

TOTON DEVELOPMENT STRATEGIC ASSESSMENT

TN04 – TOTON STRATEGIC MODELLING REPORT

IDENTIFICATION TABLE

Client/Project owner	Mode Transport Planning
Project	Toton Development Strategic Assessment
Title of Document	TN04 – Toton Strategic Modelling Report
Type of Document	Technical Note
Date	19/05/2026
Reference number	TN04
Number of pages	26

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1. INTRODUCTION

- 1.1.1 SYSTRA has been commissioned by Mode Transport Planning to assess the impact of three housing sites (Toton North, Toton East and Toton West) in Toton with primary access provided from Stapleford Lane. The East Midlands Gateway Model (EMGM) will be used to assess the impacts and access strategies of the Toton sites.
- 1.1.2 There will be four 'Do Something' scenarios to test the phasing of the development. These are as follows:
- Scenario 1 – Toton West only
 - Scenario 2 – Toton West and East
 - Scenario 3 – 'Full Scenario' (Toton West, East and North, including Toton Link Road)
 - Scenario 4 – 'Full Scenario' plus Chetwynd sensitivity test
- 1.1.3 Initially, the reporting will be for Scenario 3, as this is the priority test.
- 1.1.4 This Technical Note details the approach taken to develop and assess the four 'Do Something' scenarios. Analysis has been undertaken within the East Midlands Gateway Model (EMGM), with comparisons made against the reference case model defined in technical note TN03.



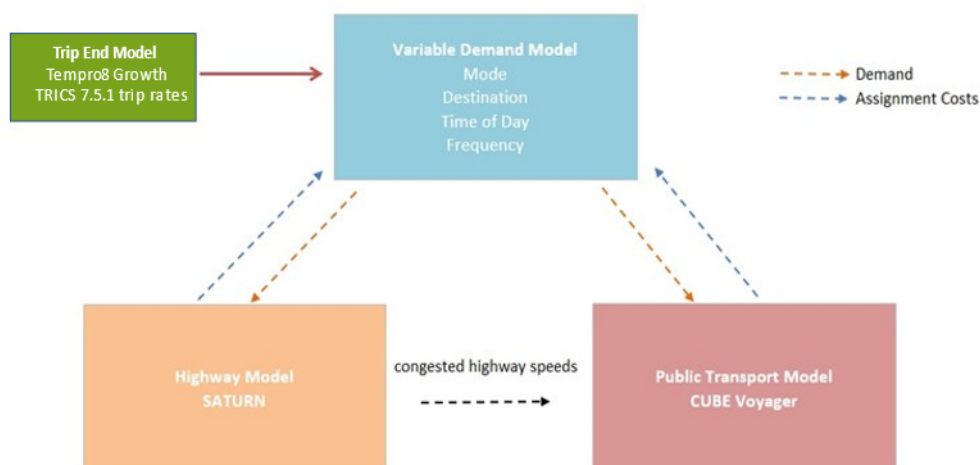
2. FORECASTING METHODOLOGY

2.1 Structure of the East Midlands Gateway Model (EMGM)

2.1.1 The EMGM was developed as a multimodal transport model built following guidance in the Department for Transport's (DfT) Transport Analysis Guidance (TAG). An overview of the structure of the EMGM is shown in Figure 1. In summary, the modelling suite is comprised of the following elements:

- SATURN Highway Model;
- CUBE Voyager Public Transport Model;
- CUBE Variable Demand Model including destination, mode choice, trip frequency and time of day responses; and,
- TRICS based Trip End Model.

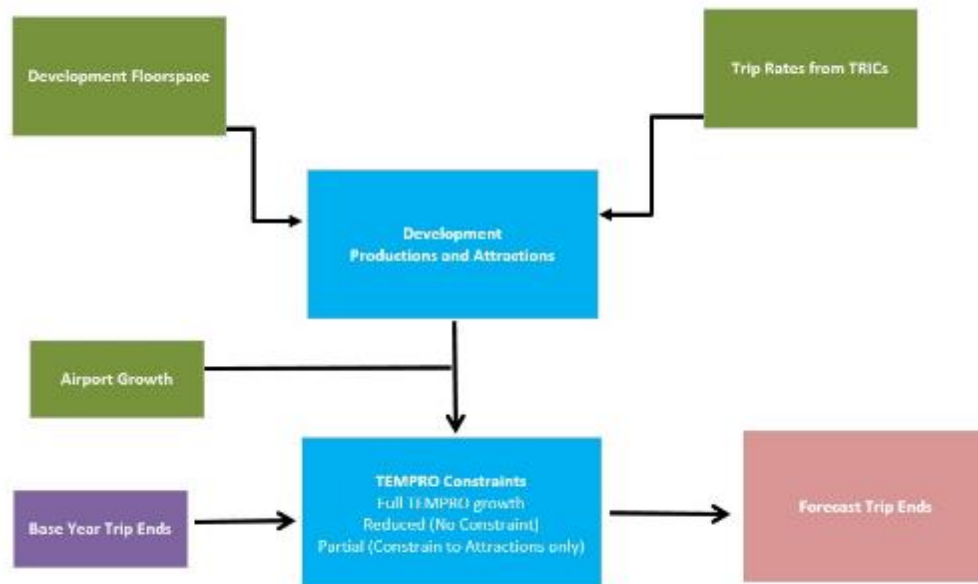
Figure 1. EMGM Technical Structure



2.2 Forecast Demand and the Trip End Model

- 2.2.1 Forecast demand is calculated in the Trip End Model, the structure of which is shown Figure 2.

Figure 2. Trip End Model Structure



- 2.2.2 The number of development trips is calculated from trip rates contained within TRICS software and applied to floorspace or the number of dwellings proposed at each development. The development trips are added to the base matrices and then background growth is applied to the matrix in a way that ensures that the outturn growth matches TEMPro 8 growth forecasts i.e. the EMGM is constrained to TEMPro growth.
- 2.2.3 Outturn generations for developments which have been entered specifically will closely align to the expected level of generations. Residual TEMPro growth is applied to surrounding wards within each MSOA and constrained at a district level.
- 2.2.4 East Midlands Airport growth provided by the airport is applied as a development zone to ensure that the growth in passengers and freight predicted by the airport is achieved within the model.
- 2.2.5 Trip rates have been extracted from TRICS 7.5.1 for different types of land-use and segmented by mode and time period. The final person trip rates applied in the trip end model are shown in Table 1. Trips rates exclude walk and cycling trips. These have been previously agreed during development of the model with the Local Authorities and National Highways for the development of previous EMGM Reference Cases.

Table 1. EMGM Person Trip Rates

	AM PEAK (08:00 – 09:00)			PM PEAK (17:00 – 18:00)		
	ARRIVAL	DEPARTURE	TOTAL	ARRIVAL	DEPARTURE	TOTAL
Residential 250> (per dwelling)	0.183	0.729	0.912	0.570	0.257	0.827
B1 Employment (per 100sqm)	1.631	0.115	1.746	0.102	1.479	1.581
B2 Employment (per 100sqm)	0.388	0.145	0.533	0.081	0.375	0.456
B8 Employment (per 100sqm)	0.087	0.023	0.110	0.011	0.042	0.090
Primary Education (per 100sqm)	7.193	1.613	8.806	0.311	0.658	0.969
Secondary Education (per 100sqm)	2.341	0.256	2.597	0.066	0.634	0.700
Food Retail (per 100sqm)	3.518	2.624	6.142	6.558	6.887	13.445
Non-Food Retail (per 100sqm)	0.287	0.069	0.356	0.253	0.206	0.459
Café/Restaurant/Bar (per 100sqm)	0.000	0.000	0.000	6.256	2.874	9.130
Health Centre (Clinic) (per 100sqm)	1.952	0.355	2.307	0.124	0.805	0.929



3. SCENARIO 1 – TOTON WEST

3.1 Introduction

- 3.1.1 This chapter details the development and infrastructure schemes that have been included in the 2026 and 2041 Scenario 1 test.
- 3.1.2 This Scenario includes 420 residential units associated with Toton West, situated to the West of Stapleford Lane.

3.2 Trip Rates

- 3.2.1 Trip Rates are assumed to be the standard EMGM rates for residential.

3.3 Infrastructure

- 3.3.1 Access to Toton West is assumed to be directly off Stapleford Lane, to the south of the Toton Lane Park and Ride site.
- 3.3.2 It is accessed by a single access road. No other infrastructure is provided.



4. SCENARIO 2 – TOTON WEST AND EAST

4.1 Introduction

- 4.1.1 This chapter details the development and infrastructure schemes that have been included in the 2026 and 2041 Scenario 2 test.
- 4.1.2 This Scenario includes 420 residential units associated with Toton West and 155 residential units associated with Toton East, both accessed off Stapleford Lane.

4.2 Trip Rates

- 4.2.1 Trip Rates are assumed to be the standard EMGM rates for residential.

4.3 Infrastructure

- 4.3.1 Access to Toton West and East are both assumed to be off Stapleford Lane, south of Toton Lane Park and Ride.



5. SCENARIO 3 – ‘FULL SCENARIO’

5.1 Introduction

- 5.1.1 This chapter details the development and infrastructure schemes that have been included in the 2026 and 2041 Scenario 3 test.
- 5.1.2 This Scenario includes 420 residential units associated with Toton West, situated to the West of Stapleford Lane.
- 5.1.3 It also includes 155 residential units associated with Toton East and 880 residential units associated with Toton North.

5.2 Trip Rates

- 5.2.1 Trip Rates are assumed to be the standard EMGM rates for residential.

5.3 Infrastructure

- 5.3.1 Access to Toton West is assumed to be directly off Stapleford Lane, to the south of the Toton Lane Park and Ride site.
- 5.3.2 It is assumed that the Toton Link Road will be built for this scenario, with access between Stapleford Lane and the A52 possible without having to traverse Bardills Roundabout.
- 5.3.3 Access to the Toton East and Toton North sites will be off the link road, with the East site closer to Stapleford Lane and Toton North closer to the A52.



6. SCENARIO 4 – ‘FULL SCENARIO’ PLUS CHETWYND SENSITIVITY

6.1 Introduction

- 6.1.1 This chapter details the development and infrastructure schemes that have been included in the 2026 and 2041 Scenario 4 test.
- 6.1.2 This Scenario has the same profile of developments as Scenario 3.

6.2 Trip Rates

- 6.2.1 Trip Rates are assumed to be the standard EMGM rates for residential.

6.3 Infrastructure

- 6.3.1 The infrastructure is the same as in Scenario 3, apart from the following difference. Access to the Chetwynd Barracks development will be provided from the Link Road as well as Swiney Way. Traffic will have a choice of either access points but no through access is modelled.



7. SCENARIO 3 ANALYSIS

7.1 Introduction

Scenario 3 includes Toton West, Toton East and Toton North, with a total of 1,455 residential units in both 2026 and 2041. It has been compared against their respective Reference Case.

7.2 Key Highway Impacts

Development Distribution

- 7.2.1 Site distribution represents the extent to which development traffic utilises the highway network.
- 7.2.2 For the 2026 year, distribution is shown in Figure 3 and Figure 4. For 2041 this is shown in Figure 5 and Figure 6. These show the routes that the newly generated traffic takes on the network.
- 7.2.3 The Toton developments are close to the A52 and M1, so the vast majority of traffic interacts with the SRN. In the AM peak, the largest flows are out of the development, towards Nottingham on the A52 Eastbound and towards Derby and the M1 on the A52 Westbound. In the PM peak the reverse is true, with traffic returning to the development.

Figure 3. 2026 Do Something – AM Distribution

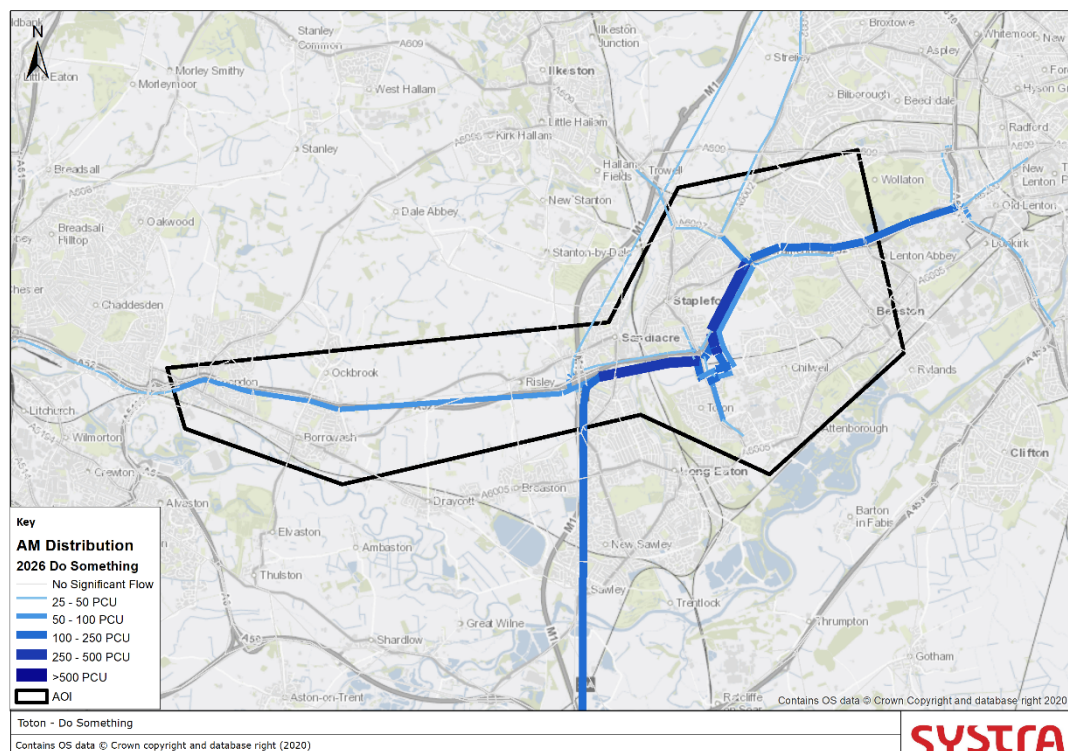


Figure 4. 2026 Do Something – PM Distribution

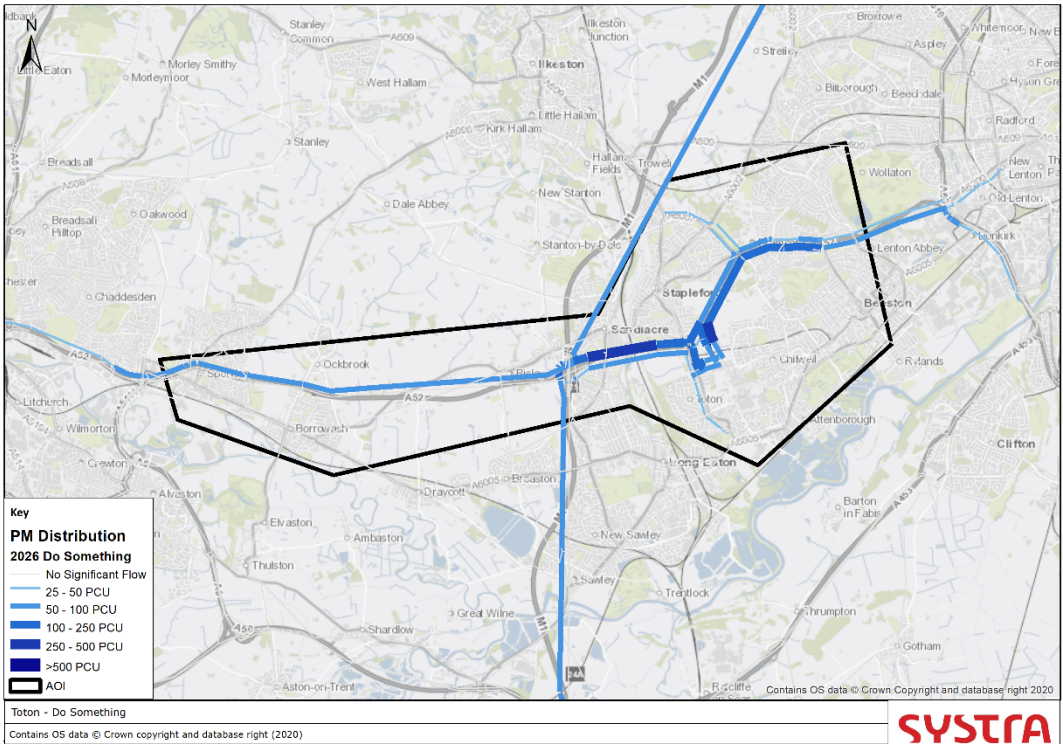


Figure 5. 2041 Do Something – AM Distribution

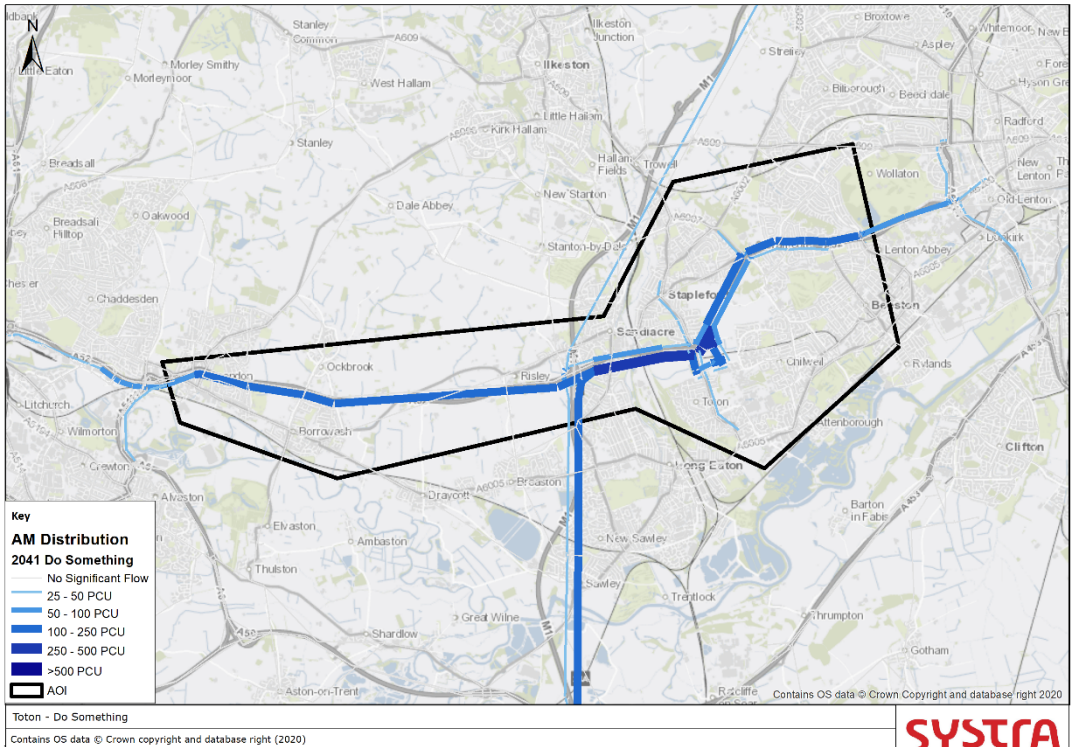
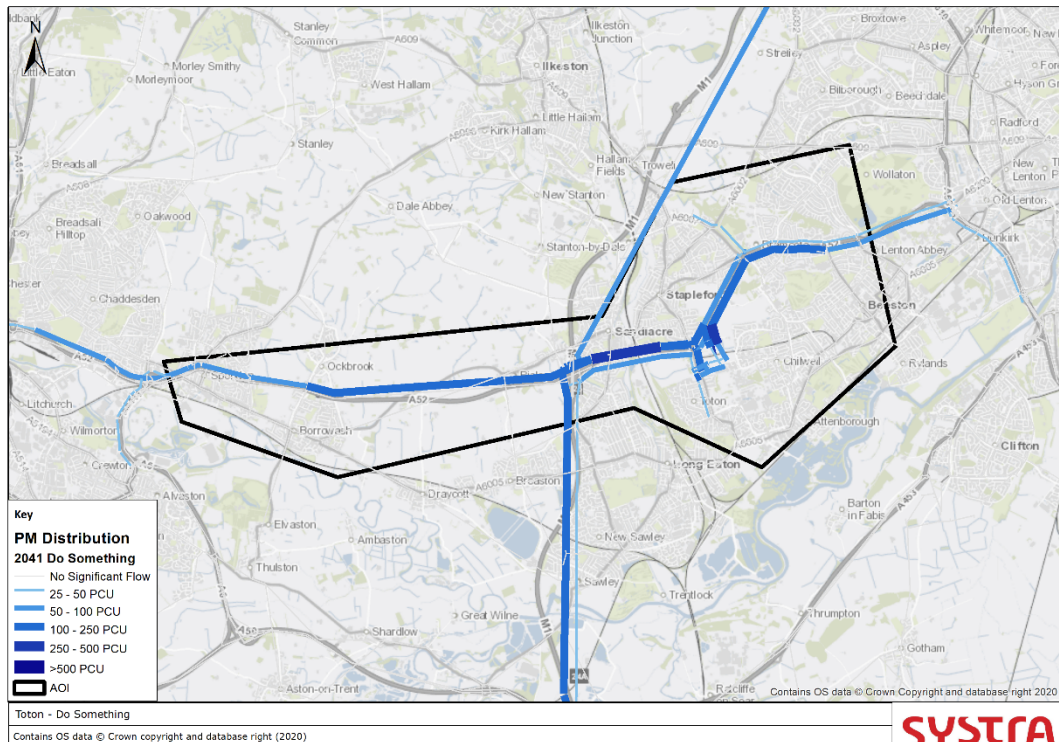


Figure 6. 2041 Do Something – PM Distribution



Background Traffic Reassignment

- 7.2.4 Traffic reassignment plots show the impact on non-development traffic with the introduction of the new development.
- 7.2.5 Figure 7 and Figure 8 show the reassignment in 2026, with Figure 9 and Figure 10 showing the same for 2041.
- 7.2.6 Blue links represent roads which background traffic is moving away from, whilst red links represent roads which experience an increase in traffic. Since demand tends to reassign away from major routes and spread over several minor routes, these plots can often be misinterpreted as an overall flow reduction.
- 7.2.7 There is a reduction in non-development traffic using the A52 and M1 south of M1 J25 across both years. The reduction on the A52 is in part caused by development traffic displacing non-development traffic, but it is also caused by the reduction in speed between Bardills and Bramcote roundabouts between the Reference Case and Do Something, with the addition of the Toton Link Road junction. This reduction in speed is because the junction is signalised, meaning traffic on the A52 is no longer free flowing and often needs to stop.
- 7.2.8 The traffic that is displaced from these routes does not use a single alternative; traffic reassigns in small numbers to individual roads. This includes routes away from the immediate vicinity of the development, such as the A38 between Derby and M1 and the A46 between Leicester and the A606 (both not shown in the plots). In 2026, some traffic moves to the A453 between the M1 and Nottingham.
- 7.2.9 There is also a reduction in traffic on the A6005 through Beeston in all peaks and years. In the AM peak of 2026, there is a reassignment to Town Street. The reduction in flow along the A52

allows more traffic to join Bramcote roundabout here. This means that less non-development traffic now travels through Beeston and joins the A52 further East. In the PM peak, the redistribution through Beeston is a result of the improved conditions of the A52. Whilst there is no significant change south of Long Eaton, the reduction in flow Eastbound begins at A50 J1 and increases along the B6540. Westbound, there is a reduction as far as Sawley, then an increase in flow all the way to A50 J1. Traffic from Sawley to Nottingham is therefore rerouting to the A50, M1 and A52 instead of using the A6005.

- 7.2.10 In the AM peak of 2041, conditions on the A52 improve such that traffic that travelled along Toton Lane, Swiney Way, A6005 and Wollaton road is now faster using the Link Road and A52. In the PM peak, traffic that used the A6005 now routes up Toton Lane, along the Link Road and A52.
- 7.2.11 In the PM peak of 2041 there is a reassignment from Tamworth Road to Wilsthorpe Road. Instead of travelling down Tamworth Road and up Wilsthorpe Road, traffic now travels via Derby Road. This is route flipping in the model due to small changes in flow/delays.

Figure 7. 2026 Do Something vs Reference Case – AM Reassignment

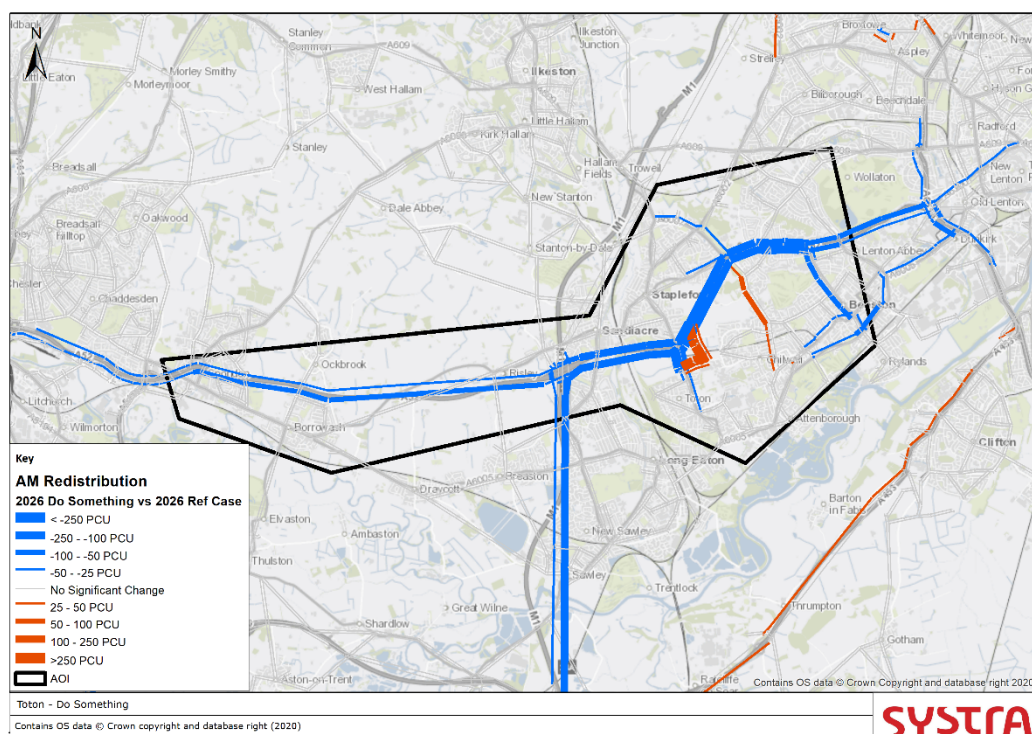


Figure 8. 2026 Do Something vs Reference Case – PM Reassignment

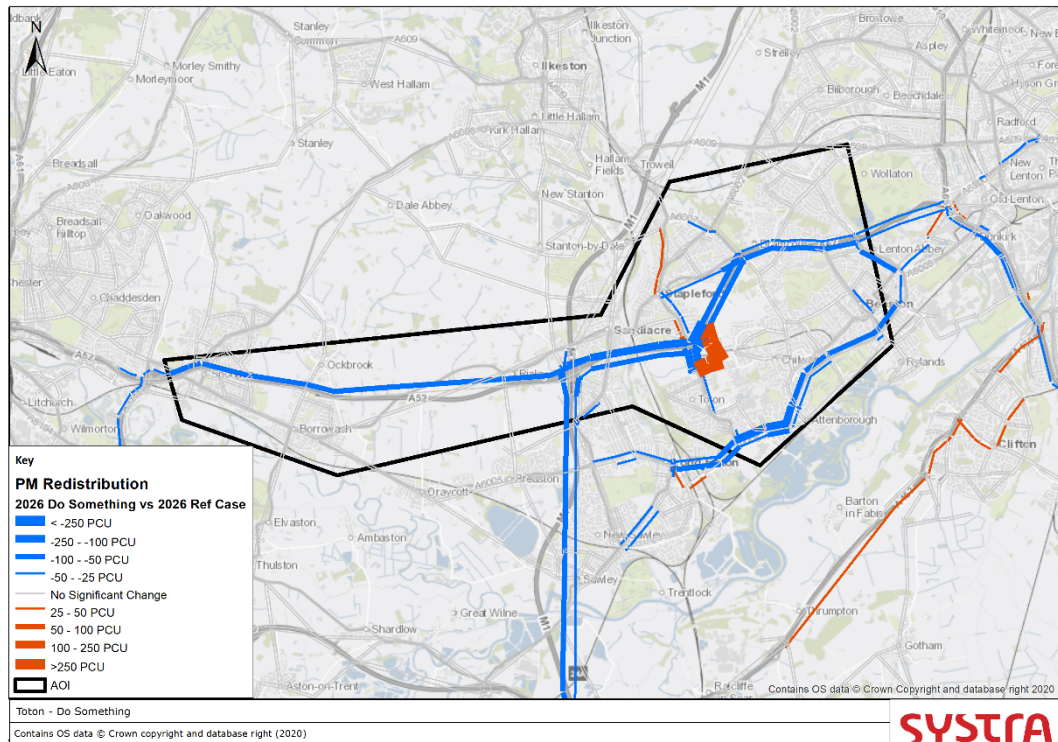


Figure 9. 2041 Do Something vs Reference Case – AM Reassignment

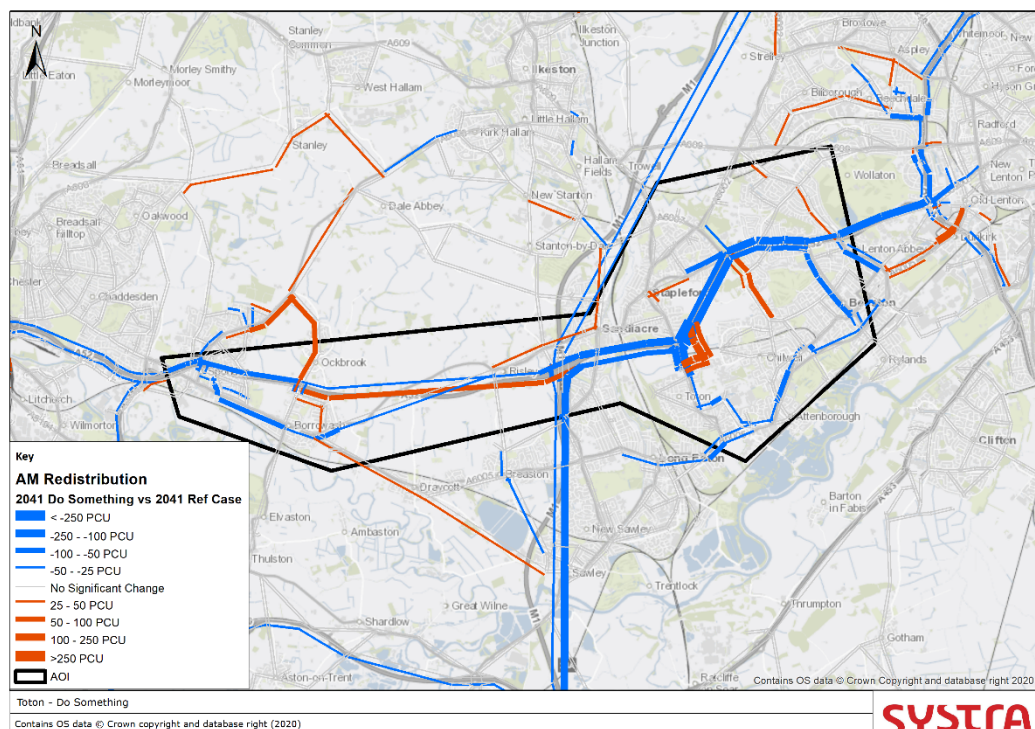
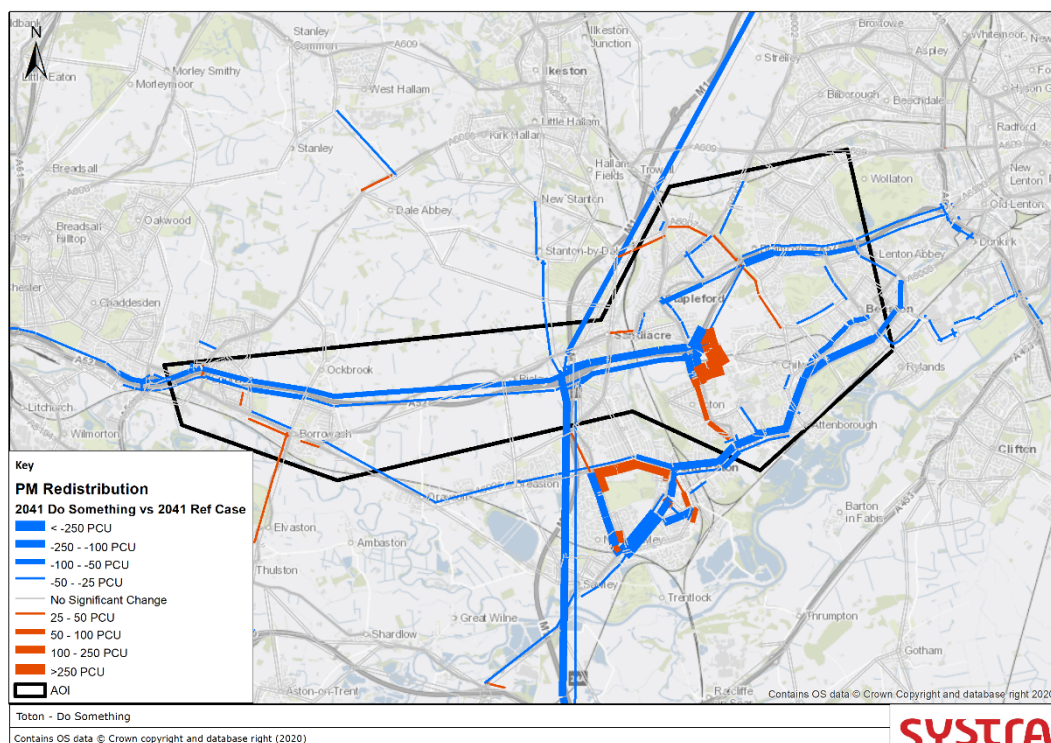


Figure 10. 2041 Do Something vs Reference Case – PM Reassignment



Flow Change

- 7.2.12 Flow change is measured by determining change in actual flow between the Reference Case and the Do Something scenario. Red lines represent roads which experience a net increase in traffic whilst green lines represent roads which experience a net reduction in traffic.
- 7.2.13 The addition of a signalised junction on the A52 between Bardills and Bramcote Roundabouts to connect the Toton Link Road serves to slow down traffic. This changes the type of traffic using the route.
- 7.2.14 In all cases there is a reduction in traffic using Toton Lane between the Link Road and Bardills Roundabout, as well as on the A52 between the Link Road and Bardills Roundabout in both directions. This is because traffic heading between Toton and Nottingham can now avoid Bardills Roundabout entirely.
- 7.2.15 In the AM Peak, there is a reduction in flow from M1 J25 and Bardills Roundabout, also between Wollaton Road and Toton Link Road. This is because traffic seeks an alternative route to avoid the delay of the signals. There is an increase in the opposite direction, from Bardills roundabout towards Derby and from Toton Link Road towards Nottingham. This increase is traffic from the Toton developments.
- 7.2.16 In the PM Peak, the reverse is generally true, with an increase in traffic on the A52 towards the development, although there is an increase in flow on the A52 between Toton Link Road and Bramcote Roundabout.

Figure 11. 2026 Do Something vs Reference Case – AM Flow Change

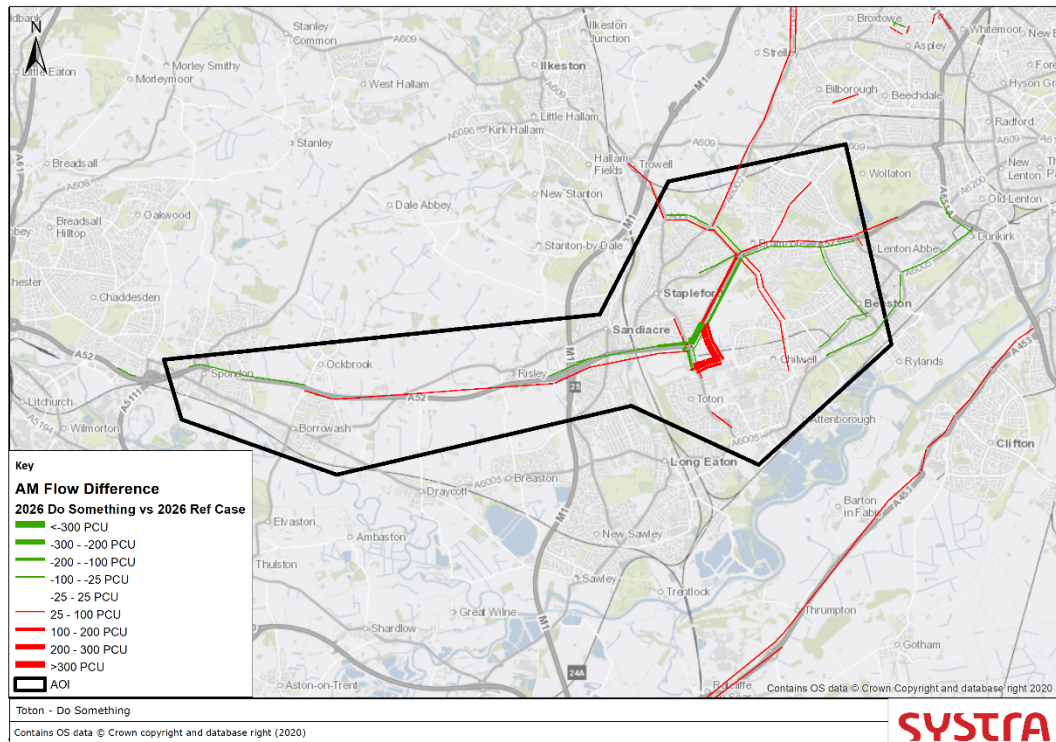


Figure 12. 2026 Do Something vs Reference Case – PM Flow Change

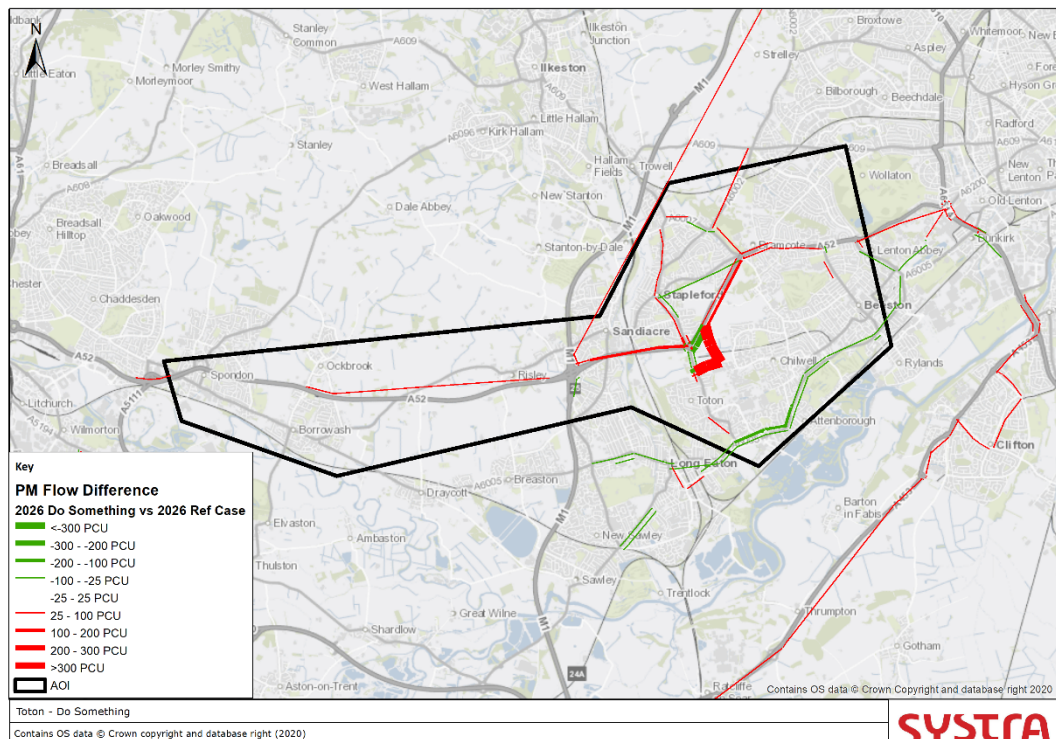


Figure 13. 2041 Do Something vs Reference Case – AM Flow Change

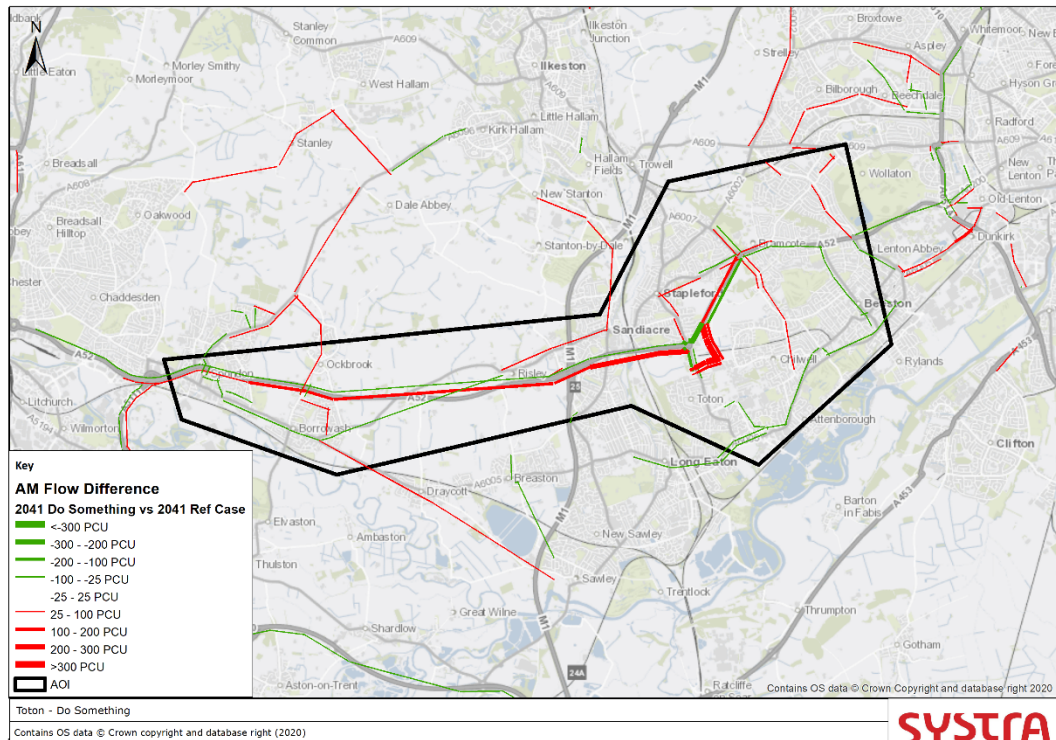
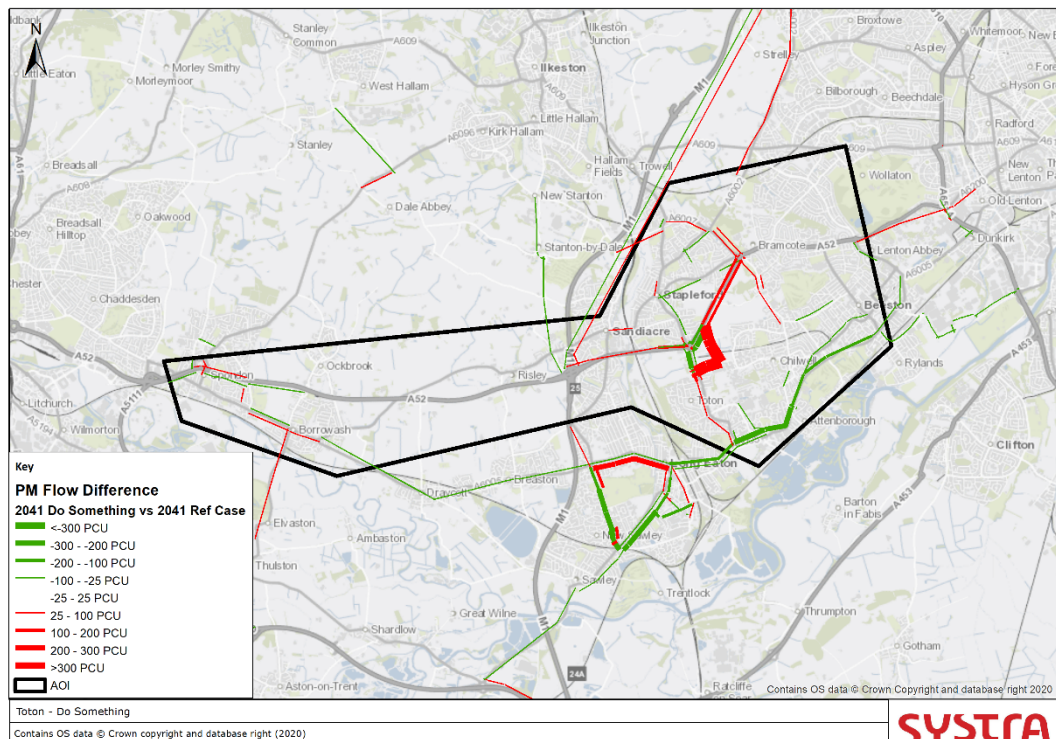


Figure 14. 2041 Do Something vs Reference Case – PM Flow Change



Change in Congested Junctions (V/C%)

7.2.17 Junction congestion is measured by determining the ratio of the volume of traffic to the capacity of traffic that can be accommodated by a junction. A Volume to Capacity percentage

(V/C%) of 85% is considered to be the upper threshold at which the junction is operating effectively. Increasing beyond this increases the likelihood of operational problems including congestion and associated delays and queues. A V/C percentage of $\geq 100\%$ indicates that the junction is being forced to operate beyond its theoretical maximum capacity.

- 7.2.18 Those junctions identified as being $>85\%$ congested within the 'Reference Case' or 'Do Something' scenario are assessed, with 'Do Something' scenario compared to the 'Reference Case' scenario. Figure 15 and Figure 16 show the change in congestion for the AM and PM peaks respectively for 2026. Figure 17 and Figure 18 show the same for 2041.
- 7.2.19 The reduction in flow on Toton Lane between Bardills Roundabout and Toton Link Road results in a reduction in congestion across all years and peaks at:
- Toton Lane P&R junction
 - The Toton Lane approach/exit of Bardills Roundabout
- 7.2.20 In the AM peak of 2026, the increase in flow along the A52 Eastbound from the Toton developments towards Nottingham and Ilkeston/M1 J26 leads to a small increase in congestion at:
- The A52 West (Brian Clough Way) approach/exit of Bramcote Roundabout
 - The A52 East (Derby Road) approach/exit of Bramcote Roundabout
 - The junction of A6007 (Ilkeston Road) with A6002 (Coventry Lane)
- 7.2.21 In 2041 there are more changes to congestion. In both peaks, the congestion at both ends of the Toton Link Road, where it meets the A52 and the B6003 (Toton Lane) is greater than 85% in the Do Something scenario. These junctions are not modelled in the Reference Case, so while a difference cannot technically be calculated, an assumption that they are zero in the Reference Case has been used to show that the junctions are over capacity.
- 7.2.22 In the AM peak of 2041 there is an increase in congestion at the A52 Derby Road/Clifton Boulevard junction. The A52 Clifton Boulevard Southbound on slip blocks back onto the roundabout in the Reference Case, affecting its performance. As a result, many of the arms are close to, or at 85% V/C. The addition of a small amount of flow from Nottingham on the A6200 in the Do Something scenario worsens congestion at the junction, including on the mainline of Clifton Boulevard.
- 7.2.23 Also in the AM peak is a reduction in congestion at junctions on the A52 between Priory Roundabout and Bramcote Roundabout. This is caused by the reduction in flow on the A52 westbound. Additionally, there is a reduction in congestion at junctions on Wollaton Road, this is because fewer vehicles are turning left onto the A52, reducing the block back.
- 7.2.24 In the PM peak there is an increase in V/C on Swiney Way, as a result of traffic blocking back from the junction with the B6003.



Figure 15. 2026 Do Something vs Reference Case – AM Congestion Change

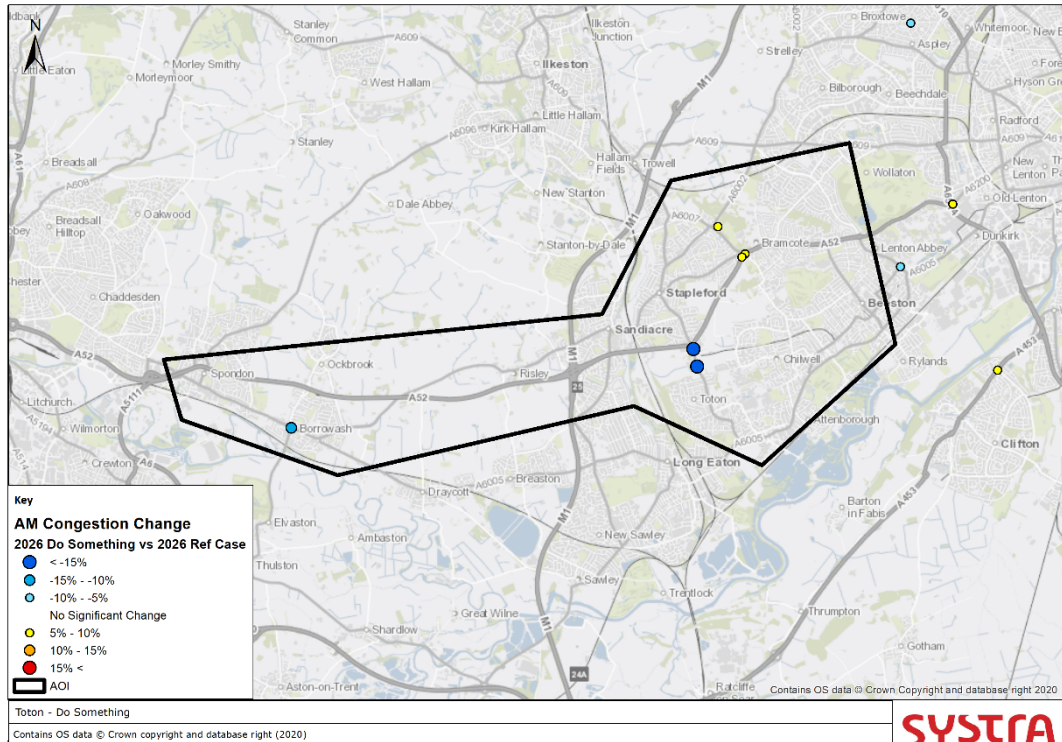


Figure 16. 2026 Do Something vs Reference Case – PM Congestion Change

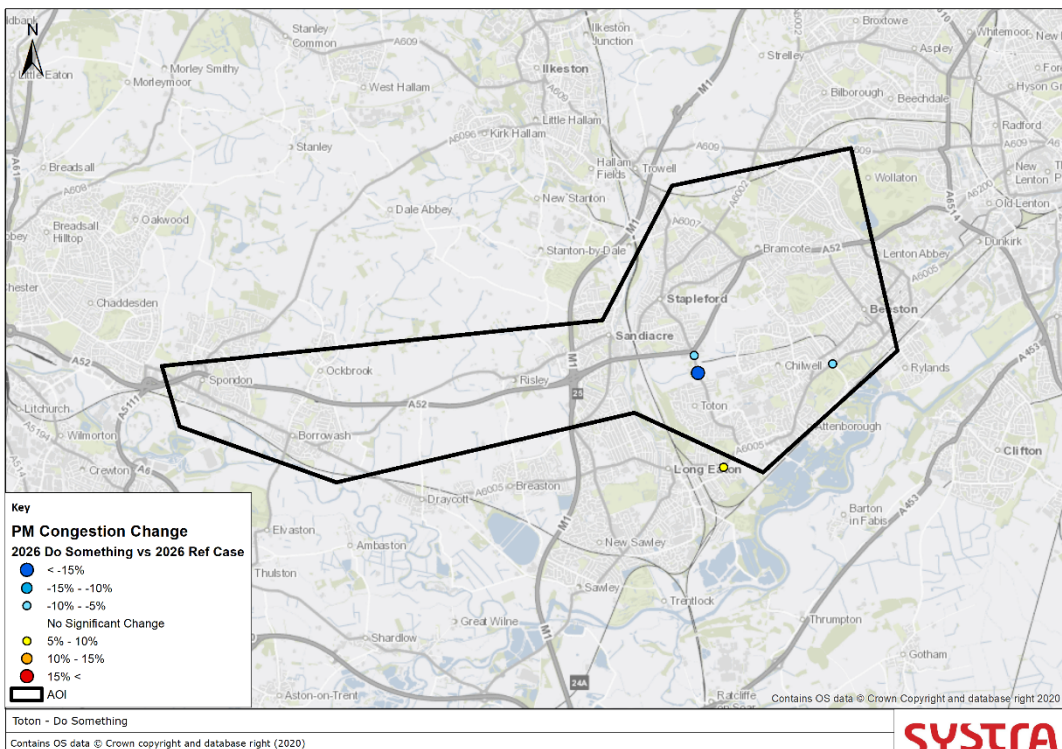


Figure 17. 2041 Do Something vs Reference Case – AM Congestion Change

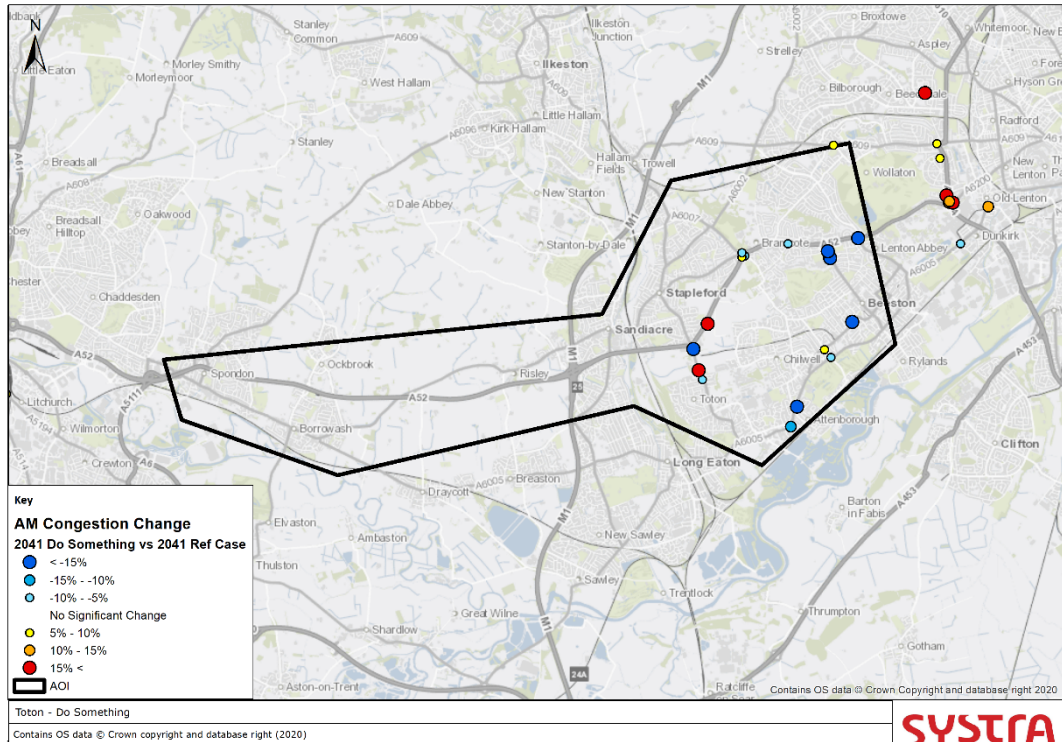
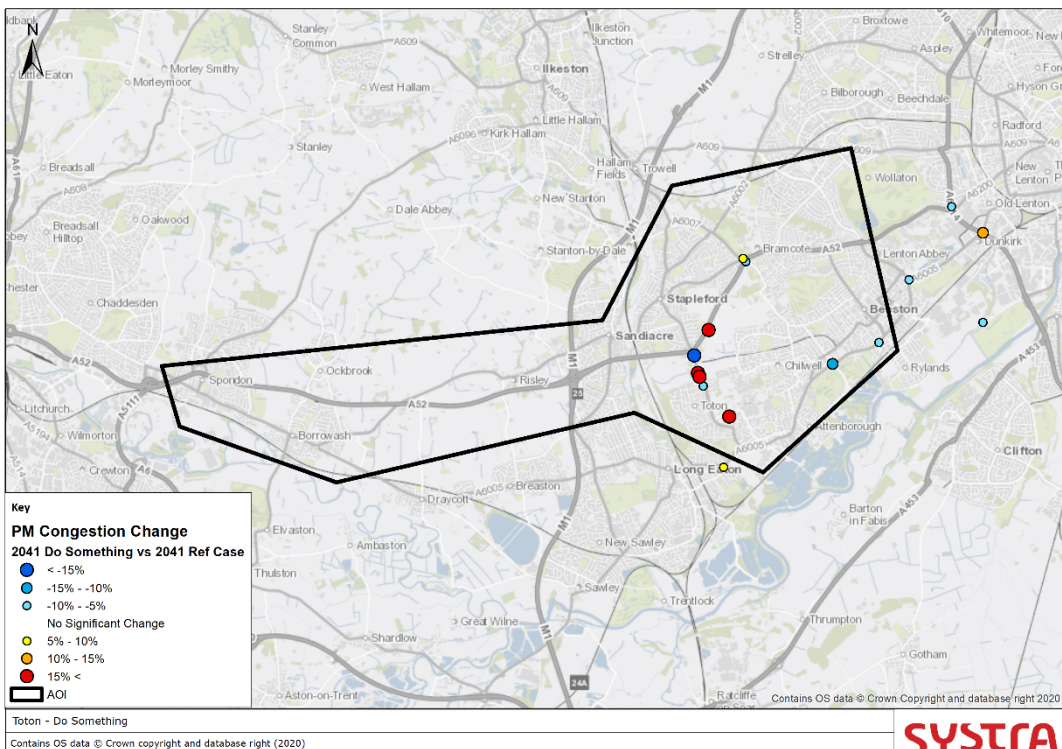


Figure 18. 2041 Do Something vs Reference Case – PM Congestion Change



- 7.2.25 Network statistics provide a way of gauging the overall impact from the addition of trips associated with the development sites. An explanation of the key indicators is as follows:
- Congestion / Over Capacity Queues – reflect the change in overall congestion and is the time spent queuing at junctions that are over capacity. As traffic levels increase, a growing number of junctions reach capacity, and the time spent queuing at junctions can increase.
 - Total Travel Time – across the highway network in PCU hours.
 - Total Travel Distance – across the highway network in PCU kilometres.
 - Average Speed – expressed as kilometres per hour, averaged for all traffic. Increased traffic levels lead to greater delays, potentially resulting in a lower average travel speed.
- 7.2.26 Table 2 displays key network statistics for the 2026 Do Something Scenario compared against the Reference Case. Table 3 shows the same for 2041.
- 7.2.27 In the PM of 2026, Over Capacity Queues and Total Travel Time both decrease in the Do Something Scenario, relative to the Reference Case. Within the AOI there is mostly a reduction in flow and congestion. Many of the reassignment effects are seen outside of the AOI.
- 7.2.28 There is also a reduction in Over Capacity Queues in both peaks of the 2041 Do Something Scenario. This is because of the reduction in flow and congestion on the A52 and A6005 routes.



Table 2. 2026 Network Statistics - Do Something Comparison

	REFERENCE CASE SCENARIO		DO SOMETHING SCENARIO 3		% DIFFERENCE	
	AM	PM	AM	PM	AM	PM
Over Capacity Queues (PCU hrs)	581	1076	593	804	2%	-3%
Total Travel Time (PCU hrs)	7775	8697	7851	8380	1%	-4%
Total Travel Distance (PCU km)	361789	369772	363148	372669	0%	1%
Average Speed (km/hr)	47	43	46	45	-2%	5%

Table 3. 2041 Network Statistics - Do Something Comparison

	REFERENCE CASE SCENARIO		DO SOMETHING SCENARIO 3		% DIFFERENCE	
	AM	PM	AM	PM	AM	PM
Over Capacity Queues (PCU hrs)	1330	1184	1300	1150	-2%	-3%
Total Travel Time (PCU hrs)	9780	9507	9819	9799	0%	3%
Total Travel Distance (PCU km)	404539	398175	406722	399779	1%	0%
Average Speed (km/hr)	41	42	41	42	0%	0%



Matrix Totals

7.2.29 Table 4 displays the highway and public transport matrix totals plus the highway mode share for the model area in 2026. Table 5 shows the same for 2041.

Table 4. 2026 Do Something Matrix Totals

	REFERENCE CASE SCENARIO		DO SOMETHING SCENARIO 3		DIFFERENCE	
	AM	PM	AM	PM	AM	PM
Highway Person Demand	419609	467350	420382	467899	774	549
PT Person Demand	38405	34628	38580	34784	174	156
Highway Mode Share	92%	93%	92%	93%		

Table 5. 2041 Do Something Matrix Totals

	REFERENCE CASE SCENARIO		DO SOMETHING SCENARIO 3		DIFFERENCE	
	AM	PM	AM	PM	AM	PM
Highway Person Demand	451262	495049	452139	495677	877	628
PT Person Demand	39723	35793	39914	35959	191	166
Highway Mode Share	92%	93%	92%	93%		

8. CONCLUSIONS

8.1 Scenario 3 - Conclusions

- 8.1.1 The addition of 3 developments at Toton alongside delivery of the Toton Link Road leads to an overall improvement in Congestion within the AOI in the Do Something Scenario, relative to the Reference Case. It also leads to an improvement in Over Capacity queues in all but the AM peak of 2026. The AM 2026 Reference Case model had minimal levels of Over Capacity Queues, and the increase is modest.
- 8.1.2 The addition of the Toton Link Road slows down traffic on the A52 because the junction is signalised. Traffic that is not associated with the development reroutes to avoid the area, giving development traffic access to the M1, Derby and Nottingham without contributing to increasing congestion.
- 8.1.3 The rerouted non-development traffic uses many different routes including local roads and routes away from the AOI, as far away as the A38 north of Derby and A46 north of Leicester.
- 8.1.4 There is also a secondary effect on the A6005 in Beeston, where the improvement in conditions on the A52 makes that route more attractive. Traffic reassigns from as far away as A50 J1 and uses the M1 and A52 instead of the route through Long Eaton and Beeston to reach Nottingham.
- 8.1.5 With higher levels of traffic in 2041 compared to 2026, the junctions at either end of the Toton Link Road become congested ($V/C > 85\%$). This is a result of more through traffic using the link road.



APPROVAL

Version	Name		Position	Date	Modifications
1	Author	Huw Harrhy	Consultant	10/06/2026	
	Checked by	Helen O'Mara	Associate Director	10/06/2026	
	Approved by				

