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Northamptonshire Strategic Transport Model (NSTM)

TRAFFIC FORECASTING REPORT

NNJPU Core Strategy Assessment

05/05/2015

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1 Project Background

1.1 Purpose

1.1.1 WSP has been tasked by the North Northamptonshire Joint Planning Unit (NNJPU) to provide guidance on how future housing and employment development will impact on the highway network in the boroughs of Corby, Kettering, Wellingborough, and East Northamptonshire district.

1.1.2 This forecasting report details results taken from the Northamptonshire Strategic Transport Model (NSTM). The NSTM has been constructed as a strategic multi-modal model covering Northamptonshire capable of assessing the impacts of future changes in journey patterns within Northamptonshire.

1.1.3 The results from the NSTM outlined in the report will be used to inform the Joint Core Strategy being developed by the NNJPU which aims to provide a strategic plan for Corby, East Northamptonshire, Kettering and Wellingborough going forward to 2031. It also provides information on the performance of the draft Infrastructure Delivery Plan (IDP) against forecast traffic flows.

1.2 NSTM specification

1.2.1 The validated base year model which the NSTM forecasts were based on in this report is 2014. The base year model was re-validated with Automatic Traffic Count (ATC) data collected in 2014. The associated Local Model Validation Report (LMVR) is available dated December 2014.

1.2.2 The NSTM was run for a forecast year of 2031 with an AM peak (08:00-09:00) and PM peak (17:00-18:00) model for multiple scenarios detailed in Section 2.

1.2.3 SATURN version 11.2.05 is the highway modelling software package used within the NSTM. EMME version 3.1 is used for the public transport and demand model element of the NSTM.

1.3 Previous reports

1.3.1 This report supersedes the following NSTM reports submitted as part of the transport evidence base for the North Northamptonshire Joint Core Strategy Pre-Submission consultation which took place between 26 January 2015 and 9 March 2015:

- Northamptonshire Strategic Transport Model Traffic Forecasting Report of the JCS
- Northamptonshire Strategic Transport Model Traffic Forecasting Report of the JCS Addendum

1.3.2 The modelling detailed in this latest report includes the most up-to-date committed development, housing and employment information in line with the North Northamptonshire Joint Core Strategy, as proposed.

1.3.3 The NSTM has been updated since the pre-submission consultation. Previous modelling was based on a 2013 base year. The modelling detailed in this report also includes development assumptions from the adopted Core Strategy for West Northamptonshire.

1.3.4 This report is split into the following sections

- Model inputs (Section 2)

- Model results (Section 3)
- Sensitivity test results (Section 4)
- Conclusion (Section 5)

1.4 Conclusions and recommendations

1.4.1 This report outlines a number of junctions which the NSTM 2031 results suggest will experience congestion problems in the future. Section 5 of the report outlines local junctions by Local Planning Authority (LPA) which continue to show congestion problems despite the inclusion of mitigation measures identified in the Infrastructure Delivery Plan (IDP) in the NSTM. Further analysis of the junction designs in question and their input into the NSTM will be required.

2 Model Inputs

2.1 Data inputs

2.1.1 The main data inputs required for the NSTM demand model in relation to developments are as follows:

- Households
- Jobs
- Retail Space Value
- School Pupil Numbers

2.1.2 The information for these data inputs was provided to WSP by the NNJPU in terms of committed, proposed and potential developments for a forecast year of 2031. Appendix A contains details of the developments included within the NSTM model runs.

2.2 Previous modelling data inputs

2.2.1 The modelling detailed in the previous "Northamptonshire Strategic Transport Model Traffic Forecasting Report of the JCS (23rd January, 2015)" tested two different employment distributions described as Scenario 2 and Scenario 5. Alongside this another report titled "Northamptonshire Strategic Transport Model Traffic Forecasting Report of the JCS Addendum" was produced, dated 23rd January 2015. The addendum detailed the results of re-testing employment Scenario 2 with a revised distribution of housing in Kettering Borough and improvements to various elements of the IDP. Appendix B includes details of the previous inputs.

2.3 Revised Scenario 5 employment developments

2.3.1 The modelling in this report is based on an amended version of the Scenario 5 (employment) assumptions, but includes the infrastructure improvements outlined in the "Northamptonshire Strategic Transport Model Traffic Forecasting Report of the JCS Addendum (23rd January, 2015)". The NNJPU requested this scenario was taken forward for further testing as the employment and housing distribution in this scenario most closely aligns with the Pre-Submission North Northamptonshire Joint Core Strategy.

2.4 Residential developments

2.4.1 Residential developments with a household size lower than 10 were not assigned a specific zone, but were aggregated within their respective district, with this total then spread proportionally across all the zones within the district according to the base year distribution. Residential developments which comprised between 10 and 500 households were allocated to a specific zone within the NSTM. Developments greater than 500 households (i.e. strategic sites) were modelled explicitly in the sense they were given their own zone(s). The internal road network and mitigation for these explicitly modelled developments was also included within NSTM. Coding of the internal road

network for explicitly modelled developments was taken from the respective masterplan for the development if it was available. In absence of this information assumptions were made in terms of how traffic for these major developments would load onto the road network.

2.4.2 Table 2.1 lists the large developments for which a masterplan was used to inform the network coding within the NSTM

Table 2.1: Large developments with masterplan used for network coding

Development	LPA
Priors Hall	Corby / East Northants
Stanion Lane Plantation	Corby
West Corby	Corby
Weldon Park	Corby
Warth Park Extension, Raunds	East Northants
A14 J10 Business Park	Kettering
Kettering East	Kettering
WEAST	Wellingborough
Wellingborough North	Wellingborough
Appleby Lodge	Wellingborough

2.4.3 For the large developments in table 2.2, more generic assumptions were made with regards to where these developments would access the NSTM network.

Table 2.2: Large developments with generic assumptions used for network coding

Development	LPA
Former Gefco automotive site	Corby
Land at Cockerell Road	Corby
Land West of Stanion	Corby
Seymour Plantation	Corby
Nene Valley Farm, Rushden	East Northants
North Raunds (West End)	East Northants
Rushden East SUE	East Northants
West of Huxlow School / Irthlingborough West SUE	East Northants
Cransley Business Park	Kettering
North Kettering	Kettering
Kettering South (A14 J9 / A509)	Kettering
Rothwell North	Kettering
North Desborough	Kettering
Weekley Wood Development Area	Kettering

2.4.4 Residual housing related to a particular settlement was split proportionally according to the base year distribution of households for the zones covering the settlement.

2.4.5 The total housing numbers for each LPA remained constant across all model scenarios and is detailed in table 2.3. These figures represent the growth in housing numbers between 2013 and 2031.

Table 2.3: Household totals by district (2013-2031)

LPA	>10 houses	<10 houses	Residual	District Total
Corby	12,905	71	259	13,235
East Northants	6,194	786	988	7,968
Kettering	9,236	500	0	9,736
Wellingborough	6,058	180	524	6,762

Total	**34,393**	**1,537**	**1,771**	**37,701**

2.4.6 Across the north Northamptonshire LPAs, a total of 33,934 dwellings were allocated to specific zones within the NSTM. Developments which comprised less than 10 dwellings were totalled up by LPA, with this total then split proportionally across the zones within each respective district according to the base year housing distribution.

2.4.7 The exception to this was East Northamptonshire where the total number of houses from developments with dwellings under 10 was 383, the remaining 403 dwellings was made up of the windfall housing allowance for East Northamptonshire district.

2.4.8 Residual housing was split across zones covering specific towns. For Corby, the 259 dwellings were split across zones representing the town of Corby. The 988 dwellings in East Northamptonshire were made up of 742 dwellings split across Rushden and 247 dwellings allocated across Oundle. The residual housing total of 524 dwellings within Wellingborough was split across zones specifically covering: Finedon (21 dwellings), Irchester (94 dwellings), Wollastan (83 dwellings) and Wellingborough town (327 dwelling windfall allowance).

2.4.9 Major residential developments comprising over 500 dwellings included in the NSTM are shown in table 2.4, representing the proposed phasing of these major developments between 2013 and 2031.

Table 2.4: Major residential developments

Development	LPA	Dwellings
Priors Hall	Corby / East Northants	4,893
Land West of Stanion	Corby	594
West Corby	Corby	3,966
Weldon Park	Corby	991
West of Huxlow School / Irthlingborough West SUE	East Northants	672
Rushden East SUE	East Northants	1,535
Kettering East	Kettering	3,385
Rothwell North	Kettering	791
North Desborough	Kettering	560
WEAST	Wellingborough	2,836
Wellingborough North	Wellingborough	1,224
	Total	**21,447**

2.5 Non-B class employment

2.5.1 The NNJPU identified predominantly B-class (B1, B2 and B8) jobs for specific developments alongside non-B class jobs associated with retail developments. A total of 6,086 jobs were allocated to specific retail developments, on top of the B-class job totals provided. Table 2.5 details the largest retail developments included in the NSTM with over 500 jobs assumed as part of the development, detailing the increase in job numbers at these developments between 2013 and 2031.

Table 2.5: Non-B class job totals by district

LPA	Development	Retail floorspace (sqm)	Jobs
Corby	Town centre retail expansion	15,500	775
East Northants	Rushden Lakes	50,800	1,714
Kettering	Town centre SHQ1 Wadcroft / Newlands	16,000	800

	Phase 1		
Wellingborough	Market Square and Tresham Institute	18,182	909

2.5.2 However the 6,086 non-B class jobs allocated to the retail developments represented a shortfall in the JCS job targets for non-B class employment between 2013 and 2031 defined for each Local Planning Authority (LPA), shown in table 2.6.

Table 2.6: Non-B class job totals by district

LPA	Non-B class job target (JCS) (A)	Retail jobs (B)	Non-B class short-fall (B-A)
Corby	2,225	1,150	1,075
East Northants	2,763	2,479	284
Kettering	3,676	1,250	2,426
Wellingborough	2,041	1,207	834
Total	**10,705**	**6,086**	**4,619**

2.5.3 In order to allocate the shortfall of non-B class jobs within the NSTM, the zones covering the major urban area within each LPA, namely Corby, Rushden, Kettering and Wellingborough were ascertained. The base year distribution of jobs within these selected zones was determined from TEMPRO, with the shortfall in B-class jobs for each respective district then allocated proportionally across the zones for each urban centre using the base year distribution.

2.5.4 However, within Kettering Borough, a total of 2,326 jobs were split across zones covering Kettering town. The remaining 100 jobs were allocated to zones covering Desborough to take account of a foodstore anticipated within the Pre-submission Joint Core Strategy Policy 12.

2.6 Employment development scenarios

Scenario 5

2.6.1 Scenario 5 includes all employment sites assumed to provide B1, B2 and B8 use class jobs, but with job assumptions aligned to match B-class job targets in the Pre-Submission JCS. This has an impact of reducing the job totals at individual sites significantly. Due to an oversupply in employment sites the JPU have aligned to the NNJPU job targets. This has the effect of diluting the job numbers at individual sites significantly, but has the benefit of showing exactly how the JCS should be implemented across the area – a strategic approach which is considered consistent with the objective of testing the impact of strategic development within an overarching plan.

2.6.2 Table 2.7 provides a summary of the job totals included in the NSTM by district in north Northamptonshire for Scenario 5.

Table 2.7: Scenario 5 employment job totals by district

District	B-class jobs	Retail jobs	Non-B class shortfall	District Total
Corby	7,475	1,150	1,075	9,700
East Northants	4,438	2,479	284	7,201
Kettering	4,424	1,250	2,426	8,100
Wellingborough	4,059	1,207	834	6,100
Total	**20,396**	**6,086**	**4,619**	**31,101**

Major employment developments

2.6.3 Table 2.8 outlines the major employment developments B-class jobs included within Scenario 5 (reflecting job assumptions aligned to the Pre-submission JCS).

Table 2.8: Scenario 5 major employment developments

Development	LPA	Sc5 B-class jobs
Priors Hall	Corby	604
Stanion Lane Plantation	Corby	3,009
Former Gefco automotive site	Corby	1,066
Seymour Plantation	Corby	417
Land at Cockerell Road	Corby	525
West Corby SUE	Corby	931
Ex Sludgebeds	Corby	290
North Raunds (West End)	East Northants	527
Vehicle Depot, Islip	East Northants	788
Warth Park Extension, Raunds	East Northants	783
Nene Valley Farm, Rushden	East Northants	700
West of Huxlow School / Irthlingborough West SUE	East Northants	849
Rushden East	East Northants	277
Rothwell North	Kettering	236
Kettering South (A14 J9 / A509)	Kettering	1,103
Kettering East	Kettering	232
Weekley Wood Development Area	Kettering	801
A14 J10 Business Park	Kettering	699
Cransley Business Park	Kettering	248
North Kettering	Kettering	785
Appleby Lodge	Wellingborough	1,826
WEAST	Wellingborough	1,722
Wellingborough North	Wellingborough	227

2.7 TEMPRO comparison

2.7.1 TEMPRO (Trip End Model Presentation Program) is software which can provide forecasts for:

- Population
- Employment
- Households by car ownership
- Trip ends
- Traffic growth

2.7.2 TEMPRO uses data from the National Transport Model (NTM), provided by the Department for Transport (DfT). It is common practice within the UK to use TEMPRO for transport planning purposes. The latest definitive version of TEMPRO is version 6.2

2.7.3 Comparisons against TEMPRO growth from the NTEM version 6.2 are shown below to emphasise how the level of employment and housing modelled in NSTM compare.

2.7.4 For Scenario 5, table 2.9 details how the employment levels compare to TEMPRO. Across the north Northamptonshire LPAs, the level of employment modelled is 219% higher than TEMPRO.

Table 2.9: TEMPRO vs Scenario 5 employment comparison

LPA	TEMPRO Jobs Growth	NSTM Jobs Sc5	Difference vs TEMPRO
Corby	4,128	9,700	135%
East Northants	462	7,201	1459%
Kettering	4,105	8,100	97%
Wellingborough	1,058	6,100	477%
Total	**9,752**	**31,101**	**219%**

2.7.5 Table 2.10 details the difference between the housing modelled in both NSTM scenarios compared to TEMPRO. Overall, what is modelled in NSTM for the north Northamptonshire LPAs is 1% higher in terms of housing compared to TEMPRO. However, there are notable variations between the LPAs. The housing included for Corby in the NSTM is at a level 293% higher than TEMPRO, whereas all the other LPAs have housing levels in the NSTM below TEMPRO levels, particularly Kettering which is being modelled in the NSTM -46% below TEMPRO.

Table 2.10: TEMPRO vs NNJPU housing comparison

LPA	TEMPRO Housing Growth	NSTM Housing (Sc5)	Difference vs TEMPRO
Corby	3,365	13,235	293%
East Northants	7,821	7,968	2%
Kettering	17,166	9,196	-46%
Wellingborough	8,290	6,762	-18%
Total	**36,642**	**37,161**	**1%**

2.8 Infrastructure delivery plan

2.8.1 The Infrastructure Delivery Plan (IDP) is a comprehensive series of transport and highway infrastructure improvements and mitigation identified by Northamptonshire County Council (NCC) developed through previous modelling runs which reflects adopted Area Action Plans and incorporating key strategic schemes identified by NCC and the Highways England, designed to deal with future traffic growth within the north Northamptonshire LPAs. The latest proposals included in the draft IDP were coded in the NSTM forecast model network in all model runs discussed within this report.

2.8.2 Tables 2.11-2.15 overleaf outline the IDP proposals for each of North Northamptonshire's local authority areas.

Table 2.11: Corby infrastructure

Reference	Description	Mitigation
C1	A427 / Uppingham Road	Minor widening to northern Uppingham Road approach
C2	A6003 Rockingham Road / Uppingham Road	Minor widening to Rockingham Road approaches
C3	Vian Way / Uppingham Road	Three arm roundabout
C4	Elizabeth Street / Cottingham Road	Minor widening to eastern Cottingham Road arm
C5	Corby Link Road	New A43 alignment
C6	Corby Northern Orbital – Phase 2	Between Rockingham Motor Speedway and Willowbrook East Industrial Estate
C7	Gretton Brook Road / A6116	Minor widening to western Rockingham Road approach
C8	A427 Weldon Road/ A6086 Lloyds Road/ A6086 Geddington Road	Minor widening to Lloyds Road and eastern A427 Weldon Road approach
C9	A6014 Oakley Road/ Danesholme Road/ Lewin Road	Minor widening to northern A6014 Oakley Road approach
C10	A427 Oakley Road/ A427 Westcott Way/ Oakley Road/ Elizabeth Street	Minor widening to all approaches
C11	A6003 Caldecott Road/A6003 Main Street/Gretton Road/Cottingham Road	Additional right turn lane on A6003 Caldecott Road
C12	Corby West - A6003 / Danesholme Road access	Four arm roundabout
C13	Corby West - Northern A6003 access / A427 access	Three arm roundabouts
C14	A6003 Uppingham Road (between Wescott Way and Danesholme Road)	Speed reduction to 40mph
C15	Weldon Relief Road	New Link with 30 mph between the A43 and Oundle Road

Table 2.12: East Northamptonshire infrastructure

Reference	Description	Mitigation
E1	Duck Street and Rectory Road, Rushden	Changed to two-way
E2	Rectory Rd / Newton Rd / Park Rd, Rushden	Left turn filter lane from Rectory Road
E3	High Street, Higham Ferrers	Traffic calming, assumed speed of 20mph
E4	A45 / A6 Chowns Mill roundabout	Revised signalised junction design
E5	A45 Stanwick to Thrapston	Upgraded to dual carriageway
E6	A45 Skew Bridge roundabout	Increased capacity to accommodate Rushden Lakes retail development, including relief link between A5001 Northampton Road and Crown Way
E7	A45 / B663 Raunds roundabout	Capacity improvements

Table 2.13: Kettering infrastructure

Reference	Description	Mitigation
K1	A43/A6003 Rockingham Road/ Rockingham Road	Roundabout improvements
K2	Montague Street/ Stamford Road/ Central Avenue/ Windmill Avenue	East of Kettering - Junction Improvement a
K3	Windmill Avenue/ St Mary's Road	East of Kettering - Junction Improvement b
K4	Windmill Avenue/Deeble Road	East of Kettering - Junction Improvement c
K5	London Road/Barton Road/ Pytchley Road	East of Kettering - Junction Improvement d
K6	Barton Road/ Windmill Avenue	East of Kettering - Junction Improvement e
K7	Barton Road/Warkton Lane	East of Kettering - Access Junction E
K8	Warkton-Weekley Avenue	Part of Phase 3 of East of Kettering development
K9	A14 Junction 10a	Related to the East of Kettering development
K10	A14 Junction 10	Closure of eastern slip roads as part of Junction 10a scheme, realignment of A6 as part of A14 J10 Business park proposals
K11	A14 Junction 7 to 9	Widening to from dual carriageway to three lanes

Table 2.14: Kettering TCAAP infrastructure

Reference	Description	Mitigation
KTC1	Northampton Road/ Station Road/ Bowling Green Road	Altered to take into account bus only links on Sheep Street
KTC2	Bowling Green Road/ London Road	Altered to take into account bus only links on Sheep Street / Market Street
KTC3	London Road/ Market Street	Altered to take into account Queen Street becoming two-way link
KTC4	Silver Street/ High Street	Altered to take into account new two-way links in town centre
KTC5	Montagu Street/ Victoria Street	Altered as Victoria Street becomes two-way link
KTC6	Northall Street/ Eskdaill Street	Altered to take into account new two-way links in town centre
KTC7	Station Road	Made into two-way link
KTC8	Trafalgar Road to Northfield Avenue	Link road
KTC9	Queen Street	Made into two-way link
KTC10	20mph zone in city centre	Within Northall Street / Victoria Street / Northfield Avenue
KTC11	Sheep Street / Market Street	Made bus only; no through traffic

Table 2.15: Wellingborough infrastructure

Reference	Description	Mitigation
W1	A4500/A509/Northampton Rd	Four arm signalised roundabout
W2	A509 / Rutherford Drive	Improved capacity to A509 northern arm, taking into account Park Farm Way dualling
W3	A509/Turnells Mill Lane/ Embankment	Four arm signalised roundabout
W4	Senwick Road/ Elsden Road/ Midland Road	Signalised junction
W5	A45 / Wilby Way roundabout	Four arm signalised roundabout
W6	Park Farm Way dualling	Included by changes to junction saturation flows
W7	Northern Interceptor Road	Four arm junction with Alma Road / Park Road
W8	Church Street	Becomes bus only as part of TCAAP and introduction of one way system with interceptor road
W9	Route 4 to WEAST	Part of the WEAST development
W10	Route 2 to WEAST	Part of the WEAST development
W11	Route 2 to WEAST extension	Part of the WEAST development
W12	Eastern Relief Road (along Sidegate Lane)	Part of the WEAST development
W13	Route 6	Part of the WEAST development
W14	A509 Niort Way / Kettering Road / A510 Northern Way / Harrowden Road	Northern arm changed to link related to IWIMP, A509 severed and downgraded
W15	A509 Niort Way / Gleneagles Drive	Four arm roundabout
W16	A509 Niort Way / Hardwick Road	Hardwick Road amended to left turn only due to A509 dual carriageway
W17	A509 Niort Way - Wellingborough North priority access	Between Gleneagles Drive & A509 / A510 / Harrowden Rd roundabouts
W18	A509 Niort Way / IWIMP	Four arm roundabout
W19	A510 Northern Way / Nest Farm Road	Four arm roundabout
W20	A510 Northern Way / A510 Stewarts Rd / Sanders Rd	Four arm roundabout to include Route 6 to WEAST
W21	A509 Niort Way	Upgraded to dual carriageway
W22	IWIMP link	Connecting Isham Bypass to A509 Niort Way
W23	IWIMP link / Red Hill Street	Through Wellingborough North development
W24	Isham Bypass	Bypasses A509 Kettering Road

3 Model Results

3.1 Introduction

3.1.1 This section will discuss the results of the modelling for Scenario 5, looking at each LPA in turn to consider the combined impact of all of the development sites (employment, housing and retail), focusing on the volume to capacity ratio at key junctions.

3.2 Volume to capacity ratio

3.2.1 In order to determine the suitability of the IDP to accommodate future traffic growth up to 2031, NSTM outputs have been used to identify junction 'hotspots' i.e. locations at which the volume of traffic is near or exceeds the maximum capacity of a junction. These junctions are the locations at which congestion and queuing is most likely to occur and constrain the local and strategic highway network during the morning and evening peak hours.

3.2.2 The 'Volume to Capacity Ratio' (V/C) was analysed for every turn and junction arm within the north Northamptonshire LPAs in each model run. The capacity for each link and turn is set within the NSTM representing the maximum number of vehicles per hour which the road network can adequately accommodate. The volume of traffic is the traffic flow assigned to a given link and turn within the NSTM. The volume of traffic assigned to a link or turn is divided by its respective capacity to generate a ratio which can be converted to a percentage, giving an indication of how the road network copes with the forecast levels of traffic. The maximum V/C ratio at a junction (or for more complex junctions, the approach) was identified. Turns or junction approaches with a flow of less than 500 vehicles were excluded to ensure major junctions arms or turns were focused on in the analysis.

3.2.3 Table 3.1 shows how the volume to capacity ratios have been categorised in terms of the scale of the problem they represent. Appendix C contains tables which detail the maximum V/C values for congested junctions across all model runs.

Table 3.1: Volume to capacity ratio definitions

Volume to capacity ratio	Severity
75 to 85%	Moderate
85 to 100%	Significant
100% +	Highly significant

3.2.4 Appendix D contains traffic flow figures for Scenarios 5 model runs.

3.3 Scenario 5 - Corby

3.3.1 Figure 3.1 and figure 3.2 detail the V/C ratios at congested junctions within Corby in the 2031 AM peak and PM peak Scenario 5 model runs.

3.3.2 The following roundabout on the A43 is shown to experience highly significant V/C ratios (over 100%) in both the AM peak and PM peak. The approaches associated with the A43 Stamford Road and A6116 experience the highest levels of delay.

- A43 Stamford Road / Geddington Road (node 1046)

3.3.3 A427 Oakley Road / A427 Weldon Road roundabout (node 1201) also shows severe congestion (V/C ratios over 100%) in both peaks.

3.3.4 The following junctions have a highly significant V/C value (100%+) in the AM peak hour, with a significant V/C (85-100%) in the PM peak:

- A6003 Uppingham Road / A6014 Oakley Road / Oakley Road (node 1187)
- Tower Hill Road/Gainsborough Road (24696)

3.3.5 The following roundabout shows significant capacity problems (85-100%) in both peaks, with the main problem on the Lloyds Rd approach in the AM, and on the A6086 northern approach in the PM:

- A6086 Phoenix Parkway / Lloyds Road (node 1202)

3.3.6 The following junctions are shown to experience significant V/C issues (85-100%) in the AM peak hour:

- A427 Cottingham Road/Beanfield Avenue (Node 1012) – due to traffic flows along Cottingham Road preventing traffic on Beanfield Avenue from turning left/right at this priority junction.
- A6003 / Danesholme Road/ West Corby Access Road (node 1013) – due to West Corby SUE traffic from being hindered from turning right at the roundabout because of high northbound traffic flows on Uppingham Road.
- A6003/Uppingham Road/A6116 Rockingham Road (Node 1198) – due to northbound traffic on Uppingham Road being hindered from turning right/left at the roundabout because of high westbound traffic flows on Rockingham Road.

3.3.7 The following junctions are shown to experience significant V/C issues (85-100%) in the PM peak hour:

- A6116 Rockingham Road / Rockingham Road (node 1199) – due to southbound traffic on Gretton Brook Road being hindered from turning right/left at the roundabout because of high eastbound traffic flows on Rockingham Road.
- A6014 Oakley Road/Gainsborough Road (Node 1038) – due to high flows of northbound traffic on Oakley Road hindering waiting southbound traffic on Oakley Road from turning right into Gainsborough Road and thus blocking southbound traffic on Oakley Road from travelling straight ahead.
- Sower Leys Road/Dunedin Road (Node 1039) – due to high flows of northbound traffic on Sower Leys Road hindering waiting southbound traffic on Sower Leys Road from turning right into Dunedin Road and thus blocking southbound traffic on Sower Leys Road from travelling straight ahead.
- A6116 Brigstock Road/Priors Haw Road (Node 24862) – due to high southbound traffic flows on Brigstock Road hindering traffic from turning right into Priors Haw Road and hindering traffic on Priors Haw Road from turning left into Brigstock Road at the priority junction.
- Priors Haw Road/Gretton Road (Node 24863) – due to high traffic flows traffic on Priors Haw Road at the junction.
- Rockingham Road / Lloyds Road / The Jamb (node 1203) – due to high southbound traffic flows on Rockingham Road hindering traffic from turning left/right from Lloyds Road at the roundabout.

3.3.8 These results show further junction modelling may be required or checks of the saturation flows used in the NSTM at the various key junctions around Corby should be conducted to determine if any of the identified 'hotspots' need to be potentially mitigated and re-designed. Overall, the key corridors of the A43, A427 and A6003 show the highest levels of delay which is to be expected given these strategic routes carry the highest levels of traffic and subsequent forecast traffic growth.

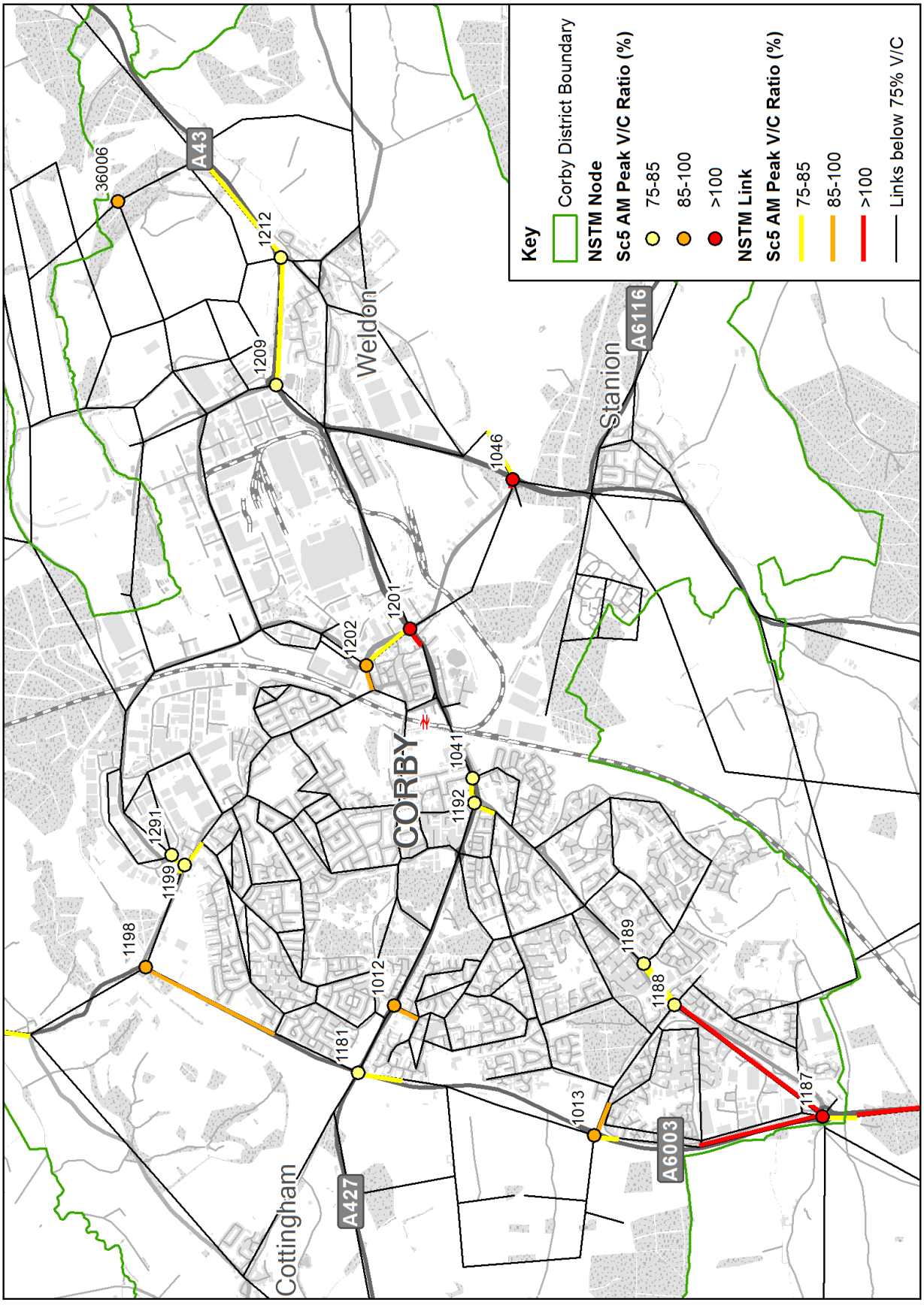


Figure 3.1: Scenario 5 V/C – 2031 AM – Corby

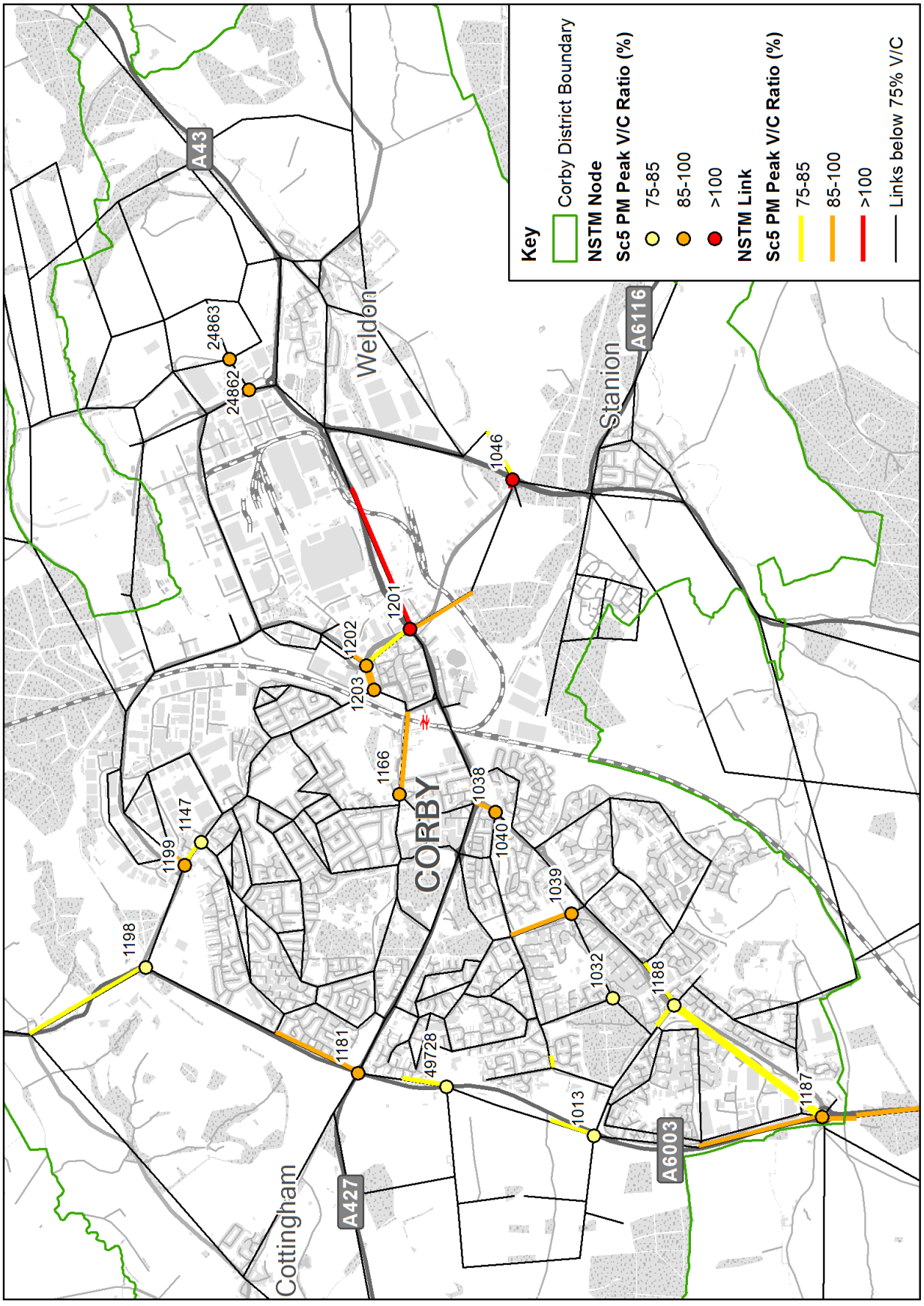


Figure 3.2: Scenario 5 V/C – 2031 PM – Corby

3.4 Scenario 5 - East Northamptonshire

3.4.1 Figure 3.3 and figure 3.4 details the V/C performance of junctions within East Northamptonshire district, focusing predominantly on the A45 corridor.

3.4.2 The Chowns Mill roundabout (A6 / A45) design generally performs well, particularly in the AM peak in which no element reports a V/C ratio greater than 85%. In the PM peak there is significant delay on the A45 south-west / circulatory approach, reaching 94% V/C (node 34010).

3.4.3 The Rushden Lakes roundabout at Skew Bridge (node 11145) experiences severe congestion in the PM peak, reaching 120% V/C, with the A45 approaches, Rushden Lakes access and A5001 approach all above 100% V/C. In the AM peak this junction performs better, but still exhibits significant congestion with a maximum V/C of 102%.

3.4.4 Two other key junctions on the A45 show significant congestion, with significant V/C values:

- A45 / B663 London Road (Raunds roundabout – node 10130)
- A45 / West Street (Stanwick roundabout – node 10065)

3.4.5 The Raunds Roundabout shows consistent congestion problems with a maximum V/C of 101% in the AM and 100% in the PM, whilst the Stanwick roundabout reaches 88% in the AM and 86% in the PM.

3.4.6 The junction designs included in the NSTM along the A45 corridor were taken from a draft version of the A45 corridor study carried out by AECOM on behalf of the Highways Agency. Further analysis and junction designs along the A45 may need to be tested in future runs of the NSTM particularly in relation to the recent announcement by Highways England that the A45 will become an Expressway.

3.4.7 At Thrapston, the A14 J13 shows highly significant congestion problems. In particular the northern A605 approach (node 10422) shows a consistent maximum V/C of over 100% in both peak hours. Whilst the westbound-off slip and circulatory approach (node 12838) at this junction are between 101-102% V/C in both peaks.

3.4.8 The following A14 junctions are shown to experience significant V/C issues in both peaks:

- A6 Bedford Road/Ave Road (Node 11889)
- A6 Bedford Road/ Wymington Lane (Node 11899)
- A5001 Wellingborough Road / B569 Irchester Road / B569 Washbrook Road (node 11828)
- A14/Brook Road to North Lodge near Thrapston (node 10030)
- A14/ High Street (to Titchmarsh) (node 10032)

3.4.9 Also within Rushden, the A5001 Wellingborough Road is shown to experience congestion westbound leaving Rushden in the AM peak, and eastbound heading into Rushden in the PM peak. Aside from the A5001 Wellingborough Road / B569 junction detailed above, the two roundabouts listed below show significant congestion. Further investigation is required to establish the causes for congestion at these locations.

- A5001 Wellingborough Road / A5001 Northampton road roundabout (node 11607)
- John Clark Way / Rectory (node 12827).
- A5028 Higham Road/ Hayway (node 11809)

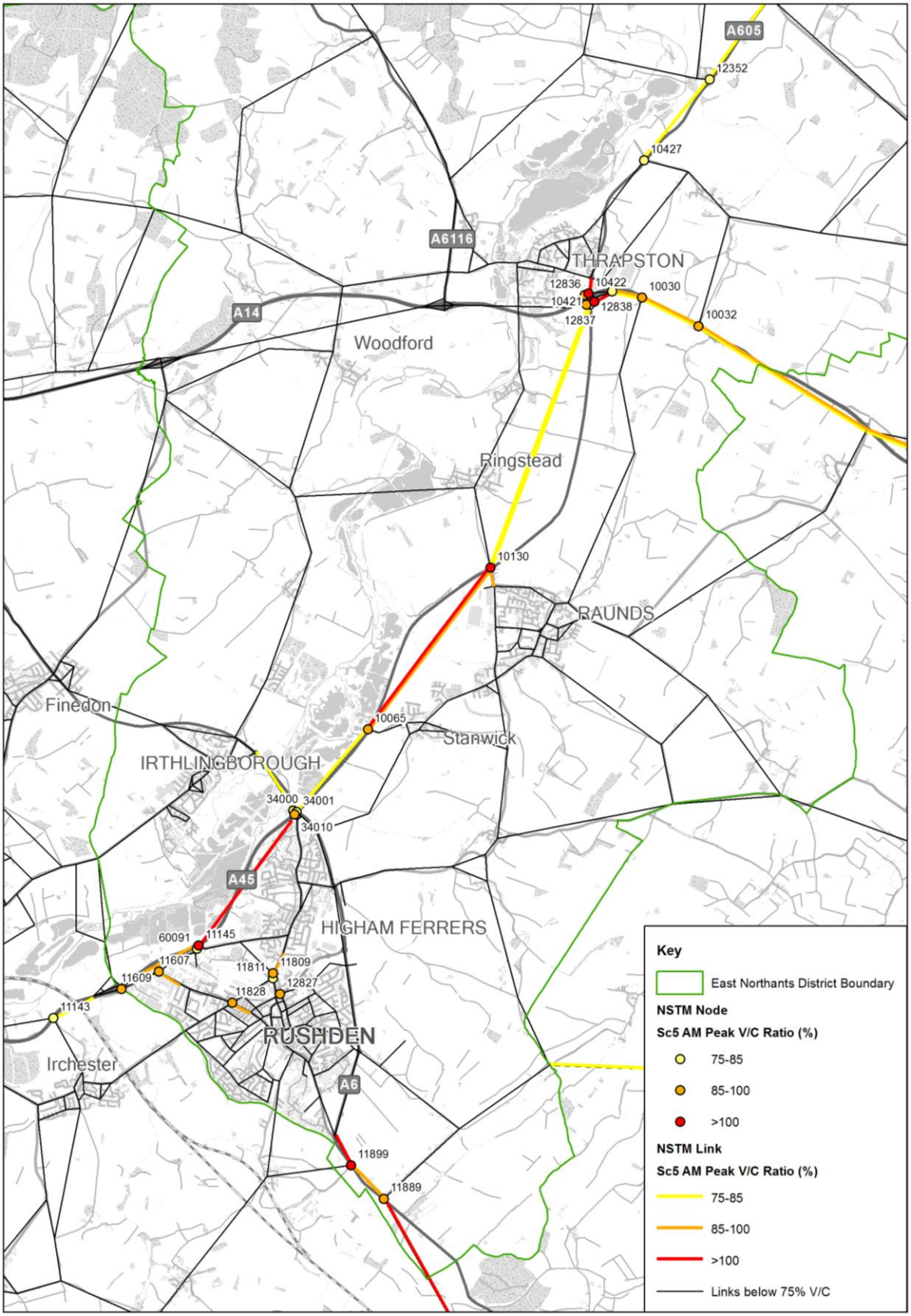


Figure 3.3: Scenario 5 V/C – 2031 AM – East Northamptonshire

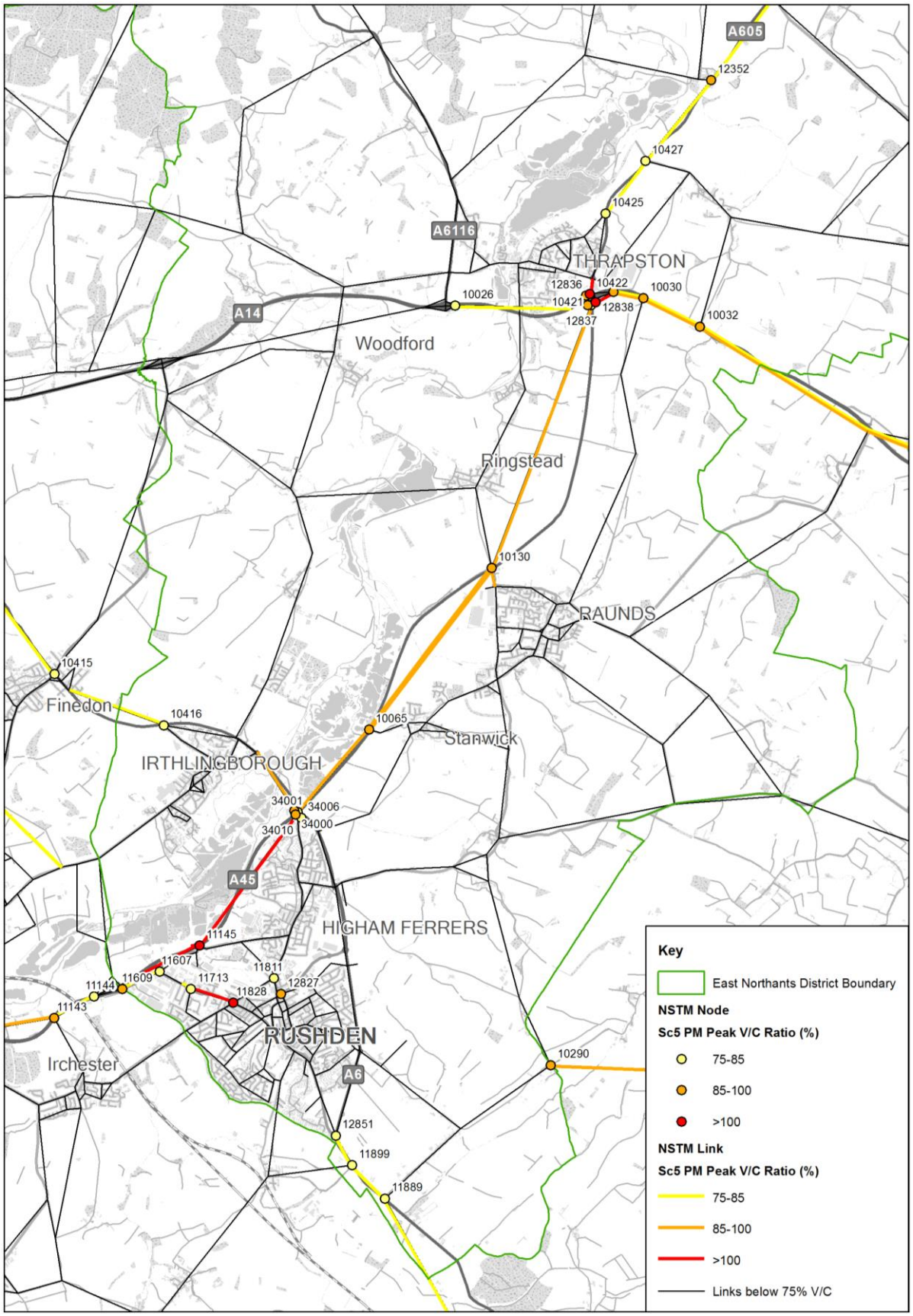


Figure 3.4: Scenario 5 V/C – 2031 PM – East Northamptonshire

3.5 Scenario 5 - Kettering

3.5.1 Figure 3.5 and figure 3.6 plot the maximum V/C ratios for junctions within the borough of Kettering. The NSTM shows high levels of traffic on the A14 between J4 and J10. In the AM peak, westbound flow on the A14 from junction 9 to 10 reaches over 5,000 Passenger Car Units (PCUs) per hour.

3.5.2 At the A14 junction 6 there is highly significant congestion apparent at the eastbound off-slip / A14 mainline (node 26011) due to the high traffic flows. Maximum V/C reaches 103% in the AM peak and 96% in the PM peak.

3.5.3 The A14 junction 7 experiences highly significant congestion in both peaks at the A14 southbound off-slip / circulatory (node 12740), between 98-102% between both peaks. Significant V/C values of between 91-95% occur in both peaks for the A14 southbound on-slip / northbound off-slip / mainline (node 10385). A43 approach (node 12745) shows severe congestion in the AM peak, whilst in the PM the northbound off-slip / circulatory (node 12743) and the northbound on slip/ mainline/southbound off-slip (node 12739) experience significant congestion.

3.5.4 The A14 junction 9 experiences significant and highly significant maximum V/C values at a number of different locations. The A509 northern arm / A14 off-slip approach (node 12704) is at between 97-101% in both the AM and PM peak. The A509 southern arm shows a highly significant maximum V/C of 115% in the PM peak, and 112% in the AM peak. Both eastbound on and off-slips with the A14 mainline (nodes 10405 and 10408) experience significant congestion with V/C between 85-99% across both peaks. Also the Boughton arm experiences severe congestions with over V/C of 100% in both peaks.

3.5.5 Within Kettering, in the AM peak the following junctions show highly significant congestion (V/C over 100%); but these junctions do not stand out as problem in the PM peak apart from 10706 (V/C of 89%):

- A6003 Barton Road / Pytchley Road (node 10768)
- A509 Pythcley Road / Holdenby / Carina Road / Orion Way (node 10706)
- A6003 Barton Road / Warkton Lane (node 11118)
- A6900 Queens St/London Rd (node 10519)

3.5.6 Within Rothwell and Kettering, the following junctions show capacity issues (85-100%) in both peaks:

- A4300 Rothwell Rd / A6003 Northfield Avenue / Lower Street (node 10549)
- B576 High Street (node 12443)
- B576 High Street / B576 Desborough Road / Bridge Street (node 12466)
- A14 J8 - A6013 Northampton Road (node 12733)
- A14 J10 - EB off slip / WB on slip / Mainline (node 12716)
- A14 J4 - EB on slip / WB off slip / Mainline (node 12754)

3.5.7 Flows on the A43 between Northampton and Kettering vary from 1000 PCUs to 1350 PCUs in one direction. No significant congestion is shown along this corridor. The A43 approach at Junction 8 is operating within capacity in both peaks.

3.5.8 The Isham Bypass experiences highly significant congestion at the northern A509 Kettering Road roundabout (node 28045), with both the northern A509 approach and the bypass approach experiencing highly V/C values over 95%. Generic saturation flows have been assumed at this junction in the absence of any detailed designs having been provided Subsequent re-testing of the performance of this junction through detailed junction modelling and re-runs of the NSTM may be required.

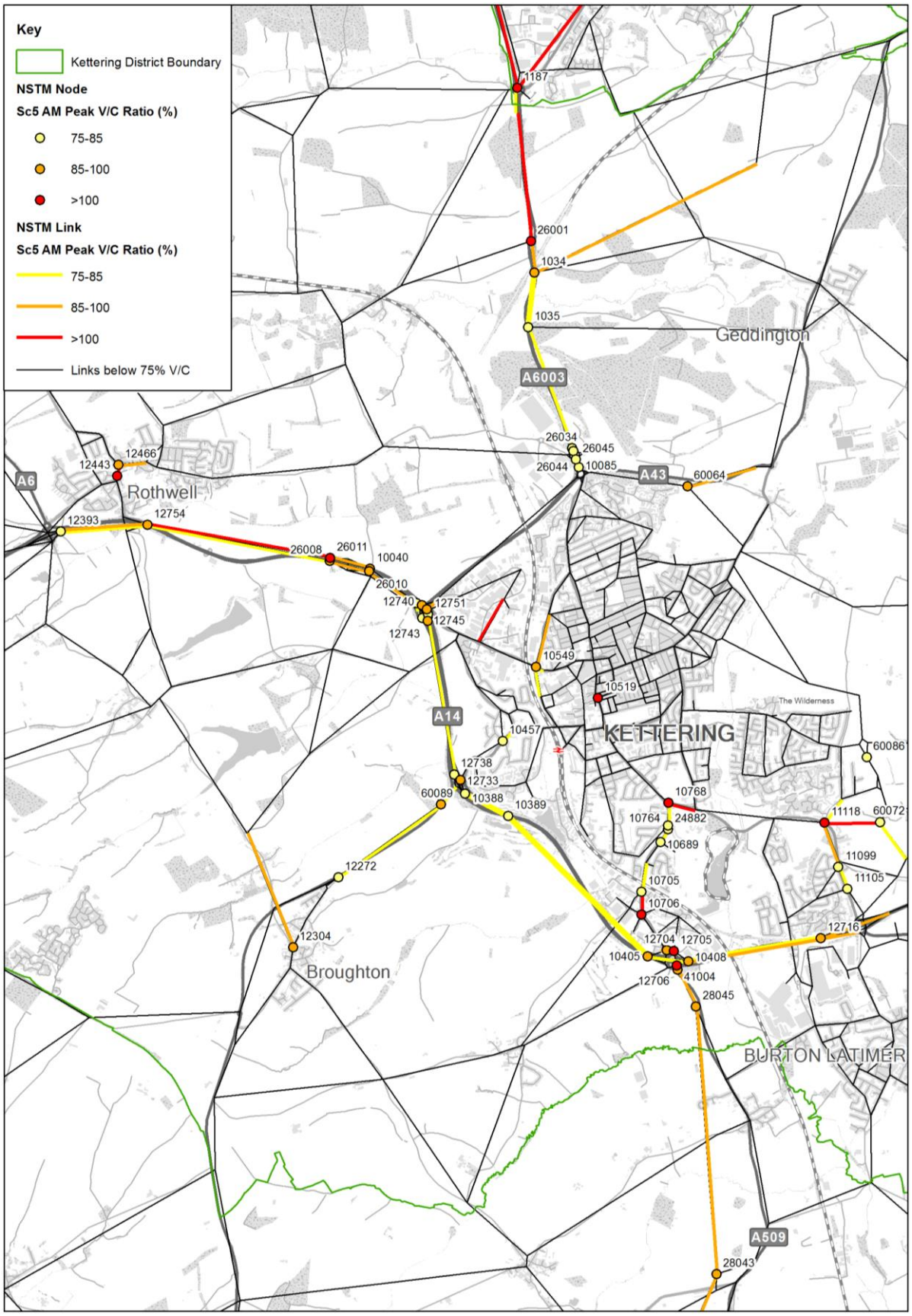


Figure 3.5: Scenario 5 V/C – 2031 AM – Kettering

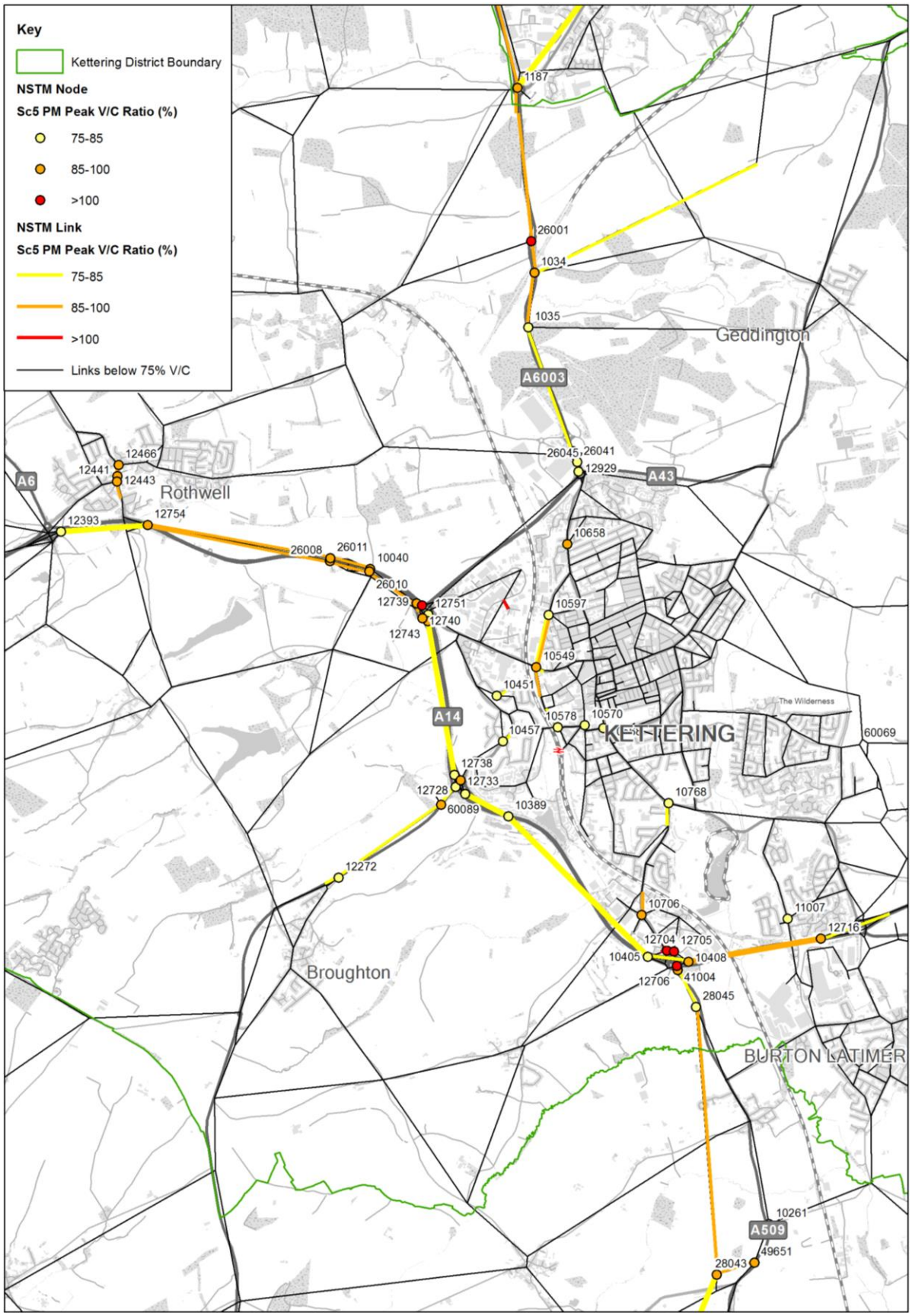


Figure 3.6: Scenario 5 V/C – 2031 PM – Kettering

3.6 Scenario 5 - Wellingborough

3.6.1 Figure 3.7 and figure 3.8 details the maximum V/C for junctions in the borough of Wellingborough.

3.6.2 The southern end of the Isham Bypass at the junction with Hilltop Road (node 28043) experiences highly significant congestion with maximum V/C of 91-99% in both peaks. In the PM peak, Isham Bypass link / A509 Kettering Road (node 28043) also shows highly significant congestion with maximum V/C of 92% .Continuing south, the junction along the IWIMP corridor related to the Wellingborough North development (node 28038) also shows significant congestion with a V/C of between 85-100% in the AM peak. The results suggest further analysis may be required of the Isham Bypass and IWIMP corridor.

3.6.3 Along the Sywell Road corridor, the Overstone Road/Wellingborough Road/ Sywell Road (node 1137) experiences high delays in the AM peak, with a maximum V/C of 97%.

3.6.4 The A45 Higham Road / A509 Wilby Way roundabout shows significant congestion in both peaks. The segregated left turn from the A45 Higham Road to the A45 southbound is the worst performing element of this junction (nodes 49711 and 49712) with V/C values between 93-94% across both peaks.

3.6.5 Within Wellingborough town centre, the following junctions experience highly significant congestion, with V/C over 100% in either the AM or PM peak:

- A5193 High Street / Silver Street / A5128 Oxford Street (node 11463)
- A5128 Cannon Street / Alma Street (node 11567)
- A5193 High Street / Queen Street (node 41031)
- A5193 High Street / A5128 Church Street (node 11324)

3.6.6 In the AM peak, significant congestion afflicts the A45 further south at junctions 10 (Earls Barton) and junction 11 (Great Doddington) with V/C values peaking between 91-98%. This includes the following approaches:

- A45 junction 11 northbound off-slip (node 11936)
- A45 junction 11 southbound on-slip (node 11938)
- A45 junction 10 Northampton Road approach (node 12605)
- A45 junction 10 Grendon Road (node 12630)

3.6.7 In both peaks, the following junctions show moderate to significant congestion with V/C values ranging 82-89%:

- A510 Wellingborough Road / Sidegate Lane (node 10272)
- A45 / Chester Road (to Irchester) (node 11143)
- A45 WB on-slip / A5001 Northampton Road / Ditchford Road (node 11609)

3.6.8 In the PM peak, some junctions exhibit significant congestion with V/C value of over 90% shown below:

- Westfield Road / Sun Lane (node 11396)
- A45 J11 - Doddington Road / NB on/off slips (node 11795)
- Stanton Cross/WEAST junction near Grange Farm (node 36514)
- Isham Bypass link / A509 Kettering Road (node 49651)

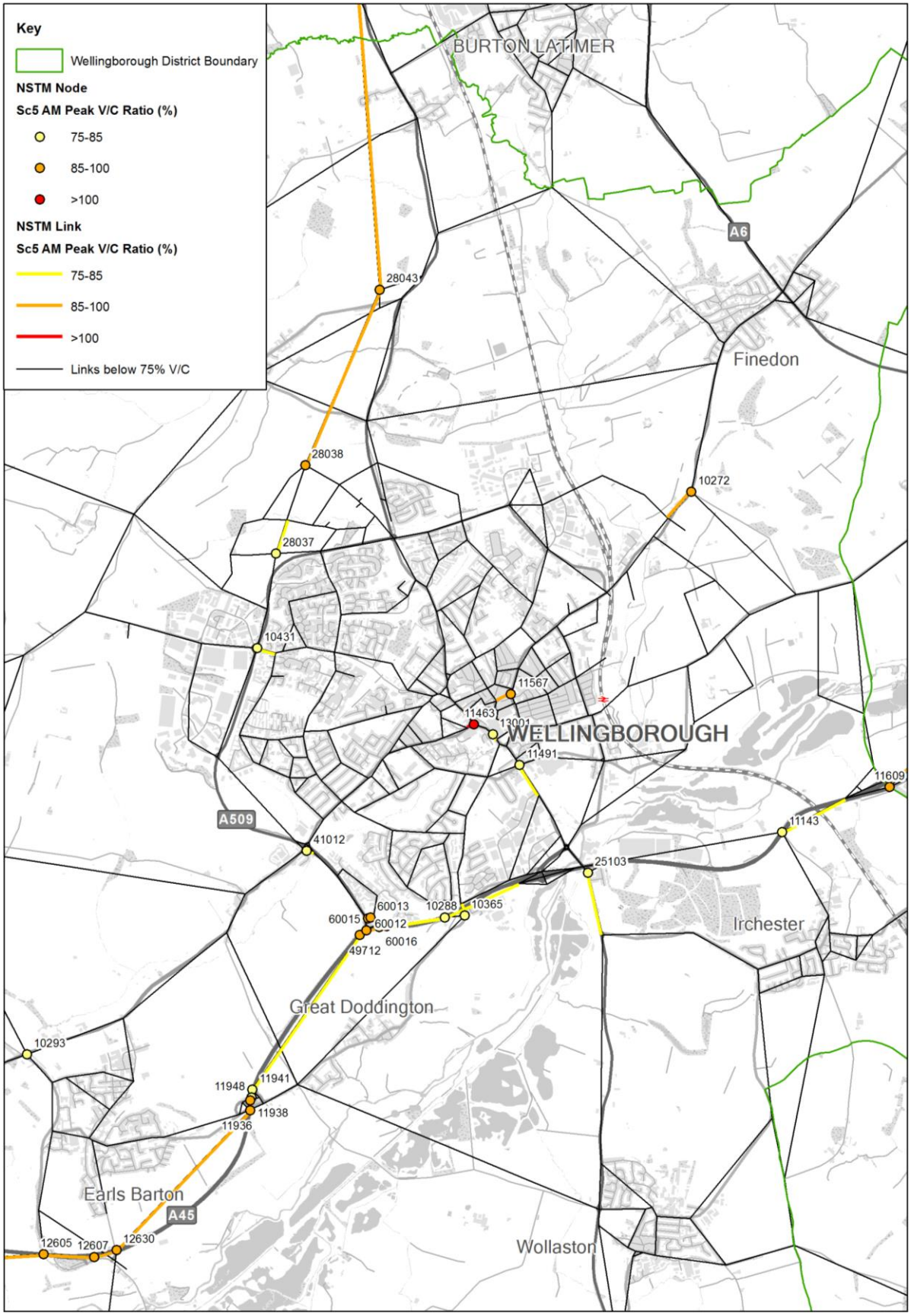


Figure 3.7: Scenario 5 V/C – 2031 AM – Wellingborough

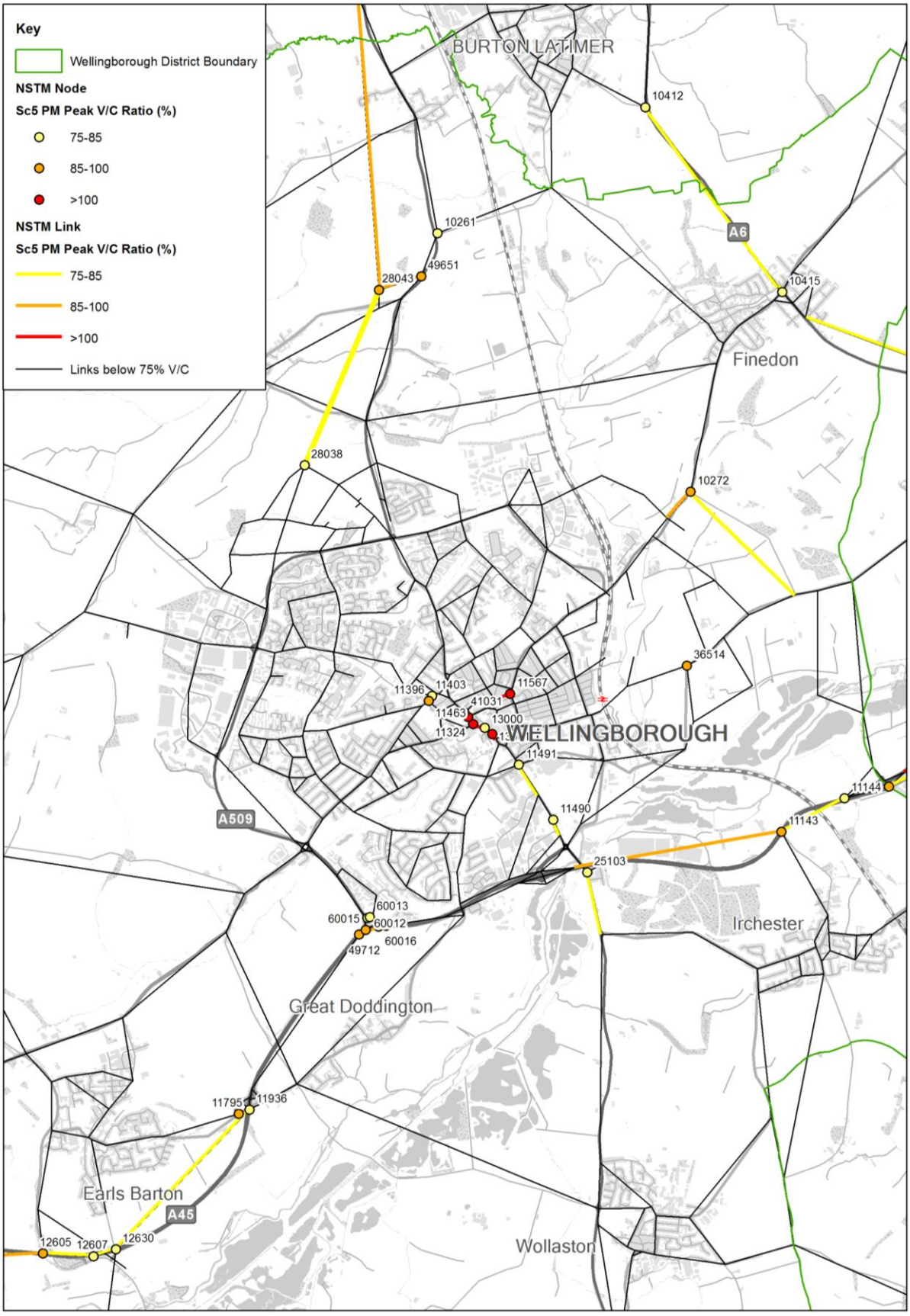


Figure 3.8: Scenario 5 V/C – 2031 PM – Wellingborough

4 Sensitivity Tests

4.1 Introduction

4.1.1 Sensitivity tests were carried out for Scenario 5. These were used to highlight the relative impact of specific additional developments that have at present been identified as potential sites for growth, but which are presently at a conceptual stage

4.2 Additional developments tested

4.2.1 The underlying assumptions in Scenario 5 remained unchanged in the sensitivity tests. The difference is the inclusion of the developments outlined in table 4.1

Table 4.1: Additional developments included in sensitivity tests

LPA	Development	Jobs	Housing
Corby	Rockingham Motor Speedway	3,580	-
East Northamptonshire		6,133	-
East Northamptonshire	Deenethorpe Airfield	210	1,000
Kettering	Kettering Energy Park	375	-

4.2.2 The inclusion of the above developments in the sensitivity tests mainly leads to flow differences in Corby and Oundle. Flows remain stable in Wellingborough, whilst in Kettering; the Kettering Energy Park development does not lead to significant changes in traffic levels or routing due to the relatively small scale of the development and over-supply of employment relative to housing in the borough of Kettering.

4.3 Scenario 5 sensitivity test

4.3.1 Figure 4.1 to figure 4.6 detail the flow difference between Scenario 5 and the Scenario 5 sensitivity tests in Corby, Oundle and Kettering.

4.3.2 In Corby the increases in flow in the sensitivity test occur on the A43, A6003 and A6116. Figure 4.1 shows in the AM peak, southbound flow on the A6003 increases by around 80 PCUs, whilst southbound on the A43 Stamford Road flow increases by around 200 PCUs east of the Priors Hall development. Two-way flow on the A6116 Brigstock Road increases by around 430 PCUs due to the Rockingham Motor Speedway development. Figure 4.2 shows in the PM peak increased flow northbound on the A6003 of around 80 PCUs and 200 PCUs northbound on the A43 Stamford Road occurs, whilst two-way flow on the A6116 Brigstock Road increases by over 450 PCUs.

4.3.3 Figure 4.3 and figure 4.4 show increased flow on the A427 Benefield Road to and from Oundle due to the inclusion of the re-development of Rockingham Motor Speedway and Deenethorpe Airfield, increasing two-way in the AM peak by 150 PCUs, and by around 55 PCUs in the PM peak.

4.3.4 Figures 4.5 and 4.6 show the difference in flow in Kettering. The inclusion of the Kettering Energy Park is not shown to significantly change the traffic flows. This is due to the difference in the housing and employment assumptions detailed in tables 2.9 and 2.10 which show the employment demand is much higher than the housing supply. Therefore adding further employment to this LPA does not generate a substantial difference in traffic as there is insufficient demand from the housing for the additional employment which has been added.

4.3.1 Appendix C includes the V/C ratios for the Scenario 5 sensitivity test runs. In the AM peak, the inclusion of the Rockingham Motor Speedway leads to a worsening in performance at the A6116 Gretton Brook Road / Causeway Road / Princewood Road (node 1291) junction which increases from 83% V/C in the main Scenario 5 assignment to 99% in the sensitivity test. In the PM peak, this junction shows increases from 60% V/C in the main Scenario 5 assignment to 80% in the sensitivity test. The A6116 Rockingham Road / A6116 Gretton Brook Road / Rockingham Road (node 1199) junction shows a worsening performance, rising to 100% V/C in the sensitivity test, having been at 96% V/C in the main Scenario 5 PM peak assignment.

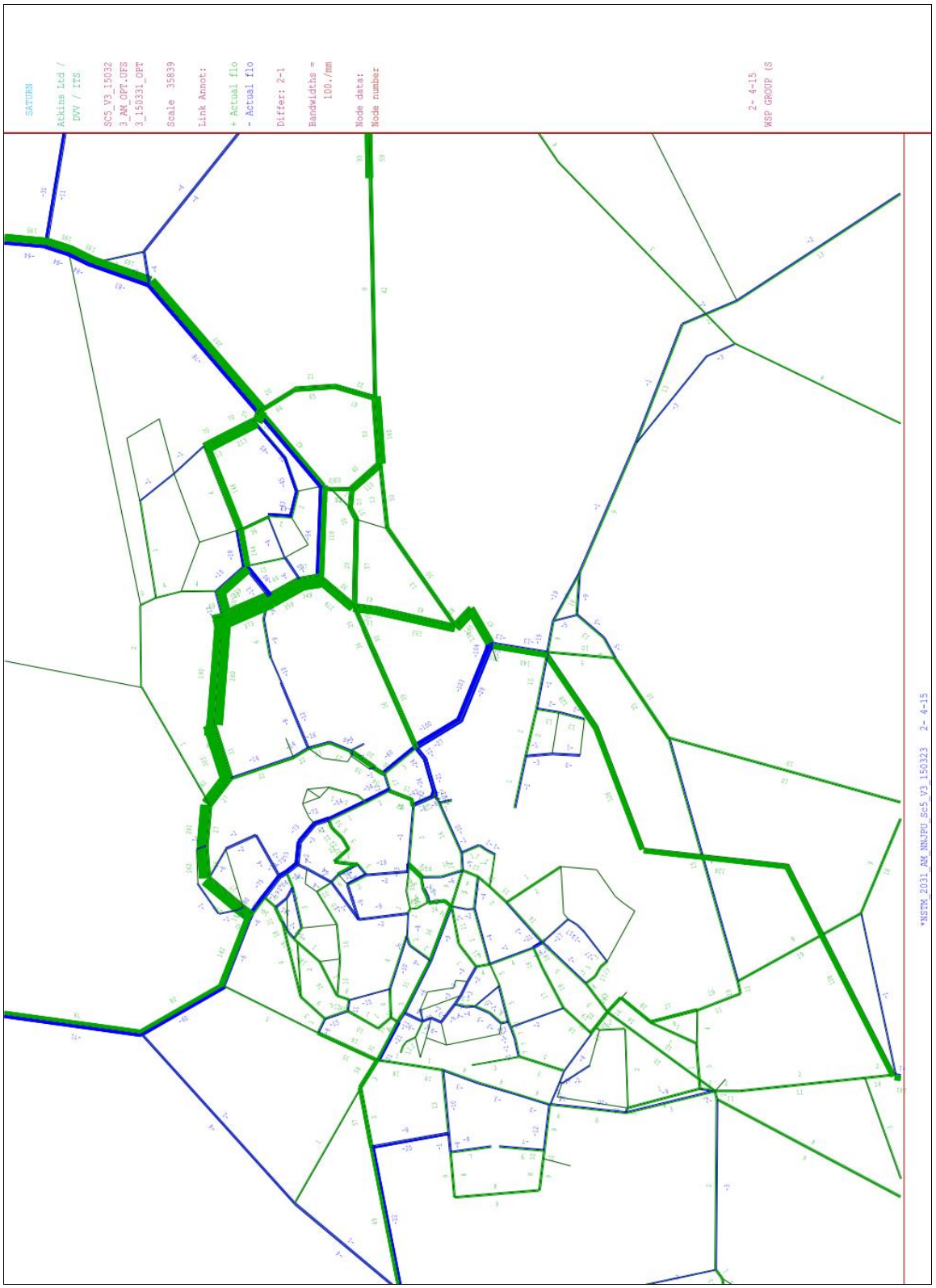


Figure 4.1: Flow difference – 2031 AM - Scenario 5 vs Scenario 5 sensitivity test – Corby

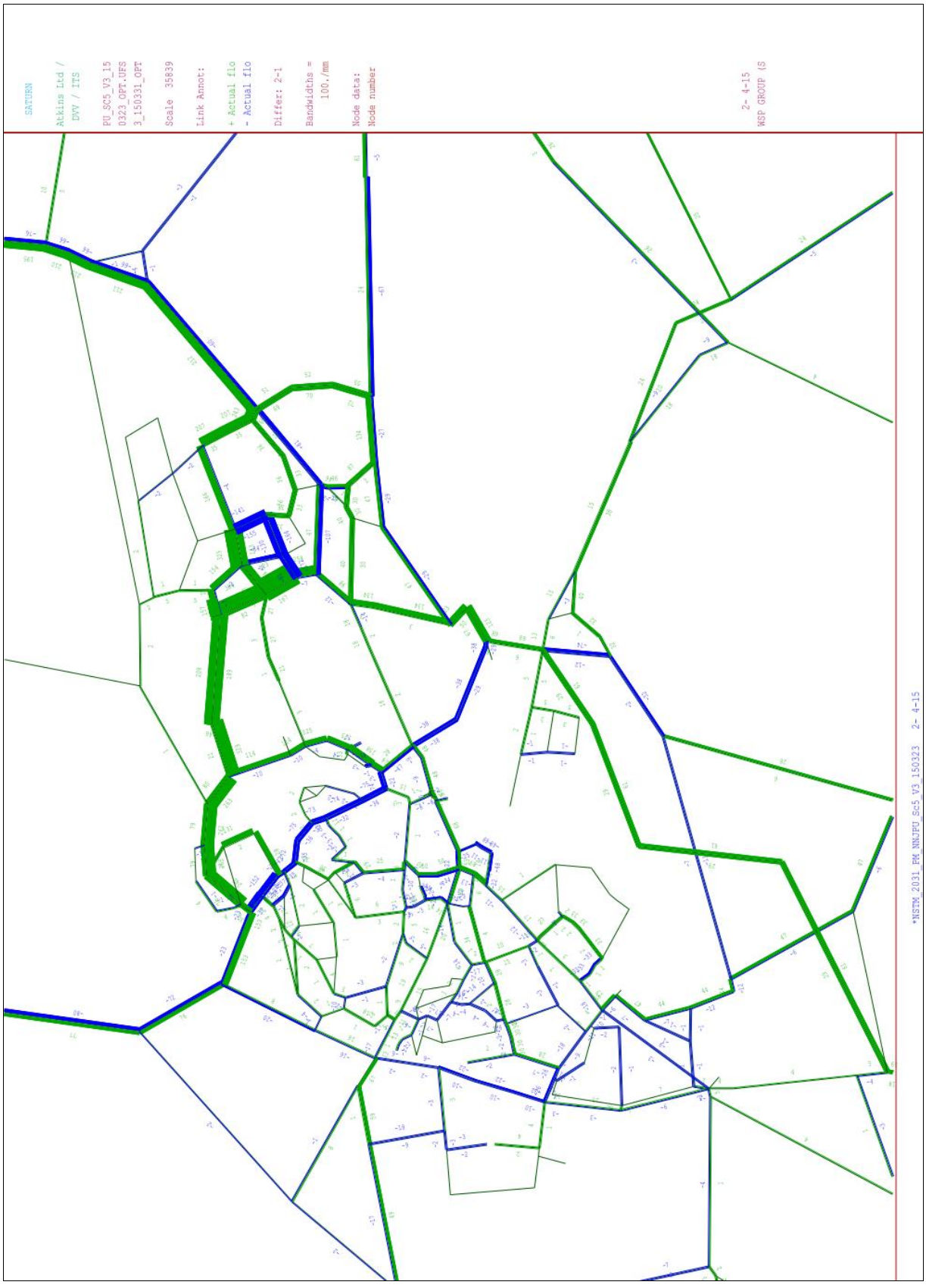


Figure 4.2: Flow difference – 2031 PM - Scenario 5 vs Scenario 5 sensitivity test – Corby

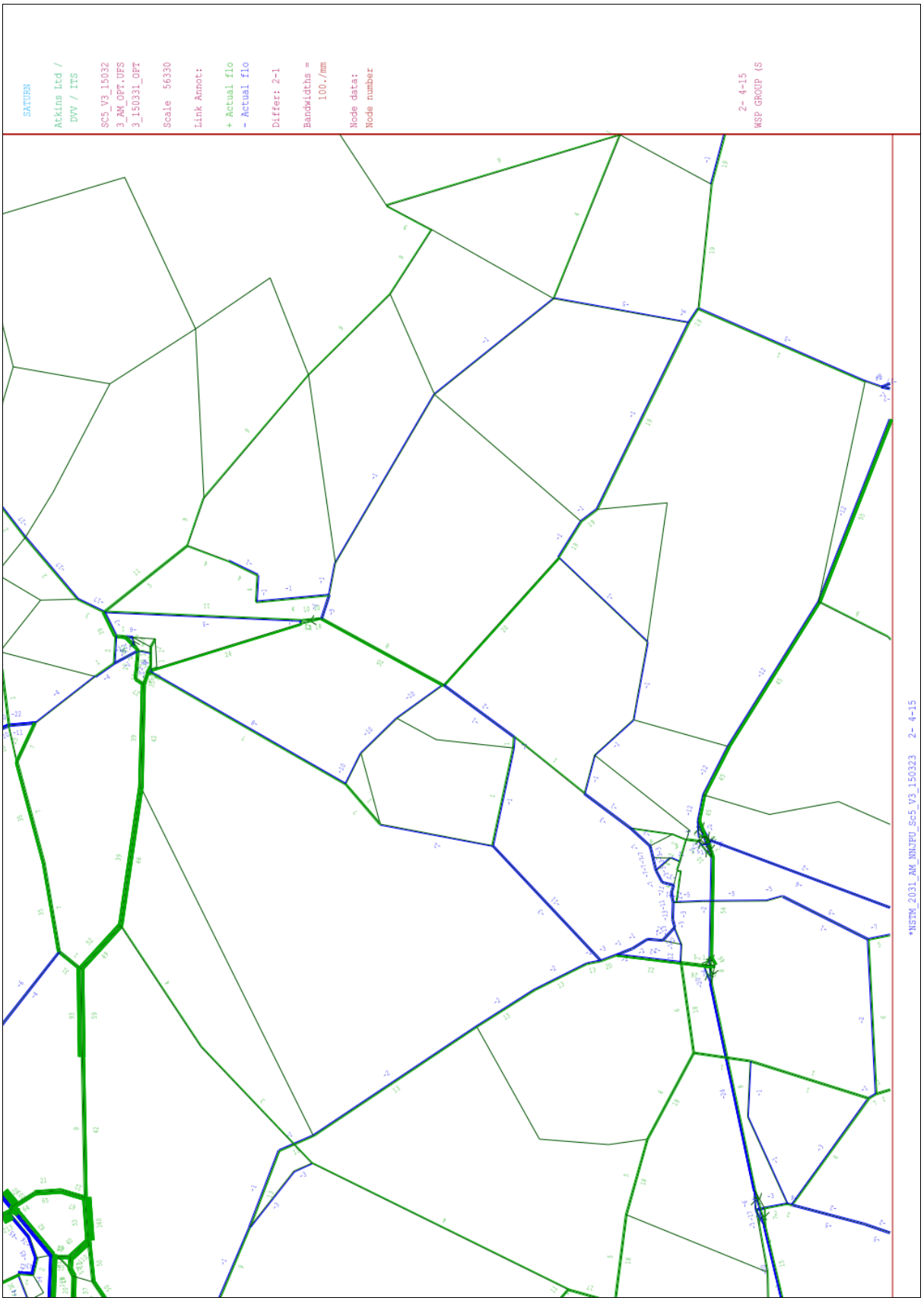


Figure 4.3 Flow difference – 2031 AM - Scenario 5 vs Scenario 5 sensitivity test – Oundle

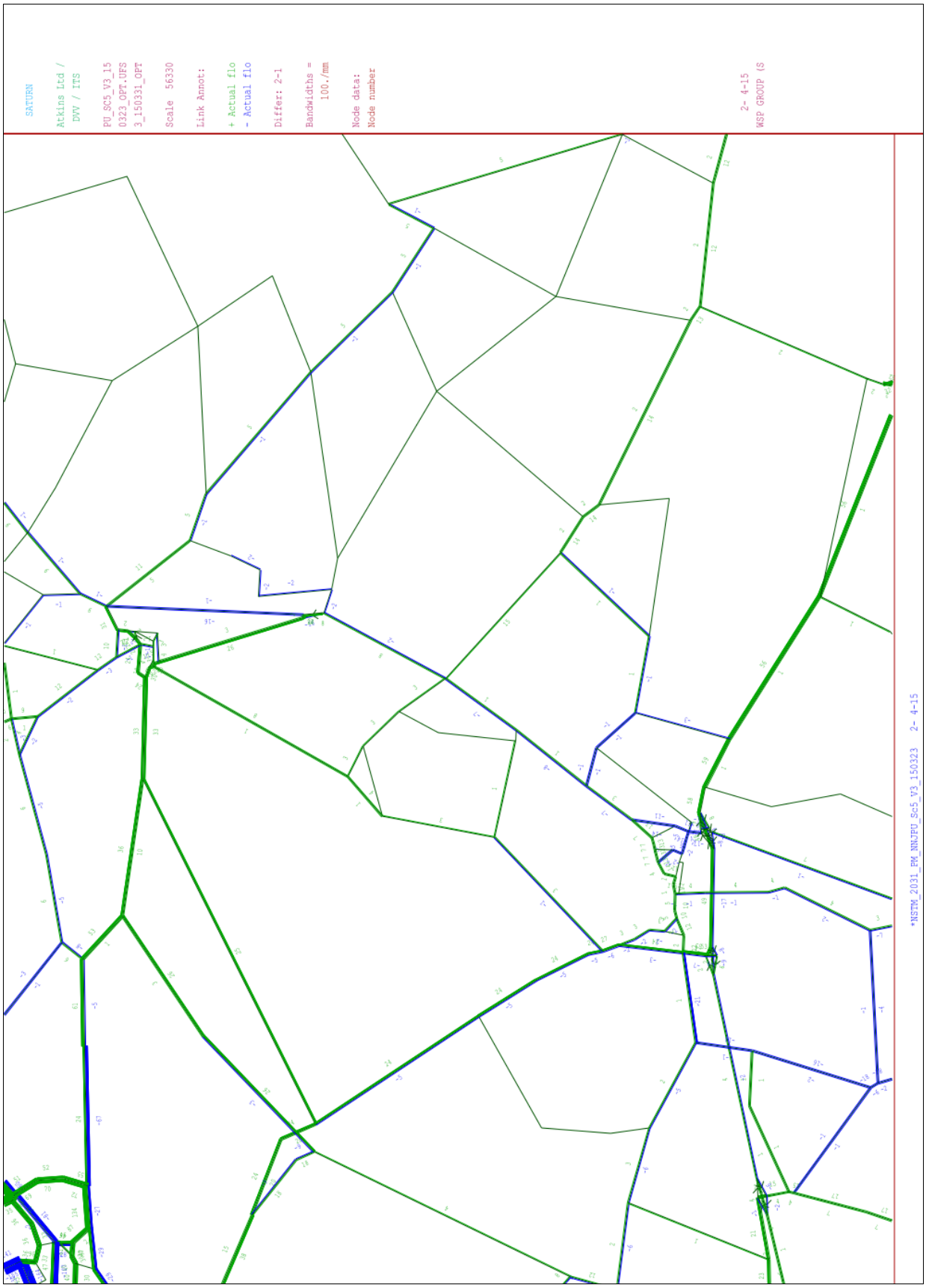


Figure 4.4 Flow difference – 2031 PM - Scenario 5 vs Scenario 5 sensitivity test – Oundle

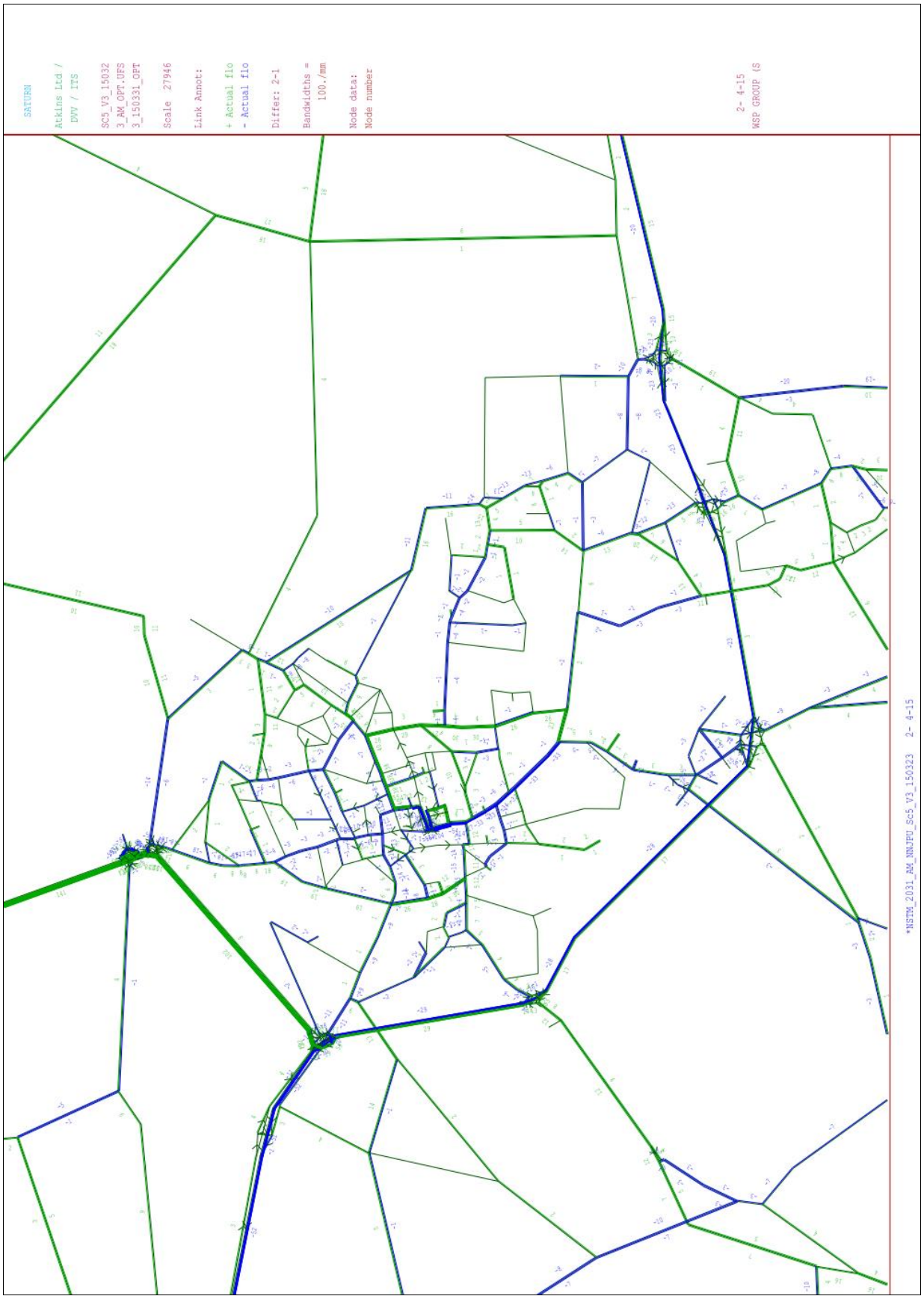


Figure 4.5 Flow difference – 2031 AM - Scenario 5 vs Scenario 5 sensitivity test – Kettering

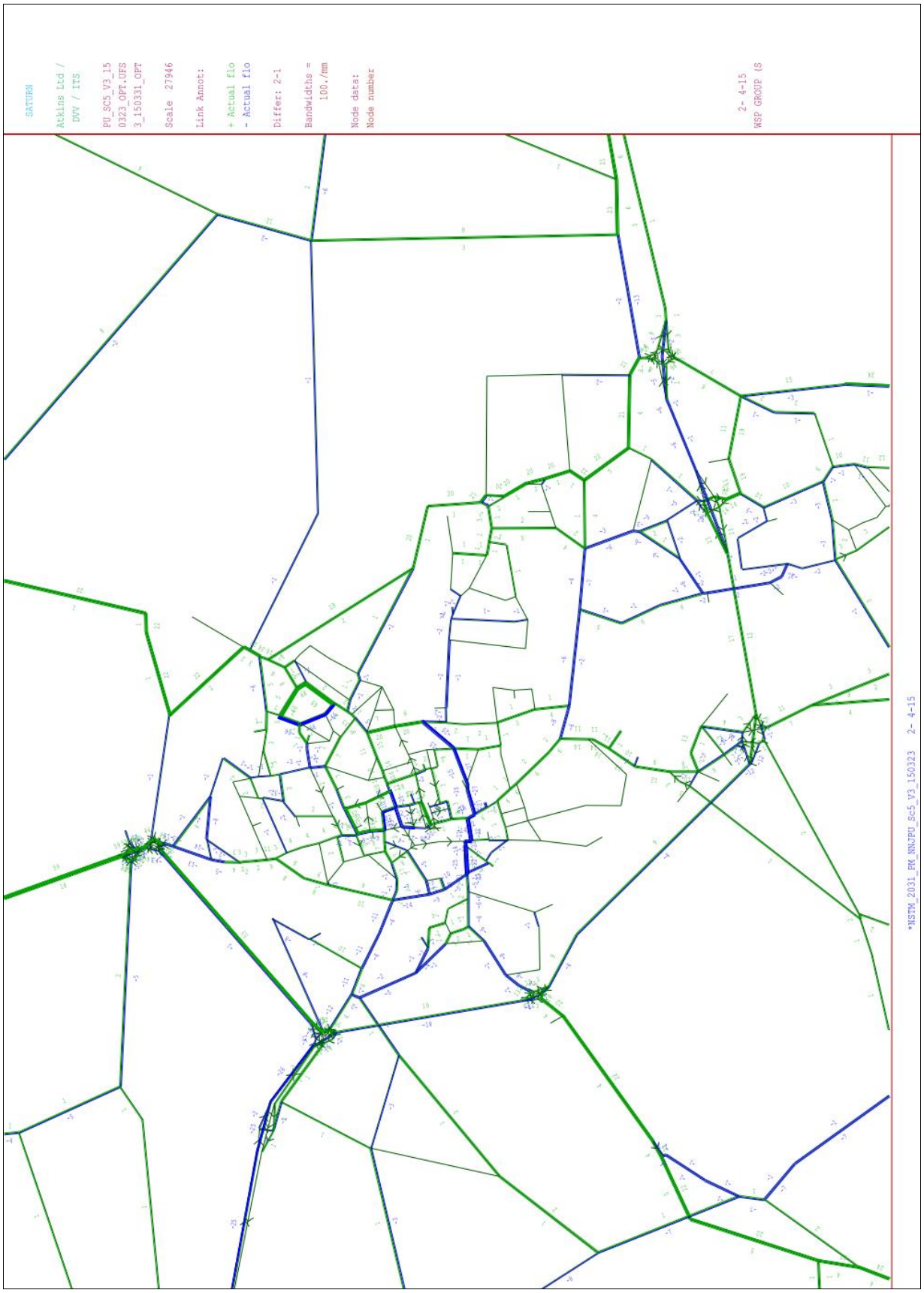


Figure 4.6 Flow difference – 2031 PM - Scenario 5 vs Scenario 5 sensitivity test – Kettering

5 Conclusions

5.1.1 The modelling detailed in the previous "Northamptonshire Strategic Transport Model Traffic Forecasting Report of the JCS" tested two different employment distributions described as Scenario 2 and Scenario 5. Following on from this the "Northamptonshire Strategic Transport Model Traffic Forecasting Report of the JCS Addendum" re-tested employment Scenario 2 with a revised distribution of housing in Kettering Borough and improvements to various elements of the draft IDP. The modelling in this report is based on an amended version of the Scenario 5 (Housing) assumptions, but includes the infrastructure improvements outlined in the "Northamptonshire Strategic Transport Model Traffic Forecasting Report of the JCS Addendum". The NNJPU requested this scenario is taken forward for further testing as the employment and housing distribution in this scenario most closely aligns with the North Northamptonshire Joint Core Strategy.

5.1.2 Following the results of the modelling, the key infrastructure on the corridor between Kettering and Wellingborough listed below are shown to experience highly significant congestion problems. Further analysis of the junction designs along this route may be required in order to understand the nature of capacity constraints on these strategic corridors.

- A14 Junction 9
- Isham Bypass
- IWIMP

5.1.3 Along the A45 corridor, four junctions in particular show highly significant congestion, listed below. Further detailed analysis of the designs at these junctions may be required.

- Skew Bridge / Rushden Lakes roundabout
- A45 / West Street (Stanwick roundabout)
- A45 / B663 London Road (Raunds roundabout)
- A14 Junction 13 (A14 / A45)

5.1.4 The Chowns Mill (A6 / A45) roundabout design included in the NSTM is shown to generally cope with forecast levels of traffic, though one element of the design reaches a volume to capacity ratio of 94% in the PM peak. However, the results for this junction represent a significant improvement in comparison to previous NSTM results provided to the NNJPU.

5.1.5 The following junction on the A43 in particular is shown to be consistently over capacity and may require further analysis:

- A43 Stamford Road / Geddington Road roundabout

5.1.6 The A43 between Northampton and Kettering is operating within capacity. No junction has been flagged up with significant delays along this corridor.

5.1.7 Sensitivity tests were carried out for Scenario 5, including the Rockingham Motor Speedway, Deenethorpe Airfield and Kettering Energy Park developments. These main differences in the sensitivity tests affected the key roads in Corby and Oundle.

Appendices

Appendix A – Modelled developments

Appendix B – Previous Modelled developments

Appendix C – Maximum volume to capacity ratios at junctions

Appendix D – Traffic flow figures for Scenarios 5 and Scenario 5 Sensitivity model runs

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