

Stafford Eastern Distributor Road Indicative Economic Assessment Staffordshire County Council

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ATKINS

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1. Introduction

This report considers the need for long standing plans to provide the Eastern Distributor Road (EDR). It considers five potential scenarios for this historical road proposal. The findings presented in this report are intended to provide an initial assessment of the likely costs and transport benefits, and establish the feasibility of each scenario to help steer the Plan for Stafford Borough and the review of the Stafford Borough Integrated Transport Strategy. However, it is noted that for conclusive proof of feasibility, a study based on a fully WebTAG compliant model would be necessary to provide a robust business case to justify the improvements.

This report continues, covering the following topics:

- The Eastern Distributor Road;
- SATURN model;
- Forecast Eastern Distributor Road demand;
- Scheme costing;
- Initial Economic Assessment;
- DIADEM sensitivity test; and
- Summary.

2. The Eastern Distributor Road

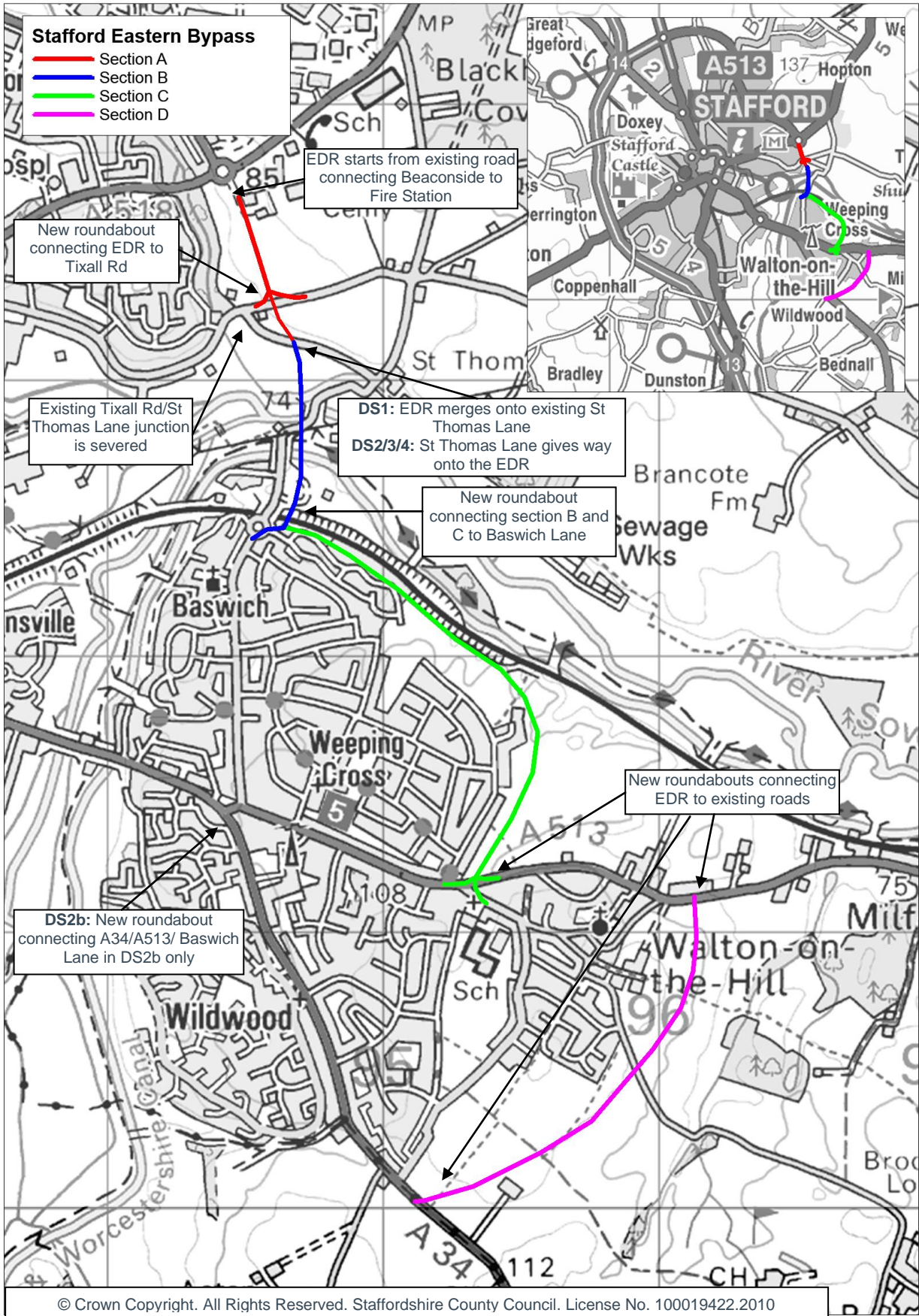
There are currently five proposals for the EDR under review, each of which is to be considered in this report. These are made up of four sections of road, with the designs including one, two, three or all four of the sections respectively.

Figure 2-1 shows the four sections of road under consideration, with the key features of the route labelled. The following is a summary of each of the designs:

Scenario	Sections included	Description
Do Something 1	Section A only	Extends between A513 Beaconside and Tixall Rd. It connects to Tixall Rd at a new roundabout, continuing through to merge onto the existing St Thomas Lane. The existing St Thomas Lane/Tixall Rd junction is severed. This section provides access to a proposed development site of 600 new dwellings.
Do Something 2a	Sections A & B	As with DS1, with the road now continuing past St. Thomas Lane, crossing over and running parallel to Baswich Lane and extending to the northern edge of the Baswich residential area. Here the new road connects to Baswich Lane and Cornwall Drive through a new roundabout. The severed St. Thomas Lane now forms a priority junction with the EDR. This section of road would include the construction of several new bridge structures in order for the new link to cross over Baswich Lane, the River Sow, the Staffordshire and Worcestershire Canal, and the West Coast Mainline Railway.
Do Something 2b	Sections A & B with Weeping Cross Roundabout	As with DS2a, but with a new larger roundabout included in place of the existing double roundabouts at the junction between A34/A513/Baswich Lane to test whether this helps to accommodate the extra traffic using Baswich Lane.
Do Something 3	Sections A, B & C	As with DS2a, with the road continuing wholly around the Baswich residential area, forming a new roundabout junction with A513 Weeping Cross/The Rise, close to Walton High School.
Do Something 4	Sections A, B, C & D	As with DS3, with an additional section of road which runs to the east of Old Croft Road, connecting via two roundabout junctions between the A513 Milford Road and the A34 Cannock Road.

The new route is to be single carriageway operating at a speed limit of 30mph. In all five scenarios, it is considered that general improvements will be made to Baswich Lane to facilitate the additional traffic which will be encouraged into this area. The improved Baswich Lane will remain at its current 30mph speed limit.

Figure 2-1 – Overview of Eastern Distributor Road Features



3. SATURN Model

The Eastern Distributor Road options are to be assessed using a SATURN model previously constructed for submission of a major scheme business case for the Stafford Western Access Improvements. Details of this model can be found in the following documents:

- Stafford Western Access Improvements LMVR (February 2010); and
- Stafford Western Access Improvements Forecasting Report (May 2010).

However, a quick summary of the model is provided below:

- Base Year 2007;
- Forecast Years 2016, 2026 and 2031;
- AM (0800-0900) and PM (1700-1800) peak hours;

Since the Western Access Improvements business case, the 2016 and 2031 models have been updated by Staffordshire County Council as follows:

- Changes to zones to the north of Stafford; and
- Update for the latest land use development forecasts in the study area.

As such, the Stafford EDR assessment will use 2016 and 2031 forecast years to assess the likely impact of the new road scenarios.

These models will be sufficient to give an initial assessment of the potential performance of the route, but it is noted that the inter peak impacts cannot be measured, and that the missing 2026 year model may affect the economic calculations slightly.

3.1. Model Changes

The initial coding of sections A, B and C of the Eastern Distributor Road was completed by Staffordshire County Council. However, upon receiving the model, Atkins have completed a full review of the network coding and made the following alterations:

- Increase the length of Section C of the Eastern Distributor Road. It was previously coded as 1490m, but this was found to be too short and so it has been lengthened to 1800m;
- Coding of St Thomas Lane/Blackheath Lane as a simulation, priority junction. This was previously an external node junction;
- Coding of the new junction between the southern end of Section B and Baswich Lane as a priority junction for scenarios DS2a, DS2b, DS3 and DS4. This was previously an external node junction;
- Coding of the new St Thomas Lane/EDR junction as a priority junction in DS2a, DS2b, DS3 and DS4;
- In the DS2b scenario only, coding of the new A34/A513/Baswich Lane roundabout, replacing the two mini-roundabout junction previously in place;
- Coding of Section D of the EDR for the DS4 scenario, connecting the link to the A34 Cannock Road and the A513 via two new roundabout junctions; and
- Creation of a Do Minimum model by removing the EDR from the DS1 model. This new DM model preserves the changes made by Staffordshire County Council when adding in the 6 new zones (6801-6806).

4. Eastern Distributor Road Usage

4.1. Traffic Flows

The forecast models for the five EDR options provide information about the traffic that is likely to use the new road. By interrogating the models, it is possible to compare the flow on each part of the new route, and to study the movements that are making use of the EDR.

Table 4-1 shows the forecast flow in vehicles on the key sections of the route and helps to demonstrate the likely usage, and the potential impact on Baswich Lane to the north (bypassed by Section B of the EDR) and to the south (Baswich Lane between Section B and A34/A513/Baswich Lane junction).

Table 4-1 – Forecast 2031 Flows on Eastern Distributor Road Key Links

Flow in vehs		DM		DS1		DS2a		DS2b		DS3		DS4	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Section A	NB	-	-	1238	659	1452	823	1451	820	1446	834	1453	833
	SB	-	-	347	893	747	1489	757	1494	737	1488	729	1486
Section B	NB	-	-	-	-	1053	689	1049	688	1050	692	1036	686
	SB	-	-	-	-	717	1344	734	1358	706	1314	697	1304
Section C	NB	-	-	-	-	-	-	-	-	79	18	79	14
	SB	-	-	-	-	-	-	-	-	12	47	11	47
Section D	NB	-	-	-	-	-	-	-	-	-	-	25	43
	SB	-	-	-	-	-	-	-	-	-	-	93	53
Baswich Lane S	NB	788	646	815	724	1398	742	1383	741	1273	742	1261	747
	SB	445	509	557	682	632	889	648	903	631	884	624	883
Baswich Lane N	NB	1114	673	1119	739	510	105	512	104	510	101	512	106
	SB	496	870	601	1067	4	2	4	2	12	9	12	9

The table demonstrates that (considering two way flows in vehicles):

- Section A of the EDR is used by 1,500-2,400 vehicles during the two peak time periods across the scenarios. Use of Section A increases substantially when both Sections A and B of the EDR are included (particularly in the southbound direction).
- Section B of the EDR is used by 1,700-2,100 vehicles across the scenarios in which it is included. The use of Section B is relatively unchanged when Section C and also Section D are included.
- Section C of the EDR is used by less than 100 vehicles for both the DS3 and DS4 scenarios in which it is included. This appears to suggest that there is not a significant demand for this section of the EDR.
- Section D of the EDR is also used by less than 100 vehicles for the DS4 scenario, again indicating that there little demand for this section of the EDR.
- Baswich Lane South experiences an increase in vehicles in all Do Something scenarios. The increase is particularly notable in Do Something 2a, 2b, 3 and 4 where sections A and B of the EDR give motorists a more direct route between Baswich and A518 Weston Road.
- Baswich Lane North experiences a substantial reduction in traffic in Do Something 2a, 2b, 3 and 4 (down to 12 or less vehicles in the southbound direction). Whilst this is to some extent a function of the

generality of the model, it suggests a significant switch of traffic onto Section B from Baswich Lane due to its directness.

- Comparing DS2a with DS2b reveals that there is negligible difference in traffic flows in the two scenarios. This suggests that the replacing the existing double roundabout configuration at the A34/A513/Baswich Lane junction with a single large roundabout in DS2b has very little impact in terms of facilitating traffic flows using the EDR.

4.2. Which movements benefit from the EDR?

The forecast models provide information as to which movements will use the new road. This helps to identify whether the trips that benefit from the road are local or long distance movements, and also to identify the impact of the four sections of route on which movements are encouraged.

Figure 4-1 to Figure 4-7 show select link analyses on each section of EDR in each scenario. The DS2b scenario is not included as the traffic patterns are very similar to those seen in DS2a. Traffic patterns are largely the same for the two forecast years and for the AM and PM peak models, therefore, all the figures are based on the 2031 AM peak models. The figures are as follows:

- Figure 4-1: **Do Something 1** select link on **Section A**;
- Figure 4-2: **Do Something 2a** select link on **Section A**;
- Figure 4-3: **Do Something 2a** select link on **Section B**;
- Figure 4-4: **Do Something 3** select link on **Section A**;
- Figure 4-5: **Do Something 3** select link on **Section B**;
- Figure 4-6: **Do Something 3** select link on **Section C**; and
- Figure 4-7: **Do Something 4** select link on **Section D**.

4.2.1. Do Something 1

Figure 4-1 demonstrates that the key through movements which use the Eastern Distributor Road are trips between the A34/A513/A518 and zones in the east and north of Stafford. There is very little movement towards Stafford central using the scheme. The Beaconside corridor is the key access to the north of the new road.

Constructing just Section A encourages significant additional traffic onto Baswich Lane and Holdiford Road/Tixall Road in order to access the EDR from the south. This increase can be clearly seen in Figure 4-1

4.2.2. Do Something 2a

Figure 4-2 and Figure 4-3 show the key movements which use Sections A and/or B of the EDR in the Do Something 2a forecast. The movements that use the EDR are the same as Do Something 1, but with the following key differences:

- Due to the implementation of Section B (which offers a more direct and efficient route compared to the northern section of Baswich Lane), some A449 traffic is encouraged to use Silkmore Lane, Lichfield Road, Baswich Lane and the EDR to avoid travel through central Stafford; and
- More traffic from the A518 uses the EDR in this scenario, which is most likely because Section B of the EDR provides a more efficient route to the A34 (south) and A449 compared to Baswich Lane.

4.2.3. Do Something 3

Figure 4-4 to Figure 4-6 show the key movements which use Sections A, B, and/or C of the EDR in the Do Something 3 forecast. The results are very similar to those in Do Something 2 as very little traffic makes use of Section C (as shown in Table 4-1). The majority of traffic using Section C travels between the A34 to the north and the A513 to the south east, using the full length of the EDR.

4.2.4. Do Something 4

Figure 4-7 shows the key movements which use Section D of the EDR in the Do Something 4 forecast. None of the traffic using this link travels along any other sections of the EDR. Instead, there is only a small volume of traffic which travels between Holdiford Road and the A513 to the east and the A34 and M6 to the south.

Figure 4-1 – 2031 AM DS1 Select Link on Eastern Distributor Road Section A

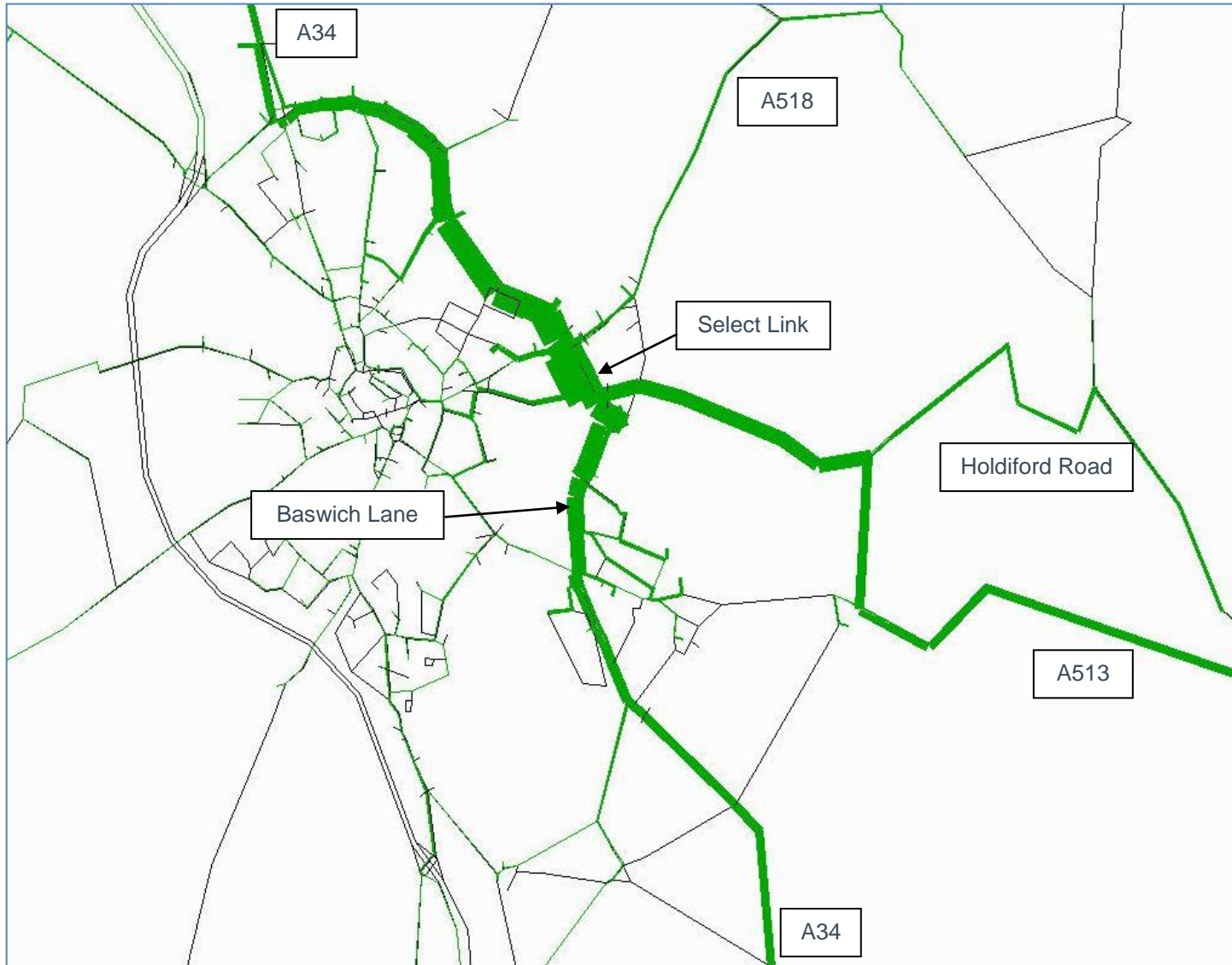


Figure 4-2 – 2031 AM DS2 Select Link on Eastern Distributor Road Section A

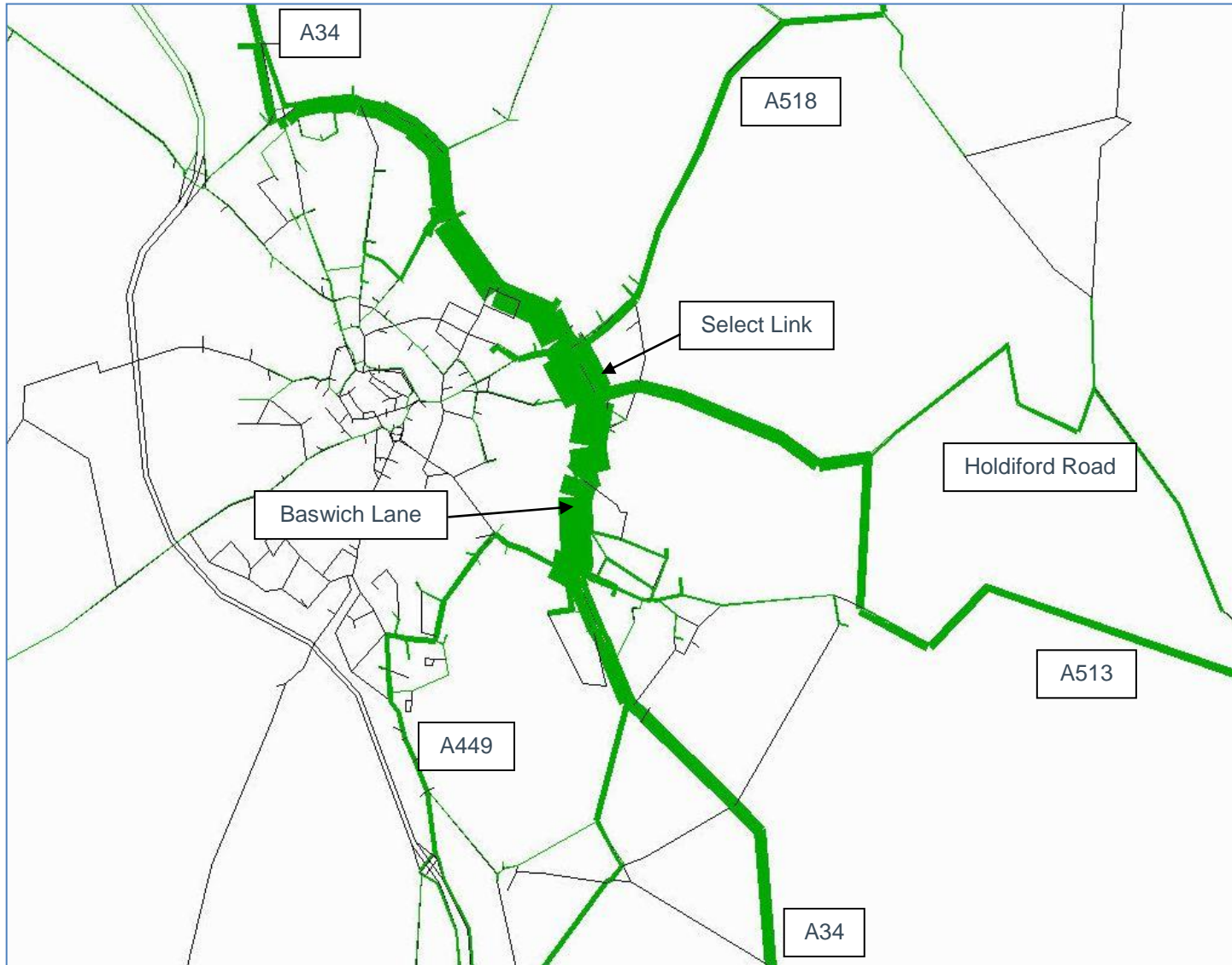


Figure 4-3 – 2031 AM DS2 Select Link on Eastern Distributor Road Section B

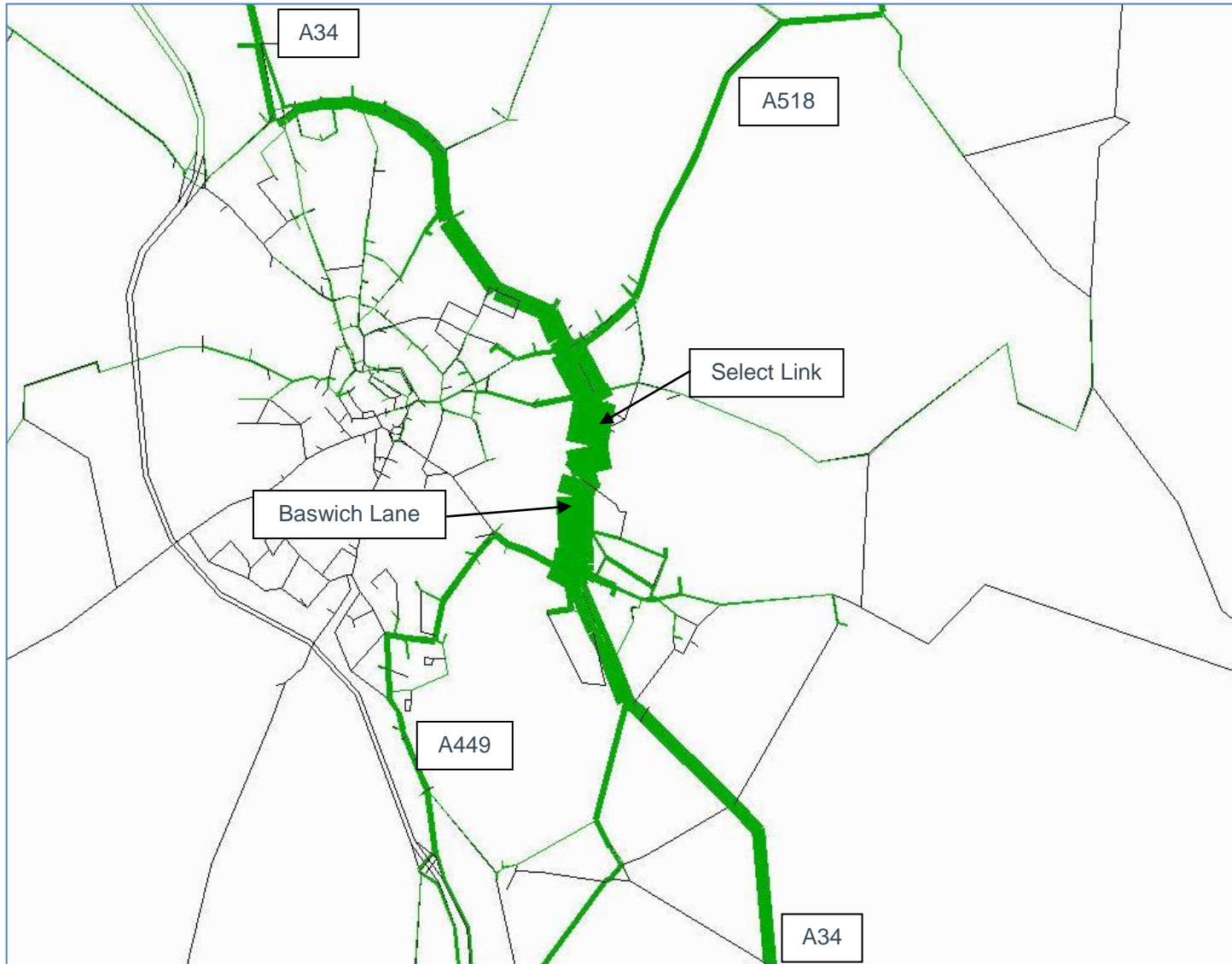


Figure 4-4 – 2031 AM DS3 Select Link on Eastern Distributor Road Section A

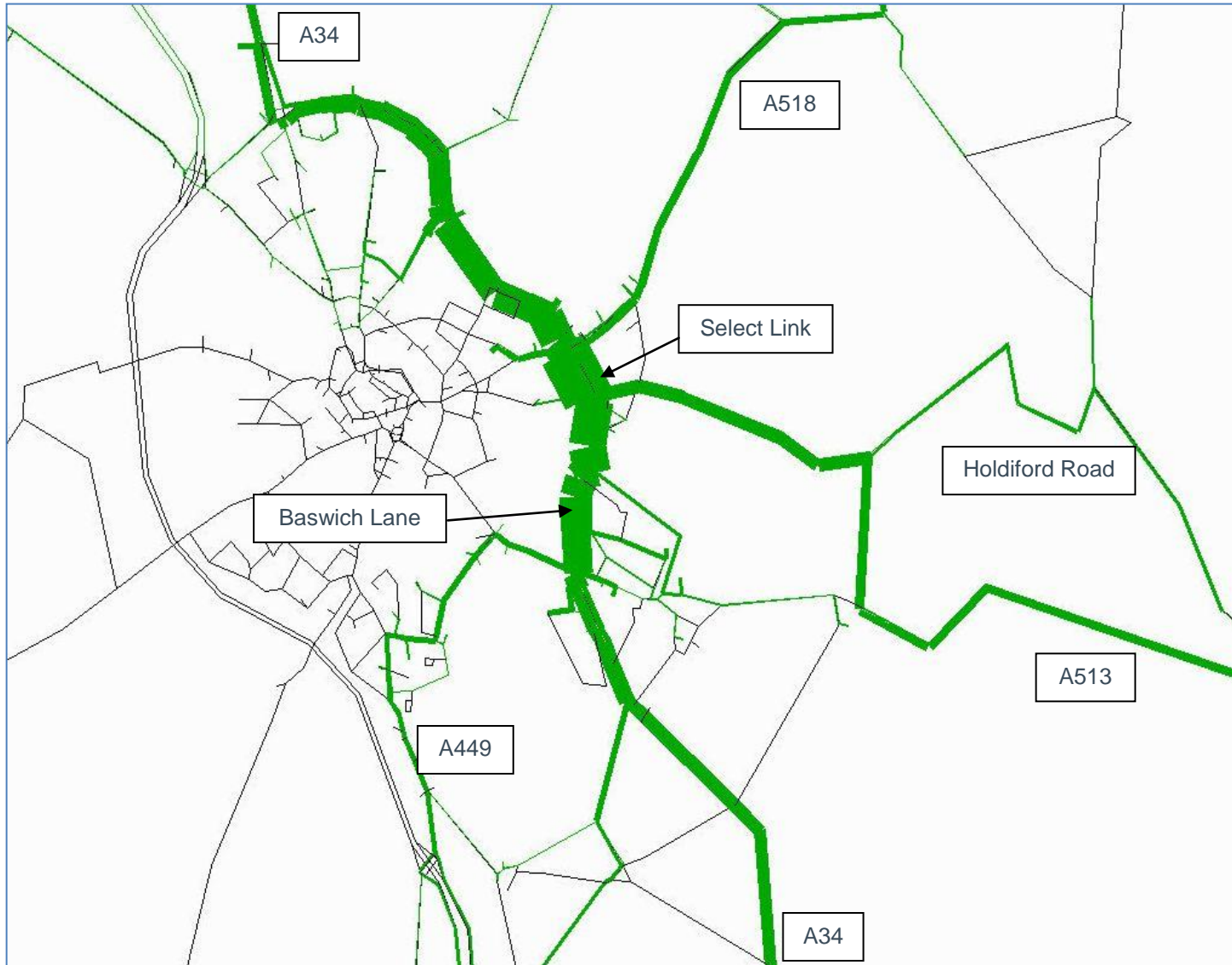


Figure 4-5 – 2031 AM DS3 Select Link on Eastern Distributor Road Section B

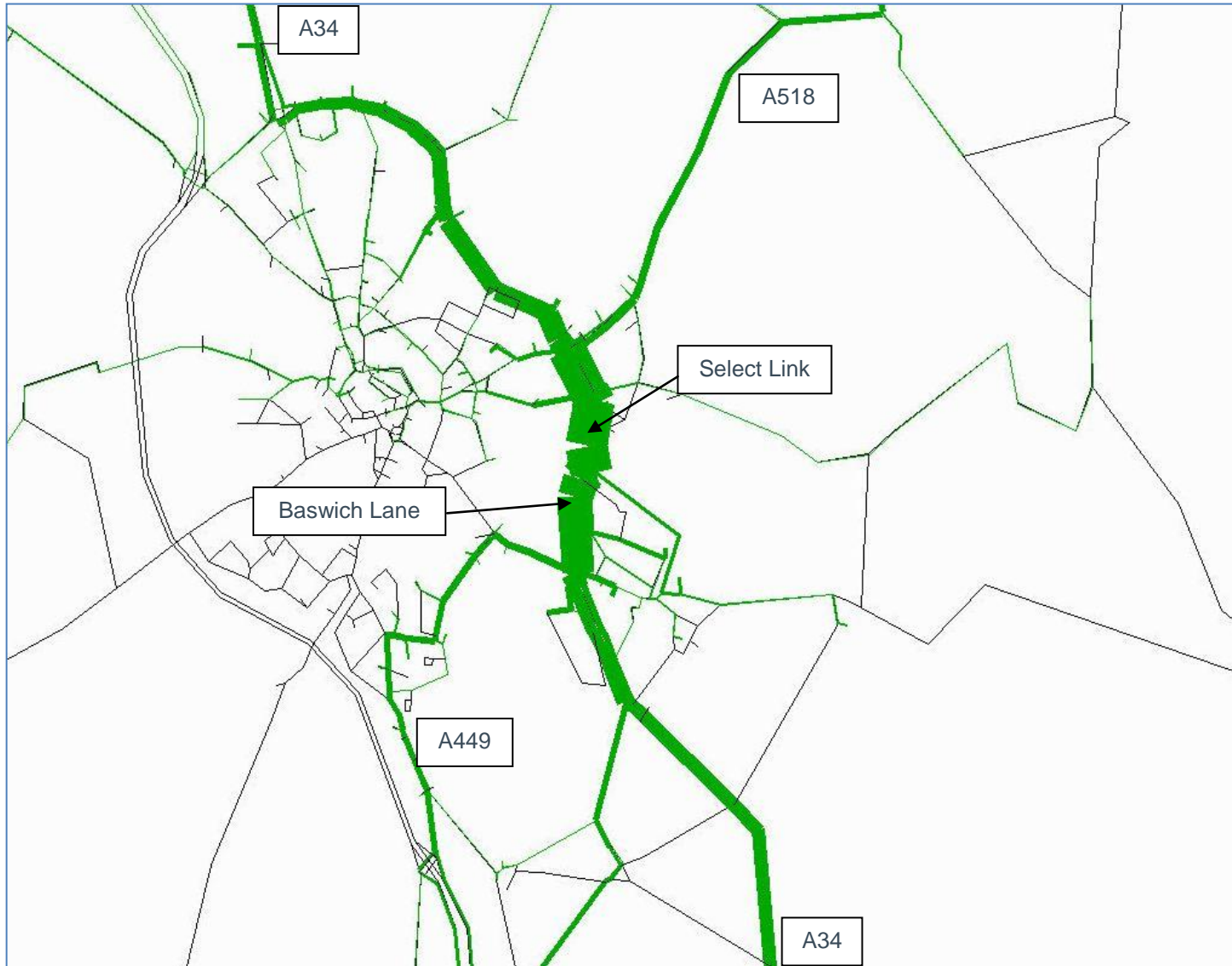


Figure 4-6 – 2031 AM DS3 Select Link on Eastern Distributor Road Section C

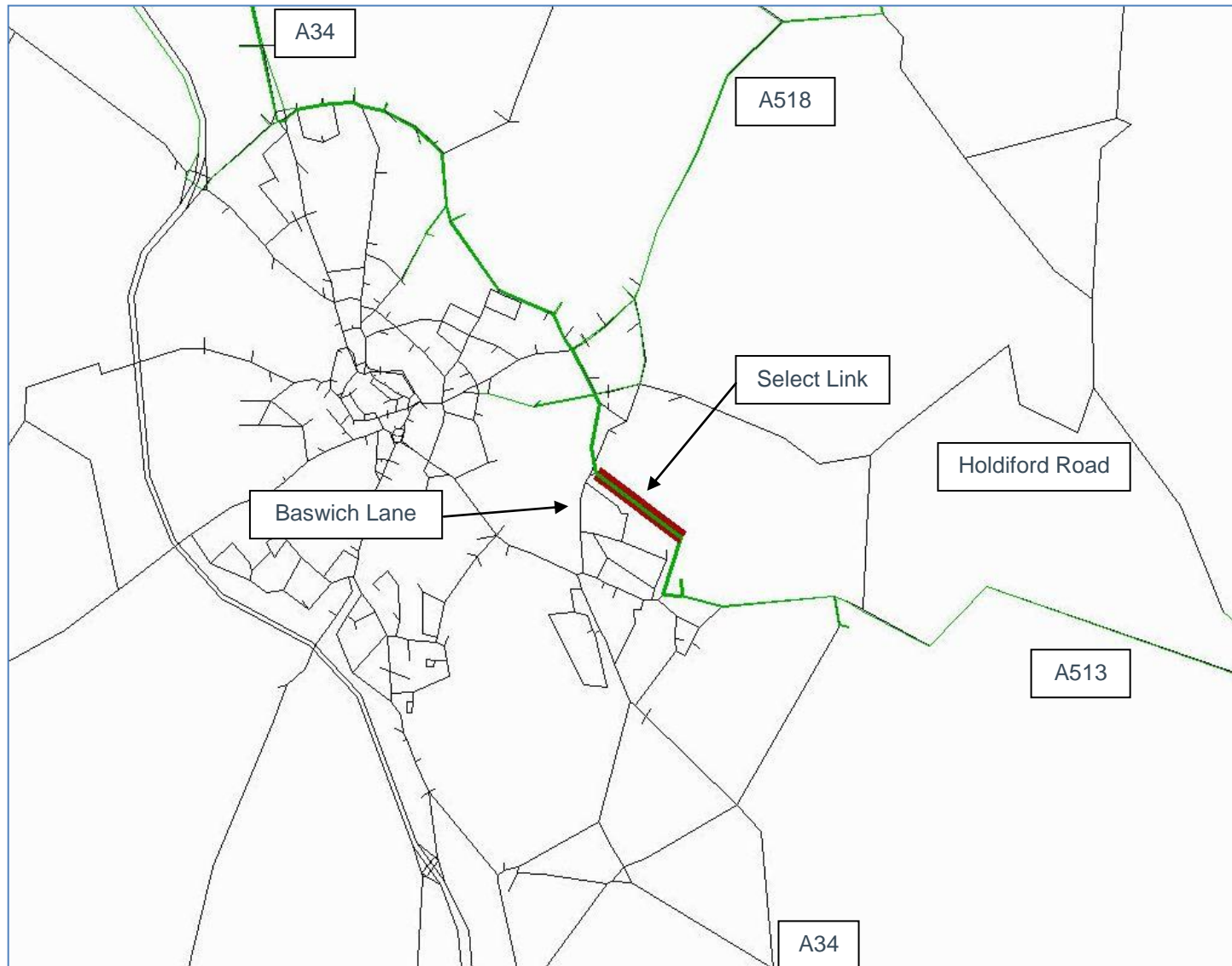
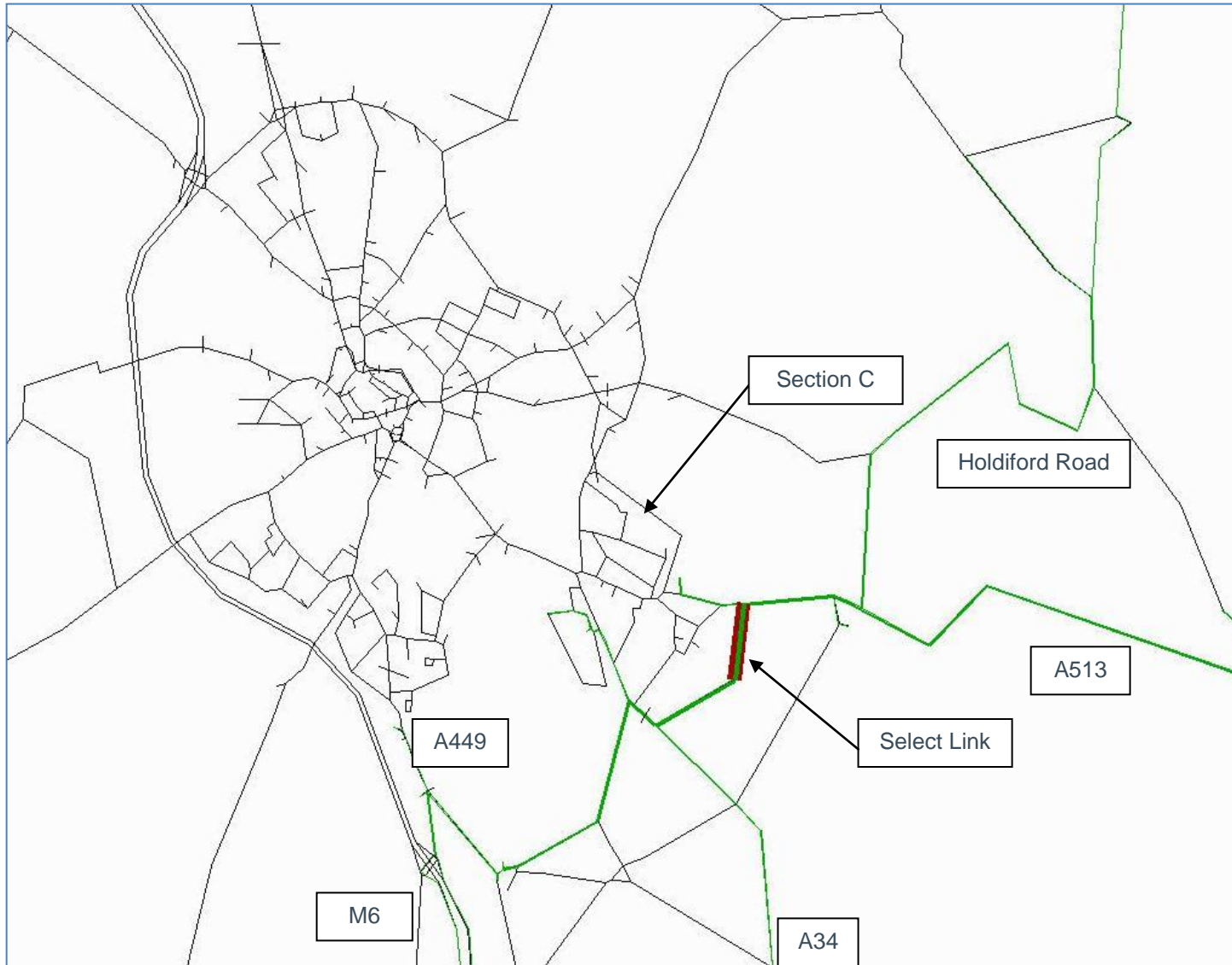


Figure 4-7 – 2031 AM DS4 Select Link on Eastern Distributor Road Section D



4.3. Difference Plots

By considering the difference between Do Something and Do Minimum models, it is possible to understand the general impact on trip patterns caused by the Eastern Distributor Road. This will demonstrate which routes will benefit from less stress as traffic reroutes to take advantage of the new road.

Figure 4-8 to Figure 4-15 show the flow differences between four of the EDR scenarios (AM and PM peak) and the Do Minimum model without the EDR. These are only provided for the 2031 forecast year, as the differences should be more pronounced in this year. Again, DS2b is not included as the overall traffic patterns are almost identical to those seen in DS2a. The figures are as follows:

- Figure 4-8 shows the difference between **Do Something 1 AM** model and the Do Minimum;
- Figure 4-9 shows the difference between **Do Something 1 PM** model and the Do Minimum;
- Figure 4-10 shows the difference between **Do Something 2a AM** model and the Do Minimum;
- Figure 4-11 shows the difference between **Do Something 2a PM** model and the Do Minimum;
- Figure 4-12 shows the difference between **Do Something 3 AM** model and the Do Minimum;
- Figure 4-13 shows the difference between **Do Something 3 PM** model and the Do Minimum;
- Figure 4-14 shows the difference between **Do Something 4 AM** model and the Do Minimum;
- Figure 4-15 shows the difference between **Do Something 4 PM** model and the Do Minimum;

When interpreting the figures, note that green bars indicate an increase in PCUs (passenger car units) along a road, whereas blue bars indicate a decrease in PCUs along a road.

4.3.1. Do Something 1

The inclusion of Section A of the EDR results in an increase in traffic flow on the A34 Cannock Road, A513 Beaconside, Baswich Lane and Tixall Road (east of Baswich Lane). This is a result of traffic travelling between the east/south of Stafford and the north choosing to use Baswich Lane, EDR and Beaconside, rather than the previous route through the town centre.

With traffic now taking advantage of the EDR, there are small general decreases in traffic around central Stafford. During the AM peak, there is also a reduction on the A34 Lichfield Road to the south east of the town centre. This is because the EDR now provides a more direct alternative to this route. However there is an increase in traffic in the PM peak on Lichfield Road between Silkmore Lane and Weeping Cross.

There are large localised traffic reductions on Blackheath Lane, Weston Road and Tixall Road around Section A as development and other traffic that previously used Blackheath Lane, now use the EDR.

4.3.2. Do Something 2a

In this option the introduction of Section B has a similar impact to DS1; however the most obvious difference is the diversion of traffic from the northern section of Baswich Lane onto the more direct route along Section B. There is also an increased draw of traffic towards the southern section of Baswich Lane resulting in a decrease in traffic routeing through the centre of Stafford. This is also highlighted by the reduction in traffic along the A449 from the M6 Junction 13 with trips re-routeing to take advantage of the new direct route to access the east side of Stafford. There are benefits to Lichfield Road between Silkmore Lane and Weeping Cross in the AM, but not in the PM peak.

As with DS1, traffic in the north part of Stafford increases along Beaconside resulting from the draw to this corridor.

4.3.3. Do Something 3 and Do Something 4

The change in flows between the DM and DS3/DS4 are very similar to the DM to DS2 analysis. This is to be expected due to the relatively low levels of trips which actually make use of Sections C and D of the scheme.

For DS3, the flow on the southern section of Baswich Lane and the A513 at Weeping Cross is reduced slightly as a small volume of traffic transfers onto Section C. The only other noticeable impact for DS4 is a slight transfer of traffic travelling between the south and east from Brocton Lane onto Section D.

Figure 4-8 – DS1 – DM AM Flow Difference Plot
Green = Increase Blue = Decrease

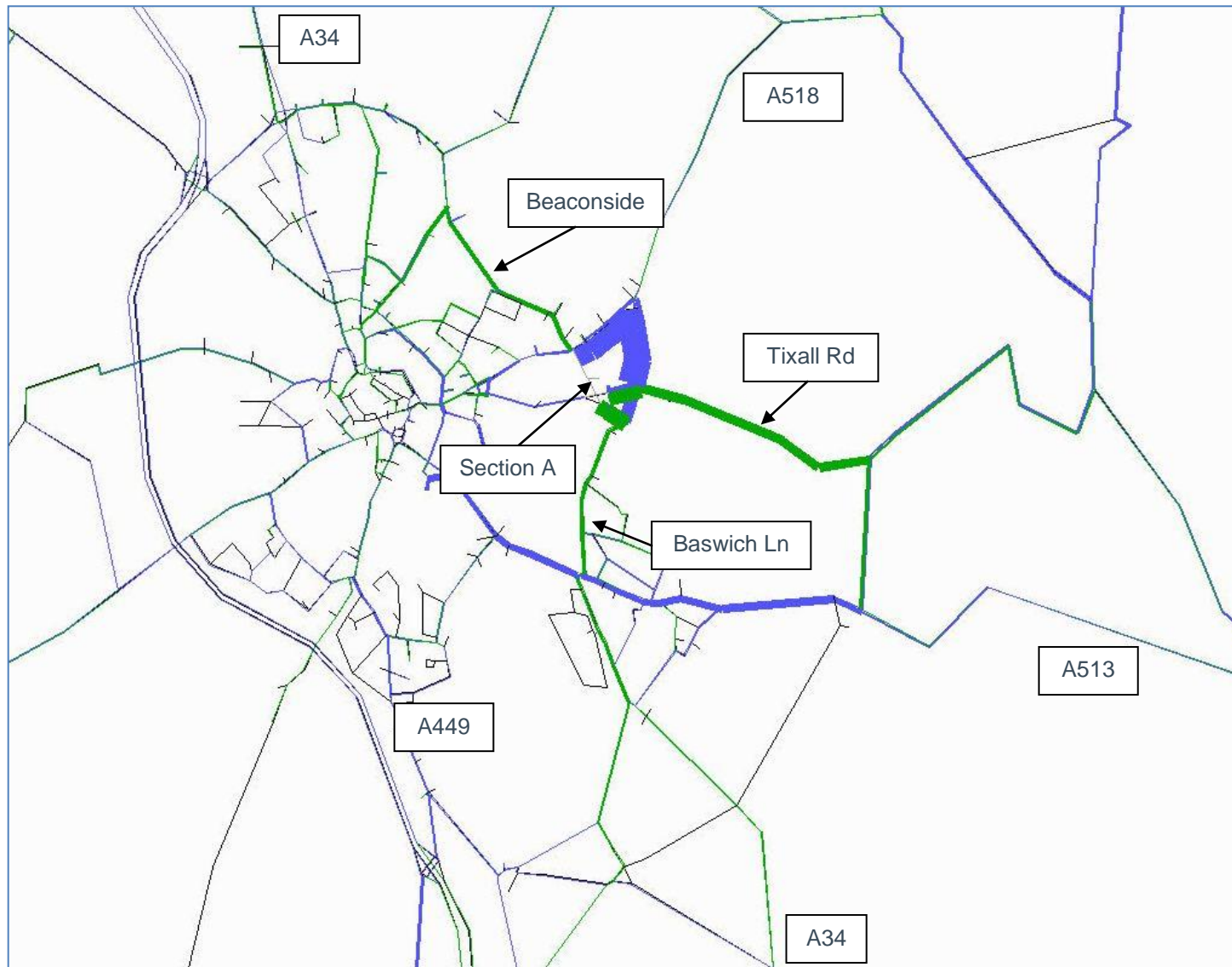


Figure 4-9 – DS1 – DM PM Flow Difference Plot
Green = Increase Blue = Decrease

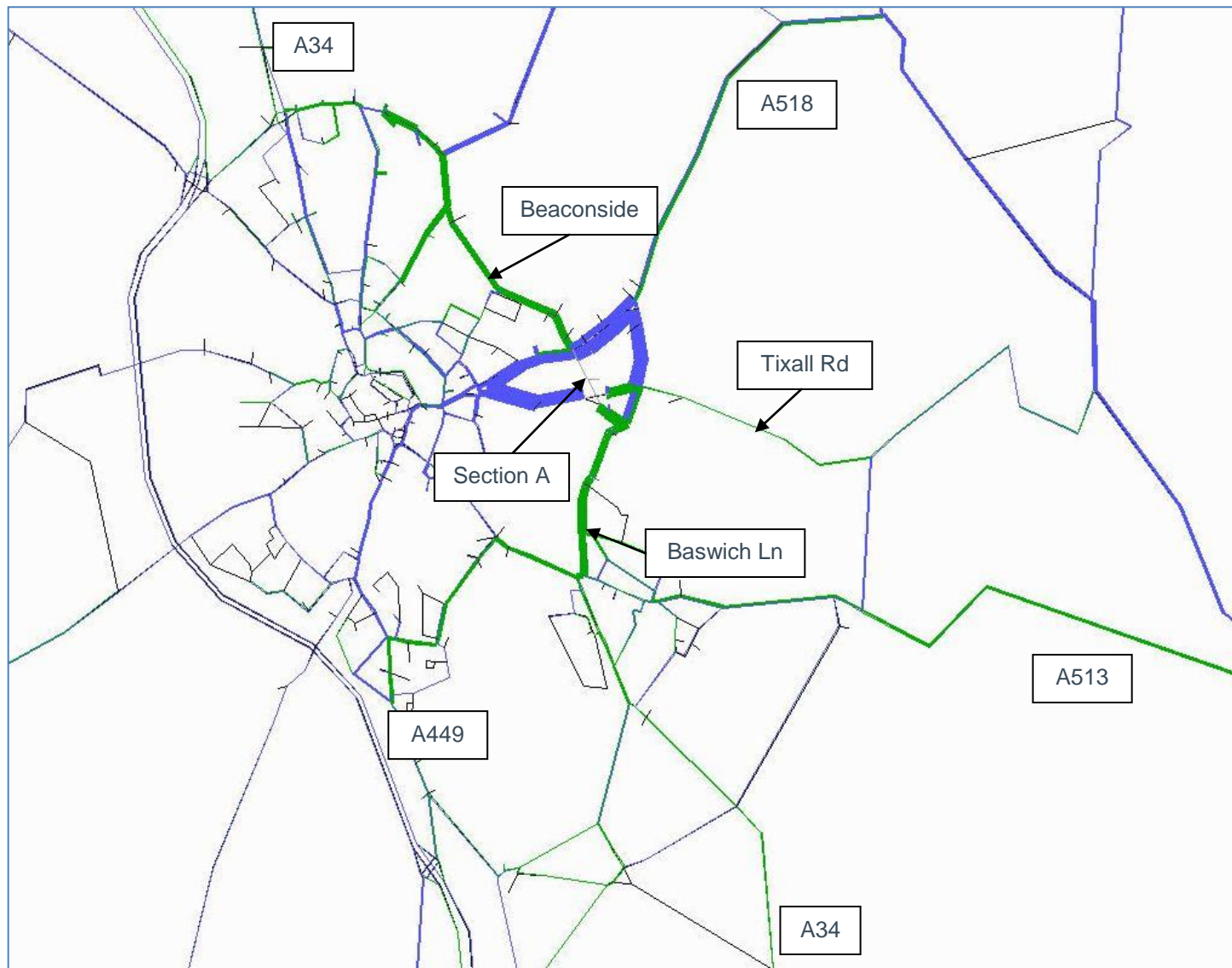


Figure 4-10 – DS2A – DM AM Flow Difference Plot
Green = Increase Blue = Decrease

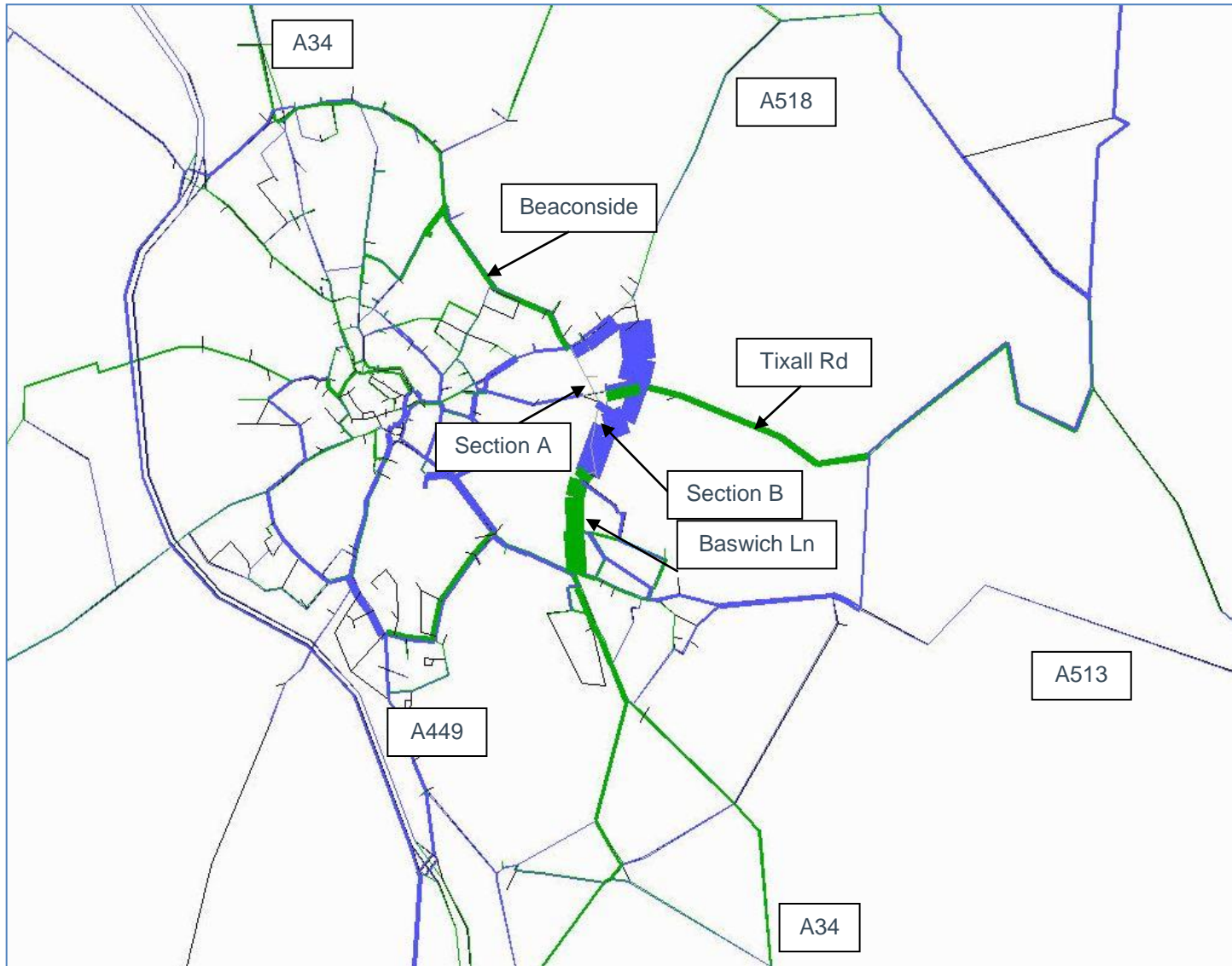


Figure 4-11 – DS2A – DM PM Flow Difference Plot
Green = Increase Blue = Decrease

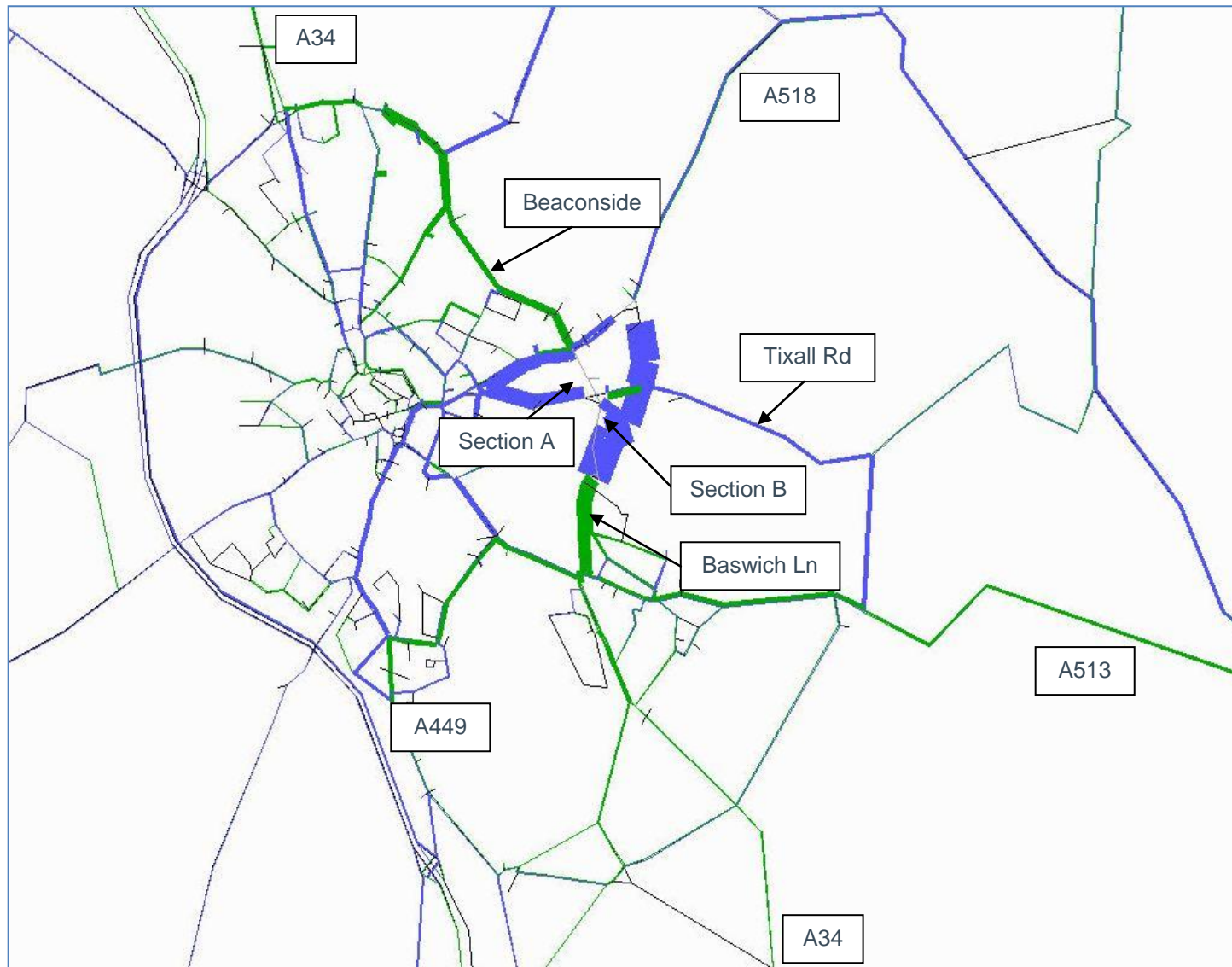


Figure 4-12 – DS3 – DM AM Flow Difference Plot
Green = Increase Blue = Decrease

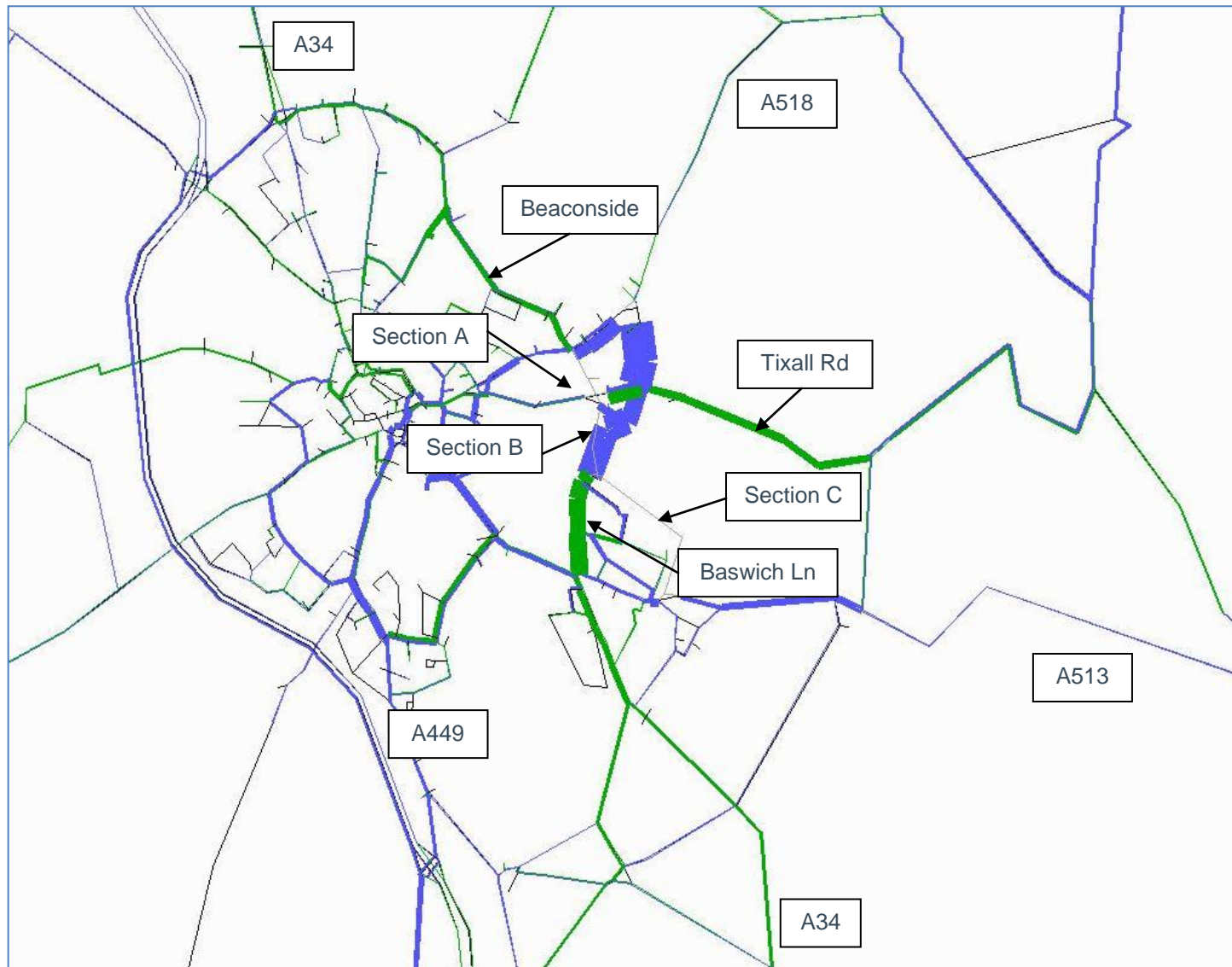


Figure 4-13 - DS3 – DM PM Flow Difference Plot
Green = Increase Blue = Decrease

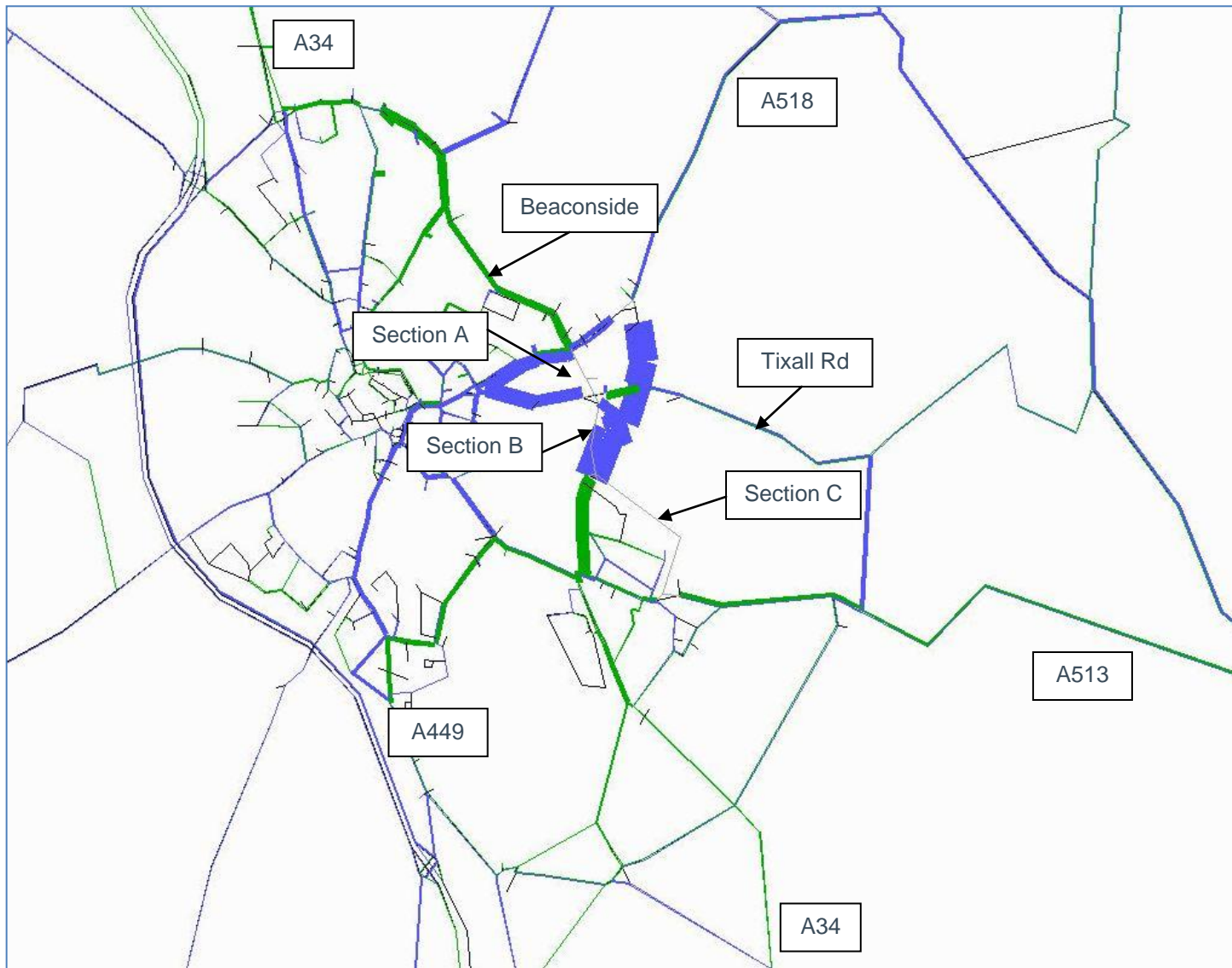


Figure 4-14 – DS4 – DM AM Flow Difference Plot
Green = Increase Blue = Decrease

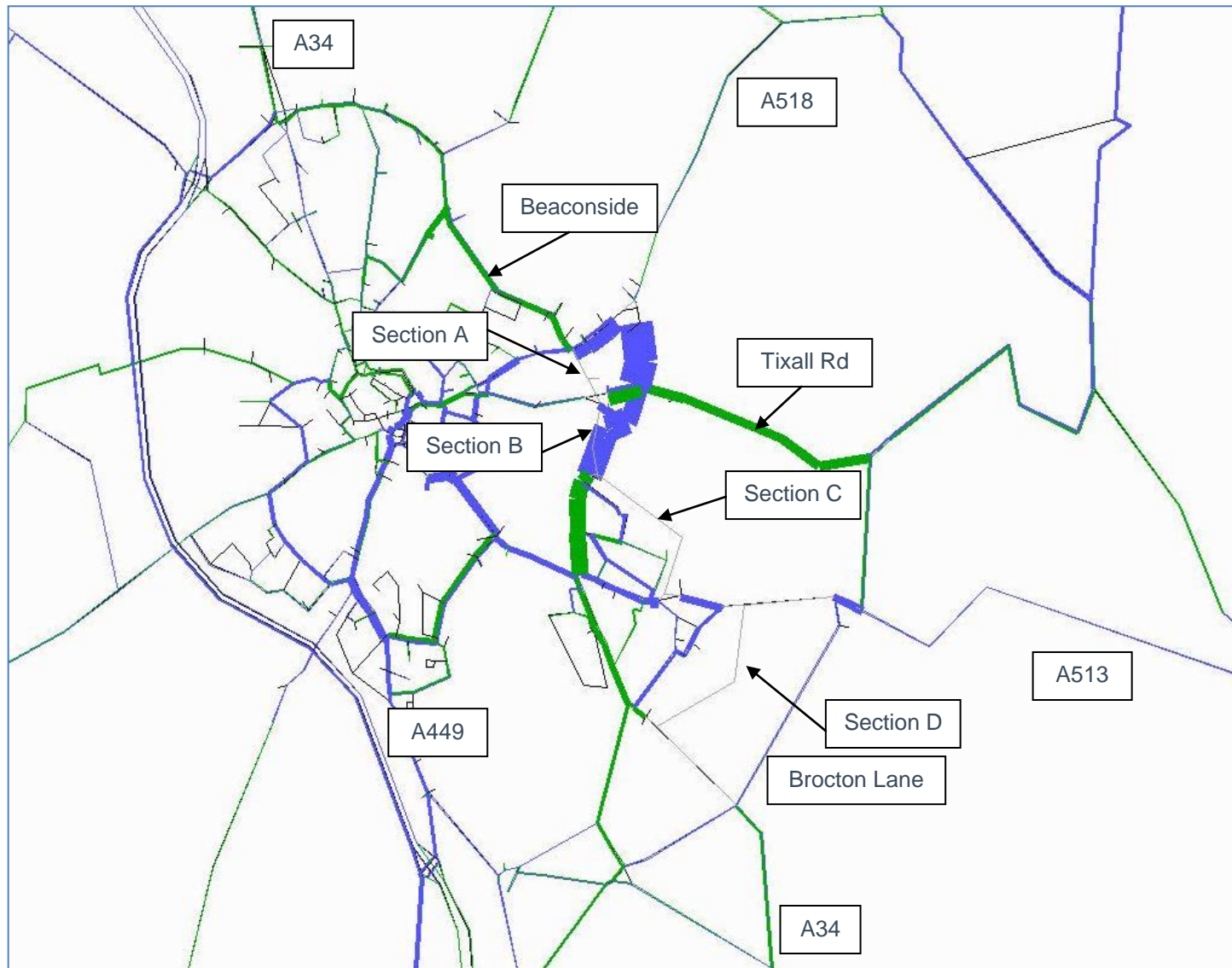
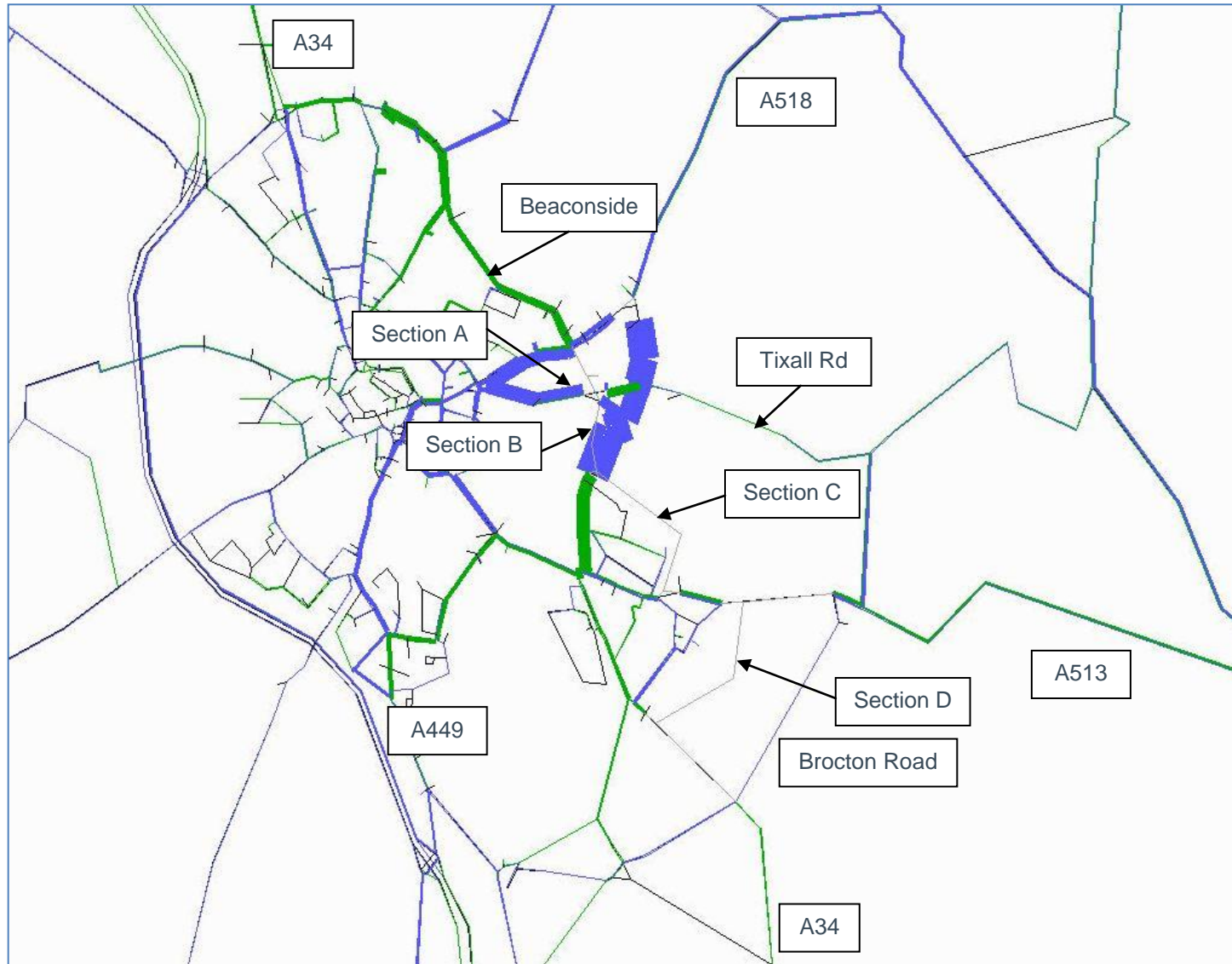


Figure 4-15 – DS4 – DM PM Flow Difference Plot
Green = Increase Blue = Decrease



5. Initial Economic Assessment

In order to provide an understanding of the economic feasibility of proceeding with the Stafford Eastern Distributor Road scheme, the three scenarios are to be assessed using the DfT's TUBA software, to gain an initial understanding of the scale of economic benefits resulting from the proposals. This section considers the following:

- Scheme Costs;
- TUBA Benefits; and
- Sectored Benefits.

5.1. Scheme Costs

An initial costing for each of the sections has been undertaken by Atkins in conjunction with Staffordshire County Council. Staffordshire County Council has provided the structures costs and land costs associated with the three scenarios, which have been analysed and verified by Atkins, in addition to calculating the remaining costs.

Atkins' cost assessment has been undertaken following a detailed site visit and by applying standard rates to develop the overall costs of the scheme. The key cost attributes are presented as follows:

Table 5-1 – Scheme Costs

2012 Q1 Prices (excl VAT)	DS1	DS2a	DS2b (Incl Baswich Lane Rbt)	DS3	DS4
Supervision	£160,533	£321,066	£359,594	£423,807	£515,132
Construction	£1,759,641	£4,326,683	£4,726,254	£10,763,691	£16,485,475
Prelims (5%)	£96,008	£232,387	£254,292	£559,375	£850,030
Structures	£250,000	£16,530,000	£16,530,000	£16,530,000	£16,530,000
Stats	£105,000	£300,000	£405,000	£605,000	876,111
Preparation (5%)	£118,559	£1,085,507	£1,113,757	£1,444,094	£1,762,837
Land	£1,425,000	£4,025,000	£4,025,000	£16,525,000	£27,636,111
Total	£3,914,742	£26,820,643	£27,413,897	£46,850,966	£64,655,698

In order to use these costs in an economic assessment of the scheme the following adjustments are required:

- Adjustment for Optimism Bias;
- Adjustment for Risk;
- Application of Indirect Tax
- Increase costs to reflect construction inflation
- Adjustment to 2010 prices
- Discount values to 2010

These adjustments are defined below. It has been assumed at this stage that all costs will be spent in 2015 for a 2016 opening year.

Table 5-2 – Scheme Cost adjustments

	DS1	DS2a	DS2b	DS3	DS4
2012 Q1 prices	£3,914,742	£26,820,643	£27,413,897	£46,850,966	£64,655,698
Optimism Bias (44%)	£5,637,228	£38,621,726	£39,476,011	£67,465,391	£93,104,205
Risk (assumed 25%)	£7,046,535	£48,277,157	£49,345,014	£84,331,739	£116,380,256
Indirect Tax (19%)	£8,385,377	£57,449,817	£58,720,567	£100,354,769	£138,492,504
Construction Inflation (in line with HA assumptions = 6.2%)	£8,905,270	£61,011,705	£62,361,242	£106,576,765	£147,079,040
2010 prices (0.933)	£8,310,594	£56,937,468	£58,196,885	£99,459,785	£137,257,401
Discount to 2010 (3.5% for 5 years)	£6,997,298	£47,939,820	£49,000,216	£83,742,470	£115,567,048

For the Optimism bias adjustment an increase of 44% has been applied in line with WebTAG for a scheme at Programme Entry Stage.

At this stage a full Quantified Risk Assessment has not been undertaken for the scheme and hence due to the preliminary stage of the design the costs have been factored by 25% to reflect this risk.

No costs associated with the maintenance of the scheme or the existing roads have been assumed at this stage.

Overall the costs of the schemes at 2010 prices discounted to 2010 are:

- DS1 - £7.0M
- DS2a - £47.9M
- DS2b - £49.0M
- DS3 - £83.7M
- DS4 - £115.6M

Besides the fact that each option has more new carriageway than the previous option, the key driving force behind the costs increasing substantially between the options are:

- DS2a and DS2b have a substantial (circa £16M) increase in structures costs compared with DS1. This is due to the fact that Section B of the EDR requires three separate structures in order to cross the River Sow, the Staffordshire and Worcestershire Canal and the West Coast Mainline Railway. This drives the cost increase between DS1 and DS2, with the optimism bias and risk uplifts accentuating this difference;
- DS3 has a substantial (circa £12M) increase in land costs when compared to DS2. The application of optimism bias and risk uplifts further accentuates this difference.

5.2. TUBA Benefits

Each of the Do Something scenarios are compared to the Do Minimum scenario (i.e. without the Eastern Distributor Road) using the latest version of TUBA (v1.9). The 2016/2031 AM/PM models are used to inform the TUBA assessment assuming an opening year of 2016 and a horizon year of 2075 (i.e. 60 year assessment).

The present value of benefits (PVB), present value of costs (PVC), net present value (NPV) and benefit to cost ratio (BCR) results of these TUBAs are presented in Table 5-3. Note that the figures are provided in 2010 prices, discounted to 2010.

Table 5-3 – TUBA Benefits by Scenario

	DS1	DS2a	DS2b	DS3	DS4
PVB	£38,179,000	£60,742,000	£60,616,000	£57,928,000	£56,927,000
PVC	£6,997,298	£47,939,820	£49,000,216	£83,742,470	£115,567,048
NPV	£31,181,702	£12,802,180	£11,615,784	-£25,814,470	-£58,640,048
BCR	5.46	1.27	1.24	0.69	0.49
BCR Category¹	Very High VfM	Low VfM	Low VfM	Poor VfM	Poor VfM

The table demonstrates that the first two sections of the proposed EDR provide the majority of the economic impact. Section A is responsible for generating approximately £38M of benefits, with a further £23M of benefits accrued when Section B of the EDR is built in conjunction with Section A.

Comparing the Do Something 2a scenario with the 2b scenario (where the double roundabout junction at Weeping Cross is replaced by a single, larger roundabout junction) reveals that benefits are marginally lower for DS2b, with £60.6M of benefits compared to £60.7M for DS2a. This suggests that any potential benefits for traffic seeking to access the scheme section via Baswich Lane are outweighed slightly by increased disruption for other traffic using the junction.

The Do Something 3 results provide further evidence to the flow assessment earlier in this report that there is no clear benefit to be achieved by pursuing Section C of the EDR. The initial assessment demonstrates that PVB for DS3 is approximately £3M lower compared with the DS2a scenario which does not include this section. Furthermore, the additional cost of implementing this option is higher than the forecast additional benefits, resulting in a negative NPV for DS3 of -£25.8M. This result is in line with the flow analysis which demonstrates that Section A and B traffic tends to prefer to use Baswich Lane to link to the A34, than use Section C of the EDR, which only links to the A513 towards Rugeley. The implementation of new roundabouts connecting Section C with Section B and the A513 also introduces increased delay for other motorists who do not use the link but still have to travel through the junctions.

For Do Something 4, again there is no evidence to suggest that the inclusion of Section D of the EDR will provide any clear benefit for motorists, with the total PVB decreasing from £57.9M for DS3 to £56.9M for DS4. The increased costs for this option are far greater than the forecast benefits, resulting in a negative NPV for DS4 of -£58.6M. This result can again be explained by the very low level of traffic which uses Section D, with no vehicles using this link travelling via any other section of the EDR. Meanwhile, the inclusion of new roundabout junctions on the A518 Lichfield Road and the A38 Cannock Road introduces delay for motorists who were previously unimpeded along these two routes.

In considering these results, it should be noted that the benefit estimates are likely to be conservative due to a number of key factors:

- There exists only an AM and PM peak model. It can be argued that the Eastern Distributor Road can only generate further benefits outside of these time periods, but it is not possible to quantify these additional benefits using the existing models;
- The TUBA assessment does not include benefits accruing from accidents savings. By introducing a new road constructed to the latest design standards, it is likely that there would be some accident benefits in addition to the TUBA economic benefits;

¹ Categories as defined in the DFT's 'VfM Guidance'; see <http://assets.dft.gov.uk/publications/value-for-money-assessments-guidance/vfmguidance.pdf>

- The model is only available for years 2016 and 2031, whereas typically an intermediate year would be used to help shape the benefits over time. The impact of not having an intermediate year will be explored later in this section.

The overall Benefit to Cost Ratio of the schemes are 5.46 for DS1, 1.27 for DS2a, 1.24 for DS2b, 0.69 for DS3 and 0.49 for DS4. Therefore DS1, which involves constructing just Section A of the EDR, is the only scenario that produces a BCR above 2 in line with the DFT's criteria of value for money. In scoring 5.46, DS1 is considered very high value for money.

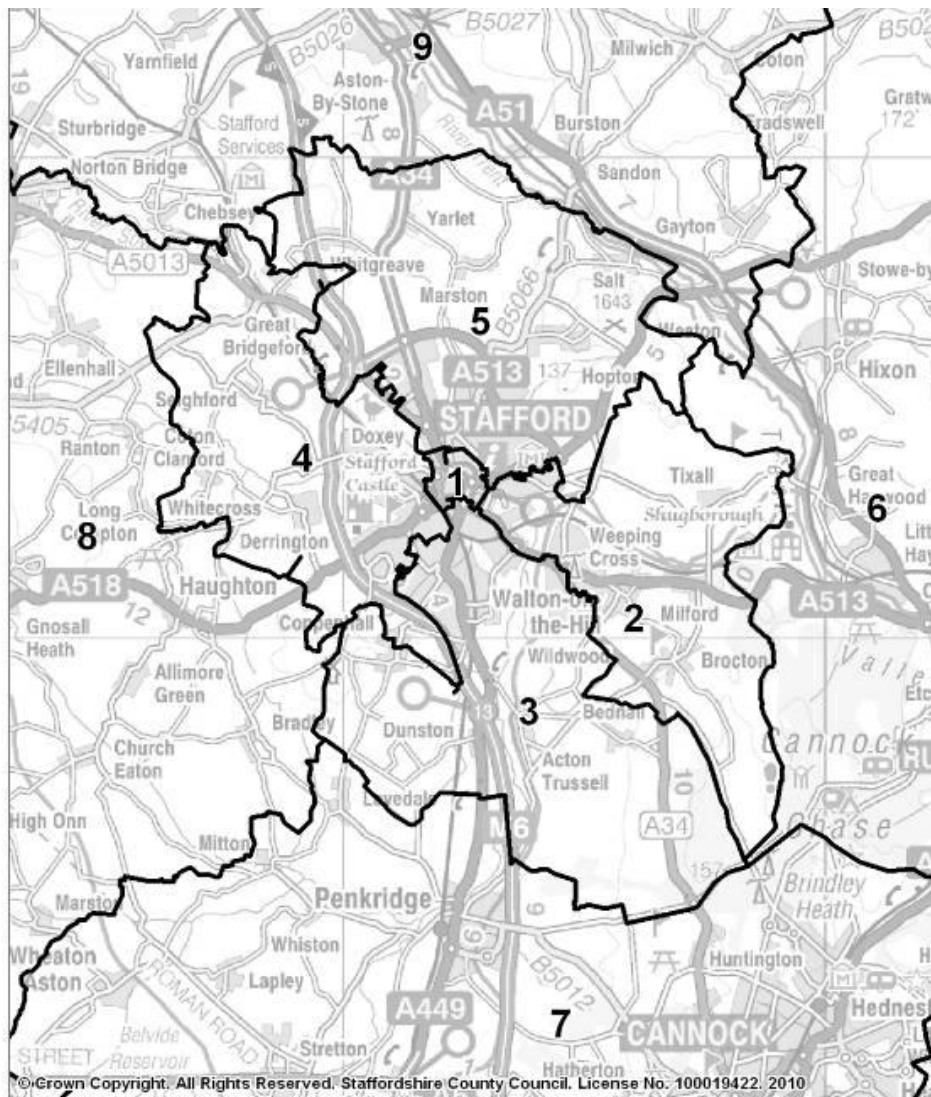
5.3. Sectored Benefits

By sectoring the TUBA outputs, it is possible to better understand the movements that benefit from the Eastern Distributor Road and which movements, if any, suffer dis-benefits.

Figure 5-1 shows the 9 area TUBA sectoring system that is to be used. This is consistent with the sector system previously used for the Western Access Improvements model. The sectors separate out the town centre; north, east, south and west quadrants of Stafford; and the north, east, south, and west areas external to Stafford. The sector outputs are used to get a broad understanding of the movements that benefit from the Eastern Distributor Road (which is within Sector 2).

The sector to sector benefits for each of the three scenarios are then shown in Table 5-4, Table 5-5 and Table 5-6 respectively.

Figure 5-1 – TUBA Sector System



5.3.1. Do Something 1 Analysis

Table 5-4 – Do Something 1 Sector Benefits

£000s	1	2	3	4	5	6	7	8	9	Total	%age
1	6	217	186	22	65	267	282	78	154	1277	3%
2	641	30	49	213	2191	408	9	137	896	4575	12%
3	438	134	59	330	1159	473	4	101	577	3276	9%
4	45	112	125	53	130	85	142	56	95	842	2%
5	51	1635	1008	332	-1743	2815	1349	220	-430	5238	14%
6	942	1058	813	384	4477	1108	659	495	659	10595	28%
7	941	15	15	310	2580	420	56	74	1859	6271	17%
8	133	-5	18	39	308	266	62	6	259	1086	3%
9	179	1746	321	179	-199	620	1122	321	157	4447	12%
Total	3377	4943	2595	1864	8969	6461	3685	1489	4225		
%age	9%	13%	7%	5%	24%	17%	10%	4%	11%		

Table 5-4 demonstrates the following:

- Trips from Sector 6 and to Sector 5 experience the largest proportion of the benefits. It is therefore unsurprising that the 6 to 5 movement itself is the highest individual movement to benefit. These are movements from the east to the north of Stafford, which, given that this section of route connects the east to the north is a sensible finding;
- The only movements which significantly suffer due to Section A of the EDR are movements between Sectors 5 and 9, and between Sector 5 and itself. The flow diagrams shown earlier in this report demonstrates that this section of the route encourages more traffic onto the already busy A513 Beaconside. This is likely to explain some of the dis-benefits associate with movements that originate/terminate on and around this road (i.e. Sector 5).

5.3.2. Do Something 2a Analysis

Table 5-5 demonstrates the sector benefits for the Do Something 2a model which includes the EDR Sections A and B. In general, the benefits are much better spread amongst the sectors for the DS2a scenario compared with DS1. While many of the findings are similar, key differences include:

- Whereas previously Sector 6 to 5 movements were the most prosperous, in this scenario there are a number of movements which create high benefits. Movements from sectors 2, 3, 6 and 7 to Sector 5 (and the reverse movements) all experience significant benefits where not all did before. This is a sensible finding, as Sectors 2, 3, 6 and 7 all lie to the east or south of the new route, while Sector 5 is to the immediate north. Therefore, by connecting these sectors using Sections A and B provides good benefits to all these movements;
- As before, intra Sector movements at Sector 5 suffer from substantial dis-benefits. This again reflects the additional delay bought onto the A513 Beaconside as traffic uses this route to access the EDR.

Table 5-5 – Do Something 2a Sector Benefits

£000s	1	2	3	4	5	6	7	8	9	Total	%age
1	-10	732	430	36	130	493	859	190	41	2900	5%
2	1003	642	284	392	4125	1015	217	305	2072	10056	17%
3	717	354	78	483	2783	1494	-81	140	855	6824	11%
4	66	434	355	81	452	328	509	111	126	2463	4%
5	-155	3290	2073	45	-4601	1358	3573	449	-1438	4593	8%
6	1133	1622	1173	297	3211	407	1216	565	527	10152	17%
7	1528	291	49	463	6907	1545	96	125	3328	14331	24%
8	298	239	76	66	1580	663	156	15	401	3495	6%
9	-88	3041	433	68	-859	433	1527	440	189	5183	9%
Total	4493	10645	4951	1931	13726	7736	8073	2340	6102		
%age	7%	18%	8%	3%	23%	13%	13%	4%	10%		

Sector benefits for the Do Something 2b model are very similar to those observed in DS2a and hence they have not been presented.

5.3.3. Do Something 3 Analysis

Table 5-6 shows the sectored benefits for the Do Something 3 model with Sections A, B and C of the proposed EDR. The benefits table tells the following:

- There are very few significant differences between the Do Something 2a and Do Something 3 benefits tables. All but two of the sector to sector movements have a less than £0.3m change as a result of including Section C of the EDR.
- The two sector to sector movements that have changed by more than £0.3m are Sector 5 to 6 and Sector 1 to 6. These are west to east movements, demonstrating where delays have increased for traffic using the A513 following the introduction of a new roundabout which connects to Section C.

Table 5-6 – Do Something 3 Sectored Benefits

£000s	1	2	3	4	5	6	7	8	9	Total	%age
1	-9	653	416	49	117	189	794	185	39	2433	4%
2	1065	591	261	407	4198	925	236	328	2158	10168	18%
3	776	319	78	496	2785	1279	-108	143	900	6669	12%
4	65	392	388	82	491	142	519	112	145	2336	4%
5	-190	3185	2006	58	-4745	972	3395	419	-1547	3553	6%
6	983	1481	972	151	2984	244	1179	458	493	8944	16%
7	1655	271	37	483	6942	1535	103	130	3448	14603	26%
8	319	245	87	71	1566	581	156	15	413	3453	6%
9	-53	2936	446	90	-781	378	1430	419	206	5070	9%
Total	4610	10071	4689	1887	13558	6245	7704	2210	6255		
%age	8%	18%	8%	3%	24%	11%	13%	4%	11%		

5.3.4. Do Something 4 Analysis

Table 5-7 shows the sectored benefits for the Do Something 4 model with all four Sections of the proposed EDR. The benefits table tells the following:

- There are very few significant differences between the Do Something 3 and Do Something 4 benefits tables. However, there is a noticeable reduction in benefits for movements to and from Sector 7. This can be attributed to the increased delay for motorists travelling along the A34 Cannock Road who are now impeded by the implementation of a new roundabout on the link connecting to Section D. Benefits to and from Sector 6 are also reduced owing to increased delay for motorists impeded by the new roundabout connecting Section D to the A513.

Table 5-7 – Do Something 4 Sectored Benefits

£000s	1	2	3	4	5	6	7	8	9	Total	%age
1	-13	698	472	34	107	126	682	177	14	2297	4%
2	1136	494	300	453	4256	855	106	326	2166	10093	18%
3	850	319	63	563	2920	1248	-294	158	978	6805	12%
4	74	403	415	86	505	106	364	103	136	2193	4%
5	-138	3234	2151	54	-4489	990	3246	470	-1427	4090	7%
6	863	1314	1005	62	3028	261	1113	370	521	8538	15%
7	1619	265	-75	461	6761	1483	71	118	3017	13720	24%
8	324	172	101	70	1611	588	124	15	432	3437	6%
9	-22	2941	532	90	-654	428	1016	511	201	5044	9%
Total	4692	9842	4965	1873	14045	6086	6429	2249	6039		
%age	8%	18%	9%	3%	25%	11%	11%	4%	11%		

6. DIADEM Sensitivity Test

This report aims to provide an indicative understanding of the likely benefits of the Eastern Distributor Road. However, a full assessment would include running a variable demand model (i.e. using DIADEM) to see how trip distribution and frequency are influenced by the introduction of the new distributor road. DIADEM is a software package which has been developed to facilitate variable demand modelling of existing highway models, providing an adjustable hierarchical structure of travel frequency, mode choice, distribution and time of day choice.

Rather than undertake a full set of DIADEM runs for all scenarios, a DIADEM sensitivity run has been undertaken to illustrate the likely impact of DIADEM, without committing the time and resources of setting up and calibrating a demand model, then running a full assessment.

Therefore, the previous Stafford Western Access Improvement (SWAI) model will be used to undertake an indicative assessment of the impacts of DIADEM. This demand model has already been calibrated for the Western Access Improvements and so is considered appropriate for running further tests.

As such, the 'with Western Access Improvements' scenario (previously the Do Something during the Western Access Improvement testing²) will form the Do Minimum for this assessment, while a new version of the Western Access Improvement model is created to represent the Do Something by including all 4 sections of the Eastern Distributor Road.

For reporting purposes, the 'fixed' and 'variable demand' models refer to assignments of the SWAI model, both incorporating the DS4 scenario (i.e. not the Do Minimum).

This report will only consider the effects of the demand model on the Eastern Distributor Road to the A34 as this is the most severe intervention under consideration and likely to provide the greatest impact on the demand model, which typically reduces benefits.

6.1. Demand Modelling impact on Flows

Table 6-1 shows the modelled flows on the key sections of distributor road for the before and after variable demand modelling models.

The table demonstrates that the variable demand modelling adds trips to the new distributor road (particularly Section A and B) and the connected Baswich Lane route to the A34. This is an intuitive response, as the demand modelling redistributes trips to take advantage of the additional network capacity provided by the new road.

² See Stafford Western Access Improvements Forecasting Report, May 2010

Table 6-1 – Impact of DIADEM on Key Links for DS4 Scenario (2031)

Flow in vehs		Fixed DS4		Variable Demand DS4		Difference	
		AM	PM	AM	PM	AM	PM
Section A	NB	1493	903	1538	961	+45	+58
	SB	948	1467	1015	1573	+67	+107
Section B	NB	1184	759	1251	816	+67	+57
	SB	782	1184	838	1293	+56	+108
Section C	NB	88	8	139	10	+51	+2
	SB	12	48	12	52	+0	+3
Section D	NB	29	42	31	42	+3	0
	SB	86	52	85	51	-1	-1
Baswich Lane S	NB	913	717	983	756	+70	+39
	SB	691	715	734	765	+44	+49
Baswich Lane N	NB	79	4	133	4	+54	0
	SB	3	1	3	1	0	0

6.2. Demand Modelling impact on TUBA outputs

In order to understand the impacts of the demand model assignment on the economic assessment of the scheme, a TUBA assessment has been undertaken.

In undertaking this comparison, however, it is recognised that the TUBA outputs from this sensitivity test will not match the other economic outputs presented above. This is because the dedicated Eastern Distributor Road model includes many other development changes in and around the north/east of the Stafford with some of these accessing onto or very close to the proposed Eastern Distributor Road. As a result these developments affect the economics.

Table 6.2 provides a comparison between the fixed and variable demand model TUBA results. This indicates the likely impact that a demand modelled Eastern Distributor Road has on benefits. The following table shows the TUBA benefits from the fixed and variable demand modelled DS4 scenario:

Table 6-2 – DIADEM impact on TUBAs

	Fixed	Variable Demand	% Diff
PVB	£75,974,000	£76,705,000	+1%

The table demonstrates that DIADEM variable demand modelling slightly increases the benefits generated by the Eastern Distributor Road. This shows an estimated increase in benefits of 1% from the fixed assignment.

Table 6-3 shows the pre and post DIADEM matrix totals for the 2031 forecast year. This demonstrates that the variable demand process has added a small number of trips to the model due to the extra road network capacity around Staffordshire.

Table 6-3 - Pre- and Post-DIADEM Matrix Totals

	Fixed	Variable	Diff
2031 AM	41299	41373	+74
2031 PM	43738	43816	+78

Figure 6-1 and Figure 6-2 show the flow difference between the variable and fixed assignments in the AM and PM peak respectively. They demonstrate that the variable demand modelling encourages further trips onto the new Eastern Distributor Road. This, in conjunction with the matrix totals shown earlier, explains the slight increase in benefit following the demand modelling, as the improved road network encourages further trips onto the network and specifically onto the distributor road.

Figure 6-1 – 2031 AM Variable – Fixed Demand Flow Passenger Car Units (PCUs)

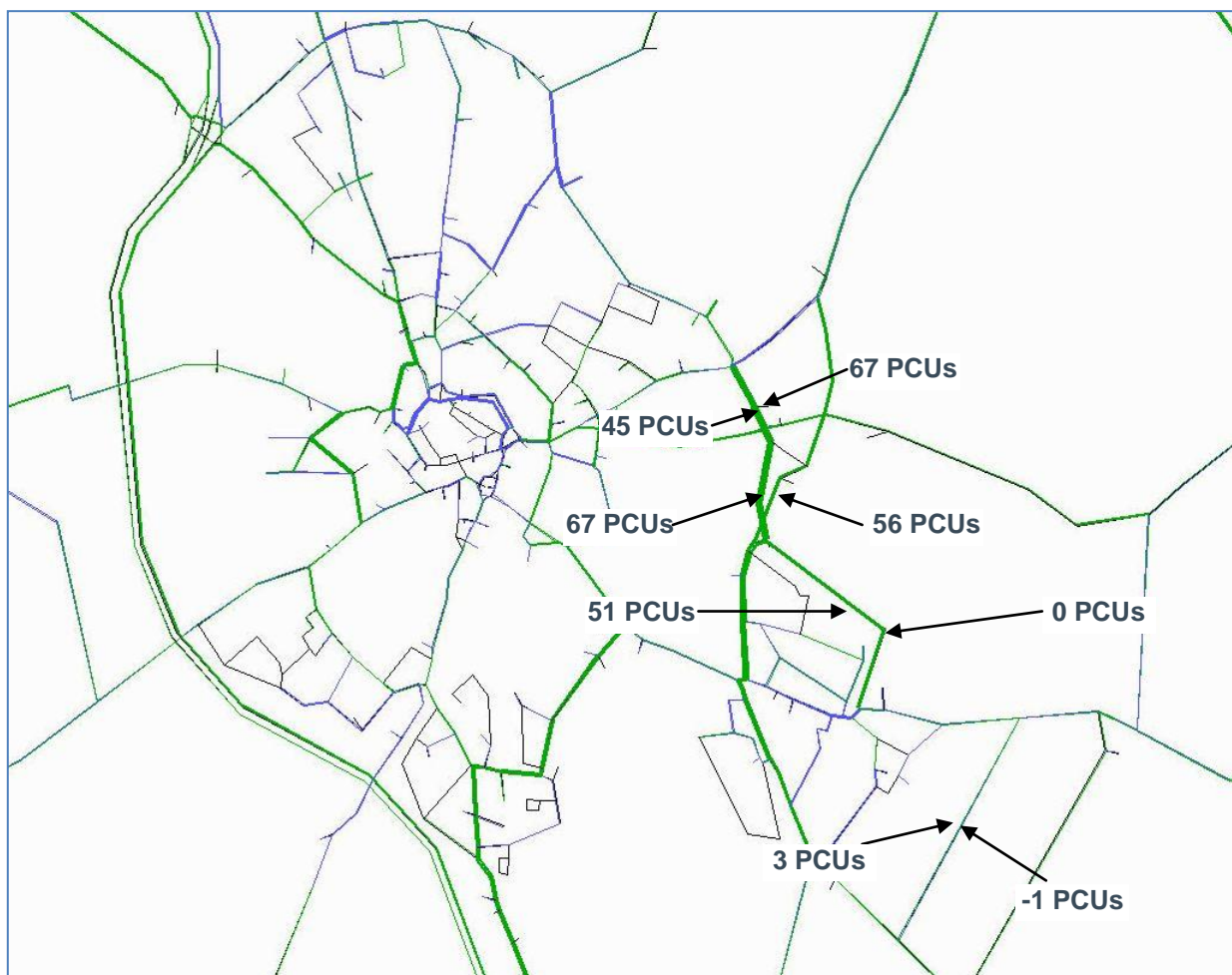
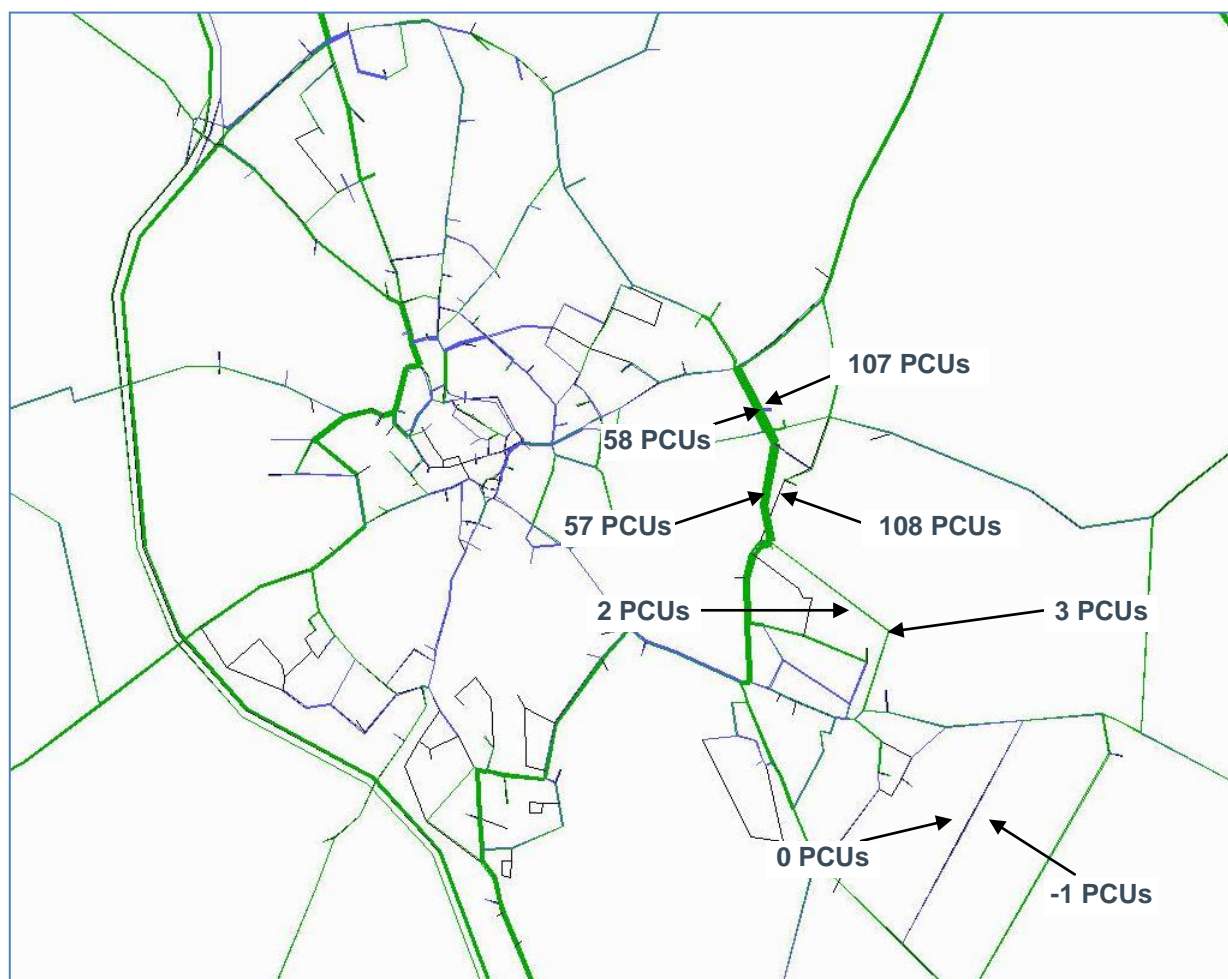


Figure 6-2 – 2031 PM Variable – Fixed Demand Flow (PCUs)



6.3. Projected Impact of Demand Modelling on BCR

Assuming that the 1% benefit increase demonstrated in the demand model test is typical of the increase that would occur if the Eastern Distributor Model was modelled in this approach, it is possible to project the impact on BCR that a demand model may have. Table 6-4 shows the previously provided costs (PVCs) from Section 5 of the report, but with the demand model projected benefits (PVBs).

Table 6-4 – TUBA Benefits by Scenario

	DS1	DS2a	DS2b	DS3	DS4
Fixed PVB	£38,179,000	£60,742,000	£60,616,000	£57,928,000	£56,927,000
Variable Demand Model PVB	£38,561,800	£61,349,400	£61,222,200	£58,507,300	£57,496,300
PVC	£6,997,298	£47,939,820	£49,000,216	£83,742,470	£115,567,048
NPV (Variable)	£31,564,502	£13,409,580	£12,221,984	£-25,235,170	£-58,070,748
BCR (Variable)	5.51	1.28	1.24	0.70	0.50
BCR Category	Very High VfM	Low VfM	Low VfM	Poor VfM	Poor VfM

The table demonstrates an increase in BCR for all scenarios when compared to the previously presented Table 5-3. However, this increase is marginal, suggesting that variable demand modelling is unlikely to have a major impact on any potential scheme in terms of value for money.

DS1 remains a viable option with a BCR of 5.51, being scored as very high value for money based on the DfT's scoring criteria. DS2a and DS2b would both still be considered as low value for money, with BCRs of 1.28 and 1.24 respectively. Finally, DS3 and DS4 both remain poor value for money, with BCRs of 0.70 and 0.50 respectively.

7. Summary

This report outlines the initial assessment of the Stafford Eastern Distributor Road (EDR) undertaken with the 2012 version of the Stafford SATURN Transport Model, and has focussed on understanding the following:

- Flow levels on and around the schemes;
- Understanding of the origins and destinations of who would use the schemes;
- The level of traffic diversion due to the schemes;
- An indicative cost for each scheme;
- The overall economic benefits of the schemes; and
- The benefits and dis-benefits for sectorised movements.

The traffic flow analysis demonstrated:

- **Section A: Beaconside to St Thomas Lane**
There is high vehicle demand for Section A of the EDR with between 1,500 to 2,400 vehicles using the link during peak time periods across all of the potential scenarios. This section primarily provides benefits for road users travelling between east and north Stafford rather than to the town centre. It tends to draw traffic away from central Stafford with traffic re-routeing via Beaconside to the north and Baswich Lane or Holiford Lane/Tixall Road to the south. There are large localised traffic reductions on Blackheath Lane, Weston Road and Tixall Road.
- **Section B: St Thomas Lane to Cornwall Drive**
Again, there is high vehicle demand for Section B of the EDR with between 1,700 to 2,100 vehicles using this section during peak time periods for all scenarios. The link provides a more direct route between the A513 and Tixall Road, with traffic diverting away from the northern section of Baswich Lane. The implementation of Section B also results in a large increase in traffic along Section A, with more vehicles such as those travelling from/to the A449 diverting away from central Stafford and onto the EDR, via Silkmore Lane and Lichfield Road. This increases the level of traffic using the southern section of Baswich Lane whilst traffic travelling from/to the A513 is also diverted away from Tixall Road/Holdiford Road and onto Baswich Lane in order to travel via Section B;
- **Section C: Baswich Lane to A513 Weeping Cross**
There is very little demand for Section C of the EDR as traffic is more likely to use Baswich Lane. Less than 100 vehicles use the link during the peak hour time periods;
- **Section D: A513 Milford Road to A34 Cannock Road**
As with Section C, there is very little demand for Section D (again less than 100 vehicles use the link during the peak periods). The DS4 scenario assessment has also demonstrated that none of the traffic using the link travels via any other section of the EDR;

In addition to traffic flow analysis, an indicative assessment regarding the impact that variable demand modelling is likely to have on scheme benefits has been undertaken. This has been based on the Stafford Western Access Improvements (SWAI) model which already has a calibrated variable demand model. The Stafford Eastern Distributor Road has been added to this model, and the impact of demand modelling on TUBA outputs assessed. This demonstrated that:

- Demand modelling encourages more traffic to use the scheme roads and connected Baswich Lane road;
- This increase of traffic using the scheme increases the benefits of the scheme marginally by approximately 1% over the 60 year assessment period. It can therefore be assumed that a full, WebTAG compliant assessment would have a similar response.

Finally, a sector analysis of the TUBA outputs has been undertaken to ensure the results are understood and in line with expectations. This concluded that the areas which are benefiting from the EDR are logical, with trips from east/south Stafford to north Stafford (and the reverse) benefiting most from the intervention.

In summary, the key economic findings from this initial assessment are:

- DS1 provides a very high value for money BCR of 5.46 (increasing to 5.51 with variable demand modelling). This is largely due to the low cost of the scheme, and the high levels of flow that are shown to use the new road if implemented;
- DS2a provides a low value for money BCR of 1.27 (increasing to 1.28 with variable demand modelling). The scenario produces significant benefits of approximately £48M, but there is a substantial increase in the cost of structures to build this option, and hence the NPV reduces significantly, as does the BCR. There appears to be substantial demand for this road with high flows when tested, however the cost of structures means the option returns a low BCR over 60 years;
- The BCR for DS2b (replacing the double roundabout junction at the A513/A34 Weeping Cross with a single larger roundabout) equates to a value of 1.24 (i.e. lower than for DS2a). This is a result of the increased costs associated with the network changes, combined with a slight reduction in benefits. Overall the improvements in travel time for vehicles travelling to/from Baswich Lane are outweighed by increased disruption for other traffic using the junction; and
- DS3 and DS4 both provide a poor value for money BCR of 0.69 and 0.50 respectively. These options both cost substantially more than DS2 due to high land costs. However, the additional sections of road have very little demand and hence the benefits are lower than in DS2a owing to the increased disruption for other vehicles which have to travel through the connecting junctions. As such, the cost of both schemes outweigh their benefits, resulting in a negative NPV and a poor BCR

8. Recommendations

Section A of the Stafford Eastern Distributor Road could deliver significant transport benefits within the Local Plan period and therefore this section should be protected from development.

Section B could provide high benefits, but at a high cost which would result in low value for money, although the cost could be reduced following further detailed investigations. There may be the potential to value engineer this section of the route and other benefits could be captured if a full Major Scheme Business Case was produced. It may therefore be appropriate to continue to protect Section B within the plan period.

It is unlikely that the economic benefits of replacing the existing double roundabout configuration, at the A513/A34 Weeping Cross Junction, with a single large roundabout will outweigh the associated additional costs.

Sections C and D have few demonstrable transport benefits. Therefore both the planning authority and highway authority should consider whether it is appropriate to continue to protect these sections of the route.

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