Braintree Local Plan Review Regulation 19 Transport Evidence Annex

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Essex County Council and Braintree District Council

Braintree Regulation 19 Local Plan Transport Evidence
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Appendices

Appendix A. Method for assessing the acceptability of the transport impact of growth

Chapter 2 introduces a movement index for helping transport authorities consider the acceptability of transport impacts arising from local plan growth and supporting the identification of appropriate mitigation measures in line with the NPPF vision-led approach to transport planning and the county's LTP4. This appendix provides technical information on the transport assessment method, which has guided the findings and recommendations.

A.1 Strategic versus detailed

Traditional approaches to acceptability of local plan development often focus on using level of service (LoS), volume/capacity (V/C) and queue length indicators around junctions.

At the preferred options, plan making, Regulation 18 stage of local plan preparation there is risk that sole use of these indicators would tilt plans to highway schemes at the expense of the vision for sustainable transport; and put focus on specific problem locations while losing sight of the strategic tapestry of the transport network, and the cumulative impact of how people and goods move through the network using all modes.

At the Regulation 19 stage and in site-specific, developer-led transport assessments, LoS, V/C and queue length indicators have their role – ideally when used to test the effectiveness of mitigation measures to strike the right balance between pedestrian, cycle, bus, car and goods vehicle movements aligned with a sustainable transport vision. It is also appropriate that they are considered at key junctions such as found on the strategic road network managed by National Highways (NH).

However, at the Regulation 19 stage, a more strategic approach is recommended, aligned with the intent of the NPPF and the draft LTP4.

A.2 Assessment of keeping people and goods moving (theory and method)

The assessment of keeping people and goods moving is, arguably, the key criterium for which an objective judgement is required, to be informed by transport modelling. This section explains the theory and method.

Transport models can produce numerous indicators which are difficult to combine and interpret – it is metaphorically difficult to see the wood for the trees. In addition, strategic transport models are good at showing change between a reference case (without local plan growth and mitigations) and an assessment case (with local plan growth and with or without mitigations). However, strategic models are not as good at interpreting the level of problem in either of the cases.

We make an assumption that highway traffic indicators provide the most useful high level indicators since increases in flow, congestion and delay will likely impact all people and goods movements regardless of mode. Secondary analysis would then consider the impact on each mode informed by findings from the sustainable transport criterium and the traffic forecasts.

The assessment of movement performance commences by identifying key areas of the network where there are problems or change is expected. Each area of interest is then subdivided into paths, which are routes through an area.

For example, one path may go straight ahead at a junction whereas another path may turn left or right. For each path the following indicators are extracted from the model.

Relative queue (q) which shows blocking back of traffic on that path, i.e. traffic that doesn't get through in the modelled time period, which causes queues to form. This indicator only appears on the worst performing parts of the modelled network and is shown as the percentage of a link which is blocked. Relative queue ranges between 0 (no queue) to 100% (where the entire path link is blocked by the end of the modelled hour).

The ratio between modelled speed and free flow speed along the path (s).This indicator reflects delay in situations where traffic is slow moving and is calculated by dividing modelled speed by free flow speed. Traffic can be slow moving without there being a relative queue. The ratio ranges from 0+ (very slow but never 0 since some traffic must have travelled along a path even if it ends up fully blocked with traffic unable to move at the end of the modelled hour) to 1 (where there is no delay whatsoever).

The ratio between the demand for traffic to flow along a path and the actual modelled flow that is predicted to get through a path over the modelled hour (d). This indicator reflects issues where demand exceeds capacity. It is calculated by dividing demand flow by actual flow. It ranges from 1 (where all traffic can get through) to, potentially, a high number in an exceptionally congested network – though in reality the indicator will range between 1 and 2.

These indicators (q, s and d) have then been combined into a movement index (I) using the following formula:

$$I = \left(\frac{(1+q)^2}{s} \right)^d$$

The index I ranges from 1 (with no queue and delay with all traffic demand passing through) to, in extreme situations, a high number. In practice it ranges from 1 to 4 for the majority of paths with some outliers ranging to 15.

There is an index score for each of the paths through each of the areas of interest. For each area of interest, a combined index score is then calculated. This is done by calculating a weighted average of the index scores of the paths through an area. The average is weighted by path length.

In order to interpret the severity of conditions represented by the index score, a seven point scale 1-15 has also been developed, shown in Table A. 1. Since the function is non-linear the scale is also non-linear. To develop the scale, a technique borrowed from mathematical approximation theory has been used to identify the most efficient set of intervals to represent change.

Table A. 1: Relationship between the movement scale and index values

Description	Movement scale	Index values
More or less free flow	1	1.00 ≤ I < 1.03
	2	1.03 ≤ I < 1.10
	3	1.10 ≤ I < 1.19
Travelling slower	4	1.19 ≤ I < 1.31
	5	1.31 ≤ I < 1.45
	6	1.45 ≤ I < 1.63
Moderate congestion	7	1.63 ≤ I < 1.83
	8	1.83 ≤ I < 2.05
	9	2.05 ≤ I < 2.29
Substantial congestion	10	2.29 ≤ I < 2.54
	11	2.54 ≤ I < 2.82
	12	2.82 ≤ I < 3.10
Extreme congestion	13	3.10 ≤ I < 3.40
	14	3.40 ≤ I < 3.70
	15	I ≥ 3.70

Using the scale, the level of movement performance can be assessed in each area of interest. Also, problems on specific paths can be identified by looking at the indices on individuals paths. The question then arises that if growth is added to the network, or mitigations made, whether performance is acceptable or not.

To answer this question, it is assumed that there will be two scenarios (reference and assessment scenarios) to be compared against each other. Depending on the changes between scenarios and the scale of problem, the matrix shown in Table A. 2 shows how a judgement can be reached on whether the assessment scenario can be found broadly acceptable in terms of movement performance – noting that sustainable transport and safety impacts also need to be considered.

The main report illustrates how this method is being applied in praxis in the Braintree local plan evidence project. For example, see the assessment of the different scenarios as discussed in chapters 2, 4 and 5.

Depending on the change between the scenarios being compared, the change in the movement indices also help identify the level of concern to inform acceptability:

- passable ✓
- caution **!**
- unsatisfactory ✗

Table A. 2: Acceptability matrix for initial assessment

Reference case level of problem	Assessment case level of problem														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	✓	✓	!	!	!	!	✗	✗	✗	✗	✗	✗	✗	✗	✗
2	✓	✓	✓	!	!	!	✗	✗	✗	✗	✗	✗	✗	✗	✗
3	✓	✓	✓	✓	!	!	✗	✗	✗	✗	✗	✗	✗	✗	✗
4	✓	✓	✓	✓	!	!	!	!	✗	✗	✗	✗	✗	✗	✗
5	✓	✓	✓	✓	✓	!	!	!	✗	✗	✗	✗	✗	✗	✗
6	✓	✓	✓	✓	✓	✓	!	!	!	✗	✗	✗	✗	✗	✗
7	✓	✓	✓	✓	✓	✓	✓	!	!	✗	✗	✗	✗	✗	✗
8	✓	✓	✓	✓	✓	✓	✓	✓	!	!	✗	✗	✗	✗	✗
9	✓	✓	✓	✓	✓	✓	✓	✓	!	!	✗	✗	✗	✗	✗
10	✓	✓	✓	✓	✓	✓	✓	✓	✓	!	✗	✗	✗	✗	✗
11	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	!	✗	✗	✗	✗
12	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	!	✗	✗	✗
13	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗
14	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗
15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗

A.3 Reaching a view on acceptability

Information on movements of vehicles through the highway network is a good proxy for all movement, as buses, cyclists and pedestrians can be affected by general traffic delay, however, to reach a view on the acceptability of a local plan from the perspective of transport, additional interpretation is needed to assess also the impact on other modes and safety.

Appendix B. Reference Case Sites

B.1 Committed Residential Sites

Table B. 1 Committed Large Residential Site Allocations

Reference	Location	Site Name	No. of dwellings
COGG182	Coggeshall	Land North of Colchester Road	300
BOCN135	Braintree	Millview Park Land off Church Street, North of Grove Field High Garrett	253
CRESS203 CRESS209	Cressing	The Maples, Land between Long Green and Braintree Road, Long Green	250
	Rivenhall	Phase 4 Land NE of Rectory Lane	225
KELV335	Kelvedon	Station Field, Land west of Kelvedon Station Station Road (Monks Farm)	206
SILV389	Silver End	Land off Western Road	204
	Greenstead Green	Bournewood Park, Land off Bournebridge Hill Greenstead Green	197
BOS6H	Braintree	Land West of Panfield Lane	189
BOCN137	Braintree	Phase 3 Towerlands Park	179
WIS06	Witham	Phases 3B, 4 South West Witham Growth Location, off Hatfield Road	176
BOCN137	Braintree	Phase 1 Towerlands Park	168
WITN426	Witham	Land north of Conrad Road	148
	Silver End	Land West of Boars Tye Road	94
HATF314	Hatfield Peverel	Priory Grange, Land south of Stonepath Drive	82
HATR306	Halstead	Land North of Oak Road (Oak Field Tidings Hill)	80
	Cressing	Land West of Mill Lane	78
HATR304	Halstead	Land West of Mount Hill	71
EARC225	Earls Colne	Land Rear Of 12 To 24 Halstead Road	64
CRESS201	Cressing	Land at Appletree Farm Polecat Road	63
HATF630	Hatfield Peverel	Hatfield Bury Farm Bury Lane	50
FINC708	Finchingfield	Land West of Bardfield Road	50
BOCS140A	Braintree	Land north of Rayne Road (Rayne Lodge Farm Phase 2)	42
KELV626	Kelvedon	Land adjacent Watering Farm Coggeshall Road	35
		Total	**3,530**

Table B. 2 Committed Small Residential Site Allocations

Settlement	Dwellings
Coggeshall	37
Braintree	223
Cressing	18
Kelvedon	70
Witham	121
Halstead	135
Hatfield Peverel	35
Earls Colne	67
Finchingfield	30
Great Yeldham	29
Gosfield	54
Great Notley	42
Bradwell	19
Belchamp St Paul	7
Steeple Bumpstead	49
Bardfield Saling	8
Gestingthorpe	6
Shalford	26
Birdbrook	6
Belchamp Walter	8
Wickham St Paul	7
Great Bardfield	12
Bures Hamlet	6
Middleton	3
Pentlow	4
Bulmer	16
Stisted	6
Toppesfield	4
Fairstead	3
Great Saling	2
Rayne	4
Belchamp Otten	1
Liston	1
Twinstead	2
Ovington	1
Bures	1
Panfield	2
Stambourne	2
Sturmer	1
Tilbury Juxta Clare	1
Toppesfield	1
Total	**1,070**

B.2 Committed Employment Sites

Table B. 3 Committed Employment Site Allocations

Reference	Location	Site Name	Land Use Class	Employment (Ha)
15/01319/OUT	Braintree	Extension to Springwood Drive industrial area in Braintree (Site ref a)	E(g)(i), B2, B8	0.40
LPR5	Braintree	Springwood Industrial Estate, Braintree	E(g)(i), B2, B8	25.08
LPR5	Braintree	Braintree Town Centre	E(g)(i), B2, B8	13.72
LPR5	Braintree	Driberg Way, Braintree	E(g)(i), B2, B8	1.72
18/01318/OUT	Braintree	Land East of Broad Road (Site ref b)	E(g)(i), B2, B8	1.20
LPR4	Great Notley	Horizon 120	E(g)(i), B2, B8	13.33
LPR4	Great Notley	Slamseys Farm	E(g)(i), B2, B8	2.32
LPR5	Great Notley	Skyline 120, Great Notley	E(g)(i), B2, B8	8.32
LPR5	Halstead	Bluebridge Industrial Estate, Halstead	E(g)(i), B2, B8	9.04
LPR5	Halstead	Broton Drive Industrial Area, Halstead	E(g)(i), B2, B8	1.48
LPR5	Halstead	Halstead Town Centre	E(g)(i), B2, B8	0.65
	Feering	Land at Feering	E(g)(i), B2	2.30
LPR8	Feering	Threshelfords, Feering	E(g)(i),	0.96
LPR5	Gosfield	Gosfield Airfield	E(g)(i), B2, B8	3.08
LPR5	Earls Colne	Hangar Field, Earls Colne Business Park	E(g)(i), B2, B8	1.20
LPR5	Earls Colne	Earls Colne Airfield	E(g)(i), B2, B8	8.08
LPR5	Earls Colne	Riverside Business Park, Earls Colne	E(g)(i), B2, B8	0.88
LPR8	Earls Colne	Atlas Works, Earls Colne	E(g)(i)	0.36
LPR8	Steeple Bumpstead	Blois Meadow Business Centre, Steeple Bumpstead	E(g)(i)	0.44
RIVE362/363	Witham	North East of Eastways, Witham	E(g)(i), B2, B8	0.82
21/00031/OUT	Witham	Extension to Eastways Industrial Estate, Witham (Site ref d)	E(g)(i), B2, B8	1.36
LPR5	Witham	Eastways, Witham	E(g)(i), B2, B8	16.52
LPR5	Witham	Freebournes, Witham	E(g)(i), B2, B8	17.56
LPR8	Witham	Witham Town Centre - Office	E(g)(i)	1.63
LPR5	Haverhill	Sturmer Industrial Estate, Haverhill	E(g)(i), B2, B8	4.92
LPR5	Great Yeldham	Hunnable Industrial Estate, Great Yeldham	E(g)(i), B2, B8	1.12
RIVE364	Rivenhall	Kelvedon Park (Rivenhall)	B2	0.62
LPR5	Kelvedon	Allshots Farm, Kelvedon	E(g)(i), B2, B8	0.68
LPR5	Kelvedon	London Road, Kelvedon	E(g)(i), B2, B8	0.48
LPR8	Kelvedon	Land at Cranes Lane, Kelvedon	E(g)(i)	0.24
LPR5	Coggeshall	Coggeshall Industrial Area	E(g)(i), B2, B8	1.20
LPR5	Black Notley	Lynderswood Farm, Black Notley	E(g)(i), B2, B8	3.28
LPR5	Sible Hedingham	Rippers Court and former Premdor site, Sible Headingham	E(g)(i), B2, B8	0.76
		Total		**146**

B.3 Adopted Local Plan Residential Site Allocations

Table B. 4 Adopted Local Plan Housing Developments – Large Sites

Reference	Location	Site Name	Dwellings
BLAN114	Black Notley	Hazelwood, Land East of Great Notley SGL Black Notley	1,750
BOCN132	Braintree	Land at Straits Mill Braintree	1,000
FEER232 FEER233B	Feering	Land South of Feering West of A12 Feering, Strategic Growth Location (Crown Estates land)	835
BOS6H	Braintree	Land West of Panfield Lane	825
HATF315 HATF316	Witham	Woodend Farm Hatfield Road Witham	400
BOCN 137	Braintree	Towerlands Park	277
BOCN 135	Braintree	Land off Church Street North of Grove Field High Garrett Braintree	250
CRESS203 CRESS209	Cressing	Land at Long Green Cressing	200
WITC423	Witham	Lodge Farm Witham	199
COGG182	Coggeshall	Land North of Colchester Road Coggeshall	145
SILV389	Silver End	Land north of Western Road Silver End	115
SILV388	Silver End	Crittall Works site Silver End	65
HASA2180	Halstead	The old wood yard site Fenn Road Halstead	54
CRESS193	Cressing	Land off Braintree Road Cressing	47
HATR2202	Halstead	Land adjacent Blamsters Farm Mount Hill Halstead	44
SIBH377	Sible Hedingham	Former Tanners Dairy Prayors Hill Sible Hedingham	44
CRESS 201	Cressing	Land at Appletree Farm Polecat Road Cressing	41
FEER230	Feering	Land South of Feering West of A12 Feering	40
KELV335	Kelvedon	Station Field, Land West of Kelvedon Station Kelvedon	38
HATR306	Halstead	Land North of Oak Road Halstead	34
WITN425	Witham	4 & 6 Chipping Hill and Chipping Hill Industrial Estate	30
		Total	**6,433**

Table B. 5 Adopted Local Plan Housing Developments - Small Sites

Settlement	Dwellings
Braintree	44
Coggeshall	20
Earls Colne	18
Halstead	102
Hatfield Peverel	11
Kelvedon	13
Witham	69
Total	**277**

Appendix C. New Local Plan Allocations

C.1 Preferred Spatial Option Housing Development – Strategic Sites

Table C. 1 Preferred Spatial Option Housing Development Strategic Sites

Reference	Location	Site Name	Dwellings (allocation 2043)
KELV2208	Kings Dene	Kings Dene at North Kelvedon	2,250
HASA2179COL E2100	Halstead (North)	Land North and East of Halstead, Land East of Bluebridge Ind Estate	1,750
GGHR2141 GGHR2416	Halstead (South)	Land to South East of Halstead, Land East of Colchester Road, Halstead	1,100
CRES2101	East of Braintree	Last East of Braintree	1,900
HATF2193 HATF2195	Hatfield Peverel	Land north of A12, Hatfield Peverel, Land at Bovington's Farm, Hatfield Peverel	1,150
		Total	**8,150**

C.2 Preferred Spatial option Employment Development – Strategic Sites

Table C. 2 Preferred Spatial Option Employment Development Strategic Sites

Reference	Location	Site Name	Employment (Ha)
KELV2208	Kings Dene	Kings Dene at North Kelvedon	18.1
HASA2179COL E2100	Halstead (North)	Land East of Bluebridge Ind Estate	6
GGHR2141 GGHR2416	Halstead (South)	Land East of Colchester Road, Halstead	18.11
		Total	**42.21**

C.3 Preferred Spatial Option Housing Development – Large Sites

Table C. 3 Preferred Spatial Option Housing Development Large Sites

Reference	Location	Site Name	Dwellings
BCBG2010	Braintree	John Pease Manor Street	45
BLAN 2027	Black Notley	Land at Friars Farm	430
BOCN2032	Braintree	Land adj to the Coach House, Panfield Lane	35
BOCN2033	High Garrett	Land East of A131	125
COGG2084	Coggeshall	Land South Colchester Rd	200
COGG2085	Coggeshall	Land to the south of West St	57
CRES2102	Cressing	Mill Lane	78
GGHR2143	Halstead	Halstead Hall	34

Reference	Location	Site Name	Dwellings
GGHR2146	Halstead	Land west of Blamsters	55
HATR2203	Halstead	Land south of Windmill Rd	70
KELV2214	Kelvedon	West St Domincs London Road	50
KELV2215	Kelvedon	Land North East of Cranes Lane	100
KELV2218	Kelvedon	Car ParkDeal of Kelvedon	20
KELV2219	Kelvedon	Railway Garage Station Rd	45
PANF2508	Panfield	Land North West of Panfield Lane, Braintree	100
RIVE2249	Rivenhall	Land north of Rickstones Road	45
WITS2515	Witham	Land north of Gershwin Boulevard	32
WITN2312	Witham	Cut Throat Lane Carpark	52
WITN2312	Witham	Land North of Witham	52
BOCN2018	Bocking	Land to the west of the A131	55
BOCN2031 (part)	Bocking	Land at High Garrett, Bocking	115
CRES2112	Cressing	Land off Braintree Road, Tye Green, Cressing	350
PANF2604	Panfield	Land North West of Towerlands, Panfield Road	150
SILV2272	Silver End	Land north of Western Road, Silver End	375
		Total	**2,670**

C.4 Preferred Spatial Option Employment Development – Large Sites

Table C. 4 Preferred Spatial Option Employment Development Large Sites

Reference	Location	Site Name	Employment (Ha)
BOCN2033	High Garrett	Land East of A131	7
CRES2102	Cressing	Mill Lane	9.2
GGHR2146	Halstead	Land west of Blamsters	5.5
KELV2214	Kelvedon	West St Domincs London Road	1.5
KELV2215	Kelvedon	Land North East of Cranes Lane	6.51
KELV2218	Kelvedon	Car ParkDeal of Kelvedon	0.6
KELV2219	Kelvedon	Railway Garage Station Rd	0.8
WITN2312	Witham	Cut Throat Lane Carpark	0.74
	Braintree	Extension off Barlow Tyrie, Springwood Drive industrial area in Braintree	2.1
	Great Notley	Slamseys Farm	1.3
	Cressing	Shardloes Workshop, Cressing	0.3
	Gosfield	Extension to Gosfield Business Park, the old airfield	3
		Total	**38.55**

C.5 Preferred Spatial Option Housing Development – Small Sites

Table C. 5 Preferred Spatial Option Housing Development - Small Sites

Settlement	Dwellings
Great Yeldham	16
Little Yeldham	30
Steeple Bumpstead	10
Toppesfield	6
Bures Hamlet	8
Bocking North	30
Braintree Central and Beckers Green	30
Kelvedon	10
Hatfield Peverel	20
Feering	9
Total	**160**

Appendix D. Strategic Model Plots

Introduction

This appendix brings together flow difference, relative queue and speed plots from the 2043 NEMo reference and assessment case AM and PM models. They have been grouped by plot type and time period to facilitate comparison between scenarios. The key assumptions in the scenarios are summarised in Table 2.1:

- Scenario 1 – 2043 reference case demand with only committed mitigation
- Scenario 2 – 2043 assessment case without mitigation and with business as usual (BaU) demand
- Scenario 3 – 2043 assessment case with mitigation and BaU demand
- Scenario 4 – 2043 assessment case with mitigation and sustainable transport (ST) demand.

D.1 AM flow, speed and queue plots

D.1.1 Summary of impact in the AM

Table D. 1 Summary of impact in the AM

ID	Location	AM peak movement index ratings				
		2023 base	Sc1: 2043 ref case	Sc2: 2043 LP no mit	Sc3: 2043 LP mit BaU	Sc4: 2043 LP mit ST
1	Halstead	5	6	7	7	6
2	High Garrett	1	6	7	7	6
3	Broad Rd / A131	8	7	7	7	7
4	Coggeshall	5	6	6	6	6
5	Marks Farm rbt	5	7	8	9	9
6	Galleys Corner rbt	7	13	15	7	7
7	Millenium Way	2	2	8	7	7
8	Rayne Rd / Pods Brook Rd	4	4	5	5	4
9	Rayne Rd / Pierrefitte Way	15	9	9	9	9
10	London Rd / Pierrefitte Way	10	9	10	10	10
11	Coggeshall Rd / Railway St	4	3	4	4	4
12	Rose Hill / Railway St	9	10	10	9	9
13	Hatfield Peverel	6	7	7	7	7
14	Hatfield Rd / Howbridge Rd	9	9	9	9	9
15	Kelvedon	4	6	6	5	5
16	B1018 / The Avenue	5	6	7	7	6
17	London Rd / Coggeshall Rd	2	3	4	2	2
18	A131 / London Rd	3	3	3	3	3
19	Andrewsfield	1	1	1	1	1
20	Pattiswick	6	7	7	7	7
21	South Haverhill	1	1	1	1	1
Overall assessment combining all areas		5	6	7	6	6

Key to movement scale and acceptability of change

More or less free flow			Travelling slower			Moderate congestion			Substantial congestion		
1	2	3	4	5	6	7	8	9	10	11	12
Extreme congestion			Acceptability of change								
13	14	15	Passable ✓			Caution !			Unsatisfactory ✗		

D.1.2 AM flow difference plots

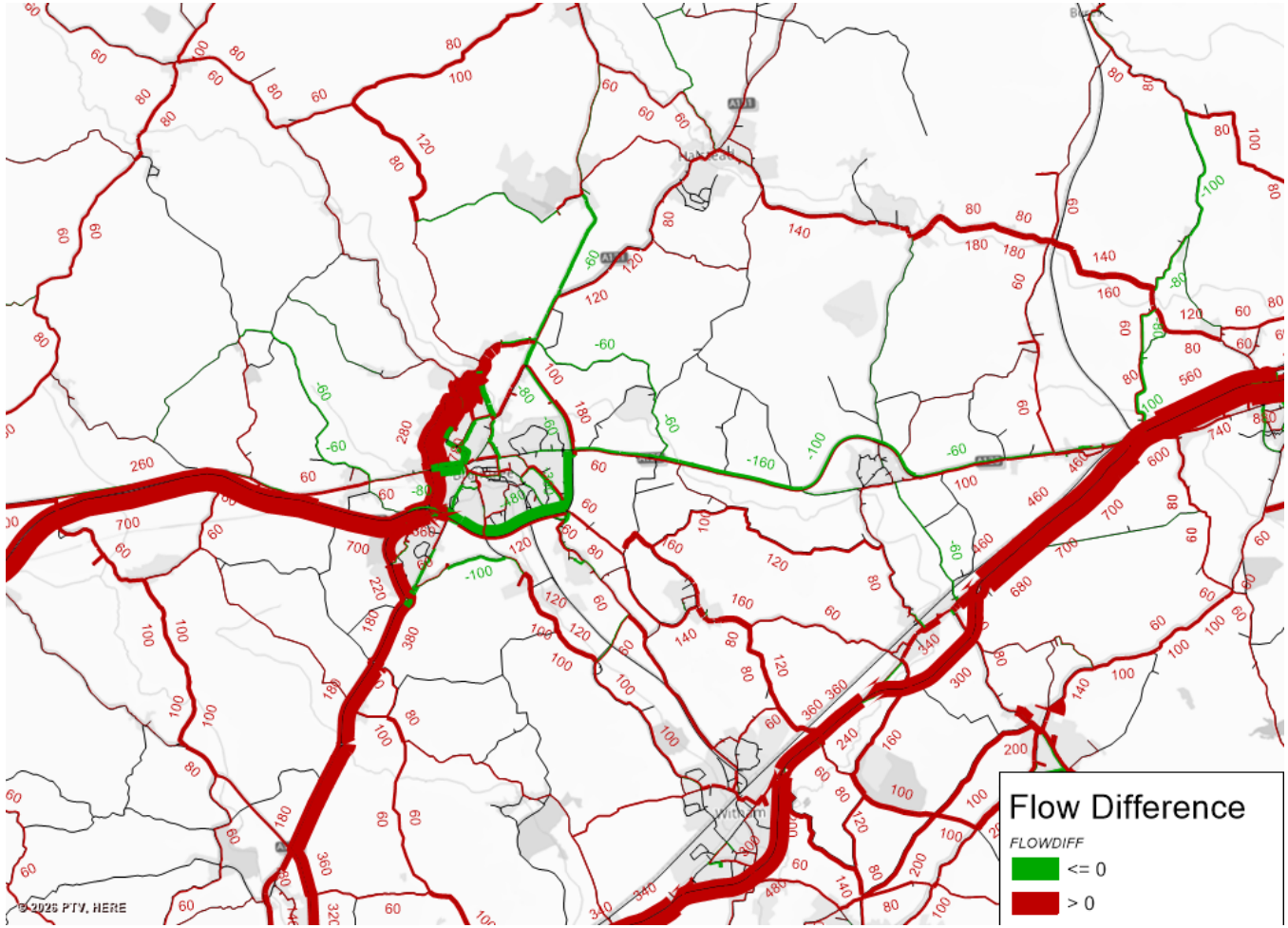

Figure D 1: AM flow difference – Scenario 1 2043 reference v 2023 base

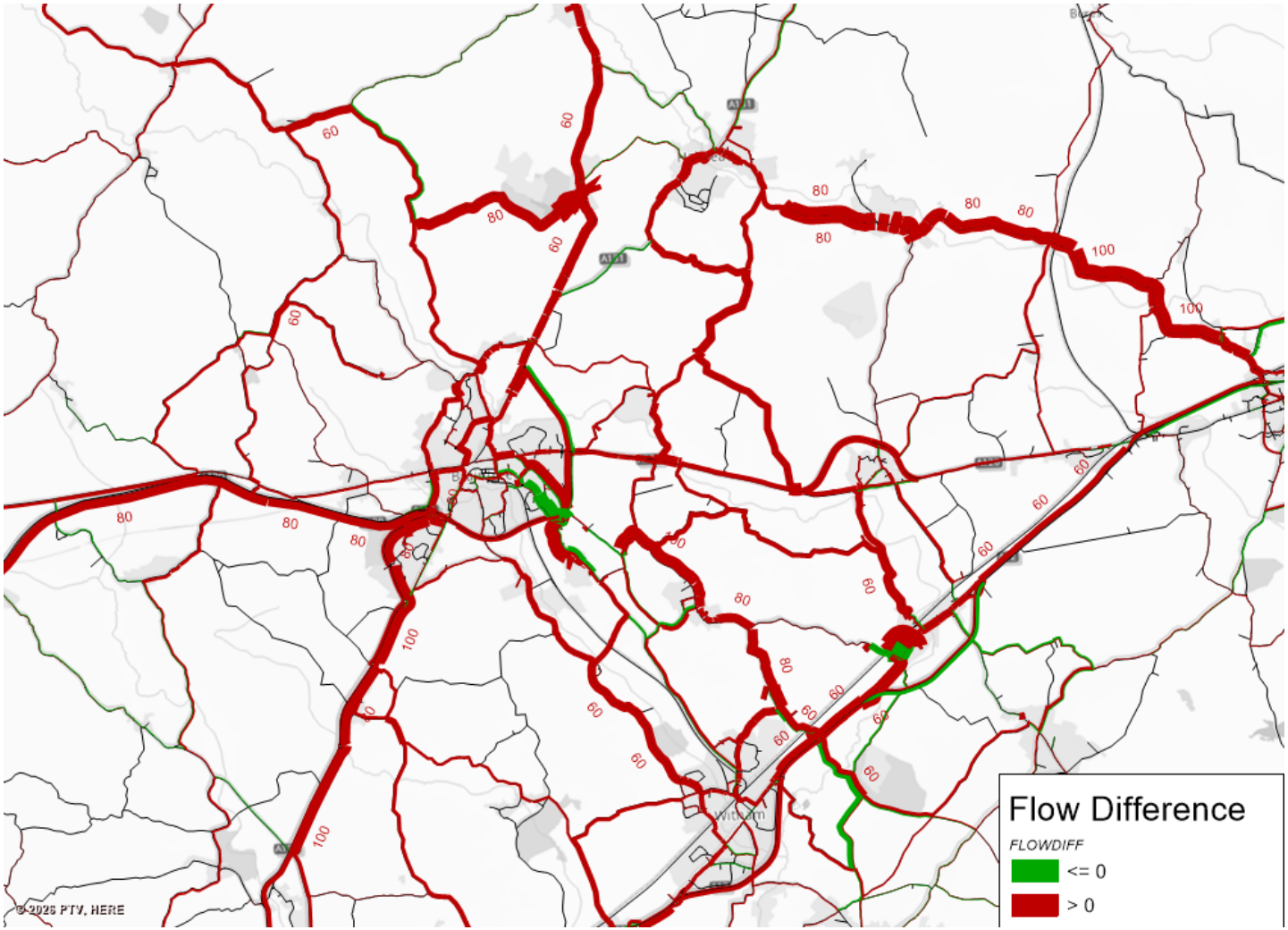

Figure D 2: AM flow difference – Scenario 2 2043 unmitigated assessment v Scenario 1 2043 reference

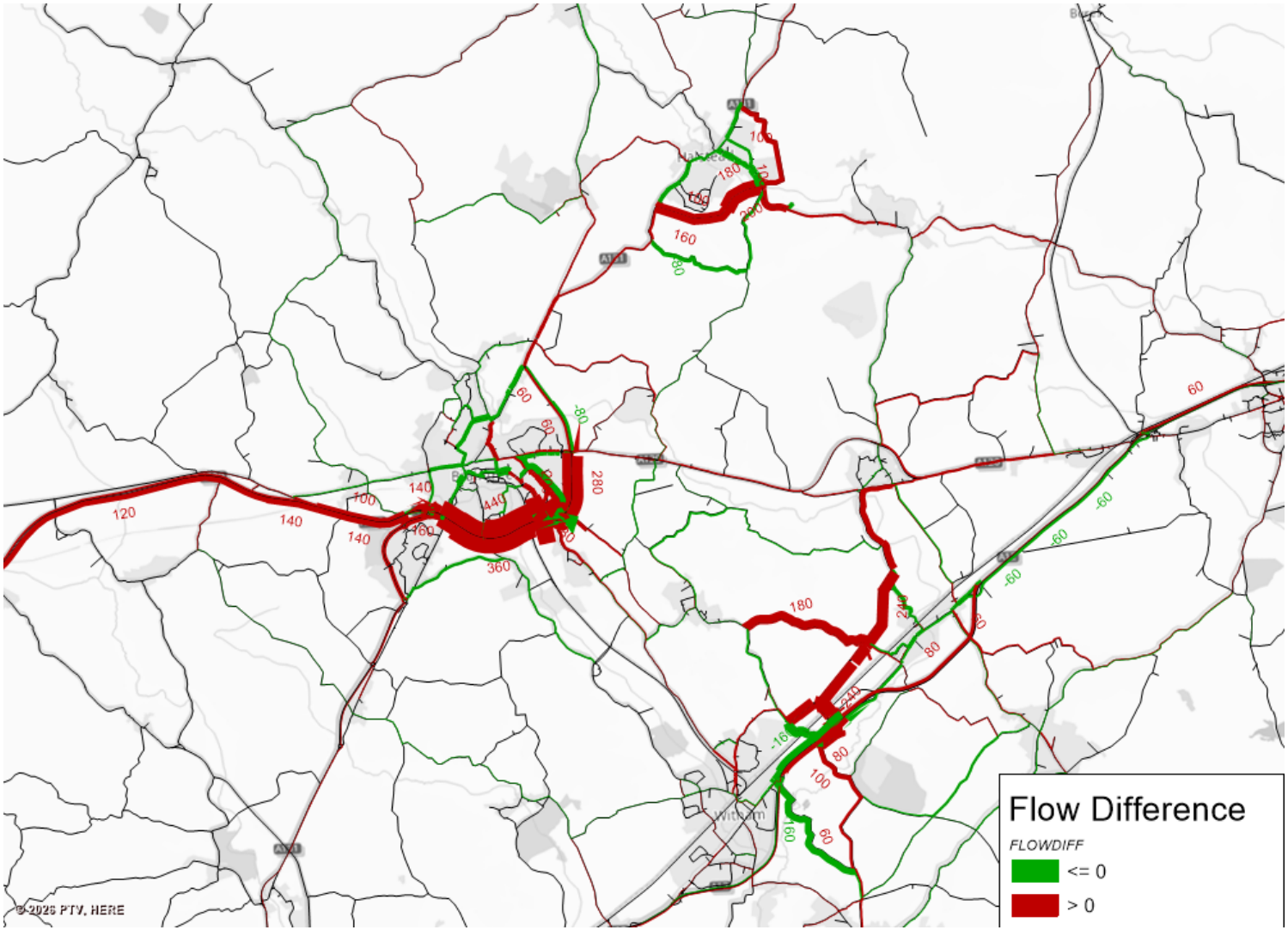

Figure D 3: AM flow difference - Scenario 3 2043 BaU mitigated assessment v Scenario 2 2043 unmitigated assessment

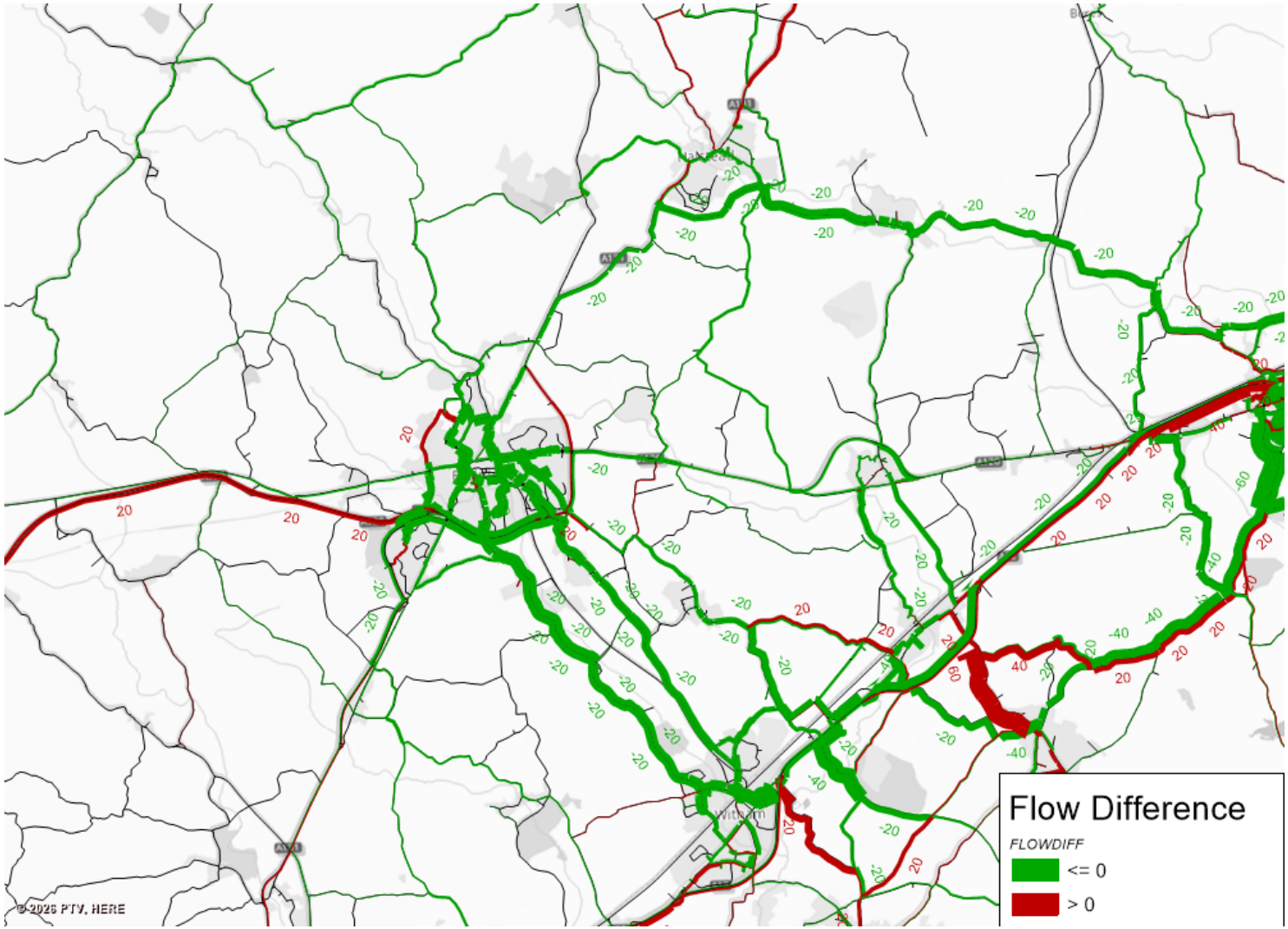

Figure D 4: AM flow difference - Scenario 4 2043 ST mitigated assessment v Scenario 2043 BaU mitigated assessment

D.1.3 AM Speed ratio plots (modelled speed / free flow speed)

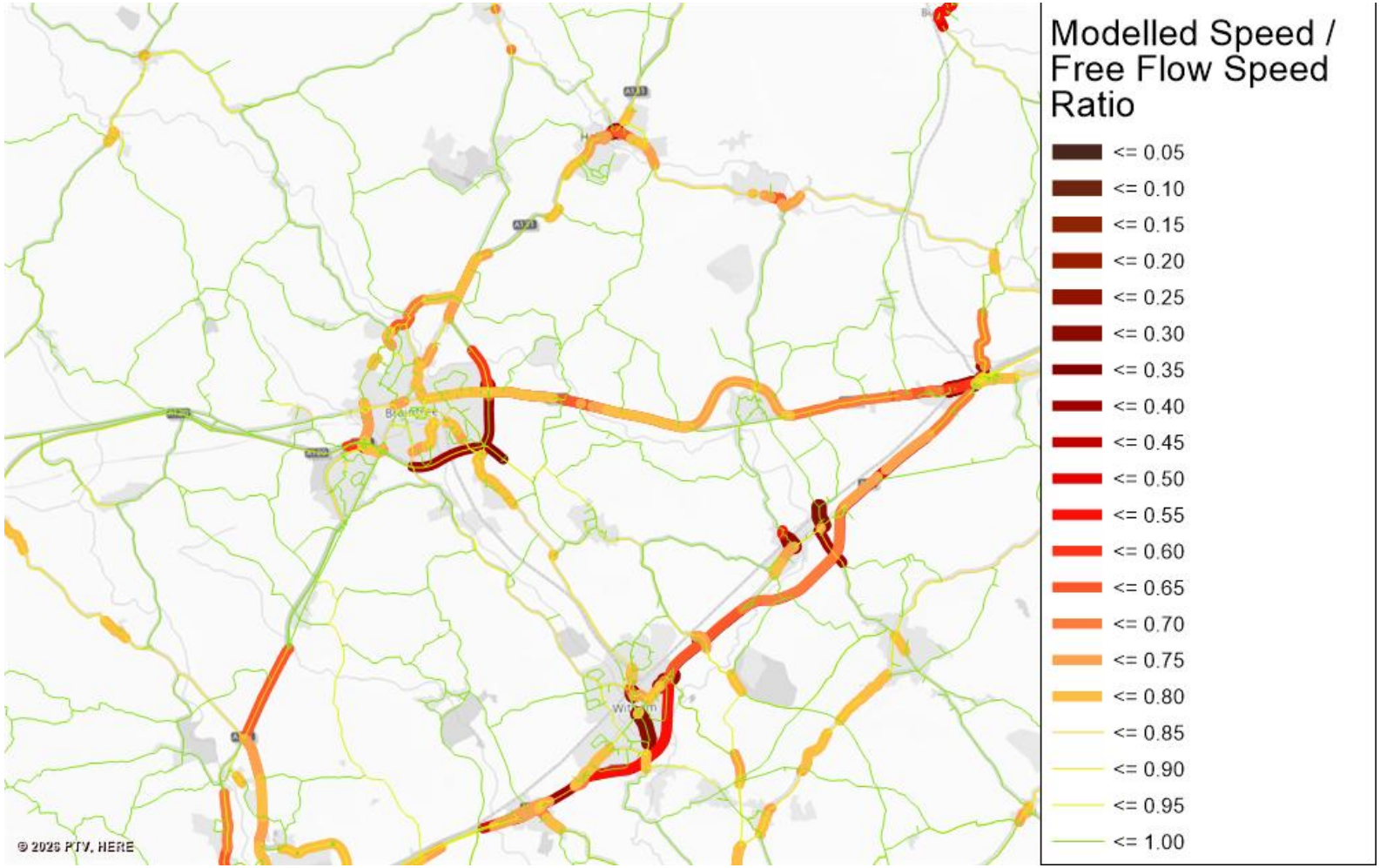

Figure D 5: AM speed ratio - Scenario 1 2043 reference

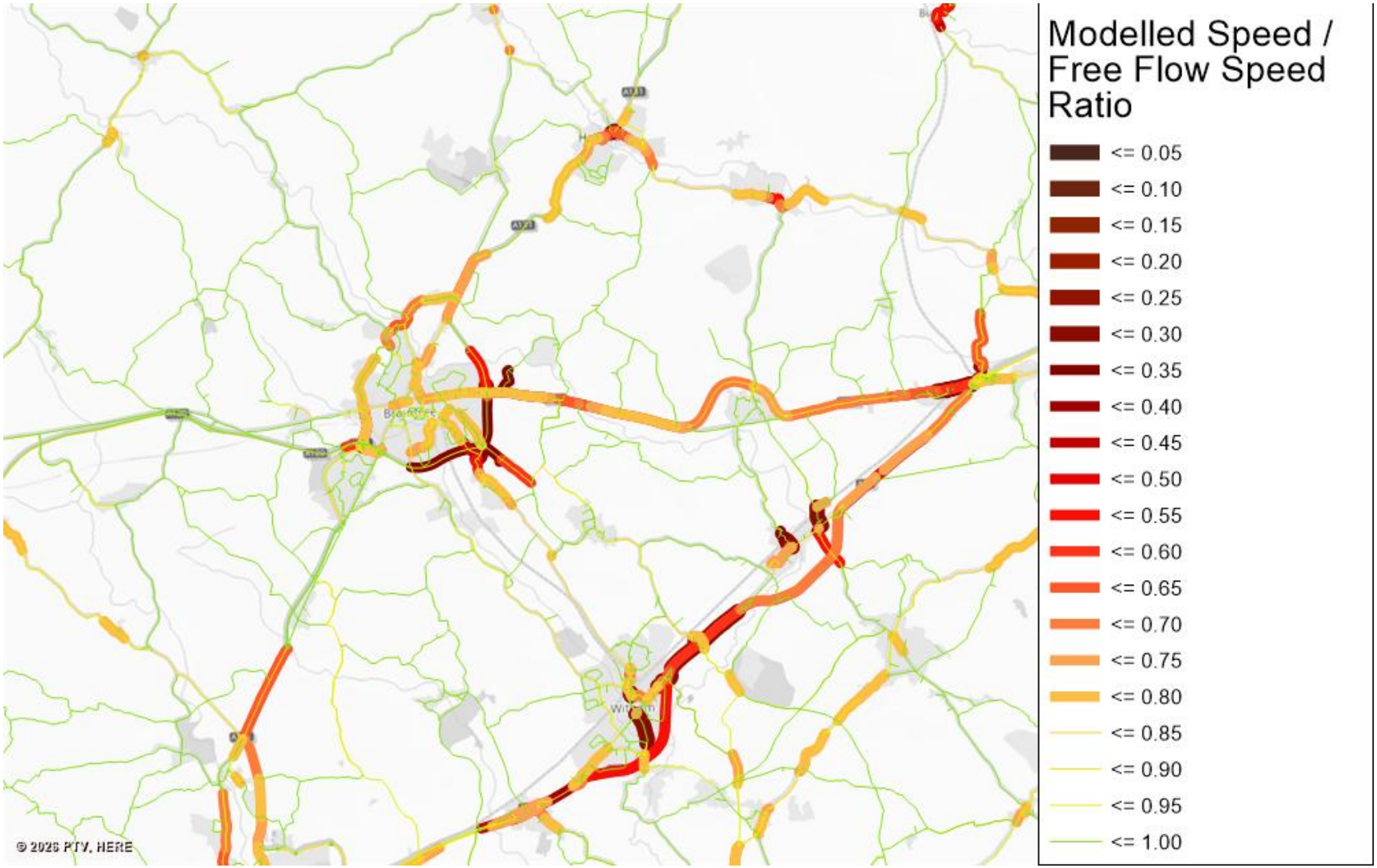

Figure D 6: AM speed ratio – Scenario 2 2043 unmitigated assessment

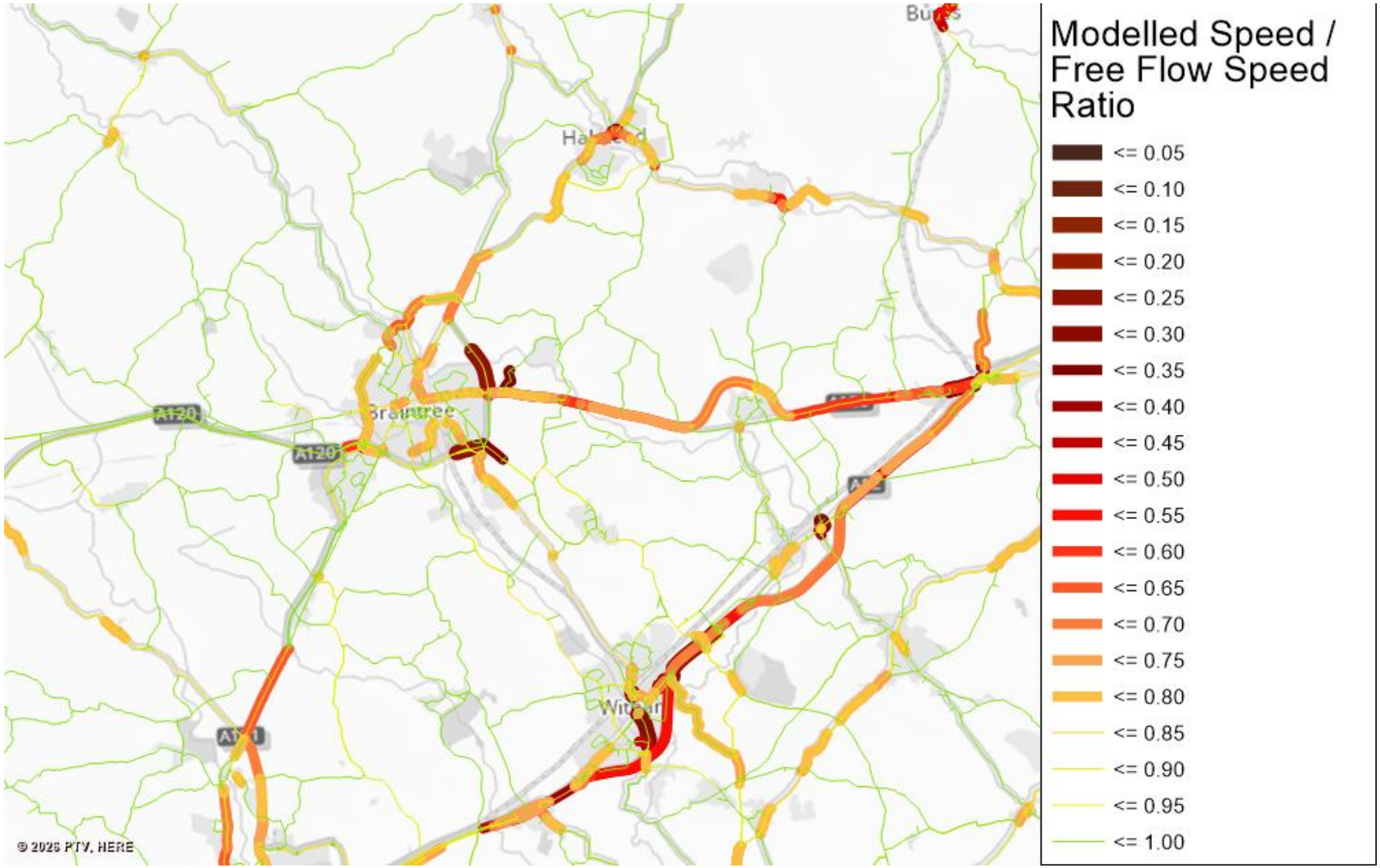

Figure D 7: AM speed ratio – Scenario 3 2043 BaU mitigated assessment

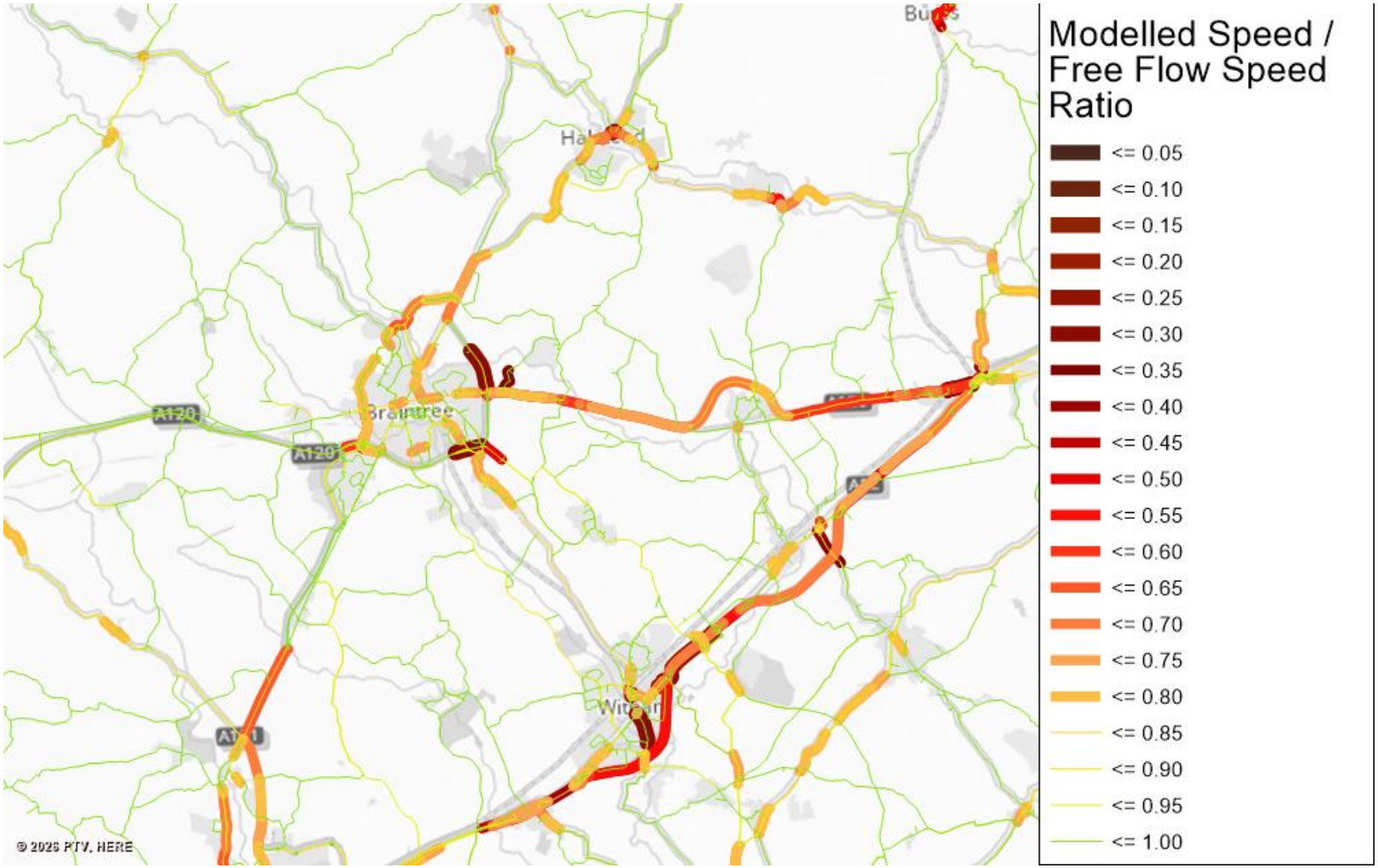

Figure D 8: AM speed ratio – Scenario 4 2043 ST mitigated assessment

D.1.4 AM relative queue plots (blocking back on road links in the model)

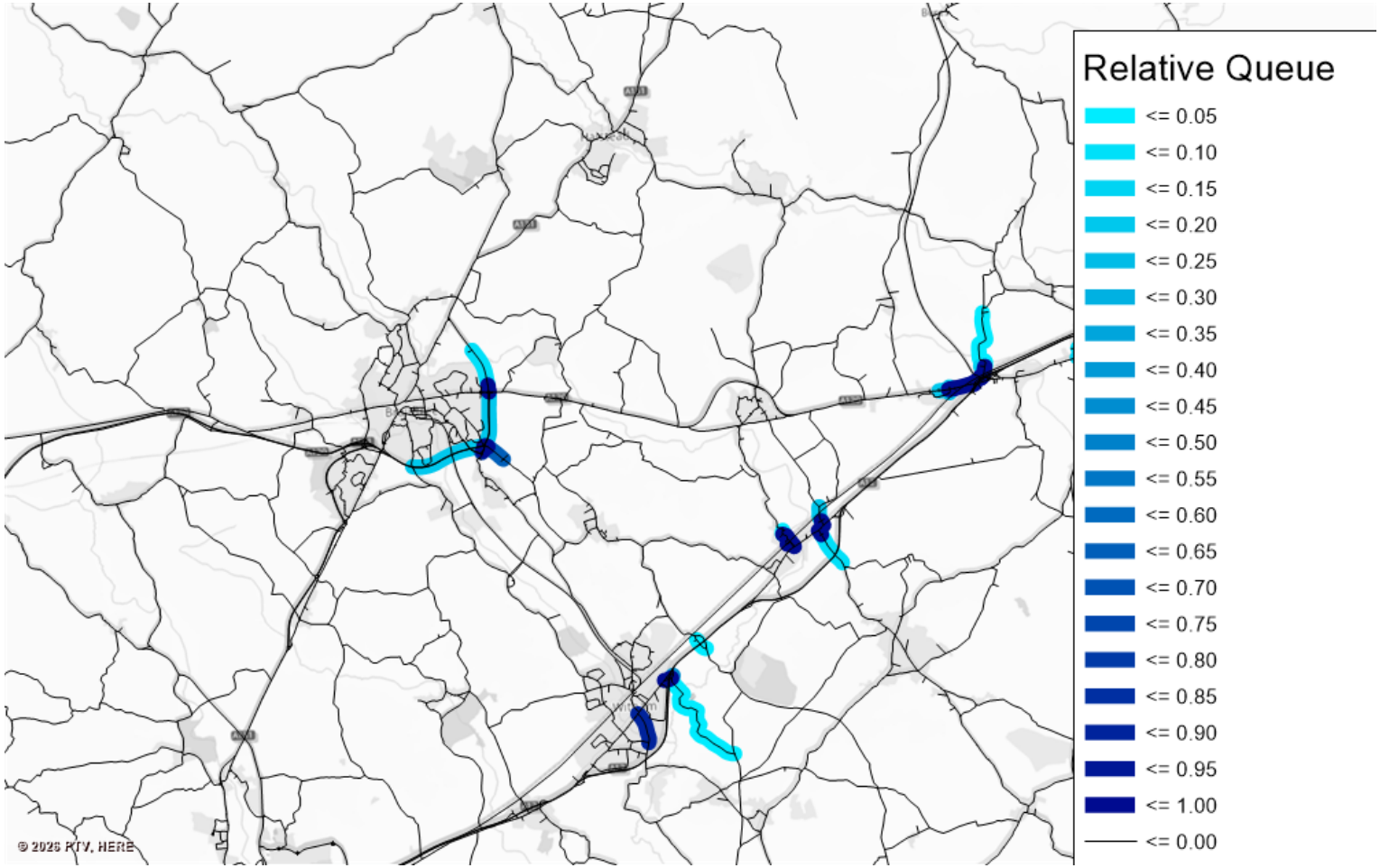

Figure D 9: AM relative queue – Scenario 1 2043 reference

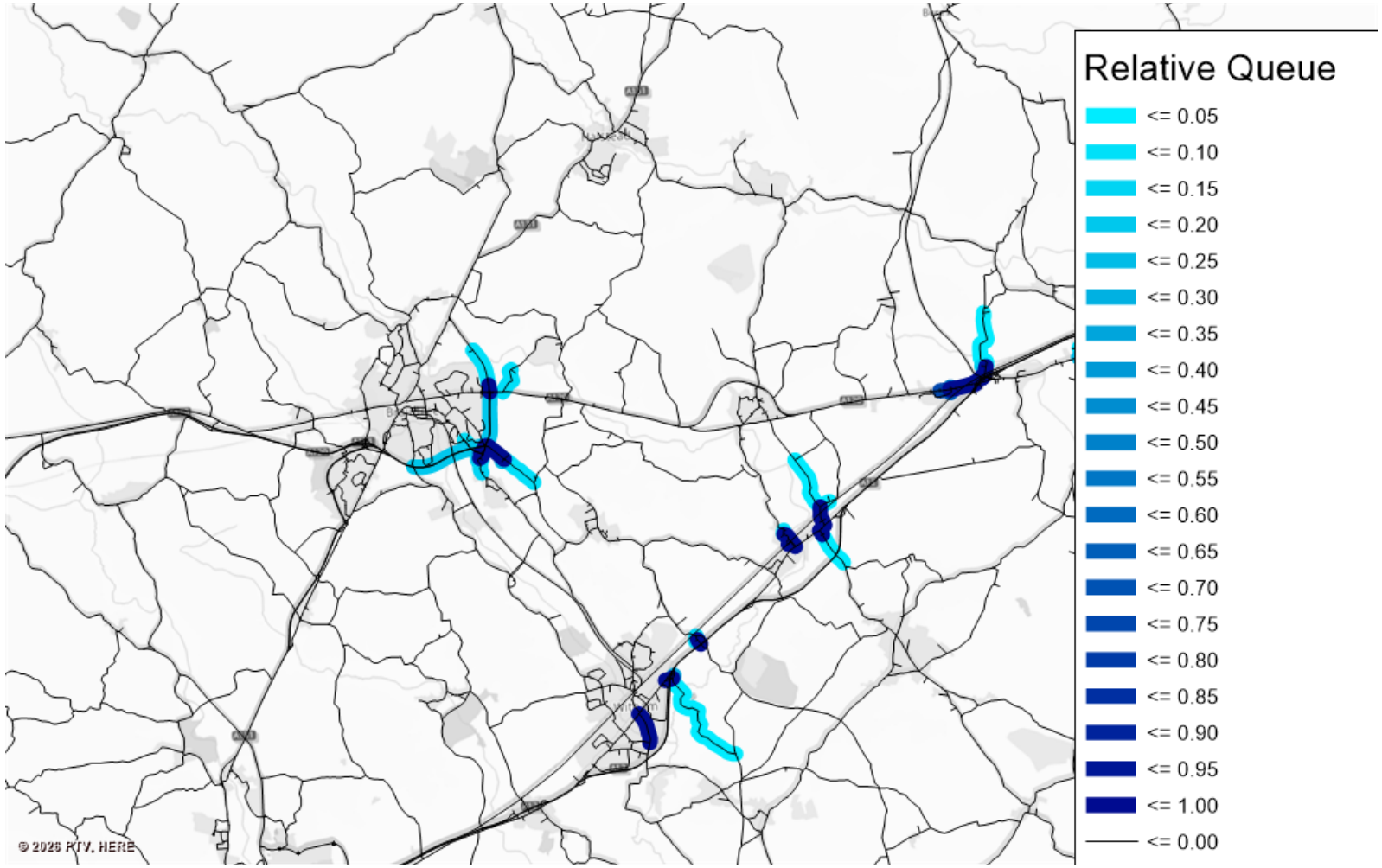

Figure D 10: AM relative queue – Scenario 2 2043 unmitigated assessment

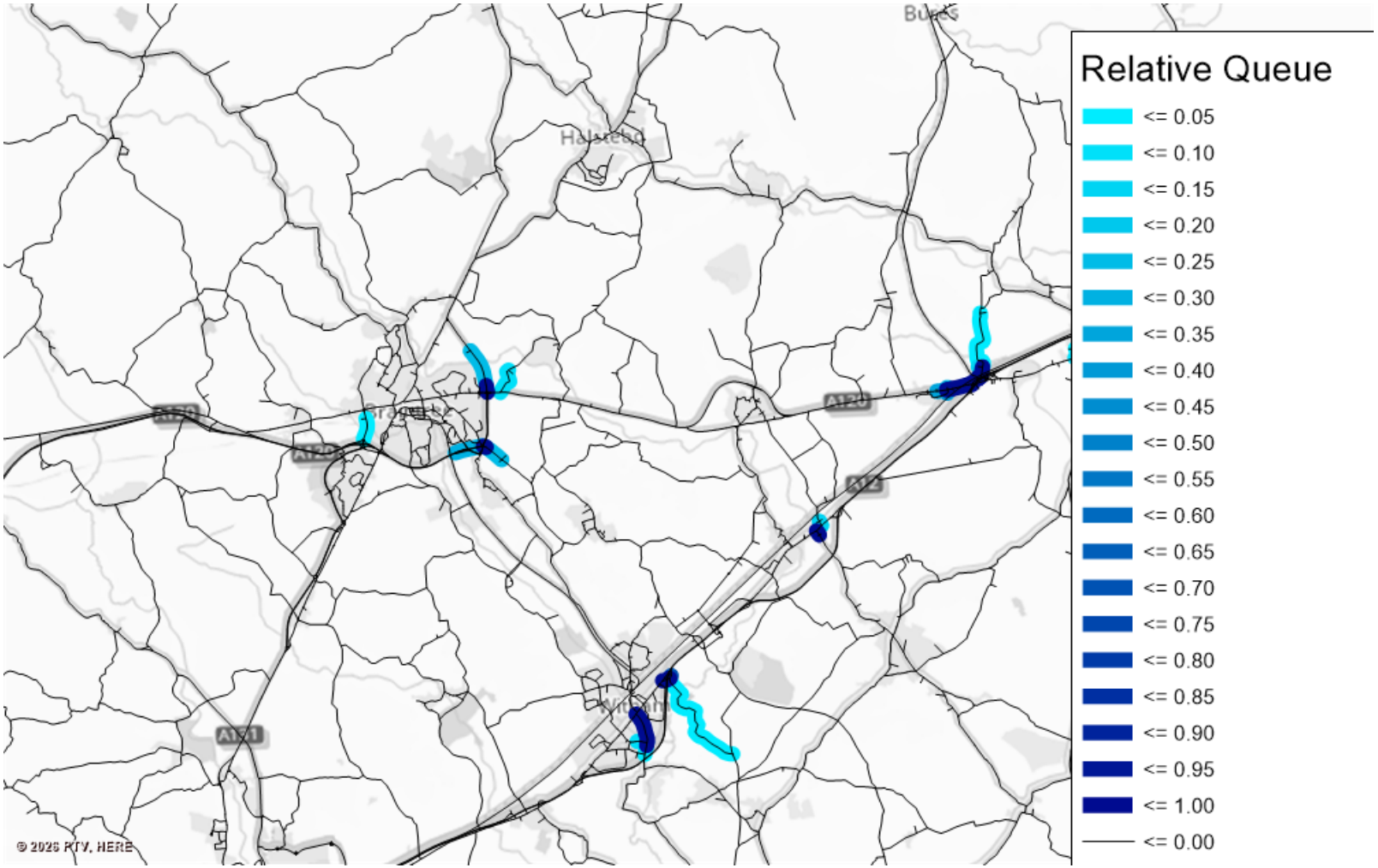

Figure D 11: AM relative queue – Scenario 3 2043 BaU mitigated assessment

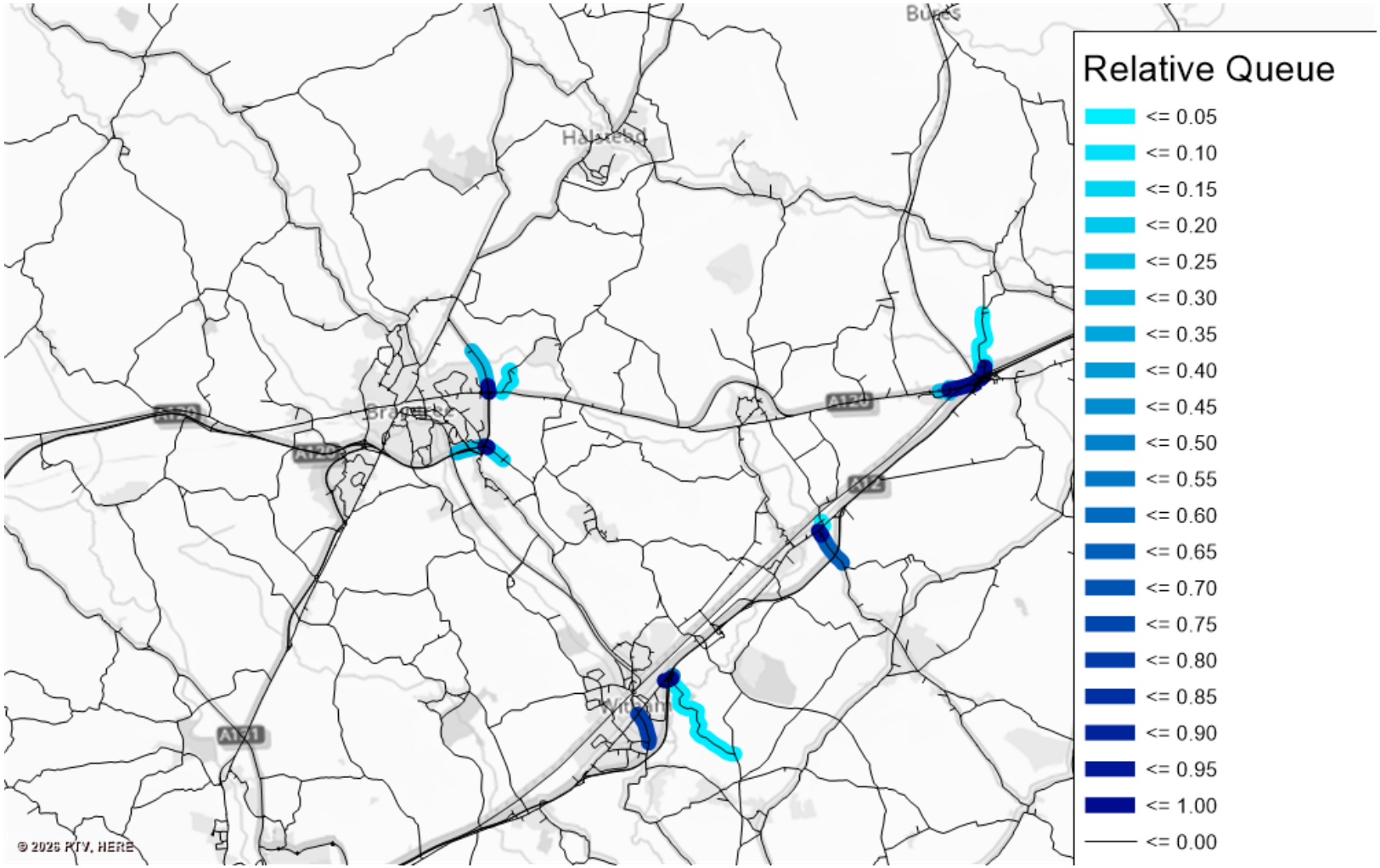

Figure D 12: AM relative queue – Scenario 4 2043 ST mitigated assessment

D.2 PM flow difference, speed and queue plots

D.2.1 Summary of impact in the PM

Table D. 2 Summary of impact in the PM

ID	Location	PM peak movement index ratings				
		2023 base	Sc1: 2043 ref case	Sc2: 2043 LP no mit	Sc3: 2043 LP mit BaU	Sc4: 2043 LP mit ST
1	Halstead	5	6	6	6	6
2	High Garrett	1	6	6	6	6
3	Broad Rd / A131	6	6	6	6	6
4	Coggeshall	4	5	5	5	5
5	Marks Farm rbt	5	6	7	7	7
6	Galleys Corner rbt	9	15	15	15	14
7	Millenium Way	2	3	3	6	6
8	Rayne Rd / Pods Brook Rd	5	11	11	9	9
9	Rayne Rd / Pierrefitte Way	15	11	12	12	11
10	London Rd / Pierrefitte Way	10	10	10	10	10
11	Coggeshall Rd / Railway St	4	4	5	5	4
12	Rose Hill / Railway St	8	11	11	10	10
13	Hatfield Peverel	6	6	7	7	7
14	Hatfield Rd / Howbridge Rd	7	7	10	9	7
15	Kelvedon	4	5	6	6	5
16	B1018 / The Avenue	4	5	5	5	5
17	London Rd / Coggeshall Rd	1	2	3	2	2
18	A131 / London Rd	4	3	3	4	3
19	Andrewsfield	1	2	2	2	2
20	Pattiswick	6	6	6	6	6
21	South Haverhill	1	1	1	1	1
Overall assessment combining all areas		5	6	7	7	6

Key to movement scale and acceptability of change

More or less free flow			Travelling slower			Moderate congestion			Substantial congestion		
1	2	3	4	5	6	7	8	9	10	11	12
Extreme congestion			Acceptability of change								
13	14	15	Passable ✓			Caution !			Unsatisfactory ✗		

D.2.2 PM flow difference plots

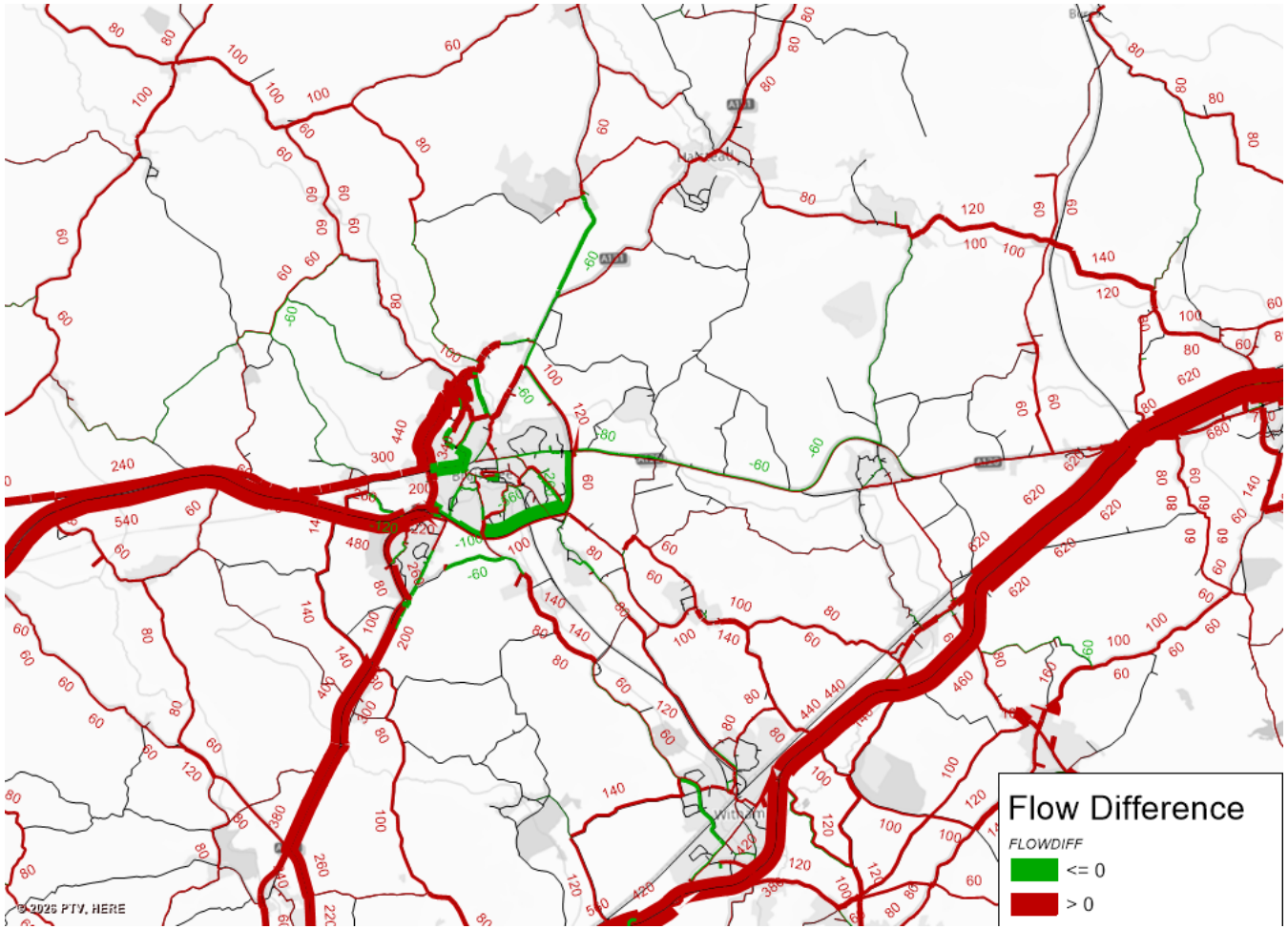

Figure D 13: PM flow difference – Scenario 1 2043 reference v 2023 base

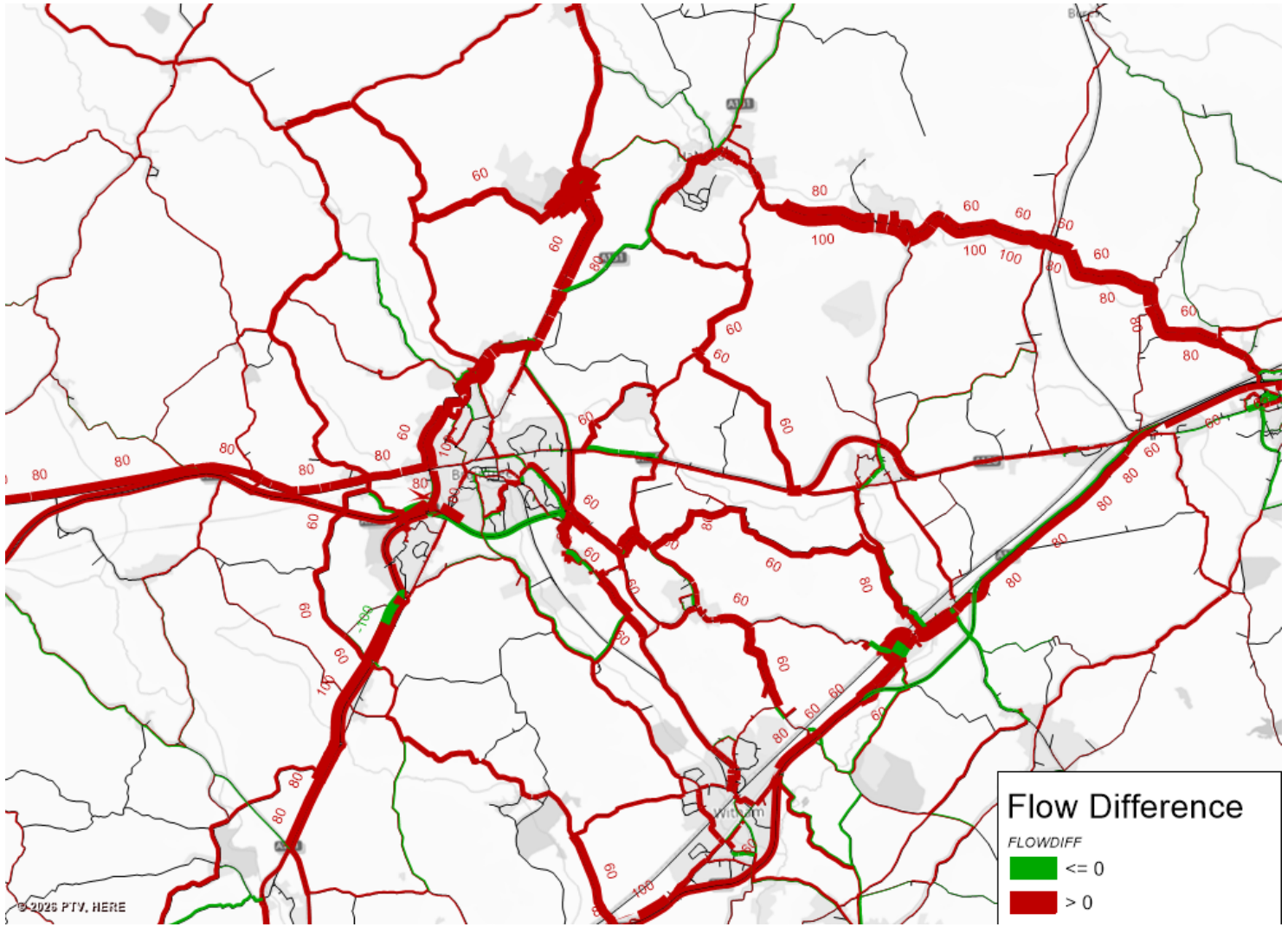

Figure D 14: PM flow difference – Scenario 2 2043 unmitigated assessment v Scenario 1 2043 reference

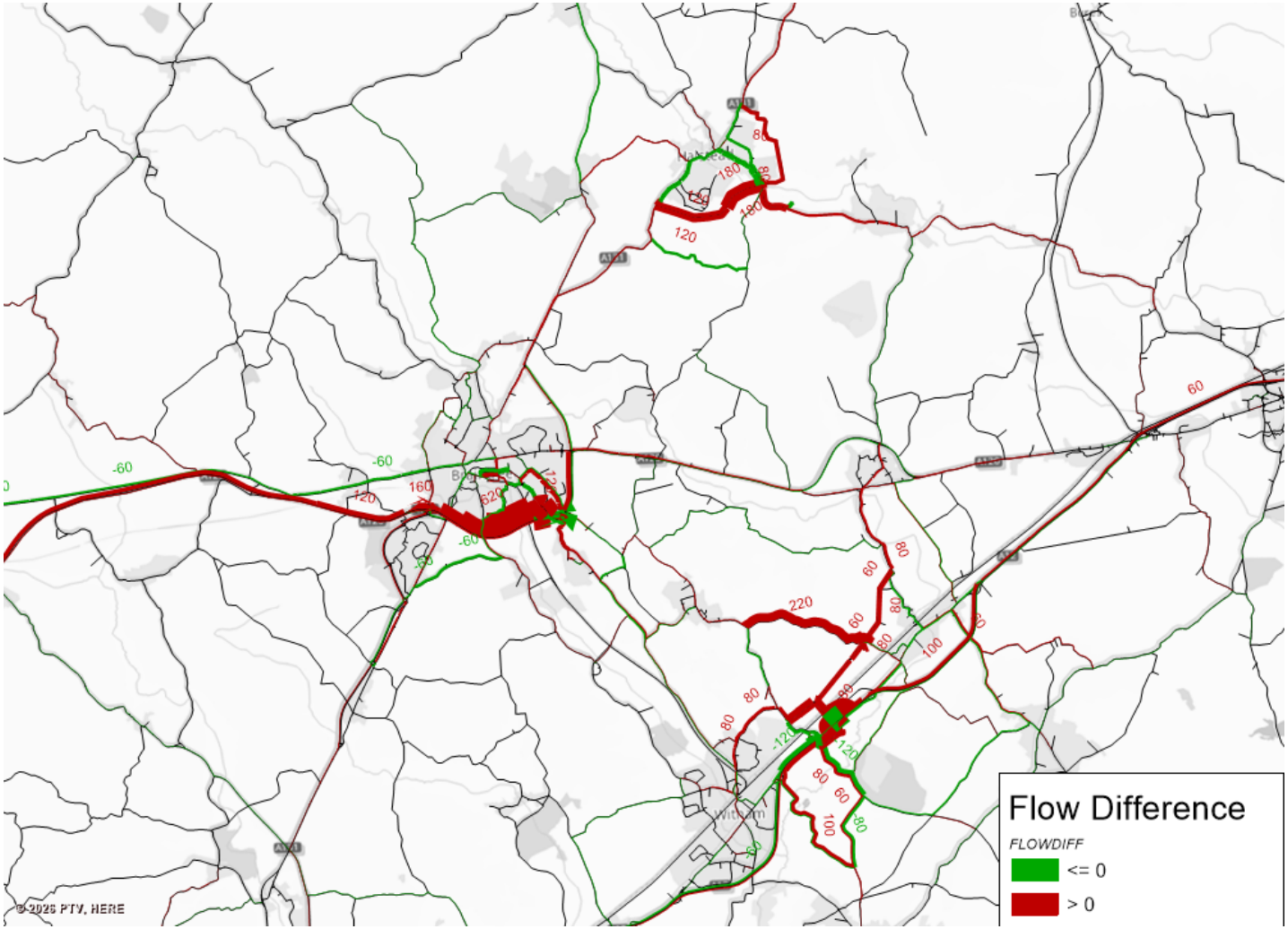

Figure D 15: PM flow difference – Scenario 3 2043 BaU mitigated assessment v Scenario 2 2043 unmitigated assessment

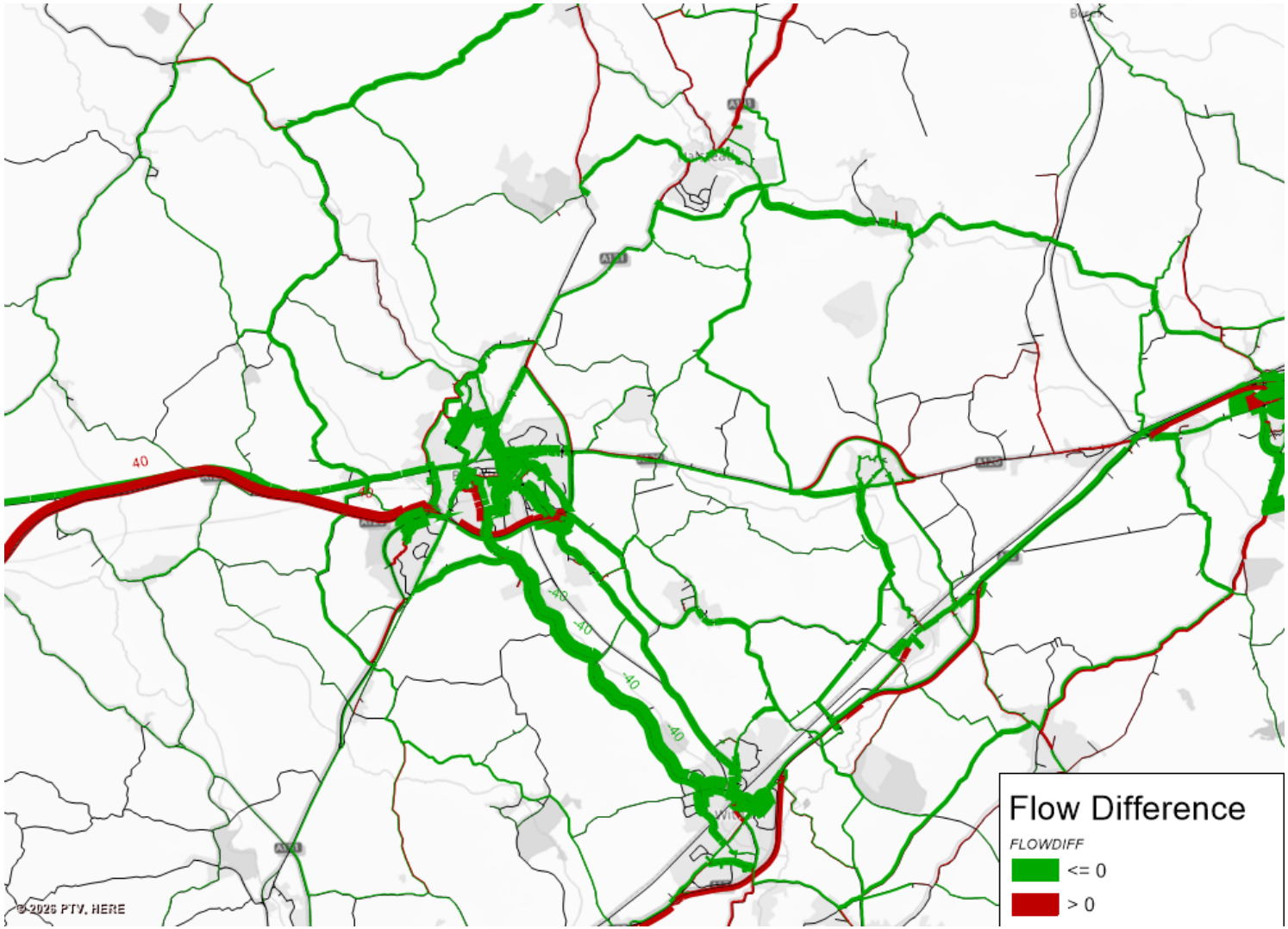

Figure D 16: PM flow difference – Scenario 4 2043 ST mitigated assessment v Scenario 3 2043 BaU mitigated

D.2.3 PM speed plots (modelled speed / free flow speed)

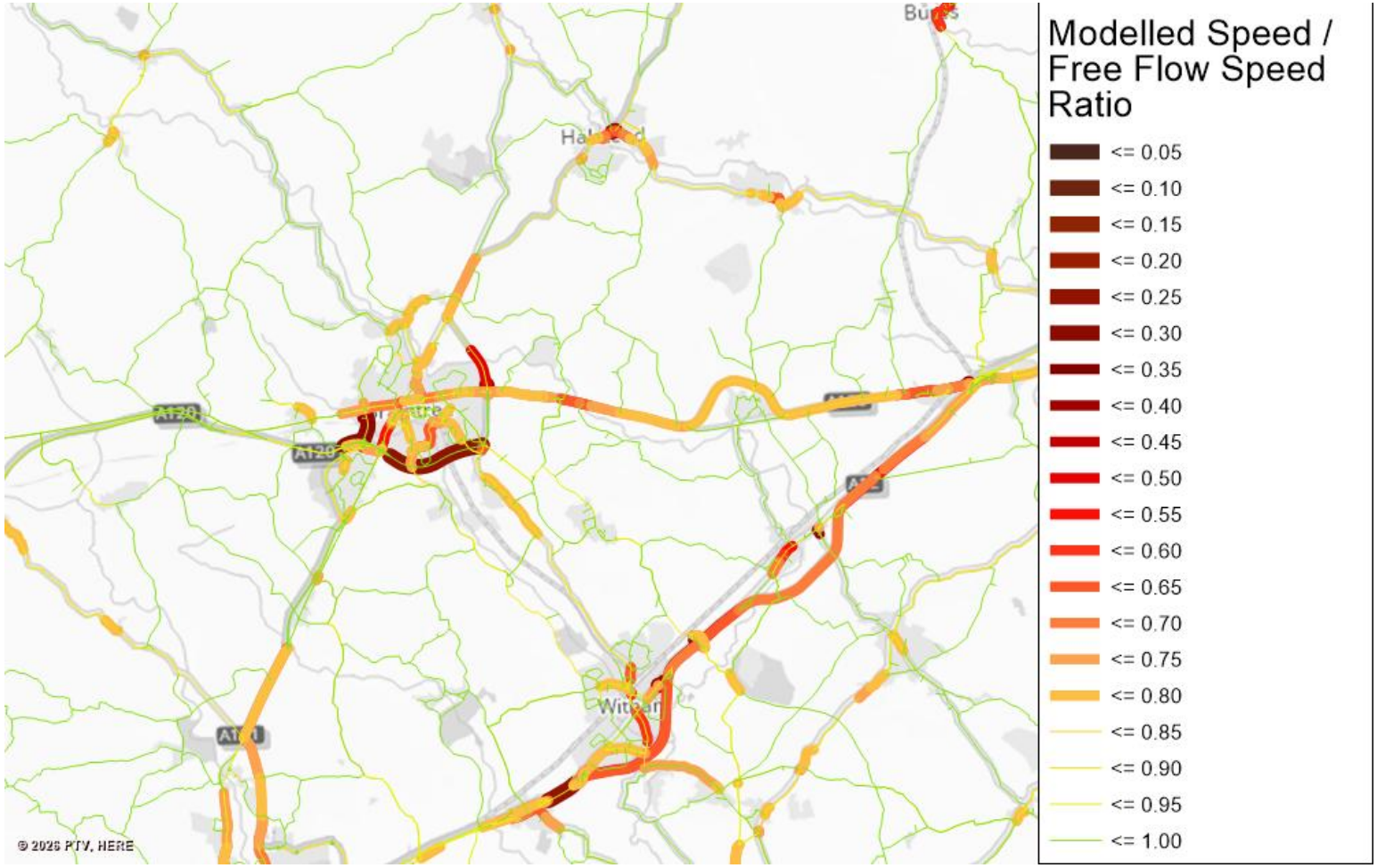

Figure D 17: PM speed ratio – Scenario 1 2043 reference

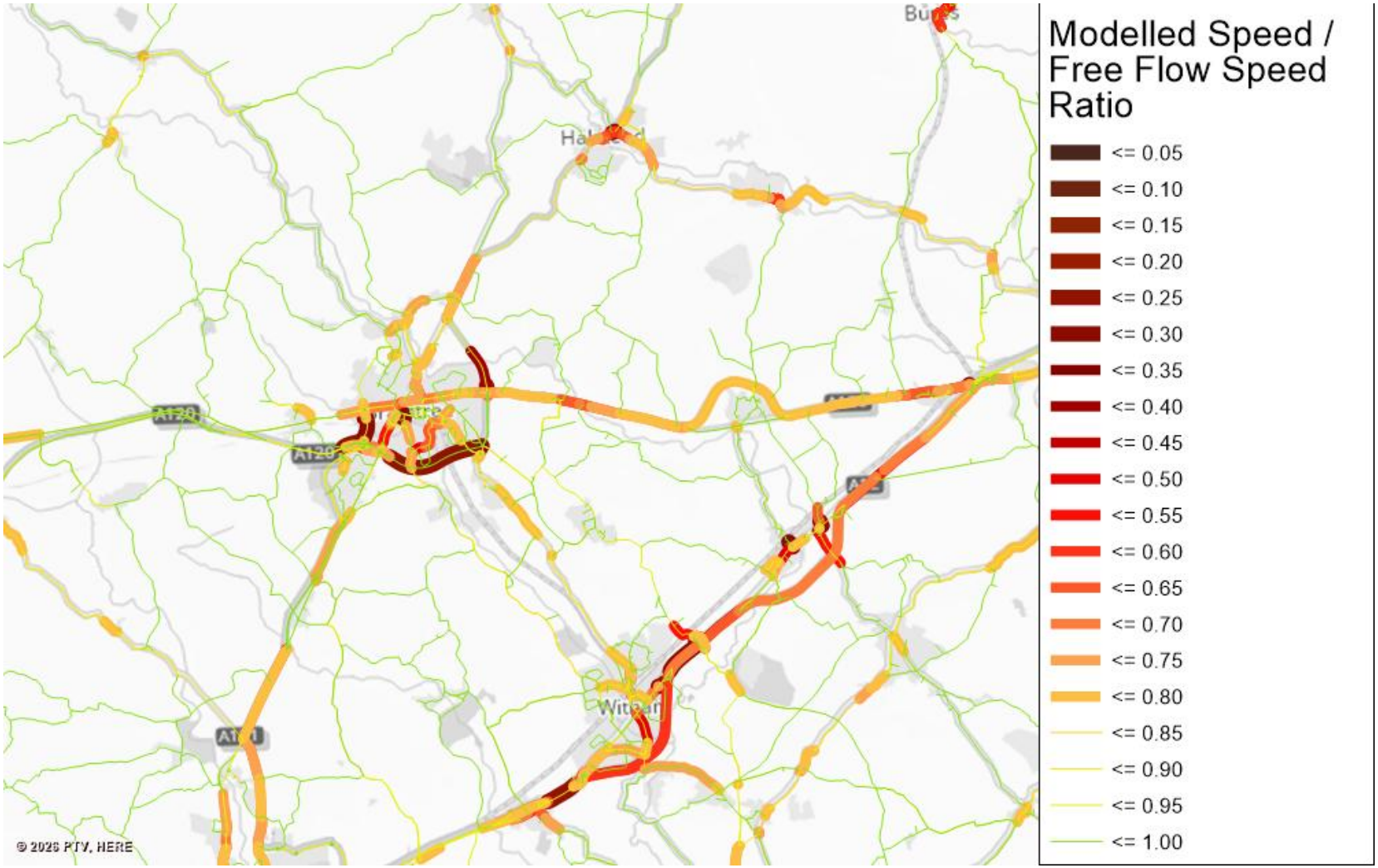

Figure D 18: PM speed ratio – Scenario 2 2043 unmitigated assessment

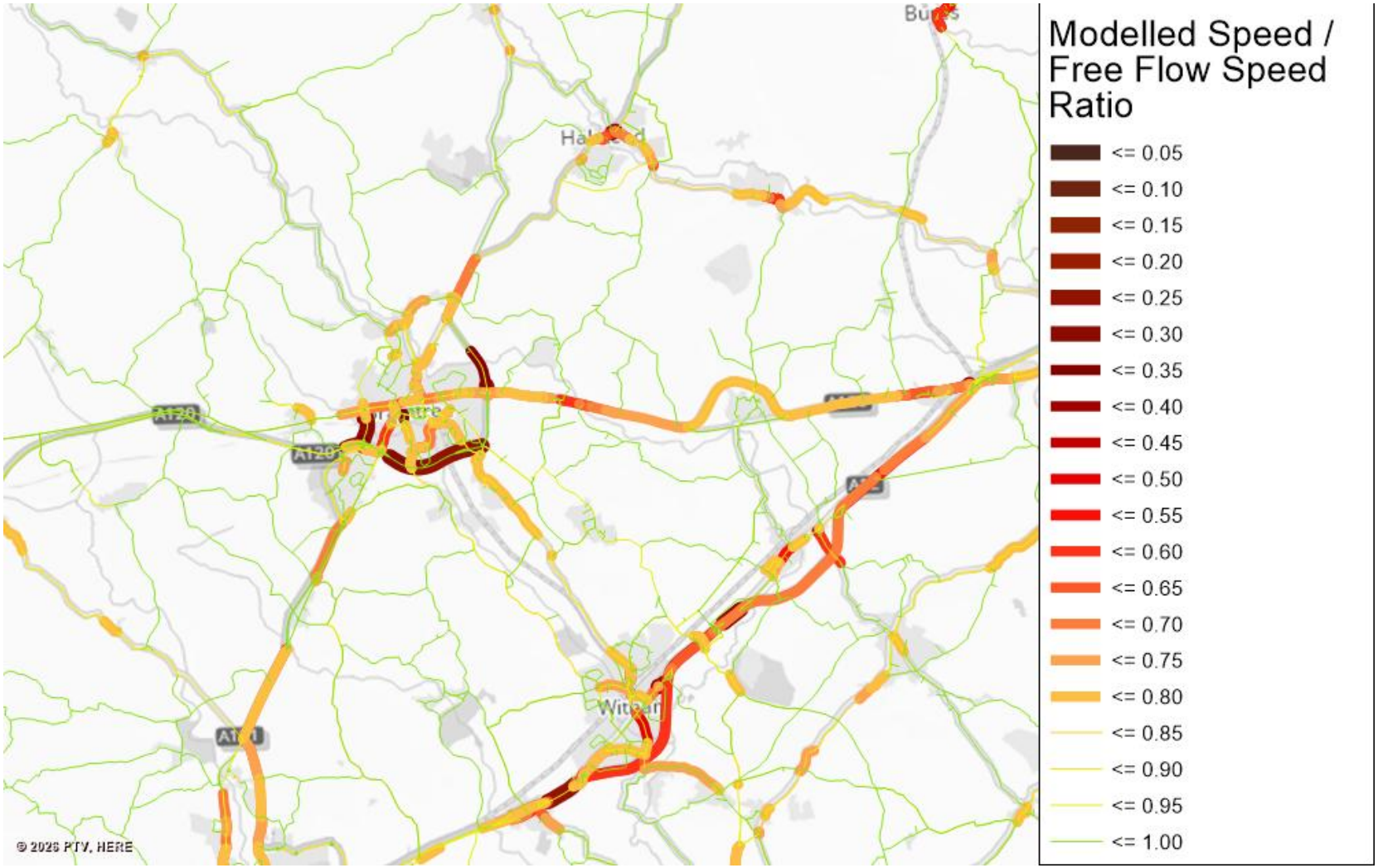

Figure D 19: PM speed ratio – Scenario 3 2043 BaU mitigated assessment

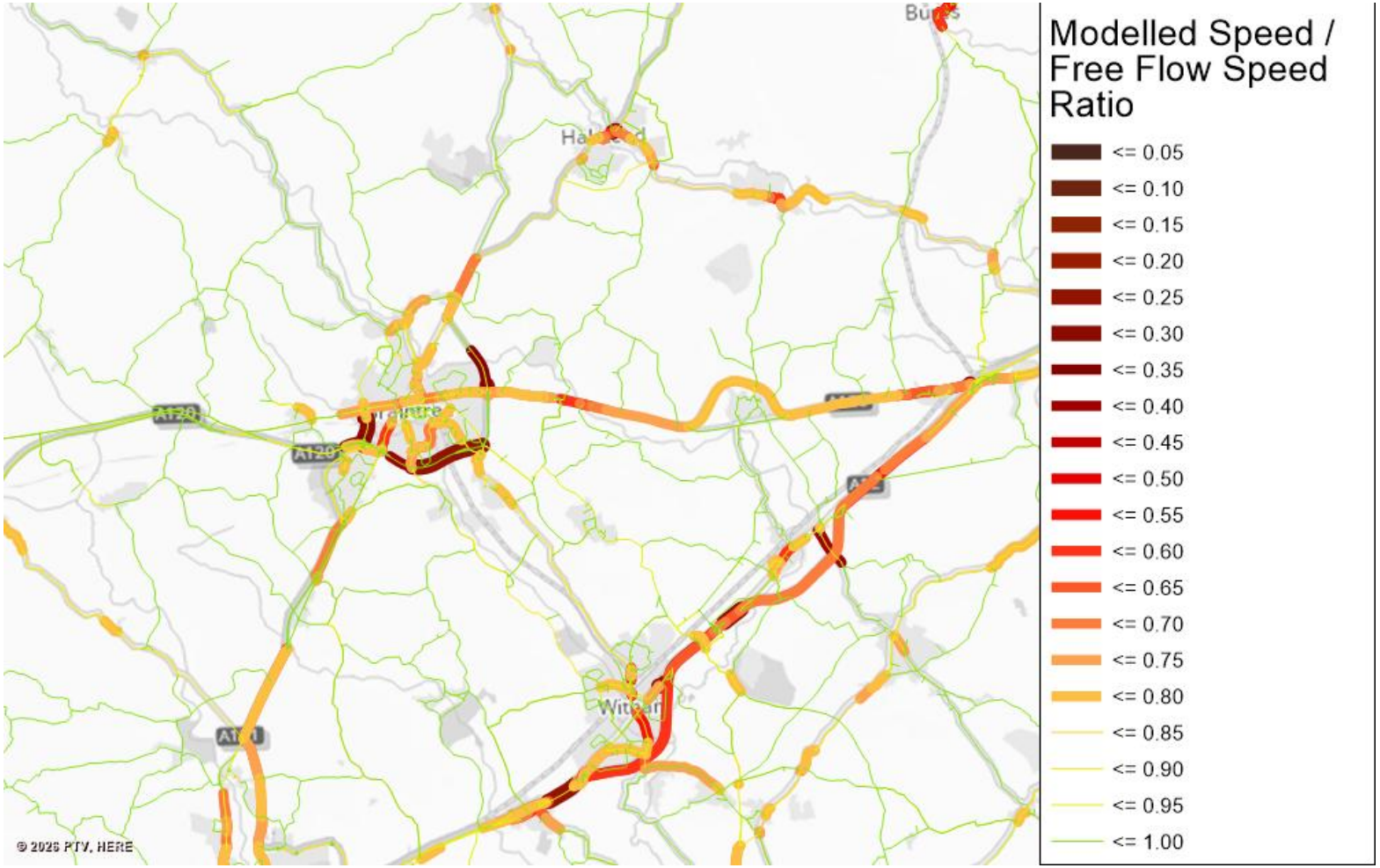

Figure D 20: PM speed ratio – Scenario 4 2043 ST mitigated assessment

D.2.4 PM relative queue plots (blocking back on road links in the model)

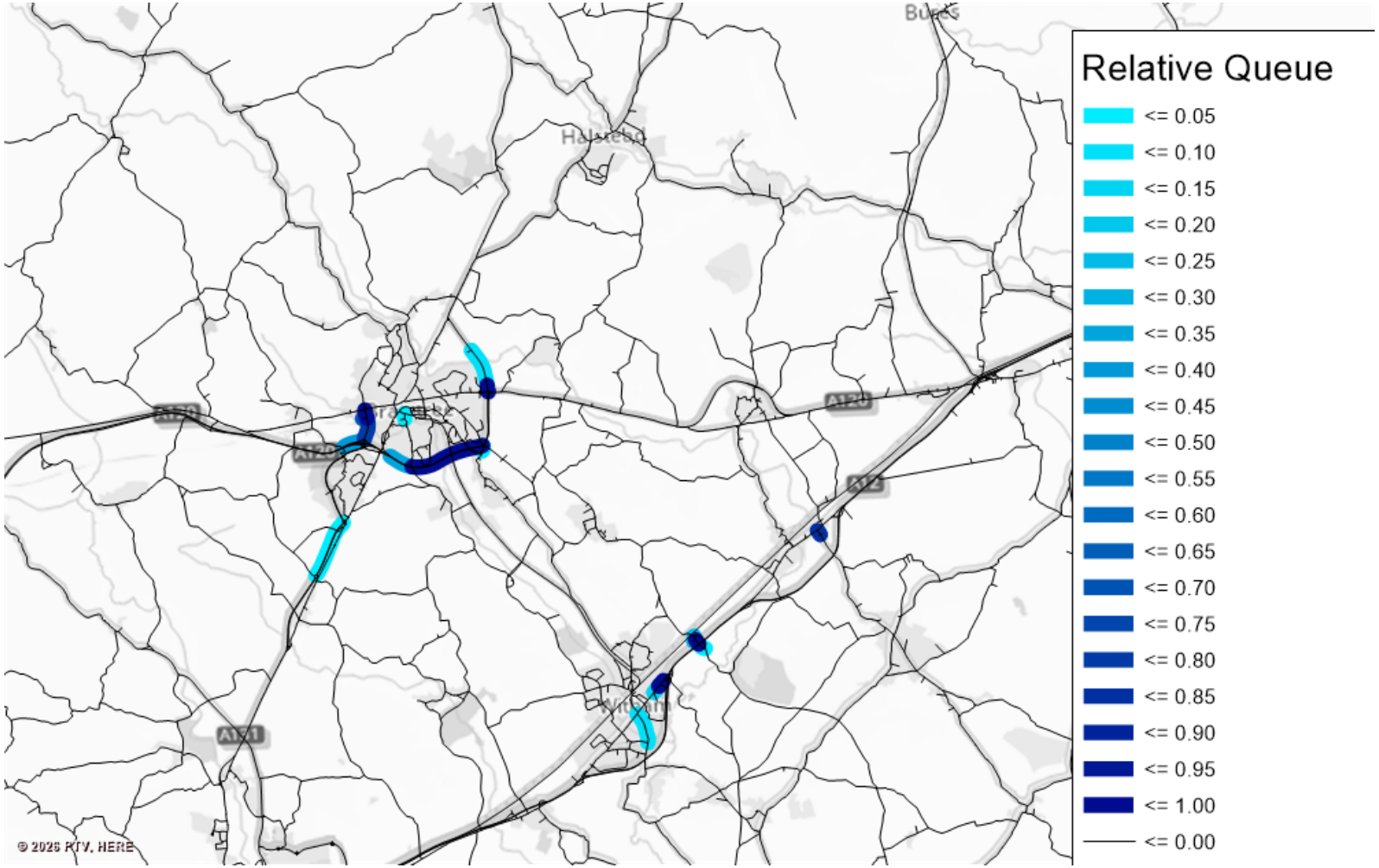

Figure D 21: PM relative queue – Scenario 1 2043 reference

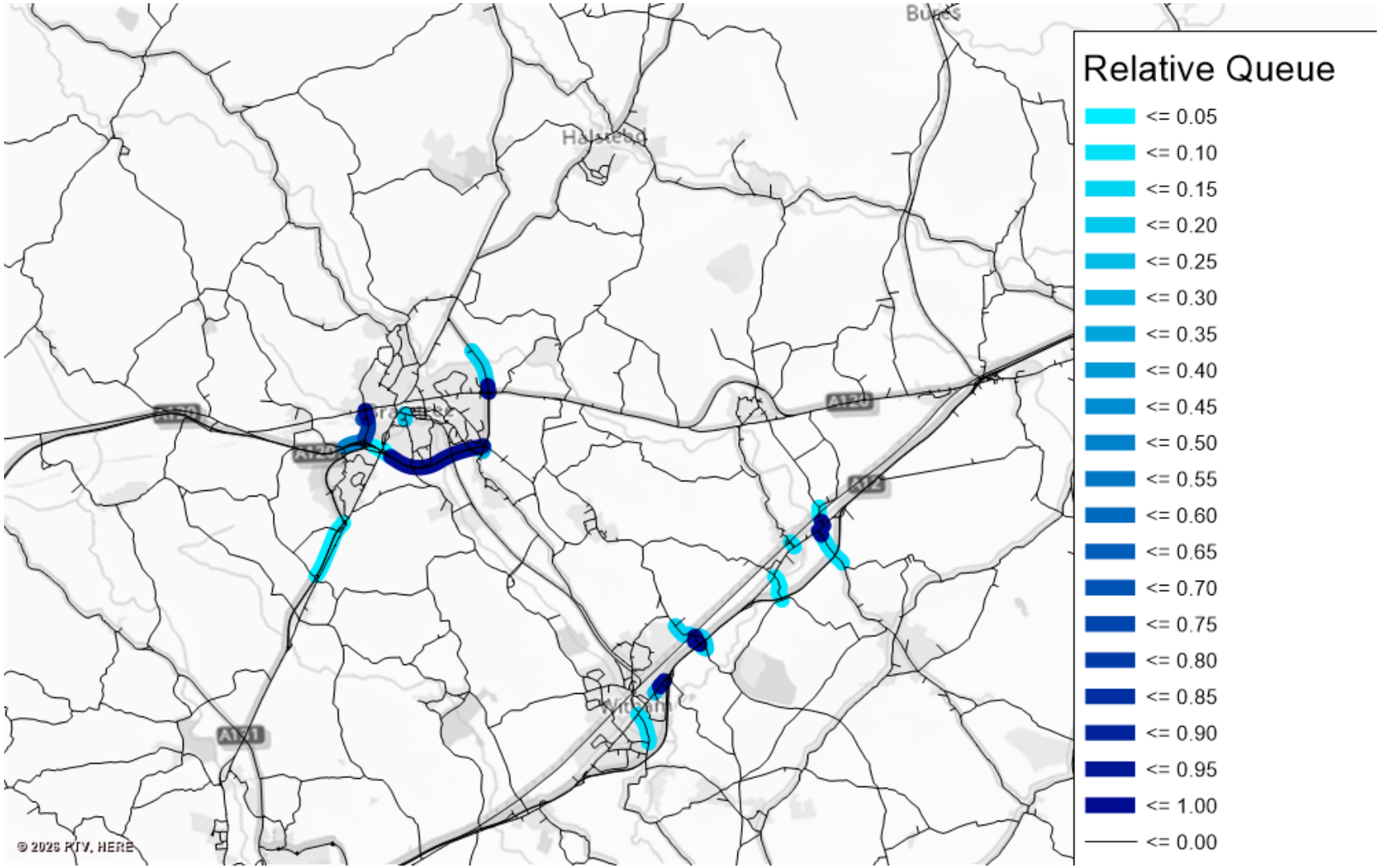

Figure D 22: PM relative queue – Scenario 2 2043 unmitigated assessment

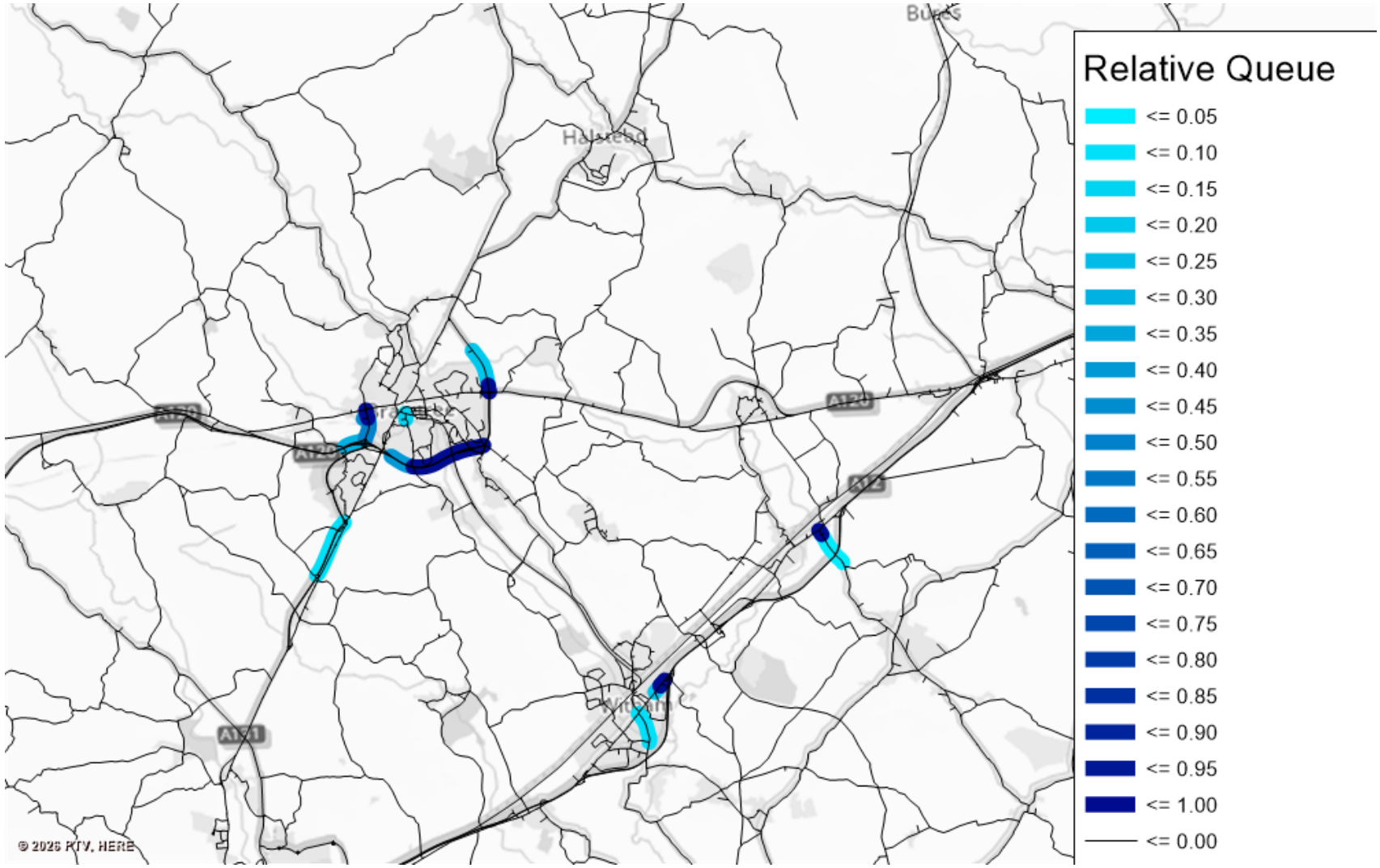

Figure D 23: PM relative queue – Scenario 3 2043 BaU mitigated assessment

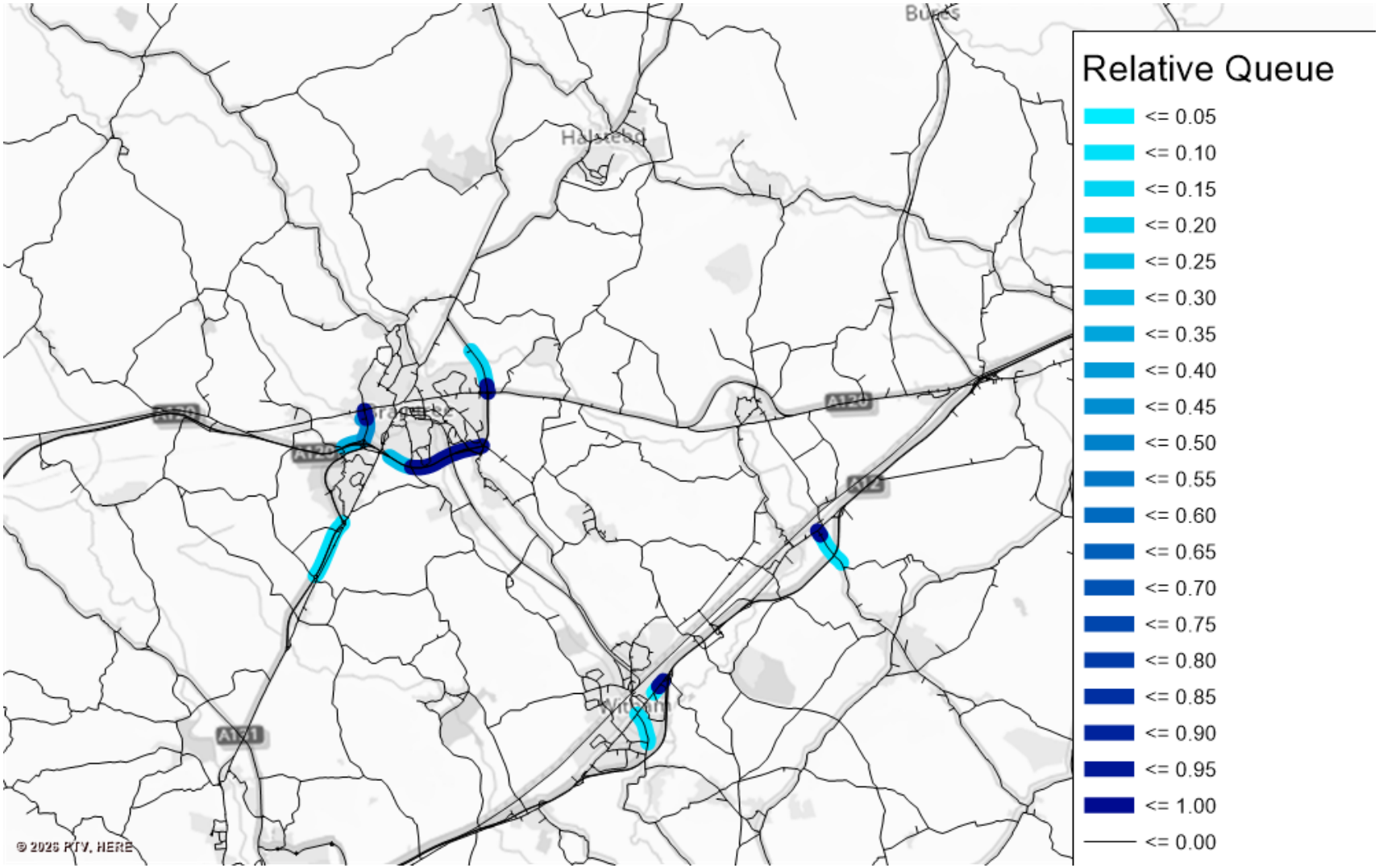

Figure D 24: PM relative queue – Scenario 4 2043 ST mitigated assessment

Appendix E. Vision-led Mitigation Measures

E.1 Introduction

This appendix sets out tables of proposed measures to mitigate the impact of the combined impact of reference case growth and new local plan growth. The measures are informing the Infrastructure Audit and Delivery Plan (IADP) for the Regulation 19 Local Plan. The cost of schemes are not shown in this report, however, the cost of each intervention has been estimated and input into the viability assessment

The main report explains that the requirement for mitigations arises from reference case growth – which comprises committed sites in the Braintree council area and possible growth in Colchester proposed in the their current local plan review – and proposed new local plan allocation in Braintree.

Accordingly, it is expected that the integrated transport and vision-based mitigations would need to be delivered in stages, with some of the largest schemes divided into phases aligned to specific sites or tranches of growth. Such phasing and incremental delivery would need to be worked out as growth comes forward as part of the planning process. It would be disproportionately complex to devise phasing at this strategic stage of plan making. Instead, it was considered more useful to show how the cumulative impact of all growth could be mitigated.

This appendix provides three lists of mitigation, which have been chosen to mitigate substantial impacts of growth and connect developments to public transport and active travel routes in line with policies and planning guidance. The three sets of measures are:

- highway measures – which support movement of all modes
- public transport measures
- active travel measures

There is an element of overlap between the sets of measures, as would be expected given the focus on integrated transport. However, it was considered useful to divide the measures into groups to illustrate how the measures are balancing the needs of all modes.

Each of the tables of measures indicates whether the need for the measures is caused by committed growth in Braintree, growth in other planning areas (principally Colchester), or new local plan growth in Braintree. The tables of measures provide an initial indication of which development groups contribute to which measures. It should be noted that this is subject to change as developments come forward and more detailed analysis is undertaken in transport assessments of planning applications.

The subsequent appendix, Appendix F, shows maps of each of the movement corridors on which measures are proposed. The maps combine highway, public transport and active travel measures, and show how they relate to nearby reference and new local plan developments in the Braintree council area. Some measures though are required due to cumulative growth further afield.

E.2 Highway related mitigation measures

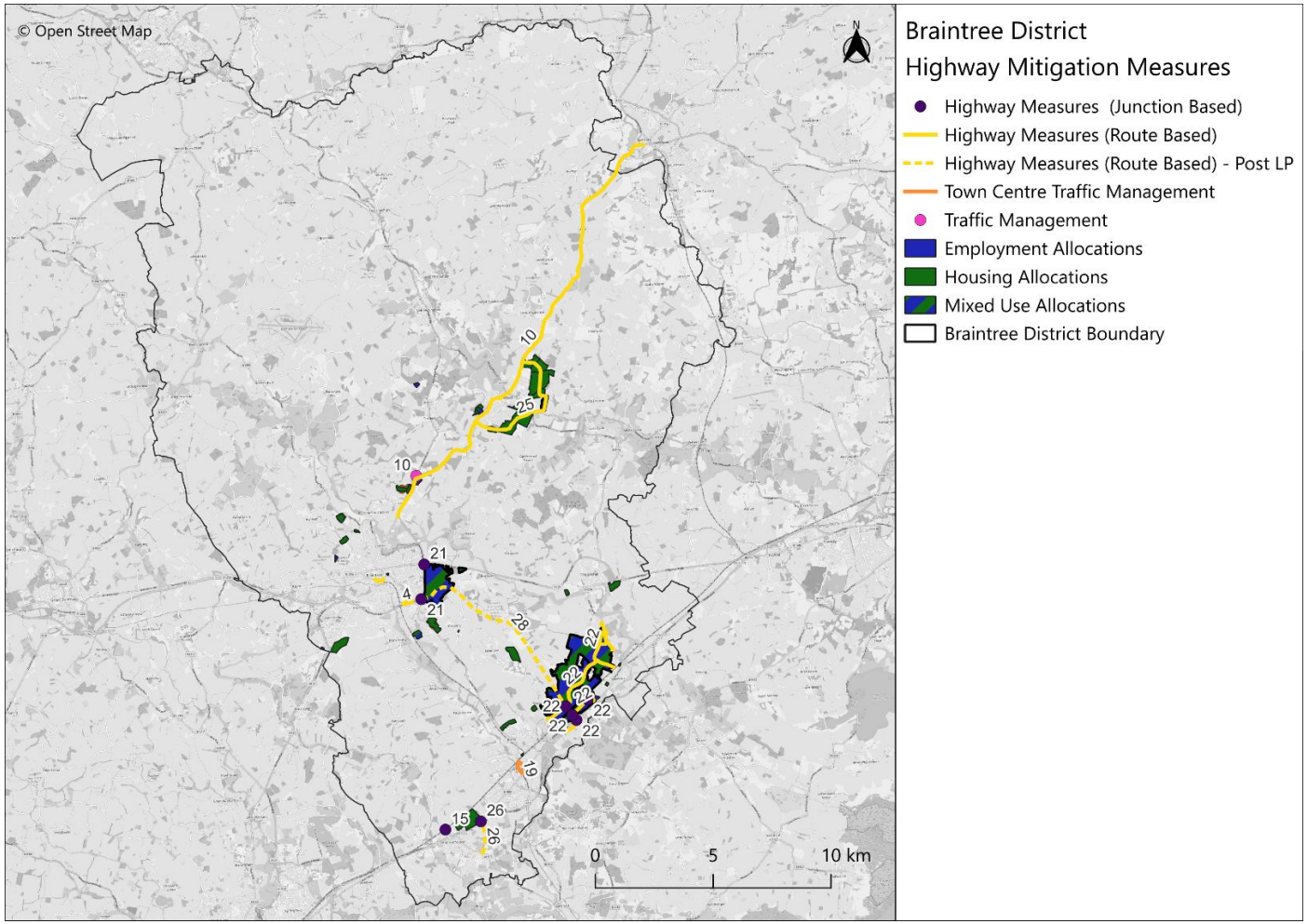

Figure E. 1 Highway Related Mitigation Measures

Table E. 1 Highway mitigations

Scheme ID	Movement Corridor	Type of Measure	Scheme Name	Scheme Description	Primary	Secondary	New Local Plan Site	Committed Sites	Growth beyond Braintree
4	A120	Road	Millennium Way Slips *(dependent on performance of Galley's Corner developer improvements)*		All in Braintree, Witham, Coggeshall, Halstead and Kelvedon	None	**P**	**P**	
8	A120	Traffic Management	Braintree Dynamic Traffic Management	Proposed upgrade to the current traffic control system, using real time data, A.I., and advanced signal technology to actively manage traffic across Braintree	All	N/a	**P**	**P**	
10	A131	Road	A131 Corridor Improvements (incl. Halstead and High Garrett)	Improve journey times on A131 Corridor North of Braintree, includes revising signal timings or layout at junction with A1017 Braintree Road. Potential roundabout (subject to testing).	All in Halstead	None	**P**	**P**	
19	A12	Road	Witham Town centre Improvements	Town centre improvements to ease congestion	All in Witham	None	**P**	**P**	

Scheme ID	Movement Corridor	Type of Measure	Scheme Name	Scheme Description	Primary	Secondary	New Local Plan Site	Committed Sites	Growth beyond Braintree
21	A120	Road	Galleys Corner Roundabout Improvements	Developer proposals include: • Elongated, part-signalised roundabout with an improved circulatory layout; • Additional entry lanes on the A120, B1018, and Long Green approaches; • Optimised signal control to manage conflicting flows and improve throughput; • Enhanced pedestrian and cycle facilities, including at grade crossings that • complement existing subways; • Geometric refinements designed to improve lane discipline and overall operational • efficiency; and • Safeguards proposed alignment for A120 to A12 (Option D) Route	All in Braintree, Witham, Coggeshall, Halstead and Kelvedon	None	**P**	**P**	
	A120	Road	Marks Farm Roundabout Improvements	Improvements to Marks Farm Roundabout on the A120. Details of this scheme are TBC but likely to include layout / capacity improvements and safety enhancements for all users	Same as above	None	**P**	**P**	
	A12	Road	A12 access options	Two options put forward by the developer for a new A12 access	KELV2208	KELV2215,KELV2214,KELV2219,SILV2272,RIVE2249, WITN2252	**P**		

Scheme ID	Movement Corridor	Type of Measure	Scheme Name	Scheme Description	Primary	Secondary	New Local Plan Site	Committed Sites	Growth beyond Braintree
22	A12	Road	Coggeshall Road and Oak Road Link	A new purpose-built link, between Coggeshall Road and Oak Road, connecting to a central roundabout within the site and the new A12 access junction.	KELV2208	None	**P**		
24	A120	Behaviour Change	Car Club	Developer to provide 10 cars for a car club service within the development	CRES2108	None	**P**		
25	A131	Road	Halstead Link Road	Would provide a bypass around Halstead Town Centre from the A131 (to the south of Halstead), connecting with the A131 (to the north of Halstead) and finally to Hedingham Road (to the northwest of Halstead)	All in Halstead	None	**P**	**P**	
26	A12	Road	New A12 junction 21 and B1019 link road	B1019 Link Road connecting into new A12 J21, originally part of A12 DCO which is no longer going ahead. Ongoing conversations with NH on whether this junction can be implemented without widening scheme	All in Hatfield Peverel	None	**P**	**P**	
28	A120	Road	Dualling the A120 between Braintree and Marks Tey	New strategic highway link to replace current A120 between the A12 and Braintree	All in Braintree, Witham, Coggeshall, Halstead and Kelvedon	None	**P**	**P**	

E.3 Public Transport Measures

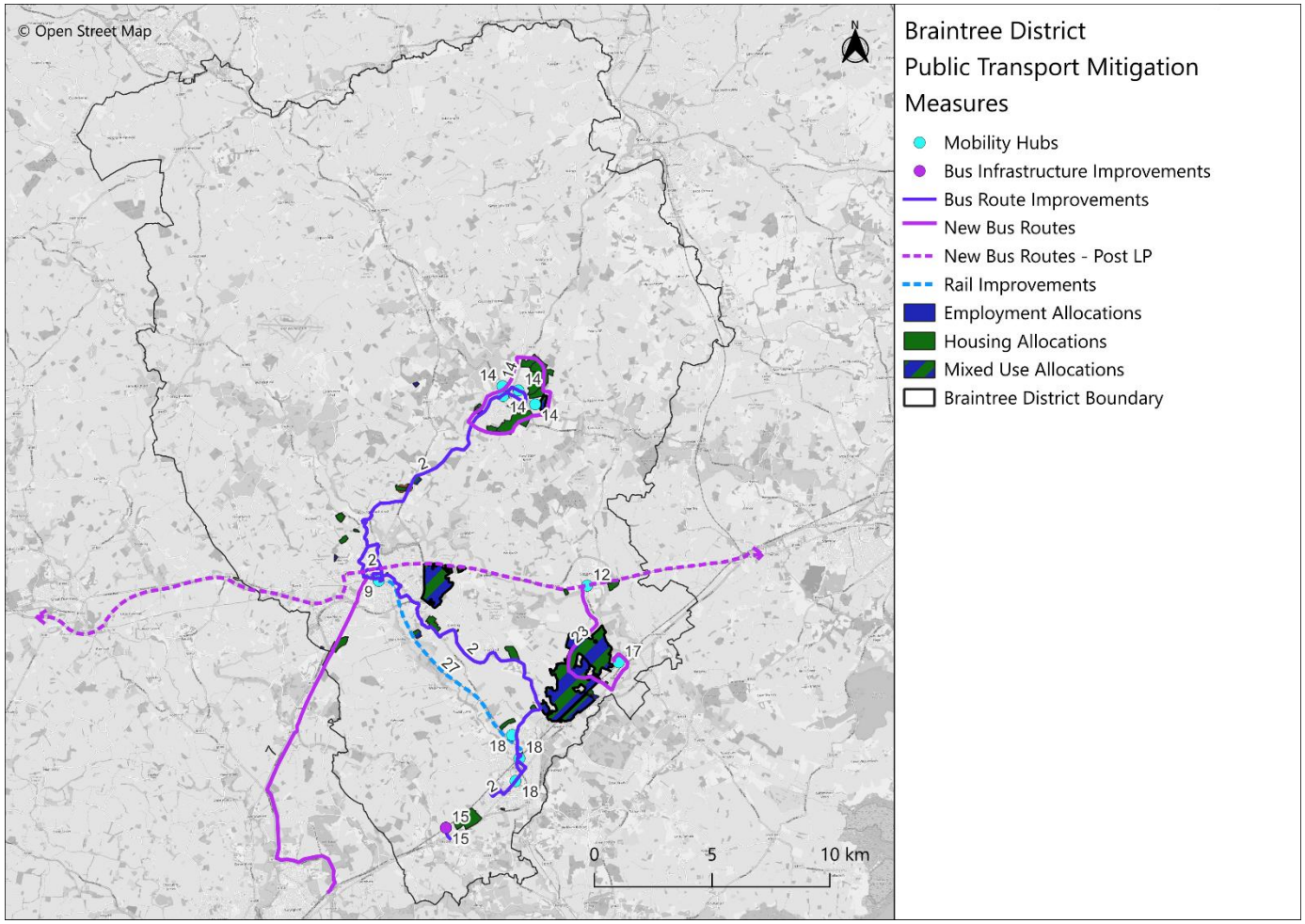

Figure E. 2 Public Transport Related Mitigation Measures

Table E. 2 Public Transport Measures

Scheme ID	Movement Corridor	Type of Measure	Scheme Name	Scheme Description	Contributing areas		Expected causal links		
					Primary	Secondary	New Local Plan Site	Committed Sites	Growth beyond Braintree
2	A120	Bus	Route 38 – Increase frequency and access into development	Service frequency improvements for bus route 38. Services currently run every 20 minutes. An increased frequency of services would support trips from the development to Witham or Braintree. Feasibility work is required to understand patronage data and current reliability.	All in Halstead	None	**P**	**P**	
	A120	Bus	Route 38 – route through the SE of the development and Cressing Station	Re-routing of bus route 38 to run through the southeast of the development, linking to Cressing Railway Station, Braintree Freeport and Braintree Town Centre.	CRES2018,CRES2112,CRES2102, SILV2272	None	**P**	**P**	
	A133	Bus	Extension of Route 38 to reach new development	An extension of bus route 38 to serve the development located on the land north west of Towerlands on Panfield Road.	PANF2604	None	**P**	**P**	

Scheme ID	Movement Corridor	Type of Measure	Scheme Name	Scheme Description	Contributing areas		Expected causal links		
					Primary	Secondary	New Local Plan Site	Committed Sites	Growth beyond Braintree
3	N/a	Multi-modal	Business and School Travel Planning	Increased focus on travel plan (TP) monitoring, more support for developers to deliver on their TP's, more effective processes to ensure developers meet their obligations. Use of tools such as "You Smart Thing" to raise awareness of travel (mainly sustainable) options.	All	N/a	**P**	**P**	
	N/a	Multi-modal	Behavioural change programme	Making best use of the network/Increase sustainable travel, therefore reducing traffic and improving junctions. Supports promotion of projects.	All	N/a	**P**	**P**	
7	A131	Bus	Bus shuttle between Braintree and Beaulieu Park Stations	Temporary scheme during construction of passing loop on Braintree branch line	All in Braintree	None	**P**	**P**	

Scheme ID	Movement Corridor	Type of Measure	Scheme Name	Scheme Description	Contributing areas		Expected causal links		
					Primary	Secondary	New Local Plan Site	Committed Sites	Growth beyond Braintree
9	A120	Multi-modal	Braintree Station Access Improvements	Introduction of a one-way system from east to west along Station Approach to minimise conflict between road users (including buses, taxis and car park users). Additional non-motorised user access along Station Approach, including a contraflow cycle lane. Enhanced urban environment, including five design options for a new pedestrianised area (to replace the existing bus turning circle) and new bus stop facilities beside the station	All in Braintree	None	**P**	**P**	
	A120	Mobility Hubs	Braintree mobility hub	Feasibility study into a mobility / integrated hubs project	All in Braintree	None	**P**	**P**	
12	A120	Mobility Hubs	Coggeshall mobility hub	Sustainable transport hubs across the town to encourage multi-modal trips	All in Coggeshall	None	**P**	**P**	
14	A131	Bus	Halstead Town Network (new bus route)	A new bus route serving Halstead Town, enhancing access to residential areas and new sites.	All in Halstead	None	**P**	**P**	
	A131	Mobility Hubs	Halstead Mobility Hubs	Sustainable transport hubs across the town to encourage multi-modal trips	All in Halstead	None	**P**	**P**	

Scheme ID	Movement Corridor	Type of Measure	Scheme Name	Scheme Description	Contributing areas		Expected causal links		
					Primary	Secondary	New Local Plan Site	Committed Sites	Growth beyond Braintree
15	A12	Bus / Mobility Hubs	Hatfield Peverel Station Turning Point, Mobility Hub and Accessibility Upgrades	Compact forecourt needs space for bus turning circle. Addition of mobility hub to encourage multi modal trips. Allowance for some accessibility upgrades.	All in Hatfield Peverel	None	**P**	**P**	
16		Bus	Route existing bus services along Hatfield Peverel High Street, to train station utilising turning provision (scheme 8)	Provides direct access to the train station.	All in Hatfield Peverel	None	**P**	**P**	

Scheme ID	Movement Corridor	Type of Measure	Scheme Name	Scheme Description	Contributing areas		Expected causal links		
					Primary	Secondary	New Local Plan Site	Committed Sites	Growth beyond Braintree
	A12	Mobility Hubs	Kelvedon Mobility Hub	Sustainable transport hubs across the town to encourage multi-modal trips.	All in Witham, Kelvedon and Hatfield Peverel	None	**P**	**P**	
17	A12	All modes	Kelvedon station Improvements	Several potential enhancements have been identified through initial NR engagement, which Kings Dene could help facilitate. This includes bridge accessibility improvements, additional car parking capacity, as well as an all-modes interchange enabling active modes integration with cycle parking, bus turn around, scooter hire/ parking and dedicated drop-off/ pick-up provision. Include cycle connectivity from Kings Dene site to rail station.	KELV2208, KELV2214,KELV2215. KELV2219	None	**P**	**P**	
18	A12	Mobility Hubs	Witham Mobility Hub	Sustainable transport hubs across the town to encourage multi-modal trips.	All in Witham	None	**P**		
23	A12	Bus	Route to serve Kelvedon, New Development and north to Coggeshall	Bus provision to the new development, which does not currently exist to provide connection to Kelvedon Station and amenities.	All in Kelvedon and Coggeshall	None	**P**	**P**	

Scheme ID	Movement Corridor	Type of Measure	Scheme Name	Scheme Description	Contributing areas		Expected causal links		
					Primary	Secondary	New Local Plan Site	Committed Sites	Growth beyond Braintree
24	A120	Bus	5 year bus / BRT subsidy	4 buses and 5 drivers for 5 years	CRES2108	None	**P**		
	A120	Travel Planning	Travel Plan Fund		CRES2108	None	**P**		
27	A120	Rail	Increase the frequency of the Braintree Branch Line	Would allow half hourly or more operation of trains along the line, linking with Witham main line for commuting journeys	All in Braintree and Cressing	None	**P**	**P**	
29	A120	Bus Rapid Transport Scheme	North Essex Rapid Transit	Connection between Braintree, Colchester and Stansted	All in Coggeshall and Braintree	None	**P**	**P**	**P**

E.4 Active Travel Measures

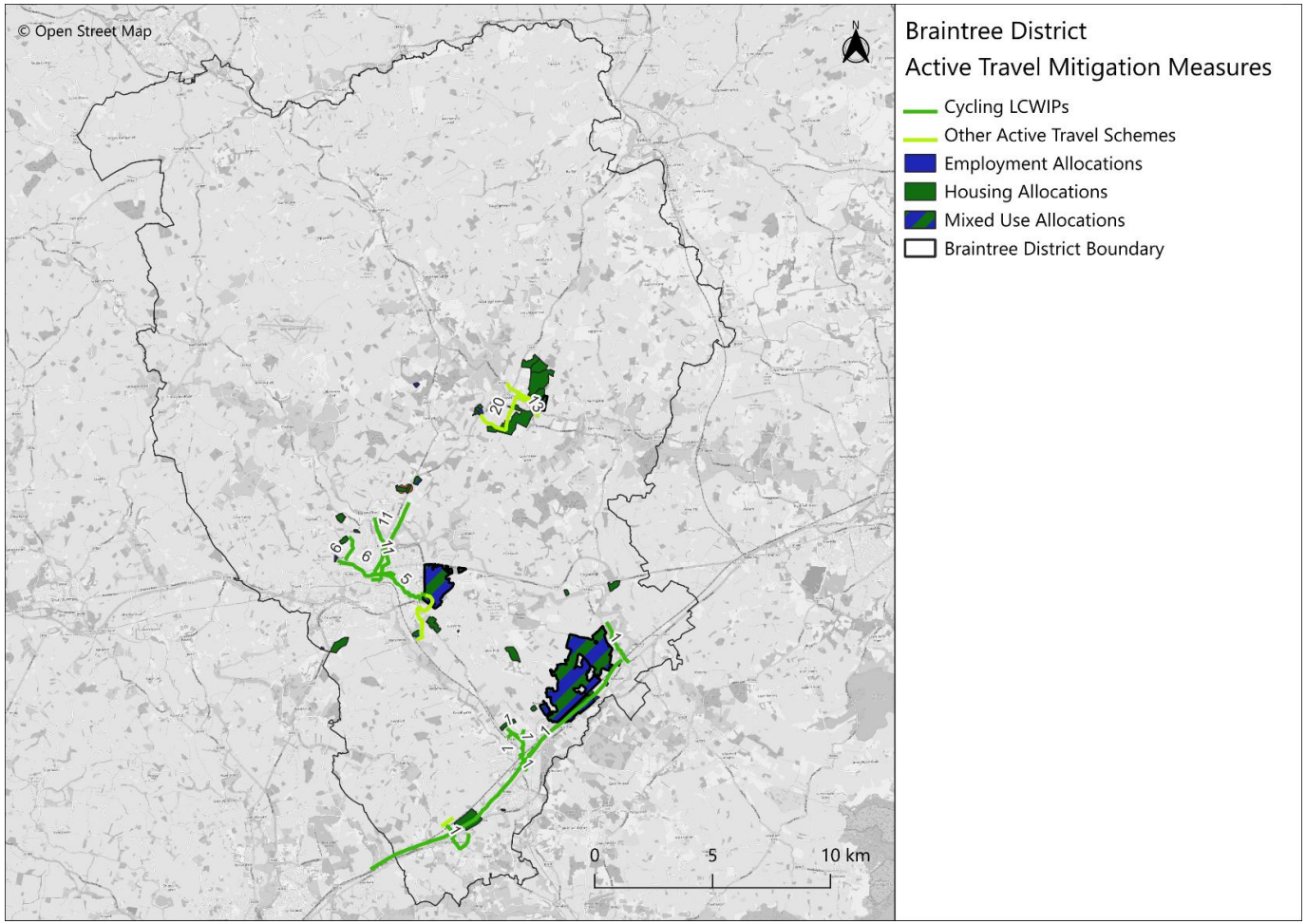

Figure E. 3 Active Travel Related Mitigation Measures

Table E. 3 Active Travel Measures

Scheme ID	Movement Corridor	Type of Measure	Scheme Name	Scheme Description	Contributing areas		Expected causal links		
					Primary	Secondary	New Local Plan Site	Committed Sites	Growth beyond Tendring
1	A12	Cycle	Countywide Cycle Link 10 Kelvedon – Hatfield Peverel	Strategic connection through the towns and linking development sites	KELV2208, KELV2214, KELV2215 All in Hatfield Peverel	None	**P**	**P**	
	A12	Cycle / Walk	Witham LCWIP 7(Witham Train station to North East Witham) Witham LCWIP 7(Witham Train station to North East Witham)	Scheme connects site to the train station along Cut Throat Lane	WITN2312	None	**P**		
1	A12	Cycle / Walk	Extend Witham LCWIP route 3 to connect with new development	Extension of the route would pick up the new development	WITN2252	WITN2312	**P**		

Scheme ID	Movement Corridor	Type of Measure	Scheme Name	Scheme Description	Contributing areas		Expected causal links		
					Primary	Secondary	New Local Plan Site	Committed Sites	Growth beyond Tendring
	A12	Cycle / Walk	Witham LCWIP Route 2 (Cressing Road to Station)	Connecting key LCWIP routes to the train station	WITN2252	WITN2312	**P**		
	A12	Cycle	Cycle Countywide link to Hatfield Peverel Train Station	Strategic connection between station and development site	HATF2193	None	**P**		
3	N/a	Cycle / Walk	Cycle Parking Study		All	N/a	**P**	**P**	
	N/a	Cycle / Walk	Safer School Streets in new developments	Implement across all new schools, improves area around schools, improved health and wellbeing of children, cleaner air.	All	N/a	**P**	**P**	
5		Cycle / Walk	A120 Active Travel Bridge - link to LCWIP 3		CRES2108	CRES2102, CRES2112	**P**		
		Cycle / Walk	Braintree LCWIP – Route 3	Connects development site to Braintree	CRES2108	CRES2112, CRES2102, SILV2272	**P**	**P**	

Scheme ID	Movement Corridor	Type of Measure	Scheme Name	Scheme Description	Contributing areas		Expected causal links		
					Primary	Secondary	New Local Plan Site	Committed Sites	Growth beyond Tendring
		Cycle / Walk	Cressing Station to LCWIP Route 3	Connects through the new development, linking developments in Tye Green and the train station	CRES2108, CRES2102	None	**P**	**P**	
6	A120	Cycle / Walk	Braintree LCWIP route 2	Support walk and cycle connections to existing services Connect with LCWIP 2 when fully operational	PANF2508	None	**P**		
	A120	Cycle / Walk	Improved facilities for pedestrians and cyclists at Porters Field	Walking and Cycling Provision	PANF2508	None	**P**	**P**	
11	A131	Cycle / Walk	Braintree LCWIP - Route 7 feasibility	Would help connect development site to Braintree (by extending the route another 800m)	BOCN2033, BOCN2028, BOCN2031 (part)	None	**P**	**P**	
	A131	Cycle / Walk	Braintree LCWIP - Route 6 feasibility	Would help connect development site to Braintree (by extending the route another 600m)	PANF2604, BOCN2032	None	**P**	**P**	
13	A131	Cycle	Countywide Cycle Route- A1124 Greenstead Hall Rd to Hospital	Local segment of North Essex Greenway. To offer sustainable connections through Halstead. Longer term would become part of	GGHR2141, GGHR2416	COLE2100, HASA2179	**P**	**P**	

Scheme ID	Movement Corridor	Type of Measure	Scheme Name	Scheme Description	Contributing areas		Expected causal links		
					Primary	Secondary	New Local Plan Site	Committed Sites	Growth beyond Tendring
				the North Essex Greenway providing strategic connectivity to Kelvedon					
20	A131	Cycle	Halstead Local Cycle Routes	Connecting current residential and new development to countywide cycle route, school and High Street	HASA2179, GGHR2141, GGHR2143, GGHR2148	GGHR2416, COLE2100	**P**	**P**	
24	A120	Cycle	E-bike Hire Scheme		CRES2108	None	**P**		

Appendix F. Maps of Vision-led Mitigation Measures

The previous appendix, Appendix E, listed proposed integrated transport and vision-based mitigation required to support reference case and proposed new local plan growth. The measures were divided, in an approximate manner, into highway, public transport and active travel schemes. The measures in each table were grouped by their location on movement corridors.

This appendix shows the location of highway, public transport and active travel measures together on each movement corridor. The maps also show how the measures relate to nearby reference and new local plan developments in the Tendring council area.

For completeness, a map for each of the movement corridors mentioned in the tables in Appendix E is provided. This means some maps are sparse. Sometimes this is because measures are required due to cumulative growth further afield. The measures provide a good indication of range and scale of mitigation that would likely be required to mitigate and connect reference case and new local plan growth.

However, additional measures might be required as more detailed analysis in undertaken, which would support planning applications. Furthermore, each of the mitigation schemes could be divided into phases to align to individual developments or tranches of growth.

F.1 Schemes in Braintree District (Strategic)

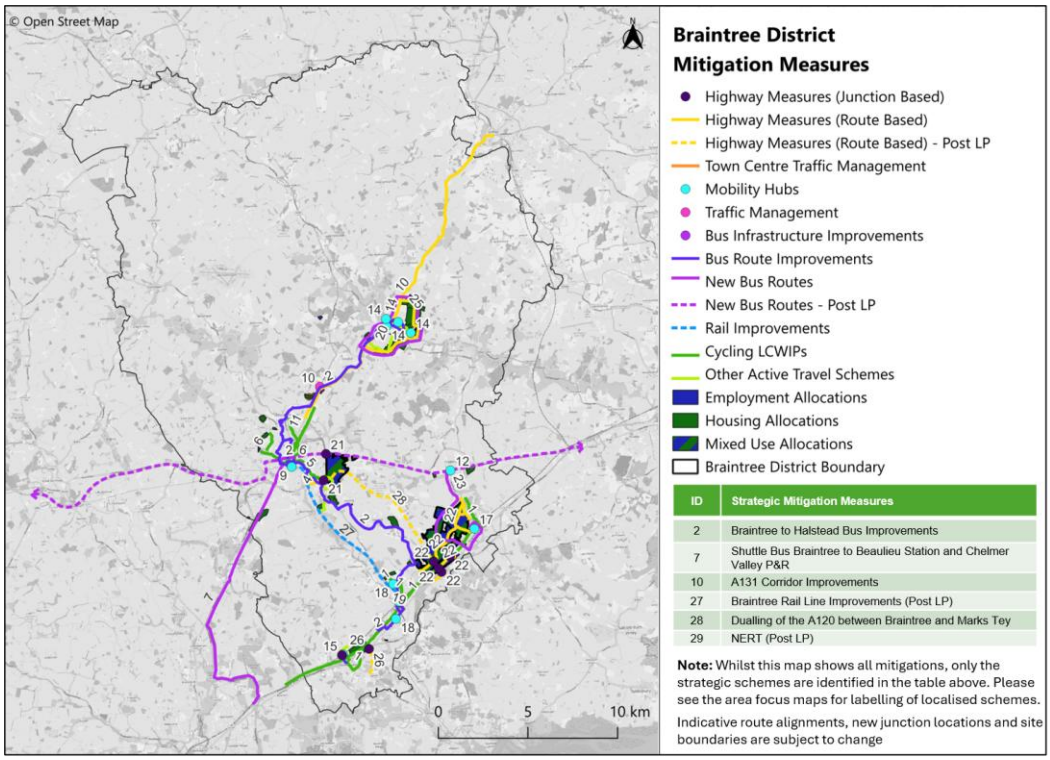

Figure F. 1 Braintree District Mitigation Measures

F.2 Schemes in Braintree, Great Notley and Cressing (Local)

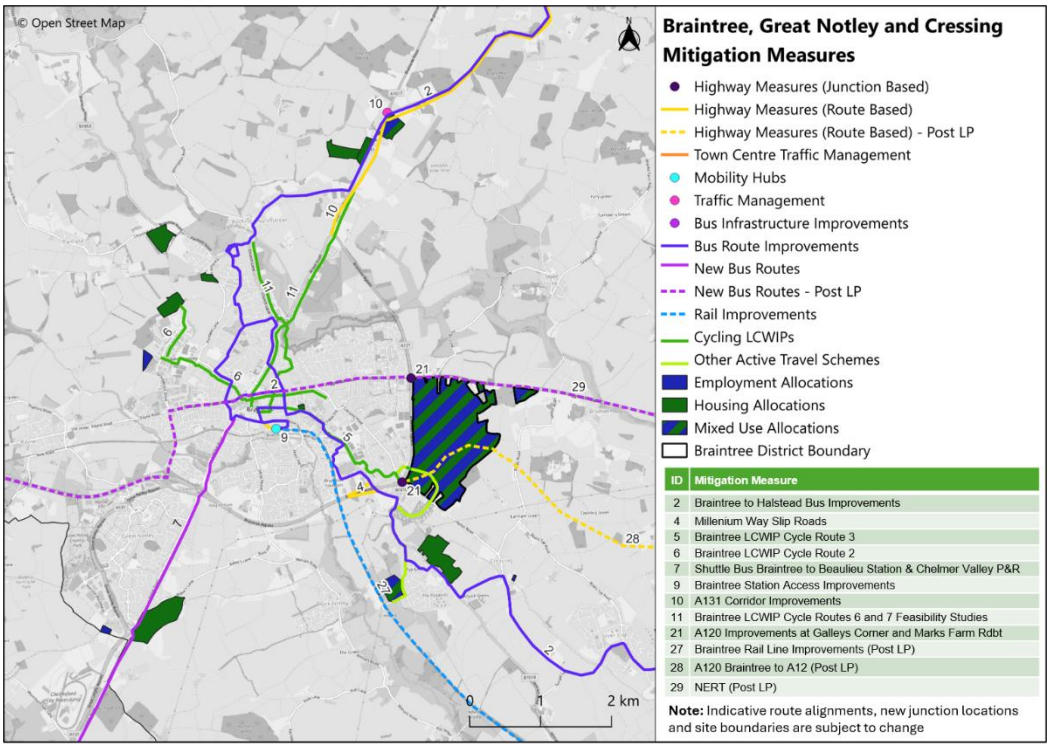

Figure F. 2 Braintree, Great Notley and Cressing Mitigation Measures

F.3 Schemes in Witham and Hatfield Peverel

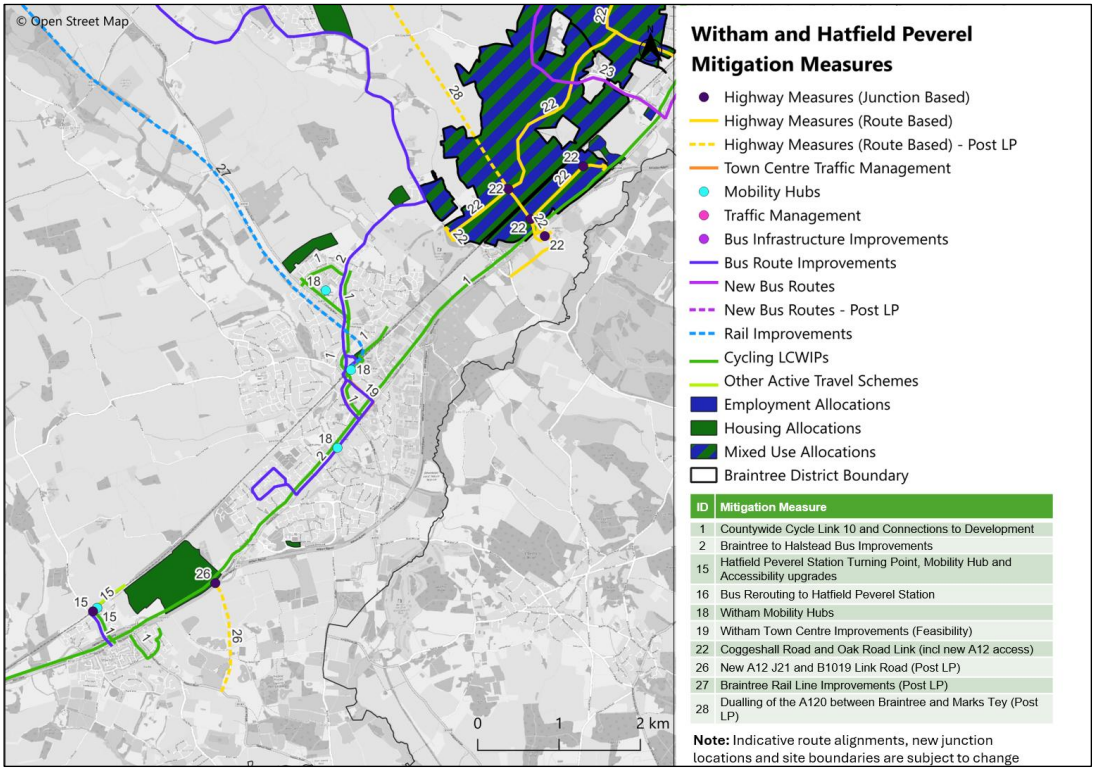

Figure F. 3 Witham and Hatfield Peverel Mitigation Measures

F.4 Schemes in Kelvedon, Coggeshall and Silver End

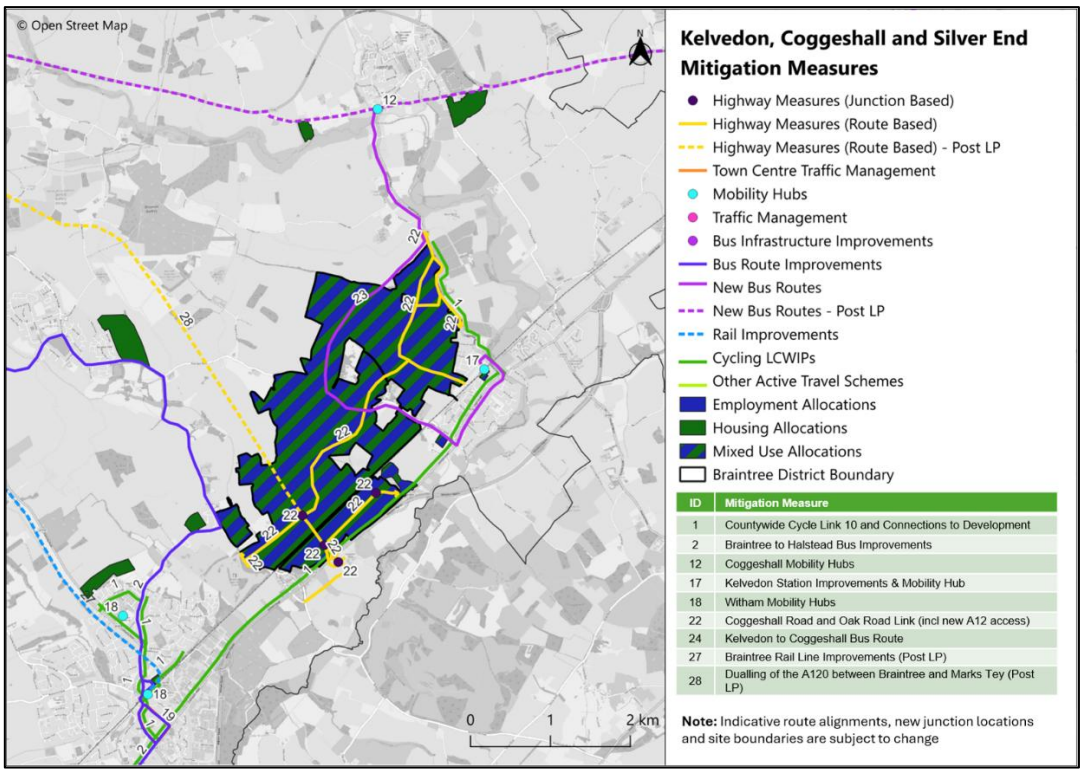

Figure F. 4 Kelvedon, Coggeshall and Silver End Mitigation Measures

F.5 Schemes in Halstead and High Garrett

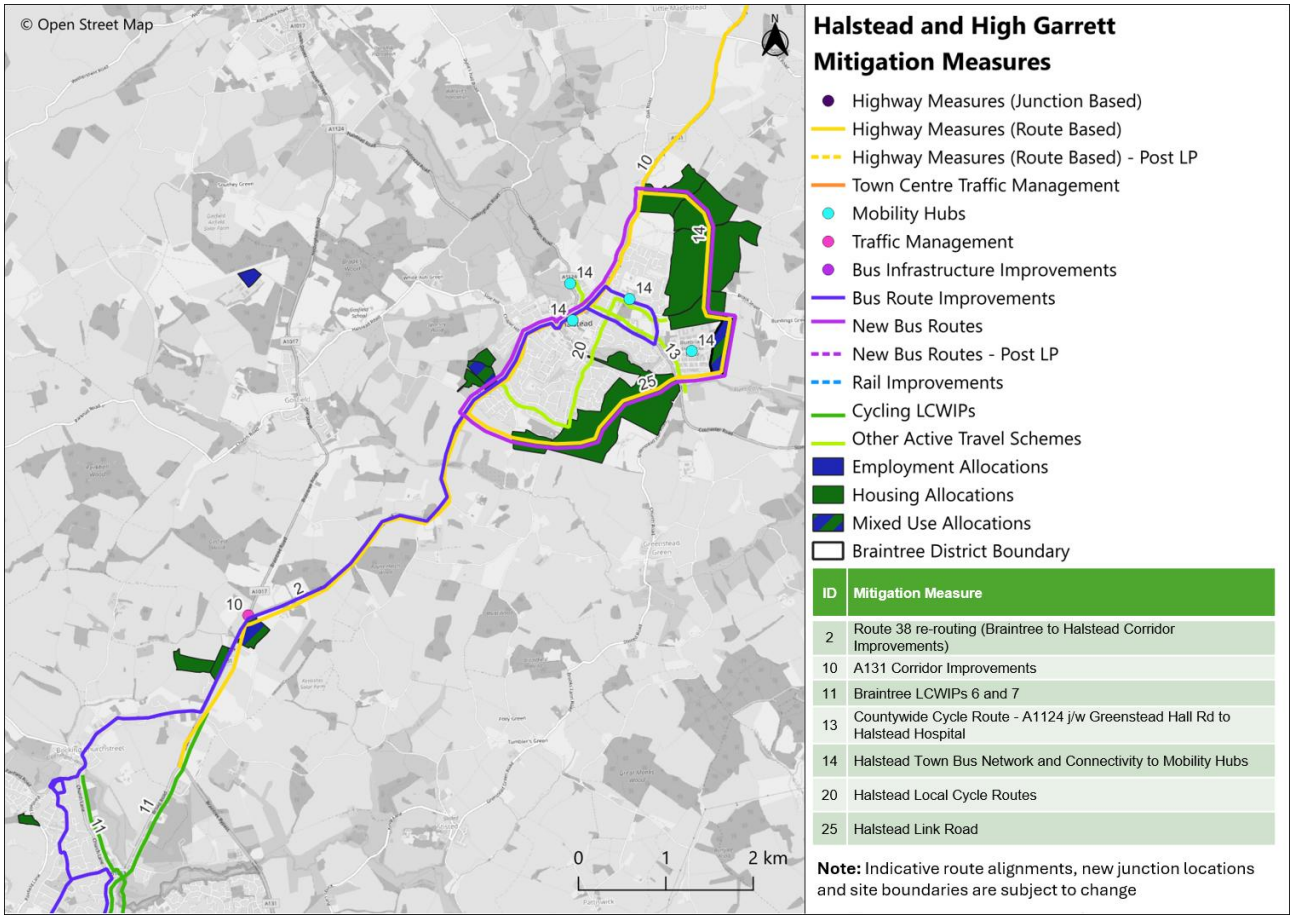

Figure F. 5: Halstead and High Garrett Mitigation Measures

Appendix G. Findings from Local Junction Models

G.1 Local Junction Modelling Approach

G.1.1 Scope of junction modelling

Capacity assessments have been undertaken at twelve junctions on the strategic and local road network in Braintree District. Junctions were selected for assessment based on expected Local Plan impact as a result of:

- Their location in proximity to larger development sites proposed as part of BDC's preferred spatial option, and/or
- Their location on key urban and strategic routes expected to experience significant delay in the future based on current-day journey time analysis

The list of junctions identified for capacity modelling, along with the software/ package used to model each is shown in Table G. 1 below. Figure G.1 shows the location of these junctions in relation to the Local Plan preferred option development sites and the extent of peak hour journey time delay currently experienced across Braintree's road network. Where there is a roundabout, this has been modelled using Junctions 11's ARCADY software, and where there is a give way junction, this has been modelled using Junctions 11's PICADY software. Signalised junctions are modelled using LinSig.

Table G. 1: Location description of assessed junction and model packages used

GROUPING	JUNCTION	MODEL PACKAGE
A120 Corridor	1) A120 Marks Farm Roundabout. Braintree	Junctions 11
	2) A120 Galleys Corner Roundabout, Braintree	
Braintree Town Centre	3) Springwood Drive Roundabout	
	4) Rayne Road / Pierrefitte Way signalised junction	LinSig
	5) London Road / Pierrefitte Way signalised junction	
	6) Rose Hill / Railway Street signalised junction	
Strategic and Urban	7) A131 Halstead Road / Gosfield Road signalised junction, High Garrett	
	8) Hatfield Road / Howbridge Road signalised junction, Witham	
A12 Corridor	9) 'Duke of Wellington Roundabout', Hatfield Peverel	Junctions 11
	10) A12 / Oak Road junction, Rivenhall	
	11) B1024 High Street / Station Road / Swan Street crossroads junction, Kelvedon	

GROUPING	JUNCTION	MODEL PACKAGE
	12) London Road / Rye Mill Lane / Inworth Road crossroads junction, Feering	

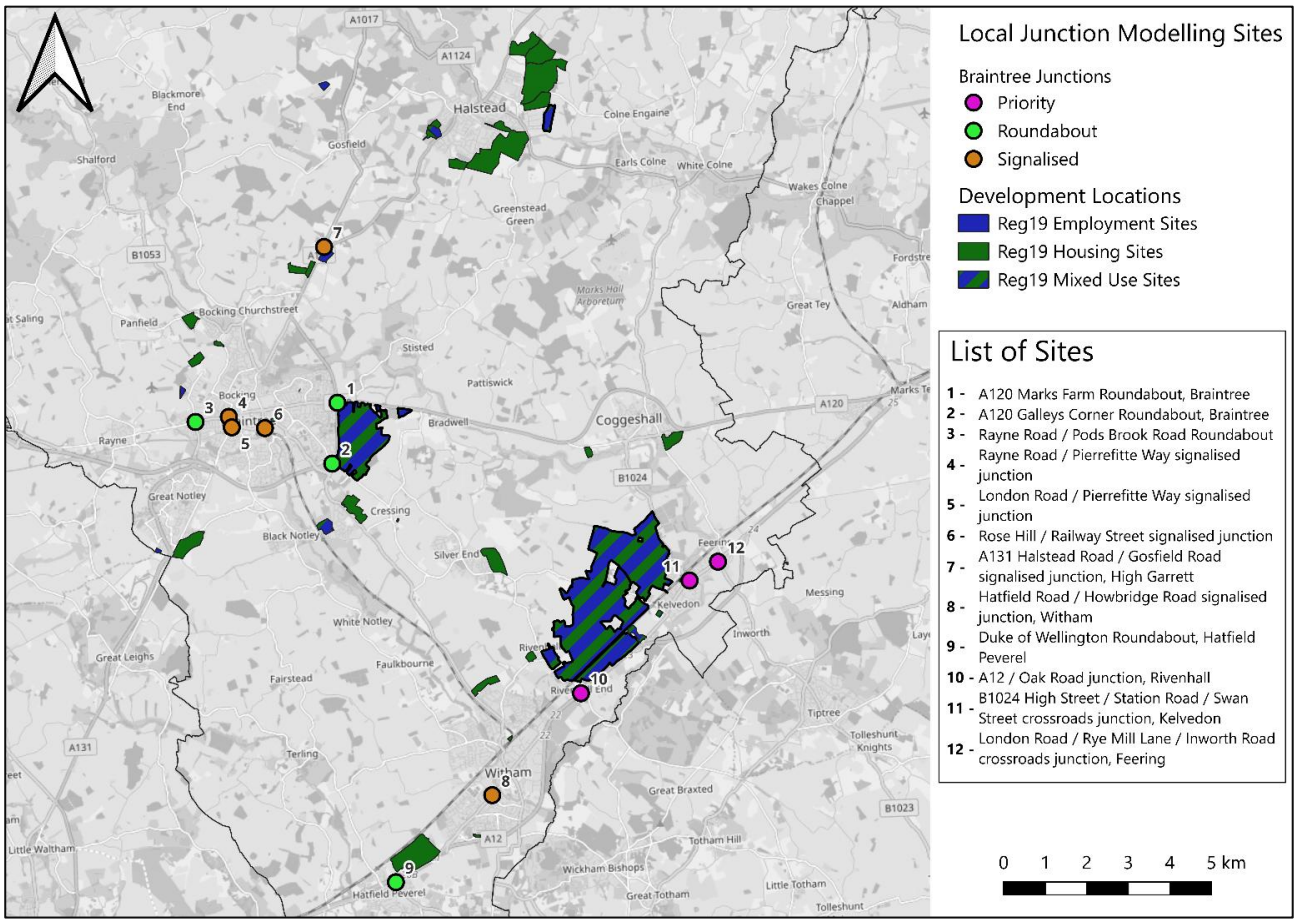

Figure G. 1: Location of assessed junctions

G.1.2 Peak hours modelled

Consistent with the VISUM strategic modelling, peak hours for the local junction modelling were as follows:

- AM Peak (07:30 – 08:30)
- PM Peak (16:30 – 17:30)

G.1.3 Forecast year scenarios modelled

To assess local junction impact across future year scenarios, a 2043 forecast year has been used for the following:

- Reference Case - without Local Plan

- Assessment Case - with Local Plan
- Assessment Case with Mitigation and Sustainable Trip Reductions (STR)

This matches the assessment year and scenarios used in the VISUM strategic modelling and ties in with the end of the Local Plan Review period.

G.1.4 Base year model build

Models for the twelve assessed junctions were built for a 2025 base year, using existing layouts and geometries obtained from to-scale GIS map layers, traffic count data from surveys undertaken since 2024 and by calibrating model delays on approach arms using 2025 journey time data sourced from the Department for Transport (DfT). This is documented in further detail in the following sub-chapters.

G.1.4.1 Base model network coding

Geometric information was based on OS mapping obtained by Essex Highways. This information was used to calculate the saturation flow, lane widths, lane allocation, and turning radii, as well as any specific geometric features for each junction.

G.1.4.2 Base model demand matrix building

To save on survey costs, existing Essex Highways traffic data from 2024 onwards was used where available, along with data from continuous counter locations across Essex. Where existing data was not available, new traffic data was collected over a two-week period from 1st June to 14th June. Care was taken to ensure that existing or newly captured survey data represented a 'neutral' period unaffected by school holidays or other dates prone to atypical traffic patterns.

For each junction, 1-day junction count and 14-day Automatic Traffic Count (ATC) data was collected and used. ATC data was used to ensure that the classified vehicle turning count data collected at each junction on a single day was representative of typical daily flows across the survey period.

Table G. 2: Month/year of survey data used in base-year model build for each assessed junction

GROUPING	JUNCTION	Traffic Data
A120 Corridor	1) A120 Marks Farm Roundabout. Braintree	Jun-26
	2) A120 Galleys Corner Roundabout, Braintree	Jun-26
Braintree Town Centre	3) Rayne Road / Pods Brook Road Roundabout	Apr/May-24
	4) Rayne Road / Pierrefitte Way signalised junction	May-24
	5) London Road / Pierrefitte Way signalised junction	Jun-26

GROUPING	JUNCTION	Traffic Data
	6) Rose Hill / Railway Street signalised junction	Jun-26
Strategic and Urban	7) A131 Halstead Road / Gosfield Road signalised junction, High Garrett	Sep-25
	8) Hatfield Road / Howbridge Road signalised junction, Witham	Jun-26
A12 Corridor	9) B1137 The Street / B1019 Maldon Road 'Duke of Wellington Roundabout', Hatfield Peverel	Jun-26
	10) A12 / Oak Road junction, Rivenhall	Jun-26
	11) B1024 High Street / Station Road / Swan Street crossroads junction, Kelvedon	Jun-26
	12) London Road / Rye Mill Lane / Inworth Road crossroads junction, Feering	Jun-26

G.1.4.3 Base model calibration

Base year ARCADY and LinSig models were calibrated using DfT GPS journey time data from 2025. This data was used to calculate observed delay on junction approach arms with which to directly compare against modelled delay outputs.

GPS journey data was obtained for the following times:

- AM Peak (07:30 – 08:30)
- PM Peak (16:30 – 17:30)
- Off-Peak to represent free-flow traffic (23:00 – 24:00)

Observed peak hour delay at the assessed junctions was calculated from the difference between free-flow off-peak journey times and AM/PM peak journey times. Adjustments were then made, where necessary, to the base year models so that modelled delay best represented observed delay on approach arms.

Junctions 11 has a lane simulation tool, designed to better simulate junctions where there is uneven lane usage on the approach to the junction. Where there is uneven lane usage, the normal Junctions 11 program will overestimate capacity, as it assumes that the entire entry width is available to all vehicles at the same time. The shortfall of the lane simulation model is that, whilst it is a useful tool, the outputs differ slightly on different runs, therefore the results have been averaged across 5 runs. The following junctions are known to have uneven lane usage on the approaches, and so the results have been generated using the lane simulation tool in Junctions 11:

- A120 Marks Farm Roundabout, Braintree
- A120 Galleys Corner Roundabout, Braintree

- B1024 High Street / Station Road / Swan Street crossroads junction, Kelvedon

G.1.5 Journey time calibration statistics

Table G. 3 below summarises the observed and modelled delay on junction approach arms following model calibration.

Table G. 3: Observed Delay Comparison against Modelled

ARM	AM Delay (s)		PM Delay (s)	
	Observed	Modelled	Observed	Modelled
A120 Marks Farm Roundabout, Braintree				
A131 SB	119.6	121.4	226.3	224.6
A120 WB	10.4	9.3	6.6	5.8
A120 NB	16.0	16.3	50.2	49.4
B1256 EB	15.4	16.0	22.4	23.3
A120 Galleys Corner, Braintree				
A120 SB	328.8	318.9	29.7	29.4
Long Green NB	221.6	244.2	40.1	38.2
B1018 NB	137.8	134.3	142.7	130.9
A120 EB	20.9	17.6	438.3	441.7
Cressing Road SB	118.3	115.4	77.5	69.8
Springwood Drive Roundabout				
Springwood Drive SB	No observed JT data available			
Rayne Road WB	4.3	5.2	4.0	4.3
Pods Brook Road NB	5.4	6.3	25.1	26.1
Rayne Road EB	9.2	8.2	42.6	42.1
Rayne Road / Pierrefitte Way signalised junction				
Aetheric Road SB	27.6	75.7	61.2	88.3
B1256 Rayne Road WB	No observed JT data available			
Pierrefitte Way NB	8.0	39.1	32.1	48.39
B1256 Rayne Road EB	42.8	84.5	33.9	50.3
London Road / Pierrefitte Way signalised junction				
Pierrefitte Way SB	23.4	75.7	14.3	88.3
St Michaels Road WB	14.8	34.3	30.2	51.3
London Road NB	23.9	39.1	57.7	48.4
Clare Road EB	No observed JT data available			
Rose Hill / Railway Street signalised junction				

ARM	AM Delay (s)		PM Delay (s)	
Railway Street SB	8.8	25.5	19.7	38.6
Rose Hill WB	48.2	78.9	31.2	58
Station Approach NB	No observed JT data available			
South Street EB	21.4	49.0	26.1	41.9
A131 Halstead Road / Gosfield Road signalised junction, High Garrett				
Gosfield Road SB	36.8	42.4	30.9	49.1
A131 SB	21.3	23.8	12.8	14.1
A131 NB	17.8	25.1	37.3	36.8
Hatfield Road / Howbridge Road signalised junction, Witham				
Spinks Lane SB	133.4	107.0	124.2	111.8
Bridge Street WB	39.5	46.7	39.6	41.9
Howbridge Road NB	60.8	45.3	93.5	74.6
Hatfield Road EB	32.4	50.6	26.6	40.9
Duke of Wellington Roundabout, Hatfield Peverel				
The Street WB	14.2	15.1	10.0	10.9
Maldon Road NB	71.7	74.9	26.8	27.2
The Street EB	16.4	16.6	26.1	25.9
A12 / Oak Road junction, Rivenhall				
Oak Road SB	10.2	11.5	6.1	7.2
A12 WB	11.4	N/A	3.5	N/A
Southern Arm NB	4.4	4.8	1.3	1.3
A12 EB	5.1	N/A	15.4	N/A
B1024 High Street / Station Road / Swan Street crossroads junction, Kelvedon				
Station Road SB	68.9	59.8	47.8	46.9
B1024 WB	14.8	14.9	4.9	5.5
Swan Street NB	No observed JT data available			
B1024 EB	9.6	0.1	8.5	1.0
London Road / Rye Mill Lane / Inworth Road crossroads junction, Feering				
Rye Mill Lane SB	No observed JT data available			
B1024 WB	6.2	6.5	4.3	4.6
B1023 NB	125.5	121.2	232.8	227.0
B1024 EB	5.8	5.4	3.7	4.3

When comparing delay at signalised junctions between modelled and observed in Table 3 above, it is apparent that the values are noticeably different on certain approach arms. This is understood to be because LinSig software calculates delays as a total of both signal-time delay and delay incurred when vehicle demand exceeds maximum through-put at the junction. In contrast, the calculation of observed delay used in the model calibration, is based on the difference between typical peak hour and free flow journey times per vehicle on a junction approach. Here, signal-time delay is largely incorporated into both time-periods, leaving the calculation of observed delay based solely on the varying levels of vehicle demand at the junction.

There are also limitations with the software and input data which may affect the levels of delay, such as the frequency of pedestrian crossing phases called over the course of an hour. LinSig assumes that all stages are called every cycle, and so does not model the effect of demand dependant stages – including pedestrian crossings, which may not always be called every cycle. Assumptions are therefore made regarding how many times demand dependant stages are likely to be called based on junction location, traffic volumes and adjacent land uses.

For example, the optimum cycle time for the Hatfield Road/Howbridge Road junction in the PM peak is modelled as 90 seconds, assuming that all stages – including pedestrian crossings – are called every cycle. However, modelled vehicle delays in the PM peak are shown to be significantly higher than those observed at the junction.

A double signal cycle with a pedestrian stage being called 50% of the time, has been shown in sensitivity tests to provide a more representative level of modelled delay, and provides a more robust platform for assessing the impact of forecast growth at the junction.

When calibrating the model, there has been a greater focus on developing models which best reflect junction operational performance, and produce delay profiles which are representative of the observed delay, given the limits of the signal data and modelling software being used.

G.1.6 Forecast year junction layout assumption

Revised layouts modelled for the Reference Case at A120 Marks Farm Roundabout and Springwood Drive Roundabout are shown in Figure 2 and Figure 3 respectively. The revised Marks Farm layout is a committed scheme to support the planning application for the nearby Straits Mill development.

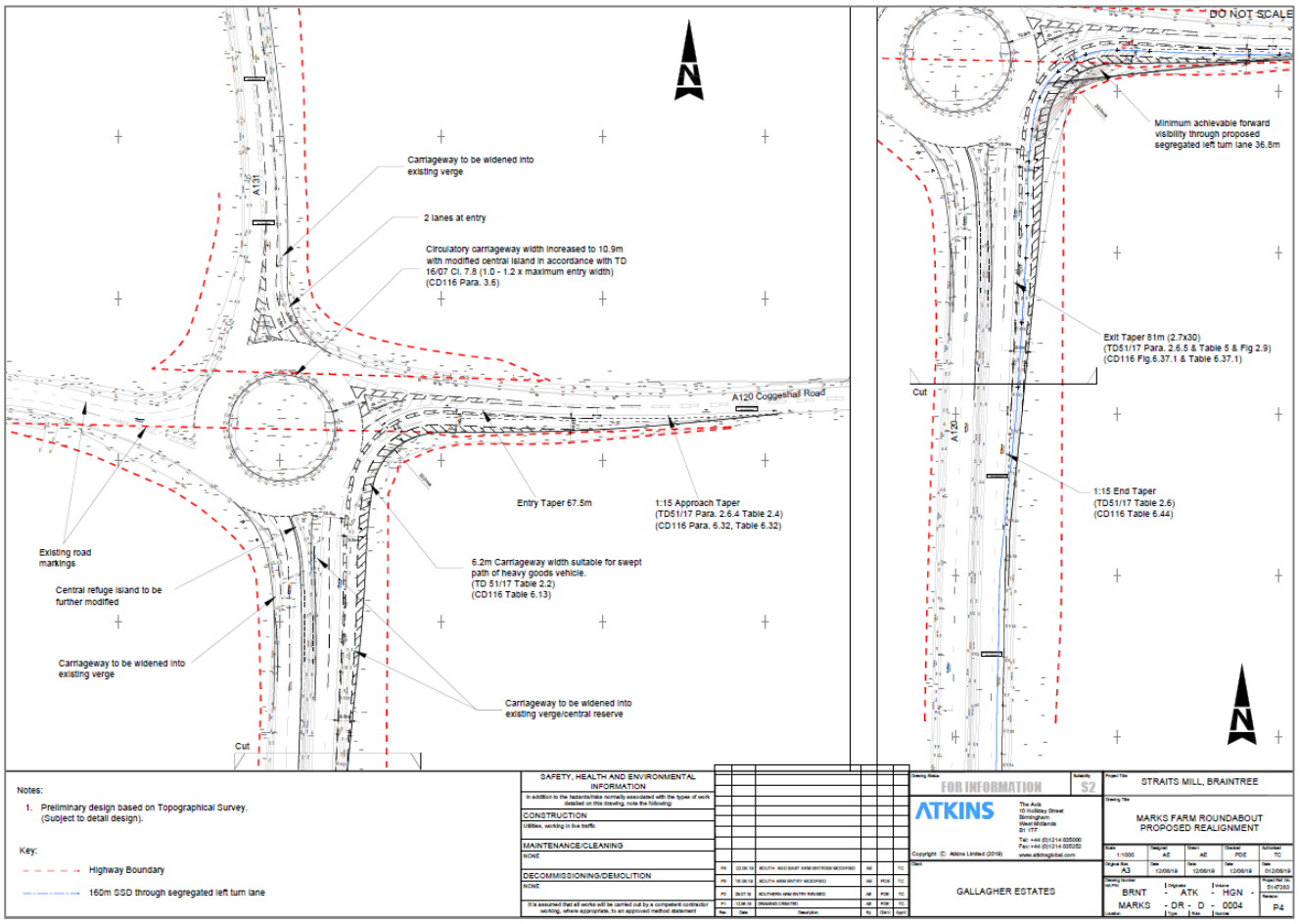

Figure G. 2: Marks Farm revised layout (Source: Atkins)

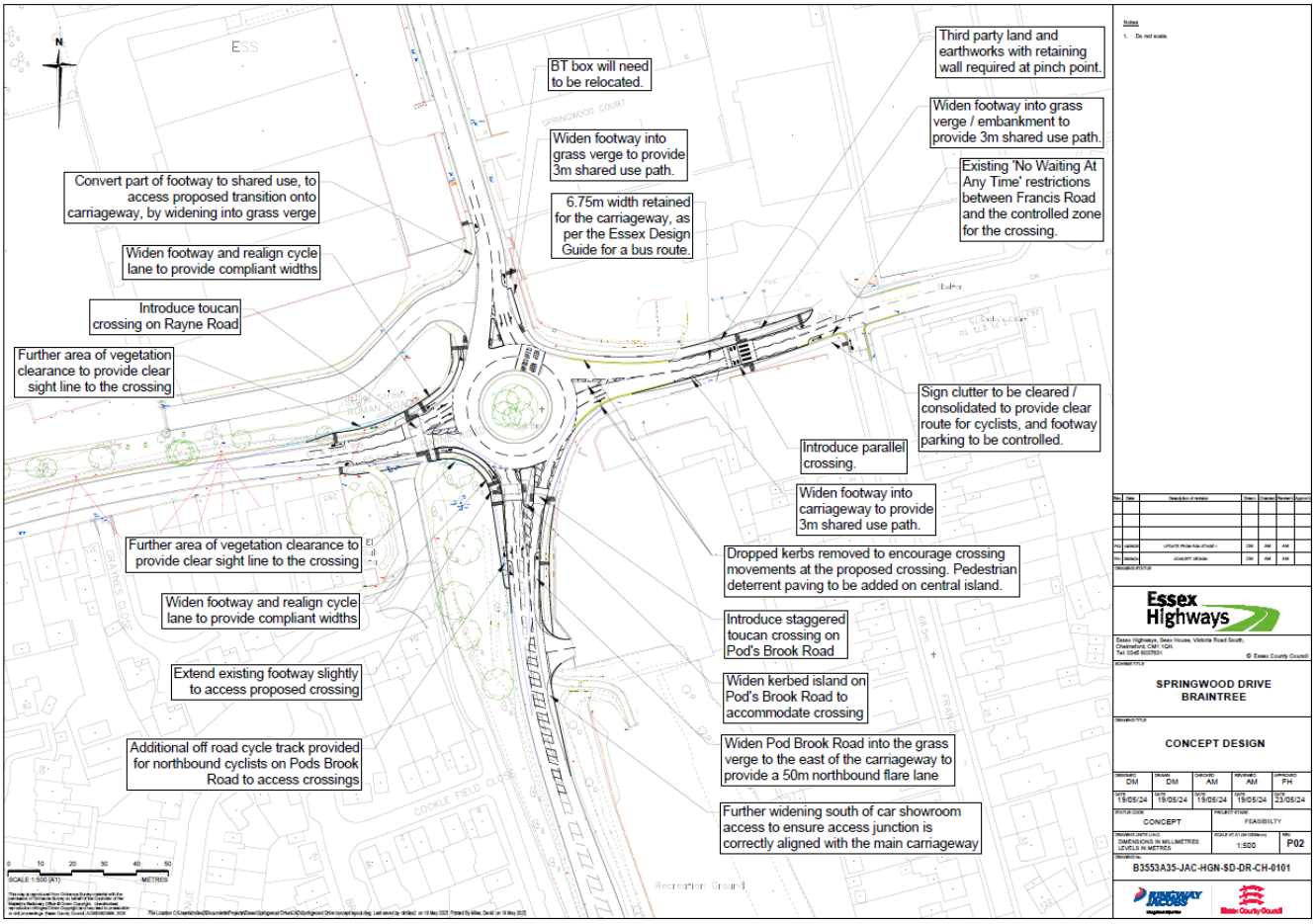

Figure G. 3: Springwood Drive revised layout (Source: Essex Highways)

G.1.7 Future junction demand matrices

Forecast demand matrices were built using modelled demand flows taken from the North Essex Strategic Model (NEMo) for each of the forecast-year scenario runs at each of the assessed junctions.

For junctions located on the A120 and A131 corridors, turning flows were taken from the strategic model and used directly in the build of the forecast junction matrices.

For all other junctions – notably those in town centre and village locations, factors were derived from the growth in approach arm flows at the junctions in the strategic model between the 2023 base and 2043 forecast year modelled scenario. These factors were applied individually to observed flows on each junction approach arm in order to generate the forecast junction matrices. This approach was typically applied in instances where the variance in junction turning flows between the strategic model and observed was shown to exceed 20% on major approach arms. In doing so, turning proportions were fixed to those observed, whilst overall growth taken from the strategic model was applied to bring overall flows at the junction up to 2043 levels.

Where a minor residential arm at an assessed junction was not coded into the strategic model, forecast matrices were infilled using the patterns of observed turning flows at the junction and then furnessed to the overall forecast flow totals through the junction in the strategic model.

G.1.8 Metrics used in junction modelling

The metrics upon which the traffic conditions at junctions have been calculated and assessed are explained below:

- RFC (Ratio of Flow to Capacity) or DoS (Degree of Saturation): provides a measure of the utilised capacity of each junction arm. Arms exceeding 0.85 indicate 85% of the capacity of the arm is used and is approaching capacity. Arms with a ratio of 1.00 indicates the full capacity of the relevant arm has been used. Arms exceeding a ratio of 1.00 are overcapacity and high volumes of traffic queues occur;
- Delay (in seconds): is the average delay in seconds per Passenger Car Unit (PCU) on each approach across the peak hour;
- Queue (in PCUs): is the average maximum queue length in Passenger Car Units (PCUs) on each approach across the peak hour.

G.2 Local Junction Modelling Outputs

This section presents the outputs of the local junction modelling for the 2043 'Reference Case', 'Assessment Case' and 'Assessment Case with Mitigation and STR' scenarios.

The outputs presented are based on the default use of a One-Hour demand profile for the junction modelling. This assumes a peaked profile with higher flows in the middle of the peak hour and proportionally lower flows towards the beginning and end of the peak hour.

For junctions operating with no spare capacity and with noticeable congestion experienced along approach arms, it may be reasonable to expect a flatter demand profile to occur in reality - with drivers shifting their travel times to avoid the busiest times within the peak hour.

To account for this potential intra-peak spreading, sensitivity tests using a FLAT demand profile were carried out for the non-signalised junctions modelled operating over capacity on any approach arm. The sensitivity test outputs are presented in the summary tables below (indicated by blue text) for junction arms with DoS values exceeding 100%.

It should also be noted that output values for junction approach arms modelled with DoS values in excess of 1.0 have been shown to be increasingly unrepresentative as conditions worsen and should therefore be considered with caution.

G.2.1 Results

G.2.1.1 A120 Marks Farm Roundabout, Braintree

Marks Farm Roundabout can be seen in its current layout in Figure G-4. This is a major 4-arm roundabout along the A120 corridor, which includes a left-turn slip road from A120 westbound, enabling access onto the A120 heading south towards Galley's Corner Roundabout. Forecast modelling of the junction has incorporated the proposed layout shown in Figure G.2 and has also used the lane simulation tool in Junctions 11, due to the uneven lane usage anticipated.

In the 2043 capacity modelling results summarised in Table G.4 below, the junction does not exceed capacity, although the Assessment Case with/without mitigation does leave the junction approaching capacity in the PM peak on the A120 northbound arm, with noticeable delays and queue lengths modelled. Nevertheless, the impact of Local Plan development on the capacity performance of the junction is shown to be limited.

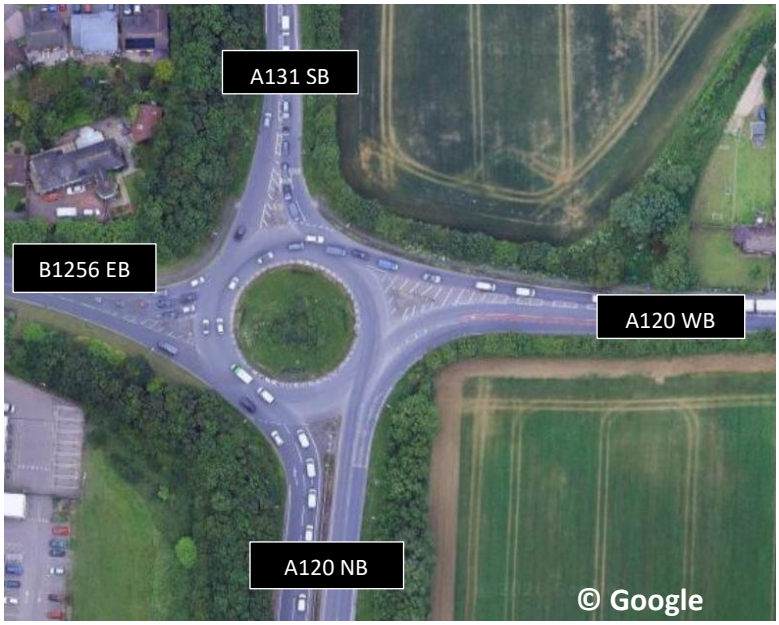

Figure G. 4: A120 Marks Farm Roundabout, Braintree – Existing Layout

Table G. 4: A120 Marks Farm Roundabout, Braintree Local Junction Modelling Outputs

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
A131 SB	2.6	10.4	59%	2.4	10.9	57%
A120 WB	3.5	22.4	70%	1.9	13.7	58%
A120 NB	3.3	11.2	51%	115.0	248.7	86%
B1256 EB	1.9	9.6	53%	3.2	16.4	68%
2043 Assessment Case Without Mitigation						
A131 SB	1.7	8.7	49%	2.0	10.0	57%
A120 WB	2.2	17.1	62%	0.8	9.1	37%
A120 NB	8.4	20.0	73%	140.6	271.9	95%
B1256 EB	2.4	14.3	61%	2.6	18.5	67%

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Assessment Case With Mitigation						
A131 SB	1.5	8.9	49%	1.9	9.6	53%
A120 WB	1.0	12.4	41%	0.8	9.1	35%
A120 NB	11.3	23.1	76%	149.6	288.1	95%
B1256 EB	3.4	20.7	73%	2.2	17.1	61%

● Within Capacity ● Approaching Capacity ● Over Capacity

G.2.1.2 A120 Galleys Corner

As shown in Table G. 5 below, Galleys Corner is a major 5-arm junction intersecting the A120. The B1256 leads to Fowlers Farm Roundabout, which then provides access to Millennium Way and Braintree Village. Uneven lane usage on the A120 approaches is anticipated based on forecast modelled turning proportions, so the junction was assessed using the Junctions 11 lane simulation tool.

In the 'with mitigation' scenario, A120 Millennium Way Slips were included in the strategic modelling, allowing traffic from the A120 west of Galleys Corner to bypass the roundabout when heading towards Millennium Way. The scheme also helps to reduce the number of left-turn movements at Galleys Corner Roundabout from the B1256 heading westbound along the A120.

The modelled results, shown in Table G. 5, indicate that with background traffic growth alone, most approach arms in the AM and PM are at, or close to capacity by 2043. The impact of Local Plan development is shown to extend delays and queue lengths on most approach arms – although it should be noted that the exponential increase in delay and queue lengths modelled in Junctions 11 when a junction significantly exceeds capacity, should be viewed as theoretical/indicative rather than a realistic interpretation.

The inclusion of mitigation on the A120 improves the capacity performance of Galleys Corner Roundabout beyond levels seen in the Reference case across the AM and PM – with the exception of the A120 southbound approach arm in the AM peak, which remains at a similar level. Whilst the mitigation strategy, as modelled, is therefore expected to accommodate Local Plan growth at the junction, it is nevertheless apparent that significant congestion is likely to persist in the future.

Therefore, further mitigation along the A120 corridor, and at Galleys Corner Roundabout in particular, will be assessed as part of the Local Plan Pre-Submission to determine an optimal arrangement of measures that will best accommodate traffic growth in the future.

Figure G. 5: A120 Galley's Corner, Braintree Existing Layout

Table G. 5: A120 Galleys Corner, Braintree Local Junction Modelling Outputs

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
A120 SB	238.7	510.9	127%	65.3	124.5	107%
	**319.5*	*549.7*	115%	*25.1*	*57.7*	98%
Long Green NB	146.9	1010.2	154%	47.8	306.6	118%
	214.3	*1150.7*	139%	*42.2*	*239.8*	104%
B1018 NB	49.8	209.4	94%	325.0	1209.0	160%
				467.7	*1321.9*	145%
A120 EB	6.8	13.9	81%	137.3	284.9	116%
				132.6	*253.7*	106%
Cressing Road SB	22.6	117.4	104%	18.2	135.9	100%
	6.5	*39.4*	83%	*13.9*	*108.8*	93%
2043 Assessment Case Without Mitigation						
A120 SB	264.4	564.4	130%	102.5	208.4	112%
	345.1	*628.0*	118%	*72.5*	*153.2*	104%
Long Green NB	195.6	1264.6	161%	111.0	713.7	134%
	287.0	*1432.6*	151%	*162.9*	*810.3*	126%

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
B1018 NB	123.1	545.4	101%	277.3	1005.2	152%
	172.8	*590.0*	95%	*393.0*	*1176.3*	140%
A120 EB	7.2	14.3	82%	220.9	501.8	124%
				297.0	*543.0*	114%
Cressing Road SB	42.9	189.2	112%	39.2	290.8	111%
	10.9	*55.8*	91%	*38.4*	*263.4*	103%
2043 Assessment Case With Mitigation						
A120 SB	282.3	531.0	127%	27.8	56.0	99%
	384.6	*584.9*	116%			
Long Green NB	152.7	944.5	144%	33.4	166.0	110%
	223.2	*1069.7*	135%	*14.0*	*80.8*	95%
B1018 NB	12.3	63.4	73%	271.3	1169.6	150%
				382.8	*1345.1*	131%
A120 EB	4.9	11.3	76%	55.1	109.8	105%
				19.5	*47.4*	96%
Cressing Road SB	5.0	32.2	76%	16.94	126.4	100%
				9.3	*80.2*	88%

Within Capacity Approaching Capacity Over Capacity

G.2.1.3 Springwood Drive Roundabout, Braintree

Springwood Drive Roundabout operates as a 4-arm junction, as illustrated in Figure 6 below. Forecast modelling of the junction has incorporated the proposed layout shown in Figure G. 6.

The modelled results shown in Table G. 6 suggest that both Springwood Drive and Rayne Road eastbound approach arms will likely experience significant delay and queuing in the PM peak in both the 2043 Reference Case and Assessment Case scenarios. Implementation of the Local Plan mitigation strategy might be expected to offer minor improvements at the junction. However, significant congestion is modelled to remain in the PM peak.

Outcomes from the strategic modelling suggest that the volume of forecast traffic routing through Springwood Drive Roundabout is heavily influenced by the levels of congestion experienced along the A120 corridor. Therefore, the introduction of further mitigation at Galleys Corner and Marks Farm Roundabout – to be assessed as part of the Local Plan Pre-Submission, would be expected to have a secondary benefit of reducing levels of congestion currently modelled at Springwood Drive Roundabout.

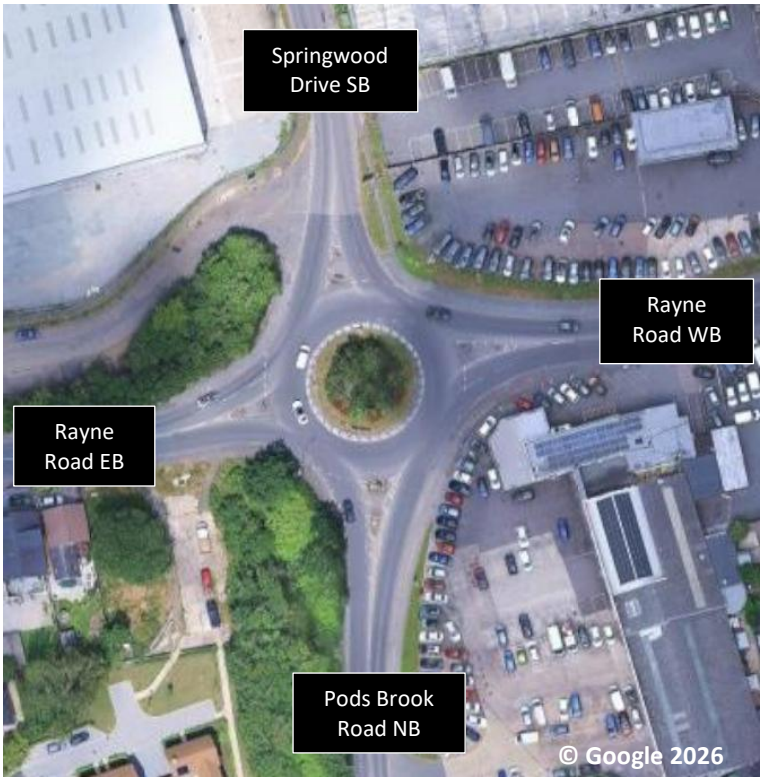

Figure G. 6: Springwood Drive Roundabout, Braintree Existing Layout

Table G. 6: Springwood Drive Roundabout, Braintree Local Junction Modelling Outputs

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
Springwood Drive SB	20.3	77.5	98%	242.6	842.6	141%
				351.3	*1221.5*	124%
Rayne Road WB	0.4	4.4	23%	0.1	3.1	11%
Pods Brook Road NB	3.5	10.1	73%	0.9	3.7	46%
Rayne Road EB	1.0	10.3	47%	403.6	3493.3	219%
				505	*4541.3*	191%
2043 Assessment Case Without Mitigation						
Springwood Drive SB	31.6	110.6	102%	385	1362.1	157%
	10.4	*42.2*	89%	*558.4*	*1938.9*	139%
Rayne Road WB	0.5	4.8	29%	0.1	3.1	11%
Pods Brook Road NB	3.8	10.8	74%	0.9	3.7	46%

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
Rayne Road EB	1.1	11.2	50%	565.5	4851.7	255%
				682.3	*6136.7*	224%
2043 Assessment Case With Mitigation						
Springwood Drive SB	14.0	53.9	95%	352.7	1232.6	153%
				511.1	*1765.1*	135%
Rayne Road WB	0.4	4.1	25%	0.1	3.2	9%
Pods Brook Road NB	2.2	6.7	69%	0.8	3.5	45%
Rayne Road EB	0.6	8.3	36%	375.3	3239.1	211%
				473.9	*4229.6*	185%

● Within Capacity ● Approaching Capacity ● Over Capacity

** Outputs in blue and italics have been modelled using a FLAT demand profile*

G.2.1.4 Rayne Road / Pierrefitte Way signalised junction

The existing layout of the Rayne Road / Pierrefitte Way signalised junction in Braintree town centre is shown in Figure G. 7 overleaf.

The results summarised in Table G. 7, suggest that the junction will likely be able to accommodate background growth and Local Plan growth to 2043. This is, however, in part due to there being a forecast reduction in traffic flows modelled at the junction due to network constraint across the surrounding area. Under the forecast conditions modelled across Braintree District in the NEMo, the implementation of the mitigation strategy is shown to manage the impact of Local Plan growth at the junction.

Figure G. 7: Rayne Road / Pierrefitte Way signalised junction Existing Layout

Table G. 7: Rayne Road / Pierrefitte Way signalised junction Local Junction Modelling Outputs

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
Aetheric Road SB	8.3	24.7	**66%**	5.1	41.5	**70%**
B1256 Rayne Road WB	0.4	35.3	**7%**	1.5	28.3	**20%**
Pierrefitte Way NB	7.7	42.6	**65%**	10.5	34.2	**71%**
B1256 Rayne Road EB	6.1	39.3	**63%**	9.7	30.2	**69%**
2043 Assessment Case Without Mitigation						
Aetheric Road SB	9.4	25.4	**72%**	5.3	42.0	**71%**
B1256 Rayne Road WB	0.5	38.3	**10%**	1.6	29.3	**21%**
Pierrefitte Way NB	8.8	42.1	**68%**	10.8	33.4	**71%**
B1256 Rayne Road EB	6.5	45.5	**70%**	10.4	32.7	**73%**

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Assessment Case With Mitigation						
Aetheric Road SB	7.4	20.6	**60%**	4.8	38.7	**57%**
B1256 Rayne Road WB	0.3	41.4	**7%**	1.4	29.6	**18%**
Pierrefitte Way NB	4.6	40.5	**57%**	10.3	32.6	**68%**
B1256 Rayne Road EB	4.6	43.4	**59%**	9.0	31.4	**67%**

● Within Capacity ● Approaching Capacity ● Over Capacity

G.2.1.5 London Road / Pierrefitte Way signalised junction

The existing layout of the London Road / Pierrefitte Way signalised junction in Braintree town centre is shown in Figure G. 8 below.

The results summarised in Table G. 8 show that the addition of Local Plan growth in the Assessment Case will likely result in the Pierrefitte Way and St. Michael's Road approach arms exceeding capacity in the AM peak by 2043. However, modelling of Local Plan mitigation and sustainable trip reductions is shown to improve the capacity performance of the town centre junction with the impact of Local Plan growth fully mitigated on all approach arms in both peak periods.

Figure G. 8: London Road / Pierrefitte Way signalised junction Existing Layout

Table G. 8: London Road / Pierrefitte Way signalised junction Local Junction Modelling Outputs

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
Pierrefitte Way SB	21.4	94.9	97%	7.0	56.6	75%
St Michaels Road WB	23.6	62.8	95%	14.7	53.9	90%
London Road NB	8.5	31.6	61%	17.6	54.3	91%
Clare Road EB	5.8	121.8	79%	9.5	70.2	86%
2043 Assessment Case Without Mitigation						
Pierrefitte Way SB	27.0	128.5	101%	7.6	57.6	77%
St Michaels Road WB	35.4	114.6	101%	18.1	72.6	95%
London Road NB	9.6	33.3	66%	18.3	54.4	91%
Clare Road EB	6.6	133.8	84%	10.7	79.9	90%

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Assessment Case With Mitigation						
Pierrefitte Way SB	15.3	58.5	89%	6.6	55.8	72%
St Michaels Road WB	8.8	25.7	58%	12.2	45.5	84%
London Road NB	2.8	23.9	33%	14.3	43.8	84%
Clare Road EB	3.7	98.6	61%	8.2	61.8	81%

Within Capacity Approaching Capacity Over Capacity

G.2.1.6 Rose Hill / Railway Street signalised junction

The existing layout of the Rose Hill / Railway Street signalised junction can be seen in Figure G. 9 overleaf. The junction is located in Braintree town centre and provides access to Braintree Railway Station.

Summary model outputs shown in Table G. 9 suggest that, across the 2043 scenarios with the assignment of forecast traffic flows modelled through the town centre in the NEMo, the Rose Hill / Railway Street signalised junction will likely operate within capacity. As such, the impact of Local Plan growth on delays and queues at the junction will likely be limited.

As with all town centre junctions, careful monitoring of the impact of traffic growth on network resilience and traffic redistribution patterns across the urban centre of Braintree will be important going forward. Outcomes from the strategic modelling demonstrate that traffic conditions along routes through the town centre are extremely sensitive to network constraint and congestion at nearby junctions and on the surrounding SRN.

Whilst the capacity appraisal of town centre junctions supports the broad findings of the strategic modelling, an unstable assignment of traffic flows across the town centre could result in congestion shifting from one junction to the next as a consequence of minor changes in traffic conditions experienced across the wider network.

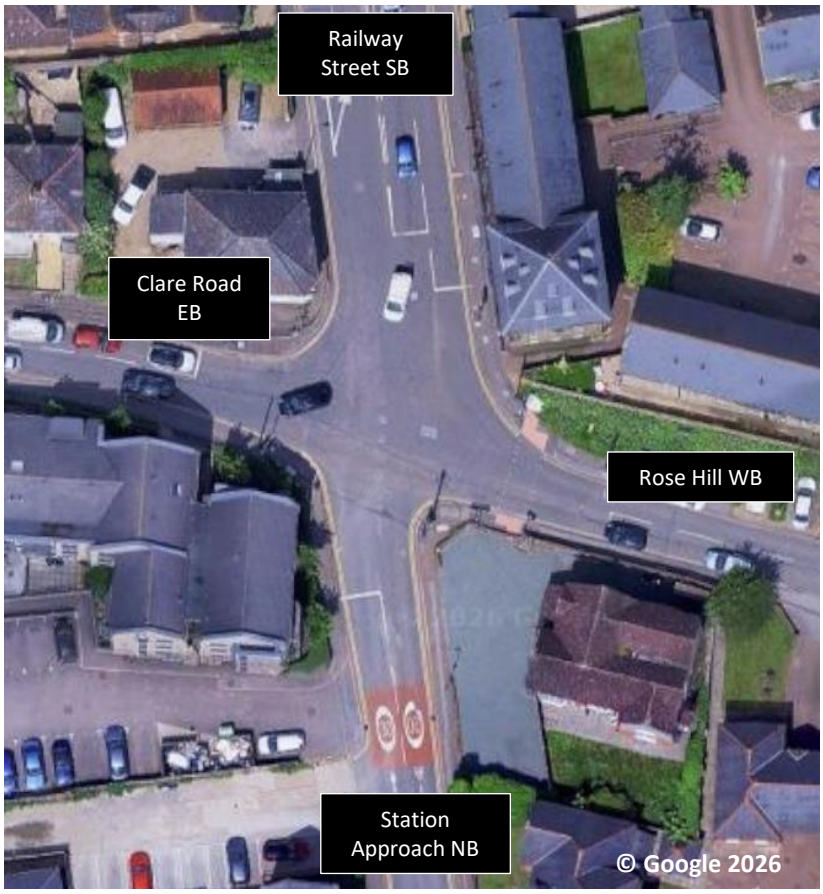

Figure G. 9: Rose Hill / Railway Street signalised junction Existing Layout

Table G. 9: Rose Hill / Railway Street signalised junction Local Junction Modelling Outputs

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
Railway Street SB	15	28.6	74%	10.4	29.8	64%
Rose Hill WB	6.4	56.1	67%	6	52.2	65%
Station Approach NB	0.9	61.7	20%	0.9	62.0	22%
South Street EB	4.9	43.8	48%	8.3	41.3	62%
2043 Assessment Case Without Mitigation						
Railway Street SB	16.7	29.8	78%	11.1	31.5	67%
Rose Hill WB	7.6	66.6	77%	6.2	50.4	64%
Station Approach NB	0.9	61.9	21%	0.9	62.0	22%
South Street EB	4.9	45.2	49%	8.3	39.8	61%

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Assessment Case With Mitigation						
Railway Street SB	13.9	26.7	**71%**	11.8	37.7	**73%**
Rose Hill WB	6.1	57.6	**67%**	5.9	44.8	**60%**
Station Approach NB	0.8	61.5	**19%**	1.1	62.8	**25%**
South Street EB	4.7	44.5	**47%**	9.8	36.8	**64%**

● Within Capacity ● Approaching Capacity ● Over Capacity

G.2.1.7 A131 Halstead Road / A1017 Gosfield Road signalised junction, High Garrett

The existing layout of the A131 Halstead Road / A1017 Gosfield Road signalised junction in High Garrett can be seen in Figure G. 10 below.

As summarised in Table G. 10, all junction approach arms are modelled to operate within capacity in both peak hours – albeit with moderate levels of delay and queuing experienced across all 2043 scenarios.

Figure G. 10: A131 Halstead Road / Gosfield Road signalised junction, High Garrett Existing Layout

Table G. 10: A131 Halstead Road / Gosfield Road signalised junction, High Garrett Local Junction Modelling Outputs

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
Gosfield Road SB	7.7	40.5	71%	6.0	44.2	67%
A131 SB	12.6	20.0	70%	6.4	12.5	44%
A131 NB	10.2	17.6	60%	13.3	17.3	70%
2043 Assessment Case Without Mitigation						
Gosfield Road SB	8.1	37.6	70%	8.4	45.2	76%
A131 SB	13.3	22.4	72%	6.9	14.7	46%
A131 NB	12.8	21.7	71%	16.7	23.1	79%
2043 Assessment Case With Mitigation						
Gosfield Road SB	8.9	40.0	74%	8.8	50.3	80%
A131 SB	13.7	22.7	73%	6.9	14.0	46%
A131 NB	13.4	22.3	72%	17.1	22.5	80%

● Within Capacity ● Approaching Capacity ● Over Capacity

G.2.1.8 Hatfield Road / Howbridge Road signalised junction, Witham

Hatfield Road / Howbridge Road signalised junction is located on the B1389 in Witham town centre. The current layout of the junction is shown in Figure G. 11 overleaf.

The results summarised in Table G. 11, suggest that the signalised junction operates just over capacity on Spinks Lane in the AM peak in the 2043 Reference Case. Delays and queue lengths are extended along Spinks Lane in both peak hours with the addition of Local Plan traffic. However, with wider mitigation and sustainable trip reductions modelled, forecast traffic conditions at the junction are shown to return, in the main, to Reference Case levels – suggesting that the impact of Local Plan growth at the junction can be broadly accommodated without need for localised capacity upgrades.

Figure G. 11: Hatfield Road / Howbridge Road signalised junction, Witham Existing Layout

Table G. 11: Hatfield Road / Howbridge Road signalised junction, Witham Local Junction Modelling Outputs

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
Spinks Lane SB	32.0	150.4	**103%**	19.9	88.5	**96%**
Bridge Street WB	10.5	46.7	**63%**	14.5	48.9	**88%**
Howbridge Road NB	10.7	46.2	**64%**	12.1	66.1	**86%**
Hatfield Road EB	12	48.4	**79%**	9.3	32.4	**77%**
2043 Assessment Case Without Mitigation						
Spinks Lane SB	53.0	273.2	**110%**	26.8	125.3	**101%**
Bridge Street WB	10.8	46.9	**64%**	20.5	82.1	**97%**
Howbridge Road NB	11.4	47.5	**67%**	11.8	64.4	**86%**
Hatfield Road EB	12.9	50.2	**81%**	11.5	36.4	**83%**
2043 Assessment Case With Mitigation						
Spinks Lane SB	38.5	187.8	**105%**	17.7	73.2	**92%**
Bridge Street WB	10.7	46.9	**64%**	21.7	92.8	**98%**
Howbridge Road NB	10.6	46.0	**63%**	11	58.4	**82%**
Hatfield Road EB	13.8	51.9	**83%**	11.4	36.2	**83%**

● Within Capacity ● Approaching Capacity ● Over Capacity

G.2.1.9 Duke of Wellington Roundabout, Hatfield Peverel

The Duke of Wellington Roundabout is a 3-arm mini-roundabout junction located on the B1137 in Hatfield Peverel. The current layout is presented in Figure G. 12: Duke of Wellington Roundabout, Hatfield Peverel Existing Layout below.

The summary of results presented in Table G. 12 suggest that the junction could operate within capacity across the 2043 scenarios modelled, assuming a flat profile of traffic across the peak hours (representative of intra-peak spreading). Nevertheless, Local Plan traffic growth is modelled to increase delays and queue lengths along Maldon Road in the AM peak, and these are shown to remain with mitigation and sustainable trip reductions modelled.

As part of upcoming Local Plan Pre-Submission modelling, long-term infrastructure measures across Braintree District beyond the 2043 Local Plan period will be assessed. This includes proposals for a B1019 link road to the A12 which would divert traffic away from the Duke of Wellington Roundabout and reduce delays and queuing on approaches to the junction. Such a scheme would need to be developed in partnership with National Highways and would involve development of a new (or relocated) junction on the A12. Given the scale of mitigation required, the scheme is not being considered as part of the proposed Local Plan mitigation strategy.

Figure G. 12: Duke of Wellington Roundabout, Hatfield Peverel Existing Layout

Table G. 12: Duke of Wellington Roundabout, Hatfield Peverel Local Junction Modelling Outputs

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
The Street WB	2.7	15.2	72%	1.5	11.1	60%
Maldon Road NB	29.2	130.2	104%	3.5	21.5	78%
	5.8	*32.6*	85%			
The Street EB	2.8	16.6	73%	6.9	29.1	88%
2043 Assessment Case Without Mitigation						
The Street WB	2.6	15.0	71%	2.1	14.4	68%
Maldon Road NB	53.7	213.7	112%	5	29.5	84%
	24.4	*119.8*	98%			
The Street EB	2.9	17.4	74%	19	70.0	99%
2043 Assessment Case With Mitigation						
The Street WB	2.7	15.0	72%	2.2	14.6	69%
Maldon Road NB	52.7	211.0	112%	5.1	30.1	85%
	23.5	*115.9*	98%			
The Street EB	2.7	16.3	73%	13.9	53.9	96%

● Within Capacity ● Approaching Capacity ● Over Capacity

** Outputs in italics have been modelled using a FLAT demand profile*

G.2.1.10 A12 / Oak Road junction, Rivenhall

The A12 / Oak Road junction in Rivenhall, as shown in Figure G. 13 overleaf, has been modelled as a priority junction with minor arm movements to/from Oak Road and to/from the southern minor arm leading to Henry Dixon Road.

The junction has been modelled as two separate junctions (northern and southern) using PICADY software within Junctions 11. Owing to developer proposals for a new junction located in the vicinity of the A12/Oak Road junction to provide access to/from the proposed the Kings Dene development, the current layout has not been modelled for the Assessment Case with Mitigation and STR scenario.

Results summarised in Table G. 13 suggest that the existing junction layout will likely operate within capacity with forecast traffic flows in the 2043 Reference Case. However, the addition of trips from the Kings Dene development will increase delays on the Oak Road approach arm in the AM peak, with intra-peak spreading required to prevent the junction operating over-capacity.

With additional safety concerns associated with the substandard slip-lane merges onto the A12 carriageway, developer junction proposals form an important component of the Local Plan mitigation strategy for development at the Kings Dene site.

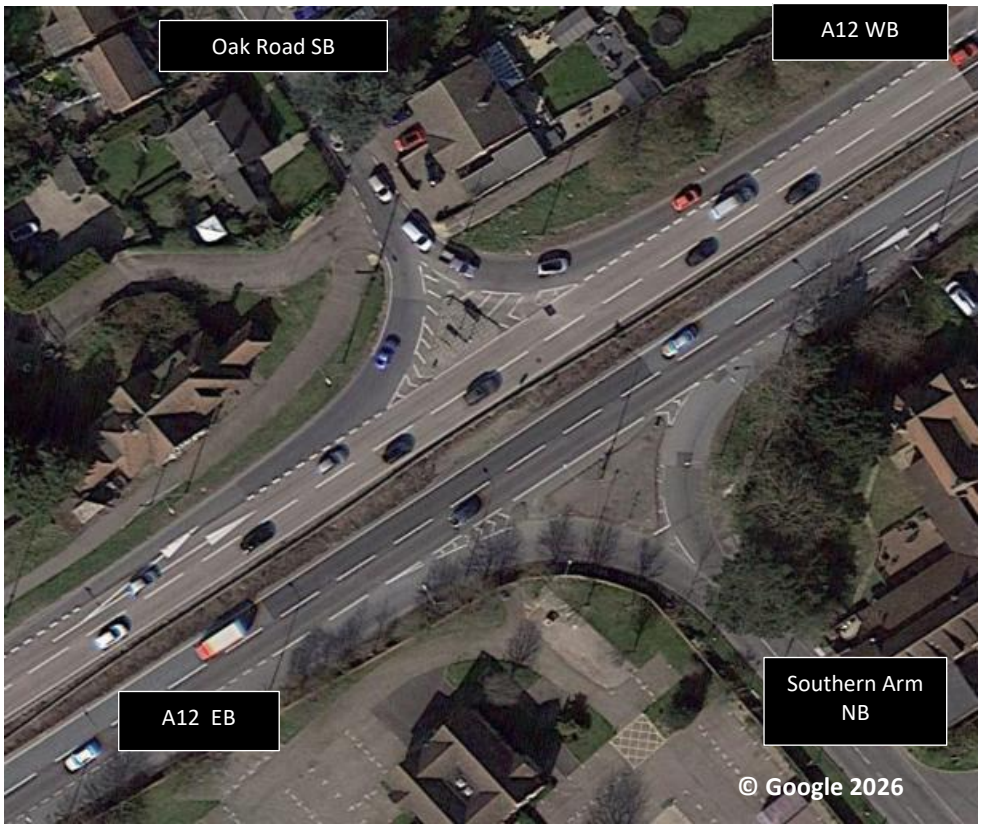

Figure G. 13: A12 / Oak Road junction, Rivenhall Existing Layout

Table G. 13: A12 / Oak Road junction, Rivenhall Local Junction Modelling Outputs

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
Oak Road SB	1.3	18.5	56%	0.9	10.5	49%
A12 WB	N/A	N/A	N/A	N/A	N/A	N/A
Southern Arm NB	1	5.8	50%	0.1	1.3	10%
A12 EB	N/A	N/A	N/A	N/A	N/A	N/A
2043 Assessment Case Without Mitigation						
Oak Road SB	39.7	268.8	116%	2.8	21.7	75%
	8.4	*71.0*	90%			
A12 WB	N/A	N/A	N/A	N/A	N/A	N/A
Southern Arm NB	7.2	24.4	89%	0.2	1.4	15%
A12 EB	N/A	N/A	N/A	N/A	N/A	N/A

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Assessment Case With Mitigation						
Oak Road SB	N/A	N/A	N/A	N/A	N/A	N/A
A12 WB	N/A	N/A	N/A	N/A	N/A	N/A
Southern Arm NB	N/A	N/A	N/A	N/A	N/A	N/A
A12 EB	N/A	N/A	N/A	N/A	N/A	N/A

● Within Capacity ● Approaching Capacity ● Over Capacity

G.2.1.11 B1024 High Street / Station Road / Swan Street crossroads junction, Kelvedon

The current layout of the crossroads junction between B1024 High Street, Station Road and Swan Street in Kelvedon can be seen in Figure G. 14 below. The junction serves as a key access to Kelvedon Rail Station.

This junction was run with lane simulation in Junctions 11 (PICADY) in order to better represent uneven lane usage on the Station Road and Swan Street approach arms.

In the Reference Case, the junction is shown to rely on intra-peak spreading of demand flows to remain within capacity on the Station Road approach in the AM peak. With no carriageway space available for a right-turn island at the junction, delays and queues are also modelled on the B1024 westbound approach arm, as right-turning flows into Station Road are shown to restrict straight-ahead movements. With the addition of Local Plan growth in the Assessment Case, additional delays are experienced by traffic flows along the B1024 westbound approach arm. However, in the Assessment Case with Mitigation and STR scenario, traffic conditions modelled at the junction return to Reference Case levels – albeit with delays persisting on the B1024 westbound approach arm.

Figure G. 14: B1024 High Street / Station Road / Swan Street crossroads junction, Kelvedon Existing Layout

Table G. 14: 1024 High Street / Station Road / Swan Street crossroads junction, Kelvedon Local Junction Modelling Outputs

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
Station Road SB	19.0	205.4	**109%**	4.0	59.0	**80%**
	8.7	*106.2*	**90%**			
B1024 WB	22.1	89.3	**95%***	1.9	9.4	**42%***
Swan Street NB	0.2	16.0	**17%**	0.2	14.3	**13%**
B1024 EB	0.0	0.1	**0%**	0.4	1.6	**12%***
2043 Assessment Case Without Mitigation						
Station Road SB	19.0	220.8	**107%**	2.5	51.6	**65%**
	8.8	*116.4*	**91%**			
B1024 WB	46.6	166.9	**105%***	5.6	22.1	**67%***
	24.3	*102.1*	**93%***			
Swan Street NB	0.3	18.2	**18%**	0.2	18.3	**17%**
B1024 EB	0.0	0.1	**1%***	0.6	2.2	**14%***

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Assessment Case With Mitigation						
Station Road SB	1.72	34.5	59%	2.22	41.7	66%
B1024 WB	21.06	85.8	94%*	3.24	14.2	55%*
Swan Street NB	0.2	14.7	15%	0.2	15.3	15%
B1024 EB	0.02	0.1	0%*	0.48	1.7	12%*

**The degree of saturation for B1024 WB and EB are not produced when the model is run in lane simulation mode. As such, to produce the DoS for these two arms, the model has been run without lane simulation turned on.*

● Within Capacity ● Approaching Capacity ● Over Capacity

** Outputs in italics have been modelled using a FLAT demand profile*

G.2.1.12 London Road / Rye Mill Lane / Inworth Road crossroads junction, Feering

The London Road / Rye Mill Lane / Inworth Road staggered crossroads junction in Feering can be seen in Figure G. 15 overleaf.

Table G. 15 summarises the results of the junction capacity modelling. In the Reference Case, the junction requires intra-peak spreading of future demand flows for the B1023 Inworth Road arm to operate within capacity in the PM peak. With the addition of Local Plan growth, the approach arm is shown to exceed capacity with significant delays and queue lengths modelled.

The Assessment Case with mitigation and STR scenario is modelled to shift delays and queues along Inworth Road from the PM peak to the AM peak with the mitigation strategy shown in the strategic modelling to redirect greater volumes of morning peak hour traffic flows through the junction.

Both assessed crossroad junctions in Kelvedon and Feering have subsequently been modelled with a signalised arrangement in an effort to help mitigate Local Plan impact. Results are documented in the following section.

Figure G. 15: London Road / Rye Mill Lane / Insworth Road, Feering Existing Layout

Table G. 15: London Road / Rye Mill Lane / Inworth Road crossroads junction, Feering Local Junction Modelling Outputs

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
Rye Mill Lane SB	0.2	10.0	14%	0.1	10.6	8%
B1024 WB	0	6.5	4%	0	4.8	4%
B1023 NB, Inworth Road	7.2	88.2	90%	34.4	311.0	117%
				15.9	*172.9*	97%
B1024 EB	0.4	6.3	25%	0.3	4.7	24%
2043 Assessment Case Without Mitigation						
Rye Mill Lane SB	0.2	10.6	15%	0.1	11.8	10%
B1024 WB	0.1	6.6	5%	0	4.9	5%
B1023 NB, Inworth Road	11.8	137.7	98%	53.3	508.4	134%
				45.2	*493.8*	107%
B1024 EB	0.4	6.6	27%	0.4	5.0	26%

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Assessment Case With Mitigation						
Rye Mill Lane SB	0.2	11.3	16%	0.1	10.8	8%
B1024 WB	0	7.0	4%	0	4.7	4%
B1023 NB, Inworth Road	52.8	414.5	125%	27.4	282.6	114%
	43.0	*389.8*	105%	*9.9*	*123.4*	92%
B1024 EB	0.4	6.2	25%	0.3	4.9	26%

● Within Capacity ● Approaching Capacity ● Over Capacity

** Outputs in italics have been modelled using a FLAT demand profile*

G.2.2 Mitigation Junction Modelling

G.2.2.1 A131 Halstead Road / A1017 Gosfield Road Roundabout

As part of the Braintree Local Plan mitigation strategy, improvements to the A131 Halstead Road / A1017 Gosfield Road junction have been proposed. The form of the improvements has yet to be confirmed/finalised; however, junction modelling has been undertaken to assess the merits of a potential redesign of the junction as a roundabout. The scheme would be dependent on the availability of land beyond the existing highway boundary through discussions with developers of a proposed housing site immediately to the south-east of the junction.

Results of the capacity modelling can be seen in Table G. 16 overleaf, for direct comparison with the summarised results in Table G. 10 earlier in the report.

Overall, the roundabout layout at the junction of the A131 and A1017 is modelled to have marginal capacity benefits over the current signalised arrangement, with moderate reductions in delay experienced on approach arms to the junction.

Whilst not necessarily a priority within the mitigation strategy, it is envisaged that the redesign of the junction as a roundabout would help provide longer-term journey time benefits for traffic flows on all approach arms.

Table G. 16: A131 Halstead Road / Gosfield Road roundabout junction, High Garrett Local Junction Mitigation Modelling Outputs

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
Gosfield Road SB	1	10.62	49%	0.8	10.32	42%
A131 SB	3.1	15.05	75%	1	6.81	49%
A131 NB	0.9	5	46%	1.4	5.86	58%
2043 Assessment Case Without Mitigation						
Gosfield Road SB	1.2	11.4	53%	1.3	13.08	56%
A131 SB	3.3	15.8	76%	1.1	7.51	51%
A131 NB	1.2	5.54	51%	1.6	6.41	61%
2043 Assessment Case With Mitigation						
Gosfield Road SB	1.4	12.58	57%	1.3	13.15	56%
A131 SB	3.6	17.3	78%	1.1	7.62	52%
A131 NB	1.2	5.69	52%	1.7	6.68	63%

G.2.2.2 B1024 High Street / Station Road / Swan Street signalised junction, Kelvedon

The B1024 High Street / Station Road / Swan Street junction in Kelvedon has been modelled with a signalised arrangement with a view to help manage future delays and queue extents on the Station Road and B1024 westbound approach arms.

Results of the capacity modelling can be seen in

Table G. 17 overleaf, for direct comparison with the summarised results in Table 14 earlier in the report.

Initial modelling of traffic signals at the junction suggests that the proposal does not offer a significant improvement over the existing layout in accommodating forecast traffic growth. Therefore, as part of Pre-Submission modelling, further option testing of signal phasing and re-optimisation will be explored to determine whether improved performance can be achieved.

Table G. 17: B1024 High Street / Station Road / Swan Street signalised junction, Kelvedon Local Junction Mitigation Model Results

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
Station Road SB	17.1	156.5	100%	9.6	105.8	91%
B1024 WB	31.0	60.0	97%	15.6	51.8	95%
Swan Street NB	0.6	41.0	11%	0.5	43.4	13%
B1024 EB	17.4	56.8	93%	26.3	59.7	95%
2043 Assessment Case Without Mitigation						
Station Road SB	17.3	172.8	101%	11.3	216.0	101%
B1024 WB	53.9	134.2	104%	53.1	135.8	104%
Swan Street NB	0.7	45.4	13%	0.7	59.6	21%
B1024 EB	24.2	87.4	97%	58.0	179.6	106%
2043 Assessment Case With Mitigation						
Station Road SB	6.8	93.7	81%	7.4	106.2	87%
B1024 WB	15.9	21.1	83%	36.4	86.7	100%
Swan Street NB	0.7	51.1	14%	0.7	50.9	16%
B1024 EB	10.5	15.1	58%	42.2	119.2	102%

G.2.2.3 London Road / Rye Mill Lane / Inworth Road signalised junction, Feering

The London Road / Rye Mill Lane / Inworth Road junction in Feering has been modelled with a signalised arrangement with a view to help manage future delays and queue extents – most notably on the Inworth Road approach arm.

Results of the capacity modelling can be seen in Table G. 18 overleaf, for direct comparison with the summarised results in Table G. 15 earlier in the report.

Initial modelling of traffic signals at the junction suggests that the proposal does not offer an improvement over the existing layout in accommodating forecast traffic growth. Therefore, as part of Pre-Submission modelling, further option testing of signal phasing and re-optimisation will be explored along with alternative junction layouts, to determine whether improved performance can be achieved.

Table G. 18: London Road / Rye Mill Lane / Inworth Road signalised junction, Feering Local Junction Mitigation Modelling Outputs

Layout	AM			PM		
	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS	Mean Max Queue (PCUs)	Average Delay (s/pcus)	DoS
2043 Reference Case						
Rye Mill Lane SB	1.6	35.6	56%	0.6	48.9	27%
B1024 WB	264.2	535.0	217%	14.2	19.0	73%
B1023 NB, Inworth Road	83.0	499.8	197%	11.0	63.4	88%
B1024 EB	157.4	510.0	207%	17.1	39.3	88%
2043 Assessment Case Without Mitigation						
Rye Mill Lane SB	1.8	37.9	61%	0.4	30.9	21%
B1024 WB	291.3	544.0	222%	73.1	249.4	114%
B1023 NB, Inworth Road	95.6	572.7	231%	26.8	262.2	113%
B1024 EB	172.4	533.0	217%	58.8	302.2	118%
2043 Assessment Case With Mitigation						
Rye Mill Lane SB	2.0	43.0	63%	1.4	115.5	50%
B1024 WB	293.3	633.0	274%	20.1	17.5	73%
B1023 NB, Inworth Road	251.1	643.6	277%	17.0	129.8	98%
B1024 EB	157.2	506.3	201%	28.0	70.5	97%

G.3 Conclusion

Local junction modelling has been undertaken as part of the Local Plan Regulation 19 transport evidence base to support the findings from the strategic modelling appraisal of Local Plan and mitigation impact. There is broad consistency in the findings between the two modelling approaches, with a similar scale of forecast congestion identified at key locations across the road network in Braintree District – including A120 Galleys Corner, Pods Brook Road approach to Springwood Drive Roundabout in Braintree, and Inworth Road approach to the junction with the B1024 in Feering.

The impact of the Local Plan mitigation strategy and sustainable trip reductions is shown in the reassignment of traffic from local town centre and rat-run routes, back to key strategic corridors such as the A120. This is reflected in the detailed capacity analysis of junctions along the A120, and at junctions within Braintree town centre.

As with all town centre junctions, careful monitoring of the impact of traffic growth on network resilience and traffic redistribution patterns across the urban centre of Braintree will be important going forward. Outcomes from the strategic modelling demonstrate that traffic conditions along

routes through the town centre are extremely sensitive to network constraint and congestion at nearby junctions and on the surrounding SRN.

Whilst the capacity appraisal of town centre junctions supports the broad findings of the strategic modelling, an unstable assignment of traffic flows across the town centre could result in congestion shifting from one junction to the next as a consequence of minor changes in traffic conditions experienced across the wider network.

Overall, junction modelling demonstrates that at most of the locations assessed, measures within the mitigation strategy are well placed to address Local Plan growth. Certain junctions will, however, rely on peak spreading in order to operate within capacity.

Modelling suggests that several junctions – including those along the A120 corridor, and those in Hatfield Peverel, Witham and Feering will likely remain over-capacity regardless of mitigation. These junctions will be subject to further appraisal as part of the Local Plan Pre-Submission to determine whether further optimisation of mitigation might be possible and deliverable within the Local Plan period and/or beyond.

Appendix H. Merge and Diverge Assessments on SRN

To assess the impact of Local Plan development on the Strategic Road Network (SRN) in Braintree District, merge and diverge assessments have been undertaken at all junctions on the A12 and A120 in the district that incorporate merge and diverge movements between the on/off-slips and main carriageway.

The assessed junctions have been highlighted in Figure H. 1 below:

Figure H. 1: Location of merge / diverge assessed junctions along A12 and A120 corridors in Braintree district

Assessments have been carried out at each junction under the following Local Plan forecast-year modelled scenarios:

- 2043 Reference Case,
- 2043 Assessment Case (i.e. with Local Plan development); and
- 2043 Assessment Case with Mitigation and Sustainable Trip Reductions

Modelled flows for the on and off slips have been compared against design standards within the Design Manual for Roads and Bridges (DMRB)[1] to help identify where improvements to the

[1] Design Manual for Roads and Bridges, 2022. CD 122 – Geometric design of grade separated junctions

merge/diverge layouts and number of lanes upstream and downstream of the merge/diverge could help to accommodate forecast traffic growth across Braintree District.
Table H. 1 outlines the recommended layouts and number of lanes for each of the A12 junctions assessed for each scenario based on the DMRB. Across the AM and PM peaks, where the recommended junction layout for the 'Reference Case' is different to existing, this has been highlighted in yellow – indicating where junction upgrades could help accommodate non-Plan related background growth.

Where the recommended junction layout for the 'Assessment Case' and 'Assessment Case with Mitigation and STR' scenarios is different to the 'Reference Case', this has been highlighted in orange - indicating where junction design upgrades could help accommodate specific Local Plan growth – with and without the implementation of a mitigation strategy.

Table H. 1 DMRB existing versus recommended layouts and number of lanes for A12 and A120 junctions assessed

Junction	Slip Rd	Existing Layout			Reference Case			Assessment Case			With Mitigation Case		
		Layout	No. of Lanes		Recommended Layout	Recommended No. of Lanes		Recommended Layout	Recommended No. of Lanes		Recommended Layout	Recommended No. of Lanes	
			Up	Down		Up	Down		Up	Down		Up	Down
A12 J20A	A12 J20A EB off-slip	C	3	2	**C**	**3**	**2**	**C**	**4**	**3**	**C**	**4**	**3**
	A12 J20A WB on-slip	**D**	**2**	**3**	**D**	**3**	**4**	D	3	4	D	3	4
A12 J20B	A12 J20B EB on-slip	**A**	**2**	**2**	**A**	**3**	**3**	**D**	**2**	3	**D**	**2**	3
	A12 J20B WB off-slip	**C**	**3**	**2**	**C**	**4**	**3**	**C**	4	3	**C**	4	3
A12 J21	A12 J21 EB on-slip	**A**	**2**	**2**	**A**	**3**	**3**	**A**	3	3	**A**	3	3
	A12 J21 EB off-slip	**A**	**2**	**2**	**C**	**4**	**3**	**C**	4	3	**C**	4	3
	A12 J21 WB on-slip	D	2	3	D	2	3	D	2	3	D	2	3
A12 J22	A12 J22 NB on-slip	**B**	2	**2**	**D**	2	**3**	D	2	3	D	2	3
	A12 J22 NB off-slip	**A**	**2**	2	**C**	**3**	2	C	3	2	C	3	2
	A12 J22 SB on-slip	B	2	2	**B**	2	**2**	**D**	2	**3**	B	2	2
	A12 J22 SB off-slip	**A**	**2**	2	**C**	**3**	**2**	C	3	2	**A**	3	**3**
A12 J23	A12 J23 NB off-slip	**A**	**2**	2	**C**	**3**	2	C	3	2	C	3	2

Junction	Slip Rd	Existing Layout			Reference Case			Assessment Case			With Mitigation Case		
		Layout	No. of Lanes		Recommended Layout	Recommended No. of Lanes		Recommended Layout	Recommended No. of Lanes		Recommended Layout	Recommended No. of Lanes	
			Up	Down		Up	Down		Up	Down		Up	Down
	A12 J23 SB on-slip	**A**	2	**2**	**D**	**2**	**3**	D	2	3	**A**	**3**	3
A12 J24	A12 J24 NB on-slip	**A**	2	**2**	**D**	2	**3**	D	2	3	D	2	3
	A12 J24 SB off-slip	**A**	**2**	**2**	**A**	**3**	**3**	A	3	3	A	3	3
A120 / Dunmow Rd, Rayne	A120 / Dunmow Rd EB on-slip	B	2	2	B	2	2	B	2	2	B	2	2
A120 Great Notley and Panners Roundabouts, Gt. Notley	A120 Great Notley and Panners rbts EB off-slip	**A**	**2**	2	**C**	**3**	2	C	3	2	C	3	2
	A120 Great Notley and Panners rbts EB on-slip	B	2	2	B	2	2	B	2	2	B	2	2
	A120 Great Notley and Panners rbts WB on-slip	**B**	2	**2**	**E**	2	**3**	E	2	3	E	2	3
	A120 Great Notley and Panners rbts WB off-slip	A	2	2	**A**	**2**	2	A	2	2	**C**	**3**	2

Junction	Slip Rd	Existing Layout			Reference Case			Assessment Case			With Mitigation Case		
		Layout	No. of Lanes		Recommended Layout	Recommended No. of Lanes		Recommended Layout	Recommended No. of Lanes		Recommended Layout	Recommended No. of Lanes	
			Up	Down		Up	Down		Up	Down		Up	Down
A120 / London Road, Braintree	A120 / London Road EB on-slip	A	2	2	A	2	2	A	2	2	A	2	2
	A120 / London Road WB off-slip	A	2	2	A	2	2	A	2	2	A	2	2
A120 / B1024 Colne Road, Coggeshall	A120 / B1024 WB off-slip	A	1	1	A	1	1	A	1	1	A	1	1

The A12 and A120 merge and diverge assessments highlight several junctions along the A12 corridor which, based on DMRB design standards, would likely benefit from layout upgrades to best accommodate future background traffic growth through to 2043. The section of A12 through Braintree District that has been assessed as part of the Local Plan transport evidence base, overlaps with the section of the A12 that has been subject to recent National Highways proposals for carriageway widening and the redesign of junctions along the corridor[2]. In this regard, the outcomes from this Local Plan impact assessment can be considered in broad alignment with the findings and recommendations found in recent studies to support the A12 widening Development Consent Order (DCO)[3].

When viewed against DMRB design standards, upgrades to a limited number of on/off-slips at junctions 20A, 22 and 23 are recommended to help accommodate forecast traffic growth attributed to Local Plan development along the A12 corridor at Kings Dene and Hatfield Peverel in particular. Similarly, upgrades to the westbound off-slip at the A120 Great Notley and Panners Roundabout are also recommended to accommodate Local Plan growth around Braintree town. In some instances, junction upgrades are recommended where mitigation has been introduced to manage Local Plan impact. Analysis of strategic model outputs presented in the main body of this report illustrates the impact of mitigation at 'bottlenecks' along the A120 and A12 corridors attracting traffic flows back to the SRN where trips were otherwise re-routing to avoid congestion. This outcome would help to explain why the release of traffic at bottlenecks may impact on the capacities of junctions and links both upstream and downstream of mitigation proposals.

Based on DMRB recommendations, the optimal merge / diverge design layouts for the A12 and A120 on and off slips for the 2043 Assessment case and Assessment case with mitigation have been summarised in Table H. 2 below. It should be noted that recommendations may change following further modelling of mitigation options along the A120 corridor at Galleys Corner and Marks Farm Roundabouts proposed for the Local Plan Pre-Submission evidence.

[2] https://national-infrastructure-consenting.planninginspectorate.gov.uk/projects/TR010060

[3] A12 Chelmsford to A120 Widening Scheme - Examination Library

Table H. 2: DMRB recommended junction upgrades along A12 and A120 corridors to help manage Local Plan impact

A12 J20A	
Assessment Case	**Assessment with Mitigation Case**
Recommended Layout Changes: • EB Off-slip to remain layout C *Lane Changes:* • EB Off-slip upstream lanes to change from 3 to 4 • EB Off-slip downstream lanes to change from 2 to 3	*Recommended Layout Changes:* • EB Off-slip upstream to remain layout C *Lane Changes:* • EB Off-slip upstream lanes to change from 3 to 4 • EB Off-slip downstream lanes to change from 2 to 3
A12 J22	
Assessment Case	**Assessment with Mitigation Case**
Recommended Layout Changes: • SB On-slip to change from layout B to layout D *Lane Changes:* • SB On-slip downstream lanes to change from 2 to 3	*Recommended Layout Changes:* • SB Off-slip to change from layout C to layout A *Lane Changes:* • SB Off-slip downstream lanes to change from 2 to 3
A12 J23	
Assessment Case	**Assessment with Mitigation Case**
Recommended Layout Changes: N/A *Lane Changes:* N/A	*Recommended Layout Changes:* • SB On-slip to change from layout D to layout A *Lane Changes:* • SB On-slip upstream lanes to change from 2 to 3
A120 / London Road, Braintree	
Assessment Case	**Assessment with Mitigation Case**
Recommended Layout Changes: N/A *Lane Changes:* N/A	*Recommended Layout Changes:* • WB Off-slip to change from layout A to layout C *Lane Changes:* • WB Off-slip upstream lanes to change from 2 to 3