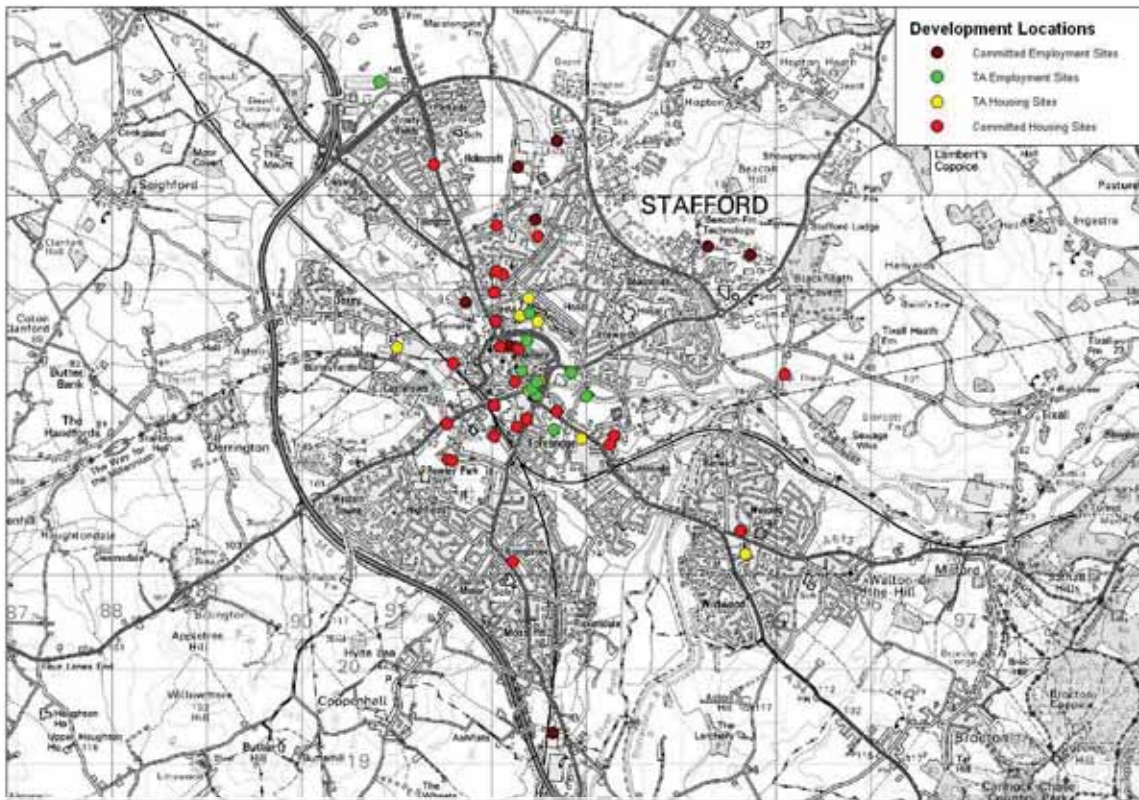
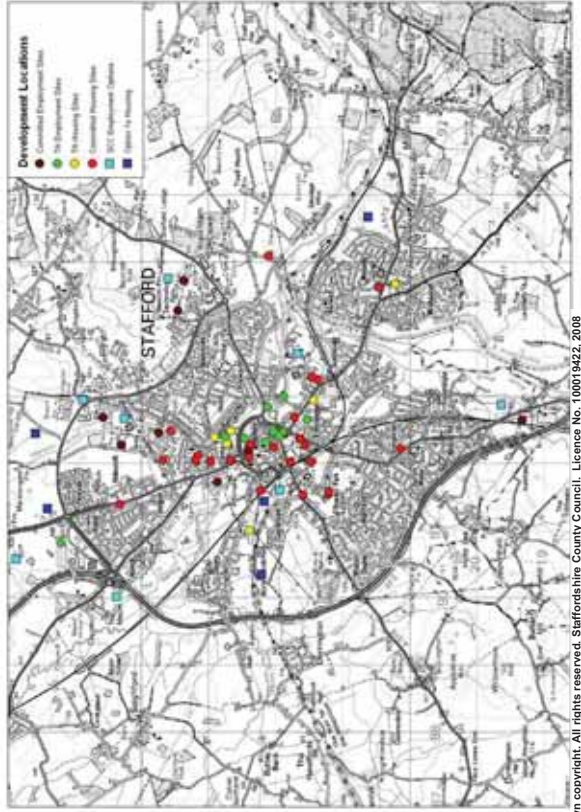
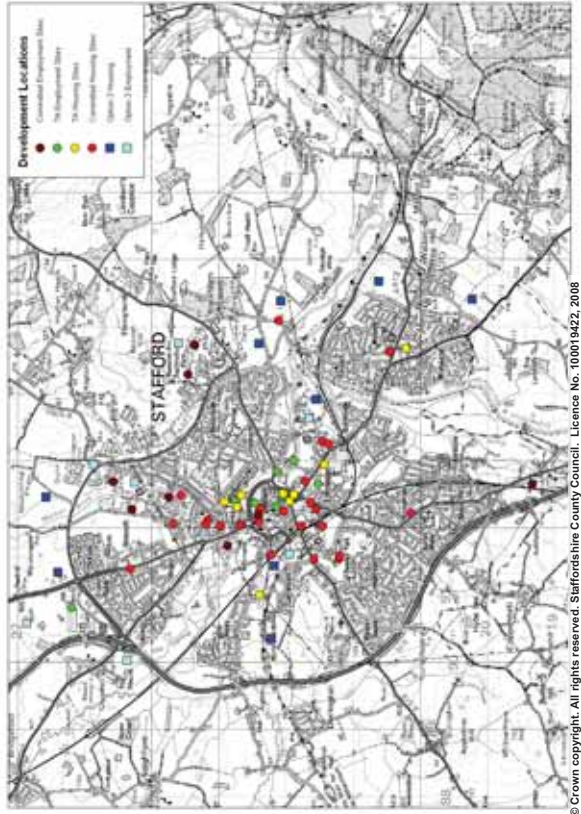


Figure 2.2 – Option 1a



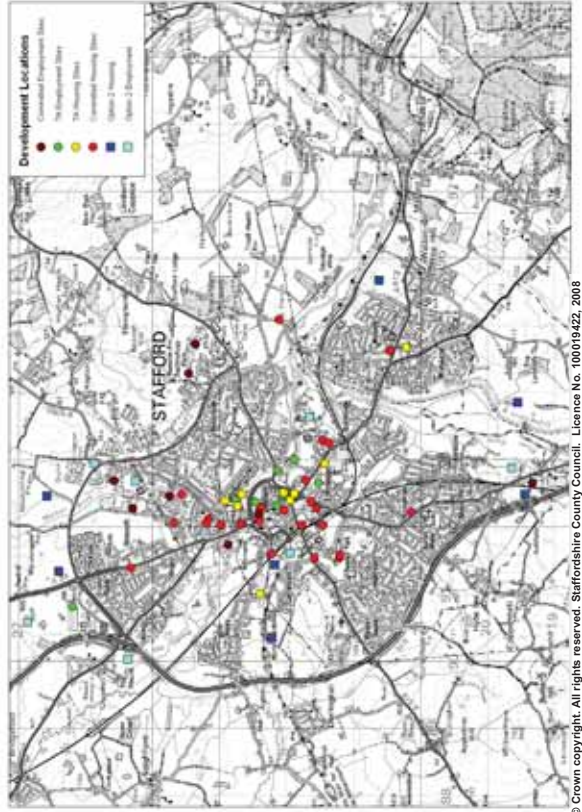
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Figure 2.4 – Option 3



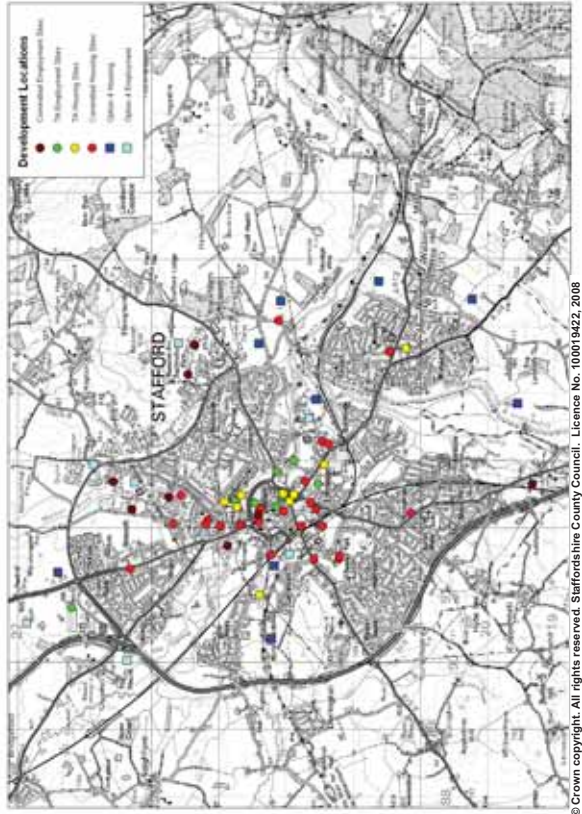
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Figure 2.3 – Option 2



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Figure 2.5 – Option 4



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Figure 2.6 – Option 1 Western

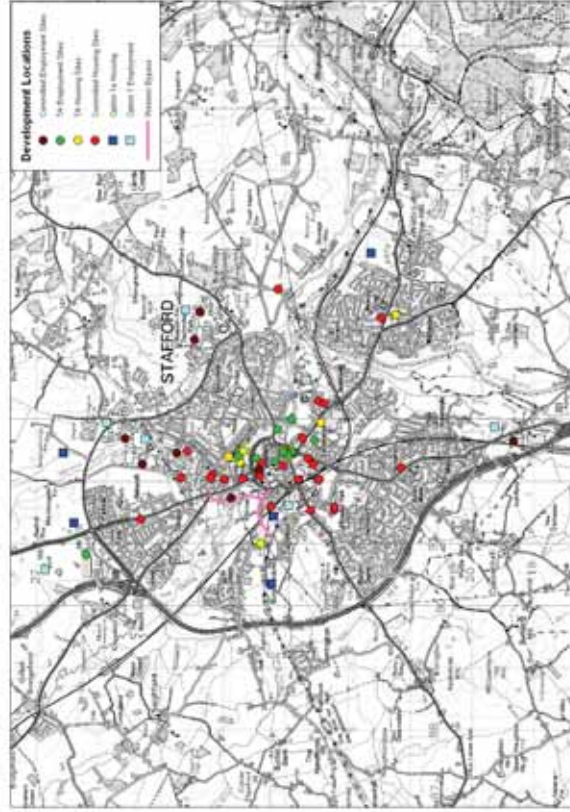


Figure 2.8 – Option 2 Test 2

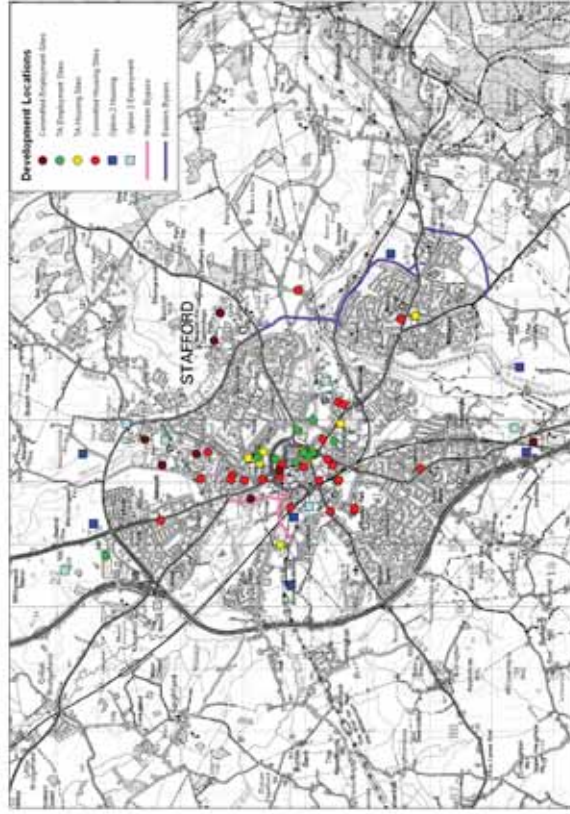


Figure 2.9 – Option 2 Test 3

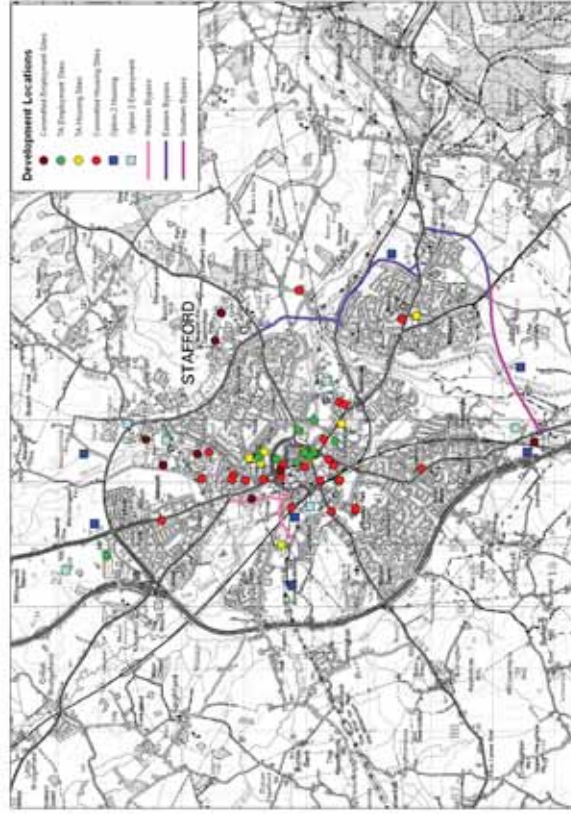


Figure 2.7 – Option 2 Test 1

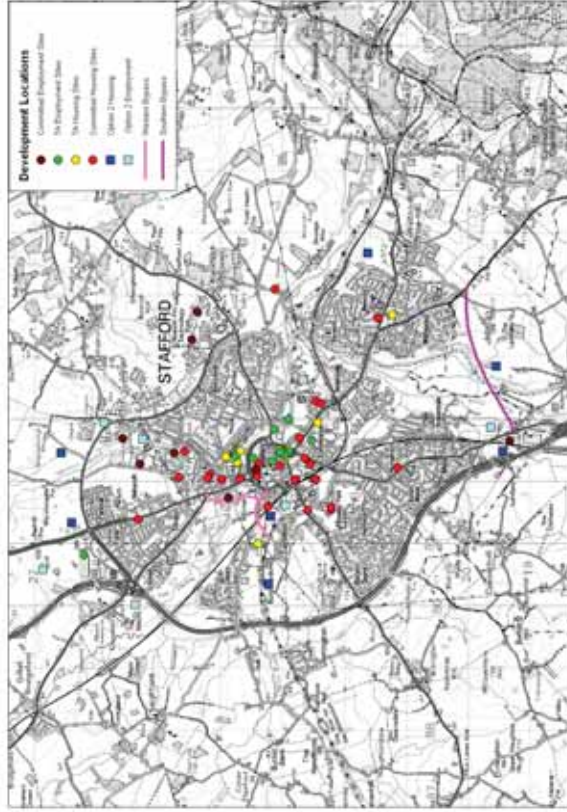


Figure 2.10 – Option 3 Test 1

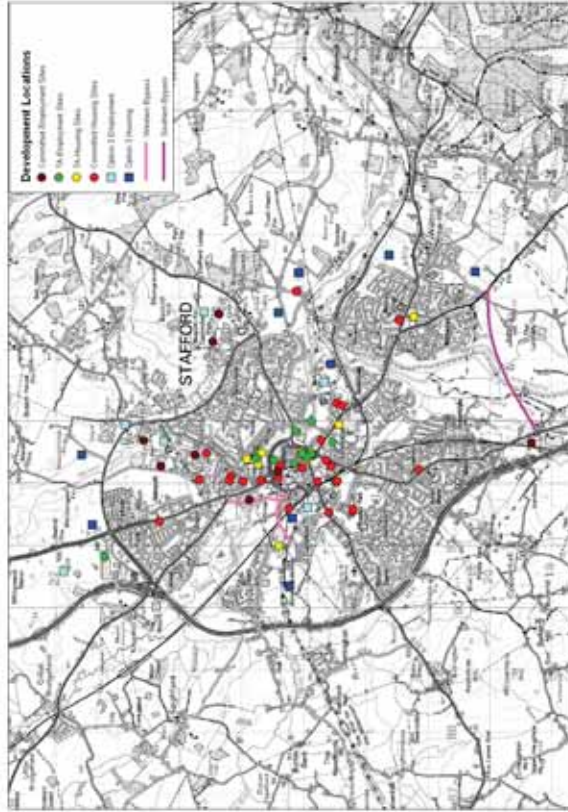


Figure 2.12 – Option 3 Test 3

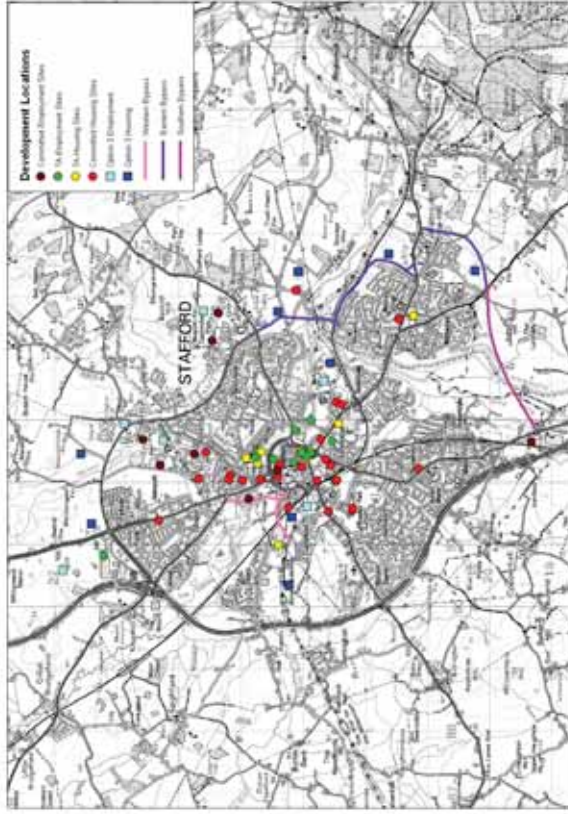


Figure 2.11 – Option 3 Test 2

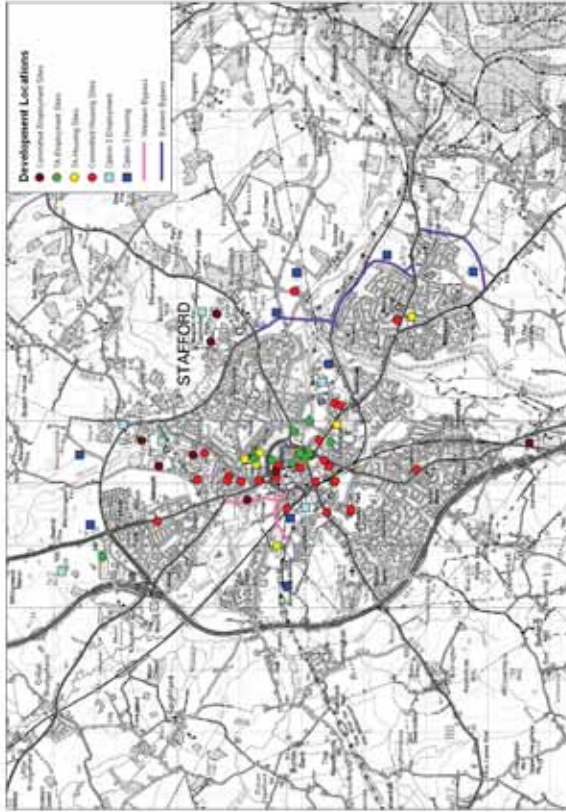


Figure 2.13 – Option 4 Test 1

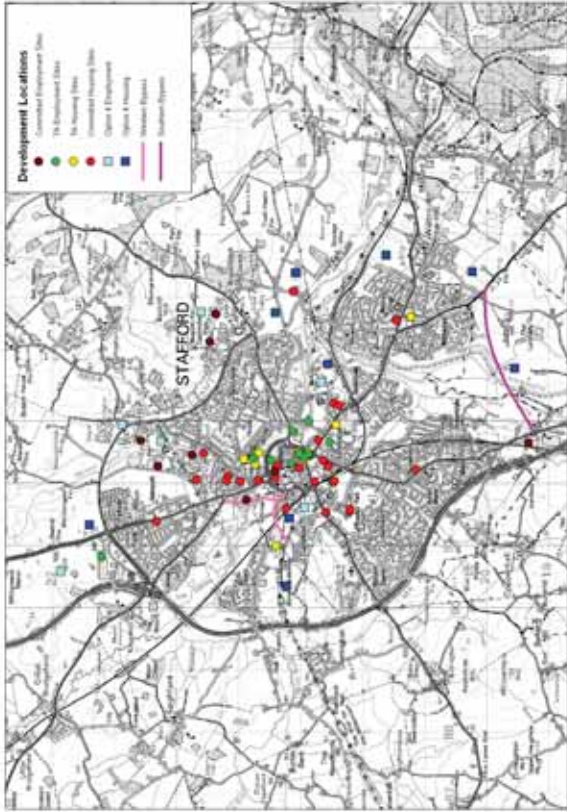


Figure 2.15 – Option 4 Test 3

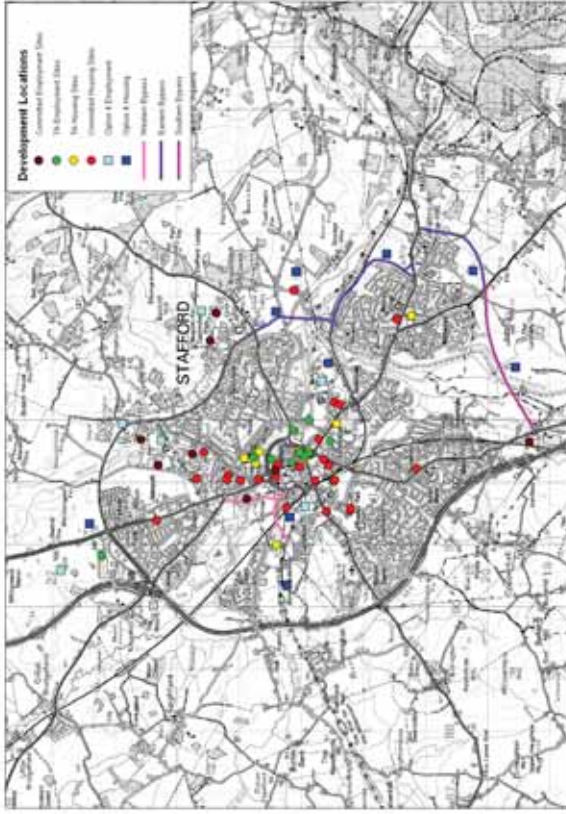
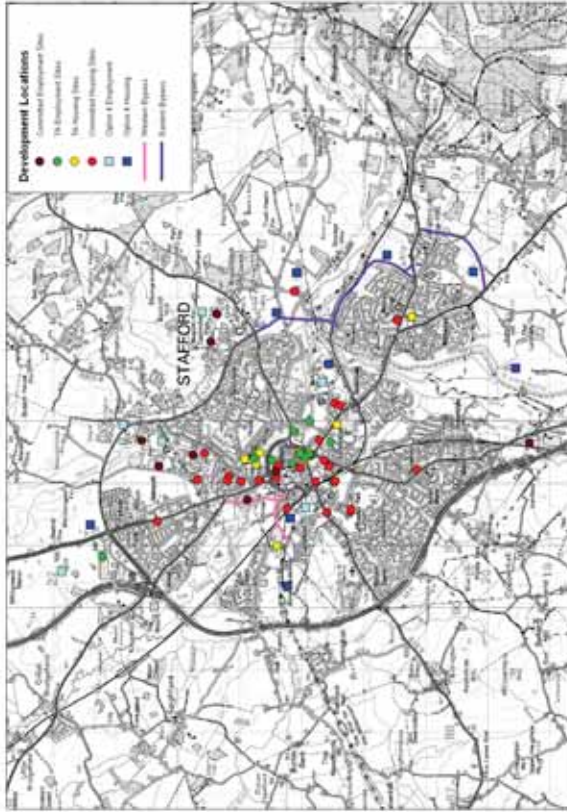


Figure 2.14 – Option 4 Test 2



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3. Initial Option Assessment

- 3.1 This section outlines the assessment of the Key Performance Indicators (KPIs) and the comparison of these for each option.
- 3.2 The performance of each of the options has been compared against 20 KPI criteria. These are the same KPIs as defined in section 4 of the IOA Report. In this report, the options are ranked from 1 to 15, with 15 being the worst, according to how they compare against one another.
- 3.3 In contrast to previous reports, and to aid consistent scoring, any differences between options will result in separate scores for those options. Only when two options are identical on a measure will they be scored equally. Equal scoring will be made at the mid-point between their rank and the next highest rank (i.e. if two options are equal first they shall be scored 1.5 with the next best scoring 3).
- 3.4 Appendix A – Detailed Evaluation of Options contains the detailed qualitative and quantitative KPI output used for the rankings. It also shows how the options were ranked for each of the 20 KPIs. The methodology used to rank the options against each KPI is also described.
- 3.5 A summary of each of the KPI scoring is provided in Table 3.1 overleaf. Furthermore, Table 3.2 provides a quick analysis of how each of the land use configurations and each of the road schemes responded to being applied together.
- 3.6 When analysing the results, it is critical to recall that the options are unequal in terms of cost of implementation and quantity of additional housing. This analysis concentrates on the benefits side of the cost-benefit ratio; it does not include any assessment of comparative scheme costs and the deliverability of each road scheme. An in-depth study of these issues will inform the decision-making process about the full implications of each option and may affect the final selection of a preferred road scheme option.
- 3.7 Therefore, the process of choosing a preferred option is a balance. For example, those Options that perform well with no road schemes are favourable as road schemes will be incredibly expensive to deliver. Equally, options that incorporate more housing than others should be preferred providing their associated disbenefits are not too great.

Table 3.1 – Summary of KPI Option Scoring

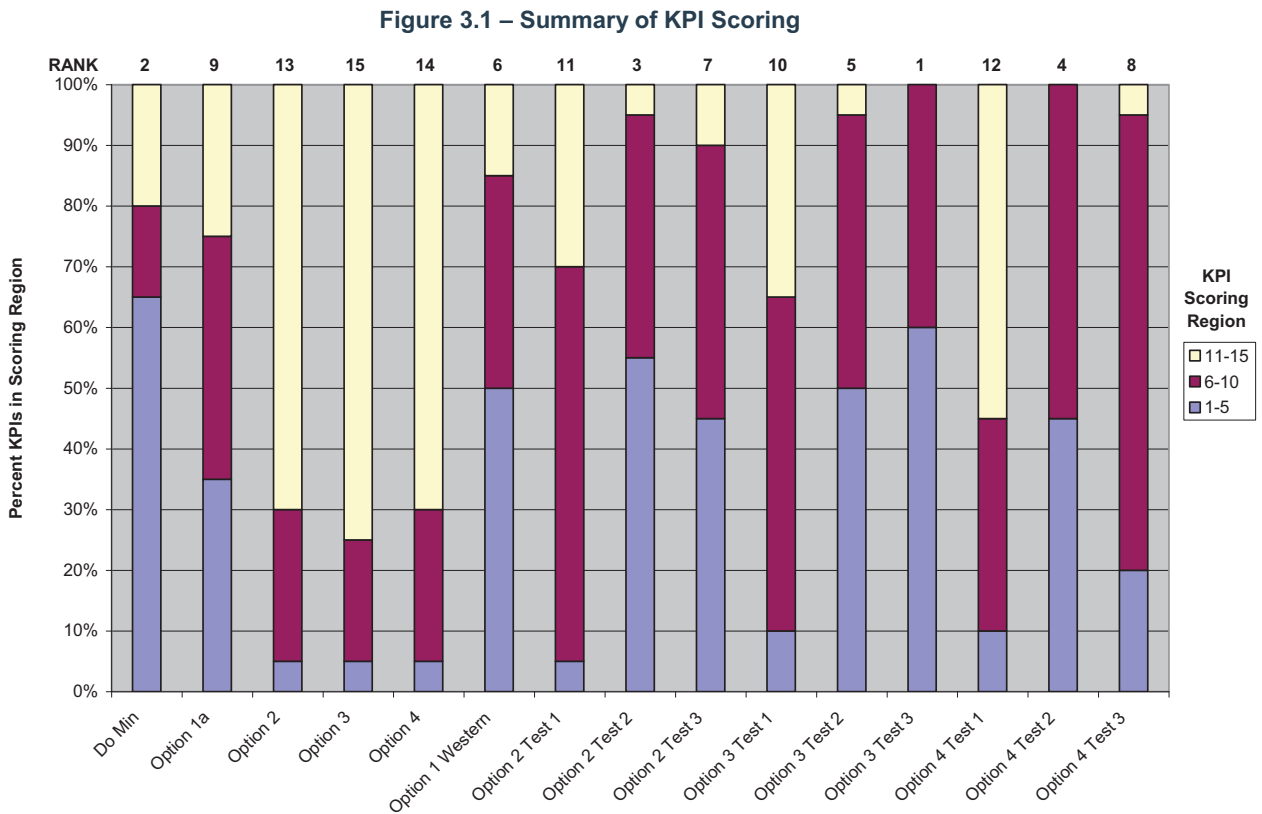
Objective	Sub Objective	Comparison of Options																							
		Do Min	Option 1a	Option 2	Option 3	Option 4	Western	Option 1	Test 1	Option 2	Test 2	Option 2	Test 3	Option 3	Test 1	Option 3	Test 2	Option 3	Test 3	Option 4	Test 1	Option 4	Test 2	Option 4	Test 3
Housing	Quantity	2,500	7,000	10,000	10,000	10,000	10,000	7,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
	Distribution	-	North - West	West - North - South	West - North - East	West - South - East	North - West	West - North - South	West - North - South	West - North - South	West - North - South	West - North - South	West - North - East	West - North - East	West - North - East	West - North - East	West - South - East	West - South - East	West - South - East	West - South - East	West - South - East	West - South - East	West - South - East	West - South - East	West - South - East
Road Schemes	Which new roads included	-	-	-	-	-	West	West & South	West & East	West, South & East	West & South	West & East	West, South & East	West & South	West & East	West & South	West & East	West & South	West & East	West & South	West & East	West & South	West & East	West, South & East	
Development Impacts	M6 Flows	5	9	15	13	11.5	8	14	7	6	10	2.5	1	11.5	4	2.5									
Development Impacts	Vehicle Hours	1	3	12	15	14	2	10	6	5	11	7	4	13	8	9									
	Vehicle Kilometres	1	3	12	15	13	2	11	6	8	10	4	5	14	7	9									
	Vehicle Speeds	1	10	12	15	14	3	9	5	2	11	7	4	13	8	6									
	Average Trip Length	15	14	9.5	12	12	8	9.5	1.5	5	6.5	1.5	3.5	12	3.5	6.5									
	Development Demand	15	13.5	6.5	6.5	6.5	13.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5									
All User Impacts	Vehicle Hours	1	9	13	15	14	4	10	5	3	11	6	2	12	8	7									
	Vehicle Kilometres	1	3.5	12	13.5	15	2	10.5	3.5	7	10.5	5	7	13.5	7	9									
	Vehicle Speeds	1	9	13	15	14	6	10	4.5	3	11	7	2	12	8	4.5									
	Average Trip Length	15	14	10.5	10.5	12	13	7.5	3	3	7.5	3	3	9	3	6									
	Demand	15	14	10	11	12	13	7	2	4.5	2	4.5	8.5	8.5	2	6									
Network Impacts	Junctions	1	5	13	15	14	2	6	10	12	8	9	7	3	4	11									
	Links	7	12	13	15	14	10	9	3	4	7	11	5	7	1	2									
Environment	CO2	1	4.5	11.5	15	14	2	10	3	8	11.5	4.5	7	13	6	9									
	NOX	1	7	12	15	10	2	14	7	9	12	4	3	12	5	7									
Access to Public Transport	Bus	1	3	2	4	4	3	2	2	2	4	4	4	4	4	4									
	Rail	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8									
Access for Non Motorised Modes	Access to the Cycle Network	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8									
	Within 15 Minutes cycle of town centre	1	2.5	13.5	7.5	7.5	2.5	13.5	13.5	13.5	7.5	7.5	7.5	7.5	7.5	7.5									
Total	Sum	99	152	206.5	229	217.5	112	175.5	104.5	117.5	163	110	96	187.5	108.5	128.5									
	Rank	2	9	13	15	14	6	11	3	7	10	5	1	12	4	8									

Table 3.2 – Land Use/Road Scheme Impacts

		ROAD SCHEME EVALUATION					
		No Test	Test 1	Test 2	Test 3	Average	Rank
10,000 LAND USE EVALUATION	Option 2	207	176	105	118	151	2
	Option 3	229	163	110	96	150	1
	Option 4	218	188	109	129	161	3
	Average Rank	4	3	1	2		

3.8 As with any ranking system there are a range of alternative methods that could be adopted. The risk in the scale of this KPI ranking is that with 15 options the sum of KPI scores could lead to debatable results. This is due to the fact that if an option scores 15 on one KPI this could have a large impact on its final ranking.

3.9 Therefore, analysis will try to interpret the individual scores in addition to the overall ranking to ensure a fair conclusion. To aid this, Figure 3.1 demonstrates the distribution of each option’s KPI scoring.



3.10 The purpose of this chart is that it provides a quick and easy understanding of what each option’s rank consists of. For example, Option 4 Test 3 and Option 1a are ranked 8th and 9th respectively. However, Option 4 Test 3 out ranks Option 1a by scoring more consistently not by scoring highly. To explain, Option 1a scores 15% more high scores (1-5 range) but is let down by its inconsistency on other measures. This contrasts well to Option 4 Test 3 that scores 75% of KPIs in the 6-10 range making it very consistent.

Impact on All Users

3.11 The assessment of the impacts on all users has noted the following:

- Option 2 Test 2, Option 3 Test 1 and Option 4 Test 2 have the highest demand indicating that they suppress the least trips of the 10,000 housing options. Interestingly, the three Test 3 options, that include all of the new road schemes, rank 4th, 6th and 8th for demand. Given their extra road capacity it might have been expected for them to perform best. The ‘Test 2’ options are the most consistently high scoring indicating that their combination of Western and Eastern road schemes is a strong solution;
- Low average trip lengths can be interpreted in two ways. When only the location of development changes it indicates that the developments are suitably located to reduce trip lengths. However, when road schemes are included a reduction in trip lengths suggests that the road is providing a more economical route for a number of drivers. There are 5 options that

tie equal first for this measure. Unsurprisingly they are all options with road measures but they include all 3 of the Test 2 options, 2 of the Test 3 options and none of the Test 1 options. The common theme between Tests 2 and 3 are the western and eastern road schemes. Therefore, the results suggest that these are the ones that best provide a reduction in journey distances. Conversely, this also suggests that the southern road scheme does not score well for journey lengths;

- Test 1 road scheme options all perform badly on the vehicle hours, kilometres and speeds KPIs. In fact, there is a pattern that for each land use option Test 1 falls centrally between the no road scheme option and the Test 2/3 option. This suggests that the southern bypass cannot provide benefits when used without the eastern bypass. Logically, when the southern and eastern combine they provide an alternate route for north-south movements. However, when the southern is utilised on its own it only provides benefits for very specific routes;
- The Test 3 options score very highly for vehicle hours and speeds but only moderately well for kilometres. This suggest that the use of all 3 new roads is good for keeping traffic moving due to the extra highway capacity it offers. The Test 2 options also perform well on Vehicle hours and speeds but are particularly efficient in vehicle kilometres; and
- Of the development options, Options 2 and 3 - across all road scheme tests - score similarly. However, Option 4 consistently performs worse over all like-for-like road scheme tests.

Impact on Strategic Routes

3.12 The assessment of the changes in trips on the M6 around Stafford has shown the following:

- All options including Test 1 road schemes score very poorly, often worse than the high growth options without road schemes (Options 2-4). This again highlights how the combination of southern and western road schemes is disjointed. Trips will not be removed from the M6 in Test 1 as there are no better options provided;
- In stark contrast to this, the options that include Test 3 score very strongly due to the seamless nature of their road schemes as the southern bypass leads directly into the eastern. The combination of southern and eastern road schemes provides a sensible alternate route for North-South movements and so reduces M6 flows. Furthermore, this is particularly evident in the flows between junction 13 and 14 for Option 2 Test 3 as this option has much of its development growth located to the north and south;
- The Test 2 options provide a good compromise here as they consistently score better than Test 1 but slightly worse than Test 3 within each land use configuration. This indicates that the eastern bypass alone contributes much of the benefit of the eastern and southern combined; and
- The options without road schemes all perform poorly with Option 4 performing best of the 10,000 housing options without road schemes.

Impacts on New Development Trips

3.13 The assessment of impacts on new development trips has shown that:

- Option 4 Tests 1-3 all score weakly in comparison to their Option 2 and 3 counterparts. Equally, all Test 1 options score poorly in comparison to the others with the same land use. Unsurprisingly, this pattern causes Option 4 Test 1 to be the weakest scoring of all the options that include road schemes. In fact, its performance is similar to the high growth options without road schemes (Options 2-4). This is likely to be due to the development configuration in Option 4 which without road schemes also performs very poorly;

- Tests 2 and 3 are difficult to separate on these measures. Test 2 is better than Test 3 when the Option 2 land use configuration is used but this pattern is reversed under Option 3 land use. This suggests that both tests are good options but that the land use locations determine whether the road scheme's capabilities are maximised; and
- Option 1 Western, the 7,000 house growth option with western distributor road scheme performs well on the measures here. However, the 3,000 less housing provided by this option appears to be responsible for the high scoring.

Network Impacts

- 3.14 An assessment has been undertaken of the overall network impacts in the key study area. These have considered the following:
- Average junction stress – where the volume to capacity (V/C) ratio is >85%; and
 - Average link stress on the approach to each junction – where the volume to capacity (V/C) ratio is >85%
- 3.15 A V/C ratio has been used as the criteria for this indicator as it is recognised that where V/C increases above 85% then the link or junction is assumed to be at capacity and hence any additional flow may cause increased delays and queuing (i.e. over capacity).
- 3.16 Diagrams showing links >85% within the key simulation network for each option and time period are provided in Appendix B. In addition, average vehicle queue length plots are also presented to identify potential locations of excessive queuing and blocking back in the highway network.
- 3.17 In contrast to the previous IOA Report and Addendum, V/C KPI is now ranked based on the impact on the existing network only. This is to prevent new road schemes negating the positive impacts of their installation. A separate section covers the deficiencies of the new road schemes.
- 3.18 This indicator has highlighted the following points:
- Option 4 land use configuration responds best to the addition of road schemes. The inclusion of these road schemes has the effect of reducing the congestion on some of the roads and junctions. This is particularly evident in Option 4 Test 2 where almost 18% of over capacity links are brought back under capacity by the inclusion of road schemes (determined by comparing Option 4 Test 2 to Option 4 statistics);
 - Broadly speaking, Options 2 and 3 with road schemes perform similarly, as do Tests 1 and 3 regardless of land use configuration;
 - Interestingly, in 7 of the 10 options that include road schemes, the number of links over capacity is brought down to the same level or below that of the Do Minimum. In these cases it mitigates the impact of 7,500 more houses. The three road scheme options that fail to do this are Option 1 Western, Option 2 Test 1 and Option 3 Test 2;
 - The number of junctions over capacity is much less likely to respond to highway improvements than the links over capacity. This is due to the fact that each link is an individual whereas a junction V/C is based on the activity of all arms. Therefore, the benefits are more muted for the junction V/C scoring. However, they also show that the introduction of road schemes has a beneficial impact on over capacity issues; and
 - As expected, the options without road schemes are the lowest scoring in terms of number of links over capacity.

Environment

- 3.19 A review of the environmental indicators extracted from the SATURN model runs has been undertaken. It is recognised that SATURN provides only a simplified emissions model and hence

the validity of these results should be treated in this light. The results do, however, provide a like-for-like comparison of the options and hence the results have highlighted:

- Each of the Test 2 options performs well on these measures with Option 3 Test 2 scoring strongest of all. This suggests that the combination of western and eastern road schemes provides a good balance between extra capacity and environmentally adverse impacts; and
- The Test 1 options are strong poor performers across all land use configurations and for both NOX and CO2. Test 1 options actually score worse in some cases than the high growth options without road schemes (Options 2-4).

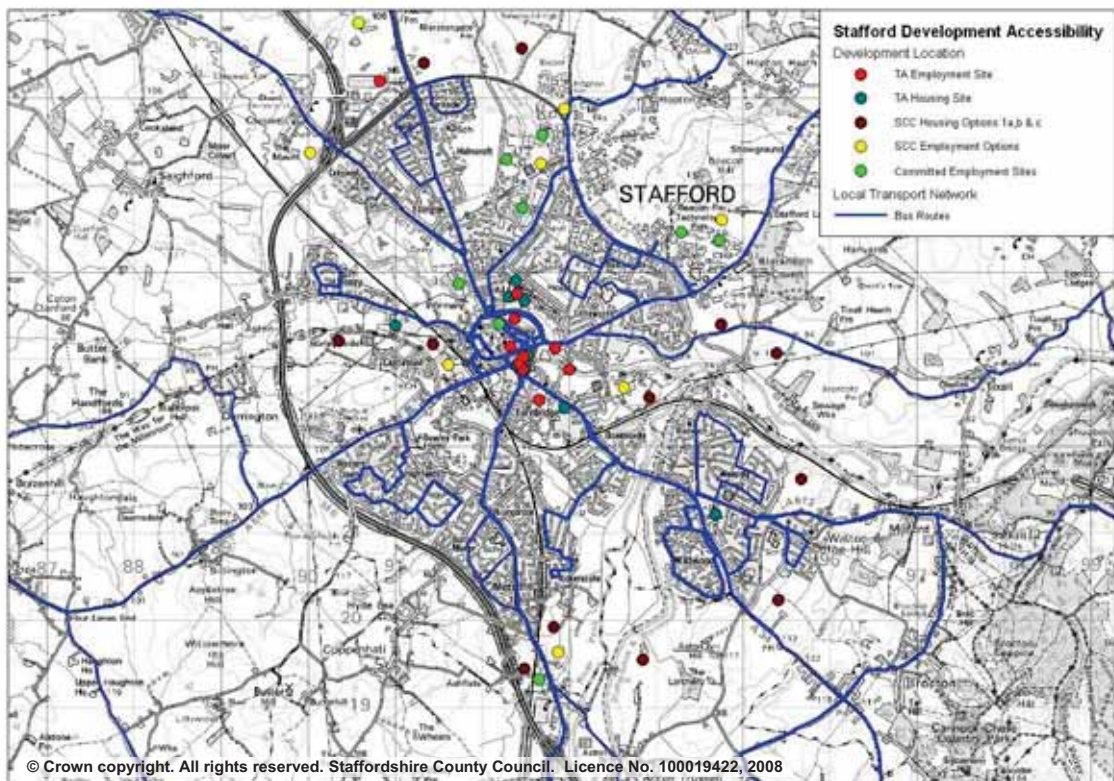
Access to Public Transport

3.20 A diagram of the developments from all Options with the bus routes is shown in Figure 3.2.

3.21 The scoring for this indicator is based on the development locations and therefore the land use configuration tells us what the scoring should be. Therefore, all Option 2 land uses regardless of road schemes score identically. The same follows for Option 3 and 4 land uses.

3.22 The results for this indicator are incredibly close with 14 of the options split by just 1.1%. Therefore, in striving for a fair test the Bus Public Transport KPI will be scored from 1 to 4. This enables the differences to be highlighted while maintaining a sense of their close proximity.

Figure 3.2 – Access to Public Transport Networks



3.23 While not forming part of the KPI assessment, Table 3.3 demonstrates the number of development units without access to public transport for each land use option. This helps to quantify the impact of the lack in bus accessibility.

Table 3.3 – Development Units without PT Access

Land Use Option	Option Housing Development Units without PT Access
Do Minimum	0

Option 1a	3400
Option 2	6000
Option 3	4550
Option 4	5050

3.24 The table demonstrates that Option 2 leaves the most development units without access to public transport while, of the growth options, Option 1a has the least.

3.25 To summarise, the key points were:

- The land use option that has the best access to the bus network is the Do Minimum. However, the best of the large growth options is Option 2.
- Option 3 and 4 land uses (including or excluding tests) score the equally poorly on this measure.
- It is noted that the difference between these land use options is very small in relation to this measure. To be precise, 12.3% of Option 2 developments fail to have suitable access to public transport while 13.4% of Option 3 and 4 developments fail on this measure.

3.26 The results of the rail access assessment were:

- The rail station in Stafford is centrally located and so 14 bus routes serve the station directly. However, due to its central location it is noted that any of the current bus routes could be combined with a short walk to reach the rail station. For this reason, all options are scored equal for access to rail. It is noted that in all cases the introduction of a new bus service to access a specific development site could change these results and hence could be considered as a condition.

Access to Non Motorised Modes

3.27 This indicator considers what proportion of land use can access the town centre within 15 minutes through cycling. This assumes a cycle speed of 16kph and that cycling distance is 1.3 times the 'crow-fly' distances. Accession, upon the DfT's guidance, uses the factor 1.2 to move from 'crow-fly' distance to actual travelling distance between two points. Based on our experience the factor 1.3 is chosen as an adjusted version of the DfT's recommended walking distance factor. The adjustment is made based on the assumption that cyclists are less likely to be able to take as many shortcuts as people travelling on foot and so will travel further on average.

3.28 The results of this KPI are also dependent solely on the land use scenario and not on the road schemes. Therefore, as with the previous KPI, all options with the same land use configuration score equally and to the results are as in the previous IOA report and Addendum.

3.29 To summarise, this indicator has highlighted the following;

- The Do Minimum provides the best access to the city centre from developments with 89% of developments within a 15 minute cycle of the centre;
- Of the high growth options, Option 1a and Option 1 Western perform best providing access to the centre for 78% of developments. Options 3 and 4 (including or excluding road tests) score marginally behind this with 77% of developments having access to the town centre by cycling; and
- Option 2 land use configuration scores worst on this measure. This highlights that the developments in Option 2 are further from the town centre than in the other land use options.

3.30 The second cycle indicator is access to the national cycle network. Due to the spatial nature of the cycle routes, all options will provide access to the cycle network for a high number of sites. In fact, due to the comprehensive cycle access shown in the Staffordshire County Council urban map all options have been assessed as equal for access by cycle.

Feedback on the New Road Schemes

- 3.31 This section aims to provide feedback on the suitability of the designs of the new road schemes based on the initial tests.
- 3.32 The Network Impacts KPI was based purely on the existing road network but the impacts on the new roads were recorded. Table 3.4 summarises the overall impact of each road scheme test.

Table 3.4 – Network Impacts on Road Schemes

	Road Schemes	Junctions (V/C>=85%, AM+PM)	Links (V/C>=85%, AM+PM)
Test 1	West/South	3	39
Test 2	West/East	9	50
Test 3	West/South/East	10	65

- 3.33 Appendix C shows how the actual flows on the Eastern and Southern bypasses differ according to their use within a land use configuration. It also shows how they respond to the inclusion/exclusion of one another.

Eastern Bypass

- 3.34 It was found that in general, the demand to use the eastern bypass is in excess of 1800 PCUs/Hr on the section between Weeping Cross Residential and Beaconside. This means that the single lane carriageway currently proposed is often over capacity and thus contributes to the V/C counts seen in Table 3.4.
- 3.35 There is a big fall in use of the southern section of the Eastern Bypass between Weeping Cross and A513 Milford Road. This is due to heavy use of Baswich Lane to access the A513 instead.
- 3.36 The section of the Eastern Bypass between the A34 and A513 is largely dependent on the inclusion of the Southern Bypass. Without the Southern Bypass to compliment it this section is used by approximately 200 PCUs in each direction bar a few exceptions.
- 3.37 When the Southern Bypass is included, this A34 to A513 section of Eastern Bypass is used by anything up to 845 PCUs as in Option 2 Test 3. This is a significant improvement in utilisation.
- 3.38 The small residential estate north of the railway line (zone 56) is currently modelled with a splay zone connector as the T-junction suggested in the diagrams appeared to prevent much of the traffic from this zone accessing the network. This should be considered if the Eastern Bypass is to be taken forward.

Southern Bypass

- 3.39 The Southern Bypass is used by a significant amount of traffic regardless of which land use or road schemes are included. Northbound actual flows range from 637 to 1138, and Southbound from 640 to 1174.
- 3.40 In general, the flows on the Southern Bypass increase when the Eastern Bypass is also included. This is less prominent in Option 3 – the only option not to have the new development on the bypass. This suggests that the inclusion of the development traffic prevents potential bypass users from travelling on the bypass.
- 3.41 The junction connecting the Southern Bypass to Acton Gate requires attention as this is often causing the approaches to be over capacity. This does not solely affect the Southern Bypass approach but also the other approaches to the junction.
- 3.42 Finally, the new housing development SF8 (zone 2119), requires access to the bypass. However, a simple T-junction was found to be insufficient to allow the traffic onto the network and therefore

this development is currently modelled with a splay zone connector. If this development is to go ahead then suitable access arrangements will have to be considered.

- 3.43 The utilisation of the Southern Bypass northbound increases significantly when the Eastern Bypass is also included.

Western Bypass

- 3.44 The Western Distributor is well utilised when incorporated and makes good use of existing roads. The results of the Option 1 Western assignment against the Option 1a results show that the Western Distributor provides all round benefits.
- 3.45 There are capacity issues in the AM at the new junction where Doxey Road meets the new distributor road. The current design for this junction may need modifying to reap the greatest benefits from the new road scheme. Currently, the Doxey Road approach from the north is over capacity in all option runs.
- 3.46 There are also capacity issues in the PM where the Western Distributor road meets the A34 Foregate Street. Junction improvements could be considered here to attain maximum efficiency from the new road scheme.
- 3.47 The results of including the Western Bypass also suggest that the Martin Drive and Kingsway roundabouts that are to be used for the Western Bypass may require improvement to handle the demand for this route.

4. Additional Tests

- 4.1 Following a meeting on the 15th May 2009 regarding the results of Chapter 3 (the Further Initial Options Assessment) and associated appendices the number of Options under consideration was reduced to three future year options in addition to the Base Year and Do Minimum for benchmarking.
- 4.2 At the meeting Atkins presented the finding of the 15 Options Comparison, discussed the merits of the various options, and the number of options were reduced. The chosen options for additional testing are Option 2 Test 2, Option 3 Test 2 and Option 3 Test 3.
- 4.3 A brief summary of these options is provided in Table 4.1.

Table 4.1 – Options for Additional Testing

Option	Option 2 Test 2	Option 3 Test 2	Option 3 Test 3
Housing Growth	10,000	10,000	10,000
Growth Location	North, West, South	North, West, East	North, West, East
Road Schemes	West, East	West, East	West, East and South

- 4.4 This section of the report provides further data and analysis on these remaining options and, through also drawing on the data of the previous chapter, aims to give sufficient information for the options to be reduced further to a solitary, preferred option.
- 4.5 Delay plots for the three remaining options are provided in Appendix E. These show junctions where the delay is forecast to be greater than 30 seconds and uses a colour theme to demonstrate the severity of delay. Base Year and Do Minimum network are also provided to enable comparison with the current situation and future year without the additional growth scenario.
- 4.6 Bandwidth actual flow plots are also provided in Appendix E. These show the quantity of flow that each road is forecast to endure by the future year traffic demand. The widths of the lines are proportional to the size of the flow. A table of key radial route flow figures is also provided.
- 4.7 Finally, key journey times are provided in Appendix D. Further to this, graphs showing how these journey times differ across the 3 options along with the Base Year and Do Minimum are provided. This helps demonstrate exactly where an option excels or performs poorly in relation to other options.
- 4.8 Option 2 Test 2 and Option 3 Test 2 are directly comparable as they have the same road schemes incorporated and thus will cost the same amount to implement. However, Option 3 Test 3 has an additional road scheme, making it significantly more expensive to implement. Therefore, when considering the results, Option 3 Test 3 would have to perform radically better than the other options to warrant selection.

Delay and Flow Analysis

- 4.9 This section draws conclusion from the tables and diagrams provided in Appendix E.
- 4.10 For the analysis of junction delays and radial route flows the Do Minimum, and to some extent the Base Year, will act as a baseline by which to compare the high growth options.
- 4.11 It is important to understand the starting point to interpret which problems are caused by growth or road schemes, which exacerbated by them and which are reduced by them.

Base Year

- 4.12 The delays in the Base Year are few, with a noticeably larger problem in the PM peak than in the AM peak.
- 4.13 The Base Year AM peak currently has no delays of greater than 90 seconds and only 8 greater than 30 seconds. The PM peak is worse, but still only has 10 junctions with greater than 30 seconds delay.

Do Minimum

- 4.14 The Do Minimum shows a significant increase in delay and flow problems from the Base Year. We would expect this given the forecast growth from 2007 to 2026 in addition to the 2,500 additional housing growth incorporated within the Do Minimum.
- 4.15 The number of junctions with delay over 30 seconds increases by over 330% in both peak periods. While many of these lie in the lowest band of 30-60 second delay, there are still a high number of more serious delays.
- 4.16 The emerging problem areas in the Do Minimum are:
- The town centre, particularly in the PM peak;
 - A34/A513 Beaconside Junction;
 - The A34 Lichfield Road near Riverway; and
 - The A449 south of the town centre, though this is less problematic than the aforementioned.
- 4.17 The flows on radial routes generally increase in the Do Minimum. The most notable increases are on Gaol Road (40%+) and tidally on Doxey Road (up to 80%).
- 4.18 The flow diagram also illustrates that Queensway in the town centre is subject to much higher flows than in the Base Year.

High Growth Options

Delays

- 4.19 The high growth options all have similar numbers of junctions over the 30 second delay threshold. However, the severity and location of delay differs between the options. Table 4.2 shows the spread of delay severity by option over both peak periods.

Table 4.2 – High Delay junction Spread by Option

	No. Junctions (AM+PM)		
	Option 2 Test 2	Option 3 Test 2	Option 3 Test 3
30-60s	51	49	53
60-90s	19	18	17
90-120s	2	6	8
Over 120s	5	6	4
Total	77	79	82

- 4.20 The table demonstrates that, while the overall number of junctions with greater than 30 second delays are similar in all options, the spread differs.
- 4.21 Option 2 Test 2 has the least number of junctions with high delay, and further, has the favourable distribution with most of these being the lower delays.
- 4.22 Option 3 Test 3 and Option 3 Test 2 both have 12 severe – above 90 second – delays whereas Option 2 Test 2 has just 7.

- 4.23 Option 3 Test 3, even with all three road schemes, performs the worst on junction delay. Much of this can be explained by examining the diagram of these delays.
- 4.24 There are a high number of exacerbated existing delay problems on Beaconside in this option. This is likely to be due to the provision of the Eastern and Southern Bypasses in Option 3 Test 3. The combination creates an 'outer ring road' along A513 Beaconside, down the Eastern Bypass and Across the Southern Bypass. This alternate route for north-south movements around Stafford appears to have pushed the problem junctions on Beaconside into more severe delays.

Flows

- 4.25 For examining flow change, Appendix E provides both a table of radial route flows for the key movements and diagrams of flows on roads for the wider outlook.
- 4.26 In the high growth options, flows in both directions along Gaol Road and Doxey Road have increased by in excess of 50% compared to the Base Year.
- 4.27 The increase on Gaol Road is likely to be due to the new housing development in the North, and is perhaps also due to vehicles choosing Gaol Road to access the Western Distributor road.
- 4.28 Doxey Road has especially high growth with most flows increasing by over 100%. This is largely due to the Western Distributor road in all options and probably indicates good use of the Western Distributor road rather than a mounting problem.
- 4.29 If the radial route flow was taken before the Western Distributor road the flow growth would be much less.
- 4.30 The flows on Foregate Street are also affected by the Western Distributor road. They show a more tidal pattern than the other flows. Northbound shows large increases in the AM peak and Southbound show similar in the PM peak. The data indicates that the high growth options, with little deviation between options, increases AM Northbound flows by approximately 500 PCUs to a 1500 PCUs/Hr total. It also increases PM Southbound flows by approximately 800 PCUs to a 2100 PCUs/Hr total.
- 4.31 Flows along Lichfield Road do not differ much between the Do Minimum and High Growth Options. This could indicate that the Eastern Bypass, incorporated within all three high growth options, prevents the additional housing growth from adversely affecting this route.
- 4.32 Option 2 Test 2 performs noticeably better along Western Road than the other high growth options. This is likely to be due to Option 2 not including housing growth in the east. Option 3 Test 3 proves slightly better than Option 3 Test 2 on this route showing that the additional road scheme provides flow benefits.
- 4.33 Looking outside the radial routes at the flow maps, the high growth options produce significantly higher flows on Queensway in the town centre. These higher flows are increased further than those seen in the Do Minimum.

Delay and Flow Summary

- 4.34 The delay analysis has highlighted that, regardless of the high growth option chosen, there will be significantly more delay on the network than in the Base Year. However, in choosing an option carefully, this delay can be minimised and the amount of remedial work required can be reduced.
- 4.35 Option 2 Test 2 demonstrated less junctions with greater than 30 second delay. It also has a greater percentage of its 77 delayed junctions nearer 30 seconds than 120 seconds which is much preferable.
- 4.36 Option 3 Test 3 performs least favourably on this measure but this is largely due to exacerbating emerging problems on the A513 Beaconside.
- 4.37 The flow analysis highlighted key routes of growth. There is particularly high growth on Gaol Road and Doxey Road and tidal growth on Foregate Street.

4.38 The total flow across all routes for each option (Table 4.3) demonstrates that Option 2 Test 2 has the smallest impact on radial route flow of the high growth options. It also shows how Option 3 Test 2 performs worst on radial route flows.

Table 4.3 – Total Flow on Radial Routes

	Base Year	Do Minimum	Option 2 Test 2	Option 3 Test 2	Option 3 Test 3
Total	22637	28177	32295	32631	32414

4.39 Table 4.4 shows the ranking for the delay and flow analysis based on benefits only.

Table 4.4 – Benefit Ranking for Delay and Flows Analysis

	Do Minimum	Option 2 Test 2	Option 3 Test 2	Option 3 Test 3
Delay Analysis	1	2	3	4
Flow Analysis	1	2	4	3

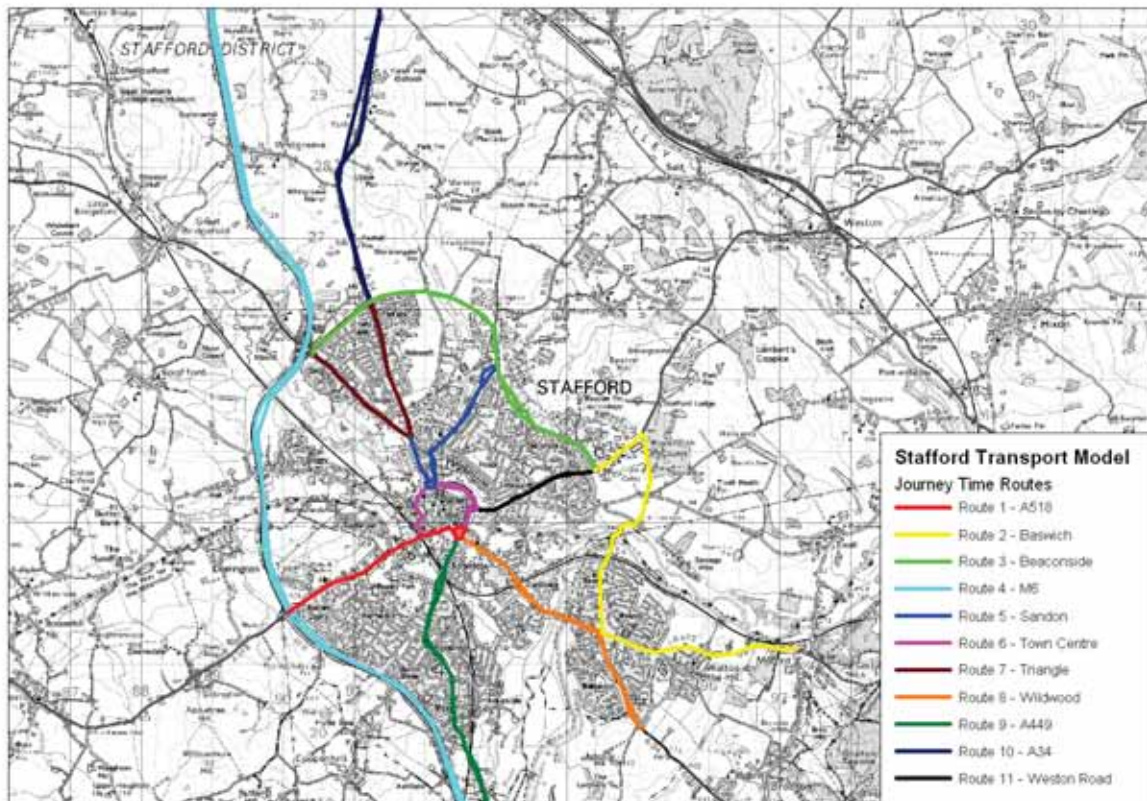
Journey Times

4.40 Due to the huge quantity of journey time data provided (44 graphs covering 11 routes) the analysis of the outputs will focus on areas of significant difference between the options and therefore may ignore certain time period or routes altogether.

4.41 Those not mentioned should be assumed to be of minor importance and are likely to show the expected pattern of Base Year providing the shortest journey time, Do Minimum higher, and the three high growth options indistinguishable from each other with the highest journey times. This is the expected outcome due to the quantity of housing growth assumed in each option (see Table 4.1).

4.42 Figure 4.1 outlines the journey time route used for this analysis.

Figure 4.1 – Journey Time Routes for Analysis



Route 1

- 4.43 Route 1 is similar for all high growth options with Option 2 Test 2 performing the marginal stronger of the three.
- 4.44 In the westbound direction, the majority of delay is caused exiting the Queensway Gyratory that seems to be producing heavy problems (amounting to minutes in the PM peak).
- 4.45 The eastbound graph shows general divergence between the high growth options and the Base Year. This suggests that the growth is simply resulting in heavy traffic along this route providing delay along large portions. Junctions around the Western Downs housing estate are causing particular problems in addition to the town centre itself.

Route 2

- 4.46 Route 2 is interesting as this movement is served by an alternate route – the Eastern Bypass - in the high growth options. This is reflected in the results particularly in the PM peak where the Do Minimum is outperformed by the high growth options.
- 4.47 This suggests that the additional road provides the additional capacity required to prevent this route from failing as traffic grows over the next 20 years. South-eastbound in the PM peak, the results show that the introduction of the Eastern Bypass could save around 5 minutes in journey time.
- 4.48 Of the high growth options, Option 2 Test 2 proves the best across both time periods and directions. This is aided by being the only high growth option to outperform the Do Minimum in the AM peak, north-westbound.

Route 3

- 4.49 Route 3 along Beaconside shows the expected order with the three high growth options performing the least favourably. It is interesting to see that the majority of time difference between the high growth options and the Do Minimum is due to the approach to the A34/A513 roundabout (which is providing severe delay in all options – see delay XXXX) in both directions. Outside of this approach the journey times are similar to the Do Minimum and Base Year.
- 4.50 This suggests that if remedial measures were implemented at the A34/A513 junction the undesirable impact of the high housing growth could be muted. Option 3 Test 3 performs the worst across Route 3 with the other high growth options closely matched.
- 4.51 Finally, the other notable problem in the Eastbound is the approach to the A513/A518 roundabout. This is particularly severe in the PM peak and affects all of the high growth options. This suggests that this would be another good remedial measure if a high growth option is chosen.

Route 4

- 4.52 There is little to note about Route 4, the M6, other than to remark on how Option 3 Test 3, with its significantly higher growth, performs better than the Do Minimum in both directions and peak periods. This again suggests that the combination of Eastern and Southern bypasses provide a real alternative to the M6 for north-south (or vice versa) travel within Stafford.
- 4.53 The options are otherwise difficult to tell apart for the M6 journey times.

Route 5

- 4.54 There is little to remark about the differences between the options here except to note that Option 3 Test 2 performs the least favourable across both time periods and directions. The other high growth options are difficult to separate.

Route 6

- 4.55 In Route 6, circling the town centre, the performance of the high growth options is often better than the Do Minimum in the PM peak. This is likely to be due to the Western Bypass removing much of the traffic in the high growth options.
- 4.56 The high growth options provide similar journey times with Option 2 Test 2 performing best in 3 of the 4 time period/direction alternatives. Furthermore, Option 2 Test 2 is the only high growth option to have a shorter journey time than the Do Minimum in the clockwise direction, PM peak.

Route 7

- 4.57 This route does not separate the options as much as highlight the developing problems at the A34/A513 roundabout as the housing growth increases. The journey times for all five options follow much the same gradient (i.e. the same journey time) except for on the approach to this junction. The delay experienced at this junction is largely responsible for the high growth options overall taking approximately 3 minutes longer when approaching from Stone Road, and approximately 5 minutes longer when approaching along the A34 from the Motorway.

Route 8

- 4.58 Westbound, Route 8 along the A34 to the east of the town centre, shows that the main difference between the Base Year and the Future Years is caused by the approach to the Lichfield Road/Riverway junction (AM peak) and the Queensway Gyratory (PM peak). Outside of these junctions the journey times are indistinguishable. This corresponds to the delay plots (see XXXX) that helps to further understand that significant delay is being experienced at these junctions.
- 4.59 In the eastbound direction, the main reason for the journey times being higher than the Base Year is due to navigating the left turn from Queensway to A34 Lichfield Road. Outside of this movement, the journey times across all options are almost identical in both peaks.
- 4.60 Of the high growth options, Option 3 Test 2 performs least favourably. The other high growth options perform similarly and the difference to the Do Minimum is small. This suggests that the problems seen in this route are not exacerbated much by the additional 7,500 houses in the high growth scenarios. This is likely to be due to the Eastern Bypass preventing the escalating problems on this route.
- 4.61 Reiterating the point, remedial measures to the Queensway Gyratory and the Lichfield Road/Riverway junction could prevent journey times from growing much beyond those seen in the Base Year.

Route 9

- 4.62 Route 9, along the A449 from the M6 to the town centre shows some significant differences between the options.
- 4.63 Of the high growth options, Option 3 Test 2 is a distinct high performer on this route. This is likely due to the fact that it contains neither southern housing growth nor the southern bypass. Therefore, demand for this route may be less than in the other options.
- 4.64 In three of the four time period/direction graphs, Option 2 Test 2 suffers on the section between Burton Manor Road and Rickerscote Road. This could be an indication of Option 2 housing growth in the south straining this road into the town centre.
- 4.65 Northbound, particularly in the PM peak, the approach to the A449/Moss Pit roundabout is a major reason for the difference in journey times between the options. Option 3 Test 3 is especially poor here. This is likely to be due to vehicles looking to access the Southern Bypass in this option causing the roundabout to delay all traffic. Ignoring this junction, the journey times are all similar for the remainder of the route.

4.66 The journey time tests on Route 9 highlight that remedial measures will be essential on this route to prevent much longer journey times (potentially minutes longer) in the future.

Route 10

4.67 Route 10 shows no significant trends.

Route 11

4.68 In Route 11 westbound, along the A518 Weston Road, the Do Minimum performs worse than some of the high growth options. Option 2 Test 2 performs particularly well perhaps due to the fact that it does not have housing growth in the east.

4.69 Considering both directions, the main delays are due to the Queensway section of the route whereas the A518 performs well in all of the high growth options. This indicates that the Eastern Bypass is effective at providing extra capacity and preventing traffic growth affecting this radial route into the town centre.

4.70 Option 3 Test 2 performs weakest of the high growth options on this route. It is the only option to perform worse than the Do Minimum in the eastbound, PM peak results. This suggests that the combination of Eastern Bypass and Eastern Development results in the extra capacity being used up by the generated traffic.

Journey Times Summary

4.71 In general, the journey time analysis has shown that the provision of new road schemes can help to mitigate the impact of the additional growth in Stafford. There are, however, problems in a number of key areas, notably at the junctions highlighted during the analysis. These were:

- Queensway Gyratory;
- A34/A513 Roundabout;
- A513/A518 Roundabout;
- Lichfield Road/Riverway Junction; and
- The Burton Manor Road to Rickerscote section of the A449.

4.72 It is thought that, attending to key problem junctions in addition to the planned road schemes could help to address the impacts of additional housing growth. However, making the right choice on growth location and road schemes will also help to ensure necessary remedial measures are reduced.

4.73 Option 3 Test 2 performed poorly on many of the routes and would rank least favourable of the high growth options based on journey times.

4.74 Option 3 Test 3 and Option 2 Test 2 traded best performances on different routes and time periods making it appropriate to consider them equal in terms of benefits.

4.75 Table 4.5 shows the ranking of the options based on the benefits for journey times.

Table 4.5 – Ranking on Journey Time Analysis

Do Minimum	Option 2 Test 2	Option 3 Test 2	Option 3 Test 3
1	2.5	4	2.5

Previous KPI Findings

4.76 It is important not to ignore the findings in the KPIs of Chapter 3 when comparing the remaining options.

- 4.77 In order to reduce confusion, the scoring of the previous KPIs have been rebased to a one-to-four scale in line with the options remaining. To this, the scoring for journey times, delays and flows have been added to provide an overall close up inspection of the four options. Table 4.6 shows the rebased scores and totals.

Table 4.6 – Rebased Initial KPIs Ranked on Benefits

KPI Type	KPI	Do Minimum	Option 2 Test 2	Option 3 Test 2	Option 3 Test 3
Development Impacts	M6 Flows	3	4	2	1
Development Impacts	Vehicle Hours	1	3	4	2
	Vehicle Kilometres	1	4	2	3
	Vehicle Speeds	1	3	4	2
	Average Trip Length	4	1.5	1.5	3
	Development Demand	4	2	2	2
All User Impacts	Vehicle Hours	1	3	4	2
	Vehicle Kilometres	1	2	3	4
	Vehicle Speeds	1	3	4	2
	Average Trip Length	4	2	2	2
	Demand	4	1	2	3
Network Impacts	Junctions	1	4	3	2
	Links	3	1	4	2
Environment	CO2	1	2	3	4
	NOX	1	4	3	2
Access to Public Transport	Bus	1	2	3.5	3.5
	Rail	2.5	2.5	2.5	2.5
Access for Non Motrised Modes	Access to the Cycle Network	2.5	2.5	2.5	2.5
	Within 15 Minutes cycle of town centre	1	4	2.5	2.5
Additional Tests	Delay Analysis	1	2	3	4
	Flow Analysis	1	2	4	3
	Journey Time Analysis	1	2.5	4	2.5
Total	Sum	41	57	65.5	56.5
	Benefits Rank	1	3	4	2

- 4.78 While the overall ranking order hasn't changed the table does help to reduce confusion and provides a base on which to choose between the options.
- 4.79 Primary focus should be cast on the high growth options as these are the most likely to be taken forward.

- 4.80 Option 3 Test 2 proves to be a poor performer in relation to the other two and is comprehensively outscored. The table confirm what the detailed journey time, delay and flow analysis had indicated; Option 3 Test 2 is not a combination of land use and road schemes that work well in conjunction.
- 4.81 Of particular interest are the results of Option 2 Test 2 and Option 3 Test 3 which are split by the narrowest margin. On paper Option 3 Test 3 is the best of the high growth options based on benefits only. However, given the comparatively high cost associated with implementing this option (with three road schemes) it does not appear to prevail by significant enough margin to warrant the extra cost.
- 4.82 Therefore, it is likely that Option 2 Test 2 is the best compromise between cost and benefits in a high growth option.

5. Summary

- 5.1 This technical note has followed on from the analysis of two previous reports, the '*Initial Options Assessment Report*' (December 2008) and the '*Addendum to the Initial Options Assessment Report*' (February 2009).
- 5.2 This technical note first focused on the results of a further ten future-year option tests analysed in Chapter 3. These findings are name the 'Further Initial Options Assessment' and are summarised below under this heading.
- 5.3 This technical note then focused on the three future year options identified in the Further Initial Options Assessment providing additional analysis and information on these. This section of the report, found in Chapter 4, is named 'Additional Tests' and is summarised below under this heading.

Further Initial Option Assessment Summary (Chapter 3)

- 5.4 This section of the report expanded on the 'Initial Option assessment' of 5 options to a 15 option assessment called the 'Further Initial Option Assessment'.
- 5.5 The main addition to the previous reports is the inclusion of road schemes to compliment the development growth schemes tested previously. The KPIs that the options were assessed against are identical to those used in the previous reports.
- 5.6 This assessment has highlighted how new road schemes can help mitigate the new development growth in Stafford in addition to the general growth in road traffic from 2007 to 2026.
- 5.7 This mitigation was largely successful and for some indicators provided future year results that show improvements on the 2007 network conditions.

Inclusion of New Road Schemes

- 5.8 The key findings on the new road schemes were:
- The inclusion of road schemes had a positive impact on the networks. In particular Test 2 road schemes (Western and Eastern roads) produce the best results across all KPIs;
 - Test 3 road schemes (Western, Eastern and Southern) also performed very strongly and the inclusion of Southern and Eastern road schemes together brings out the full benefits of the A34 to A513 section of the Eastern Bypass;
 - The Eastern and Southern bypasses together also provide a good alternate route for north-south movements in Stafford. However, it is worth noting that much of these benefits can also be gained though the inclusion of the Eastern bypass without the Southern bypass;
 - The Southern Bypass has a detrimental impact on the Acton Gate junction on the A449 that it connects to. This adverse affect is seen on all approaches, not just the Southern Bypass approach;
 - The Eastern Bypass would be heavily utilised beyond the capacity of the road proposed in the scheme plans (greater than 1800 PCUs/Hr) between Weeping Cross and Beaconside. However, much of this traffic uses Baswich Lane to access the bypass rather than using the SouthEast section between the A34 and A513;
 - The Western Bypass is well utilised with high flows in all options tested. The Volume/Capacity information suggest that improvements to the Doxey Road/Western Bypass junction and the Western Bypass/Foregate Street junctions could achieve further benefits from this road scheme; and

- Test 1 performs poorly across all land uses. The combination of Western Distributor and Southern Bypass appears disjointed as the benefits of the Southern Bypass are lost without the Eastern Bypass.

Land Use Impacts:

5.9 The key findings on the land use configurations were:

- The 10,000 housing high growth options improve considerably when combined with the new road schemes. Option 2 and 3 score almost identically across all road tests with Option 3 marginally ahead;
- Option 3 Test 3 (All three road schemes) shows the biggest improvement of an Option due to road schemes as the total score improves by over 50% from 229 to 96 when the road schemes are included;
- In land use Options 2 and 4 the inclusion of the development SF8 has a detrimental impact on the benefits of the Southern Bypass. This is due to the fact that the development is accessed from the bypass and this additional traffic acts as a deterrent for potential bypass users; and
- The 7,000 housing medium growth land use improves well with the addition of the Western Distributor road. The inclusion of the distributor road provides a 26% improvement on the overall score.

5.10 Overall, the results suggest that Option 3 Test 3 (housing in the North, West and East and all three road schemes) is the preferred growth option in terms of transport benefits. However, the inclusion of all three road schemes and their associated cost may be a deterrent.

5.11 In this case, Option 2 Test 2 (housing North, West and South and road schemes in the West and East) appears to be a good compromise. It scores very similar to the best option but only requires two road schemes.

- Furthermore, all of the Test 2 options are competitive and so a balance between cost and the results of the KPIs is required to make further decision.

5.12 Finally, the results suggest that if the 10,000 house growth option is to be chosen instead of the 7,000 growth option (Option 1 Western), additional road schemes will be required to maintain the level of service seen in Option 1 Western. The 10,000 house growth option should be combined with either road test 2 or test 3 which could lead to improved network conditions still.

Additional Tests Summary (Chapter 4)

5.13 As a result of the Further Initial Options Assessment results, the 15 options were reduced to 5 that Atkins were asked to provide additional analysis on.

5.14 This section of the report provided additional information on the Base Year, Do Minimum, Option 2 Test 2, Option 3 Test 2 and Option 3 Test 3. The Base Year and Do Minimum were primarily for benchmarking as the aim of the additional tests is to determine a sole preferred option from the three high growth options.

5.15 Three extra analyses were conducted. These were Junction Delay analysis, Radial Route Flow analysis and Journey Time analysis. The results of these analyses were interpreted, along with the findings of the Further Initial Options Assessment to provide a holistic view of the remaining options.

5.16 The Junction Delay analysis demonstrated that all of the high growth options would subject the road network to increased delays. However, it was found that there would be fewer delays in Option 2 Test 2. Option 3 Test 2 came a close second on number of delays but the severity of delays were greater making Option 2 Test 2 a distinct preferred option on this analysis.

- 5.17 The Radial Route Flow analysis showed that Gaol Road and Doxey Road are forecast to have substantially higher flows in the future regardless of option implemented. Foregate Street is also likely to show high flows in a more tidal way.
- 5.18 Option 2 Test 2 once again proved to have the lowest flows on radial routes though the results were close between all options. Option 3 Test 3 was second best on this measure.
- 5.19 Journey Time analysis demonstrated that Option 3 Test 2 was a clear poor performer.
- 5.20 However, Option 2 Test 2 and Option 3 Test 3 could not be separated on Journey times. Each of these outperformed the other on various routes. In terms of journey time benefits these two are thought to be almost identical.
- 5.21 When all the previous KPI findings were examined in addition to the new findings the following score totals were observed between the high growth options (note that lower scores are preferred):

	Option 2 Test 2	Option 3 Test 2	Option 3 Test 3
Score	57	65.5	56.5
No. Road Schemes	2	2	3

- 5.22 The difference in final score between Option 2 Test 2 and Option 3 Test 3 is minimal. It should be remembered that this score is only based on the benefits with no accounting for the cost.
- 5.23 When the cost of implementing the road schemes is considered, it is clear that Option 2 Test 2 is a strong favourite due to requiring only two new road schemes in comparison to Option 3 Test 3 requiring three road schemes.
- 5.24 Chapter 4 initially describes that Option 3 Test 3 would need to be substantially better than the other options to warrant selection. While it is better based on the KPIs considered, it is only better by the narrowest of margins.
- 5.25 Therefore, taking the cost and benefits balance, Option 2 Test 2 would probably represent the best value option.

Appendix A

Detailed Assessment of Options

Objective: Impact on All Users

Sub Objectives: Various Traffic Indicators

<u>Methodology</u>	
This objective has considered the following:	
Vehicle Hours	Total vehicle hours for trips within the model area
Vehicle Kilometres	Total vehicle kilometres for trips within the model area
Vehicle Speeds	The Average speed for trips within the model area
Average Trip Length	The Average trip length for trips within the model area
Development Demand	The total trip demand

Results

	Do Minimum AM PM	Option 1a AM PM		Option 2 AM PM		Option 3 AM PM		Option 4 AM PM		Option 1 Western AM PM		Option 2 Test 1 AM PM		Option 2 Test 2 AM PM		Option 2 Test 3 AM PM		Option 3 Test 1 AM PM		Option 3 Test 2 AM PM		Option 3 Test 3 AM PM		Option 4 Test 1 AM PM		Option 4 Test 2 AM PM		Option 4 Test 3 AM PM		
		Vehicle Hours	13607	14403	14836	15650	15473	16277	15975	16545	15711	16412	14542	15348	15116	15885	14507	15488	14417	15409	15176	15898	14572	15490	14370	15355	15508	16157	14744	15530
% Change Rel to DM	0%	-	9.0%	8.7%	13.7%	13.0%	16.7%	14.9%	15.5%	14.0%	6.9%	6.6%	11.1%	10.3%	6.6%	7.5%	6.0%	7.0%	11.5%	10.4%	7.1%	7.6%	5.6%	6.6%	14.0%	12.2%	8.4%	7.8%	7.3%	7.5%
Vehicle Kilometres	818536	839575	833893	862053	841634	878625	842173	872648	843861	873162	832338	858333	840628	865666	834385	862481	835153	864730	840753	868215	835226	863017	835452	864256	842838	871257	835085	864628	836289	866801
% Change Rel to DM	0%	-	1.9%	2.3%	2.8%	3.7%	2.9%	4.0%	3.1%	4.0%	1.7%	2.2%	2.7%	3.5%	1.9%	2.7%	2.0%	3.0%	2.7%	3.4%	2.0%	2.8%	2.1%	2.9%	3.0%	3.8%	2.2%	3.0%	2.2%	3.2%
Vehicle Speeds (km/hr)	60.2	58.3	56.2	55.1	54.4	53.5	53.1	52.8	53.7	53.2	57.2	55.9	55.6	54.7	57.5	55.7	57.9	56.1	55.4	54.6	57.3	55.7	58.1	56.3	54.4	53.9	56.6	55.7	57.3	55.9
% Change Rel to DM	0%	-	-6.6%	-5.5%	-9.6%	-8.2%	-11.7%	-9.4%	-10.7%	-8.7%	-4.8%	-4.1%	-7.6%	-6.2%	-4.4%	-4.4%	-3.8%	-3.8%	-7.9%	-6.3%	-4.7%	-4.4%	-3.4%	-3.4%	-9.6%	-7.5%	-5.9%	-4.4%	-4.7%	-4.1%
Average Trip Length (km)	18.3	17.5	17.8	17.0	17.6	16.8	17.6	16.8	17.7	16.8	17.7	16.9	17.5	16.7	17.3	16.5	17.3	16.5	17.5	16.7	17.3	16.5	17.3	16.5	17.6	16.7	17.3	16.5	17.3	16.6
% Change Rel to DM	0%	-	-2.6%	-2.6%	-3.7%	-3.8%	-3.7%	-3.8%	-3.2%	-3.8%	-3.2%	-3.2%	-4.3%	-4.4%	-5.4%	-5.5%	-5.4%	-5.5%	-4.3%	-4.4%	-5.4%	-5.5%	-5.4%	-5.4%	-3.7%	-4.4%	-5.4%	-5.5%	-5.4%	-4.9%
Network Demand	44775	48084	46885	50719	47880	51858	47807	51820	47784	51818	47008	50901	48026	52088	48274	52334	48244	52278	48275	52337	48215	52248	47986	52039	47955	52045	48204	52340	48150	52282
% Change Rel to DM	0%	-	4.7%	5.5%	6.9%	7.8%	6.8%	7.8%	6.7%	7.8%	5.0%	5.9%	7.3%	8.3%	7.8%	8.6%	7.7%	8.2%	7.8%	8.8%	7.7%	8.7%	7.2%	8.2%	7.1%	8.2%	7.7%	8.2%	7.5%	8.8%

Overall Score

Objective	Options																
	Do Min	Option 1a	Option 2	Option 3	Option 4	Option 1 Western	Option 1 Test 1	Option 1 Test 2	Option 2 Test 1	Option 2 Test 2	Option 2 Test 3	Option 3 Test 1	Option 3 Test 2	Option 3 Test 3	Option 4 Test 1	Option 4 Test 2	Option 4 Test 3
Sub Objective																	
Vehicle Hours	1	9	13	15	14	4	10	5	3	11	6	2	12	8	7		
Vehicle Kilometres	1	3.5	12	13.5	15	2	10.5	3.5	7	10.5	5	7	13.5	7	9		
Vehicle Speeds	1	9	13	15	14	6	10	4.5	3	11	7	2	12	8	4.5		
Average Trip Length	15	14	10.5	10.5	12	13	7.5	3	3	7.5	3	3	9	3	6		
Demand	15	14	10	11	12	13	7	2	4.5	2	4.5	8.5	8.5	2	6		

Objective: Impact on Strategic Routes
Sub Objectives: Flows on the M6

Methodology

This assessment has considered the total flows on the M6 around Stafford

Results

	Do Minimum		Option 1a		Option 2		Option 3		Option 4		Option 1 Western		Option 2 Test 1		Option 2 Test 2		Option 2 Test 3		Option 3 Test 1		Option 3 Test 2		Option 3 Test 3		Option 4 Test 1		Option 4 Test 2		Option 4 Test 3	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
M6 North of J14	3379	3444	3316	3415	3277	3395	3264	3387	3272	3387	3327	3421	3281	3405	3280	3409	3216	3402	3279	3400	3275	3396	3200	3394	3295	3397	3280	3398	3205	3404
Northbound	3296	3556	3287	3483	3293	3455	3205	3465	3287	3455	3286	3494	3274	3436	3272	3427	3262	3383	3271	3448	3286	3427	3238	3368	3287	3455	3284	3427	3269	3383
Southbound	6676	7000	6904	6898	6569	6850	6569	6852	6559	6842	6614	6915	6555	6841	6552	6836	6478	6784	6550	6848	6541	6823	6438	6762	6582	6852	6564	6824	6474	6787
% Change Rel DM	-	-	-1.1%	-1.5%	-1.6%	-2.1%	-1.6%	-2.1%	-1.7%	-2.3%	-0.9%	-1.2%	-1.8%	-2.3%	-1.9%	-2.3%	-3.0%	-3.1%	-1.9%	-2.2%	-2.0%	-2.5%	-3.6%	-3.4%	-1.4%	-2.1%	-1.7%	-3.0%	-3.0%	
M6 Between J13 and J14	4046	4084	4197	4133	4387	4252	4435	4121	4341	4131	4162	4110	4348	4255	4102	4067	4109	4032	4288	4155	4048	3952	4078	3955	4454	4140	4145	3916	4152	3928
Northbound	3645	4202	3678	4375	3755	4469	3563	4491	3636	4413	3672	4307	3770	4431	3695	4329	3668	4327	3665	4377	3591	4200	3583	4218	3597	4470	3490	4337	3513	4326
Southbound	7891	8286	7876	8509	8141	8721	7998	8612	7978	8544	7833	8418	8118	8686	7797	8396	7777	8359	7963	8532	7639	8152	7661	8173	8030	8610	7635	8253	7685	8254
% Change Rel DM	-	-	2.4%	2.7%	5.8%	5.3%	4.0%	3.9%	3.7%	3.1%	1.8%	1.6%	5.5%	4.8%	1.4%	1.3%	1.1%	0.9%	3.5%	3.0%	-0.7%	-1.6%	-0.4%	-1.4%	4.4%	-0.7%	-0.4%	-0.3%	-0.4%	
M6 South of J13	3759	4148	3817	4177	3810	4194	3838	4201	3834	4202	3797	4177	3769	4204	3833	4205	3867	4216	3774	4212	3855	4217	3874	4223	3752	4203	3830	4212	3866	4224
Northbound	3801	4072	3848	4077	3881	4069	3885	4062	3884	4089	3846	4105	3874	4074	3878	4135	3882	4158	3884	4104	3896	4170	3890	4174	3894	4051	3887	4120	3887	4152
Southbound	7560	8220	7665	8254	7691	8263	7723	8263	7718	8291	7643	8282	7643	8277	7710	8339	7749	8374	7658	8316	7741	8387	7784	8397	7636	8254	7716	8333	7763	8376
% Change Rel DM	-	-	1.4%	0.4%	1.7%	0.5%	2.2%	0.5%	2.1%	0.9%	1.1%	0.9%	1.1%	0.7%	2.0%	1.5%	2.5%	1.9%	1.3%	2.4%	2.0%	2.0%	2.7%	2.2%	1.0%	0.4%	2.1%	1.4%	2.5%	1.9%
Overall Percent Change	0%		0.7%		1.8%		1.1%		1.0%		0.5%		1.3%		0.3%		0.1%		0.8%		-0.4%		-0.6%		1.0%		-0.3%		-0.4%	

Overall Score

Objective	Options														
	Do Min	Option 1a	Option 2	Option 3	Option 4	Option 1 Western	Option 2 Test 1	Option 2 Test 2	Option 3 Test 1	Option 3 Test 2	Option 4 Test 1	Option 4 Test 2	Option 4 Test 3		
Sub Objective															
Development Impacts	5	9	15	13	11.5	8	14	7	6	10	2.5	1	11.5	4	2.5

Objective: Impacts on Development Users
Sub Objectives: Various development Traffic Indicators

Methodology	
This objective has considered the following:	
Vehicle Hours	Total vehicle hours for trips to and from the new developments
Vehicle Kilometres	Total vehicle kilometres for trips to and from the new developments
Vehicle Speeds	The Average speed for trips to and from the new developments
Average Trip Length	The Average trip length within the model area for trips to and from the new developments
Development Demand	The total trip demand to and from the new developments

Results

	Do Minimum		Option 1a		Option 2		Option 3		Option 4		Option 1 Western		Option 2 Test 1		Option 2 Test 2		Option 2 Test 3		Option 3 Test 1		Option 3 Test 2		Option 3 Test 3		Option 4 Test 1		Option 4 Test 2		Option 4 Test 3		
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	
Vehicle Hours	663	937	1788	2084	2382	2730	2649	2866	2542	2827	1645	1993	2255	2591	2061	2489	2071	2467	2309	2612	2129	2487	2075	2445	2479	2707	2164	2482	2172	2494	
% Change Rel to DM	-	0.0%	170%	123%	261%	191%	299%	206%	283%	202%	148%	113%	240%	176%	211%	166%	212%	163%	248%	179%	221%	165%	213%	161%	274%	189%	226%	165%	227%	166%	
Vehicle Kilometres	29782	40685	72159	85094	92958	106050	93855	108663	86623	106689	71124	83672	92644	106031	89059	102866	90292	104453	91488	104286	88740	102822	88652	103000	93888	106597	89286	103326	90649	104985	
% Change Rel to DM	-	0.0%	142%	109%	212%	161%	215%	163%	274%	182%	139%	106%	211%	161%	198%	153%	203%	157%	207%	156%	196%	153%	196%	133%	215%	162%	200%	194%	204%	156%	
Vehicle Speeds (km/hr)	44.9	43.4	40.4	40.6	38.9	38.8	35.4	37.3	36.8	37.7	43.2	42.0	41.1	40.9	43.2	41.3	43.6	42.3	39.6	39.9	41.7	41.3	42.7	42.2	37.9	39.4	41.3	41.6	42.1	42.1	
% Change Rel to DM	-	0%	-10%	-6%	-13%	-11%	-21%	-14%	-18%	-13%	-4%	-3%	-8%	-6%	-4%	-5%	-3%	-2%	-12%	-8%	-7%	-5%	-5%	-3%	-16%	-9%	-8%	-4%	-7%	-3%	
Average Trip Length (km)	10.7	10.8	10.3	10.5	10.2	10.4	10.3	10.4	10.3	10.4	10.1	10.3	10.2	10.4	9.8	10.0	9.9	10.2	10.1	10.2	9.8	10.0	9.8	10.1	10.3	10.4	9.8	10.1	10.0	10.3	
% Change Rel to DM	-	0%	-4%	-2%	-5%	-3%	-4%	-3%	-4%	-3%	-6%	-4%	-5%	-3%	-8%	-7%	-7%	-5%	-6%	-5%	-8%	-7%	-8%	-8%	-4%	-4%	-8%	-6%	-7%	-4%	
Development Demand	2783	3777	7022	8103	9076	10239	9076	10239	9076	10239	7022	8103	9076	10239	9076	10239	9076	10239	9076	10239	9076	10239	9076	10239	9076	10239	9076	10239	9076	10239	
% Change Rel to DM	-	0%	152%	115%	226%	171%	226%	171%	226%	171%	152%	115%	226%	171%	226%	171%	226%	171%	226%	171%	226%	171%	226%	171%	226%	171%	226%	171%	226%	171%	226%

Overall Score

Objective	Options															
	Do Min	Option 1a	Option 2	Option 3	Option 4	Option 1 Western	Option 1 Test 1	Option 1 Test 2	Option 1 Test 3	Option 2 Test 1	Option 2 Test 2	Option 2 Test 3	Option 3 Test 1	Option 3 Test 2	Option 3 Test 3	Option 4 Test 1
Vehicle Hours	1	3	12	15	14	2	10	6	5	11	7	4	13	8	9	
Vehicle Kilometres	1	3	12	15	13	2	11	6	8	10	4	5	14	7	9	
Vehicle Speeds	1	10	12	15	14	3	9	5	2	11	7	4	13	8	6	
Average Trip Length	15	14	9.5	12	12	8	9.5	1.5	5	6.5	1.5	3.5	12	3.5	6.5	
Development Demand	15	13.5	6.5	6.5	6.5	13.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	

Objective: Environment

Sub Objectives: CO2 and NOX

Methodology
 An assessment of the levels of both Carbon Dioxide and Nitrogen Oxide has been undertaken. This has used the direct outputs from the SATURN forecast model assignments and hence the accuracy of these results should be considered in this light.

Results

	Do Minimum Alt	Option 1a Alt	Option 2 Alt	Option 3 Alt	Option 4 Alt	Option 1 Western Alt	Option 2 Test 1 Alt	Option 2 Test 2 Alt	Option 2 Test 3 Alt	Option 3 Test 1 Alt	Option 3 Test 2 Alt	Option 3 Test 3 Alt	Option 4 Test 1 Alt	Option 4 Test 2 Alt	Option 4 Test 3 Alt
CO2 (Kg/hour)	22551 -	25083 11.2%	25879 14.8%	26164 16.0%	26002 15.3%	24121 7.0%	25805 14.4%	24741 9.7%	25029 11.0%	25853 14.6%	24760 9.8%	24987 10.8%	26033 15.4%	24931 10.6%	25142 11.5%
	-	8.9%	12.7%	16.2%	13.7%	7.3%	12.7%	10.4%	11.6%	12.7%	10.4%	11.3%	13.1%	10.7%	12.4%
	0%	10.1%	13.7%	16.1%	14.5%	7.1%	13.6%	10.0%	11.3%	13.7%	10.1%	11.1%	14.3%	10.6%	11.9%
NOX (Kg/hour)	514 -	564 9.7%	575 11.9%	573 11.5%	574 11.7%	545 6.0%	577 12.3%	556 8.2%	558 8.6%	575 11.9%	554 7.8%	553 7.6%	574 11.7%	554 7.8%	555 8.0%
	-	8.6%	10.9%	13.4%	10.9%	7.0%	11.8%	9.0%	9.0%	10.9%	8.1%	7.9%	11.0%	8.8%	9.2%
	0%	8.6%	11.4%	12.4%	11.3%	6.5%	12.0%	8.6%	8.8%	11.4%	7.9%	7.8%	11.4%	8.3%	8.6%

Overall Score

Objective	Options														
	Do Min	Option 1a	Option 2	Option 3	Option 4	Option 1 Western	Option 2 Test 1	Option 2 Test 2	Option 2 Test 3	Option 3 Test 1	Option 3 Test 2	Option 3 Test 3	Option 4 Test 1	Option 4 Test 2	Option 4 Test 3
Sub Objective															
Environment															
CO2	1	4.5	11.5	15	14	2	10	4.5	7	8	11.5	4.5	13	6	9
NOX	1	7	12	15	10	2	14	4	3	9	12	4	12	5	7


Objective: Access to Public Transport

Sub Objectives: Access to existing services

Methodology

Access to Buses
 The number of developments without access to existing bus routes within a 400m walk
 It is noted that in all four options some developments are not within a 400m walk (333m straight-line distance) of the bus network. The schemes have been scored dependent on the number of developments that don't have walkable access to the bus network.

Access to Rail
Qualitative Statement
 Existing direct bus services which pass the rail station are:
 9, 74, 75, 76, 101, 482, 825, X1, 880, 835, 836, 837, 490
 The routes are shown opposite.
 All bus services pass through the city centre and so all buses are technically eligible for connecting to the train service. Therefore, all options are scored equally.



Results

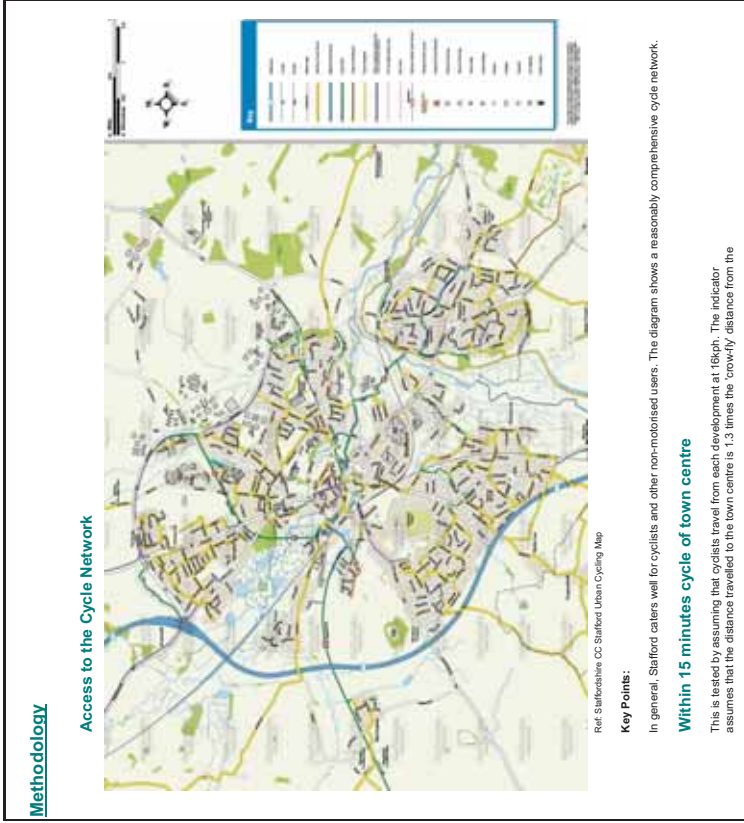
	Do Minimum		Option 1a		Option 2		Option 3		Option 4		Option 1 Western		Option 2 Test 1		Option 2 Test 2		Option 2 Test 3		Option 3 Test 1		Option 3 Test 2		Option 3 Test 3		Option 4 Test 1		Option 4 Test 2		Option 4 Test 3	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
No of development without Bus access	2		8		8		8		8		8		8		8		8		8		9		9		9		9		9	
Total Developments	51		61		65		67		67		61		65		65		65		67		67		67		67		67		67	
% Development without Bus Access	4%		13.1%		12.3%		13.4%		13.4%		13.1%		12.3%		12.3%		12.3%		13.4%		13.4%		13.4%		13.4%		13.4%		13.4%	

Overall Score

Objective	Options																													
	Sub Objective		Option 1a		Option 2		Option 3		Option 4		Option 1 Western		Option 2 Test 1		Option 2 Test 2		Option 2 Test 3		Option 3 Test 1		Option 3 Test 2		Option 3 Test 3		Option 4 Test 1		Option 4 Test 2		Option 4 Test 3	
Access to Public Transport	Bus	1	3	2	4	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Rail	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

Objective: Access to Non Motorised Modes

Sub Objectives: Access to existing Cycle Network



Results

	Do Minimum All	Option 1a All	Option 2 All	Option 3 All	Option 4 All	Option 1 Western All	Option 2 Test 1 All	Option 2 Test 2 All	Option 2 Test 3 All	Option 3 Test 1 All	Option 3 Test 2 All	Option 3 Test 3 All	Option 4 Test 1 All	Option 4 Test 2 All	Option 4 Test 3 All
% Developments within 15 minute cycle of town centre	89%	78%	73%	77%	77%	78%	73%	73%	73%	77%	77%	77%	77%	77%	77%

Overall Score

Objective	Sub Objective	Options															
		Do Min	Option 1a	Option 2	Option 3	Option 4	Option 1 Western	Option 1 Test 1	Option 2 Test 1	Option 2 Test 2	Option 2 Test 3	Option 3 Test 1	Option 3 Test 2	Option 3 Test 3	Option 4 Test 1	Option 4 Test 2	Option 4 Test 3
Access for Non Motorised Modes	Access to the Cycle Network Within 15 Minutes cycle of town centre	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
		1	2.5	13.5	7.5	7.5	2.5	13.5	13.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5

Appendix B

Network Impacts

Figure B.1 - Do Minimum 2026 AM Peak: Link Volume / Capacity Ratio > 85%

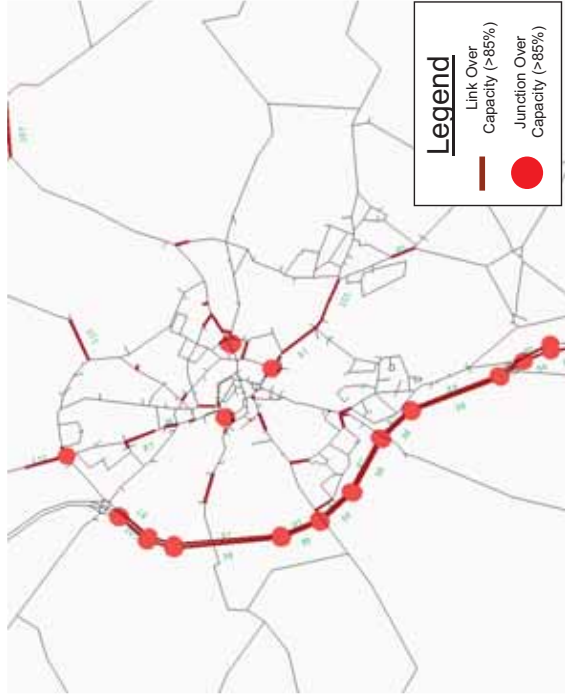


Figure B.3 - Do Minimum 2026 PM Peak: Link Volume / Capacity Ratio > 85%

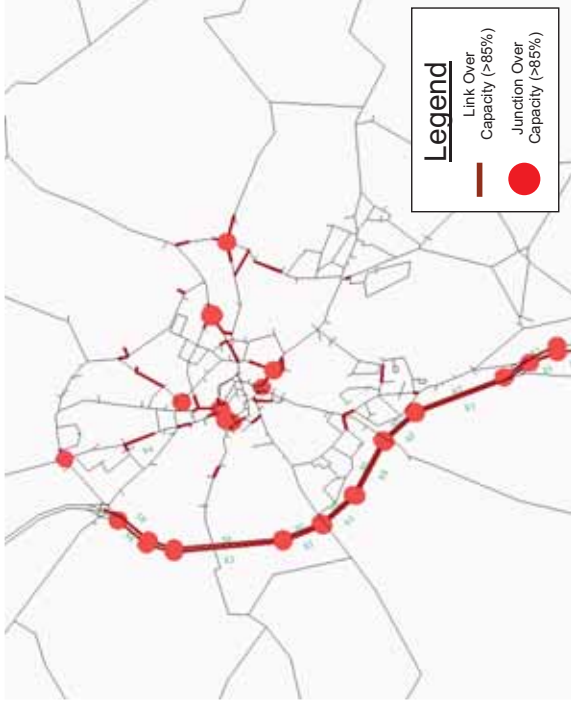


Figure B.2 - Do Minimum 2026 AM Peak: Relative Queue Lengths

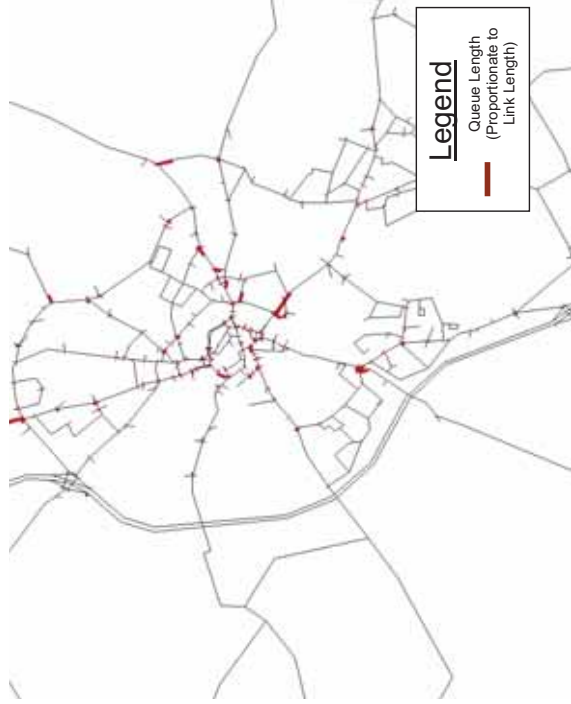


Figure B.4 - Do Minimum 2026 PM Peak: Relative Queue Lengths

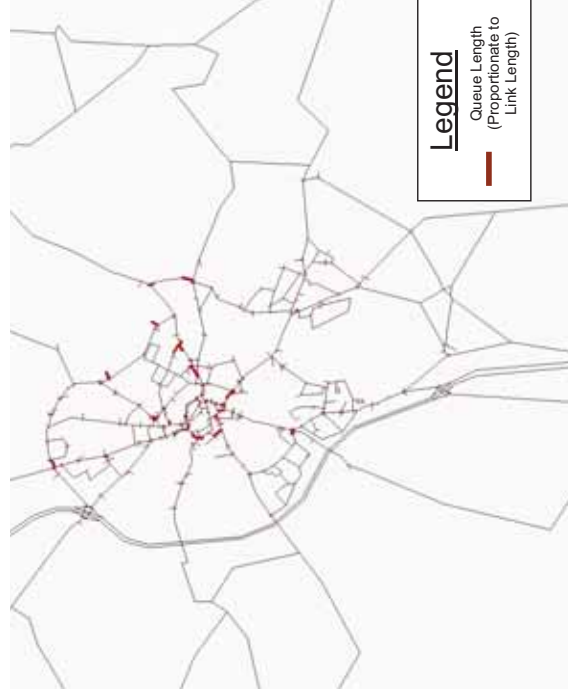


Figure B.5 - Option 1a 2026 AM Peak: Link Volume / Capacity Ratio > 85%

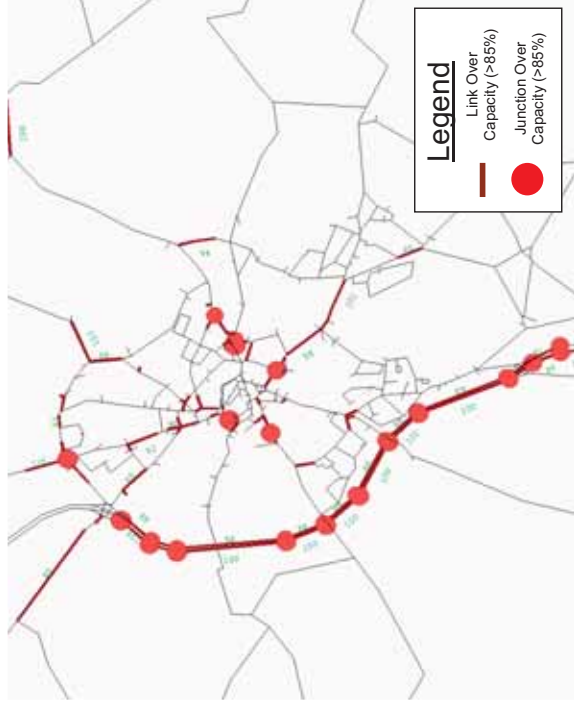


Figure B.7 - Option 1a 2026 PM Peak: Link Volume / Capacity Ratio > 85%

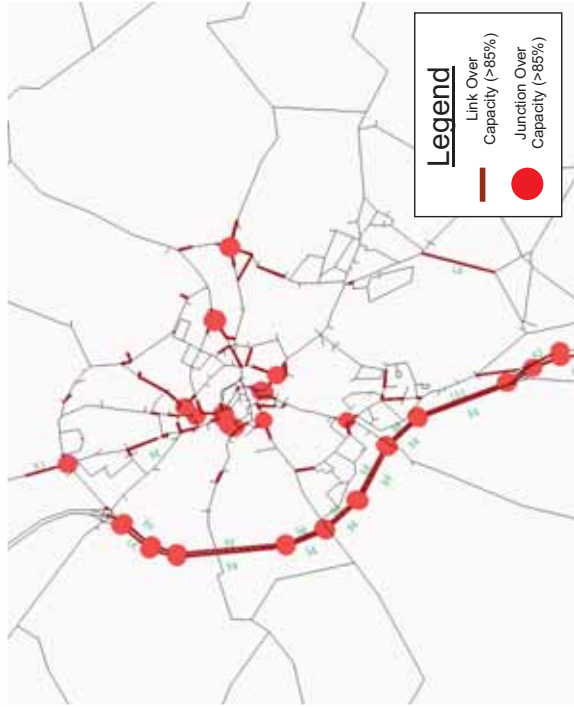


Figure B.6 - Option 1a 2026 AM Peak: Relative Queue Lengths

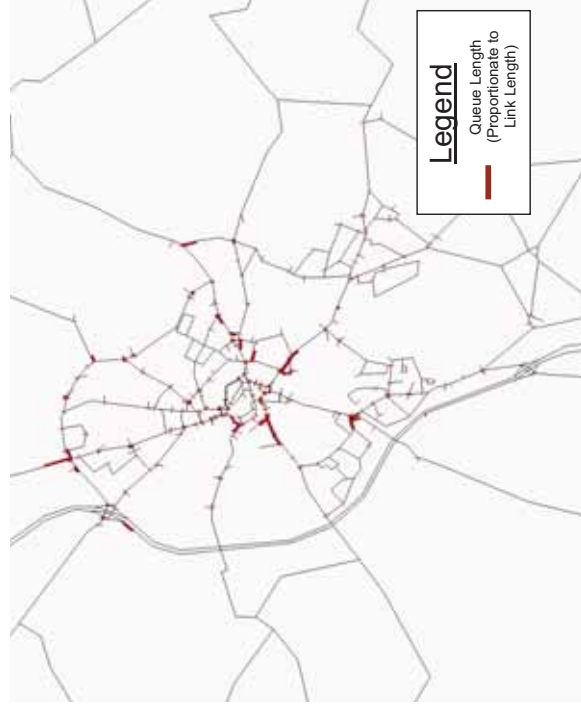


Figure B.8 - Option 1a 2026 PM Peak: Relative Queue Lengths

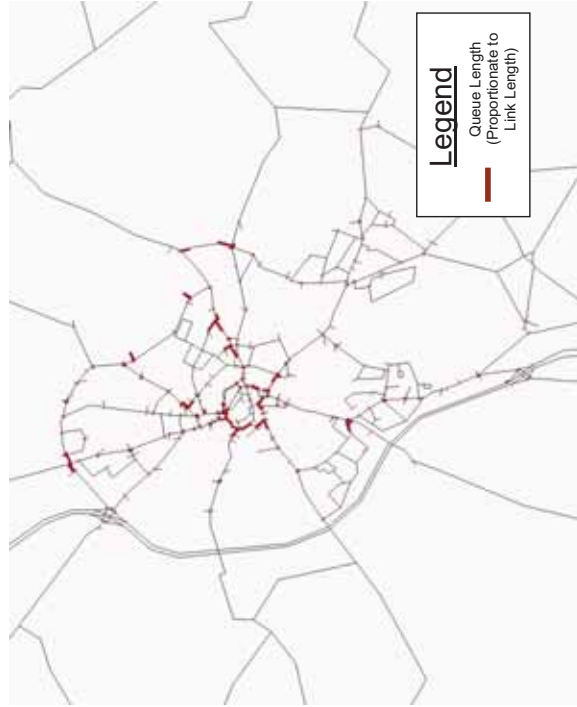


Figure B.9 - Option 2 2026 AM Peak: Link Volume / Capacity Ratio > 85%

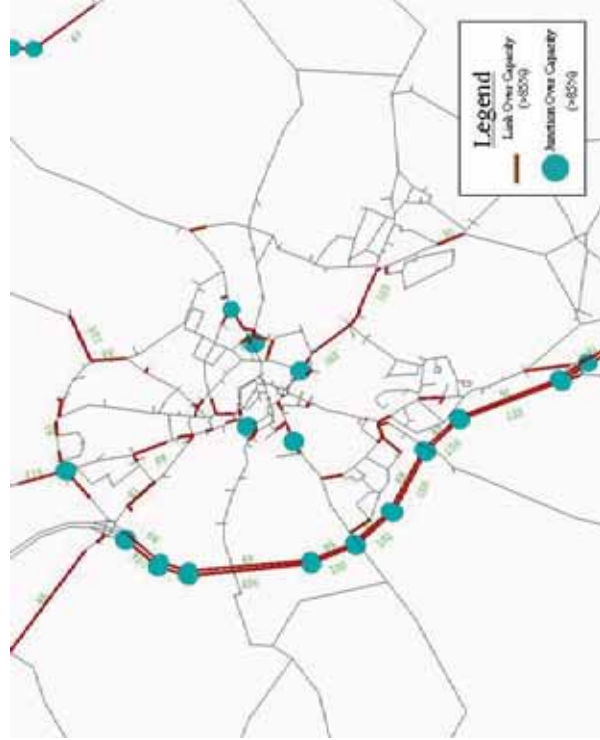


Figure B.11 - Option 2 2026 PM Peak: Link Volume / Capacity Ratio > 85%

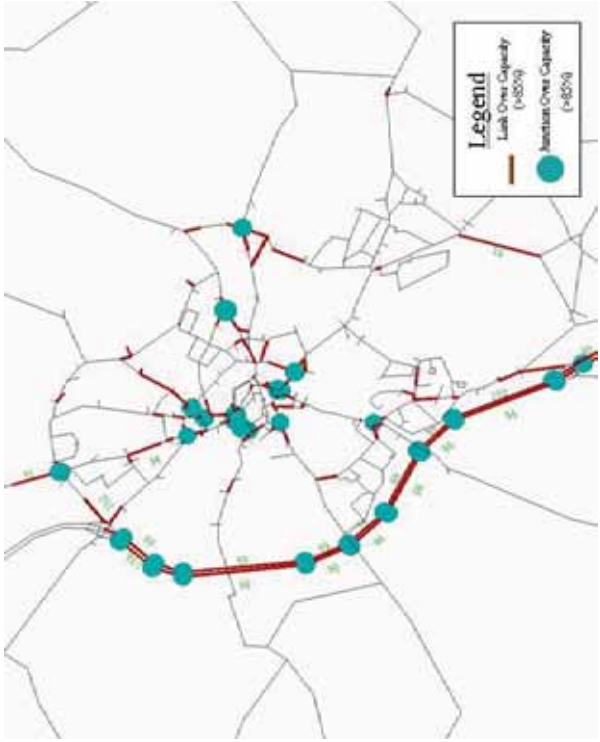


Figure B.10 - Option 2 2026 AM Peak: Relative Queue Lengths

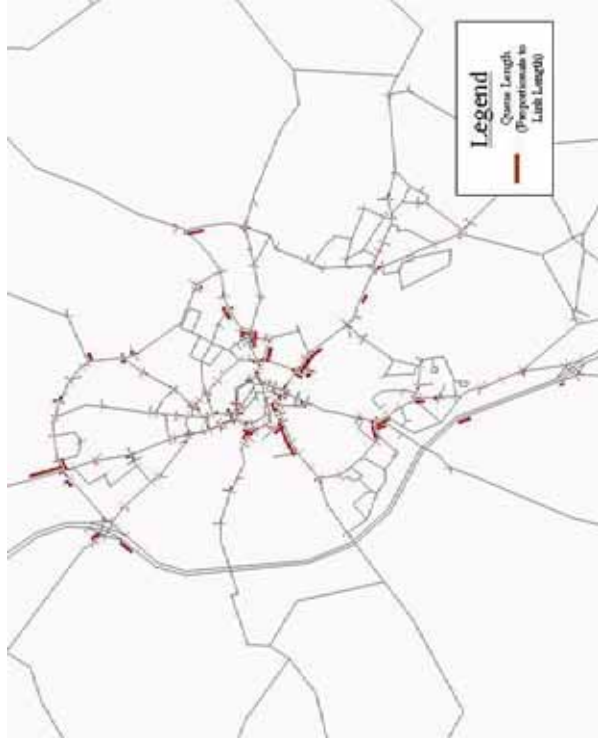


Figure B.12 - Option 2 2026 PM Peak: Relative Queue Lengths

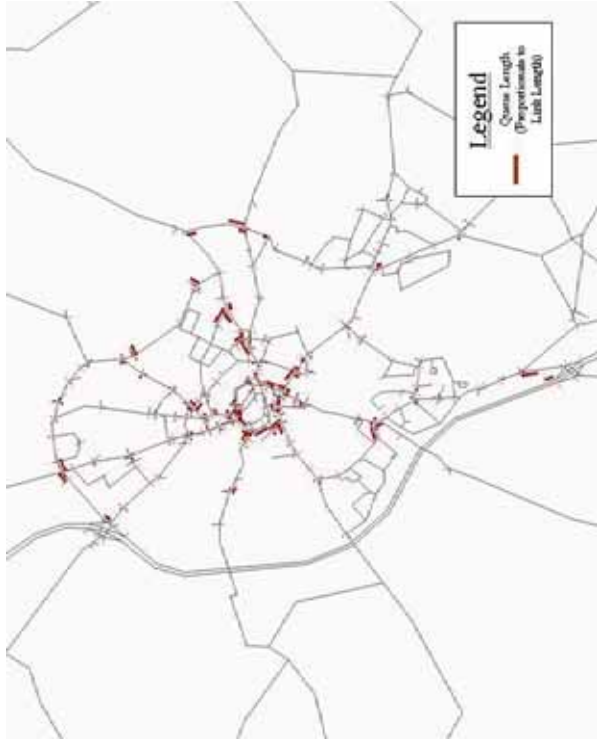


Figure B.13 - Option 3 2026 AM Peak: Link Volume / Capacity Ratio > 85%

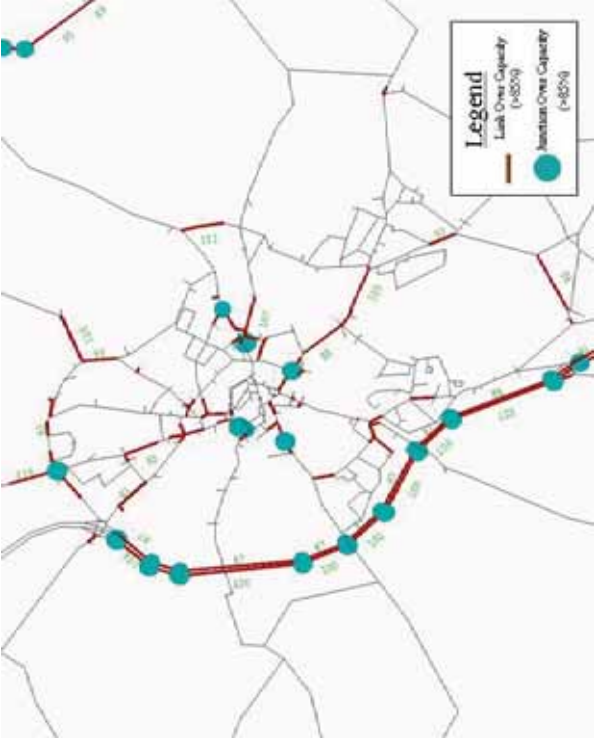


Figure B.14 - Option 3 2026 AM Peak: Relative Queue Lengths

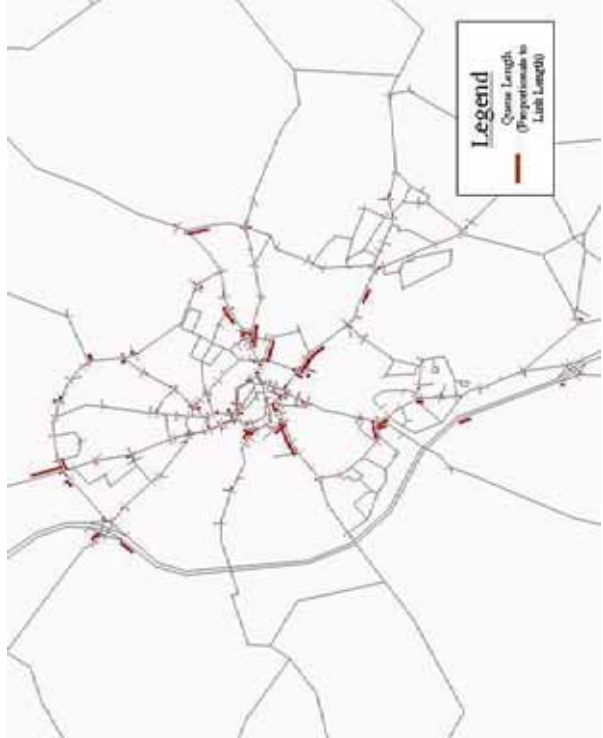


Figure B.15 - Option 3 2026 PM Peak: Link Volume / Capacity Ratio > 85%

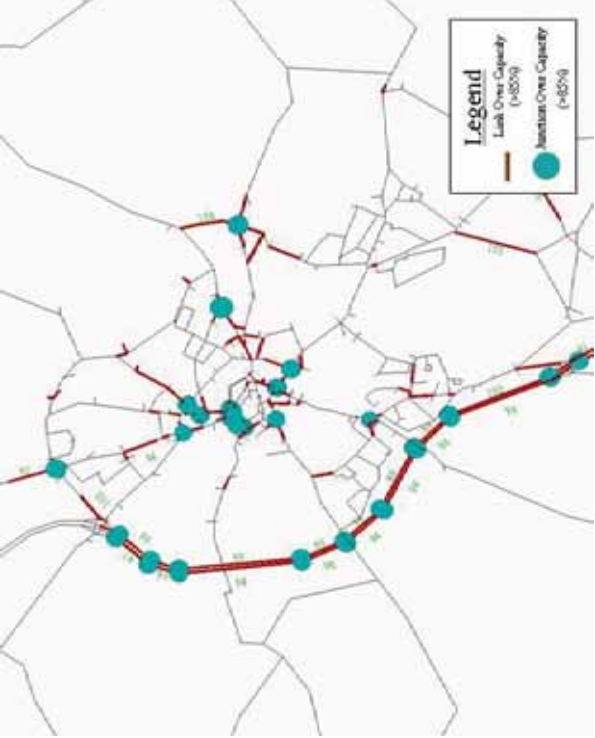


Figure B.16 - Option 3 2026 PM Peak: Relative Queue Lengths

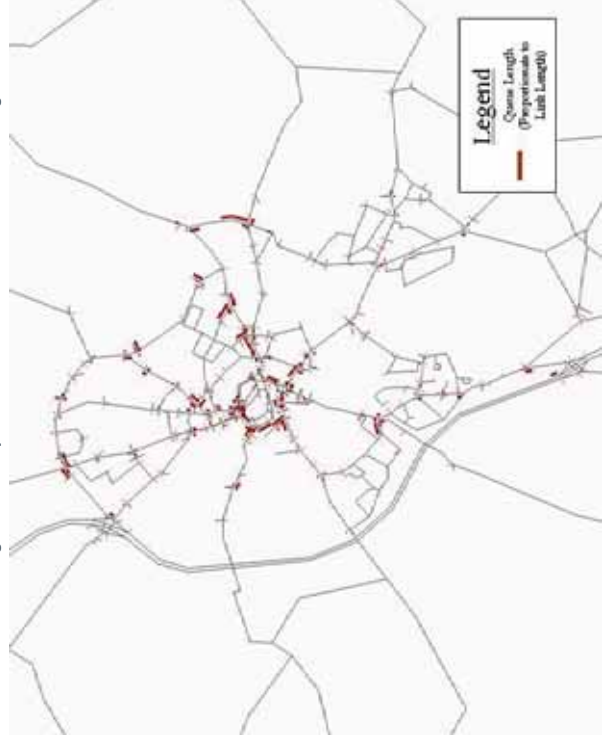


Figure B.17 - Option 4 2026 AM Peak: Link Volume / Capacity Ratio > 85%

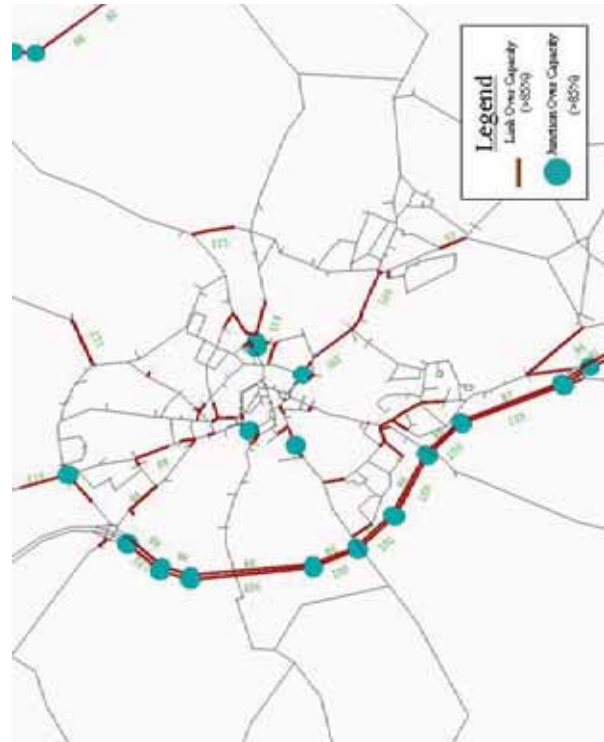


Figure B.19 - Option 4 2026 PM Peak: Link Volume / Capacity Ratio > 85%

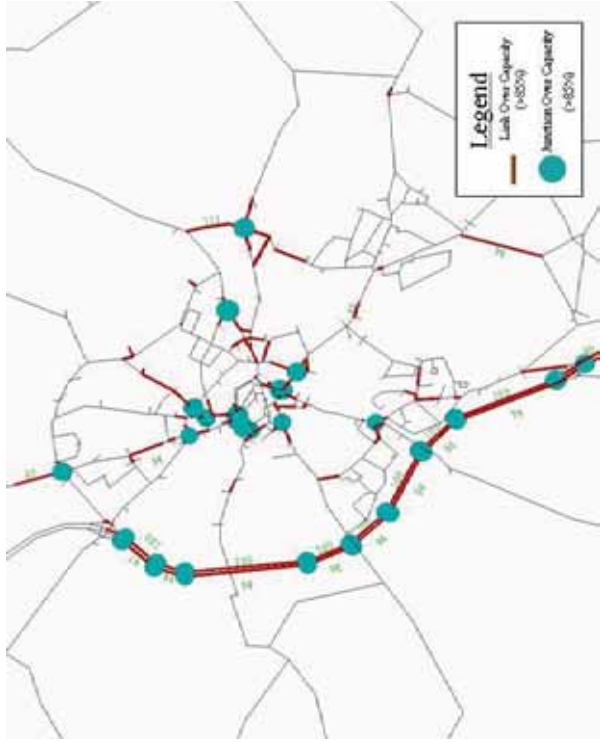


Figure B.18 - Option 4 2026 AM Peak: Relative Queue Lengths

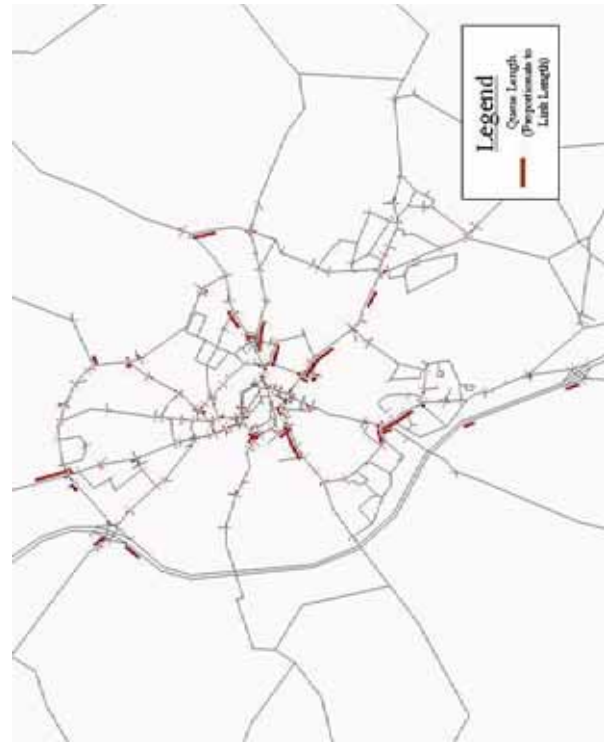


Figure B.20 - Option 4 2026 PM Peak: Relative Queue Lengths

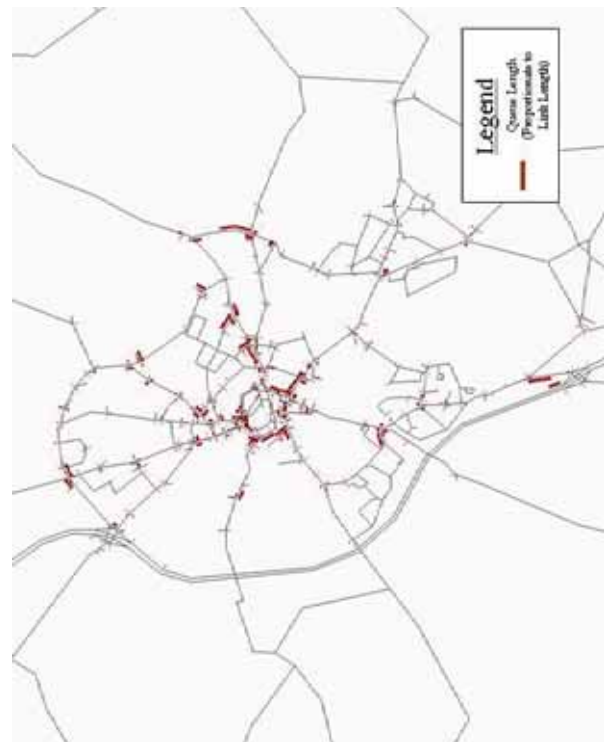


Figure B.21 - Option 1 Western 2026 AM Peak: Link Volume / Capacity Ratio > 85%

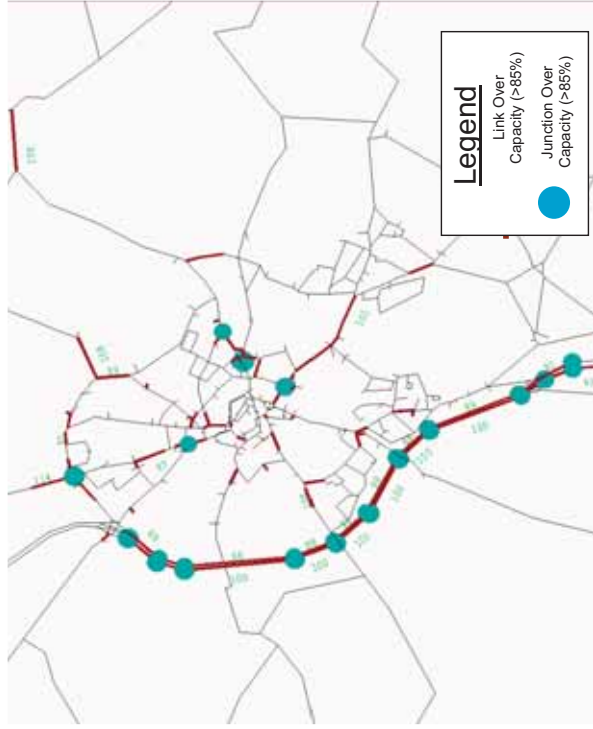


Figure B.23 - Option 1 Western 2026 PM Peak: Link Volume / Capacity Ratio > 85%

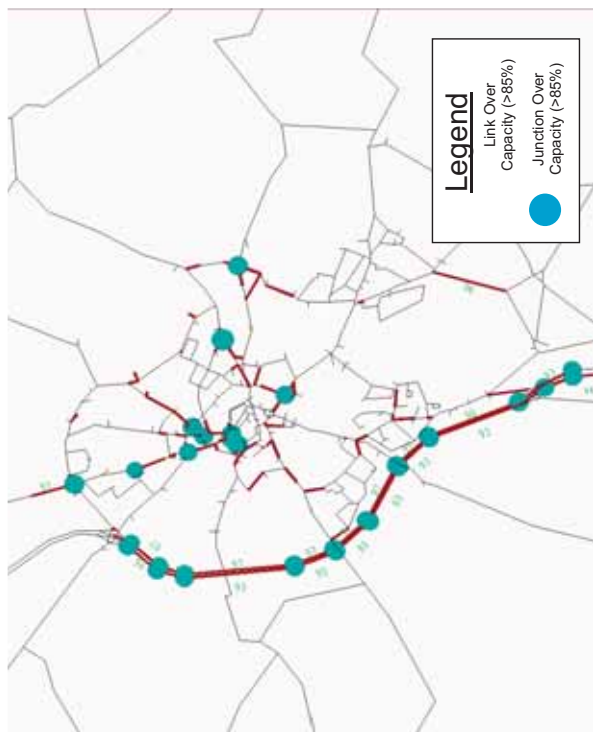


Figure B.22 - Option 1 Western 2026 AM Peak Relative Queue Lengths

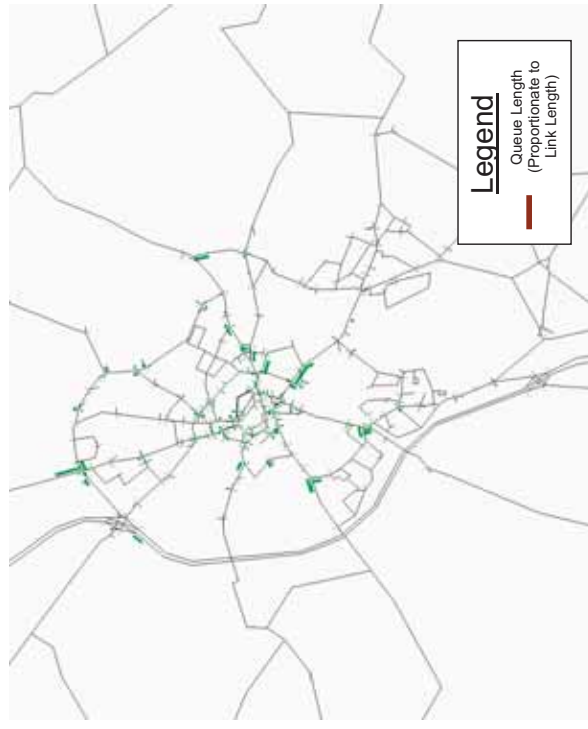


Figure B.24 - Option 1 Western 2026 PM Peak Relative Queue Lengths



Figure B.25 - Option 2 Test 1 2026 AM Peak: Link Volume / Capacity Ratio > 85%



Figure B.27 - Option 2 Test 1 2026 PM Peak: Link Volume / Capacity Ratio > 85%

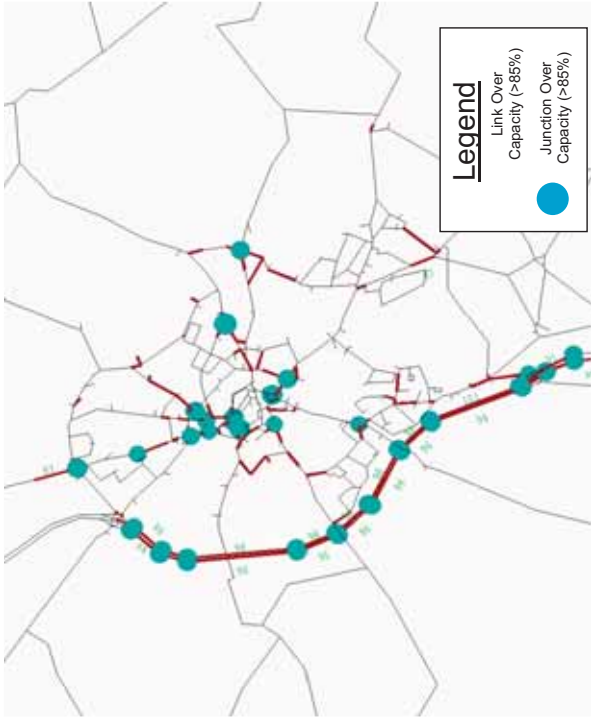


Figure B.26 - Option 2 Test 1 2026 AM Peak: Relative Queue Lengths

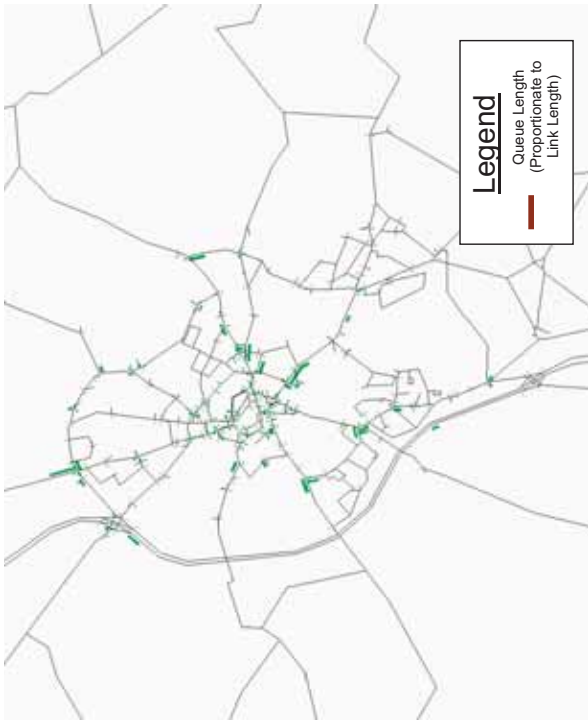


Figure B.28 - Option 2 Test 1 2026 PM Peak Relative Queue Lengths

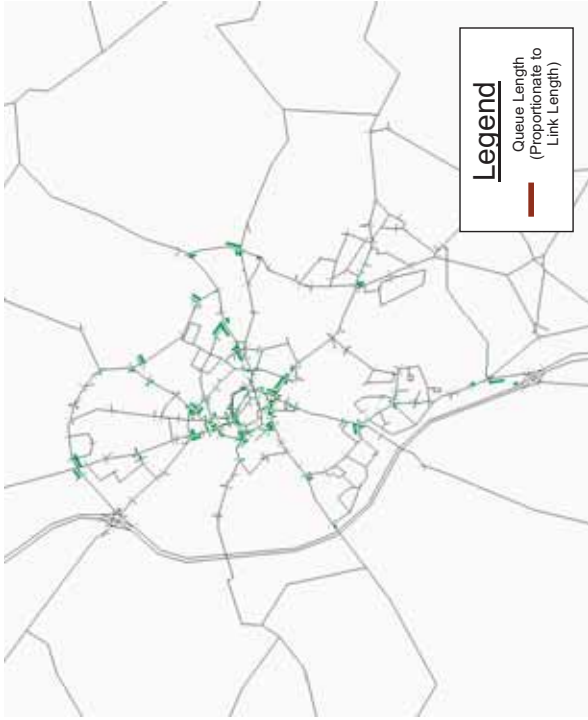


Figure B.29 - Option 2 Test 2 2026 AM Peak: Link Volume / Capacity Ratio > 85%

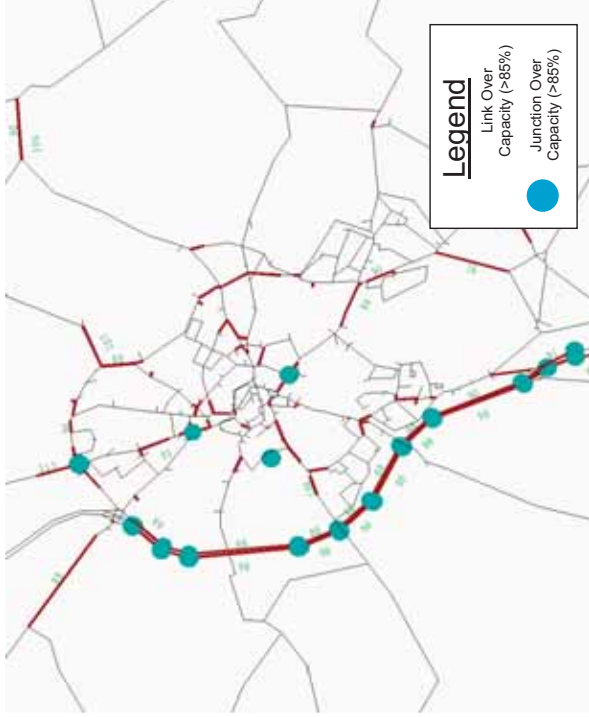


Figure B.31 - Option 2 Test 2 2026 PM Peak: Link Volume / Capacity Ratio > 85%

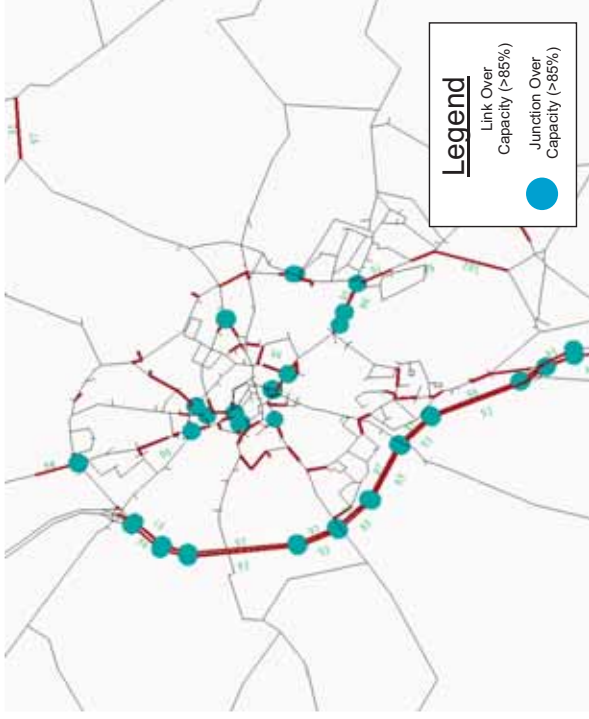


Figure B.30 - Option 2 Test 2 2026 AM Peak Relative Queue Lengths



Figure B.32 - Option 2 Test 2 2026 PM Peak Relative Queue Lengths

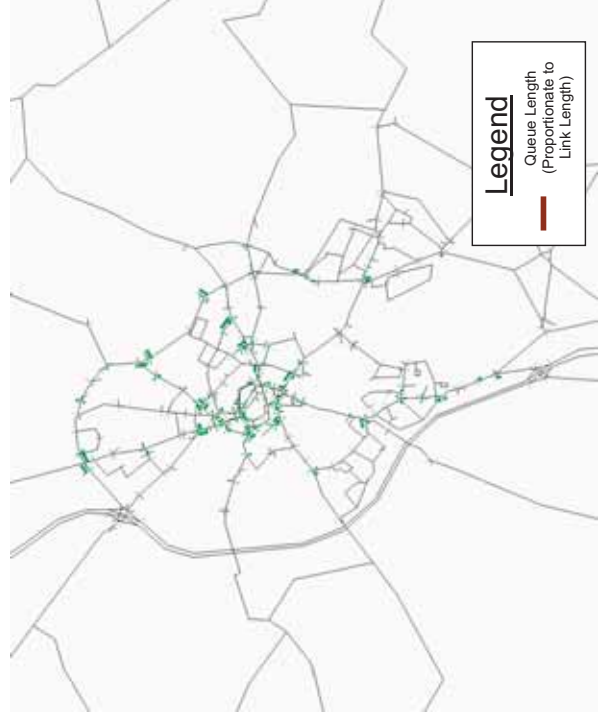


Figure B.33 - Option 2 Test 3 2026 AM Peak: Link Volume / Capacity Ratio > 85%

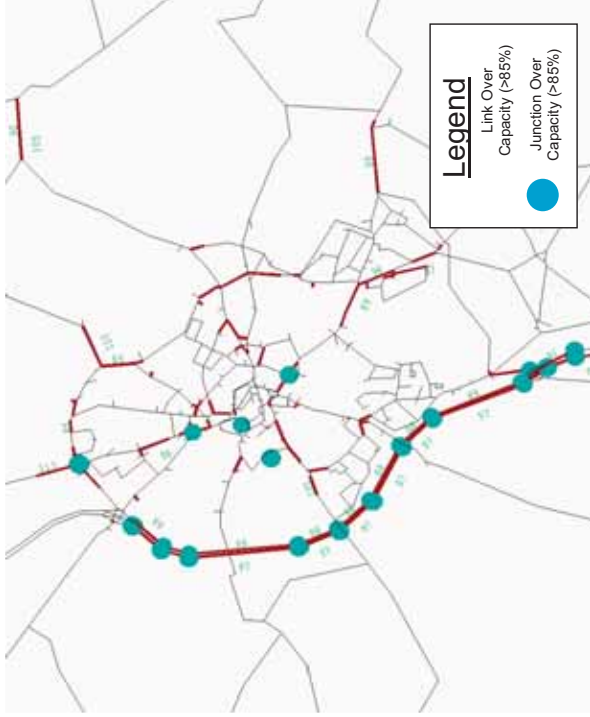


Figure B.35 - Option 2 Test 3 2026 PM Peak: Link Volume / Capacity Ratio > 85%

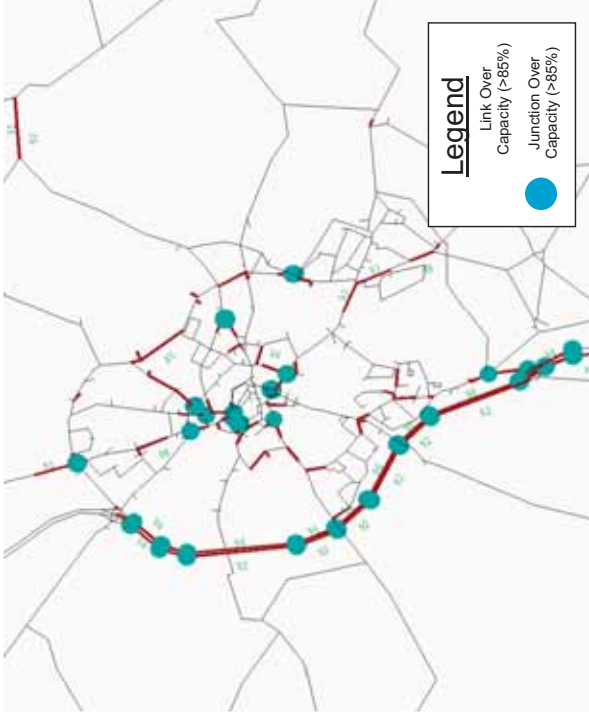


Figure B.34 - Option 2 Test 3 2026 AM Peak Relative Queue Lengths

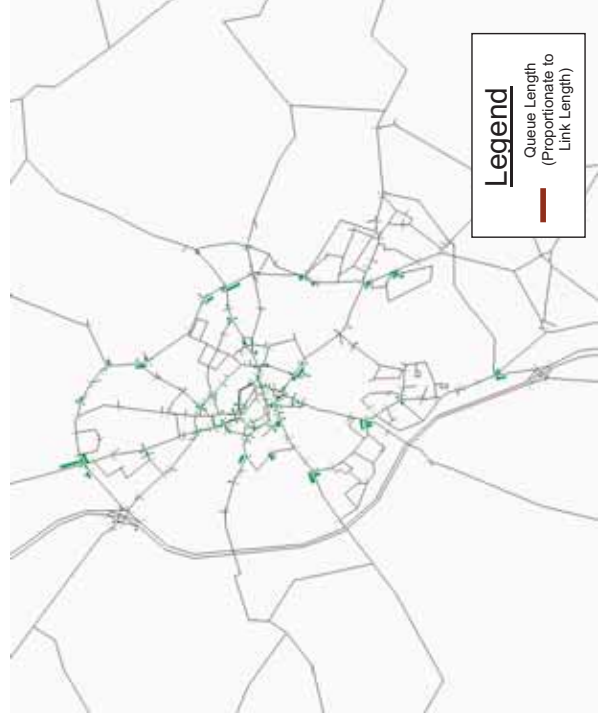


Figure B.36 - Option 2 Test 3 2026 PM Peak Relative Queue Lengths

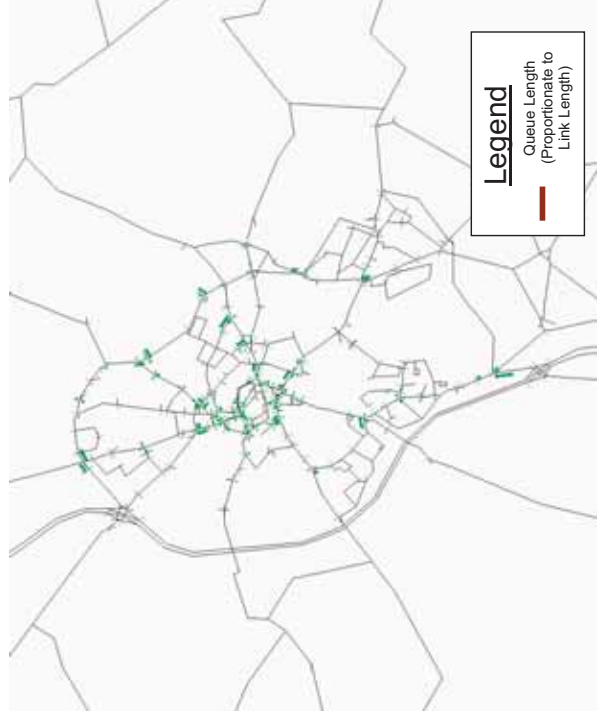


Figure B.37 - Option 3 Test 1 2026 AM Peak: Link Volume / Capacity Ratio > 85%

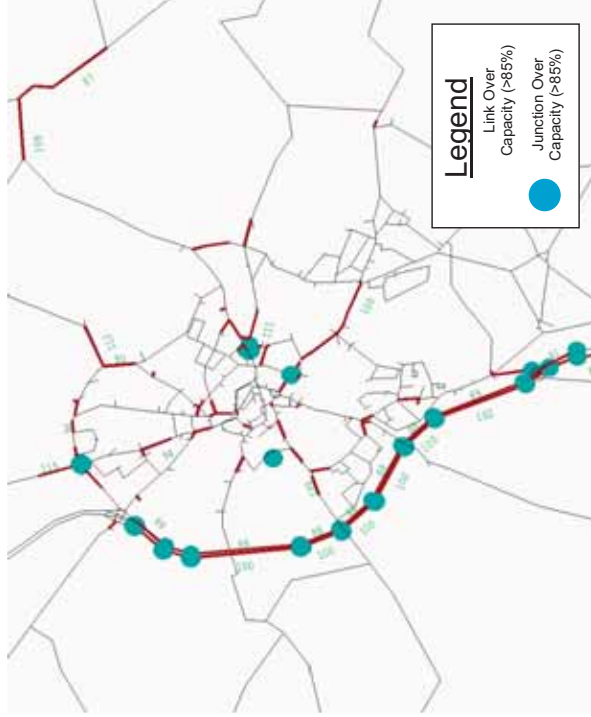


Figure B.39 - Option 3 Test 1 2026 PM Peak: Link Volume / Capacity Ratio > 85%

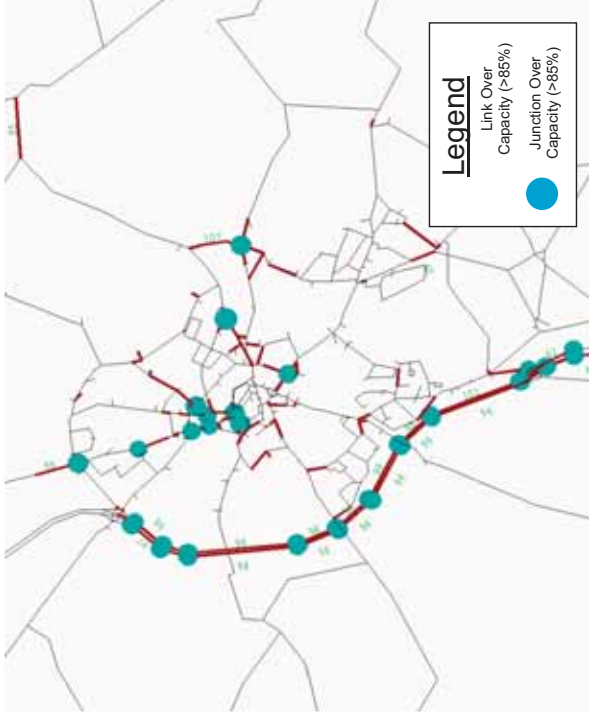


Figure B.38 - Option 3 Test 1 2026 AM Peak Relative Queue Lengths



Figure B.40 - Option 3 Test 1 2026 PM Peak Relative Queue Lengths

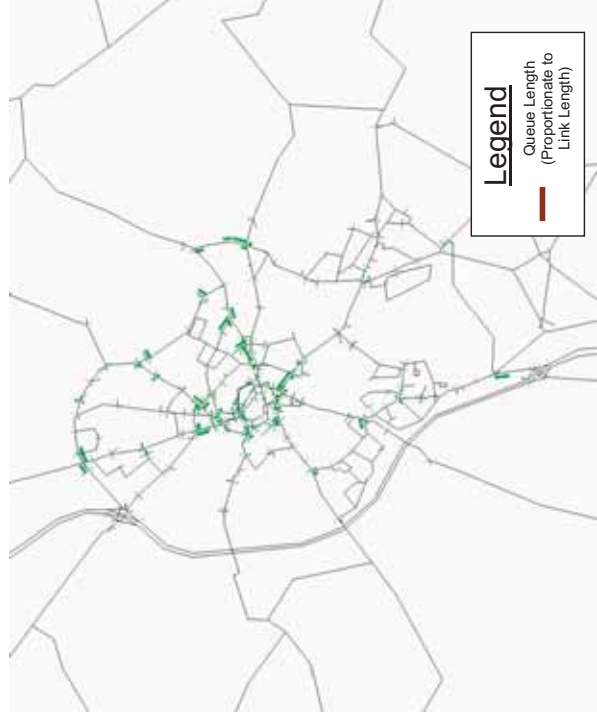


Figure B.41 - Option 3 Test 2 2026 AM Peak: Link Volume / Capacity Ratio > 85%

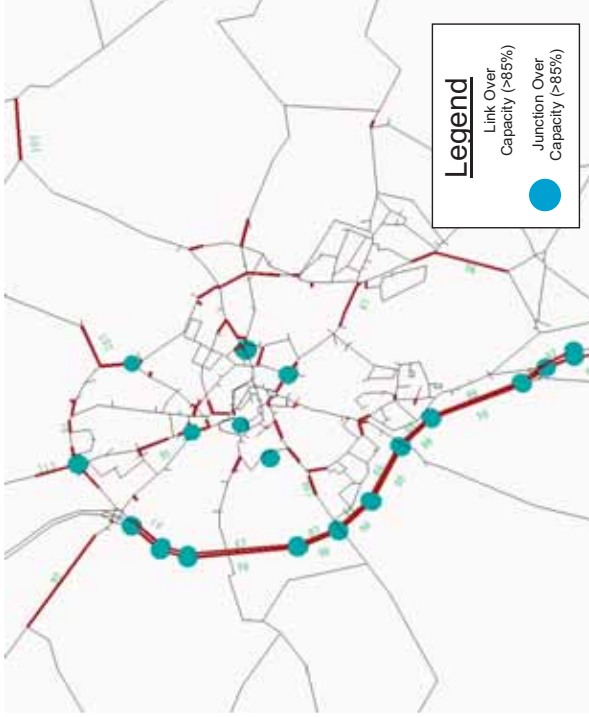


Figure B.43 - Option 3 Test 2 2026 PM Peak: Link Volume / Capacity Ratio > 85%

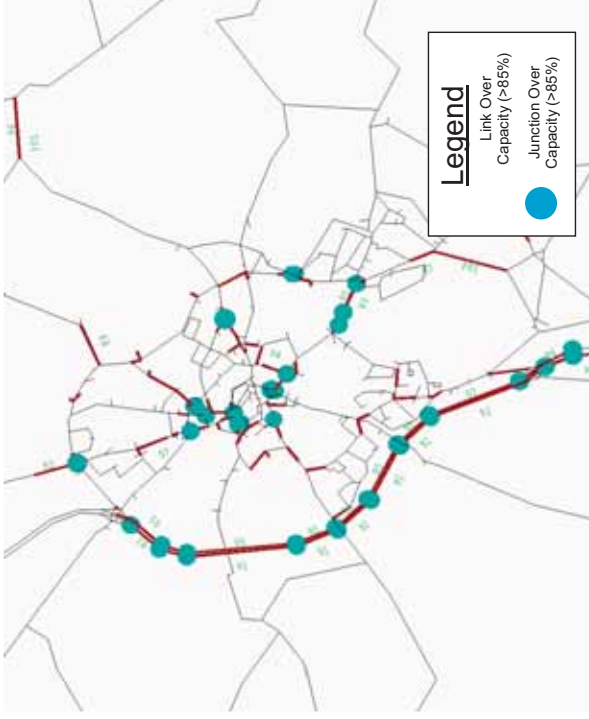


Figure B.42 - Option 3 Test 2 2026 AM Peak Relative Queue Lengths



Figure B.44 - Option 2 Test 2 2026 PM Peak Relative Queue Lengths

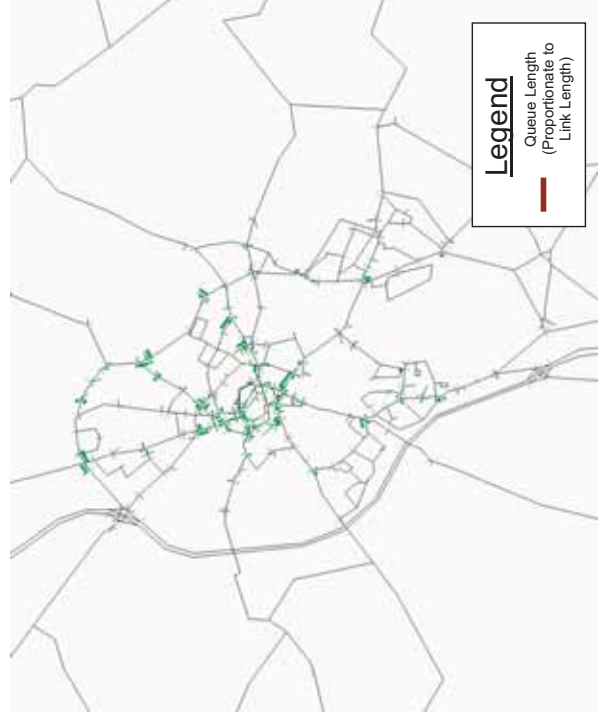


Figure B.45 - Option 3 Test 3 2026 AM Peak: Link Volume / Capacity Ratio > 85%

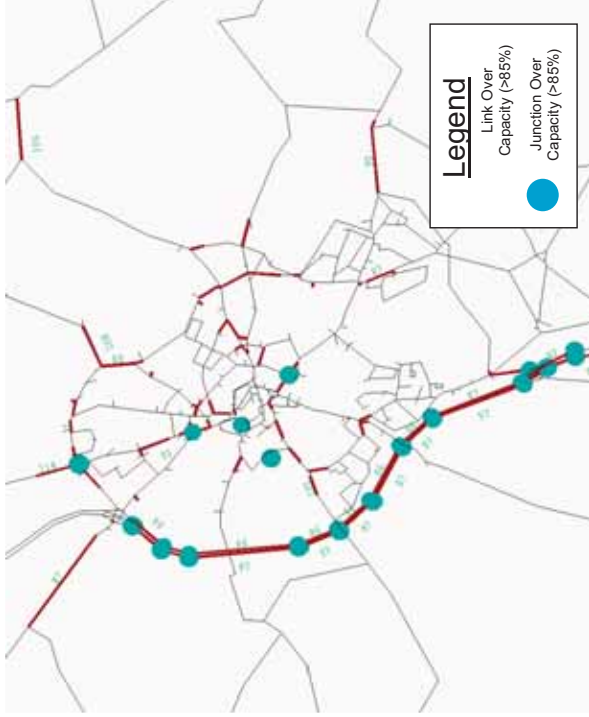


Figure B.47 - Option 3 Test 3 2026 PM Peak: Link Volume / Capacity Ratio > 85%

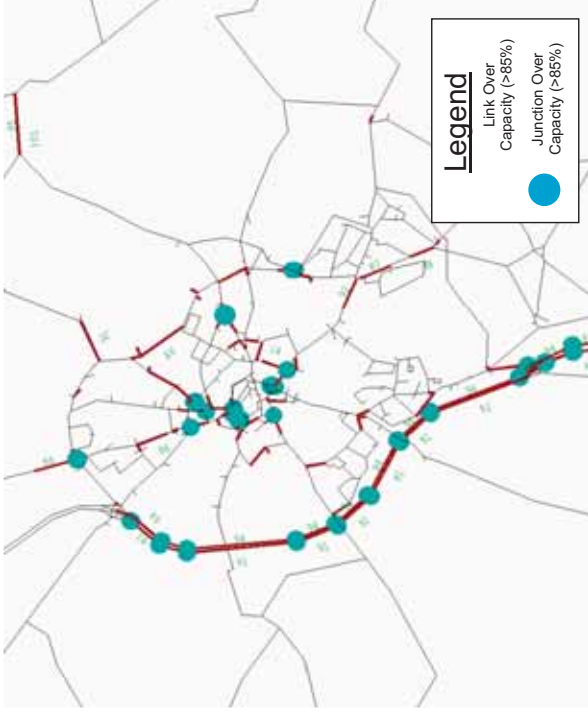


Figure B.46 - Option 3 Test 3 2026 AM Peak Relative Queue Lengths



Figure B.48 - Option 2 Test 3 2026 PM Peak Relative Queue Lengths

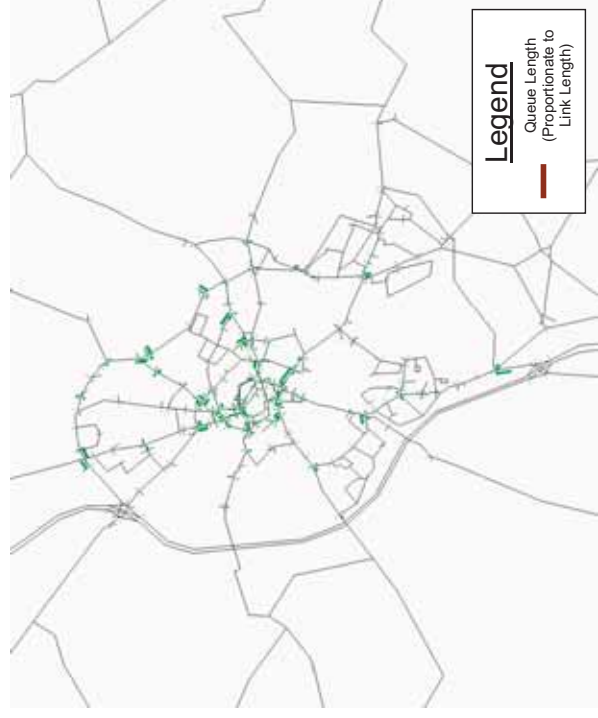


Figure B.49 - Option 4 Test 1 2026 AM Peak: Link Volume / Capacity Ratio > 85%

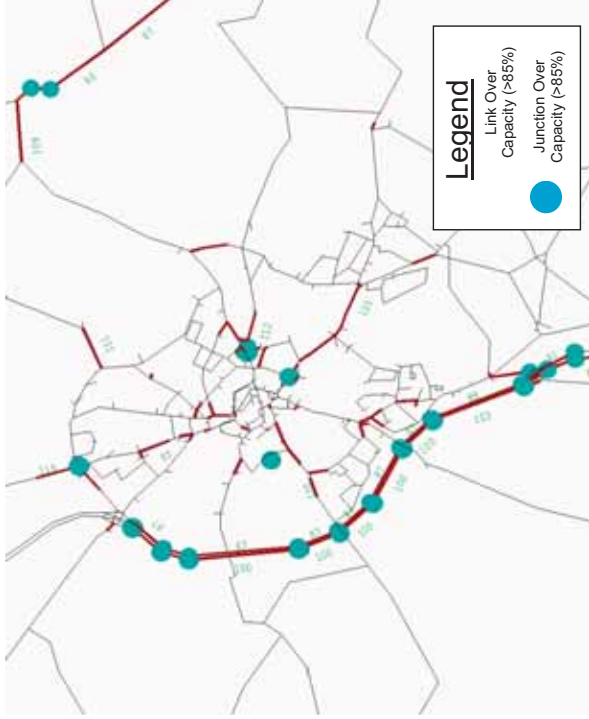


Figure B.51 - Option 4 Test 1 2026 PM Peak: Link Volume / Capacity Ratio > 85%

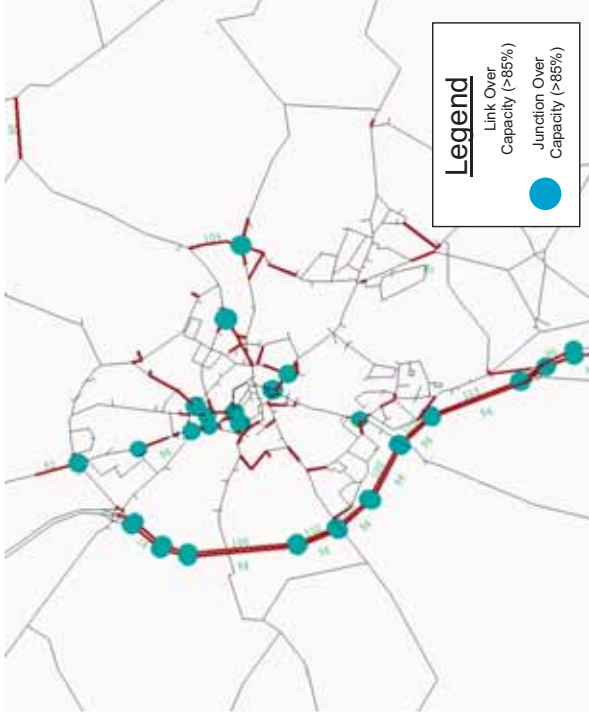


Figure B.50 - Option 4 Test 1 2026 AM Peak Relative Queue Lengths

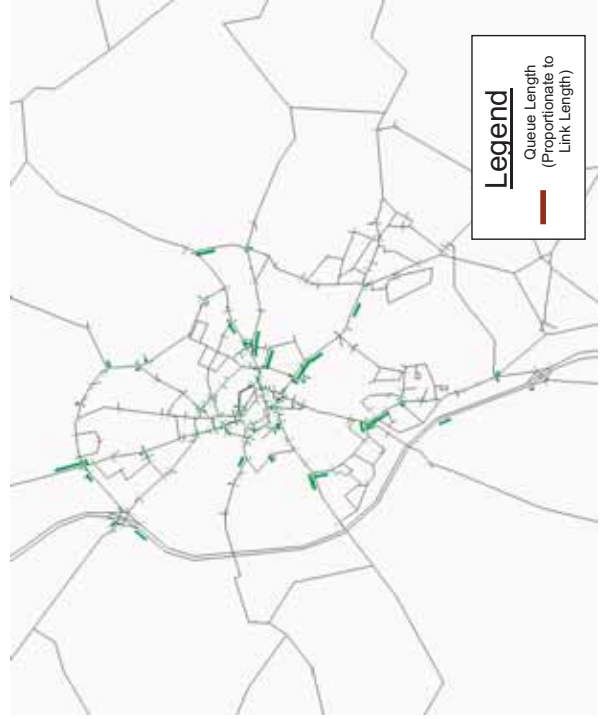


Figure B.52 - Option 4 Test 1 2026 PM Peak Relative Queue Lengths

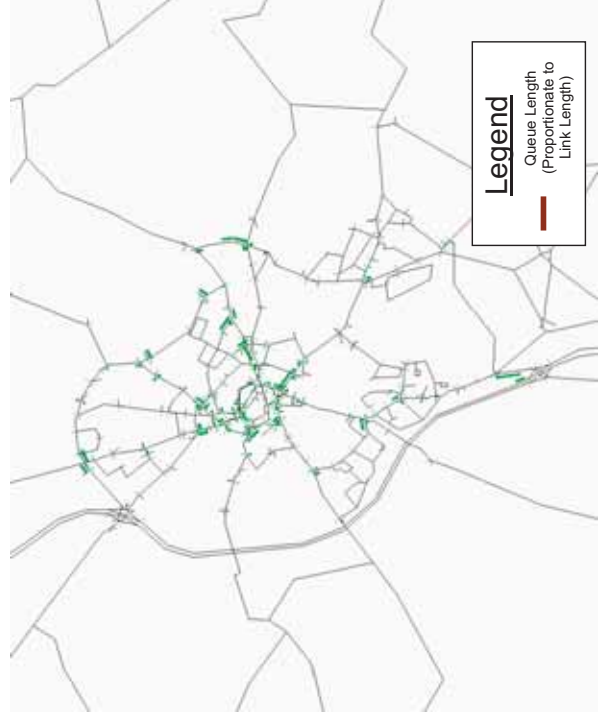


Figure B.53 - Option 4 Test 2 2026 AM Peak: Link Volume / Capacity Ratio > 85%

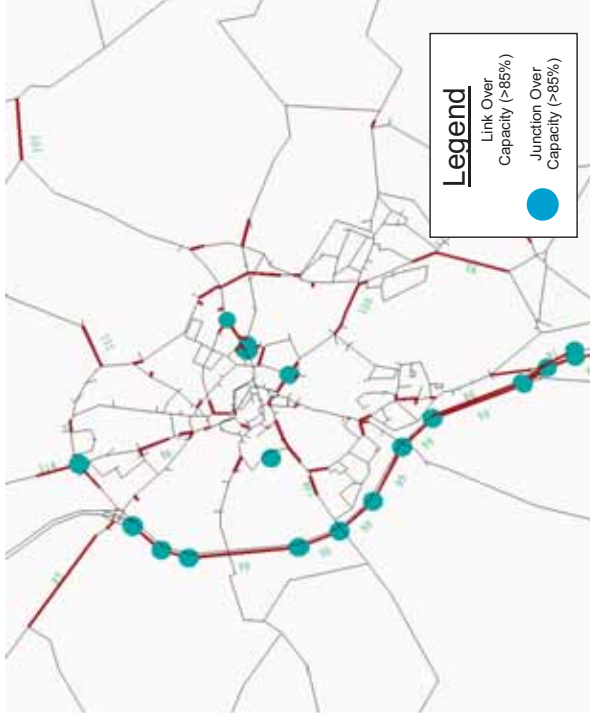


Figure B.55 - Option 4 Test 2 2026 PM Peak: Link Volume / Capacity Ratio > 85%

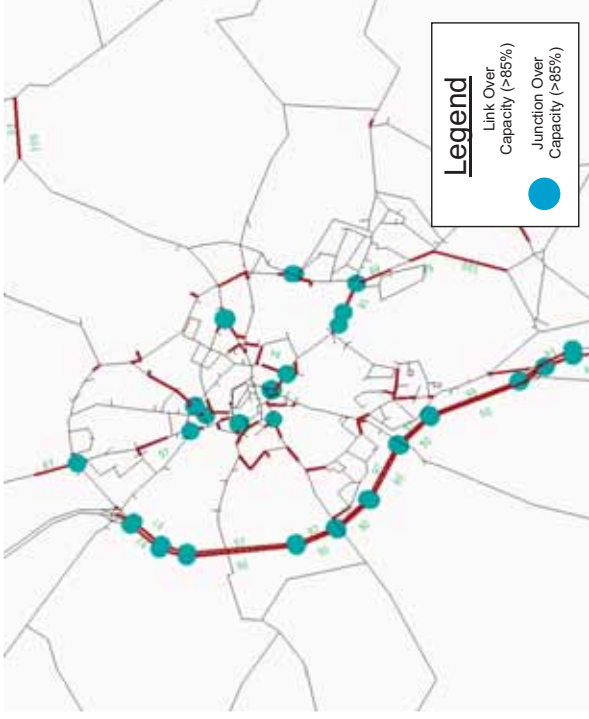


Figure B.54 - Option 4 Test 2 2026 AM Peak Relative Queue Lengths



Figure B.56 - Option 4 Test 2 2026 PM Peak Relative Queue Lengths

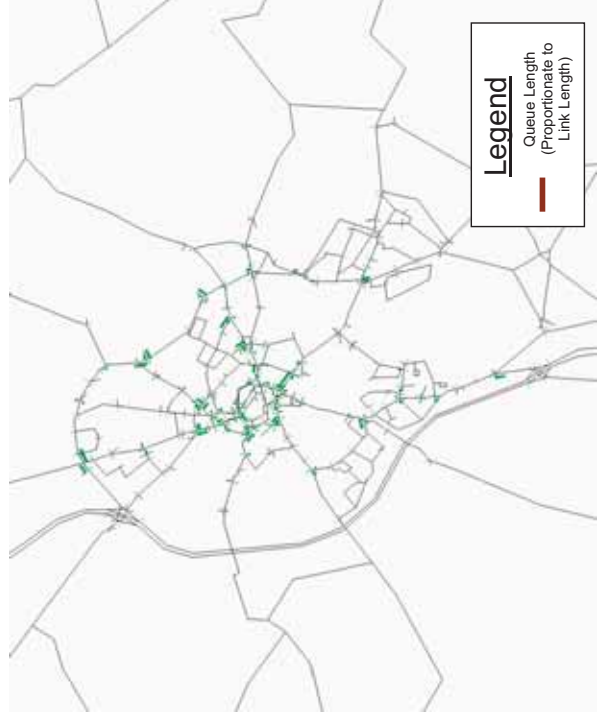


Figure B.57 - Option 4 Test 3 2026 AM Peak: Link Volume / Capacity Ratio > 85%

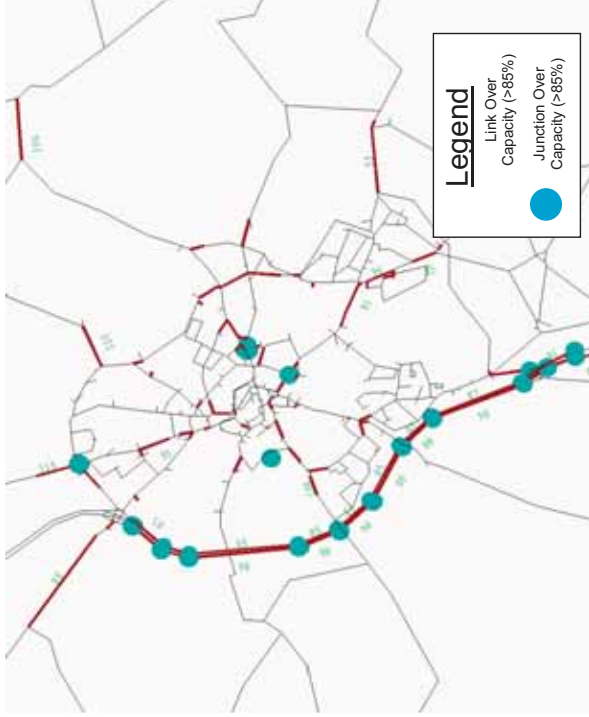


Figure B.59 - Option 4 Test 3 2026 PM Peak: Link Volume / Capacity Ratio > 85%

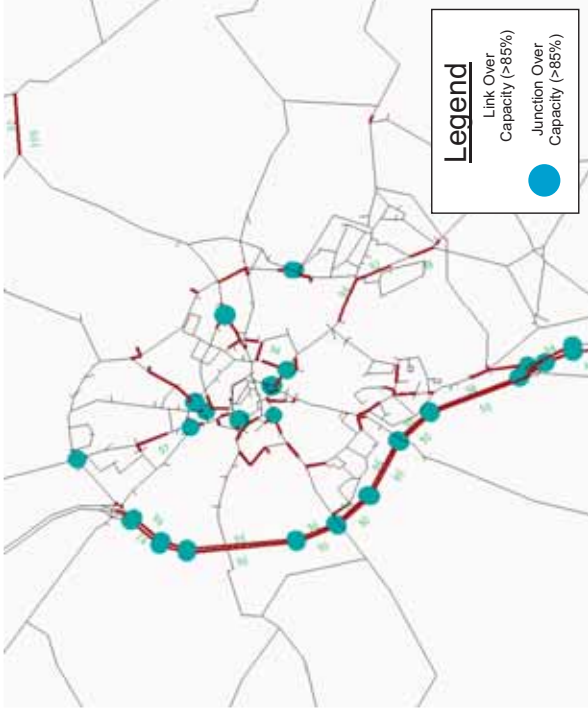


Figure B.58 - Option 4 Test 3 2026 AM Peak Relative Queue Lengths

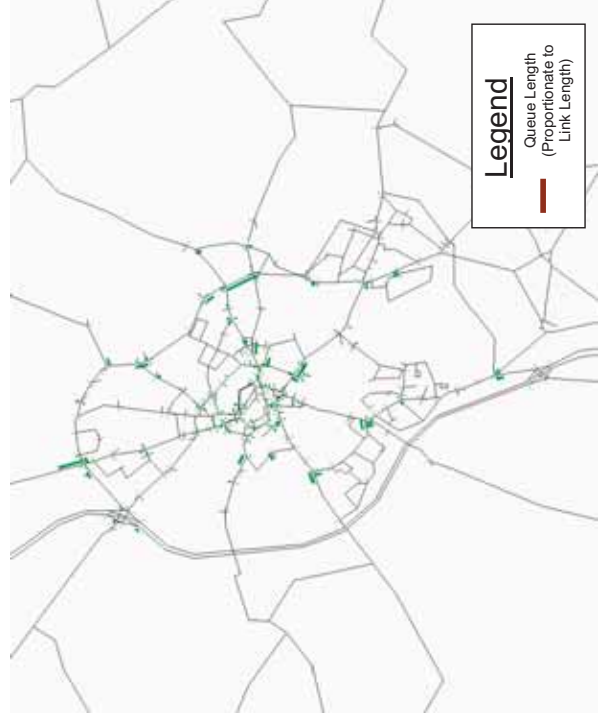
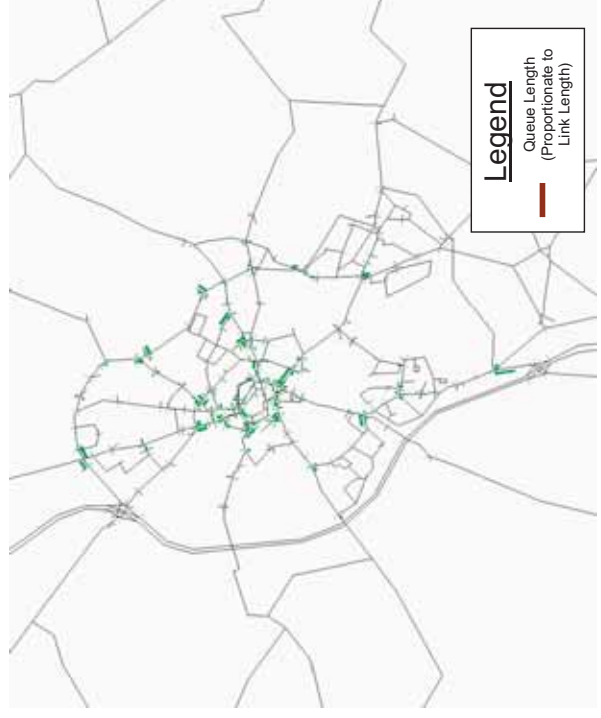


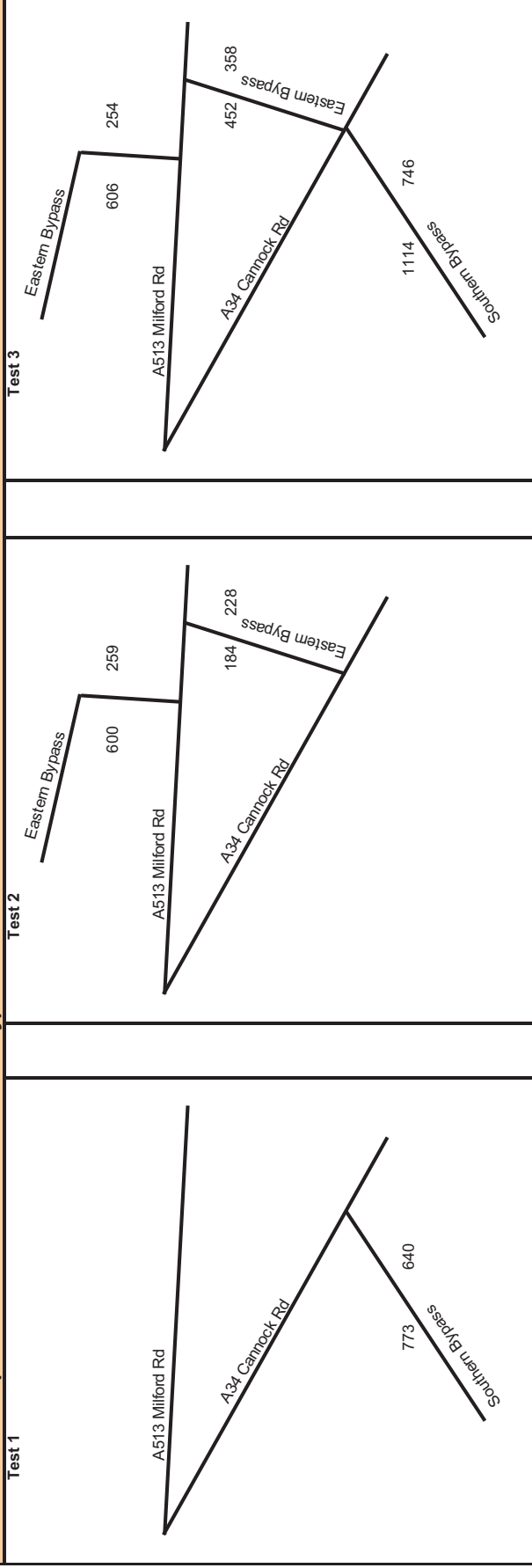
Figure B.60 - Option 4 Test 3 2026 PM Peak Relative Queue Lengths



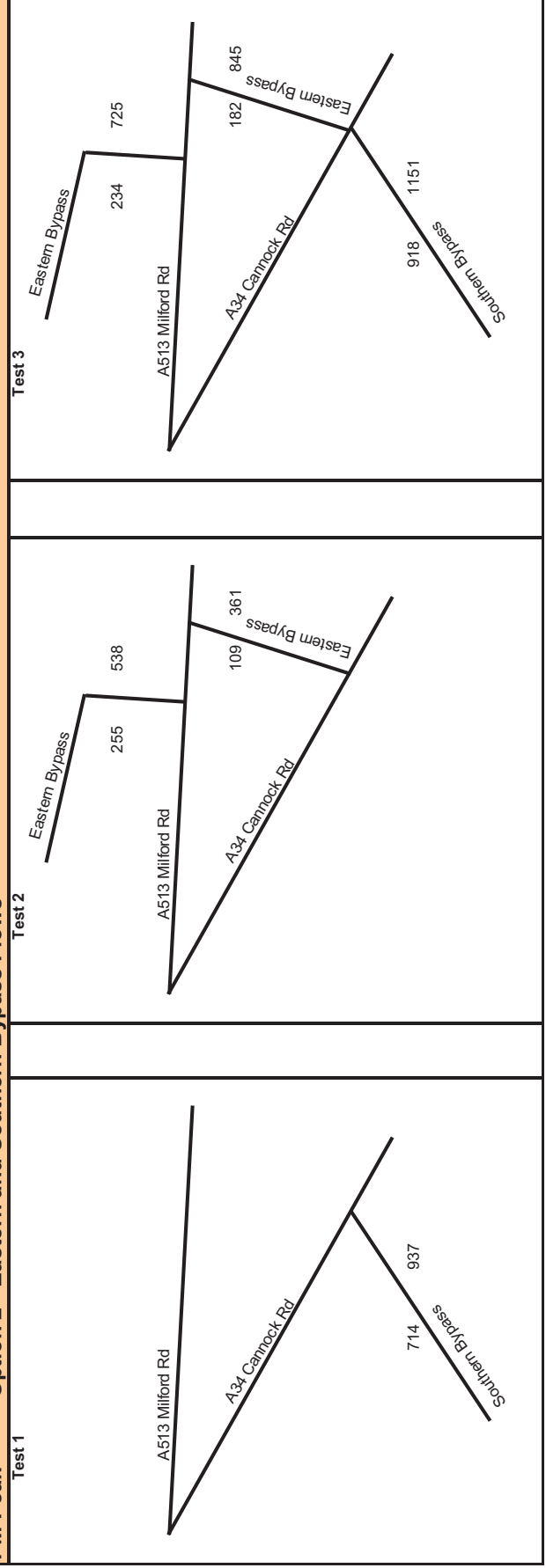
Appendix C

Eastern and Western Bypass Actual Flows

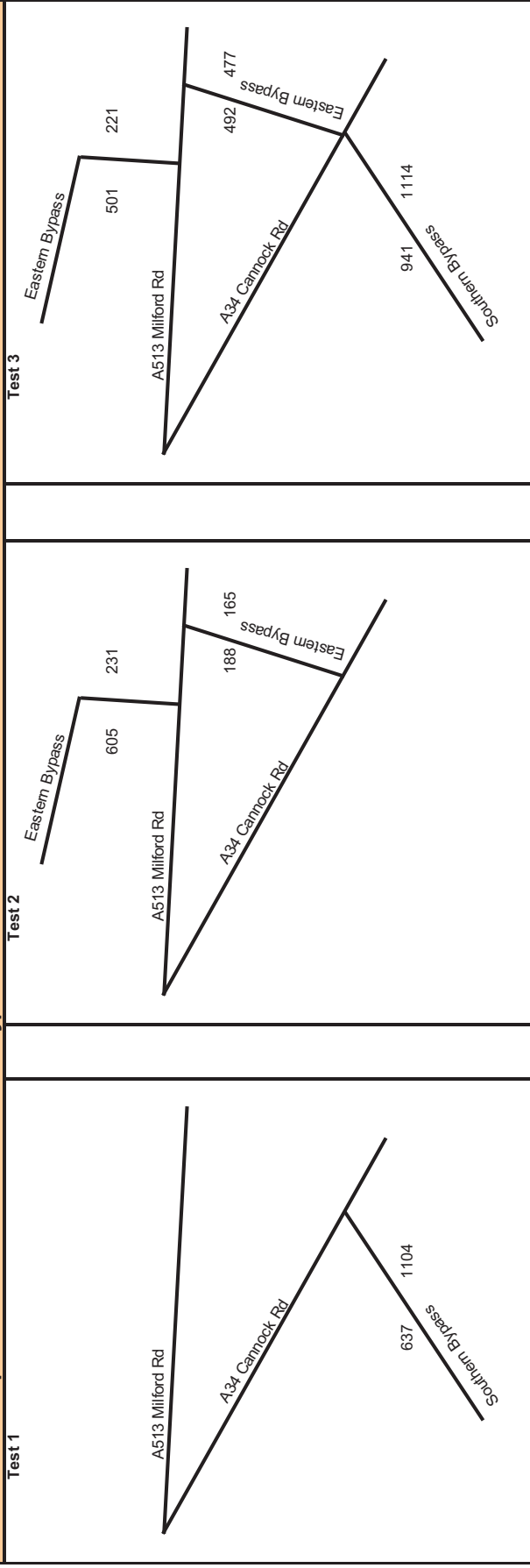
AM Peak Option 2 - Eastern and Southern Bypass Flows



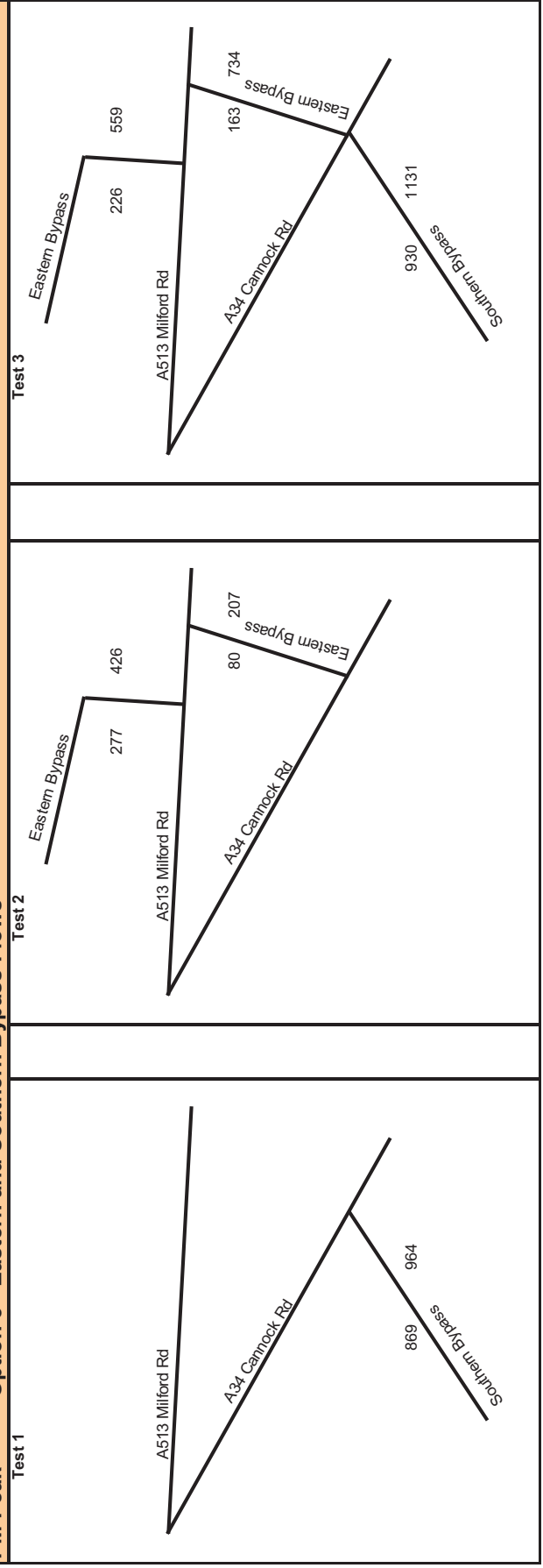
PM Peak Option 2 - Eastern and Southern Bypass Flows



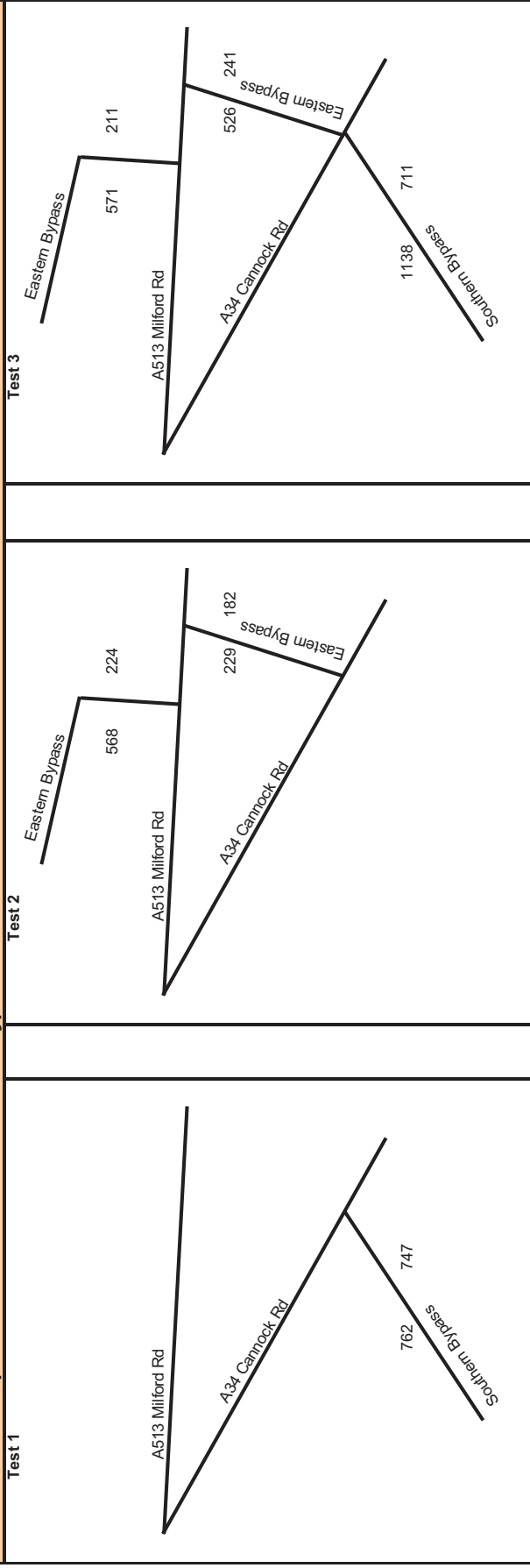
AM Peak Option 3 - Eastern and Southern Bypass Flows



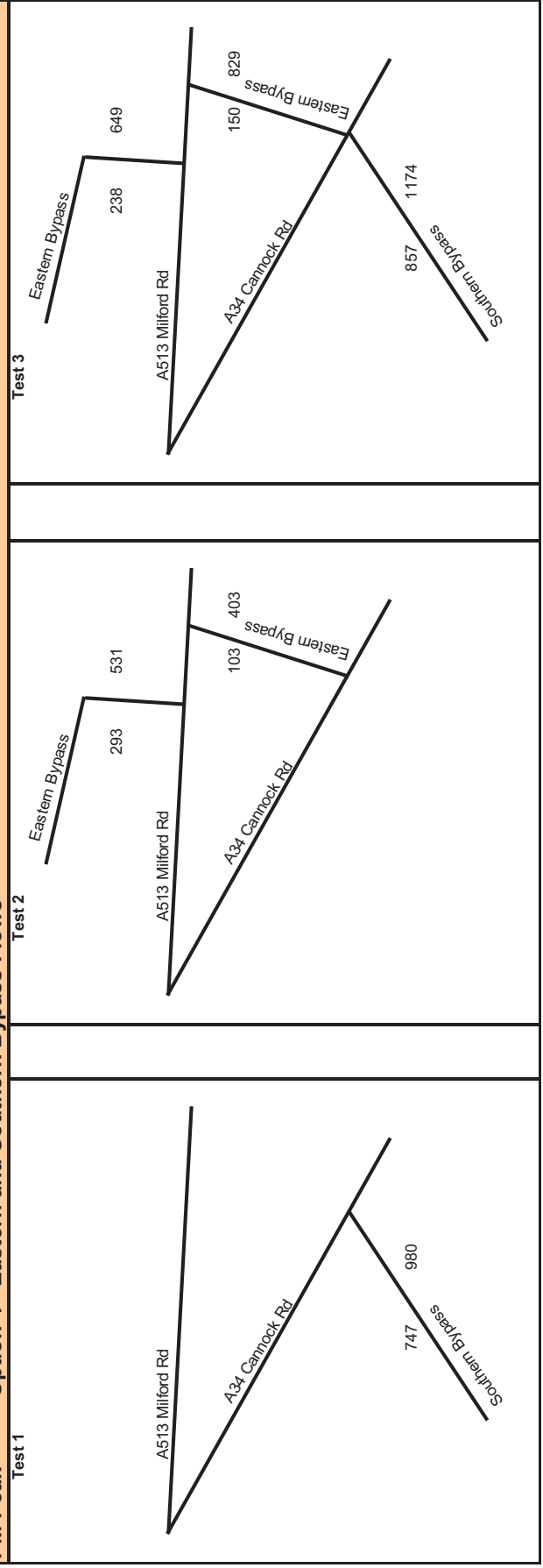
PM Peak Option 3 - Eastern and Southern Bypass Flows



AM Peak Option 4 - Eastern and Southern Bypass Flows



PM Peak Option 4 - Eastern and Southern Bypass Flows



Appendix D

Delay and Flow Analysis

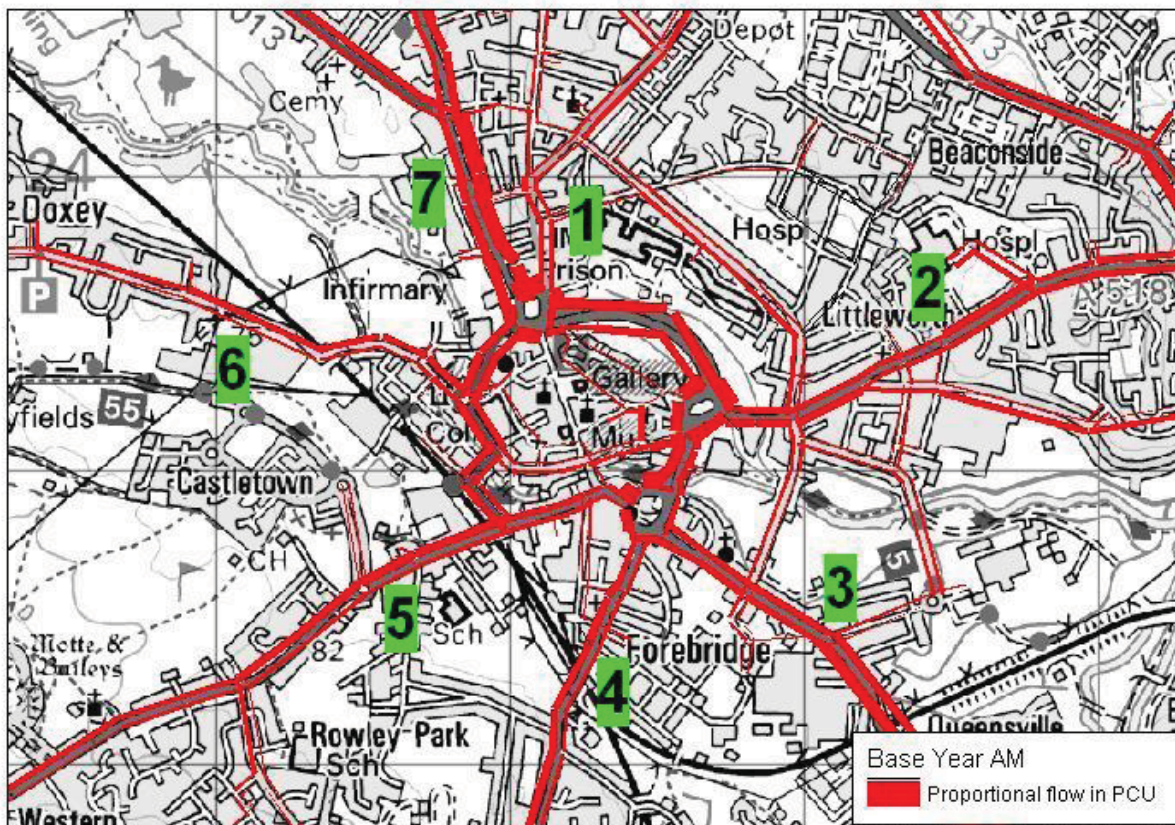
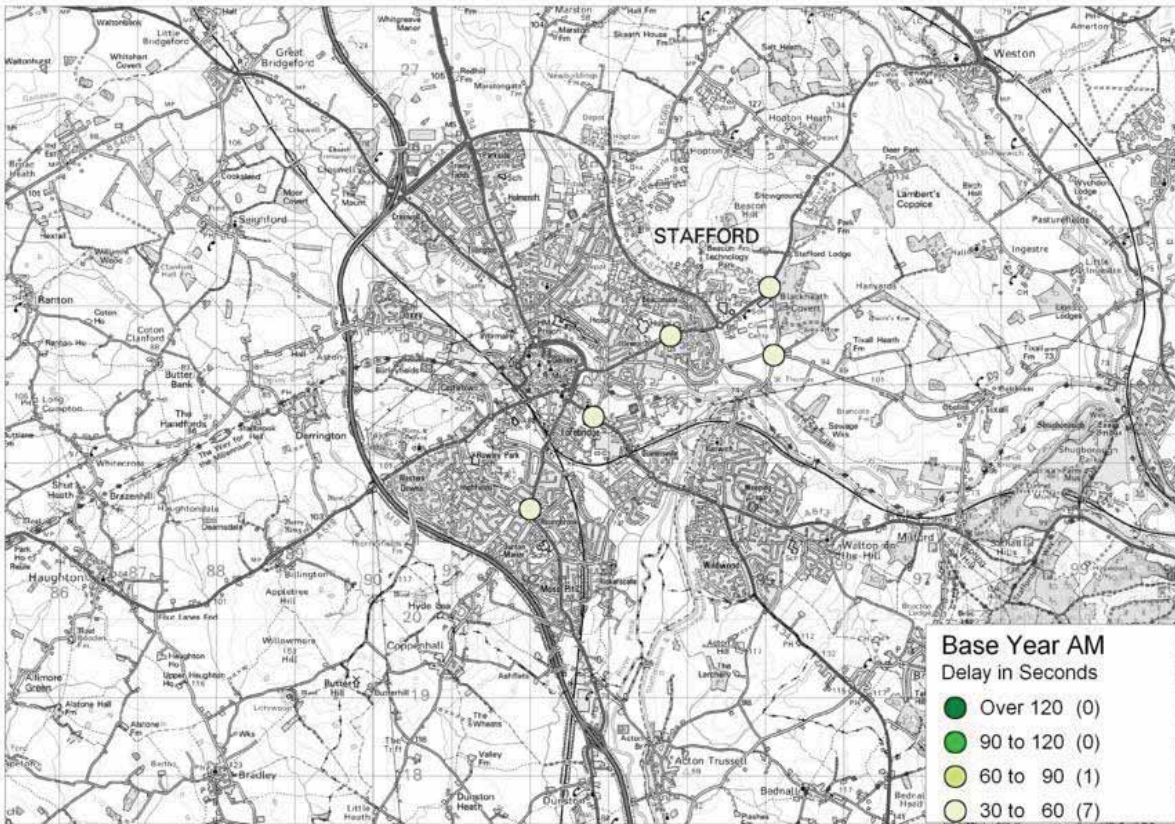
Flows on Key Radial Routes

The following table shows the flows on key radial routes in each of the options assessed. Furthermore, the ID stated matches the numbers on the flow plots on the following pages to help identify the location at which the flows were taken.

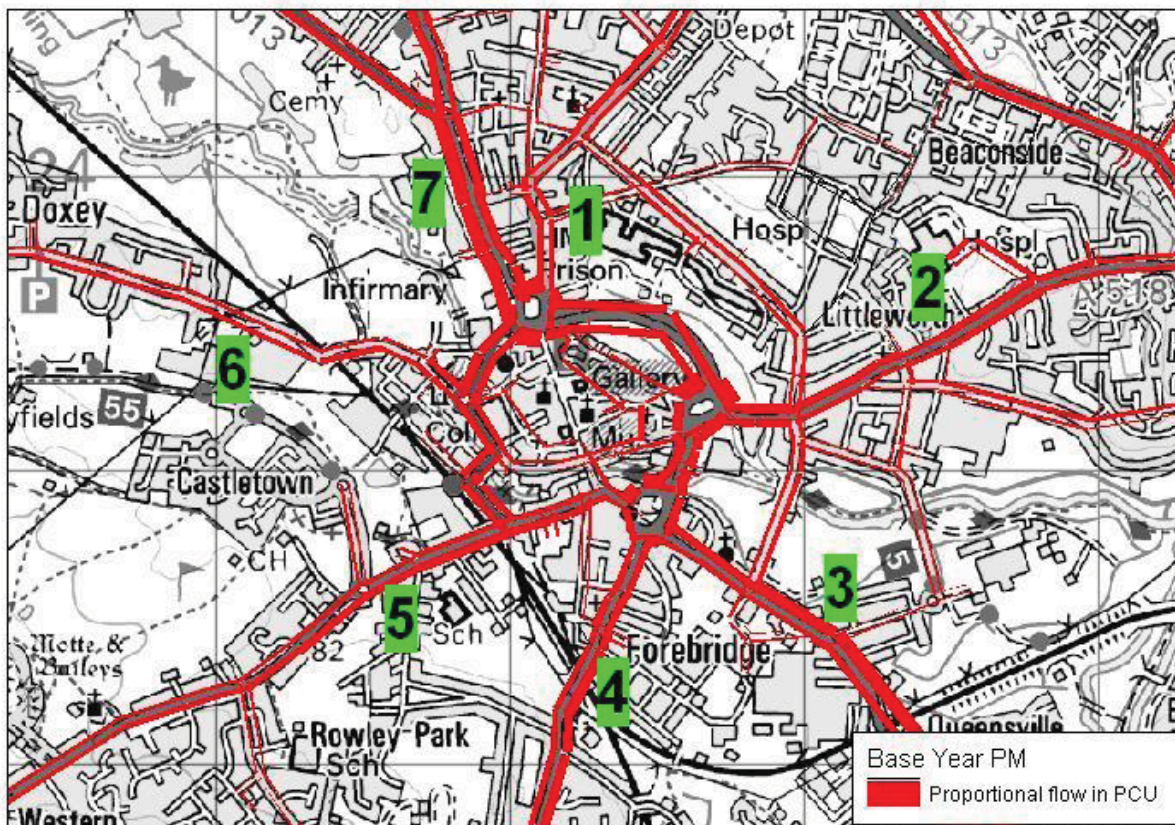
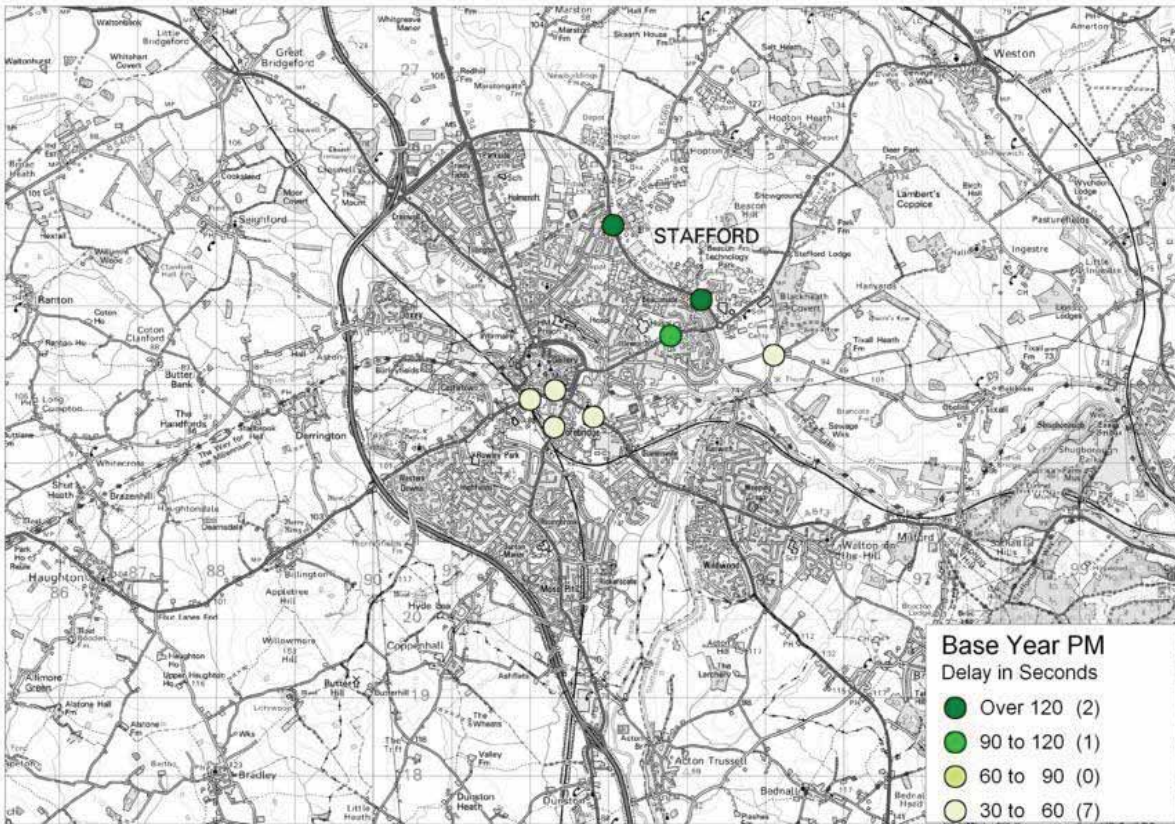
ID	Name	Base Year		Do Minimum		Option 2 Test 2		Option 3 Test 2		Option 3 Test 3	
		AM Flow	PM Flow	AM Flow	PM Flow	AM Flow	PM Flow	AM Flow	PM Flow	AM Flow	PM Flow
1	Gaol Road SB	506	548	715	927	775	1026	777	1019	774	1008
	Gaol Road NB	497	678	681	959	737	1173	787	1182	786	1185
2	Western Road EB	765	1060	913	1238	950	1296	1077	1280	1078	1262
	Western Road WB	959	873	1242	817	1353	1021	1414	1187	1363	1103
3	Litchfield Road EB	672	909	860	1088	855	1089	874	1087	854	1106
	Litchfield Road WB	839	618	853	797	890	801	916	797	921	794
4	Wolverhampton Road SB	420	1118	642	1327	746	1356	715	1376	659	1325
	Wolverhampton Road NB	919	655	1126	785	1117	703	1111	589	1114	613
5	Newport Road EB	1024	640	1276	875	1425	898	1404	904	1410	896
	Newport Road WB	516	1037	476	1128	565	1279	566	1281	571	1277
6	Doxey Road EB	784	414	1146	416	1466	1037	1489	1044	1479	1029
	Doxey Road WB	309	626	362	1126	628	1780	636	1755	647	1746
7	Foregate Street SB	1633	1045	1926	1502	2079	1862	2120	1852	2126	1877
	Foregate Street NB	1008	1565	1200	1774	1527	1861	1496	1898	1482	1927

Total	22637	28177	32295	32631	32414
Rank	-	1	2	4	3

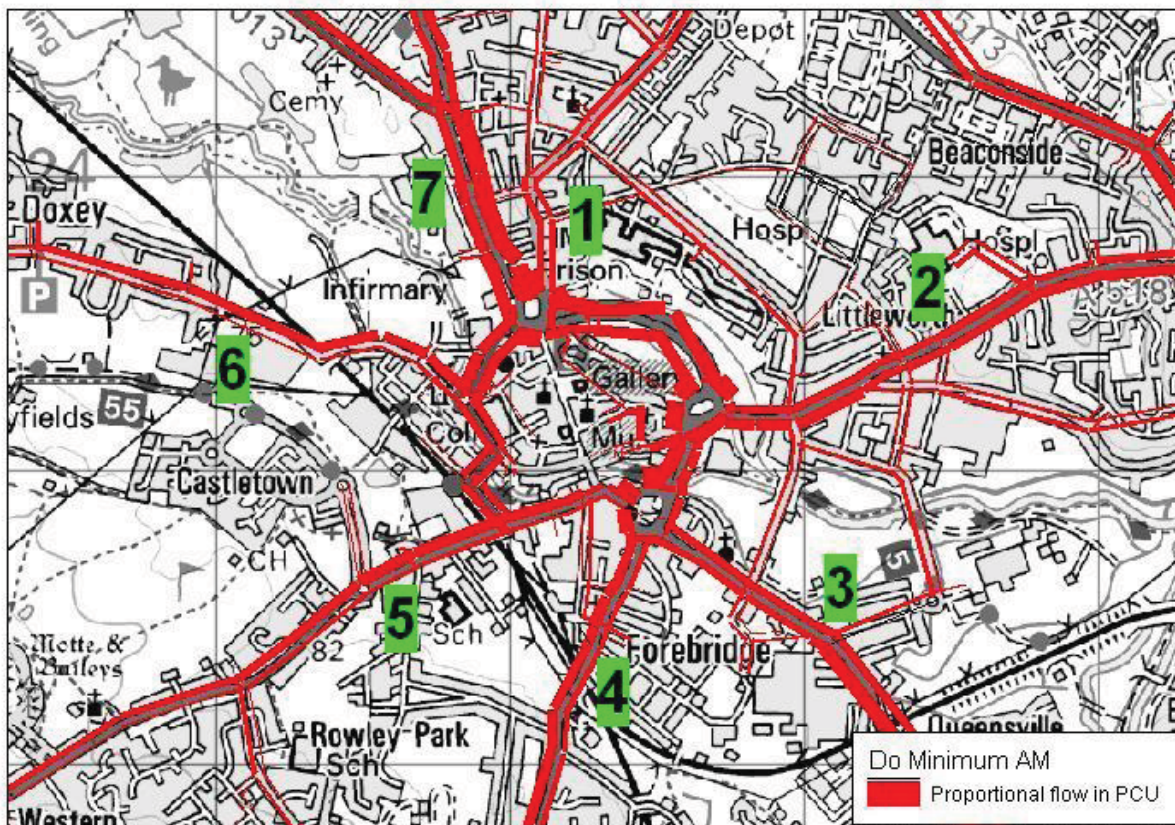
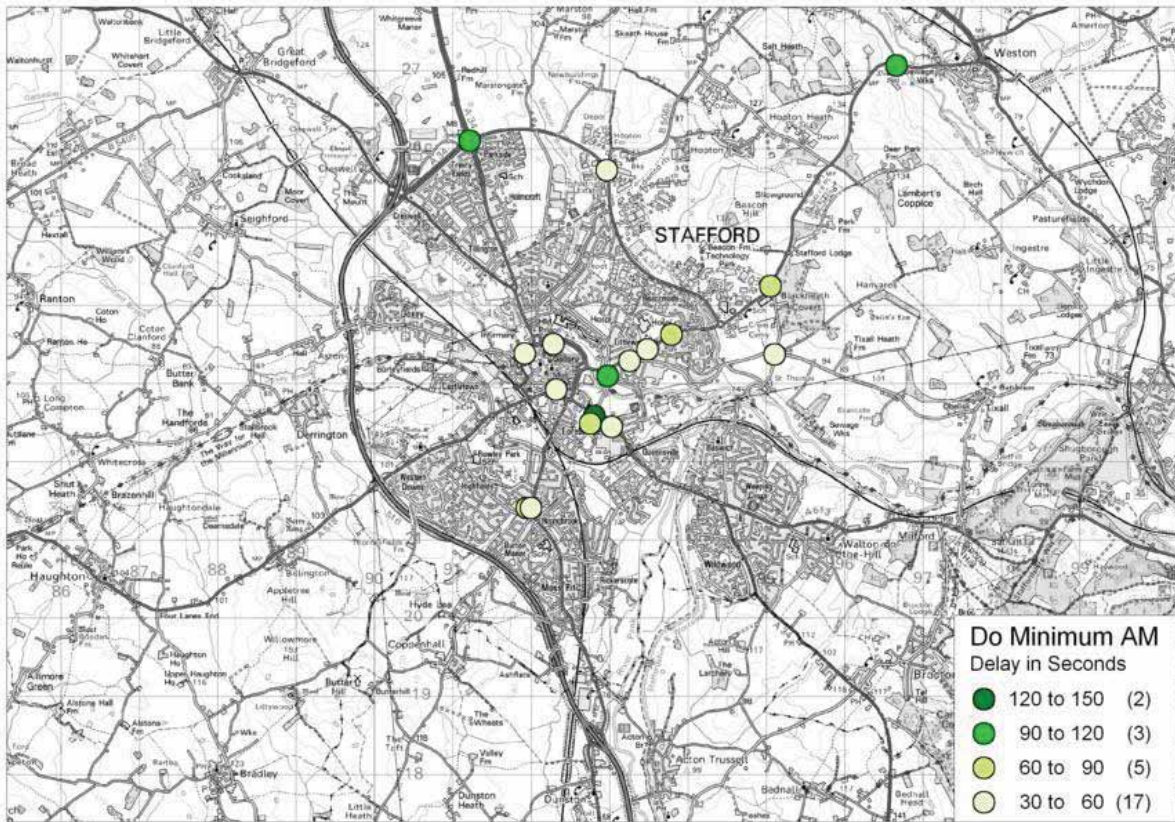
Base Year AM



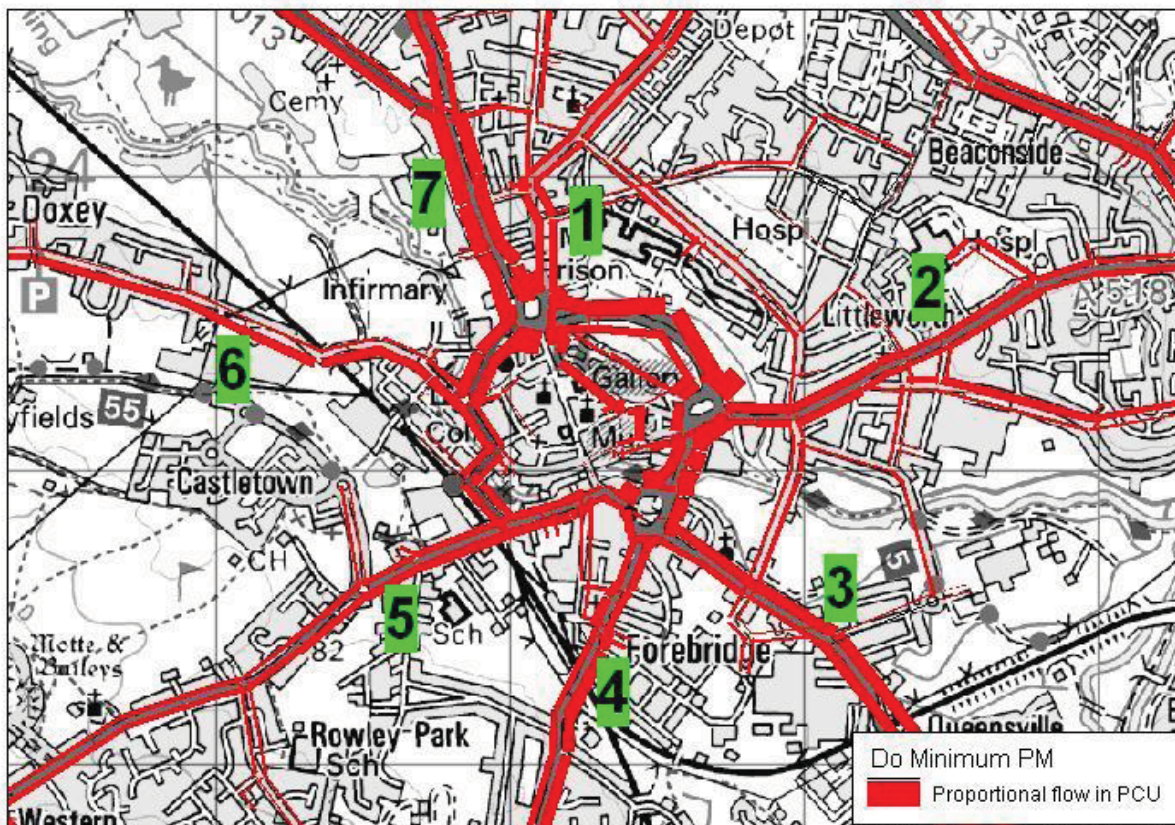
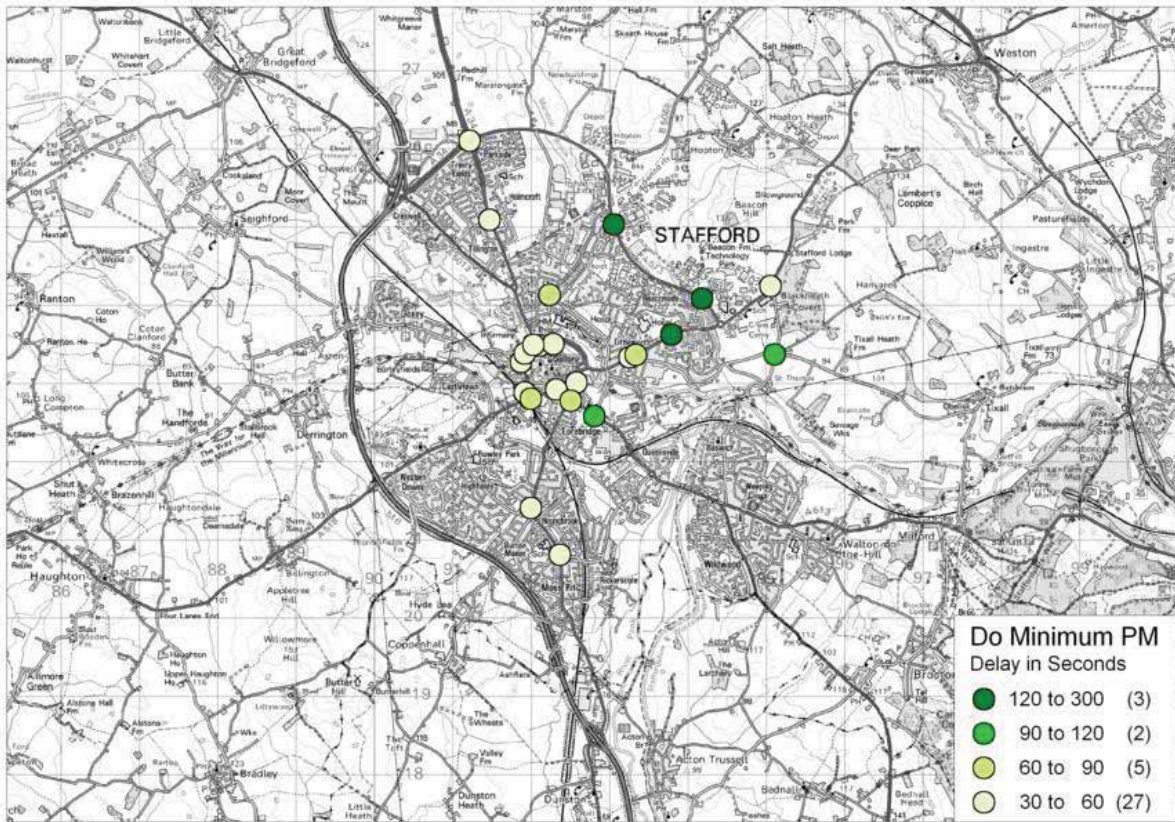
Base Year PM



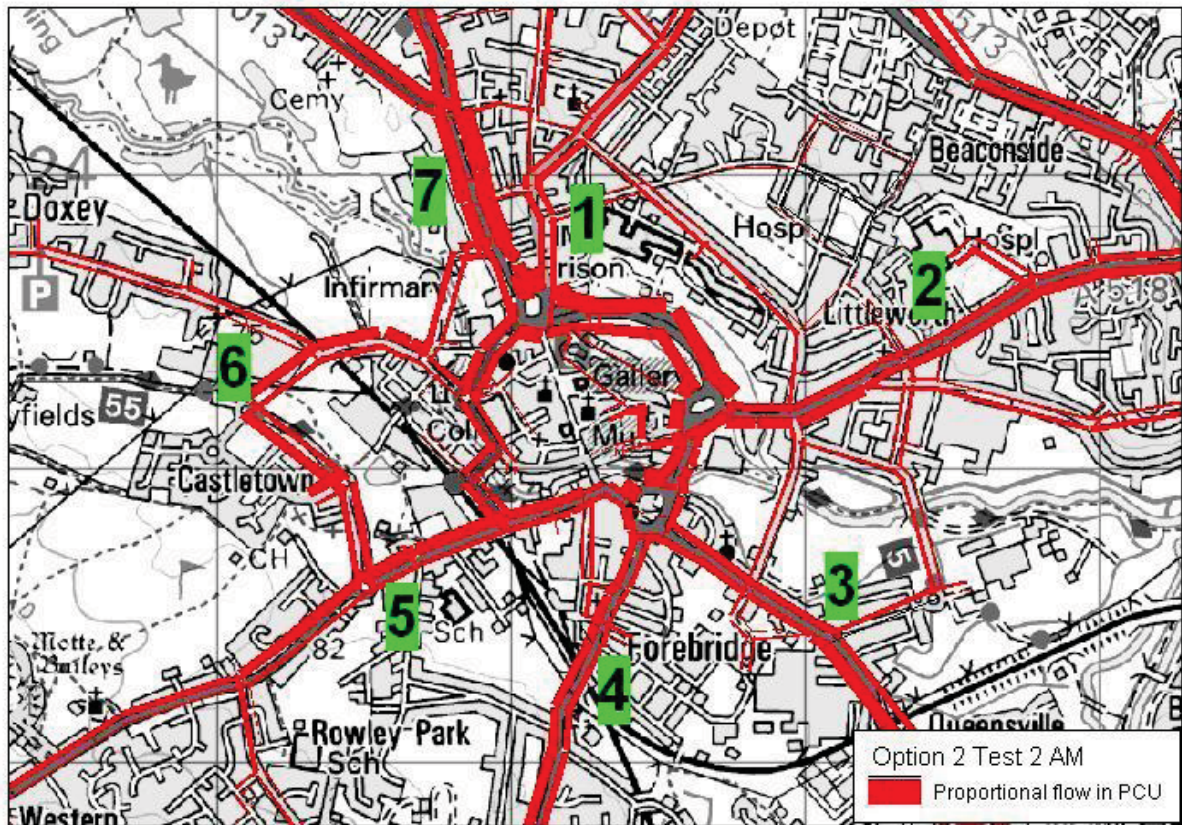
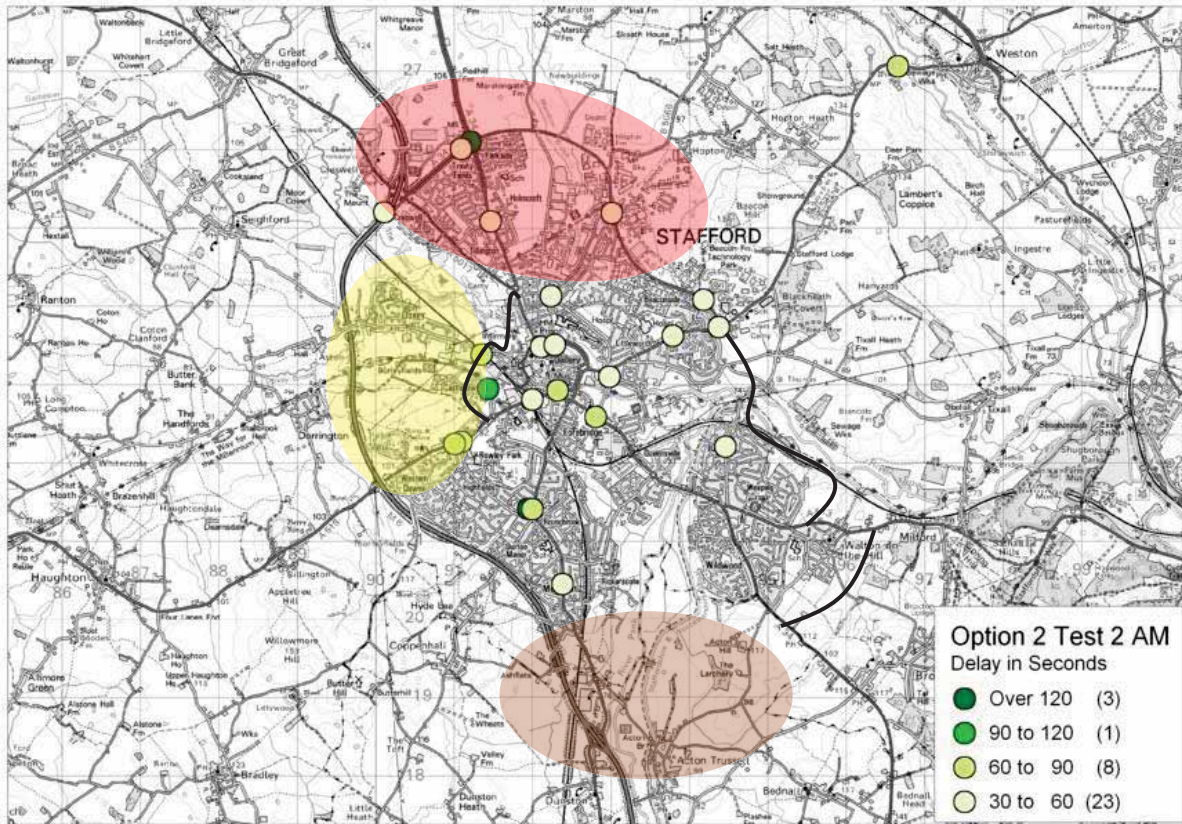
Do Minimum AM



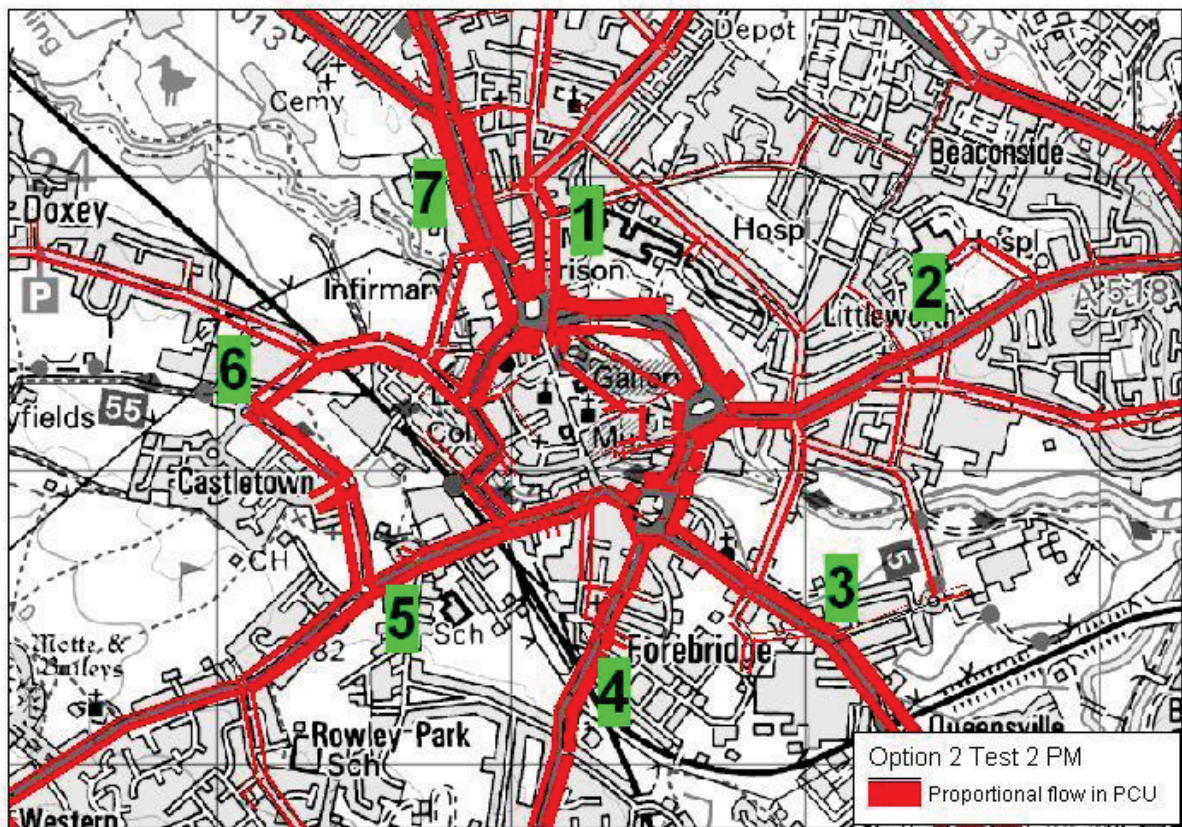
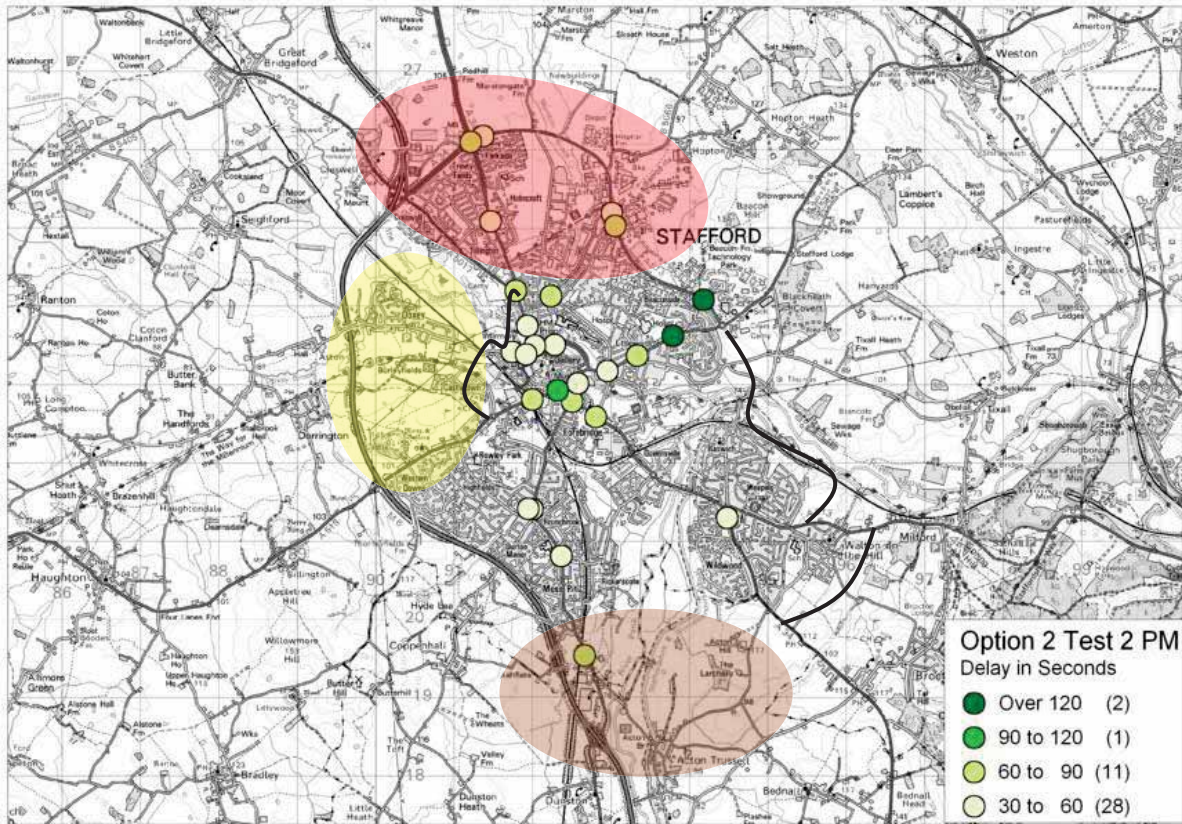
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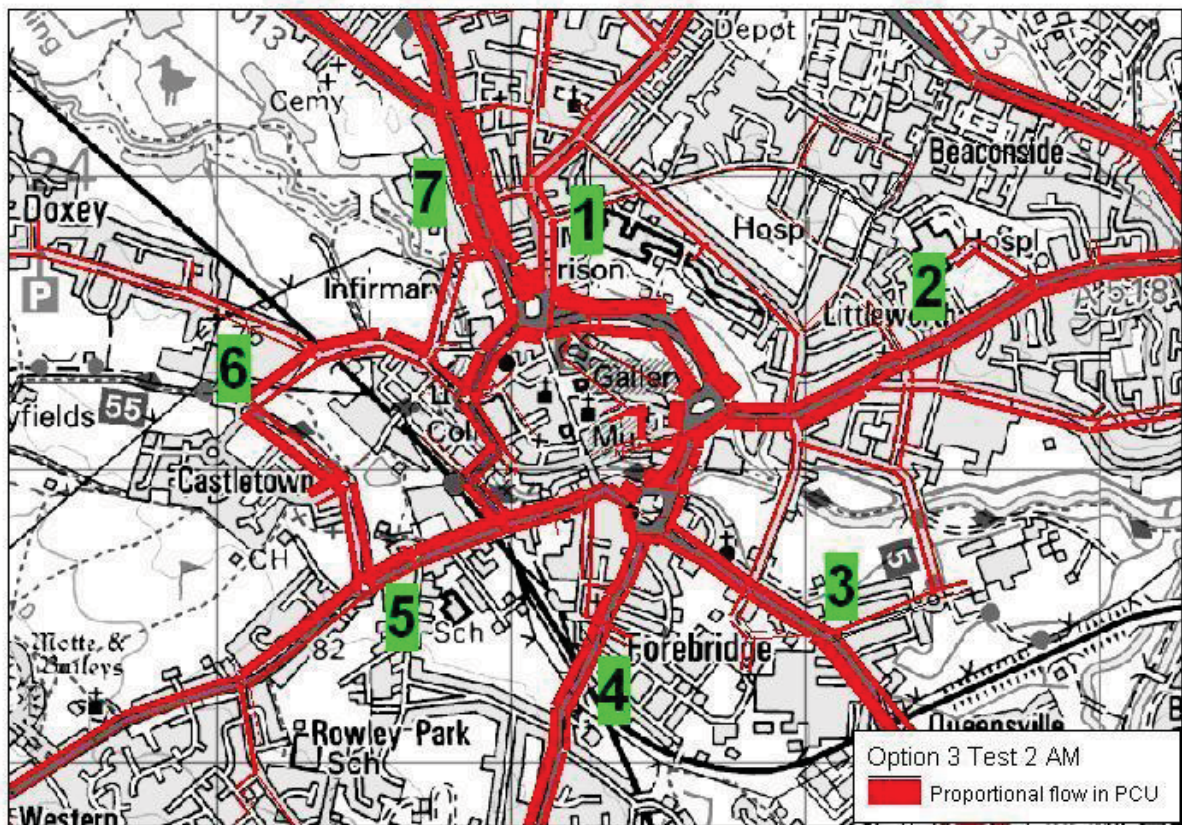
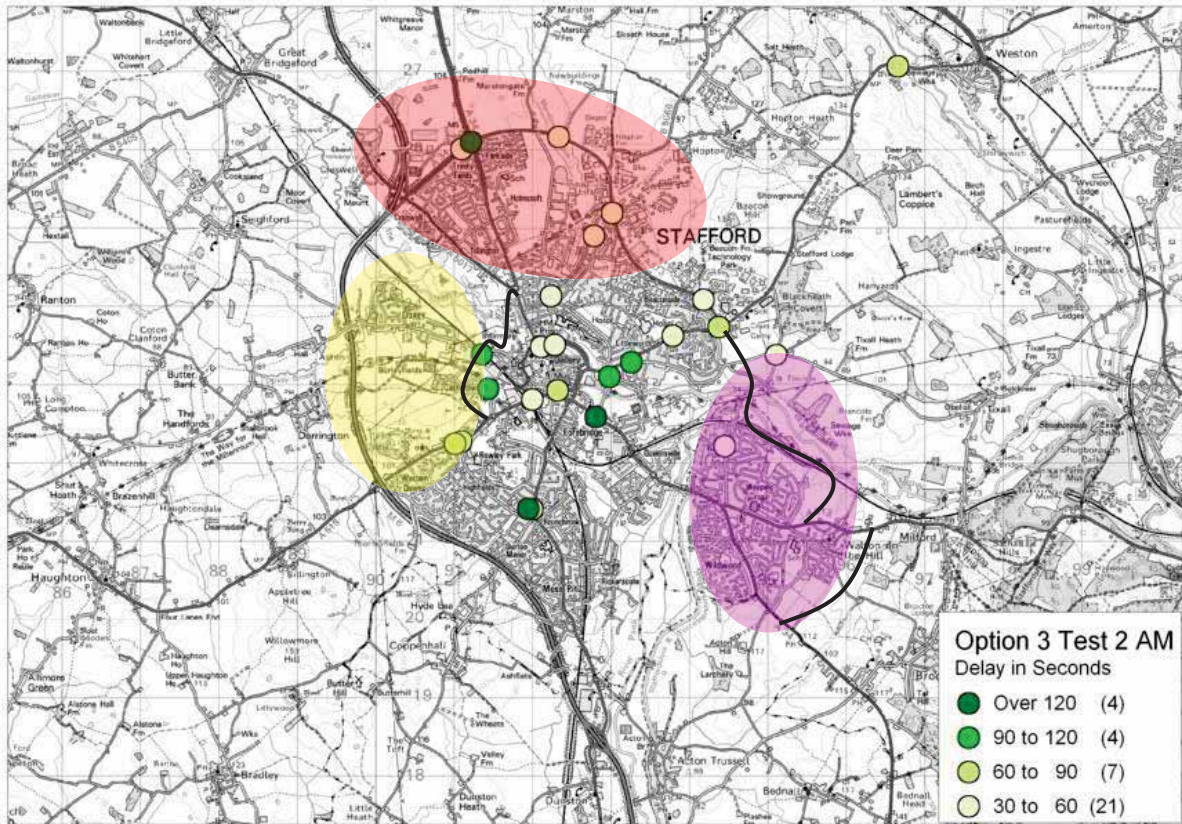
Option 2 Test 2 AM



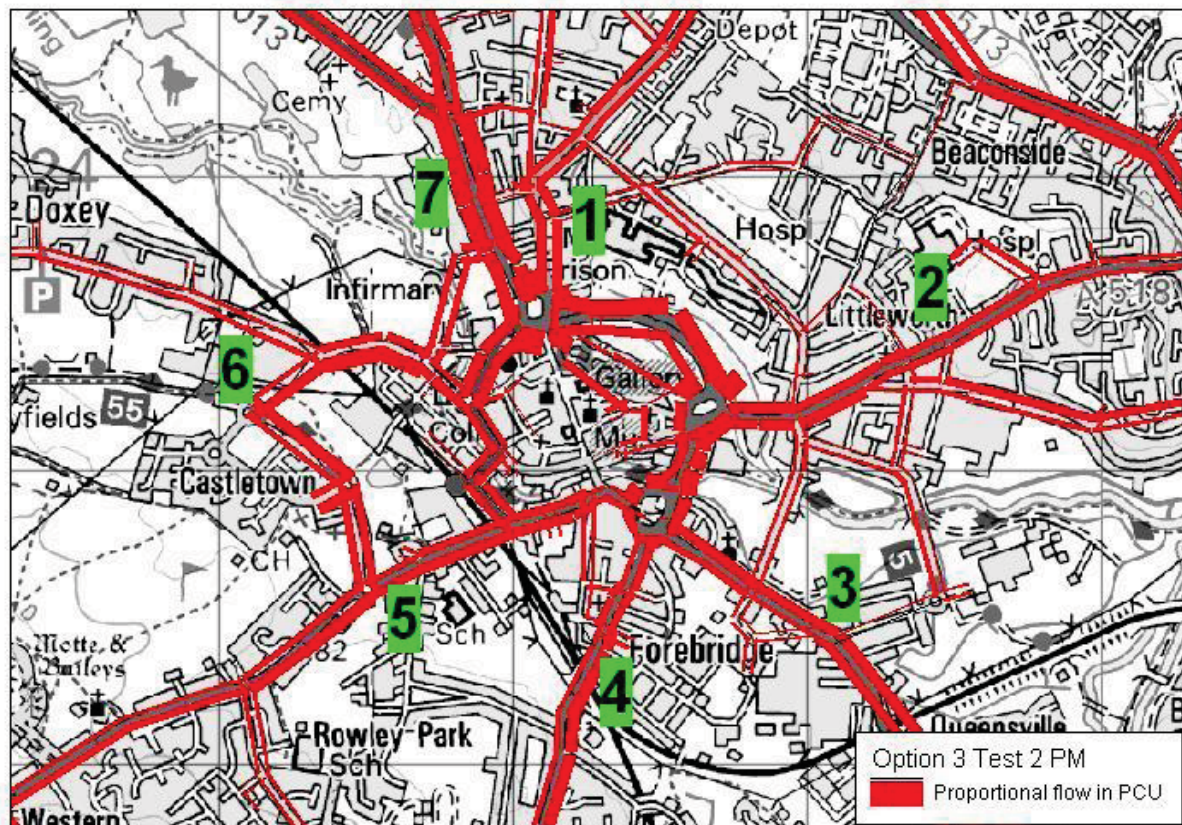
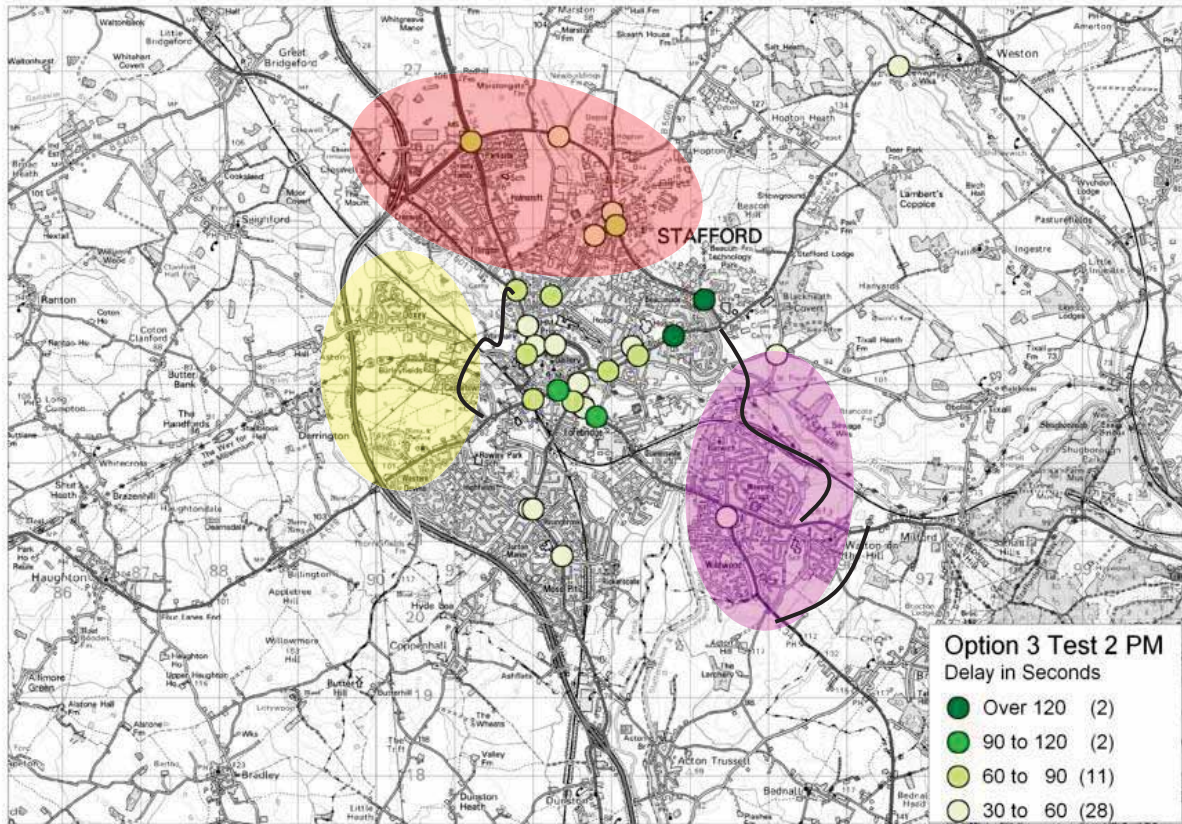
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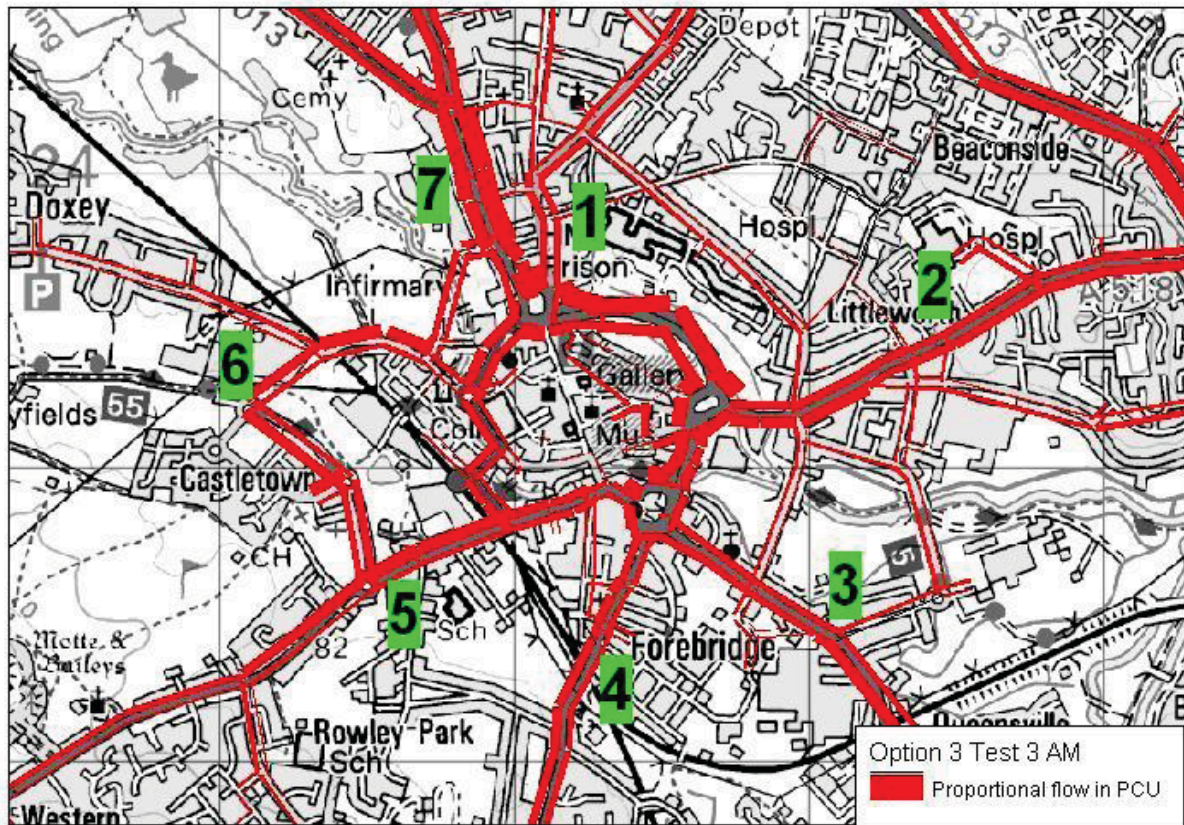
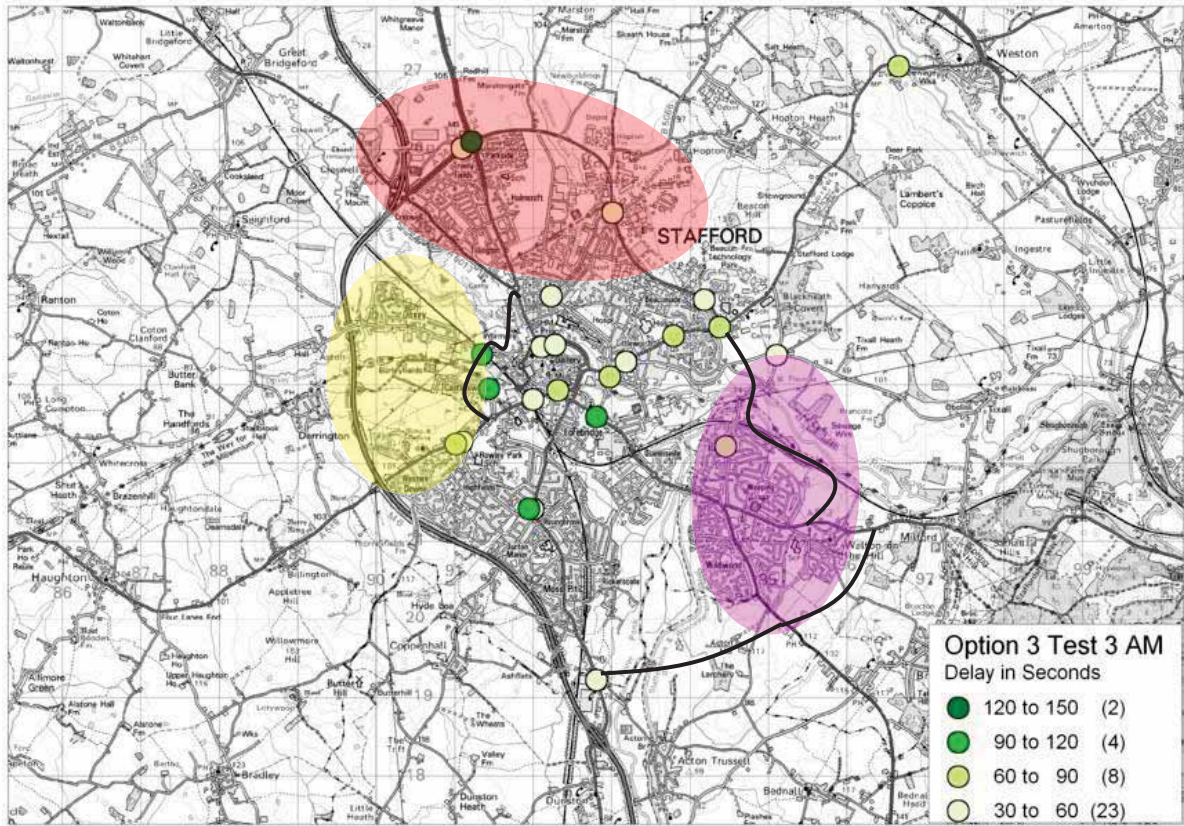
Option 3 Test 2 AM



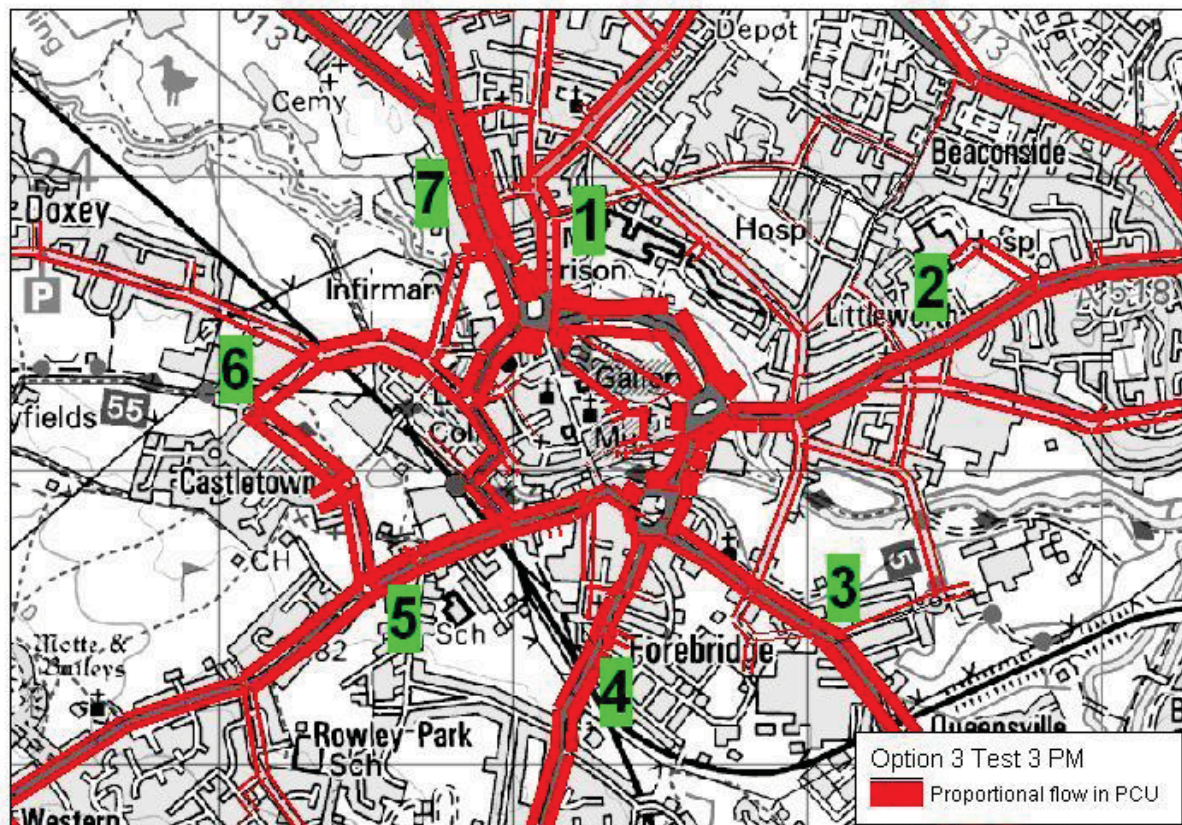
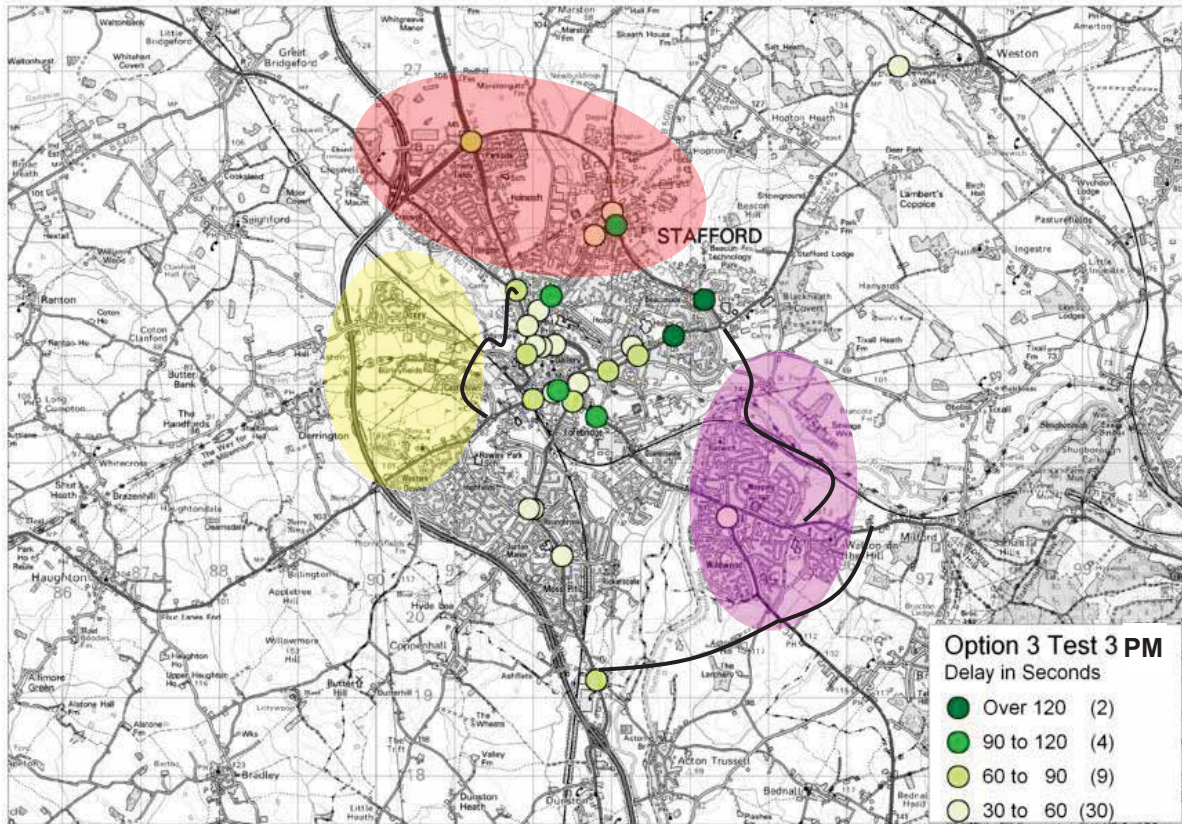
Option 3 Test 2 PM



Option 3 Test 3 AM



Option 3 Test 3 PM



Appendix E

Journey Time Analysis

11 Route Journey Time Figures

ID	Route/Timing Section	BY			AM			PM			O3T3		
		Modelled	DM	O2T2	Modelled	O2T2	DM	Modelled	O2T2	DM	Modelled	O2T2	Modelled
1	A518 / Bridge St	35	36	83	88	89	40	107	258	319	323		
2	A518 / Friars Rd	40	41	89	93	94	45	113	264	324	328		
3	A518 / Epsleys Yard	48	49	99	103	104	53	124	275	335	339		
4	A518 / Station Rd	80	80	173	172	177	88	184	338	398	402		
5	A518 / Kingsway	122	123	228	227	231	130	233	394	454	458		
6	A518 / WestWay	170	170	286	284	289	178	291	458	517	520		
7	A518 / Sundown Drive	259	259	392	391	396	266	397	568	627	630		
8	A518 / M6	273	273	407	405	410	281	411	582	641	645		
	Route 1 A518 E to W	273	273	407	405	410	281	411	582	641	645		
1	A518 / Sundown Drive	24	25	37	37	37	21	29	29	29	29		
2	A518 / WestWay	104	124	443	441	415	99	118	119	118	118		
3	A518 / Kingsway	150	170	498	496	470	145	171	174	173	173		
4	A518 / Station Rd	215	236	645	706	661	209	263	422	428	392		
5	A518 / Epsleys Yard	233	258	671	731	687	235	308	466	472	436		
6	A518 / Friars Rd	238	322	681	742	699	241	318	477	484	448		
7	A518 / Bridge St	264	395	887	948	904	278	486	595	602	572		
8	Wolverhampton Rd / Bridge St	286	417	923	984	940	303	527	636	643	614		
9	Lichfield Rd / Queensway	306	438	952	1013	969	324	557	667	674	644		
10	Lichfield Rd SB / Lichfield Rd WB	326	458	985	1046	1002	343	637	791	766	742		
11	A34 / A449	351	483	1030	1090	1046	356	666	823	806	772		
	Route 1 A518 W to E	351	483	1030	1090	1046	356	666	823	806	772		
1	Weston Rd / Blackheath Lane	52	64	56	57	56	52	62	53	58	59		
2	Blackheath Lane / Tixall Rd	138	151	165	166	165	192	554	146	154	154		
3	Blackheath Lane / St. Thomas Lane	160	173	190	191	190	215	577	169	177	176		
4	Baswich Lane / Porlock Av.	281	294	341	341	345	336	705	365	372	371		
5	Baswich Lane / Weeping Cross	316	329	383	383	387	371	748	408	415	414		
6	Weeping Cross / Hillcroft Av	369	383	437	438	442	424	802	463	470	468		
7	Milford Rd / The Crescent	406	420	518	519	522	462	845	546	553	552		
8	Milford Rd / School Lane	440	454	552	552	556	495	879	579	586	586		
9	Main Rd / Brocton Rd	525	540	662	662	666	581	970	690	696	696		
	Route 2 Baswich NW to SE	525	540	662	662	666	581	970	690	696	696		
8	Milford Rd / School Lane	79	79	103	104	103	79	79	103	103	101		
7	Milford Rd / The Crescent	117	118	152	154	151	117	122	151	151	149		
6	Weeping Cross / Hillcroft Av	149	150	223	225	222	149	155	221	221	219		
5	Baswich Lane / Weeping Cross	209	210	290	292	289	209	221	287	288	285		
4	Baswich Lane / Porlock Av.	239	240	320	322	319	239	251	317	318	315		
3	Blackheath Lane / St. Thomas Lane	358	360	434	436	433	358	375	432	433	430		
2	Blackheath Lane / Tixall Rd	413	412	510	510	507	414	467	513	518	516		
1	Weston Rd / Blackheath Lane	621	869	824	987	1007	474	788	590	621	621		
0	Weston Rd / Beaconside	676	925	908	1071	1091	529	852	669	703	703		
	Route 2 Baswich SE to NW	676	925	908	1071	1091	529	852	669	703	703		

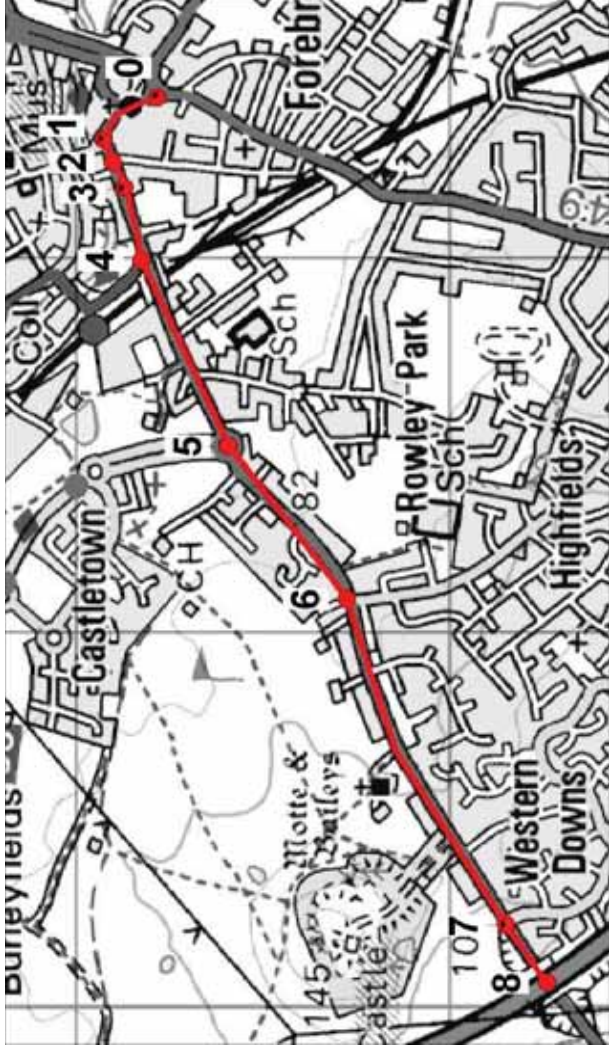
ID	Route/Timing Section	BY			AM			PM			O3T3 Modelled	O3T2 Modelled	O3T1 Modelled
		Modelled	DM	O2T2	Modelled	DM	O2T2	Modelled	DM	O2T2			
1	Beaconside / Stone Rd	59	74	265	258	239	60	92	435	431	398		
2	Beaconside / TollGate Drive	137	165	391	394	365	134	179	530	580	493		
3	Beaconside / Sandon Rd	192	222	463	467	437	185	240	593	643	557		
4	Beaconside / Coronation Rd	217	247	522	544	493	212	286	640	703	605		
5	Beaconside / Sheringham Covert	302	336	699	741	677	317	550	1365	1528	1398		
6	Beaconside / Weston Rd	332	367	758	801	737	347	589	1423	1586	1456		
	Route 3 Beaconside W to E	332	367	758	801	737	347	589	1423	1586	1456		
5	Beaconside / Sheringham Covert	25	26	130	102	86	29	44	51	51	52		
4	Beaconside / Coronation Rd	103	104	223	196	179	110	139	169	216	260		
3	Beaconside / Sandon Rd	122	124	425	428	369	130	182	330	442	429		
2	Beaconside / TollGate Drive	169	171	475	479	420	177	236	390	503	490		
1	Beaconside / Stone Rd	258	263	838	847	780	266	538	857	922	866		
0	A34 / Ecleshall Rd	317	323	913	923	856	324	607	947	1005	951		
	Route 3 Beaconside E to W	317	323	913	923	856	324	607	947	1005	951		
4	M6 / RdAbout	22	23	33	33	35	22	32	32	32	32		
3	M6 / Creswell Grove	376	524	596	563	529	356	483	481	465	465		
2	M6 / A5182	1072	1369	1416	1385	1317	1015	1271	1268	1250	1249		
1	M6 / Queensway	1092	1388	1436	1404	1336	1035	1290	1288	1269	1268		
0	Queensway / A519	1097	1393	1441	1409	1341	1040	1295	1293	1274	1273		
	Route 4 M6 S to N	1097	1393	1441	1409	1341	1040	1295	1293	1274	1273		
1	M6 / Queensway	5	5	5	5	5	5	5	5	5	5		
2	M6 / A5182	15	15	15	15	15	15	15	15	15	15		
3	M6 / Creswell Grove	660	809	806	805	794	697	844	811	813	786		
4	M6 / RdAbout	979	1213	1214	1203	1189	1034	1308	1288	1277	1240		
5	M6 / A449	996	1231	1239	1227	1226	1051	1332	1324	1304	1276		
	Route 4 M6 N to S	996	1231	1239	1227	1226	1051	1332	1324	1304	1276		
1	Sandon Rd / Beaconside	59	57	74	73	73	52	62	67	67	67		
2	Sandon Rd / Astonfields Rd	137	135	167	168	167	127	154	159	161	160		
3	Sandon Rd / Corporation St	189	188	248	250	249	181	297	421	431	410		
4	Sandon Rd / Browning St	213	212	278	280	279	205	330	457	468	445		
5	B5066 / Red Lion St	261	261	421	435	420	249	396	525	535	513		
6	B5066 / Gaolgate St	273	273	437	451	437	268	431	560	570	548		
7	B5066 / A518	291	292	460	474	459	292	650	778	776	755		
8	A34 / Sash St	329	331	523	537	522	335	719	839	837	817		
9	A34 / Browning St	348	350	552	565	550	356	750	871	869	849		
10	A34 / RdAbout	376	379	589	602	587	385	809	1096	1117	1079		
	Route 5 Sandon E to W	376	379	589	602	587	385	809	1096	1117	1079		

ID	Route/Timing Section	BY			DM			AM			PM			O3T3		
		Modelled			Modelled			Modelled			Modelled			Modelled		
1	A34 / Browning St	32	33	47	47	47	47	47	47	47	47	47	47	47	45	45
2	A34 / Sash St	51	53	100	99	99	99	99	99	99	99	99	99	99	139	144
3	A34 / B5066	85	88	151	151	151	151	151	151	151	151	151	151	199	204	199
4	B5066 / Red Lion St	97	100	173	173	173	173	173	173	173	173	173	173	219	224	219
5	Sandon Rd / Browning St	129	133	214	214	214	214	214	214	214	214	214	214	332	342	343
6	Sandon Rd / Corporation St	165	170	271	273	273	273	273	273	273	273	273	273	399	410	412
7	Sandon Rd / Astonfields Rd	207	212	323	326	326	326	326	326	326	326	326	326	452	463	465
8	Sandon Rd / Beaconside	289	296	472	480	480	480	480	480	480	480	480	480	637	687	655
9	A513 / B5066	323	335	521	537	537	537	537	537	537	537	537	537	725	781	747
	Route 5 Sandon W to E	323	335	521	537	537	537	537	537	537	537	537	537	725	781	747
1	Wolverhampton Rd / Queensway	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2	Queensway	27	29	34	35	35	35	35	35	35	35	35	35	35	35	36
3	Queensway / SouthWalls	53	49	62	62	62	62	62	62	62	62	62	62	64	63	63
4	Queensway / RdAboutN	67	65	83	83	83	83	83	83	83	83	83	83	110	102	104
5	Queensway / Gaolgate St	133	170	294	299	299	299	299	299	299	299	299	299	300	273	305
6	RdAbout / Chell Rd	139	176	305	310	310	310	310	310	310	310	310	310	380	348	393
7	Chell Rd / Broad St	178	218	357	361	361	361	361	361	361	361	361	361	465	581	627
8	Tenterbanks / Victoria Rd	199	239	383	388	388	388	388	388	388	388	388	388	491	608	653
9	Victoria Rd / Station Rd	215	255	404	409	409	409	409	409	409	409	409	409	513	629	675
10	Station Rd / Newport Rd	249	294	469	473	473	473	473	473	473	473	473	473	1009	947	988
11	Newport Rd	267	316	496	498	498	498	498	498	498	498	498	498	991	1023	1032
12	Newport Rd / Friars Rd	273	380	506	509	509	509	509	509	509	509	509	509	1002	1034	1043
13	Newport Rd / Bridge St	298	453	712	715	715	715	715	715	715	715	715	715	1120	1153	1168
0	Wolverhampton Rd / Bridge St	320	475	748	751	751	751	751	751	751	751	751	751	1161	1194	1209
	Route 6 TC Anticlockwise	320	475	748	751	751	751	751	751	751	751	751	751	1161	1194	1209
1	Wolverhampton WB / Wolverhampton NB	6	6	25	24	24	24	24	24	24	24	24	24	32	41	30
2	Newport Rd / Bridge St	41	42	108	112	112	112	112	112	112	112	112	112	290	359	353
3	Newport Rd / Friars Rd	46	47	113	118	118	118	118	118	118	118	118	118	295	365	358
4	Newport Rd	53	54	123	128	128	128	128	128	128	128	128	128	306	376	369
5	Station Rd / Newport Rd	117	114	244	244	244	244	244	244	244	244	244	244	385	454	447
6	Station Rd / Victoria Rd	143	176	320	323	323	323	323	323	323	323	323	323	421	489	483
7	Victoria Rd / Tenterbanks	160	192	341	343	343	343	343	343	343	343	343	343	442	510	504
8	Chell Rd / Broad Eye	182	215	371	373	373	373	373	373	373	373	373	373	490	562	558
9	Chell RdNB / RdAbout	230	345	452	456	456	456	456	456	456	456	456	456	627	693	684
10	RdAbout / Foregate St	250	364	488	493	493	493	493	493	493	493	493	493	661	727	719
11	RdAbout / Gaol Rd	274	387	521	526	526	526	526	526	526	526	526	526	688	754	745
12	RdAbout / Queensway	279	393	529	531	531	531	531	531	531	531	531	531	693	759	750
13	RdAbout / Lammascote Rd	328	495	729	736	736	736	736	736	736	736	736	736	928	1002	980
14	RdAbout / Queensway	342	510	747	754	754	754	754	754	754	754	754	754	948	1023	1001
15	Queensway	369	551	793	801	801	801	801	801	801	801	801	801	1093	1153	1114
16	Queensway / Wolverhampton Rd	380	563	820	828	828	828	828	828	828	828	828	828	1117	1178	1139
	Route 6 TC Clockwise	380	563	820	828	828	828	828	828	828	828	828	828	1117	1178	1139

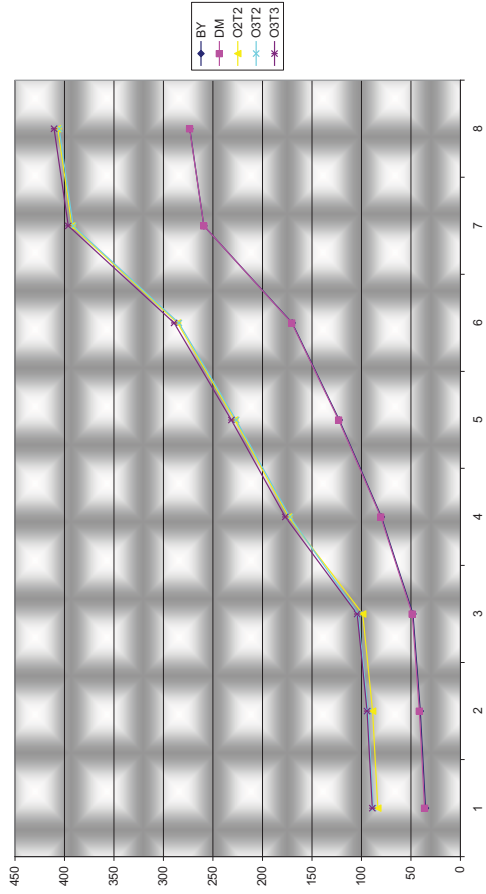
ID	Route/Timing Section	BY			AM			PM			O3T3 Modelled	O3T2 Modelled	O3T1 Modelled
		Modelled	DM	O2T2	Modelled	DM	O2T2	Modelled	DM	O2T2			
1	A5013 / Holmcroft Rd	96	107	121	123	122	87	94	131	126	125		
2	A5013 / Grey Friars Rd	174	187	232	238	232	166	185	230	224	222		
3	A34 / Holmcroft Rd	256	280	396	341	381	249	352	410	382	384		
4	A34 / Beaconside	330	356	516	464	500	324	450	521	493	498		
0	A34 / A5013	376	401	569	518	553	370	502	580	551	556		
	Route 7 Triangle Anticlockwise	376	401	569	518	553	370	502	580	551	556		
1	A34 / Beaconside	62	77	268	261	242	63	95	438	434	401		
2	A34 / Holmcroft Rd	149	164	377	371	351	143	204	548	543	511		
3	A5013 / Grey Friars Rd	233	255	478	473	455	224	294	643	638	605		
4	A5013 / Holmcroft Rd	304	327	552	547	530	296	366	716	711	678		
5	A5013 / M6	378	398	631	624	607	379	454	801	795	763		
0	A5013 / A34	427	447	687	680	662	428	509	871	859	833		
	Route 7 Triangle Clockwise	427	447	687	680	662	428	509	871	859	833		
1	A34 / Riverway	56	60	100	127	102	112	430	408	521	478		
2	A34 / St Leonards Av	82	84	126	152	127	153	459	437	550	506		
3	A34 / RdAbout	145	147	196	223	197	217	532	512	624	579		
4	A34 / A513	228	230	287	313	287	300	622	612	724	678		
5	A34 / OldCroft Rd	315	325	418	438	418	387	779	887	962	916		
	Route 8 Wildwood W to E	315	325	418	438	418	387	779	887	962	916		
1	A34 / A513	93	95	142	112	107	92	100	112	109	104		
2	A34 / RdAbout	178	201	236	206	200	178	194	207	203	196		
3	A34 / St Leonards Av	243	283	297	263	258	239	261	265	261	254		
4	A34 / Riverway	356	586	606	690	606	284	332	335	331	323		
5	A34 / LichfieldRd	404	634	676	761	677	329	483	501	491	464		
6	A34 / A449	429	658	717	802	718	344	508	527	521	489		
7	Wolverhampton / Bridge St	446	677	746	832	748	362	536	556	549	517		
8	Wolverhampton / Queensway	468	699	777	863	779	385	568	588	581	549		
	Route 8 Wildwood E to W	468	699	777	863	779	385	568	588	581	549		
1	A449 / Mill Lane	46	52	74	64	186	46	64	144	72	286		
2	A449 / School Lane	115	114	137	126	248	115	126	274	181	348		
3	A449 / Rickerscote Rd	168	178	220	205	324	168	206	445	357	426		
4	A449 / WestWay	243	330	524	478	523	245	332	565	482	547		
5	A449 / New Garden St	334	421	614	569	613	336	423	656	573	638		
6	A449 / Wolverhampton Rd	368	458	666	621	665	372	478	709	626	691		
7	Wolverhampton / Bridge St	386	477	696	650	695	390	506	738	654	719		
8	Wolverhampton / Queensway	406	497	725	680	724	411	537	768	684	749		
9	Lichfield Rd / A34	426	517	758	713	757	429	617	893	777	847		
	Route 9 A449 S to N	426	517	758	713	757	429	617	893	777	847		

ID	Route/Timing Section	BY			DM			AM			PM			O3T3					
		Modelled			Modelled			Modelled			Modelled			Modelled			Modelled		
1	A449 / New Garden St	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
2	A449 / WestWay	120	134	134	121	134	134	134	134	134	134	134	134	134	136	136	136	136	136
3	A449 / Rickerscote Rd	195	307	307	199	307	307	307	307	307	307	307	307	307	328	328	328	328	328
4	A449 / School Lane	240	352	352	243	352	352	352	352	352	352	352	352	352	376	376	376	376	376
5	A449 / Mill Lane	316	437	437	320	437	437	437	437	437	437	437	437	437	461	461	461	461	461
6	A449 / RdAbout	353	479	479	358	479	479	479	479	479	479	479	479	479	502	502	502	502	502
	Route 9 A449 N to S	353	479	479	358	479	479	404	404	404	404	466	466	502	502	502	535	535	587
1	A34 / A51	249	255	255	257	255	255	254	254	254	256	256	256	278	278	278	275	275	276
2	A34 / B5026	326	340	340	342	340	340	340	340	340	340	340	340	340	370	370	370	370	370
3	A34 / NewCastle Rd	421	441	441	441	439	439	439	439	439	440	440	440	476	476	476	476	476	477
4	A34 / Meaford	473	498	498	498	495	495	495	495	495	496	496	496	534	534	534	535	535	536
5	A34 / A5035	736	774	774	774	770	770	771	771	771	770	770	770	809	809	809	811	811	812
6	A34 / Whitmore Rd	772	814	814	814	810	810	810	810	810	809	809	809	848	848	848	850	850	851
7	A34 / Bankhouse Rd	793	838	838	838	834	834	834	834	834	834	834	834	872	872	872	874	874	875
8	A34 / Queensway	859	913	913	913	908	908	909	909	909	907	907	907	944	944	944	947	947	948
9	A500	870	925	925	925	920	920	921	921	921	919	919	919	956	956	956	958	958	960
10	A500 / A519	939	994	994	994	989	989	990	990	990	988	988	988	1025	1025	1025	1027	1027	1029
	Route 10 A34 S to N	939	994	994	994	989	989	990	990	990	988	988	988	1025	1025	1025	1027	1027	1029
1	A500 / Stone Rd	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
2	A34 / Bankhouse Rd	165	170	170	170	170	170	170	170	170	170	170	170	175	175	175	175	175	175
3	A34 / Whitmore Rd	187	193	193	193	193	193	193	193	193	193	193	193	199	199	199	200	200	199
4	A34 / A5035	222	231	231	231	231	231	232	232	232	232	232	232	240	240	240	240	240	240
5	A34 / Meaford	487	504	504	504	504	504	504	504	504	504	504	504	517	517	517	518	518	517
6	A34 / NewCastle Rd	543	563	563	563	563	563	564	564	564	564	564	564	574	574	574	575	575	574
7	A34 / B5026	644	668	668	668	669	669	670	670	670	670	670	670	676	676	676	677	677	676
8	A34 / A51	732	764	764	764	766	766	766	766	766	767	767	767	763	763	763	766	766	764
9	A34 / A513	1014	1282	1282	1282	1621	1621	1608	1608	1608	1613	1613	1613	1047	1047	1047	1057	1057	1053
	Route 10 A34 N to S	1014	1282	1282	1282	1621	1621	1608	1608	1608	1613	1613	1613	1047	1047	1047	1057	1057	1053
1	A34 / RdAbout	47	87	87	87	173	173	175	175	175	174	174	174	147	147	147	216	216	203
2	Weston Rd / Corporation St	95	130	130	130	236	236	248	248	248	242	242	242	240	240	240	599	599	539
3	Weston Rd / Hatherton St	117	153	153	153	259	259	270	270	270	264	264	264	352	352	352	621	621	562
4	Weston Rd / Kingston Av	228	303	303	303	371	371	452	452	452	438	438	438	831	831	831	856	856	804
5	Weston Rd / RdAbout	284	359	359	359	449	449	534	534	534	519	519	519	895	895	895	935	935	882
	Route 11 Weston Rd Eastbound	284	359	359	359	449	449	534	534	534	519	519	519	895	895	895	935	935	882
1	Weston Rd / Kingston Av	51	53	53	53	70	70	85	85	85	78	78	78	353	353	353	123	123	125
2	Weston Rd / Hatherton St	113	116	116	116	136	136	152	152	152	145	145	145	419	419	419	189	189	191
3	Weston Rd / Corporation St	159	154	154	154	190	190	206	206	206	198	198	198	464	464	464	235	235	237
4	Lammascote Rd / RdAbout	184	188	188	188	241	241	257	257	257	249	249	249	517	517	517	289	289	293
5	RdAbout / QueenswayS	215	212	212	212	279	279	296	296	296	287	287	287	550	550	550	324	324	327
6	RdAbout / QueenswayN	229	222	222	222	294	294	311	311	311	302	302	302	590	590	590	359	359	362
7	Queensway / Gaolgate St	295	333	333	333	512	512	532	532	532	501	501	501	786	786	786	537	537	569
8	RdAbout / Chell Rd	313	351	351	351	534	534	555	555	555	522	522	522	1005	1005	1005	755	755	776
9	RdAbout / Grey Friars	333	370	370	370	571	571	592	592	592	560	560	560	1036	1036	1036	789	789	811
10	RdAbout / Gaol Rd	345	382	382	382	593	593	614	614	614	582	582	582	1056	1056	1056	799	799	831
	Route 11 Weston Rd Westbound	345	382	382	382	593	593	614	614	614	582	582	582	1056	1056	1056	799	799	831

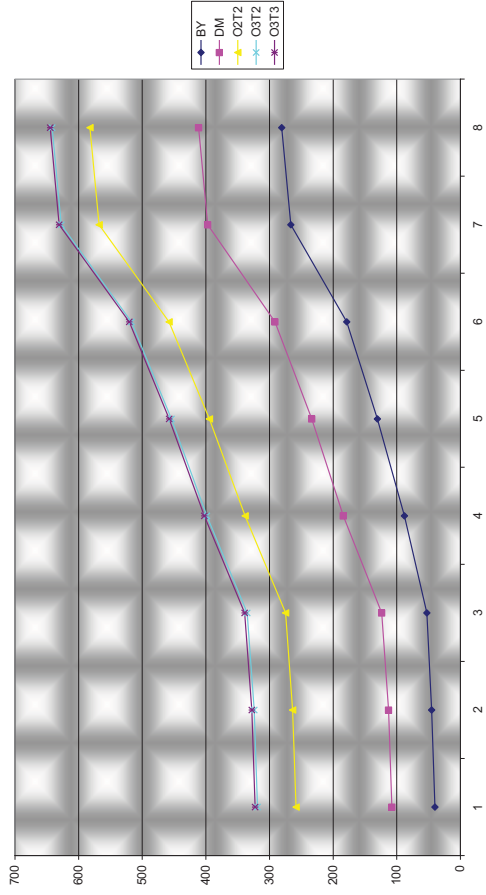
Route 1 Westbound



Route 1 WB: AM Peak



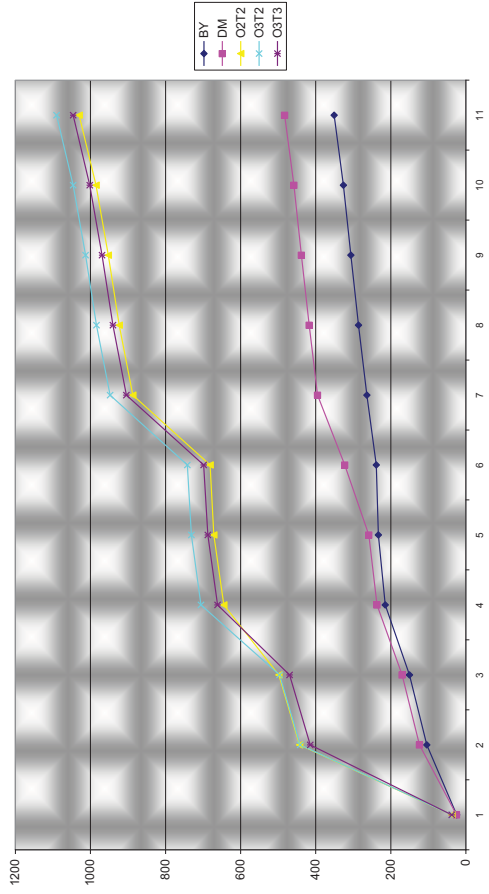
Route 1 WB: PM Peak



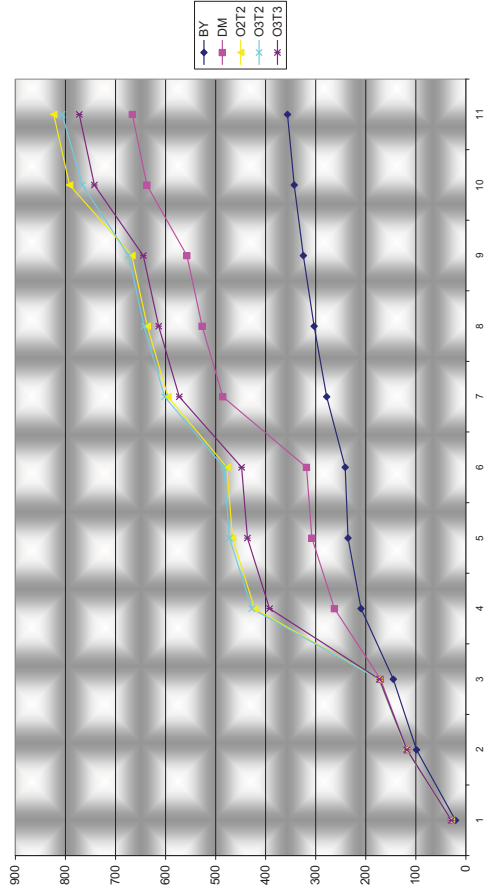
Route 1 Eastbound



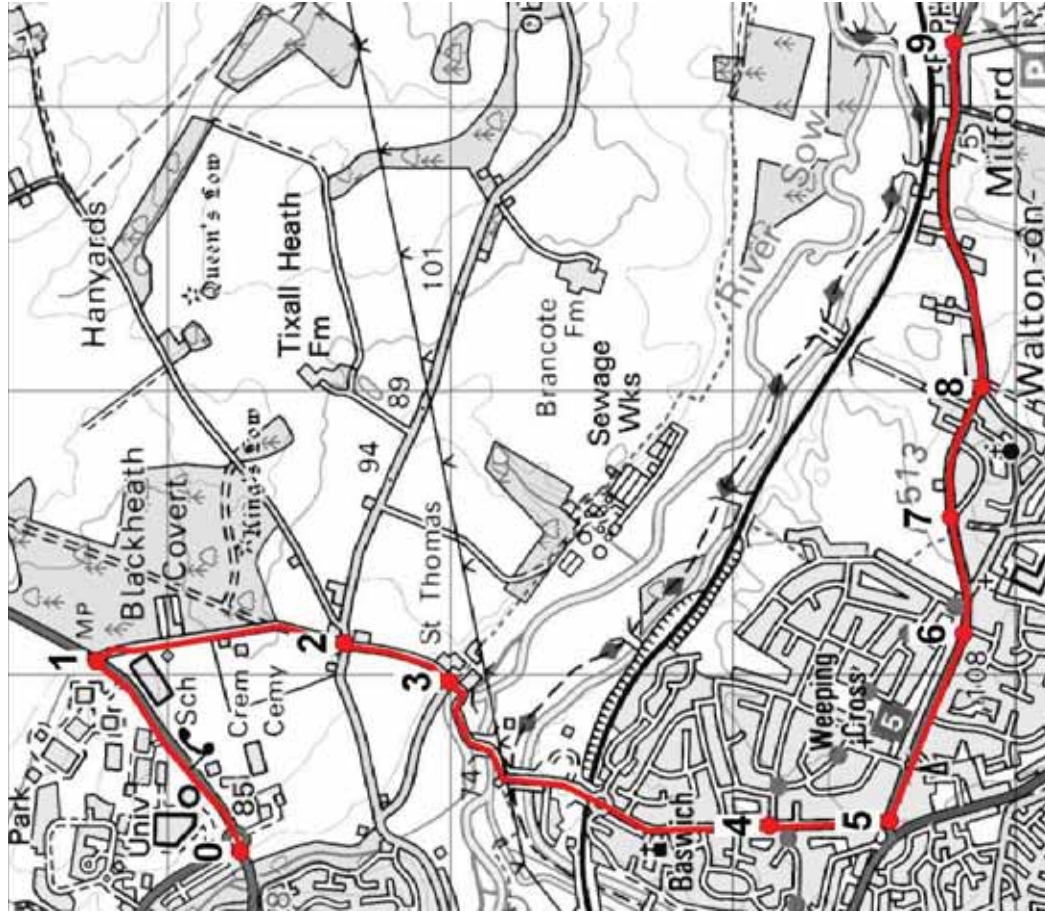
Route 1 EB: AM Peak



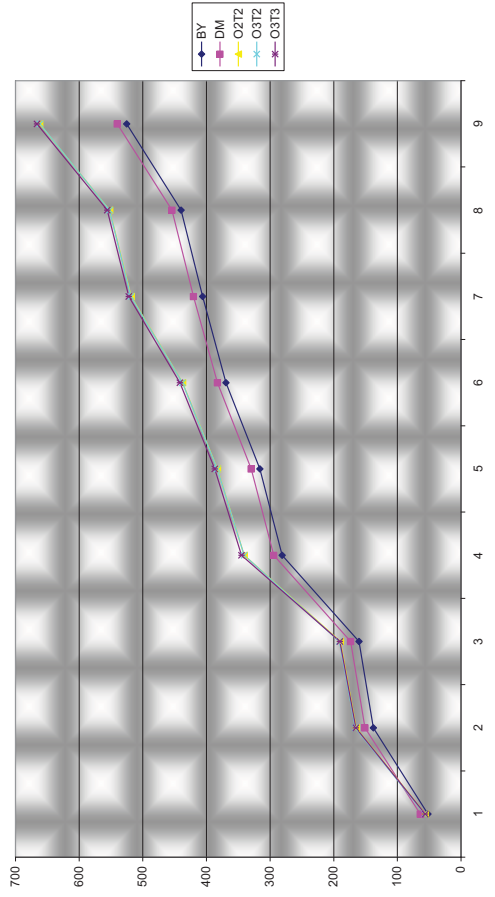
Route 1 EB: PM Peak



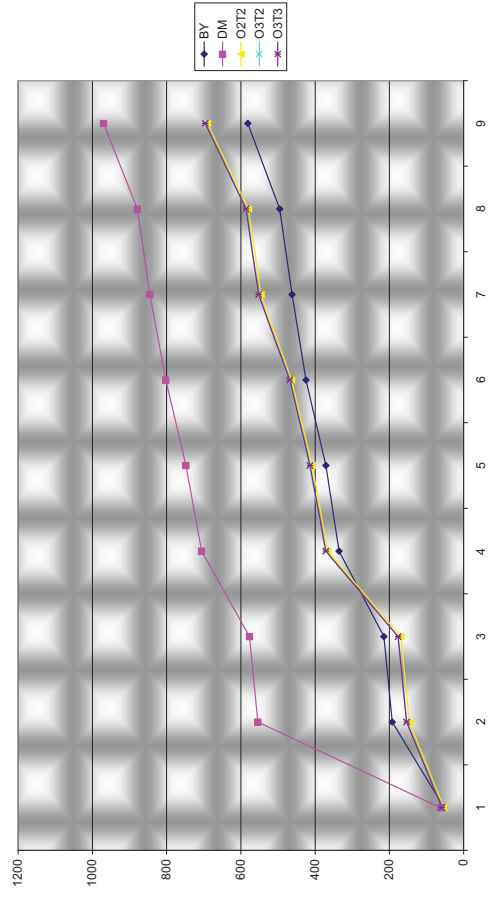
Route 2 South-Eastbound



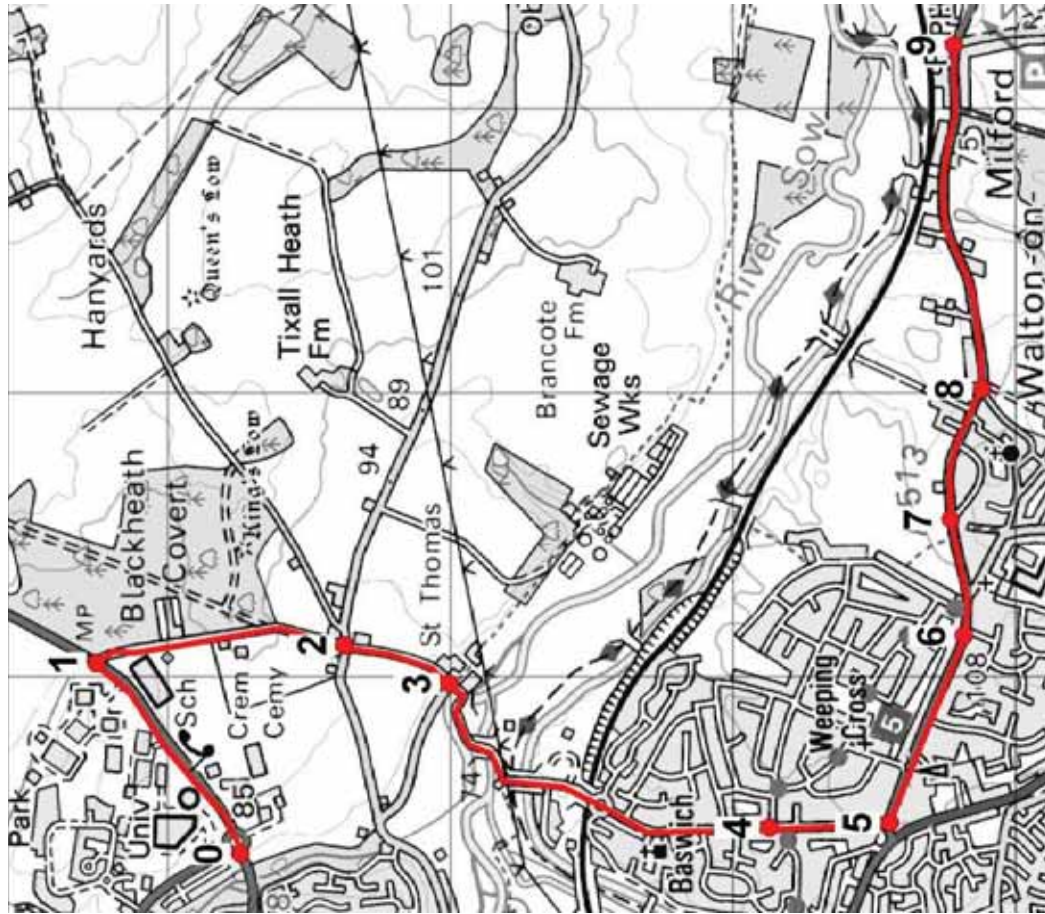
Route 2 SEB: AM Peak



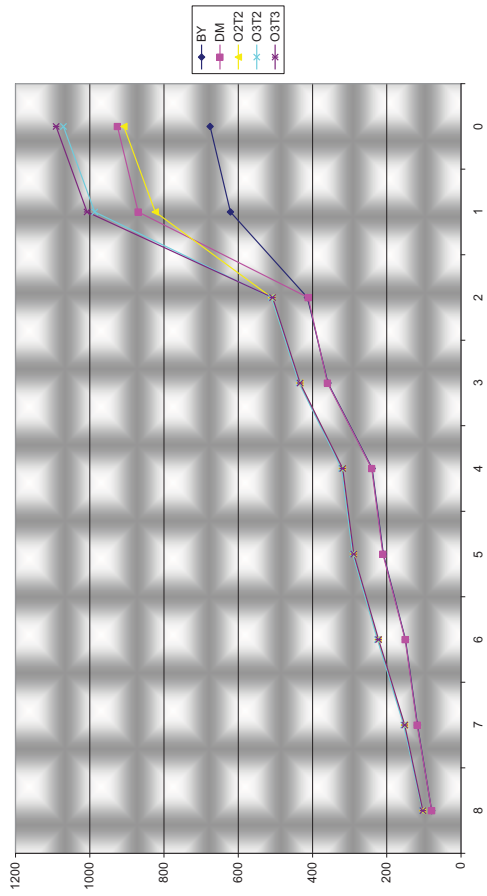
Route 2 SEB: PM Peak



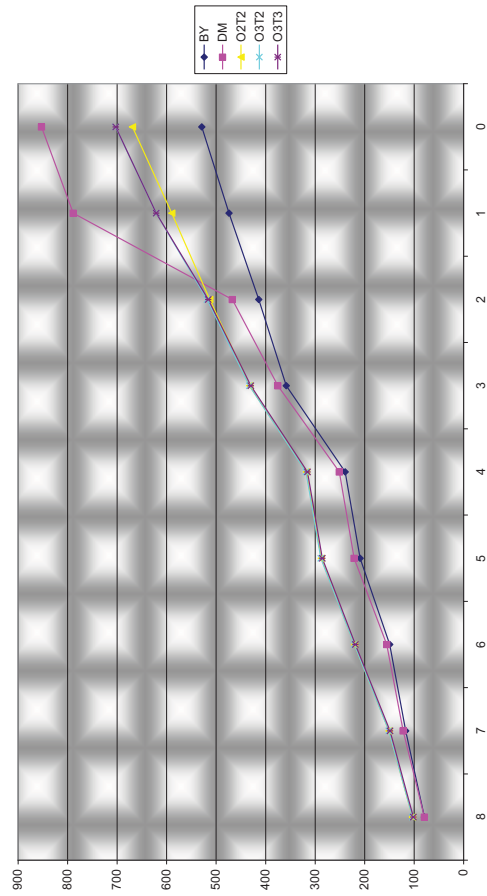
Route 2 North-Westbound



Route 2 NWB: AM Peak



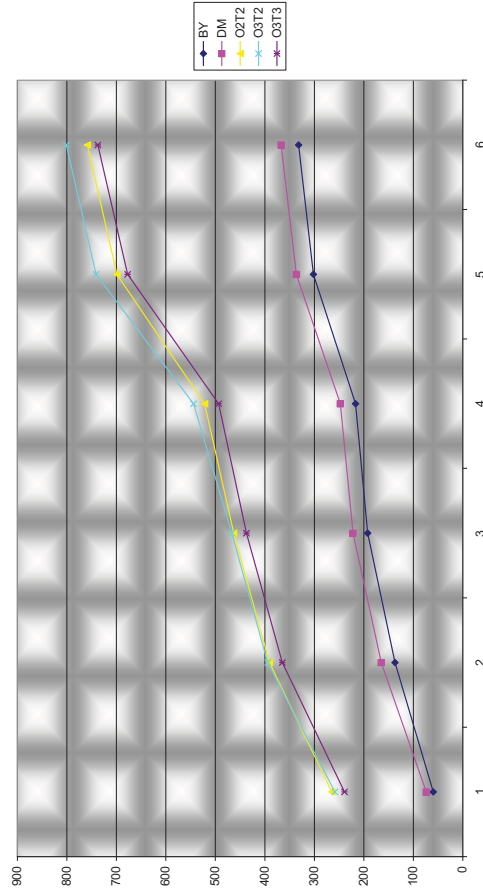
Route 2 SWB: PM Peak



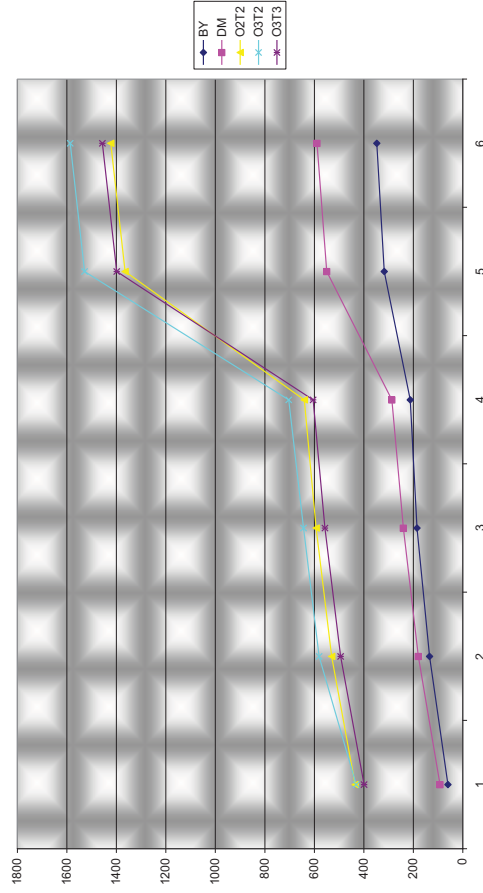
Route 3 Eastbound



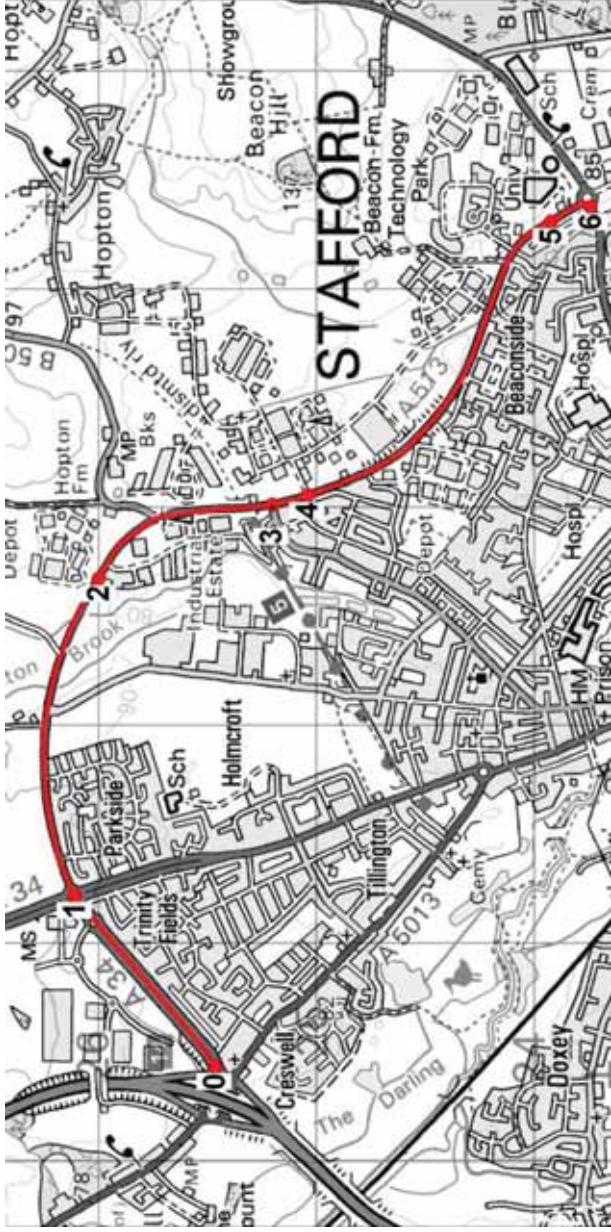
Route 3 EB: AM Peak



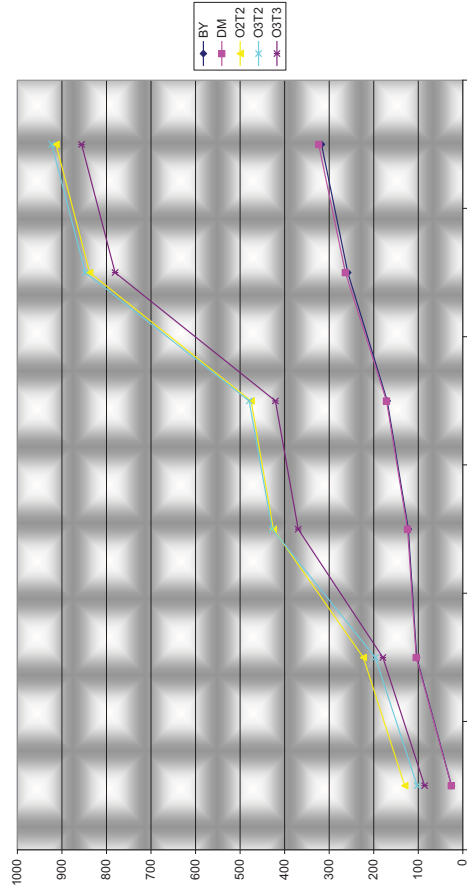
Route 3 EB: PM Peak



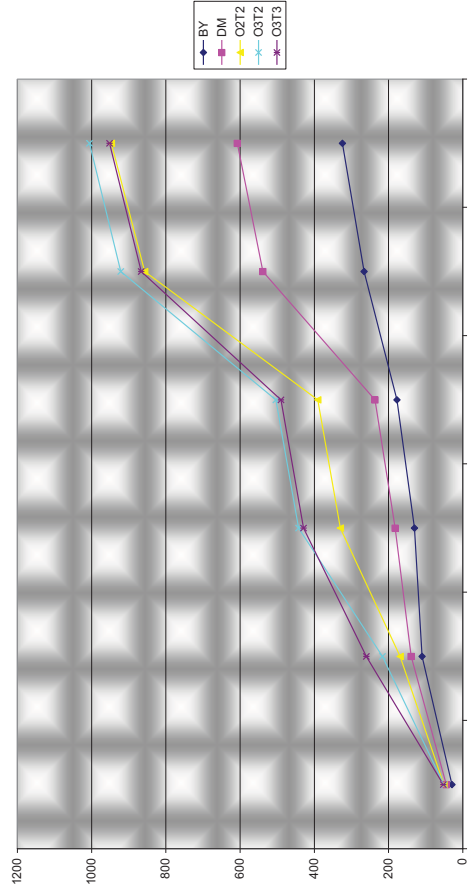
Route 3 Westbound



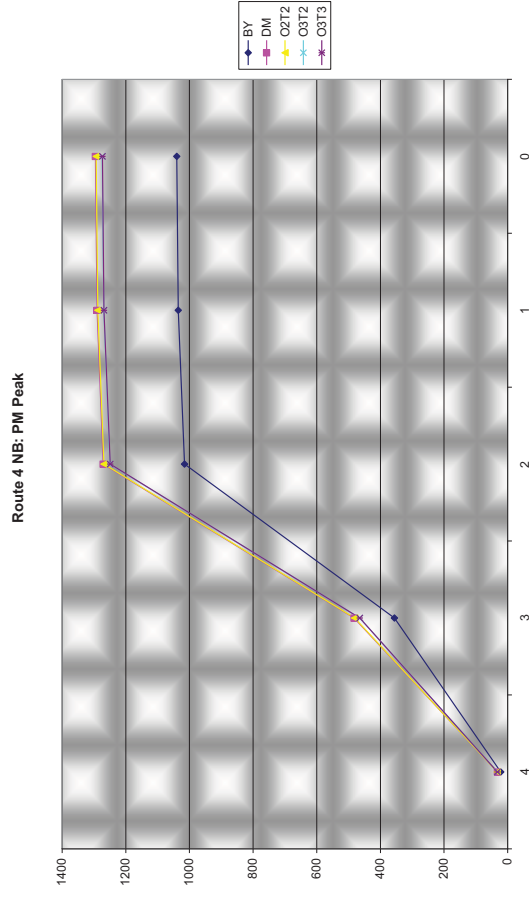
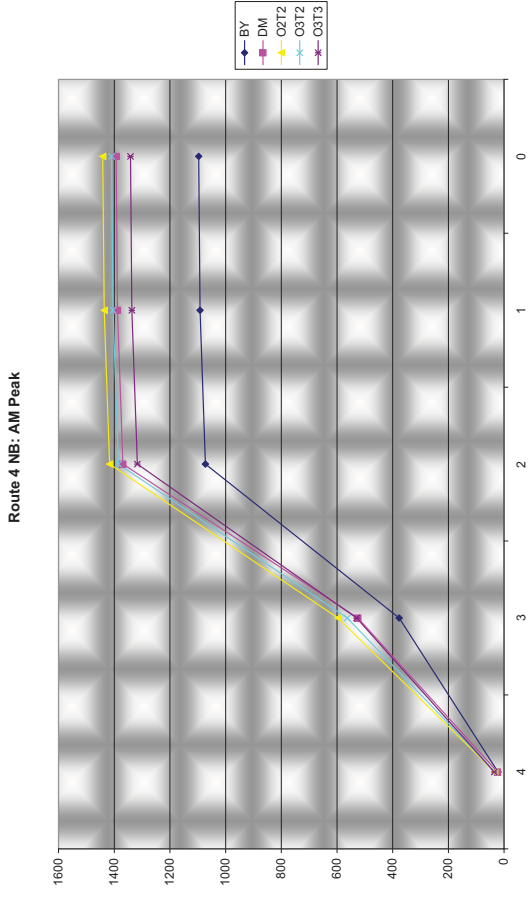
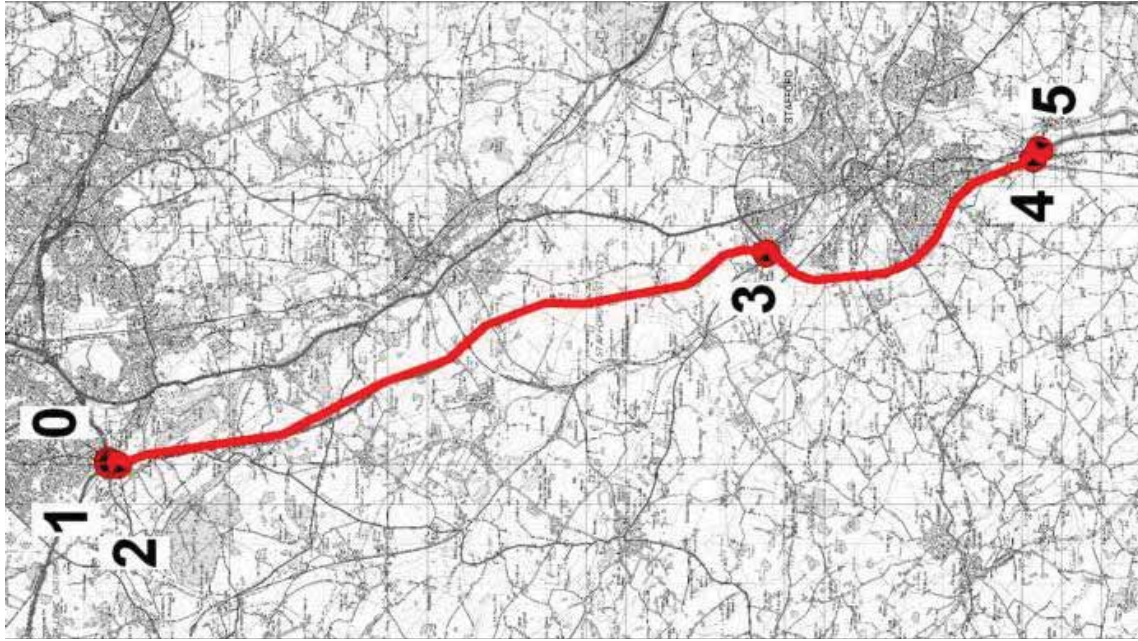
Route 3 WB: AM Peak



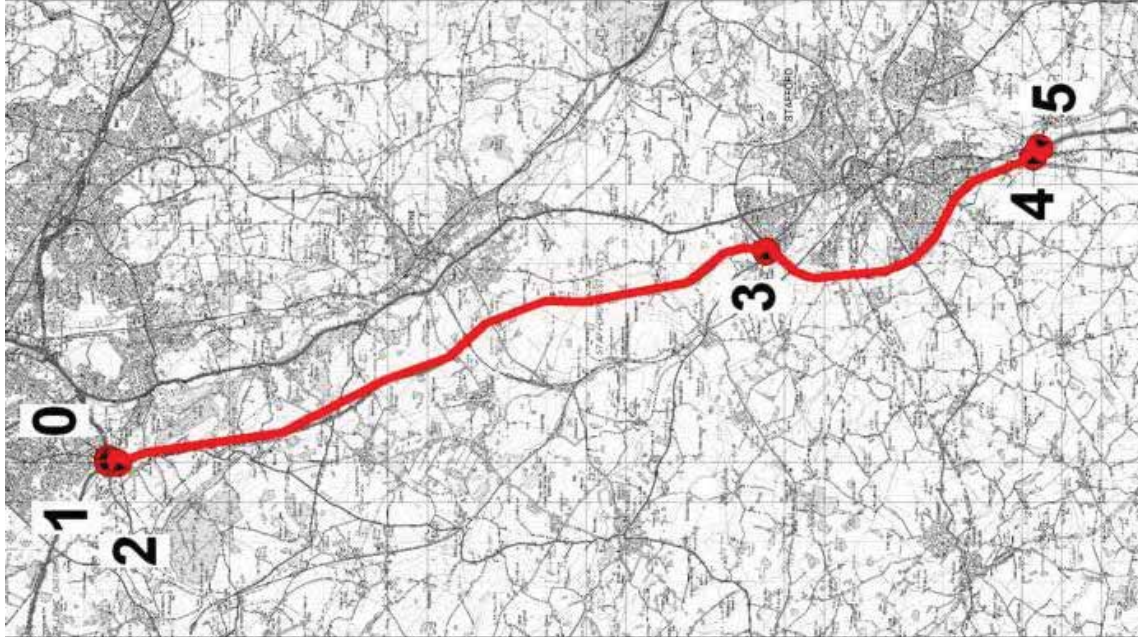
Route 3 WB: PM Peak



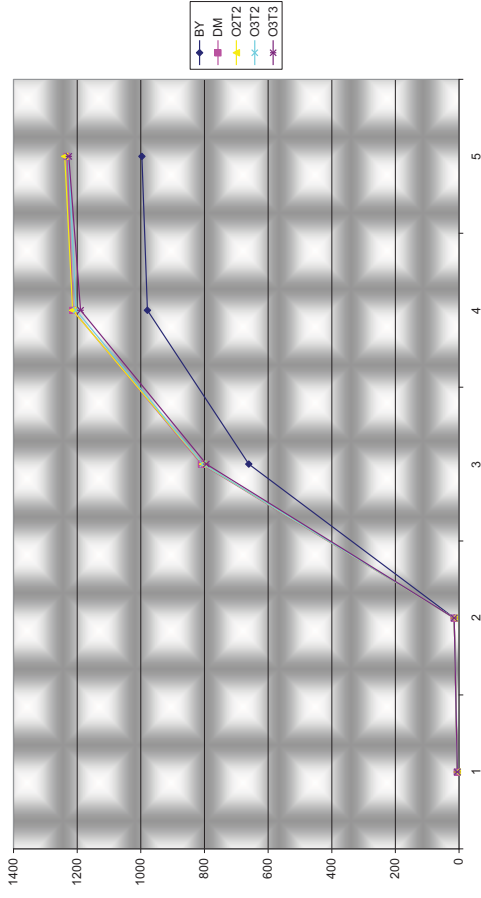
Route 4 Northbound



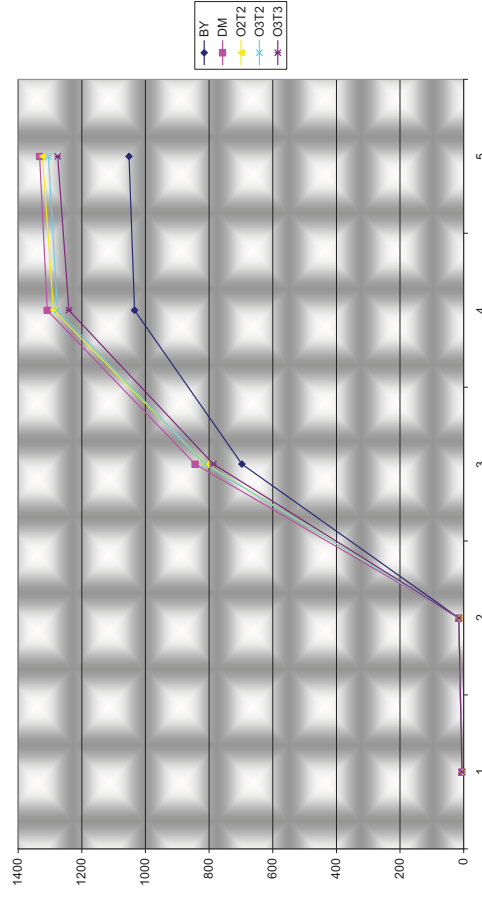
Route 4 Southbound



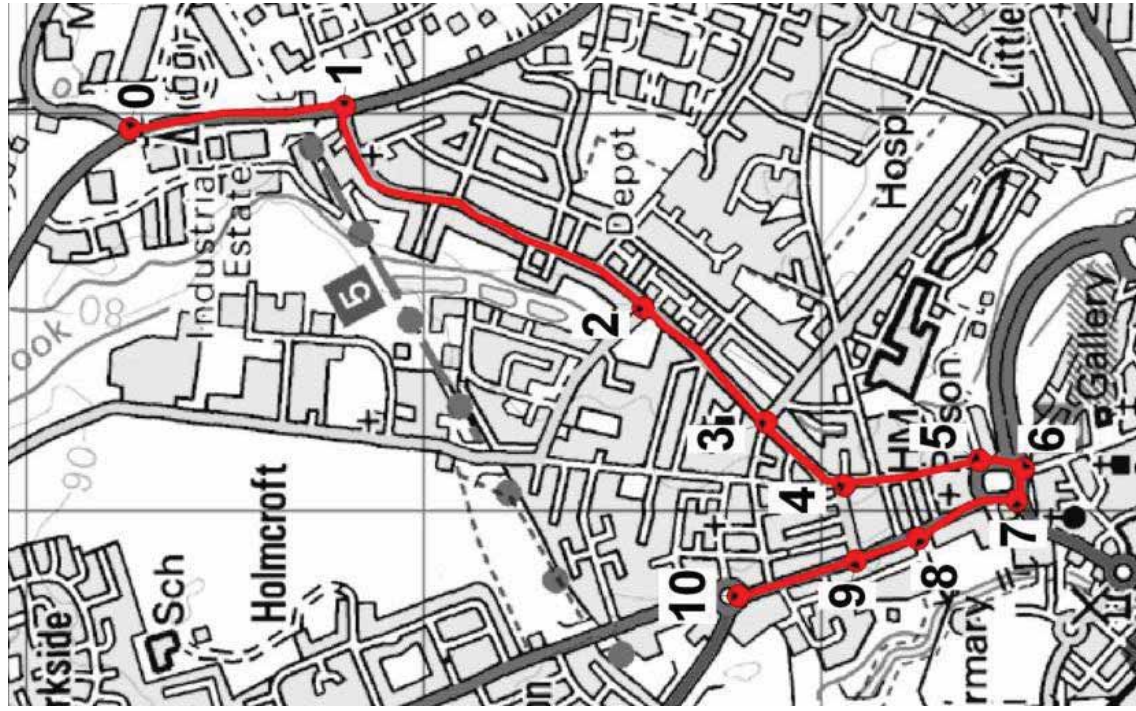
Route 4 SB: AM Peak



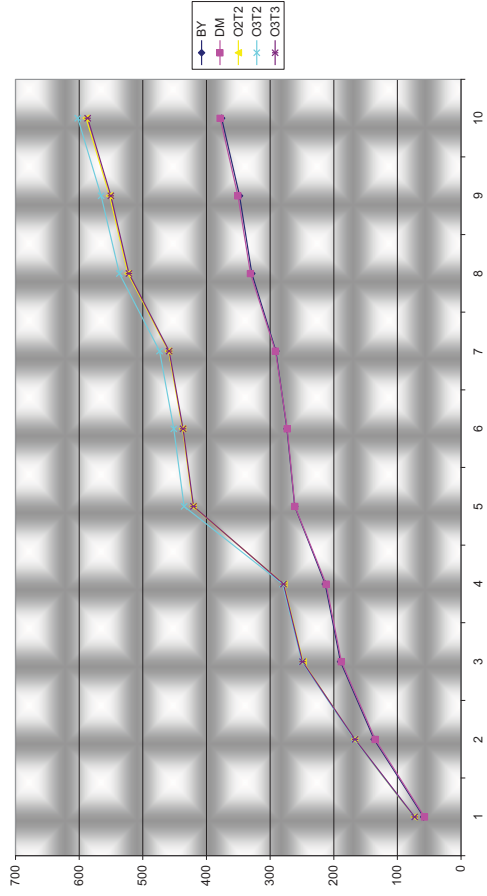
Route 4 SB: PM Peak



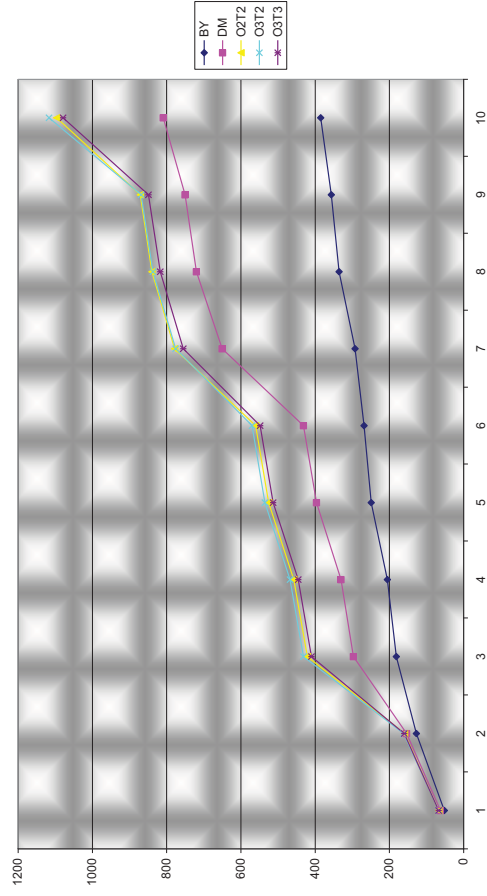
Route 5 Westbound



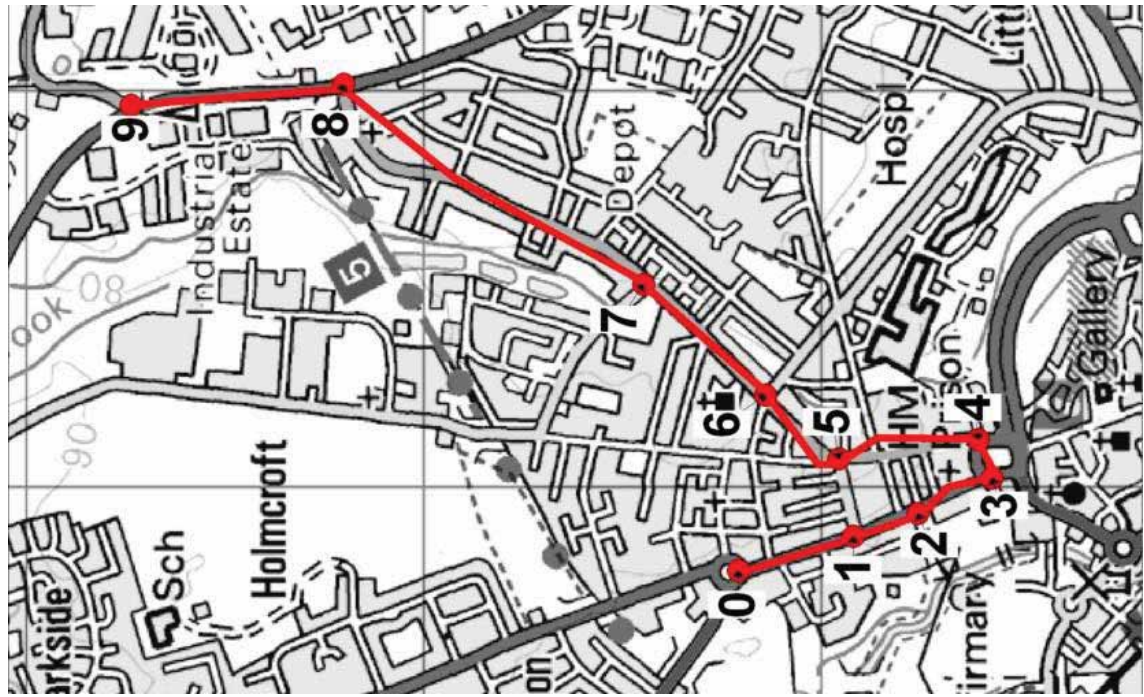
Route 5 WB: AM Peak



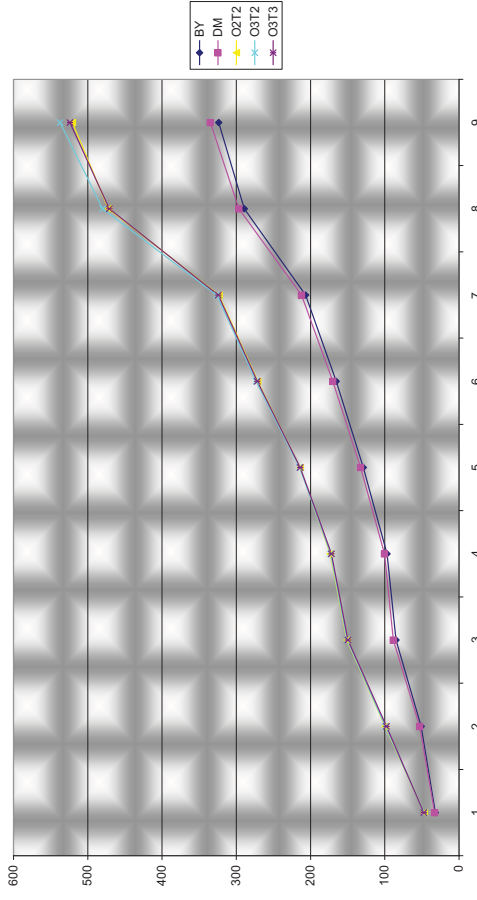
Route 5 WB: PM Peak



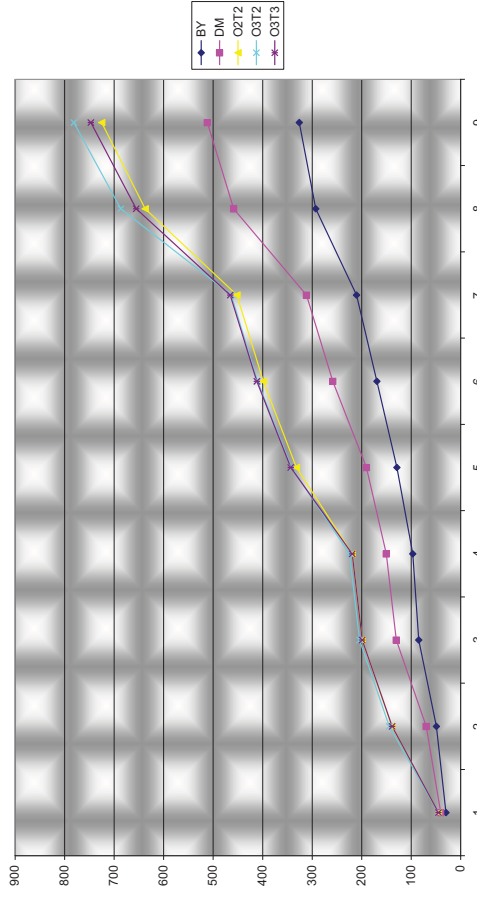
Route 5 Eastbound



Route 5 EB: AM Peak



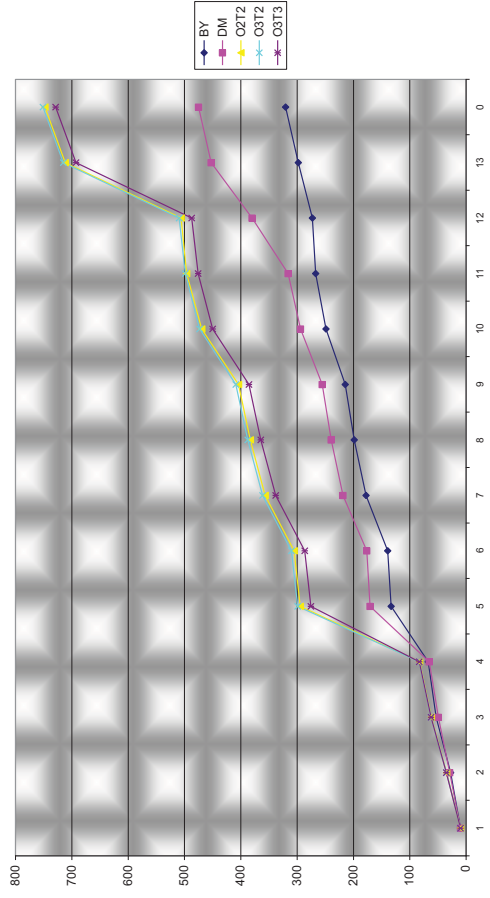
Route 5 EB: PM Peak



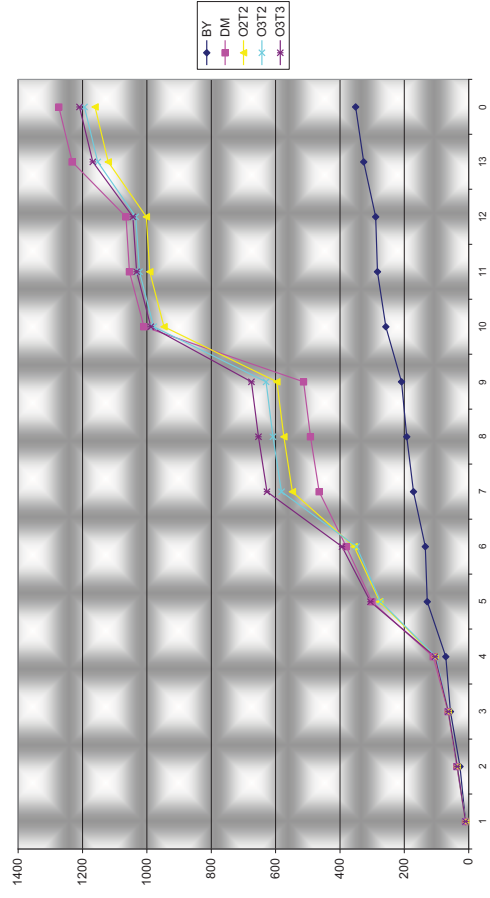
Route 6 Anticlockwise



Route 6 AC: AM Peak



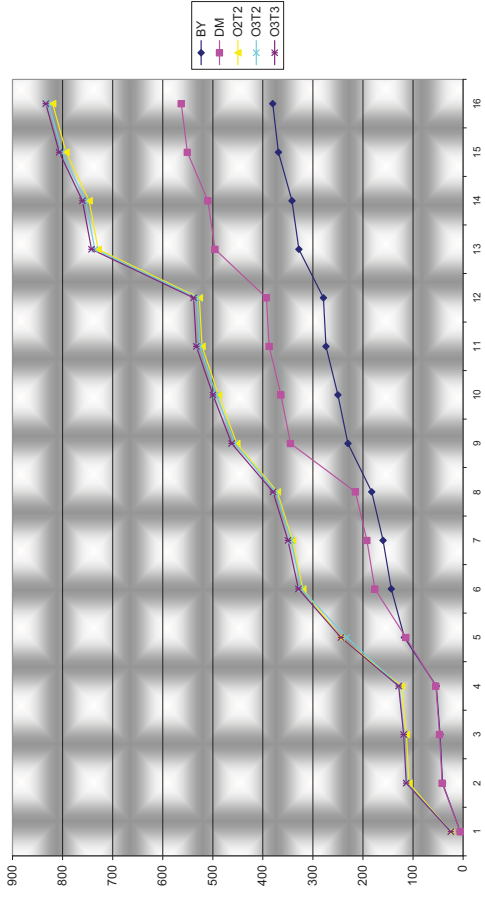
Route 6 AC: PM Peak



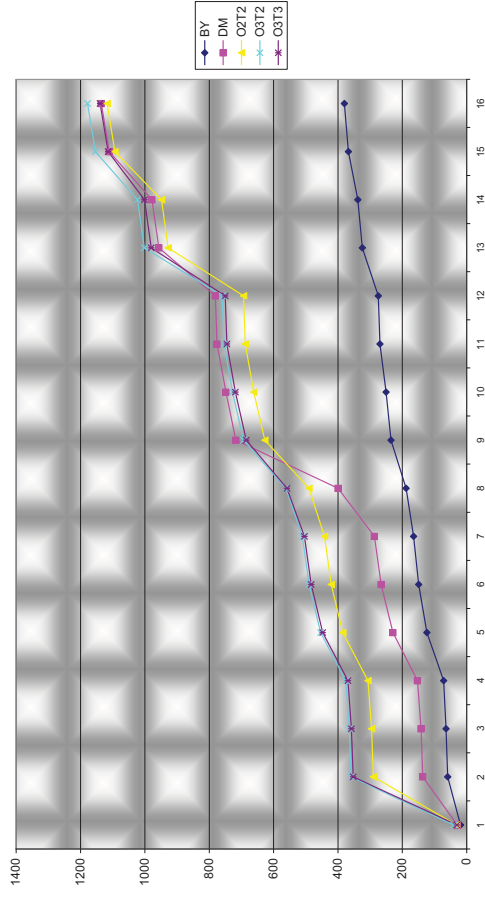
Route 6 Clockwise



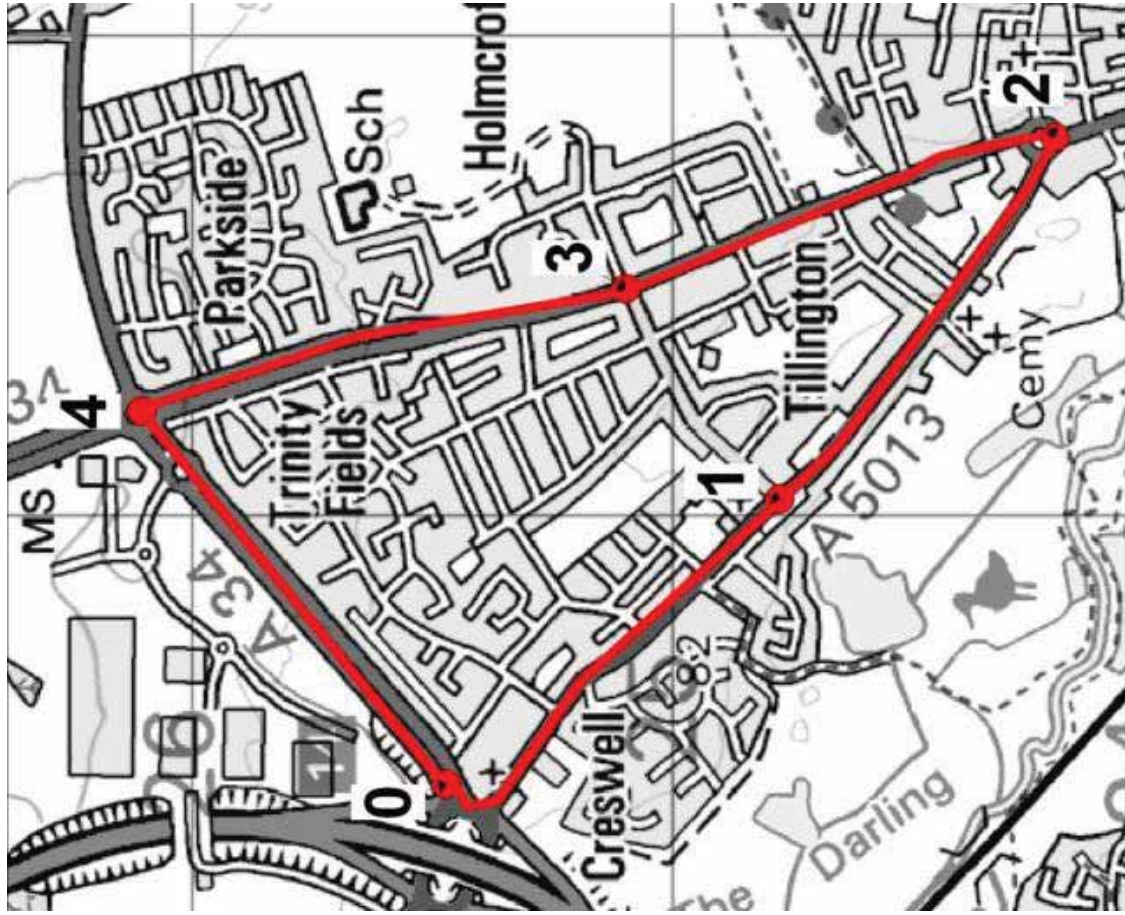
Route 6 C: AM Peak



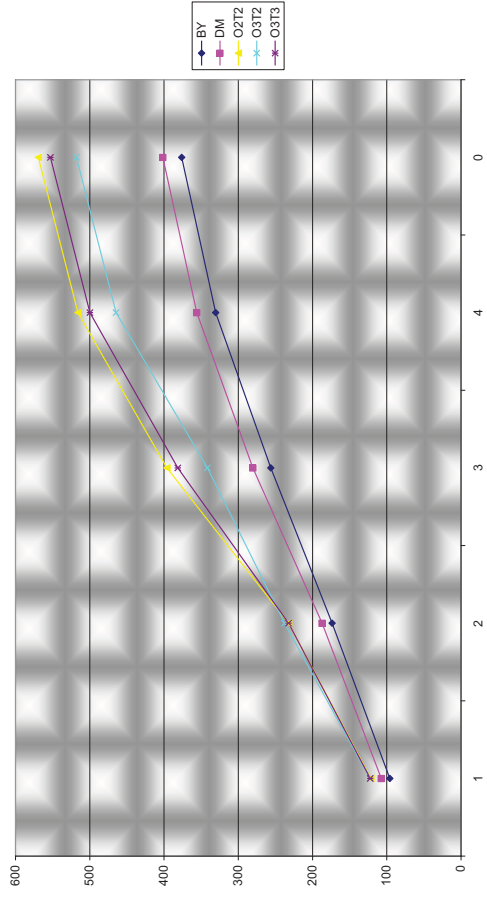
Route 6 C: PM Peak



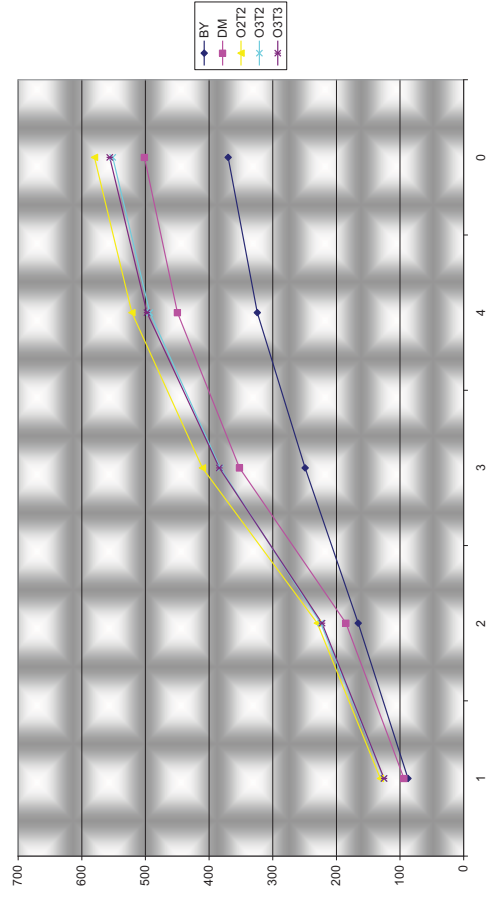
Route 7 Triangle Anticlockwise



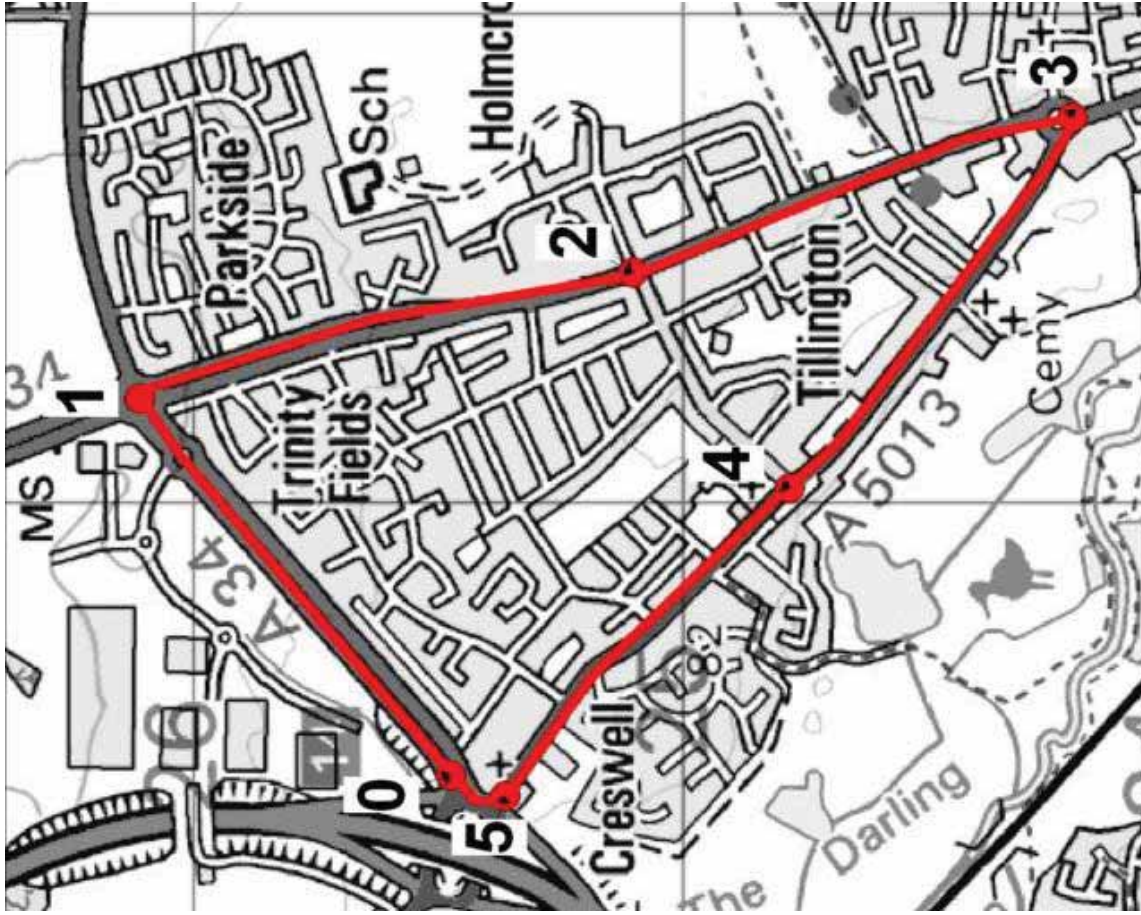
Route 7 AC: AM Peak



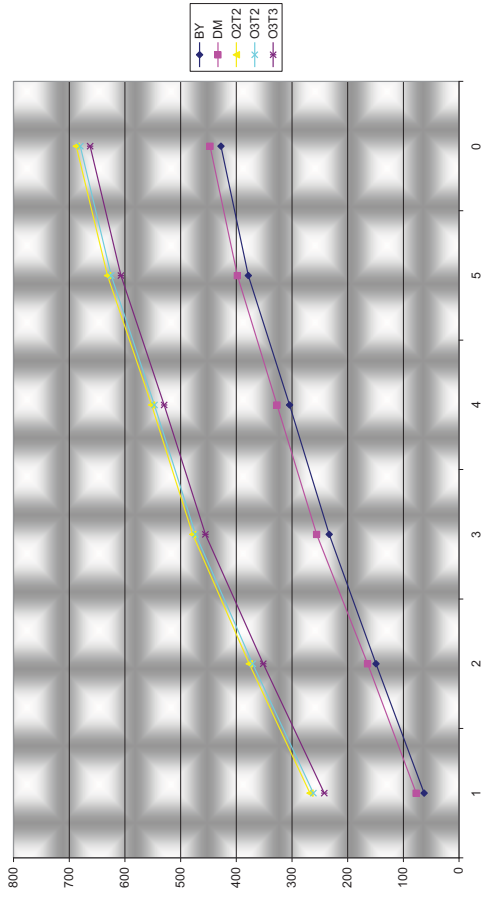
Route 7 AC: PM Peak



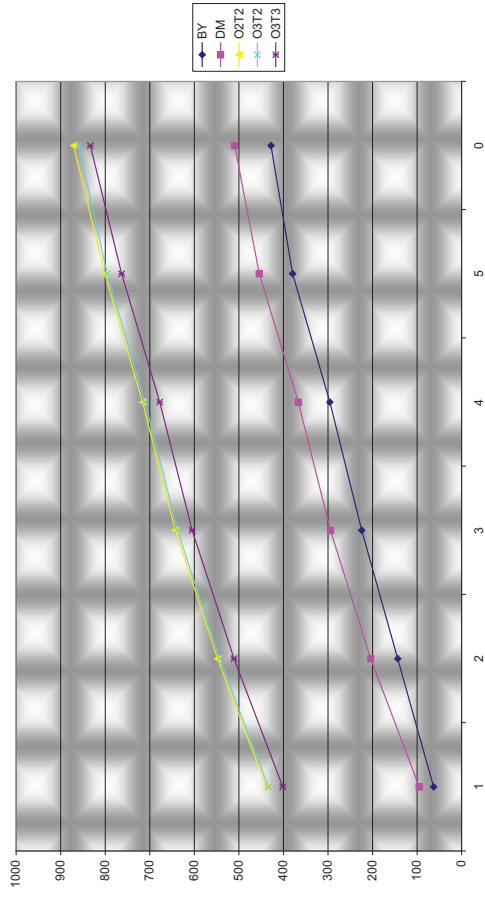
Route 7 Triangle Clockwise



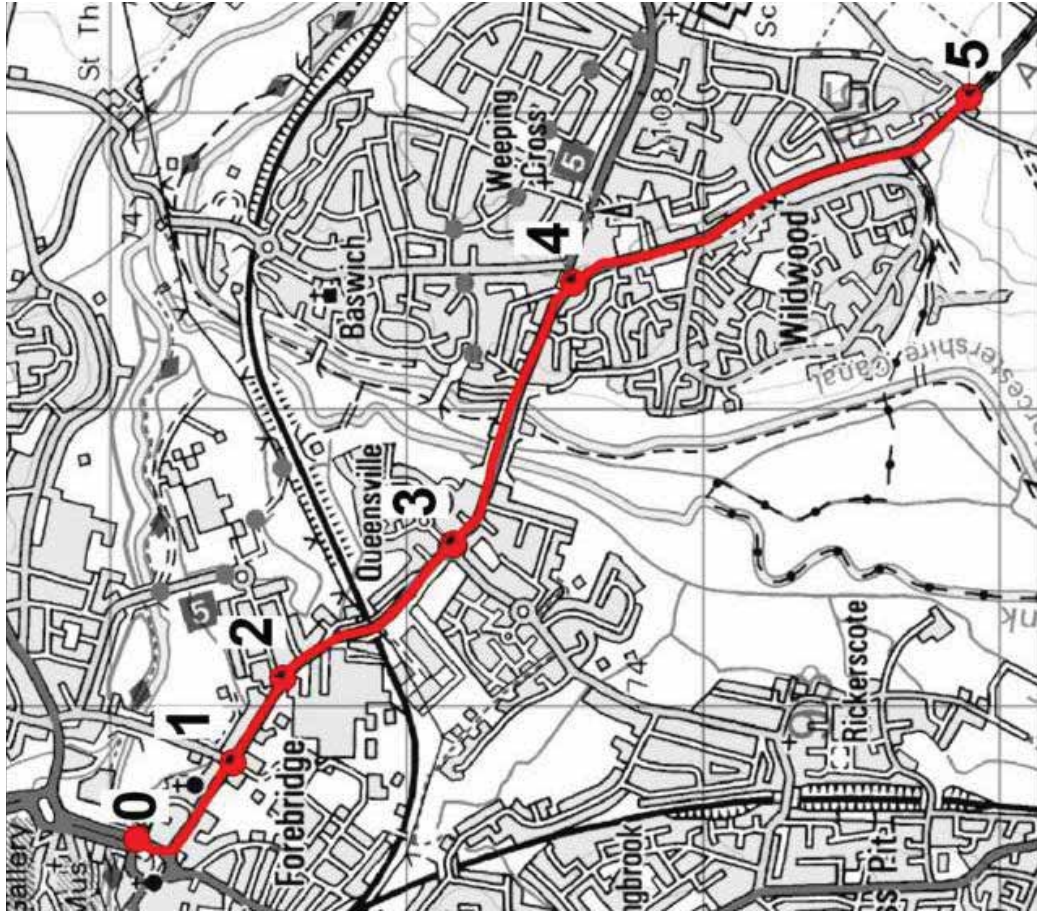
Route 7 C: AM Peak



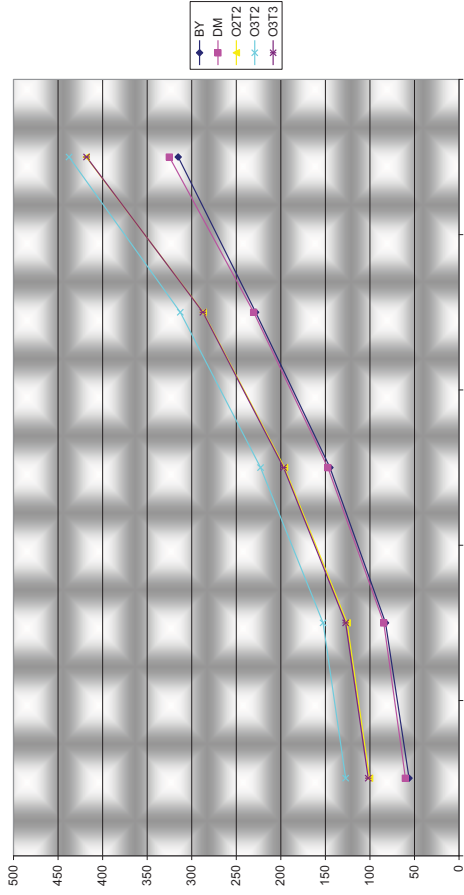
Route 7 C: PM Peak



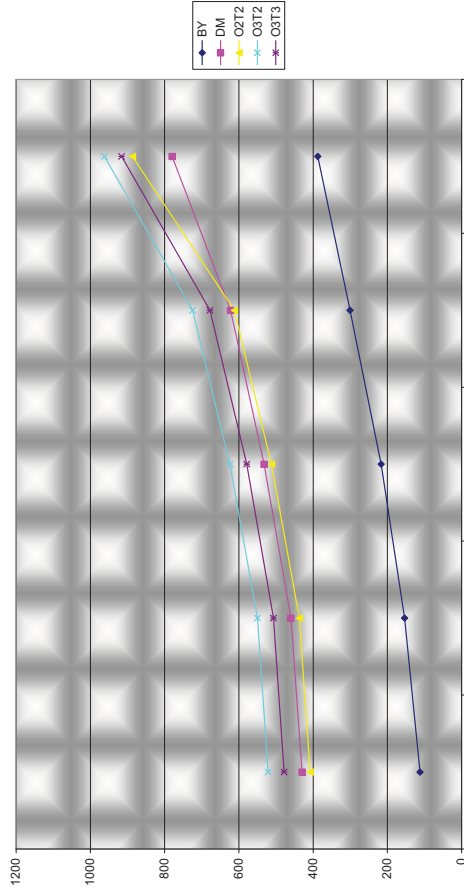
Route 8 Eastbound



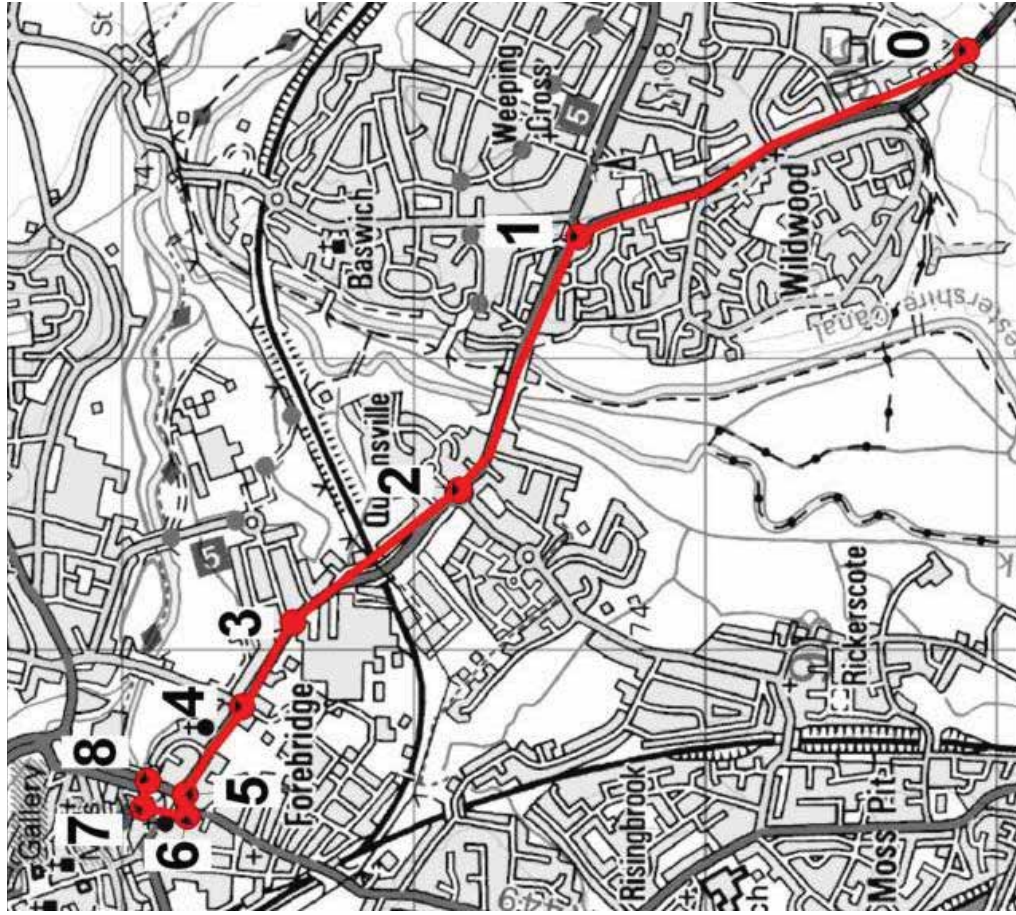
Route 8 EB: AM Peak



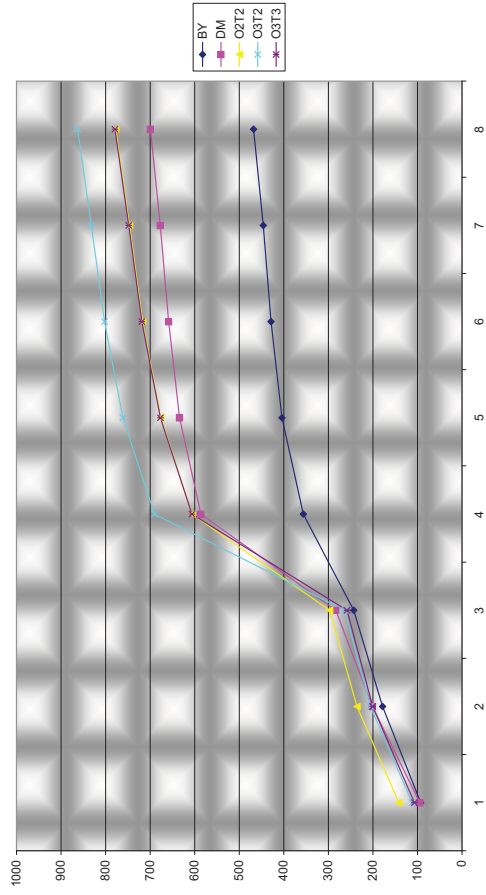
Route 8 EB: PM Peak



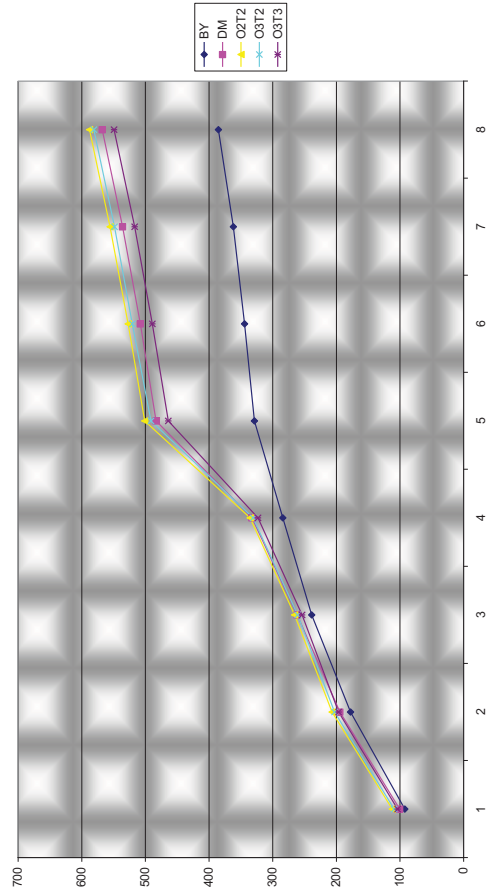
Route 8 Westbound



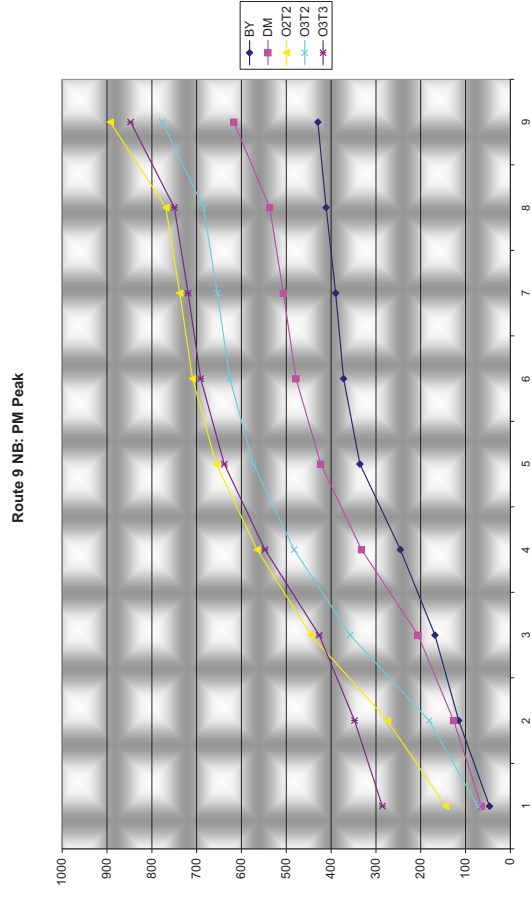
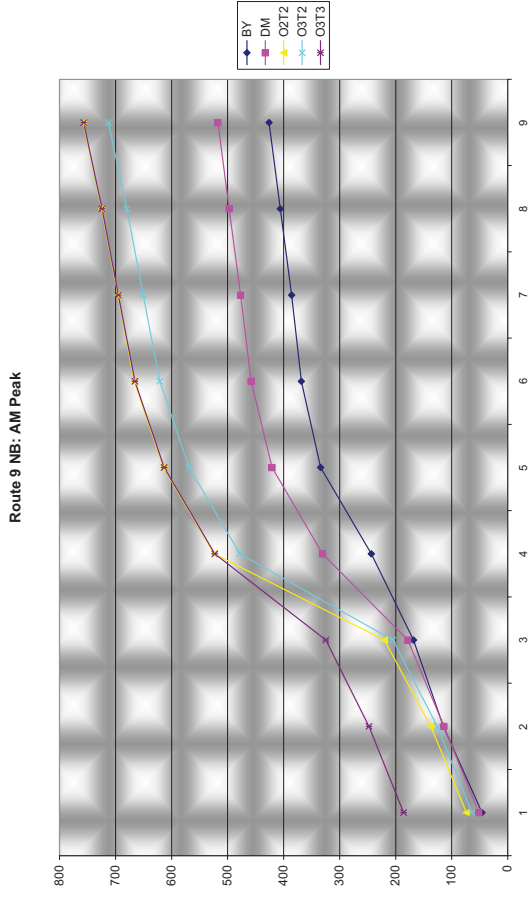
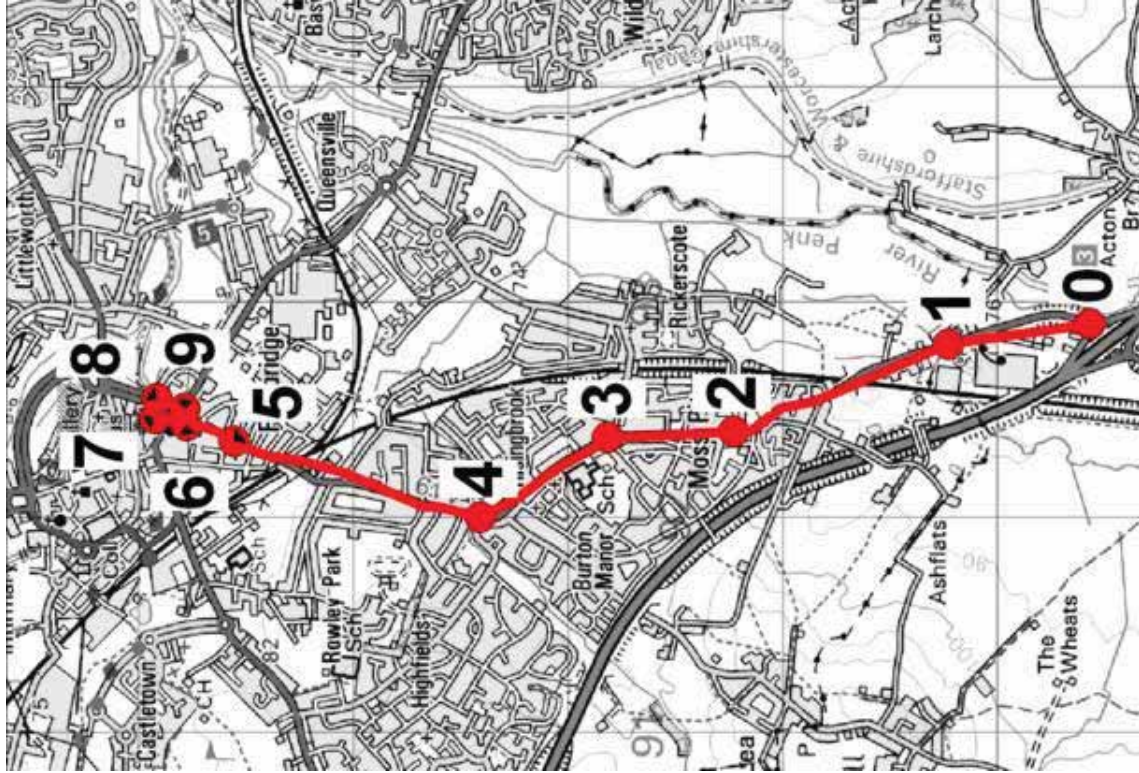
Route 8 WB: AM Peak



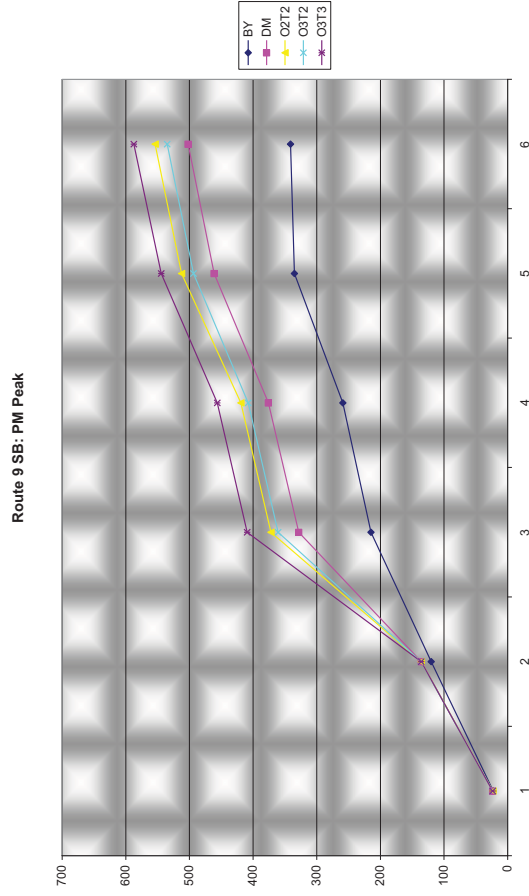
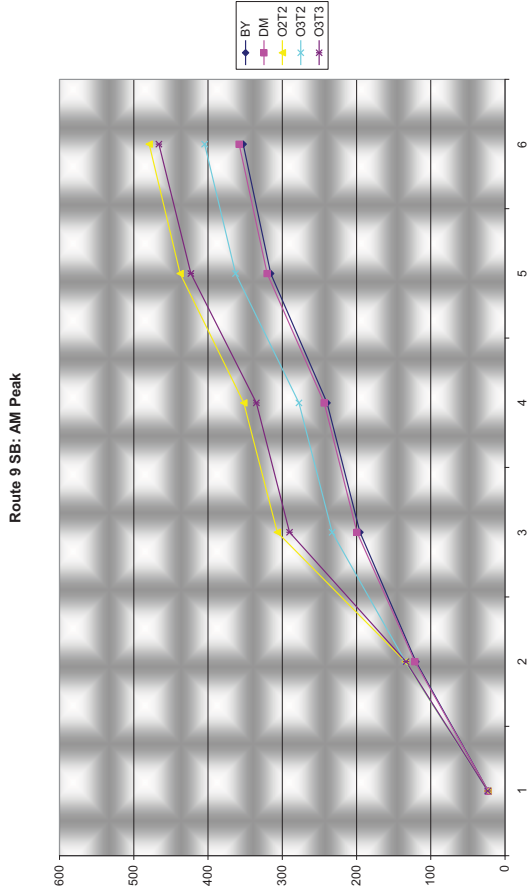
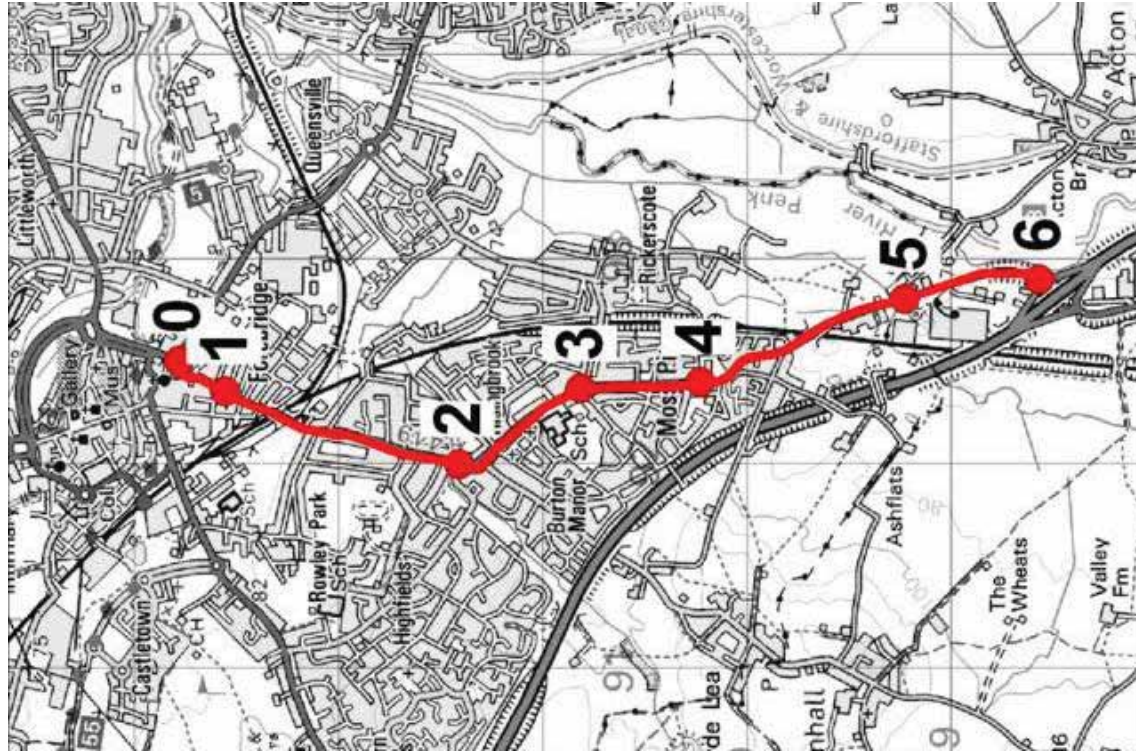
Route 8 WB: PM Peak



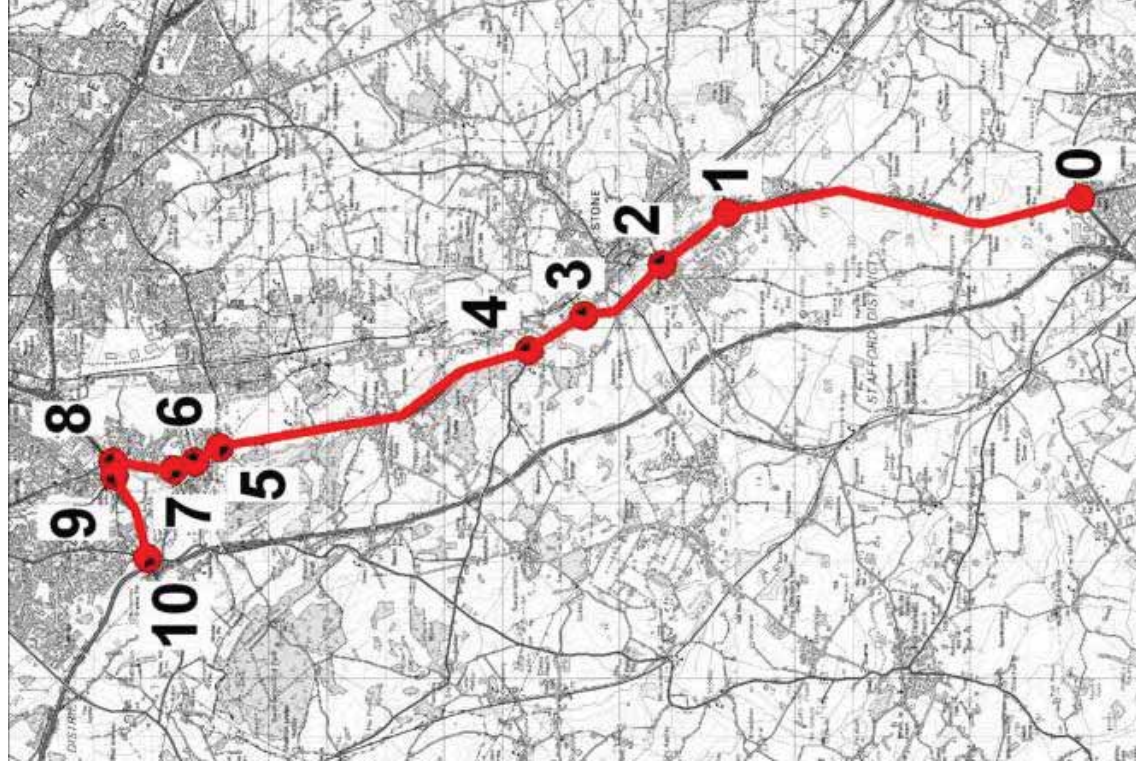
Route 9 Northbound



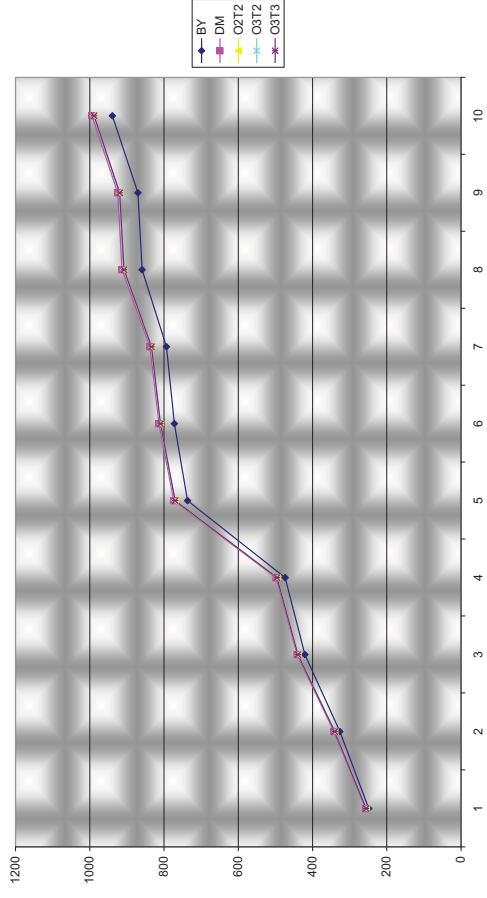
Route 9 Southbound



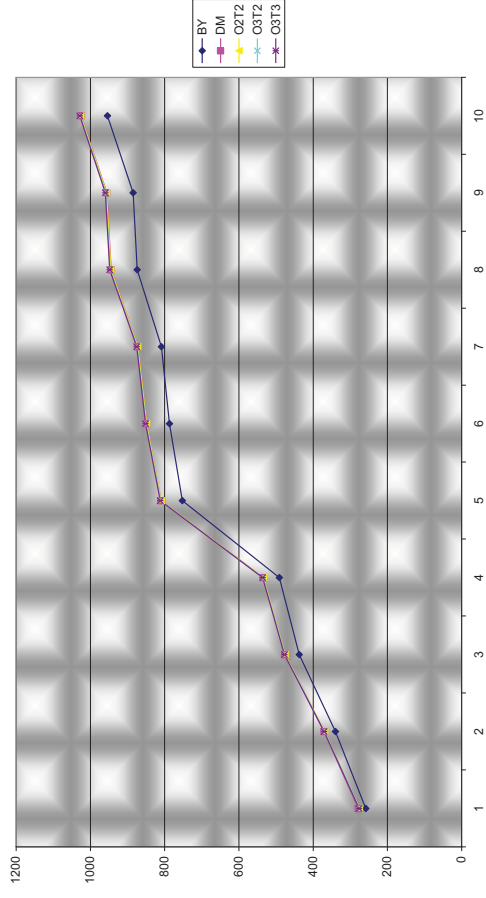
Route 10 Northbound



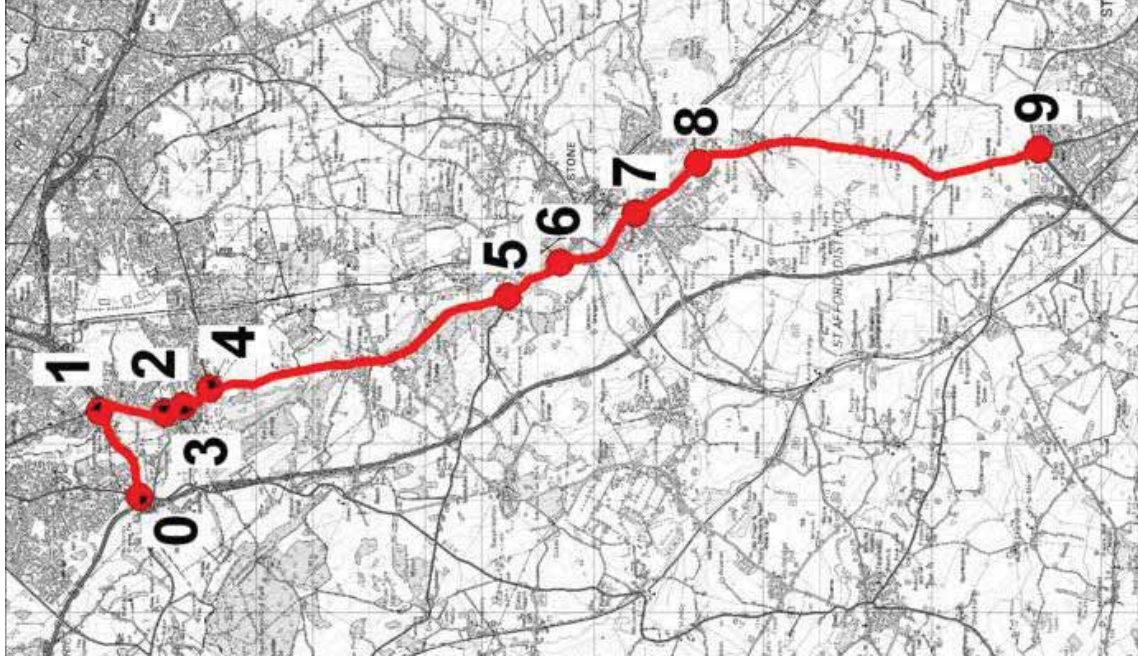
Route 10 NB: AM Peak



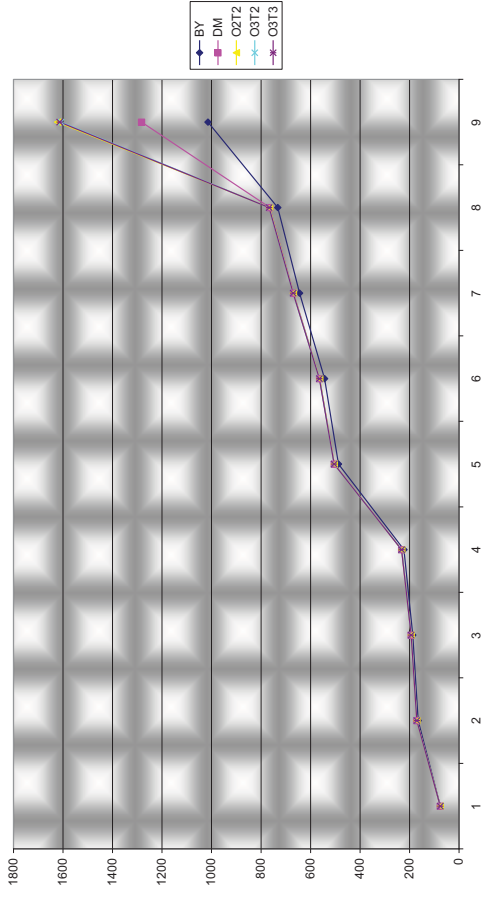
Route 10 NB: PM Peak



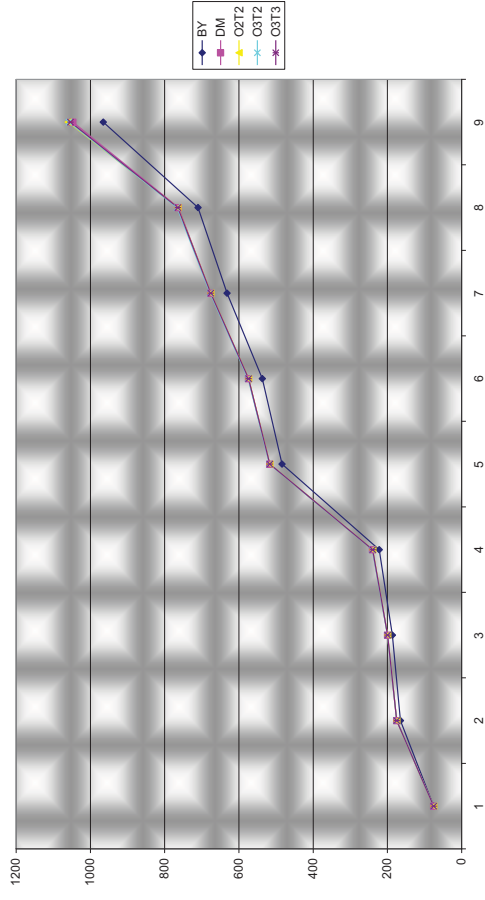
Route 10 Southbound



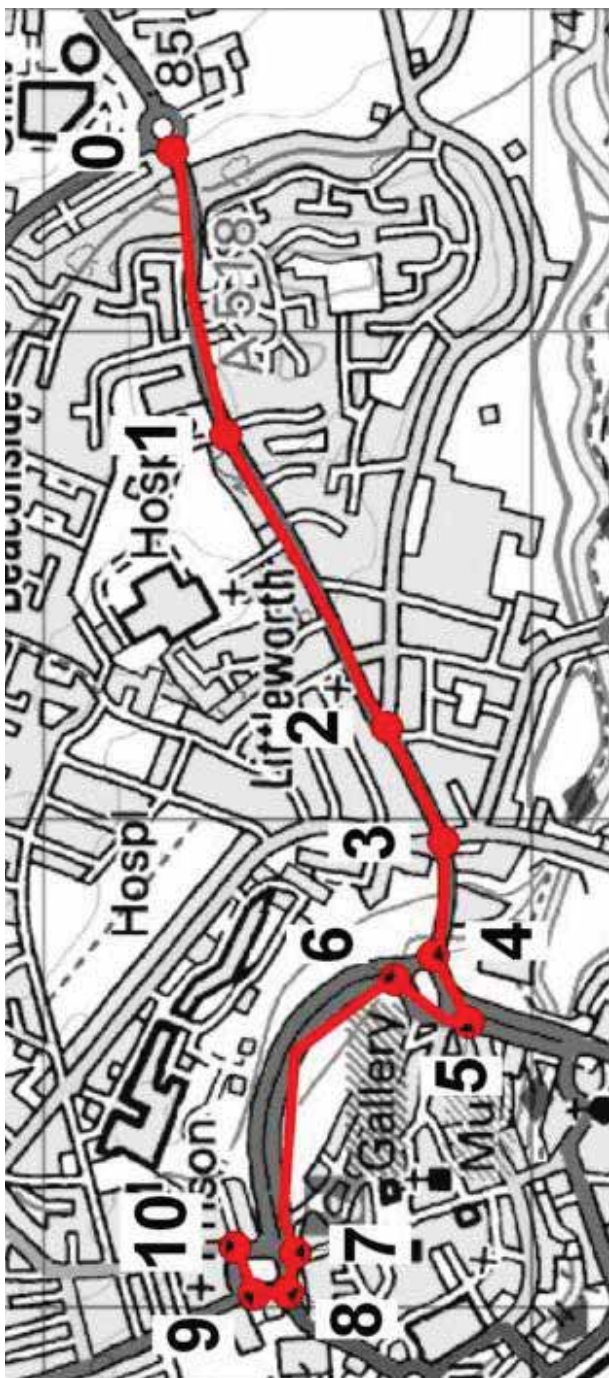
Route 10 SB: AM Peak



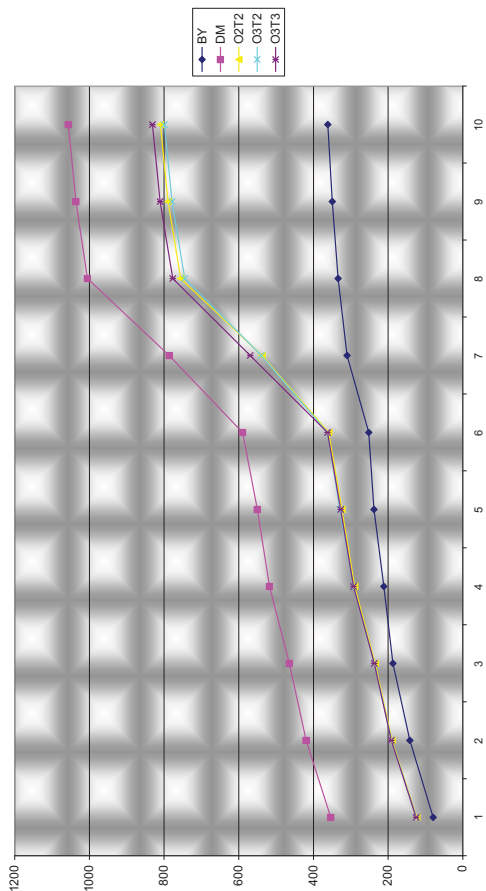
Route 10 SB: PM Peak



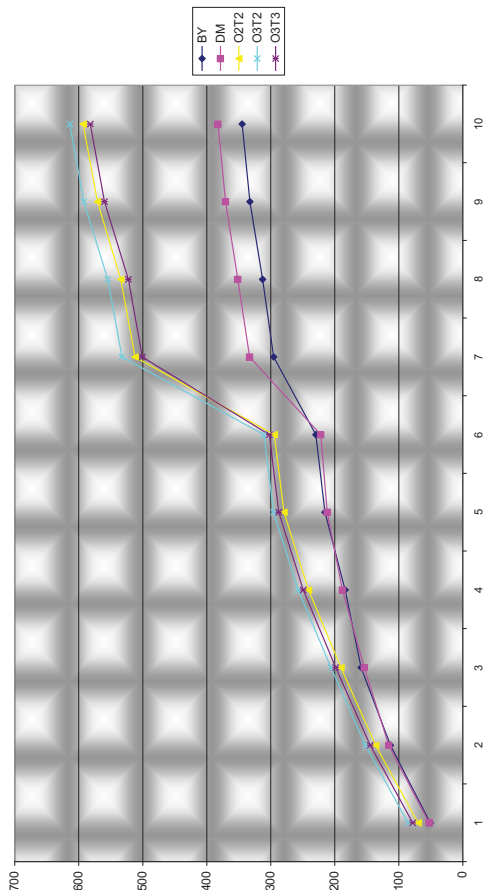
Route 11 Westbound



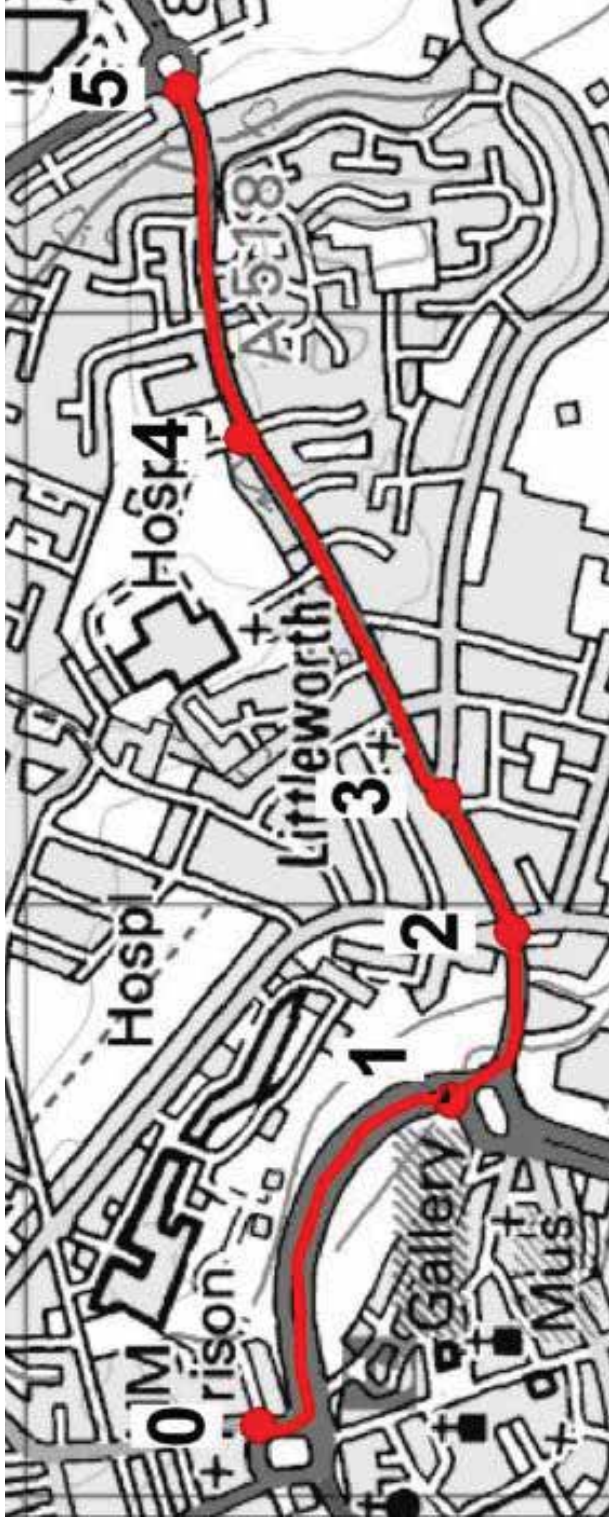
Route 11 WB: PM Peak



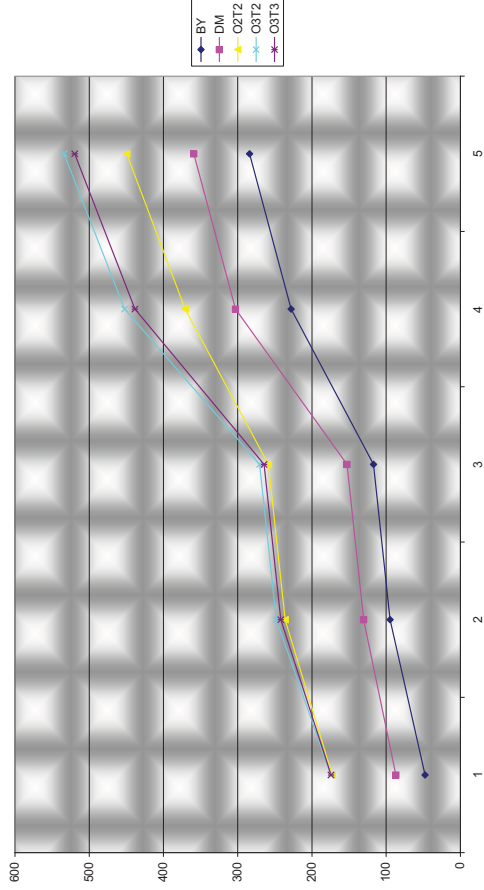
Route 11 WB: AM Peak



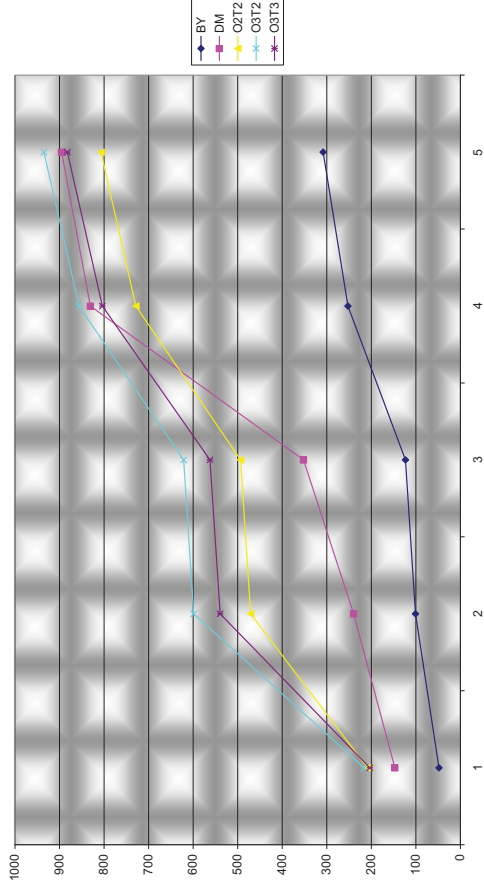
Route 11 Eastbound



Route 11 EB: AM Peak



Route 11 EB: PM Peak



Atkins Transport Planning

The Axis
10 Holliday Street
Birmingham
B1 1TF

Direct Line: 0121 483 6144
Direct Fax: 0121 483 5252

Craig.shipleigh@atkinsglobal.com

www.atkinsglobal.com

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