

PRTMv2

Charnwood Local Plan
Further Analysis and Refinement

Quality Information

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Section 1 – Introduction

1.1 Context

1.1.1 Charnwood Borough Council (CBC) is producing a new Local Plan, which will run to 2037. To support the development of the new Plan, AECOM were commissioned to assess the potential highway network impacts of the spatial growth options being considered.

1.1.2 Two spatial options were initially assessed, which then supported development of a third option referred to as the 'Hybrid Option 3'. The Hybrid Option 3 supports:

- 9,105 additional homes;
- 5 ha hectares of employment land; and
- 2,205 additional school places.

1.1.3 Figure 1.1 presents the distribution of sites that make up the Hybrid Option. Sites are located throughout the borough with key sites being proposed to expand existing urban areas, such as Loughborough (c.2,100 homes), Shepshed (c.2,050) and Syston (c.1,450), as well as smaller settlements such as Barrow upon Soar (c.700), Anstey (c.650), Sileby (c.250), and East Goscote (c.200).

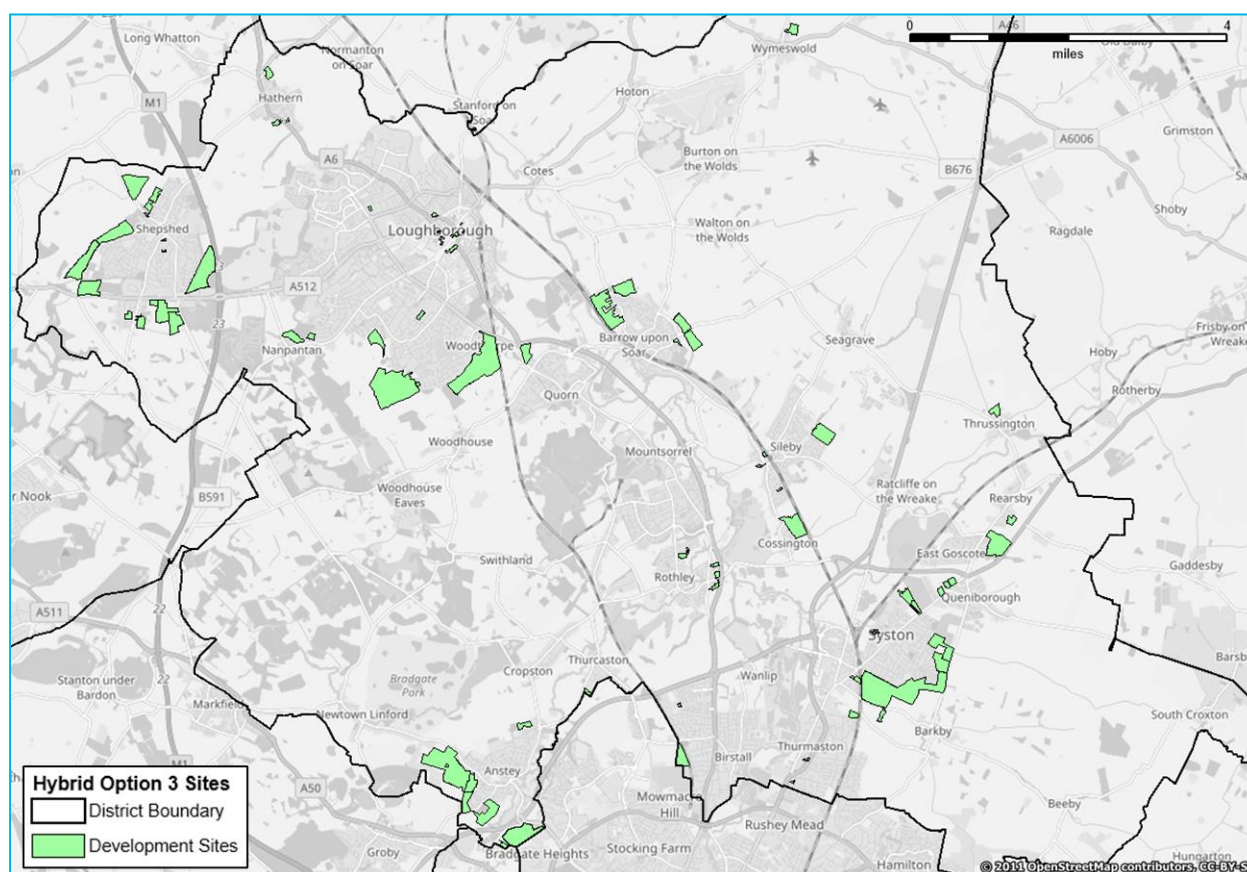


Figure 1.1: Development Sites of the Hybrid Option

1.2 Previous Work Undertaken

1.2.1 AECOM completed an assessment of the transport impacts of the Hybrid Option for the Local Plan using the Pan-Regional Transport Model (PRTM). A package of mitigation measures was developed in response to the forecast impacts, and this package was tested using PRTM to determine its effectiveness.

1.2.2 Two draft reports were produced by AECOM, which were shared with stakeholders for review and comment:

- a strategic model forecasting report: 'Charnwood Local Plan - Forecasting Report v1 (Draft for issue)' (February 2021); and

- a mitigation report: *'Mitigation Report for the Charnwood Borough Local Plan'* (Draft, February 2021); and accompanying report in Excel file format, Technical Note 3 (TN3), *'Charnwood BC LP Mitigation EAST Assessment Final'* (Final February 2021) which provided evidence supporting the generation and selection of mitigation options for the preferred option, and cost of the mitigation package.

1.2.3 As part of a process of constructive consultation undertaken throughout the project, feedback from stakeholders on these reports was sought. The comments received provided suggestions for potential further work to further interrogate aspects of modelling, clarify results, and sought to question and refine the mitigation package. A meeting was held in March 2021 to provide stakeholders and opportunity to discuss these comments and help shape the scope of further work to address these comments. Through this process, and in discussion with AECOM, CBC identified a scope for additional work which framed the research requirements of this report.

1.3 Scope of Further Analysis

1.3.1 The comments received from Highways England, Leicester City Council (LCiC), and Leicestershire County Council (LCC) are set out in the updated TN3 210527 *Charnwood BC LP Mitigation EAST Assessment TN3 Final*.

1.3.2 AECOM reviewed the long list of comments and in discussion with CBC agreed which comments were considered to be proportionate and applicable to the requirements of a Local Plan evidence base. The comments can be grouped into the following broad themes, and are identified as being in or out of scope of this report:

1.3.3 **Requests for reporting clarification:** A number of comments sought clarification on specific matters. These comments are considered to be within scope of this report.

1.3.4 **Request for Additional Analysis:** Some comments requested that further analysis of the PRTM outputs be undertaken for specific locations. This further analysis is within scope and is reported in this report.

1.3.5 **Content of the mitigation package:** Some comments referred to the content of the proposed mitigation packages and how or whether it could be enhanced. In some instances, comments proposed changes. These comments were reviewed case by case and are addressed within the scope of this report.

1.3.6 **Mitigation package impacts:** Some comments questioned the efficacy of the proposed mitigation package and asked for further research into any secondary impacts on the network, for instance as a result of induced demand or rerouteing. These comments are within scope and have been addressed through further analysis of the existing PRTM runs to identify whether refinement of the mitigation package is required. This process is documented within this report.

1.3.7 **Strategic/Local Traffic and Scheme Interaction:** One theme of comments from stakeholders, with regards to the approach to any further modelling, was to understand how strategic mitigation proposals and local mitigation proposals impacted on the forecast traffic levels. It was suggested that PRTM should be used to separate out the impact of the strategic and local mitigation measures and better understand how each set of measures helped to address the impact of growth. Conceptually this may seem appropriate; however, the mitigation package was designed with an appreciation of how the Strategic Road Network (SRN) and Local Road Network (LRN) work together as part of the wider network. The SRN and LRN are not distinct components of the network supporting only strategic and local traffic respectively, but are interrelated, and users choose routes driven by various factors which may result, in transport planning terms, in less suitable or desirable route choices.

1.3.8 A key finding of the initial modelling work was that improvements on the SRN freed up capacity on the LRN and encouraged/allowed local traffic to use suitable local routes. As traffic would use the routes if they were available, this analysis helped identify locations which needed highway improvements. Without strategic improvements, some of the locations and scale of mitigation identified for the LRN could potentially be unsuitable and unnecessary, especially if major strategic improvements were introduced in the future and facilitated the rerouteing of traffic.

1.3.9 Another aspect of the difficulty of disentangling the effects of the strategic and local mitigations is that it is not simple to separate traffic into strategic and non-strategic traffic, especially within a strategic transport model. The nature of a strategic model is to forecast the change in travel patterns based on the relative ease of travel. Restricting local traffic to only local roads, or all strategic traffic to strategic roads, would not represent the real choices individuals make when using the highway network.

- 1.3.10 It was therefore decided to not model the strategic and local improvements separately. This comment theme is outside the scope of this report.
- 1.3.11 **Allocation of Local Plan growth:** In relation to the mitigation proposed to address the traffic impacts arising from growth, some comments questioned the distribution of the housing developments around the borough. These comments have been fed back to CBC. The distribution of sites has considered transport evidence but is the result of a site selection process which takes account of a wide range of criteria and the sustainability appraisal process and is not within scope of this report.
- 1.3.12 **Further analysis of potentially notable secondary impacts:** The forecast modelling of Hybrid Option 3 with the draft mitigation package (February 2021) identified some locations which could potentially see notable secondary impacts (Section 7.11 of that report). These were reviewed in further detail to understand the impact and whether mitigation needed to be revised.

1.4 Report Objectives and Outputs

- 1.4.1 Following from above, the objectives of this report are:
- 1) to undertake further analysis of the PRTM outputs and use these to address key comments which were considered to be in scope as agreed with CBC; and
 - 2) based on the findings of further analysis to revise the mitigation package and re-estimate the cost of the package.

The outputs are:

- this report, which summarises the findings in relation to points 1 and 2 above;
- 210527 Charnwood BC LP Mitigation EAST Assessment TN3 Final – Excel file;
- a finalised version of the Forecasting Report, taking on board comments provided by CBC in February 2021; and
- a finalised mitigation report: *'210527 Charnwood BC LP Mitigation Report February 21 Final'*, taking on board minor comments provided by CBC in February 2021.

1.5 Approach

- 1.5.1 The long list of comments from stakeholders that AECOM received is presented in the revised version of TN3. Full details of which comments are within scope and how those within scope have been addressed are set out in the revised TN3.
- 1.5.2 Further analysis has been undertaken to address the comments received from stakeholders, which is discussed in Section 2 of this report. The analysis focuses on assessing the full impact of Hybrid Option 3 and the Mitigation Scenario compared with the 2037 Baseline, as well as on the specific impacts of the mitigation package on localised areas highlighted by stakeholders.
- 1.5.3 Each comment was addressed according to its nature; many comments were addressed through the further analysis or were explained through the modelling outputs, but there were a number of limitations to addressing the comments received which are discussed in Section 3. Some comments were addressed in a way which did not involve changes to the preferred packages of mitigation.
- 1.5.4 To address the comments that required changes to the proposed mitigation measures, outputs from the further analysis and additional desktop analysis using Google Maps and Google Street View were used to identify the issues and explain the causes of the traffic problems at each of the locations. From here, the best way in which to mitigate against the issues was established and proposed as mitigation for each location. This resulted in revising the mitigation packages to include two new mitigation measures and an altered mitigation proposal at M1 Junction 23. The methodology and the details of the proposed new measures are documented in Section 3 of this report.
- 1.5.5 The new or altered mitigation measures proposed were costed using the same methodology used previously for the preferred package of mitigation measures presented in the Mitigation Report. The costs for the new mitigation measures proposed are presented in Section 3.3 of this report, as is the full methodology behind calculating the costs.

1.5.6 Upon finalising the revised package of mitigation measures, a revised 2037 Mitigation Scenario model was coded to represent the changes to the mitigation package. The outputs from the revised model run are discussed in Section 5 of this report. The model analysis of the revised Mitigation Scenario largely mirrors the analysis reported in the Forecasting Report, previously issued to CBC and all relevant stakeholders. This includes assessing the impact of the Hybrid Option 3 and Mitigation Scenario against the Baseline, in terms of traffic flow and delay, and also summarising specific junction locations that have been highlighted due to the introduction of the Local Plan development and/or the package of mitigations.

1.6 Report Structure

1.6.1 Following this introduction, this report is structured as follows:

- Section 2 – Further Analysis and Findings;
- Section 3 – Refinement of the Preferred Package of Mitigation Measures;
- Section 4 – Cost of Additional Mitigation Measures;
- Section 5 – Updated Model Results; and
- Section 6 – Conclusions.

Section 2 – Further Analysis and Findings

2.1 Introduction

- 2.1.1 This section details the additional work that was undertaken following feedback from CBC, LCC, LCiC, and Highways England on the Forecasting Report.
- 2.1.2 The Forecasting Report previously reported the impact of the Mitigation Scenario as compared with Hybrid Option 3, showing the changes brought about by the package of mitigations. Further analysis was requested to demonstrate the impact of the inclusion of both the package of mitigations and the Hybrid Option 3 development on the Baseline scenario and this is shown in Sections 2.2 and 2.3.
- 2.1.3 Section 2.4 provides analysis of routeing at key locations for the Hybrid Option 3 and Mitigation Scenarios to demonstrate the impact of the package of mitigations.
- 2.1.4 Section 2.5 provides a detailed review of locations highlighted by LCiC to provide commentary on the impact of the Hybrid Option 3 developments and the package of mitigations.

2.2 Forecast Change in Highway Flows – Mitigation Scenario vs Baseline

- 2.2.1 Figure 2.1 and Figure 2.2 show the forecast changes in highway flow between the Mitigation Scenario and the Baseline.

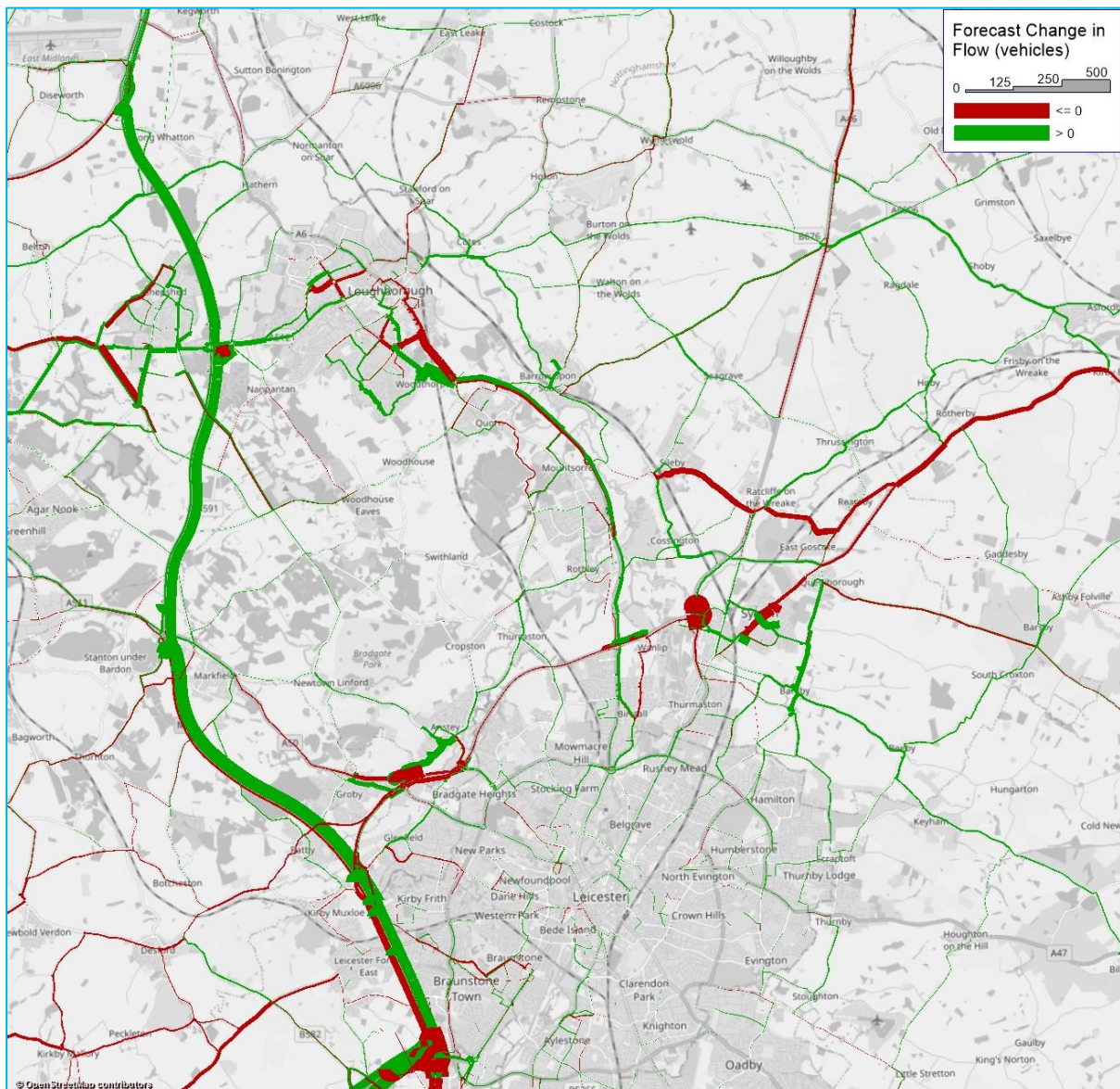


Figure 2.1: Highway Traffic Flow Change, Mitigation minus Baseline, AM Peak

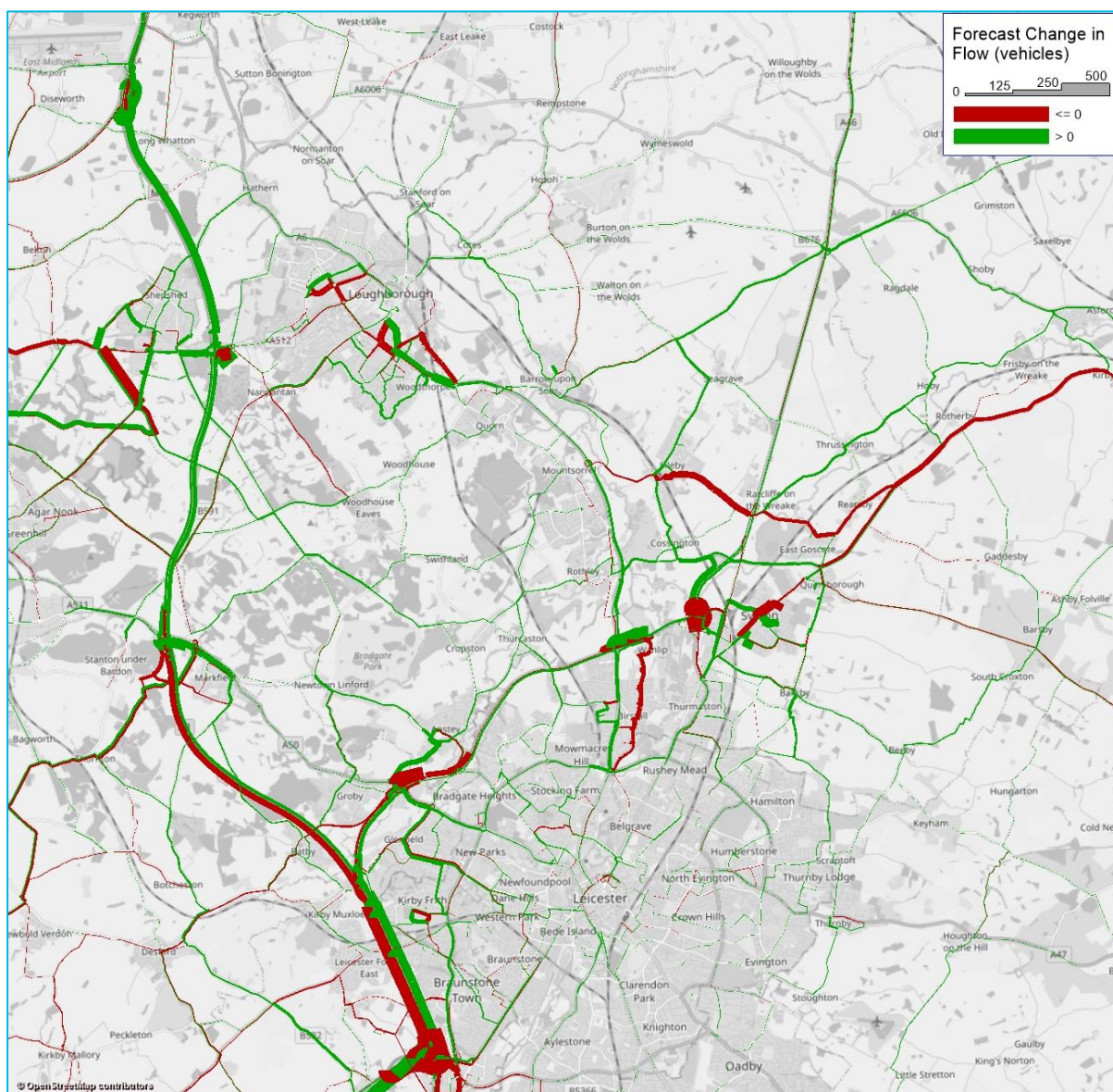


Figure 2.2: Highway Traffic Flow Change, Mitigation minus Baseline, PM Peak

2.2.2 Figure 2.1 and Figure 2.2 demonstrate the following:

- There is a clear reduction in traffic along Broome Lane, with corresponding increases in flow along the A6006/B676 and the Syston Northern Bypass.
- There is a reduction in southbound traffic on Charley Road, leaving small increases in cross-Charnwood Forest traffic.
- There is a clear reduction in traffic through Syston town centre.
- There is a reduction in traffic along Wanlip Lane, particularly marked in the PM Peak, with traffic rerouted to the A6.
- There is a reduction in traffic within Loughborough town centre, with some traffic diverted to routes such as the A6004.

2.2.3 Figure 2.1 and Figure 2.2 also highlight any issues that arise due to the combination of the Hybrid Option 3 growth and the package of mitigations.

- In this Mitigation Scenario the M1 scheme was assumed to be hard shoulder running between Junction 21a and Junction 23a with variable speeds, but with no capacity increase between Junction 21 and Junction 21a. The additional capacity and reduction in speed was only applied in the AM and PM Peaks reflecting the expectation that the hard-shoulder running would not be required in the Interpeak. The scheme has caused some traffic to reroute away from the M1, as

the lack of increase in capacity between Junction 21 and Junction 21a results in increases in delay, possibly eroding the benefits brought about by the introduction of additional capacity between Junction 21a and Junction 23a.

- The mitigations introduced at Shepshed have caused a reduction in flow along Charley Road and across Charnwood Forest in the AM Peak; however, there is a corresponding increase on Iveshead Road as an alternative route for traffic travelling south.
- There are also adverse impacts on routeing on and around the A46 caused by existing high levels of congestion. This is a known area of instability both in observed and model terms, causing local fluctuations in routeing on and off the main carriageway.

2.3 Forecast Change in Highway Delays – Mitigation Scenario vs Baseline

2.3.1 Figure 2.3 and Figure 2.4 show the forecast changes in highway delay between the Mitigation Scenario and the Baseline.

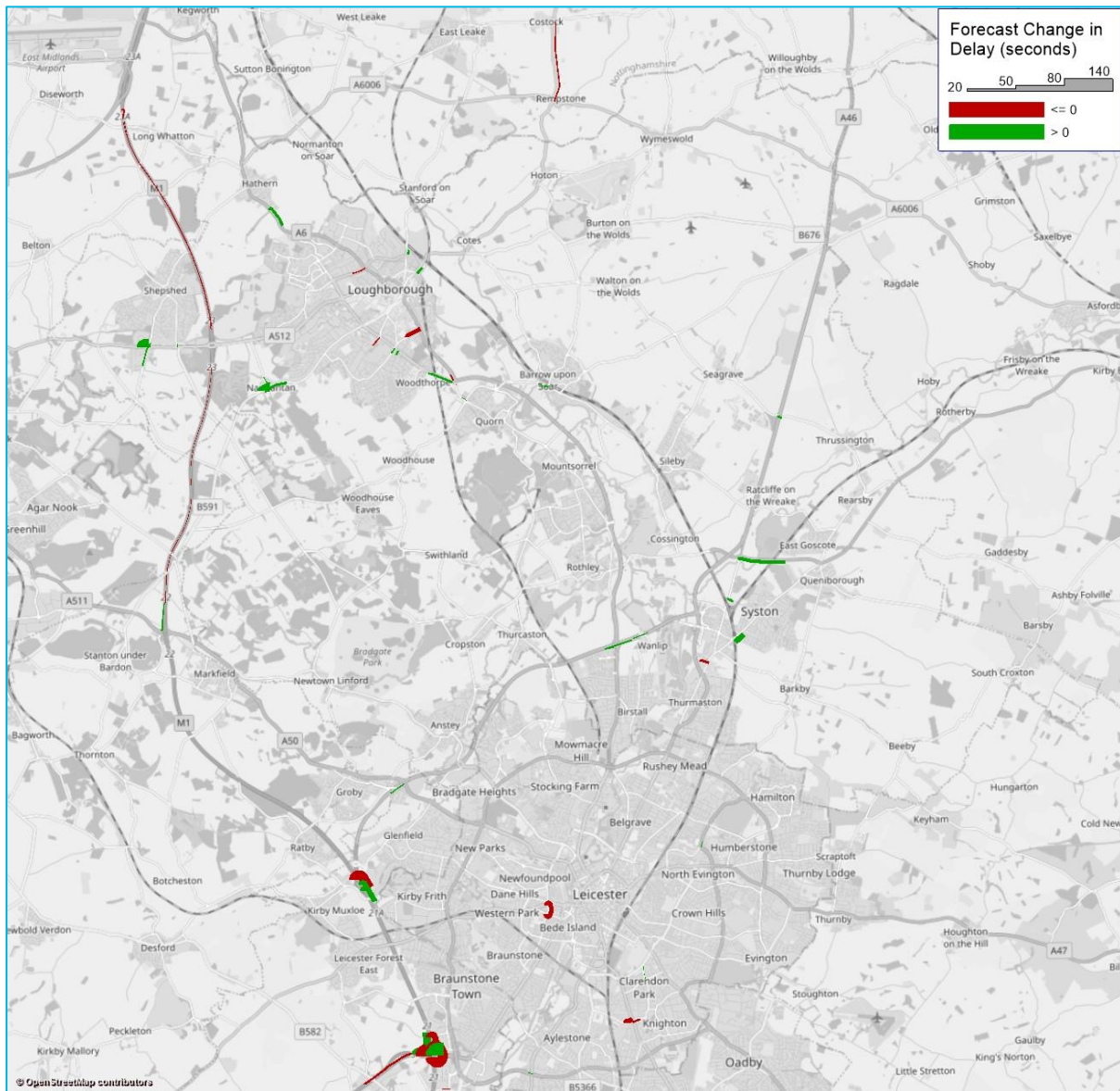


Figure 2.3: Highway Traffic Delay Change, Mitigation minus Baseline, AM Peak



Figure 2.4: Highway Traffic Delay Change, Mitigation minus Baseline, PM Peak

2.3.2 Figure 2.3 and Figure 2.4 show the following:

- There is a consistent reduction in delay along the M1 where the widening schemes have been introduced.
- There are large changes in delay at M1 Junction 21 due to the changes introduced as part of the mitigation package.
- There is an overall reduction in delay in Loughborough town centre due to the junction improvements along the A6004 and the behavioural change measures introduced, reducing car travel in the town.

2.3.3 Figure 2.3 and Figure 2.4 also highlight any issues arising due to the combination of the Hybrid Option 3 growth and the package of mitigations.

- There are increases in delay along the Syston Northern Bypass. This is a secondary impact of the traffic calming along Broome Lane, and hence some traffic is diverted onto the bypass. This increase in traffic flow results in a small increase in delay.
- There is an increase in delay at the junction of Iveshead Road and the A512 in the AM Peak. This is partly a secondary impact of the banned movement onto Charley Road, and hence there is additional traffic using Iveshead Road as an alternative route. The delay is due to an increase in traffic turning right onto Iveshead Road and is therefore being held at the junction.

- There is an increase in delay in Syston town centre. This is due to the traffic calming measures introduced, as well as some development access traffic rerouting to avoid the mitigation scheme.
- There is an increase in delay at the junction of Queniborough Road and Barkby Road, just east of Syston, in the PM Peak. This is on the northbound approach to the junction, which is the only arm to have not been upgraded as part of the mitigation package.
- There is an increase in delay at Copt Oak in the PM Peak. This is on a relatively rural road between two signalised junctions and appears as a result of some instability in the strategic model which should not be considered as a realistic impact.
- There are sections of increased delay on the A46, the largest of which being due to instability on the slip road adjacent to the Wanlip Sewage Treatment Plant.

2.4 Key Location Routeing Analysis

- 2.4.1 Comments and questions were received in relation to routeing of traffic in each of the modelled scenarios and hence additional work was undertaken to provide insights on the routeing impacts of the mitigation package.
- 2.4.2 Note that where results are shown for a single peak hour, it is due to the other peak hour's result being consistent with what is already shown and hence the same conclusions can be drawn.

Shepshed Development

- 2.4.3 Highways England raised questions about the size and scale of the developments in Shepshed and expressed concern that the mitigation along Charley Road could have significant impacts on M1 Junction 23.
- 2.4.4 Figure 2.5 and Figure 2.6 show the routeing of AM Peak origin trips from the large Shepshed development zone for the Hybrid Option 3 and Mitigation Scenarios, respectively. It can be seen that, despite traffic from the development in the AM Peak no longer using Charley Road, only a small increase in traffic is using M1 Junction 23 as an alternative.
- 2.4.5 Figure 2.7 and Figure 2.8 show the PM Peak destination trips to the large Shepshed development zone for Hybrid Option 3 and Mitigation Scenario, respectively. It can be seen that there is negligible change in routeing to the zone in the PM Peak. There are very small reductions in traffic flow on Charley Road and the A512, however these are insubstantial. Due to the nature of the turning movements that have been restricted at Charley Road, the access to Shepshed, and west to the A42, is not materially affected by the scheme. This highlights the directionality of Charnwood Forest traffic being affected by the mitigation scheme.
- 2.4.6 In both time periods the level of development traffic passing through Junction 23 in the Hybrid Option 3 is relatively small and remains small in the Mitigation Scenario.

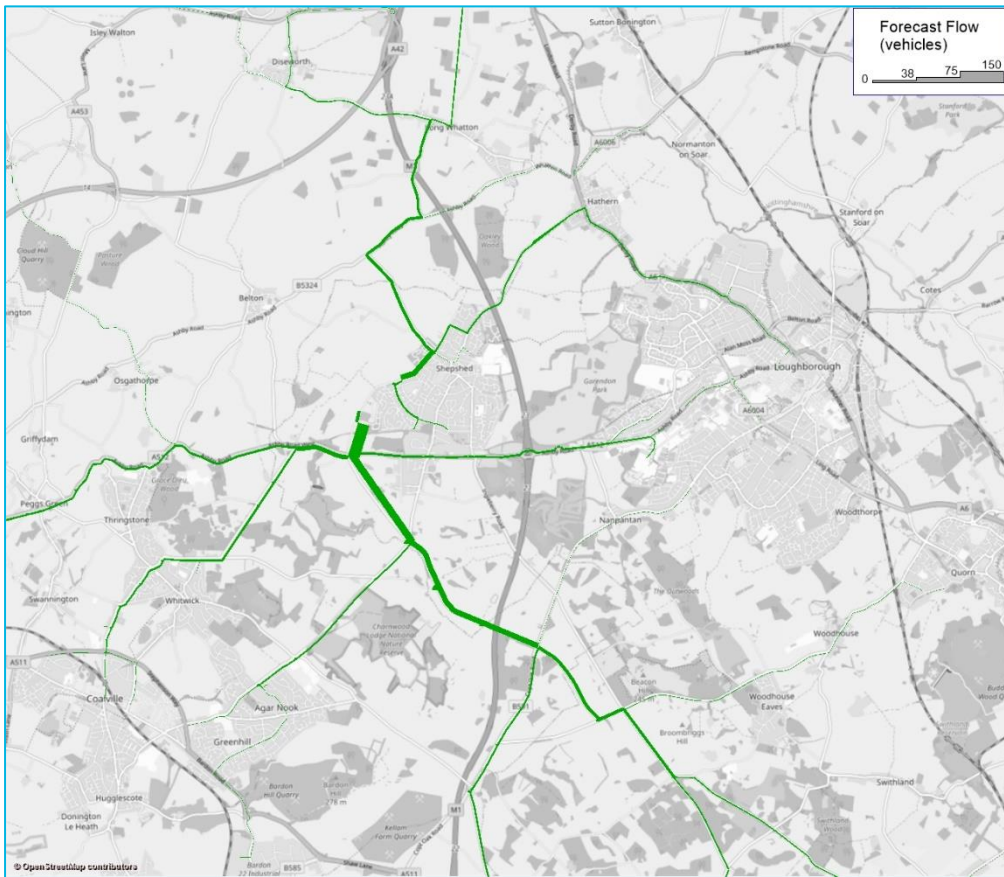


Figure 2.5: Select Link, Shepshed Zone 902, Hybrid Option 3 Scenario, AM Peak Origin

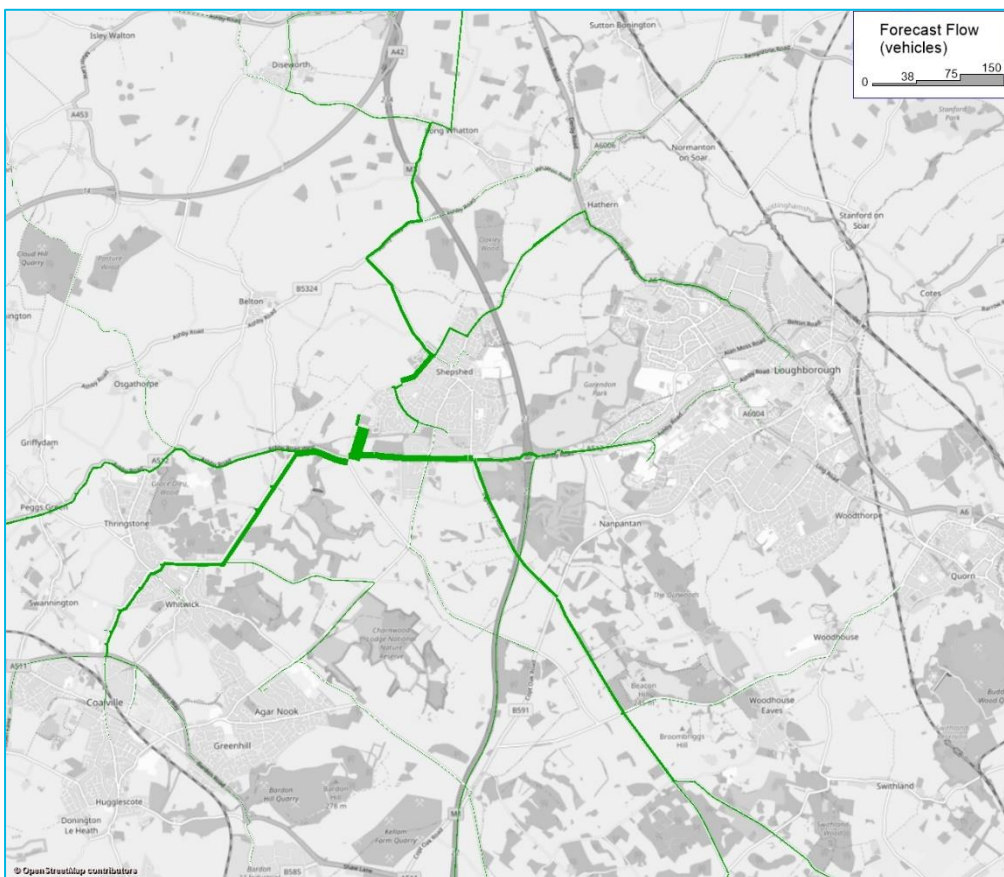


Figure 2.6: Select Link, Shepshed Zone 902, Mitigation Scenario, AM Peak Origin

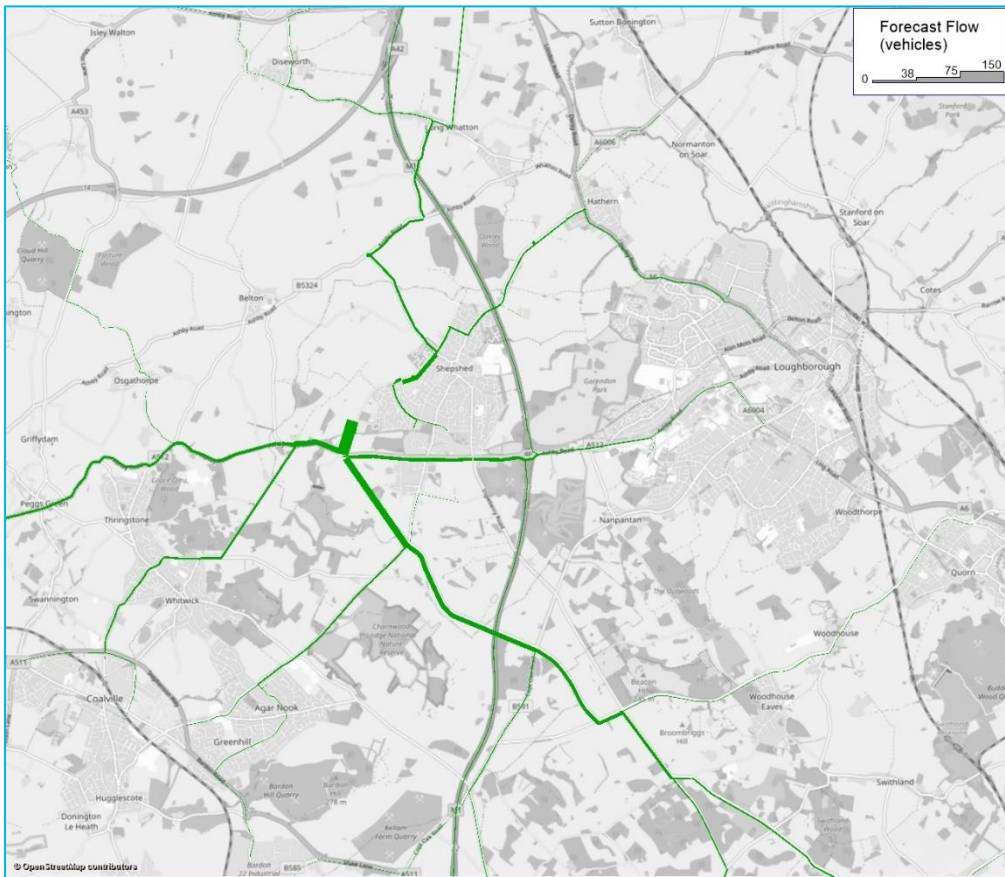


Figure 2.7: Select Link, Shepshed Zone 9042, Hybrid Option 3 Scenario, PM Peak Destination

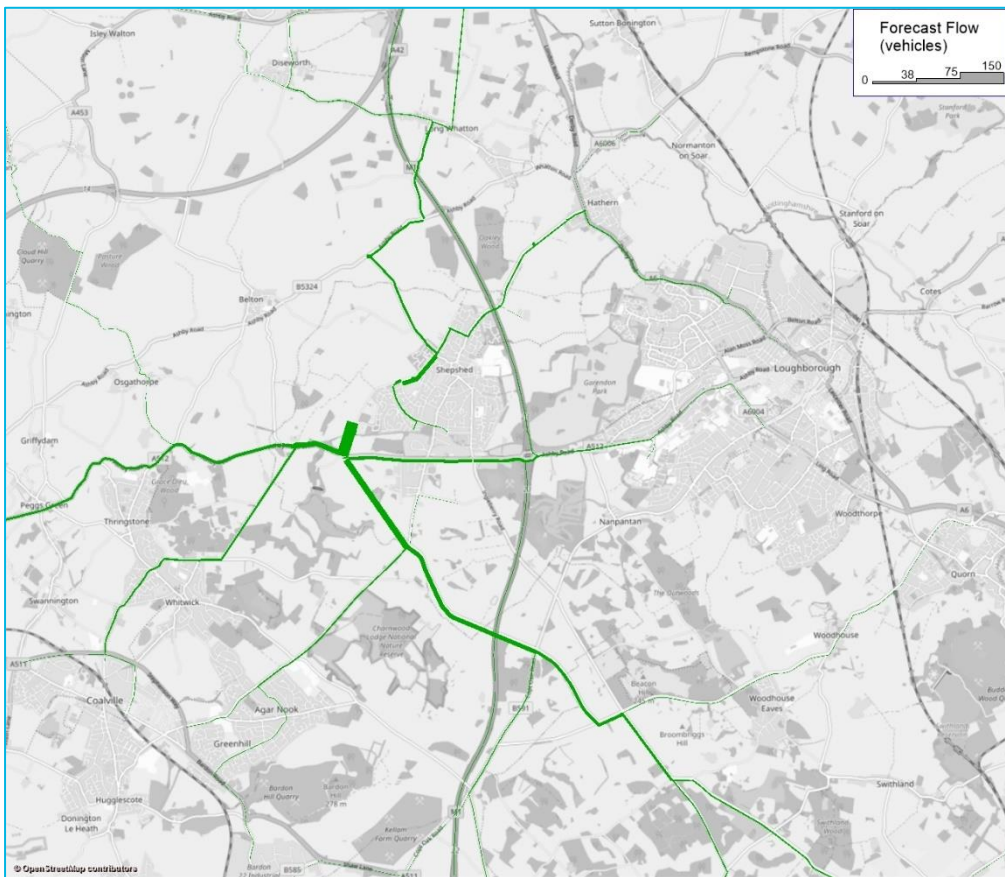


Figure 2.8: Select Link, Shepshed Zone 9042, Mitigation Scenario, PM Peak Destination

Charley Road

2.4.7 Figure 2.9 and Figure 2.10 show the routing of traffic using Charley Road (just south of the junction with Iveshead Road) in the AM Peak for the Hybrid Option 3 and Mitigation Scenarios, respectively. They show southbound traffic along Charley Road, and the corresponding southbound traffic through Charnwood Forest, has reduced as a result of the mitigation measures introduced. There are also changes in routing within Shepshed to access the A512, and therefore a small increase in traffic using Iveshead Road as an alternative route south.

2.4.8 The remaining traffic using this stretch of Charley Road and Charnwood Forest is traffic between a wide range of locations in the south, and locations along the A512 corridor in the north. The directionality of the impact of the mitigation scheme at Charley Road is highlighted here, in that controlling the southbound access has significantly reduced the southbound traffic across Charnwood Forest but has little to no impact on northbound traffic. This was also mentioned previously in Section 2.4.5.

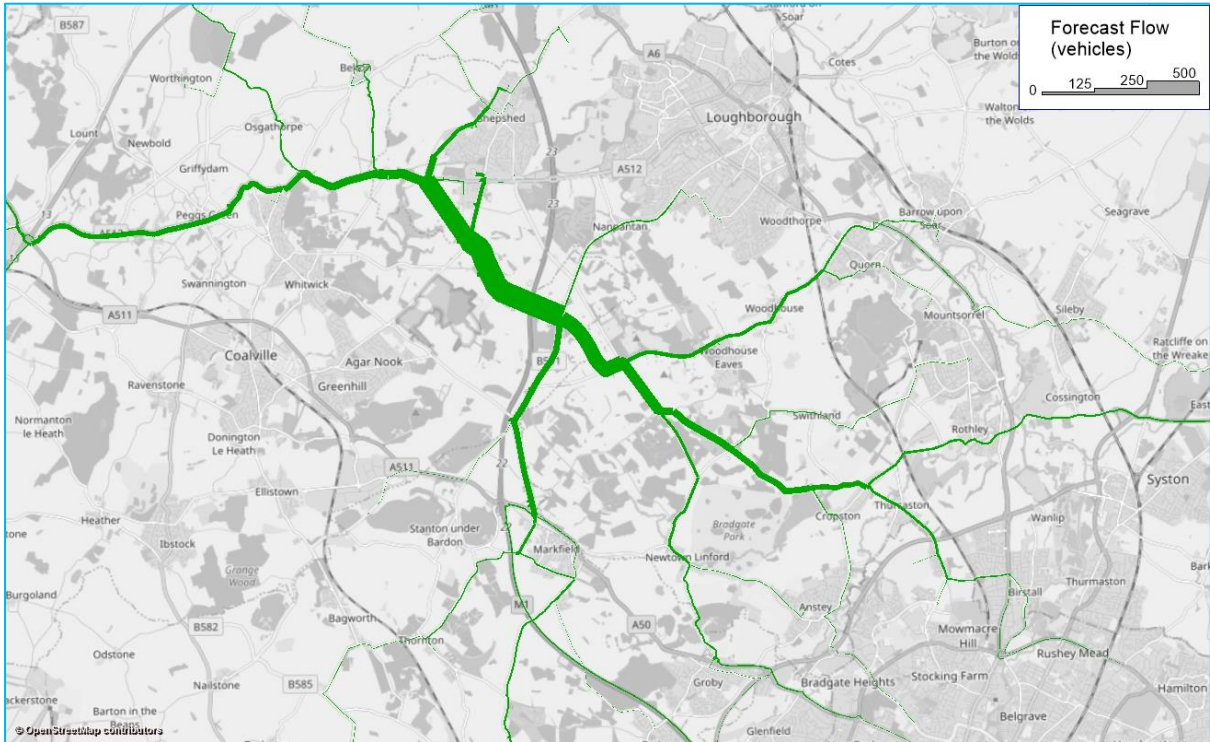


Figure 2.9: Select Link, Charley Road, Hybrid Option 3 Scenario, AM Peak

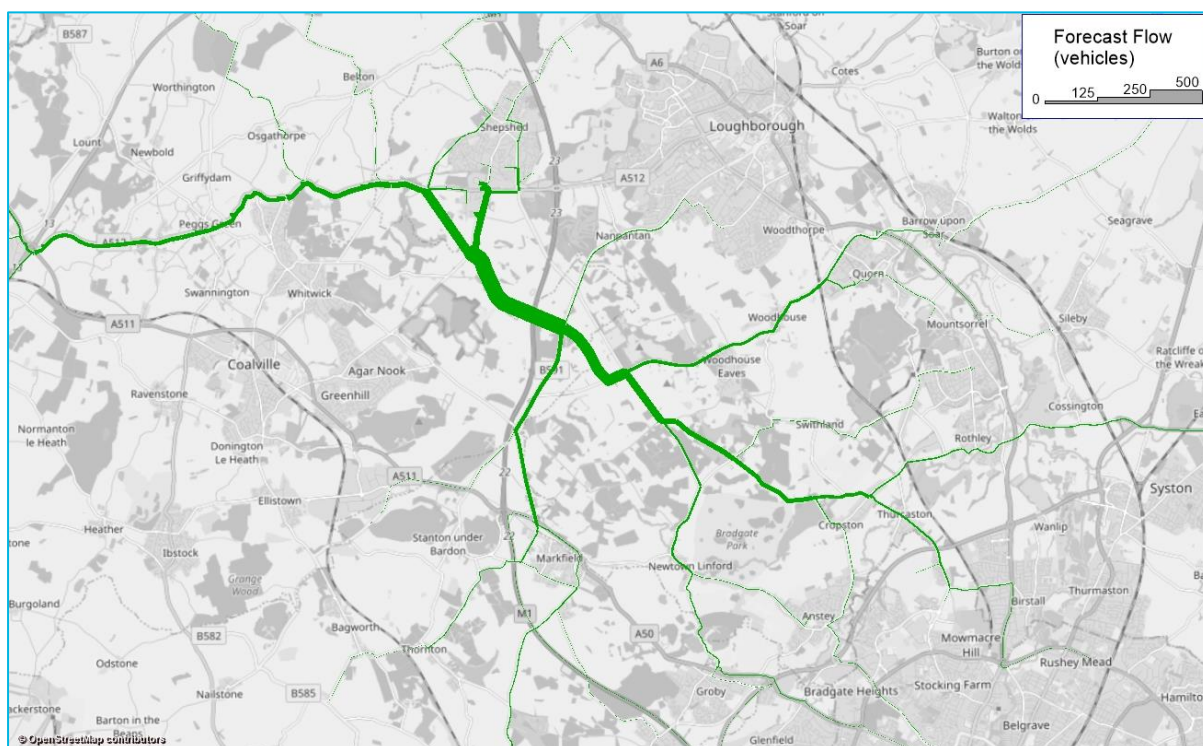


Figure 2.10: Select Link, Charley Road, Mitigation Scenario, AM Peak

[A50](#)

- 2.4.9 LCC raised questions about the attractiveness of the A50 as the preferred route between Leicester and M1 Junction 22, bearing in mind the strategic nature of the route and the inter-county traffic it facilitates. Investigation was undertaken into the Baseline Volume over Capacity (VoC) ratio of links along the A50 in both the AM and PM Peaks.
- 2.4.10 Figure 2.11 shows the link VoC ratios along the A50 for the Baseline PM Peak hour.

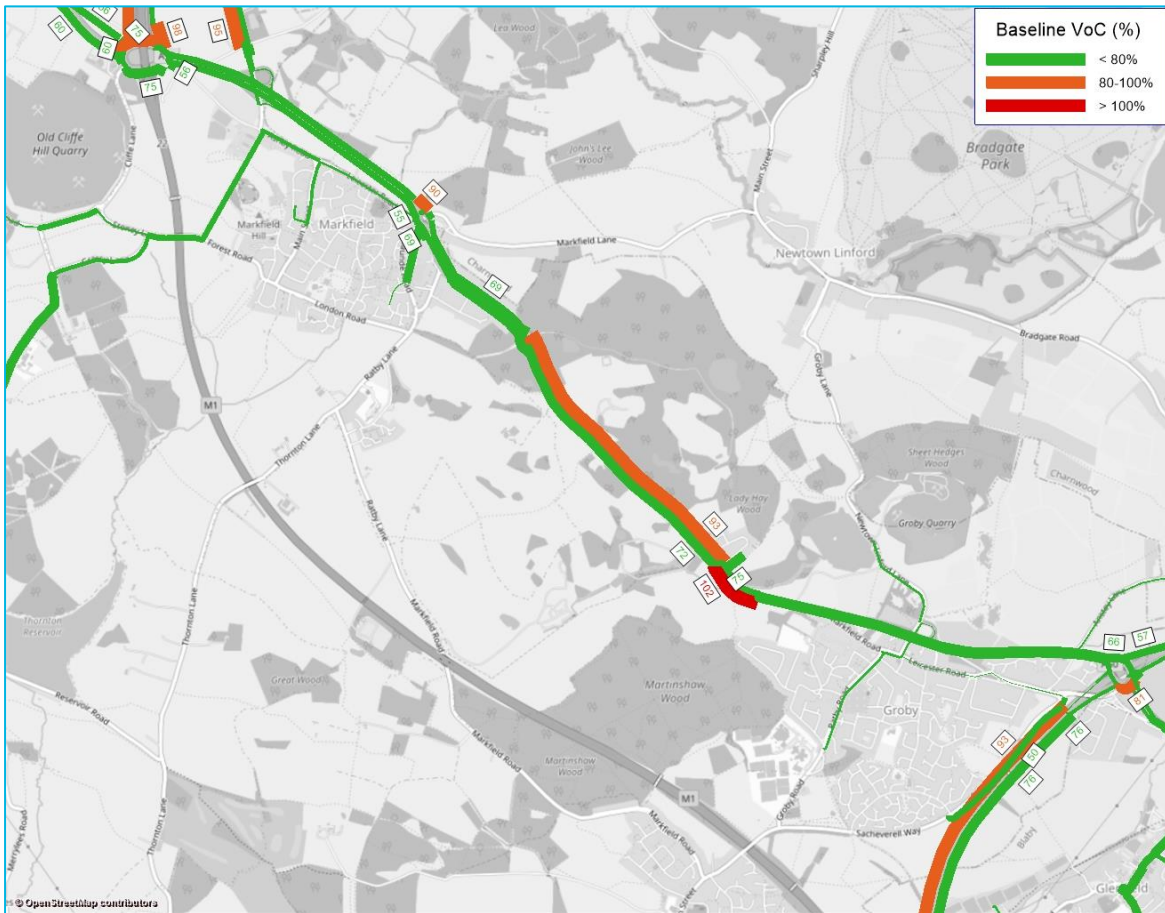


Figure 2.11: PM Peak Baseline VoC Ratios, A50

- 2.4.11 The A50 has high capacity along the majority of its route, however there are a number of junctions and roundabouts (for example, Lena Drive signalised junction and the Fieldhead roundabout) which are shown to be approaching, or at, capacity in the model. These pinch points are the limiting factor in the amount of additional traffic that can be accommodated.
- 2.4.12 Select link analysis of the routeing along the A50 in the Hybrid Option 3 and the Mitigation Scenarios shows there is no change to the scale and pattern of traffic using the A50. The vast majority of traffic using the A50 is travelling between the M1 north of Junction 22 or Coalville and Leicester or the A46 east.

Broome Lane

- 2.4.13 Figure 2.12 and Figure 2.13 show the routeing of traffic along Broome Lane in the AM Peak for the Hybrid Option 3 and Mitigation Scenarios, respectively. Figure 2.13 shows that due to the introduction of traffic calming along Broome Lane, and in contrast to Figure 2.12, the only traffic using this route is local traffic to and from Rearsby. The traffic calming has also had a substantial impact on the amount of east-west traffic crossing Charnwood Forest from the A607.

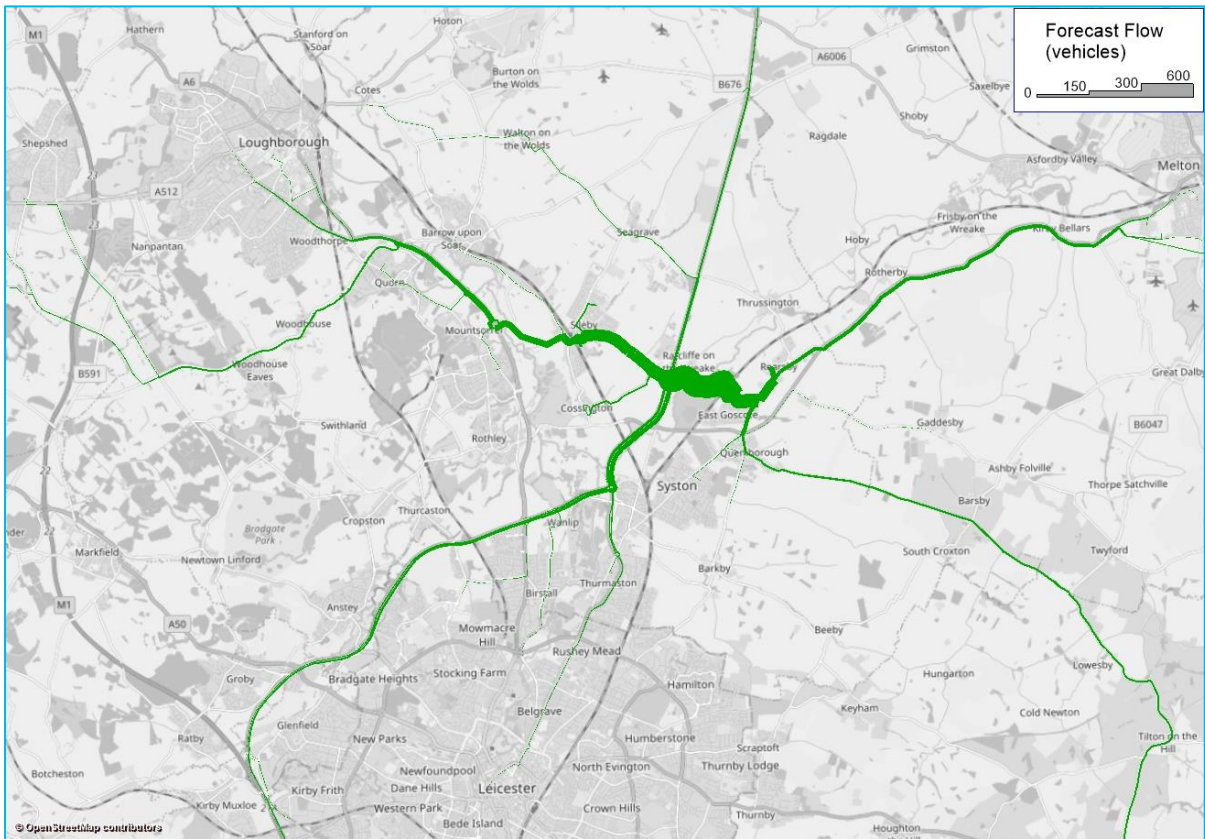


Figure 2.12: Select Link, Broome Lane, Hybrid Option 3 Scenario, AM Peak

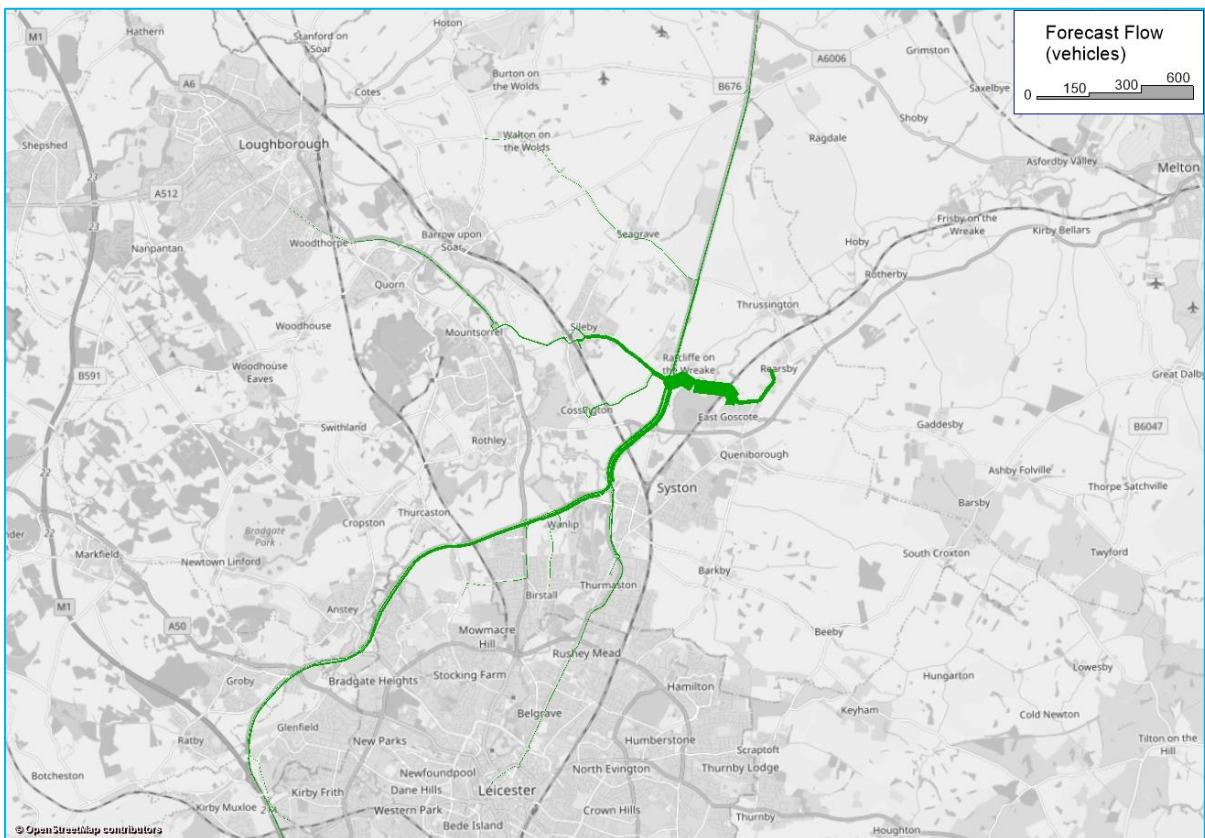


Figure 2.13: Select Link, Broome Lane, Mitigation Scenario, AM Peak

A607

- 2.4.14 In connection with the changes shown on Broome Lane, as to how longer distance strategic traffic has been affected by a local mitigation scheme, analysis of traffic flow along the A607 was also undertaken.
- 2.4.15 The A607 is a key strategic route between Melton Mowbray and Leicester (and further afield). Figure 2.14 and Figure 2.15 show the routing of traffic using the A607 at Brooksby in the PM Peak for the Hybrid Option 3 and Mitigation Scenarios, respectively. The plots show that in the Hybrid Option 3 Scenario some traffic uses Broome Lane to travel between the A607 and the A6. In the Mitigation Scenario this traffic is not present which demonstrates that the mitigation measures introduced in this area are forecast to be effective.

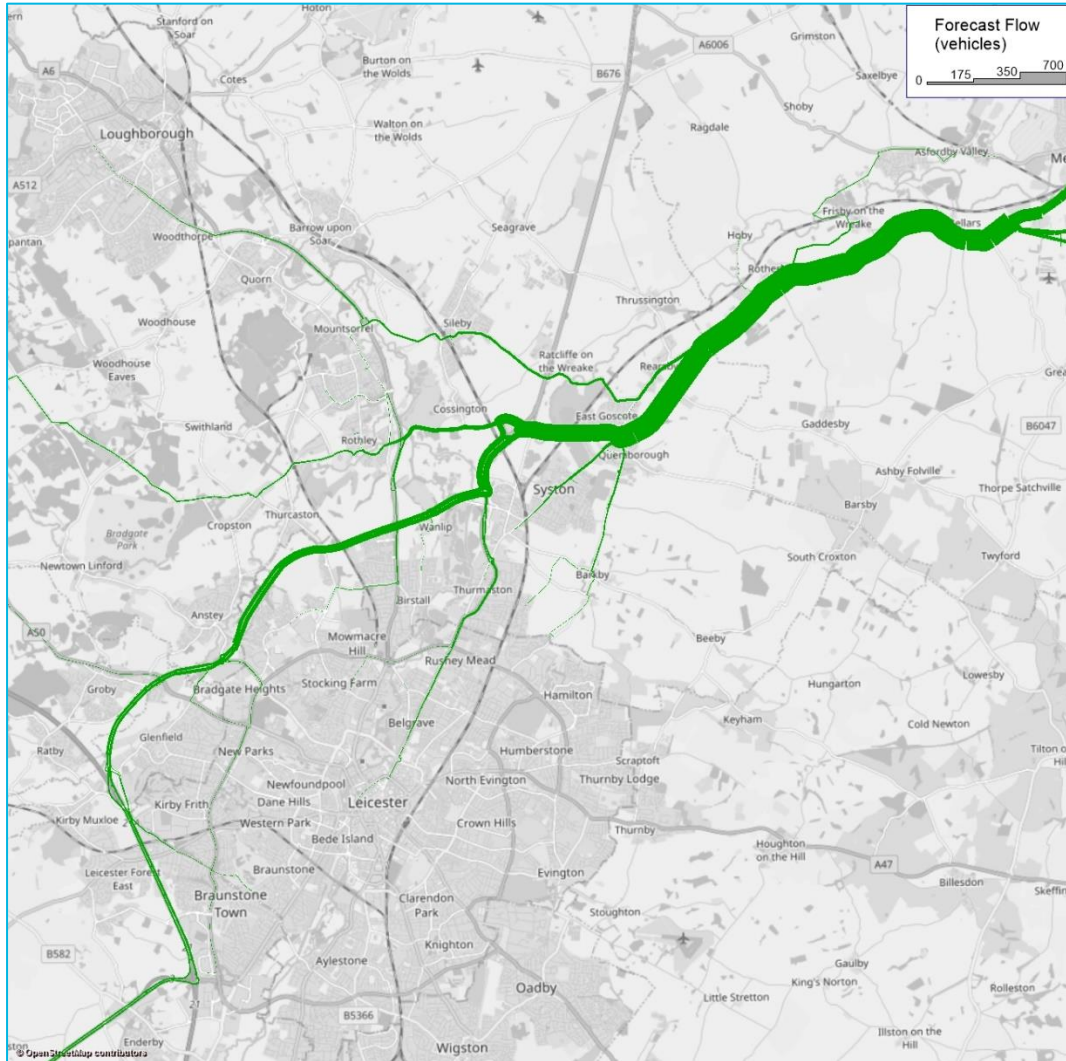


Figure 2.14: Select Link, A607 Brooksby, Hybrid Option 3 Scenario, PM Peak

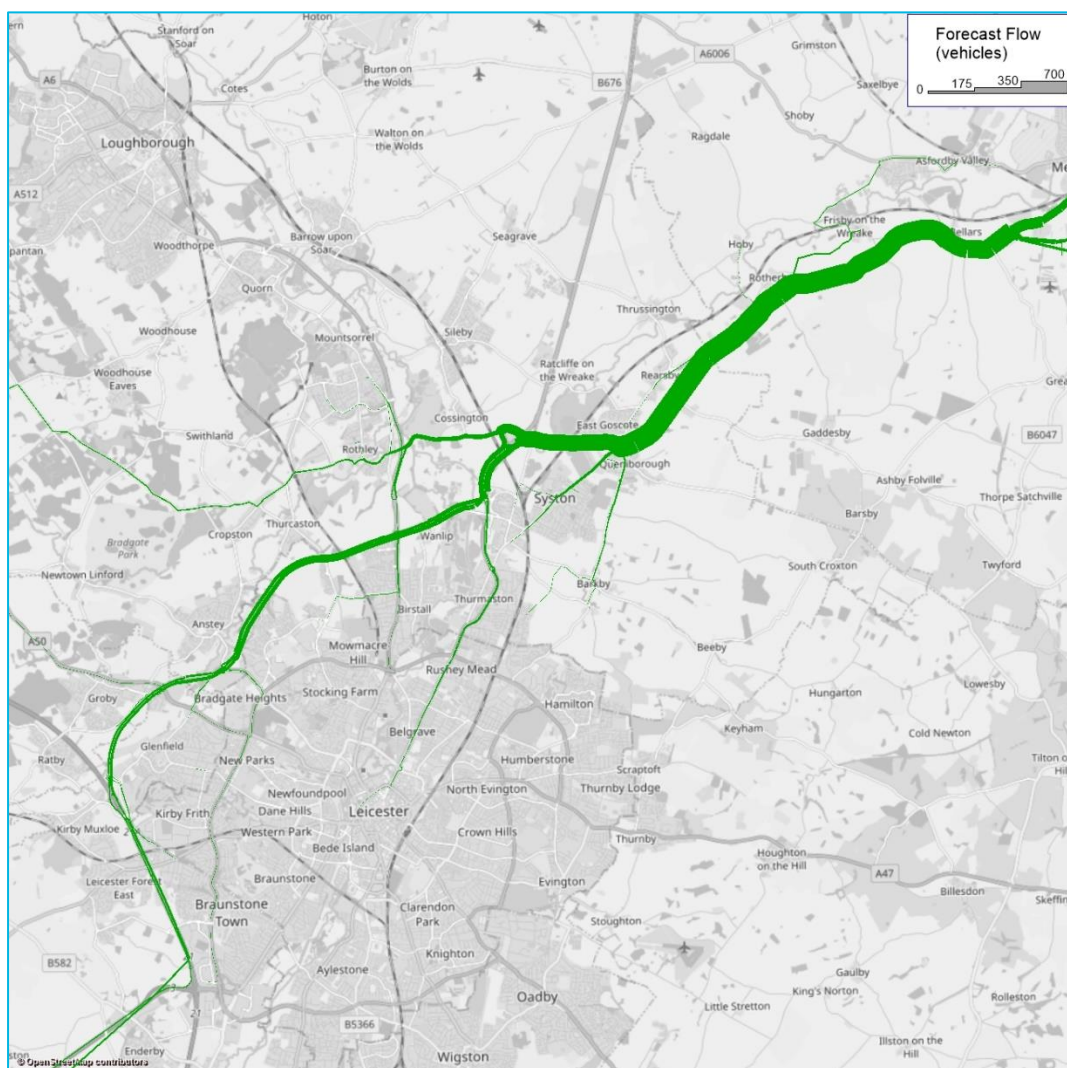


Figure 2.15: Select Link, A607 Brooksby, Mitigation Scenario, PM Peak

[Greengate Lane](#)

2.4.16 Figure 2.16 and Figure 2.17 show the routing of traffic along Greengate Lane in the AM Peak for the Hybrid Option 3 and Mitigation Scenarios, respectively. Figure 2.16 and Figure 2.17 show that in both scenarios Greengate Lane is carrying a significant amount of traffic between Leicester City and a range of locations in Charnwood. The impact of the Mitigation Scenario can be seen on Wanlip Lane, where traffic flow has reduced, however there are no other significant changes to the routing of traffic using Greengate Lane. It should be noted that only a fraction of the traffic routing via Greengate Lane is heading towards or coming from Hybrid Option 3 developments; the level of development traffic is not significant enough to be shown on the plots.

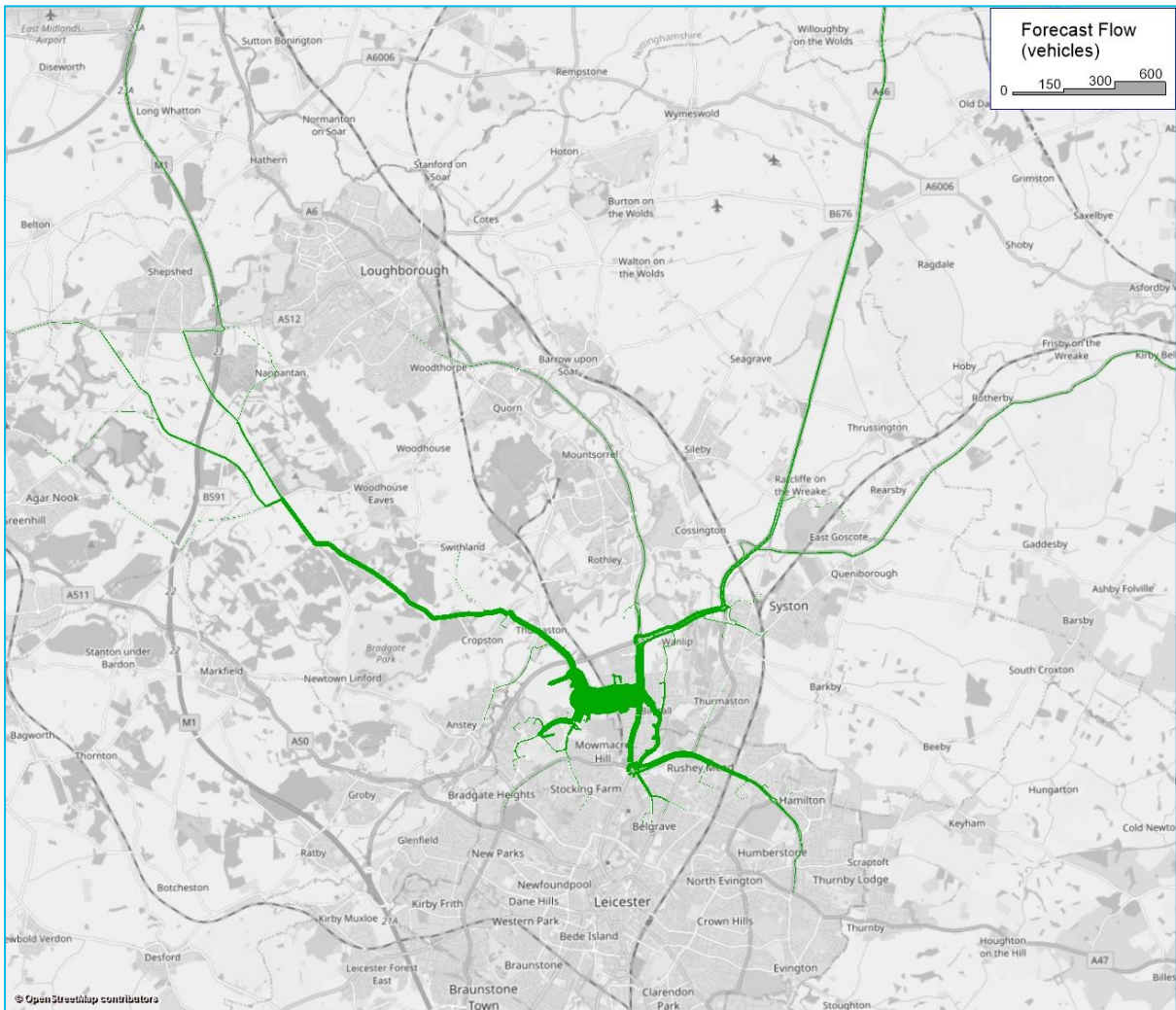


Figure 2.16: Select Link, Greengate Lane, Hybrid Option 3 Scenario, AM Peak

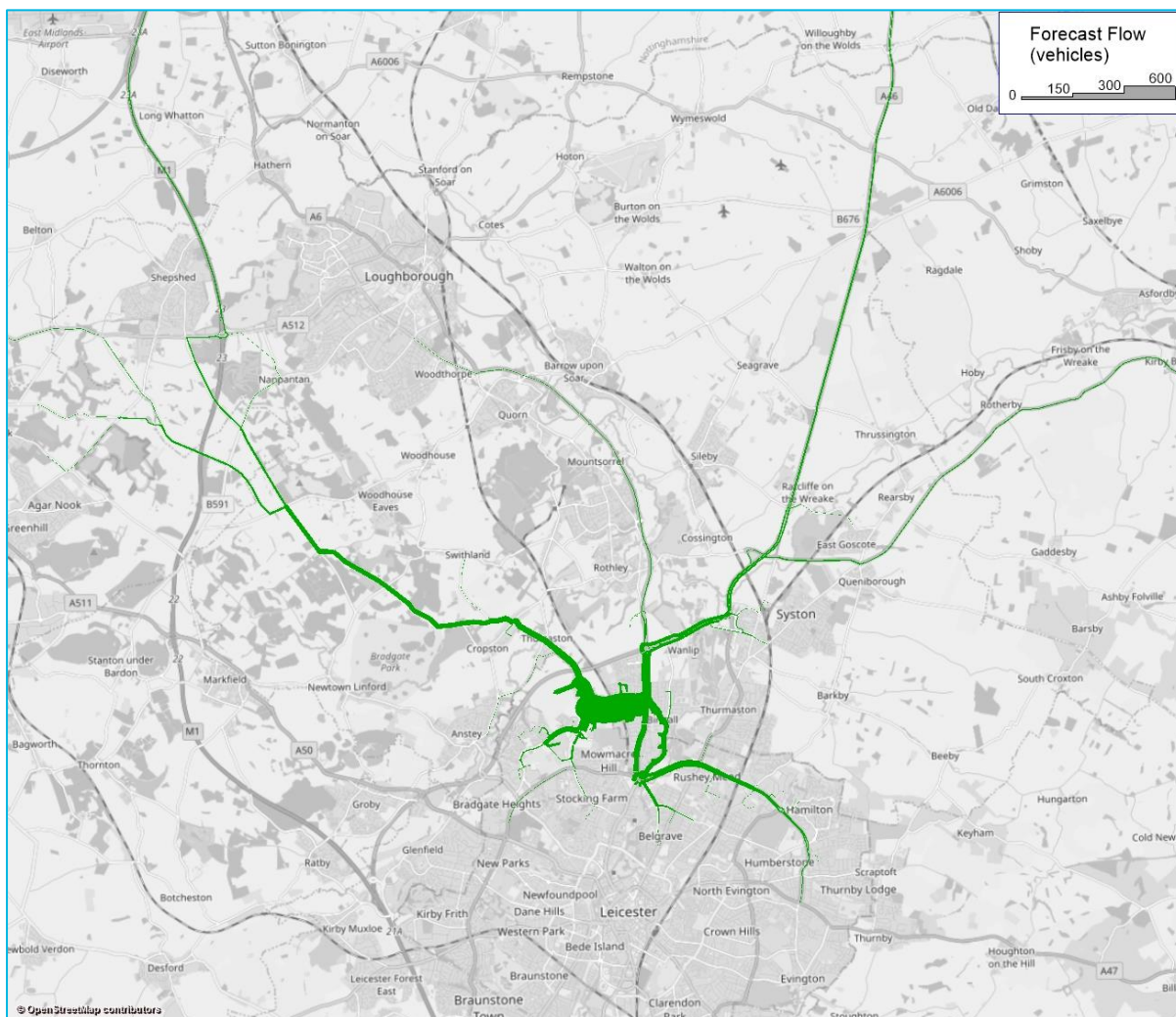


Figure 2.17: Select Link, Greengate Lane, Mitigation Scenario, AM Peak

Birstall Road

2.4.17 Figure 2.18 and Figure 2.19 show the routing of traffic along Birstall Road in the PM Peak for the Hybrid Option 3 and Mitigation Scenarios, respectively. They show the pattern of traffic using this route is mainly longer distance traffic between Leicester City and the north-east of Charnwood, in both scenarios. The traffic calming on Wanlip Lane and junction improvements on the A6 have caused a small reduction in traffic along Birstall Road, with a more notable reduction along Wanlip Lane itself. This highlights that some traffic is still avoiding the A6 as the Birstall Road/Sibson Road route remains an attractive alternative.

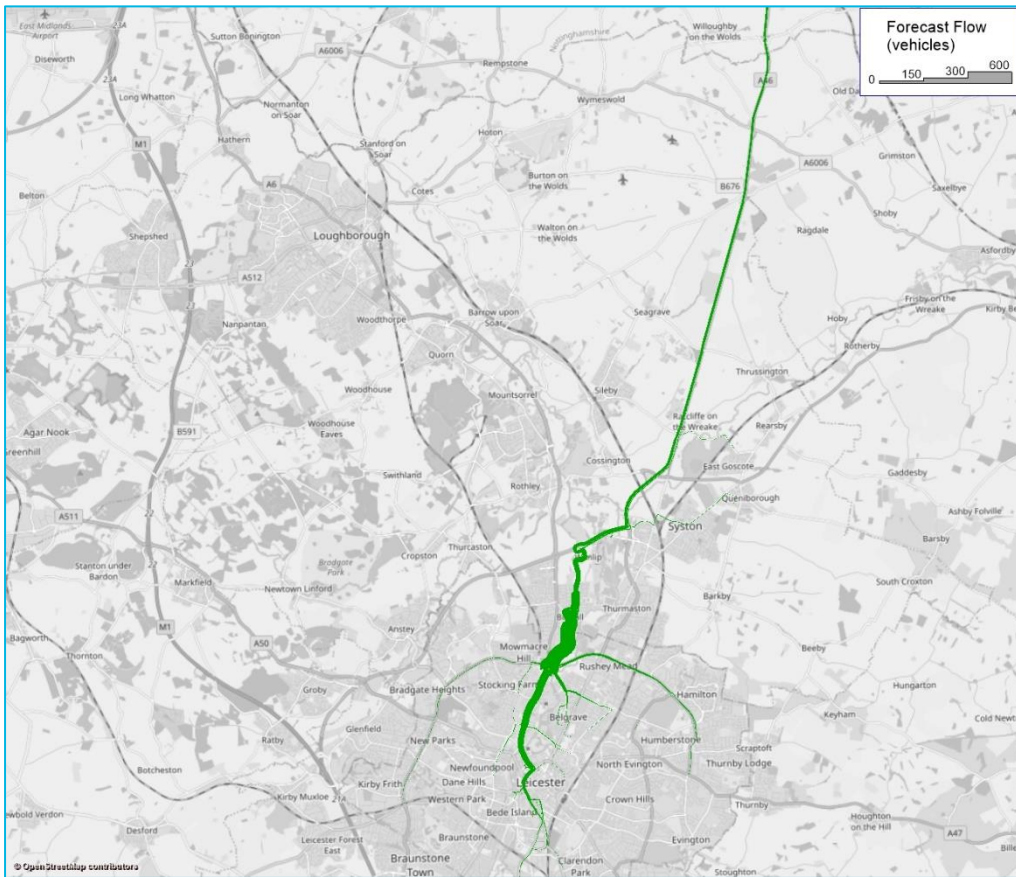


Figure 2.18: Select Link, Birstall Road, Hybrid Option 3 Scenario, PM Peak

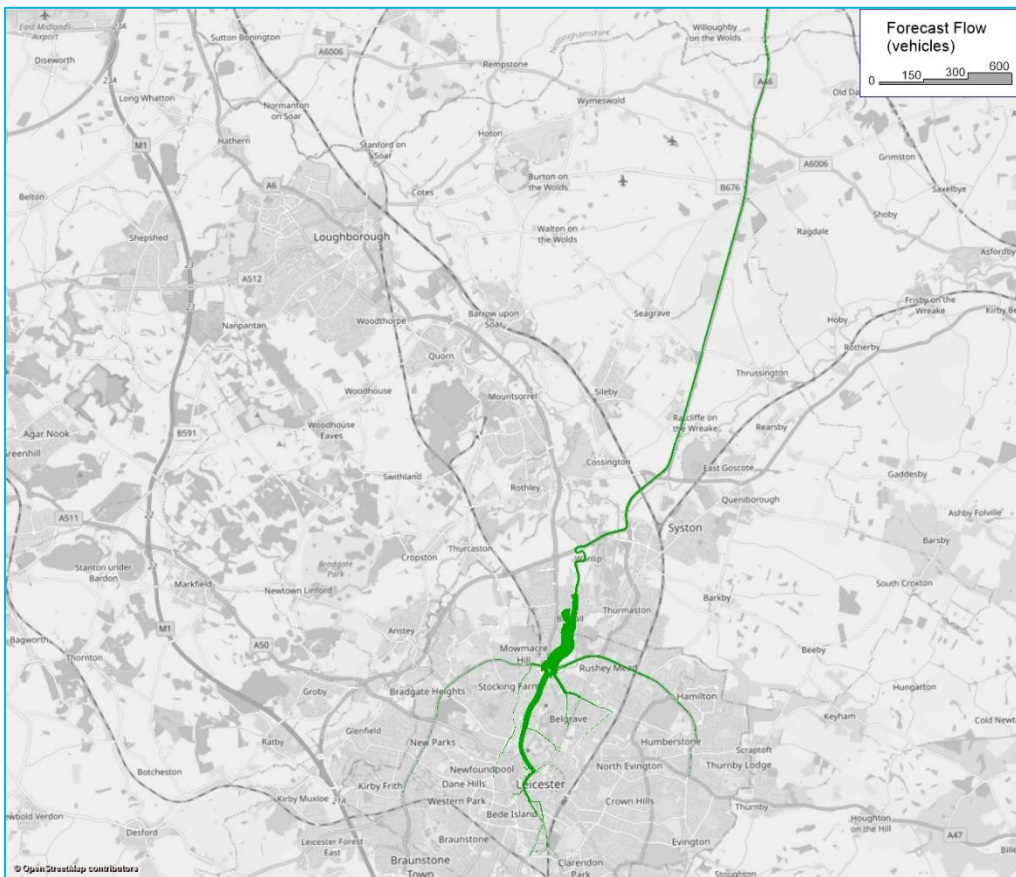


Figure 2.19: Select Link, Birstall Road, Mitigation Scenario, PM Peak

2.5 Leicester City Detailed Location Review

2.5.1 LCiC raised concerns about some of the rerouteing and changes in traffic flow seen in locations across the city. Table 2.1 shows the location and queries raised by LCiC, and the response to these locations based on further analysis of the model scenarios.

2.5.2 Many of the comments highlight areas of increased traffic or rerouteing on the outskirts of Leicester City. It is important to recognise that the inclusion of additional development and mitigation schemes will inevitably result in increased traffic, either due to an increase in overall trips or because of demand model effects such as mode shift or redistribution. This additional traffic may highlight areas that are susceptible to rerouteing due to pinch points and specific areas of delay.

Table 2.1: LCiC Identified Locations for Review

Location	Time Period	Modelling Response
Orwell Drive/ Strasbourg Drive/ Heachem Drive	PM Peak	<ul style="list-style-type: none"> Eastern section of Heachem Drive is being used as an alternative route to access the A6 at Birstall due to pinch points on the A563. Small fluctuations in traffic along all three routes, however there are no corresponding increases in delay. Link VoC ratios show all links are free flowing, hence the traffic is free to choose from the available routes.
Anstey Lane/A50/ Blackbird Road	PM Peak	<ul style="list-style-type: none"> Development at Anstey Lane is causing a small increase in flow and delay at the Bennion Road/Anstey Lane roundabout. Small changes in delay can lead to local rerouteing due to the range of routes available in this area. There are no significant changes in VoCs in the local area, suggesting that traffic has a number of route choices.
Anstey Lane	AM Peak	<ul style="list-style-type: none"> Small increase in flow due to additional traffic from the adjacent development.
Groby Road	AM Peak	<ul style="list-style-type: none"> Increase in delay at the junction of Anstey Lane and the A50 due to increase in flow along Anstey Lane. This increase in flow is driven by an increase in delay on the main carriageway of the A46, through the A50 junction. Due to significant congestion on the A46, the small increase in delay has caused a some traffic to route through Anstey and join the A46 just south of the junction in question. There is an increase in delay on the A50 southbound approach to the Anstey Lane junction. This is due to signalisation of the right turn into Anstey as part of the package of mitigations.
A47/A563	PM Peak	<ul style="list-style-type: none"> Analysis of the Baseline traffic flow and level of delay around the A47 and A563 show significant delay at all major A563 junctions, particularly at the A563/A47 junction. Overall traffic flows show that major routes are carrying the majority of the traffic, with consistently high flow on the A46, A50 and A563 indicating that capacity issues are pushing traffic to more minor routes.
Leicester Road (Thurcaston)	PM Peak	<ul style="list-style-type: none"> Small increase in flow from the Baseline due to overall increase in traffic levels accessing urban areas. No change in delay from the Baseline. Given its proximity to significant developments, like Birstall and Anstey, the small increase in traffic is to be expected.
Red Hill Circle	PM Peak	<ul style="list-style-type: none"> Minimal change in delay on Red Hill Circle roundabout itself. The mitigation measures on Wanlip Lane have encouraged traffic to use the A6, hence there is an increase in flow in both directions on the A6 arm.

Location	Time Period	Modelling Response
		<ul style="list-style-type: none"> • Increase in flow accessing the A563 via Red Hill Circle has increased the flow on the A563 east and west of this junction. There is a relatively small increase in traffic on what is a major route around the City. There is no increase in delay on the A563.
Outer Ring Road (Melton Road/Troon Way)	-	<ul style="list-style-type: none"> • Troon Way has link VoC ratios over 95% in the Baseline. • No change in delay on Melton Road, but there is a modest increase in flow due to a general increase in traffic levels.
Outer Ring Road (New Parks Way/Aylestone Road)		<ul style="list-style-type: none"> • A modest increase in flow due to induced traffic from the strategic mitigation schemes. This is a major route into the city and hence is expected to carry additional urban traffic.
Narborough Road South	-	<ul style="list-style-type: none"> • A modest increase in flow due to induced traffic from the strategic mitigation schemes. This is a major route into the city and hence is expected to carry additional urban traffic.
A47 (Tailby Avenue/Humberstone Drive)	PM Peak	<ul style="list-style-type: none"> • Small increase in delay on the A47 Uppingham Road approach to the A6030 junction causes some localised rerouting from the North Evington model zone to avoid this section. • The Uppingham Road/A6030 junction approach has high Baseline VoC ratios, and hence small changes in delay have had a corresponding impact on routing to avoid this delay. There is no significant change in link VoC ratios from the Baseline.

Section 3 – Refinement of the Preferred Package of Mitigation Measures

3.1 Introduction

- 3.1.1 This section presents the refinement of the preferred package of mitigation measures, based on stakeholder comments received and consideration of any notable secondary effects identified from the modelling of the preferred mitigation package.
- 3.1.2 Only a limited number of changes were made to the mitigation package, and these are set out in Section 3.2. All comments within scope were considered in detail for whether or not the modelling data supported changes to the mitigation package and/or whether new or amended forms of mitigation could be applied. The reasons for why some comments within scope, or issues identified in modelling, did not result in changes to the mitigation package are also set out in Section 3.3 to provide justification.
- 3.1.3 It should be noted that this report does not fully list out the preferred package of mitigations, the full list can be found in TN3. For completeness, the response to each stakeholder comment received is also documented in TN3.

3.2 Refining the Mitigation Package

- 3.2.1 The information provided through the comments, the additional analysis, and resources such as Google Maps and Google Street View were used to identify where improvements could be made to the existing mitigation proposed and to establish potential interventions in the new locations that required mitigation.
- 3.2.2 Three locations were identified as requiring either revisions to the initial mitigation proposed or entirely new mitigation measures at locations without previously proposed mitigation. These locations were:
- M1 Junction 23;
 - Iveshead Road; and
 - Anstey Lane, A563, A50, and Gynsill Lane.
- 3.2.3 These changes are discussed below.

[M1 Junction 23](#)

- 3.2.4 Comments submitted relating to the proposed mitigation at M1 Junction 23 were, in general, concerned that the intervention proposed was disproportionately large compared with the impact arising from growth.
- 3.2.5 Figure 2.1 and Figure 2.2 show that, despite the changes on the M1 itself, there are relatively small changes in traffic flow using M1 Junction 23 from Shepshed and Loughborough as a result of the Local Plan development and mitigation package combined. There are also low levels of delay in the Hybrid Option 3 scenario, both approaching and on the M1 Junction 23 roundabout itself, in both the AM and PM Peaks. This corroborates the concern that the proposed mitigation at Junction 23 is potentially excessive in scale.
- 3.2.6 It was therefore seen to be appropriate to alter the proposed mitigation at M1 Junction 23 to better reflect the scale of the Shepshed development and the impact at the junction. The proposed changes for this mitigation include changes to the flare lengths at approaches to the junction, widening of stop lines, extending lanes and changing lane movements. However the increased capacity on the motorway overbridges, and the dedicated left turn lane from the A512 westbound onto the M1 southbound have been removed from the previous package of mitigations. It was deemed appropriate to categorise this new intervention as both local and strategic as whilst it is on an SRN junction the changes proposed are predominantly local road improvements. The proposed changes are explained fully in Table 3.1.

[Iveshead Road](#)

- 3.2.7 The proposed banned turning movements at A512 Ashby Road West/Charley Road/Tickow Lane (SH2), which formed part of the initial mitigation package, were proposed to discourage traffic between Shepshed and areas of north Leicester routeing across the Charnwood Forest. The model demonstrates that the measures cause a reduction in flow along Charley Road and across Charnwood Forest in the AM Peak. However, trips appear to be using Iveshead Road as an alternative route for traveling south which is demonstrated by an increase in flow along Iveshead Road.

- 3.2.8 Traffic calming measures have been proposed as additional mitigation through the residential section of Iveshead Road (the northern section of the road) to deter strategic trips from using the road. This is set out in Table 3.1.
- 3.2.9 It has been noted that the mitigation scheme on Charley Road results in a large impact on the rerouting of southbound traffic; however, it has minimal impact on northbound traffic accessing the A512, due to the nature of the restricted turn. It has also been shown that a significant proportion of Charley Road traffic is cross-county, carrying longer distance traffic to and from the south and east of Charnwood. Further reductions in Charnwood Forest traffic could potentially be achieved through a collaborative cross-district approach.

[Anstey Lane, the A563, the A50 and Gynsill Lane](#)

- 3.2.10 The comments received regarding the cycle network suggested that additional cycle routes could be included to link key destinations in north west Leicester to the existing cycle network.
- 3.2.11 A gap in cycle infrastructure within Anstey Lane, the A563, the A50 and Gynsill Lane was identified and improvements to the cycle network within this area have been proposed to connect the locations. This is set out in Table 3.1.
- 3.2.12 The mitigation proposed is high level. For information on specific routeing and the need for supporting infrastructure, such as facilities, a more detailed assessment would be required (potentially as part of an active mode strategy update or as part of relevant transport assessments). This would consider in more detail the demand propensity for cycling within the area and the key origins, destinations and desire lines.

[Revised Mitigation](#)

- 3.2.13 The new or altered measures were used to update the preferred packages of mitigation measures. Table 3.1 shows the new or altered mitigation measures.
- 3.2.14 These changes are incorporated into the full package of mitigation measures set out in Excel file '*210527 Charnwood BC LP Mitigation EAST Assessment TN3 Final*' (May 2021).

Table 3.1: Proposed New/Altered Mitigation Measures

ID	Corridor	Link/Junction/Location	Broad Location	Source	Description	Intervention Types ¹
SH6/STRAT14	A512	M1 Junction 23 and A512	Shepshed/ Strategic Long-term	AECOM	Additional improvements (over and above committed scheme) comprising: permitting the left turn movement from lane 2 as well as lane 1 of the northbound off-slip (once widened) (lane 2 will also serve the straight ahead movement onto the northbound circulatory); extending the lane 1 flare by 60m; extending the A512 westbound lane 1 nearside flare by 60m; widen the southbound circulatory section to 3 lanes at the stop line, with lanes 1 and 2 permitting the straight ahead movement (towards the M1 southbound on-slip) and lanes 2 and 3 permitting the right turn movement (onto the westbound circulatory section, towards Shepshed); extending lane three on the southbound M1 off-slip by 30m; permitting the straight ahead movement onto the southbound circulatory from the southbound off-slip from lanes 2 and 3 (i.e. not just lane 3 as proposed in committed scheme). This is a predominantly local road improvement and is therefore not deemed to be a strategic intervention.	7. Junction improvement - car and freight
SH7	A512	Northern section of Iveshead Road	Shepshed	AECOM	Traffic calming on residential section of Iveshead Road (northern section) to consist of five speed tables, to make Iveshead Road a less desirable route choice for strategic trips.	3. Traffic calming and urban realm
AN9	A46	Parcel of land within Anstey Lane, A563, A50, and Gynsill Lane	Anstey	AECOM	New cycle paths across parcel of land within Anstey Lane, A563, A50, and Gynsill Lane.	2. Cycle network improvement

¹ Intervention Types are defined in the Mitigation Report.

3.3 Comments within scope but resulting in no change to the mitigation package

- 3.3.1 There were a number of comments that were considered but did not result in further mitigation at this stage. The reasons for these limitations fell under a number of themes, which are shown in Table 3.2 and discussed in further detail below the table.

Table 3.2: Themes to Limitations for Addressing Comments through Revised Mitigation

Limitation ID	Theme
L1	The modelling demonstrated that the issue raised in the comment only has a minimal impact on the network that would not trigger a need for mitigation
L2	Comment is regarding issues beyond the current scope of the task
L3	Comment is regarding an issue that is cause by model instability
L4	Comment is regarding proposed mitigation causing rerouteing
L5	Comment is regarding a development-specific issue
L6	Comment is regarding the interaction between local and strategic routeing

L1: No Issues Found in Further Analysis

- 3.3.2 A number of comments referred to concerns regarding non-negligible flow change on the network. The further analysis undertaken demonstrated that in some locations flow increases did not result in any additional delays or junction capacity issues, and therefore it was determined that mitigation measures would not be necessary in these locations.
- 3.3.3 In some locations, such as Leicester Road (Thurcaston) and Red Hill Circle, the analysis suggested that no further mitigation is required due to the minimal scale of the issue raised. On the Outer Ring Road (Melton Road/Troon Way) the analysis shows that the scale of change is small and the issue of local rerouteing within Leicester does not require further mitigation as part of the Charnwood Local Plan.

L2: Issues Beyond Scope of Local Plan

- 3.3.4 A number of comments, particularly regarding strategic roads and roads beyond the boundaries of the Local Plan study area, were deemed to have required going beyond the scope of the task in order to address them. The evidence and analysis put forward to stakeholders must be deemed suitable for the level of evidence required for a Local Plan submission, with the understanding that further transport and impact studies will be undertaken.
- 3.3.5 In some locations, the issues presented in the model outputs demonstrated that some issues could not be addressed without significant measures that were disproportionate to the scale of the Local Plan growth. At Birstall Road, the further analysis undertaken demonstrated that some long-distance trips are using this route instead of the A6, despite the traffic calming on Wanlip Lane. This shows that without significant changes to the capacity of the A6, given the significance of the route for a large proportion of traffic entering and leaving Leicester City, it is likely that the parallel route will remain an attractive choice in congested times; however, the traffic calming on Wanlip Lane does cause a reduction in traffic when compared with the Baseline.
- 3.3.6 Comments were raised regarding intervention AN3, which proposed a signalised right turn lane at the A50/Anstey Lane junction. Due to the substantial growth in the area, it was determined that access from the A50 northbound to Anstey Lane into Anstey was necessary. Other alternative options were considered, such as upgrading the junction to a roundabout, but this was dismissed as unfeasible due to the junction's proximity to the A46/A50 junction. Upgrading the Newtown Linford Lane junction and diverting Anstey Lane to this junction was also considered, but this was deemed to be unfeasible due to the scale of the mitigation in comparison to the problem. Therefore, the proposed mitigation in AN3 was identified as the most suitable solution and no changes were proposed to this scheme.

L3: Issues Caused by Model Instability

- 3.3.7 A small number of the issues highlighted are as a result of instability in the transport model. These issues are not representative of actual impacts, and largely point to a well-known issue of congestion or delay that is causing secondary impacts.

[L4: Rerouteing Potentially Caused by Mitigation](#)

- 3.3.8 Some comments were regarding the rerouteing of traffic caused by the proposed interventions. These were largely regarding rerouteing of traffic from local roads onto strategic roads, which demonstrates that the mitigation measures proposed have had the desired result.
- 3.3.9 Some junctions along the A50 are shown to be nearing capacity in the Baseline creating pinch points along the road and reducing the capacity the route has for additional traffic. The majority of trips using the A50 are travelling between M1 Junction 22 and Coalville and Leicester or the A46 east. When assessed further, the model outputs show that there is no change in routeing between the Hybrid Option and the Mitigation Scenario. As such no mitigation was deemed to be necessary or suitable, because the junctions close to capacity are not caused by growth in the Local Plan.

[L5: Development-Specific Issues](#)

- 3.3.10 The comments raised regarding issues at Anstey Lane/A50/Blackbird Road and at Anstey Lane should be revisited as part of development-specific transport assessments, as the changes in delay and VoCs will depend on detailed site access information, and therefore this issue will need to be considered as part of that assessment to inform an appropriate site-specific mitigation package.

[L6: Urban Rerouteing Beyond Charnwood](#)

- 3.3.11 Comments were received regarding concerns about local traffic using strategic routes.
- 3.3.12 One of the general aims of the mitigation package has been to ensure that strategic traffic is encouraged to use strategic routes, though it is acknowledged that the picture is complex particularly when attempting to separate strategic and non-strategic traffic.
- 3.3.13 A number of the comments from the stakeholders were regarding locations beyond the boundaries of the Charnwood Local Plan study area or were not necessarily caused by growth in Charnwood alone. As discussed in the section prior, increases in traffic along unimproved sections of the M1 has led to traffic rerouteing through Leicester or Hinkley and Bosworth in the PM Peak and re-joining the M1 at Junction 22. The issues highlighted at the A47/A563 junction also fall in this bracket of local rerouteing caused by the strategic mitigation schemes. Similarly, it was determined that a number of the locations flagged up in the comments had potential to be included in a wider study which extends beyond Charnwood, to address the transport needs caused by growth in the county/region, particularly focusing on intra-city travel and how to minimise urban rerouteing. This included issues raised at the following locations:
- Orwell Drive/Strasbourg Drive/Heachem Drive;
 - Anstey Lane/A50/Blackbird Road;
 - Outer Ring Road (Melton Road/Troon Way);
 - Outer Ring Road (New Parks Way/Aylestone Road);
 - Narborough Road South;
 - A47/A563; and
 - A47 (Tailby Avenue/Humberstone Drive).

Section 4 – Cost of Additional Mitigation Measures

4.1 Introduction

- 4.1.1 The additional or amended forms of mitigation proposed in Table 3.1 were costed and incorporated into the preferred package of mitigation cost as set out in '210527 Charnwood BC LP Mitigation EAST Assessment TN3 Final' (May 2021).
- 4.1.2 The information below recaps on the assumptions applied to determine the mitigation cost estimates.

4.2 Methodology for Calculating Costs

- 4.2.1 The additional mitigation measures were costed individually using the same approach undertaken for the initial mitigation packages.
- 4.2.2 Calculating the costs was initially undertaken by 'intervention type category', which requires identifying the component parts of the intervention to be costed first. High level cost benchmarks relevant to each intervention type were then developed. The costs cover capital costs and have been derived from a combination of previous experience and professional opinion. It should be noted that the costs are all as at July 2020 prices and also include allowance for:
- traffic management (at 25% of the base cost);
 - main contractor preliminaries, overheads and profit (at 30% of the base cost);
 - professional fees (i.e. those incurred for developing an intervention to a sufficient level of detail in order to gain approval from the relevant parties for implementation (at 10% of the base cost)); and
 - contingencies (i.e. to account for risks and uncertainties, at 15% of the base cost).
- 4.2.3 The percentages were applied consistently on all cost interventions. The cost estimates do, however, exclude the following:
- inflation from July 2020;
 - Value Added Tax (VAT);
 - land acquisition;
 - client's direct costs;
 - any adoption fees and commuted sums that would be payable; and
 - utilities/drainage diversion (as these are unknown).
- 4.2.4 Many of the above exclusions could vary significantly and there is not sufficient information available at this time to account for them.
- 4.2.5 High level costs were then calculated, using benchmark costs per unit and scale. The scale of each intervention was determined using professional judgement and various relevant sources such as the Google Maps Measuring Tool (GMMT). Given that the unit costs are high level, a range has been used to calculate the likely cost. This is based on a +/- 25% variation around the benchmark cost. It should be noted that the costs are indicative and the total costs may therefore lie outside this range, particularly when taking into account the cost of the exclusions listed above, some of which may see costs increase. Therefore, the costs for the mitigation measures may be greater in reality than the figures presented in this document.

4.3 Revised Costs

- 4.3.1 The costs for the additional mitigation measures are shown in Table 4.1 below. As mentioned above, this report does not fully list out the preferred package of mitigation, and therefore the overall cost of the preferred package is not discussed in this report but can also be found in TN3.
- 4.3.2 Full details of the costing are presented in the accompanying Excel file '210527 Charnwood BC LP Mitigation EAST Assessment TN3 Final' (May 2021), which supports this report.

Table 4.1: Costs for Proposed New or Altered Mitigation Measures

ID	Corridor	Link/Junction/Location	Broad Location	Capital cost total	Capital costs total low (Indicative)	Capital costs total high (Indicative)
SH6/STRAT14	A512	M1 Junction 23 and A512	Shepshed/ Strategic Long-term	£1,350,000	£1,012,500	£1,687,500
SH7	A512	Northern section of Iveshead Road	Shepshed	£90,000	£67,500	£112,500
AN9	A46	Parcel of land within Anstey Lane, A563, A50, and Gynsill Lane	Anstey	£920,000	£690,000	£1,150,000

Section 5 – Updated Model Results

5.1 Introduction

5.1.1 Following the further analysis undertaken (Section 2) and the proposed changes to the package of mitigations (Section 3), PRTM was run to test the Revised Mitigation Scenario.

5.1.2 The modelled changes in the Revised Mitigation Scenario are:

- traffic calming on the northern section of Iveshead Road;
- revision to the mitigations introduced at M1 Junction 23; and
- changing of the M1 Junction 21 to M1 Junction 23a scheme assumptions from hard-shoulder running to All Lane Running between M1 Junction 21a and M1 Junction 23a.

5.1.3 Based on the forecasting assumptions set out in Section 2.2 and Section 6 of the Forecasting Report, this section details the model forecasts produced in the assessment of the proposed Hybrid Option 3 and Revised Mitigation Scenarios. This analysis includes:

- forecast changes in travel demand (see Section 5.2);
- forecast changes in mode share proportions (see Section 5.3);
- high-level highway network statistics (see Section 5.4);
- forecast highway flow changes between the Revised Mitigation Scenario and Hybrid Option 3 (see Section 5.5);
- forecast highway flow changes between the Revised Mitigation Scenario and the Baseline (see Section 5.6);
- forecast highway delay changes between the Revised Mitigation Scenario and Hybrid Option 3 (see Section 5.7);
- forecast highway delay changes between the Revised Mitigation Scenario and the Baseline (see Section 5.8);
- forecast junction impacts of the Revised Mitigation Scenario (see Section 5.9); and
- forecast Revised Mitigation Scenario results by broad location (see Section 5.10).

5.2 Forecast Travel Demand Changes

- 5.2.1 Figure 5.1, Figure 5.2, and Figure 5.3 show the demand growth from the 2014 Base Year for Commuting, Business, and Other purposes respectively.
- 5.2.2 All three graphs show around a 10-15% increase in forecast demand growth in Charnwood, dependent on travel purpose, between the 2014 Base Year and 2037 Baseline.
- 5.2.3 The growth in population between the 2037 Baseline and 2037 Hybrid Option 3 is reflected in all three graphs with growth in demand within Charnwood (and therefore Leicestershire). It can also be seen that for all three purposes there are small increases in demand in Leicester and Blaby between the 2037 Baseline and 2037 Hybrid Option 3. This is due to the increase in trip attractions to Charnwood as a result of the proposed developments, and the resulting changes to trip distribution patterns as more people will travel between the districts for work and leisure purposes.
- 5.2.4 There are negligible changes in growth between the 2037 Baseline and 2037 Revised Mitigation Scenario in Charnwood because this analysis is across all modes; the next section demonstrates the impact of mode shift between these scenarios as a result of the package of mitigations.
- 5.2.5 Table 5.1, Table 5.2, and Table 5.3 show the same results in tabular format. The freight demand growth results are consistent with what has been reported previously in the Forecasting Report.

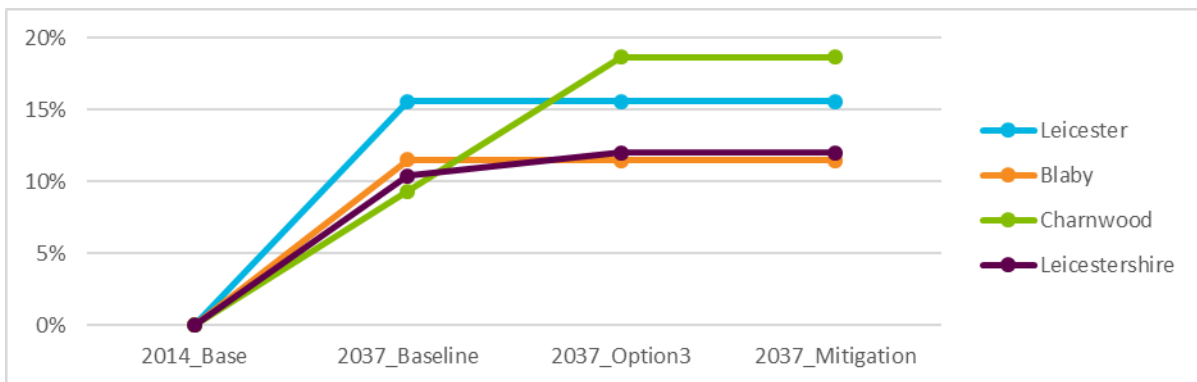


Figure 5.1: Travel demand growth from 2014, Commuting

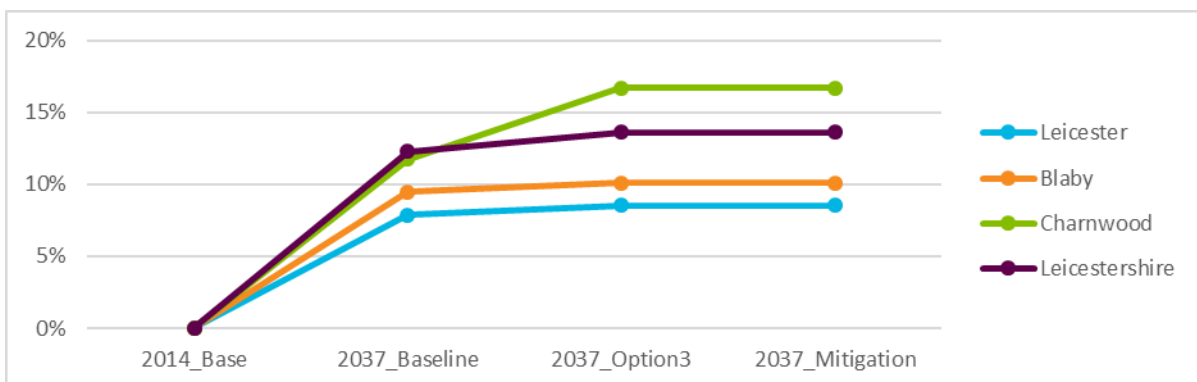


Figure 5.2: Travel demand growth from 2014, Business

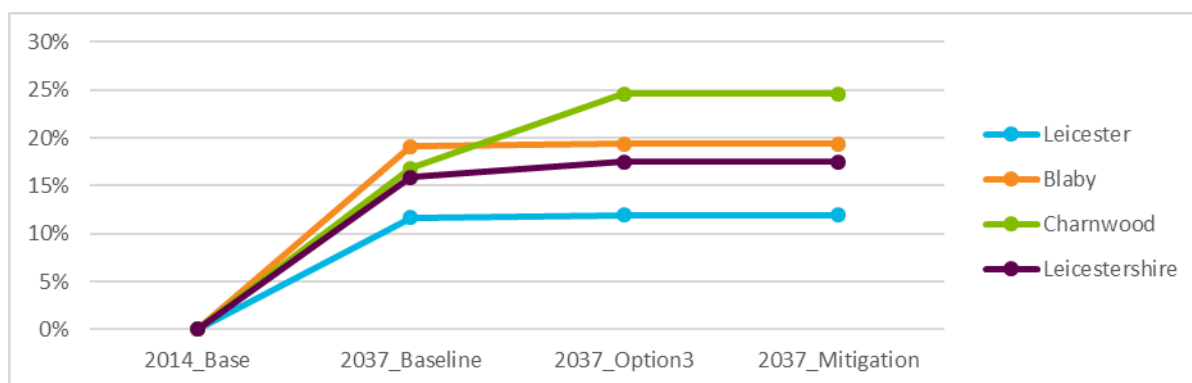


Figure 5.3: Travel demand growth from 2014, Other

Table 5.1: Travel demand growth from 2014, Commuting

District	2037 Baseline	2037 Hybrid Option 3	2037 Mitigation
Leicester	15.6%	15.6%	15.6%
Blaby	11.5%	11.5%	11.5%
Charnwood	9.3%	18.7%	18.7%
Leicestershire	10.4%	12.0%	12.0%

Table 5.2: Travel demand growth from 2014, Business

District	2037 Baseline	2037 Hybrid Option 3	2037 Mitigation
Leicester	7.9%	8.5%	8.5%
Blaby	9.5%	10.1%	10.1%
Charnwood	11.7%	16.7%	16.7%
Leicestershire	12.3%	13.6%	13.6%

Table 5.3: Travel demand growth from 2014, Other

District	2037 Baseline	2037 Hybrid Option 3	2037 Mitigation
Leicester	11.7%	12.0%	12.0%
Blaby	19.1%	19.4%	19.4%
Charnwood	16.8%	24.6%	24.6%
Leicestershire	15.9%	17.5%	17.5%

5.3 Forecast Mode Share Analysis

5.3.1 Figure 5.4, Figure 5.5, and Figure 5.6 show the 2014 Base Year, 2037 Baseline, 2037 Hybrid Option 3, and 2037 Revised Mitigation Scenario mode share proportions for highway, public transport and active modes respectively. Highway mode share increases uniformly across the four geographical areas by 3-4 percentage points between the 2014 Base Year and 2037 Baseline. This is mode shift from public transport and active modes, which have around a 1 percentage point and 3-4 percentage point reduction in mode share respectively.

5.3.2 In Charnwood between the 2037 Hybrid Option 3 and 2037 Revised Mitigation Scenario there is a small reduction in highway mode share, and corresponding small increases in public transport and active mode shares. This is due to the inclusion of the behavioural change mitigation schemes focused on Loughborough. The 3.4% reduction in car trips modelled in the town results in a just over 1 percentage point reduction in car mode share across the borough.

5.3.3 Table 5.4, Table 5.5, and Table 5.6 show the same data in tabular format.

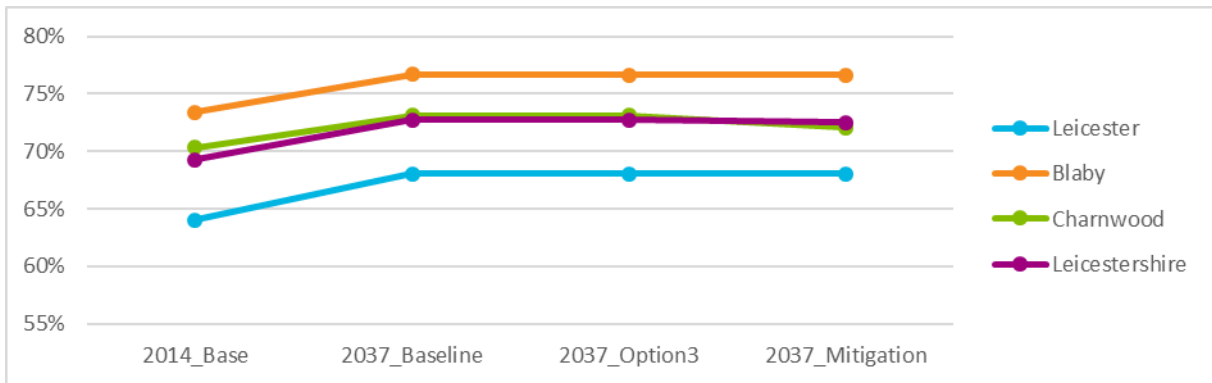


Figure 5.4: Forecast Mode Share by District, Highway

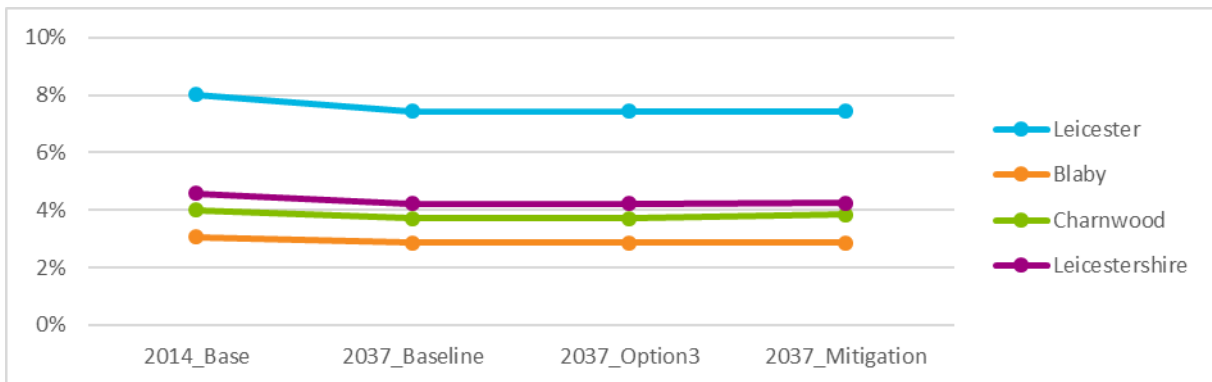


Figure 5.5: Forecast Mode Share by District, Public Transport

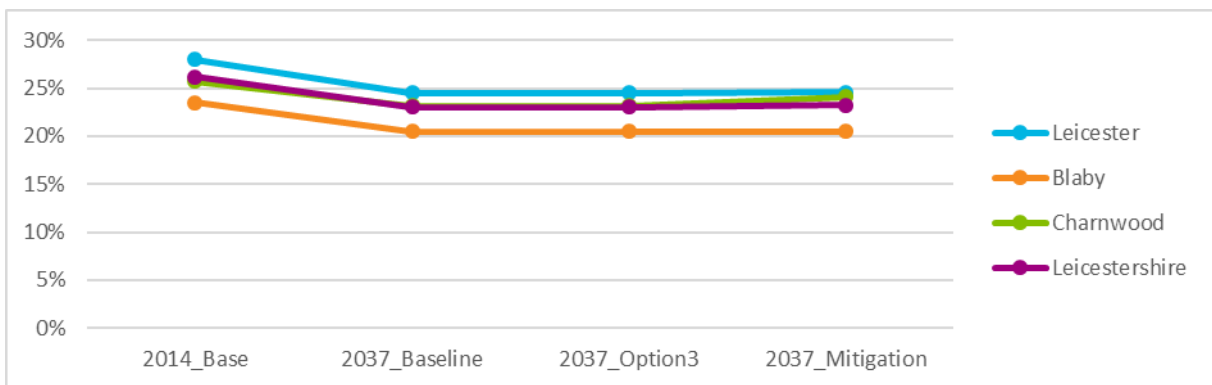


Figure 5.6: Forecast Mode Share by District, Active Modes

Table 5.4: Forecast Mode Share by District, Highway

District	2014 Base	2037 Baseline	2037 Hybrid Option 3	2037 Mitigation
Leicester	64%	68%	68%	68%
Blaby	73%	77%	77%	77%
Charnwood	70%	73%	73%	72%
Leicestershire	69%	73%	73%	73%

Table 5.5: Forecast Mode Share by District, Public Transport

District	2014 Base	2037 Baseline	2037 Hybrid Option 3	2037 Mitigation
Leicester	8%	7%	7%	7%
Blaby	3%	3%	3%	3%
Charnwood	4%	4%	4%	4%
Leicestershire	5%	4%	4%	4%

Table 5.6: Forecast Mode Share by District, Active Modes

District	2014 Base	2037 Baseline	2037 Hybrid Option 3	2037 Mitigation
Leicester	28%	25%	25%	25%
Blaby	24%	20%	20%	20%
Charnwood	26%	23%	23%	24%
Leicestershire	26%	23%	23%	23%

5.4 High-level Highway Network Statistics

- 5.4.1 Table 5.7, Table 5.8, and Table 5.9 show the high-level network statistics in the AM Peak, Interpeak, and PM Peak respectively. The 2037 Baseline is compared with the 2014 Base Year, Hybrid Option 3 is compared with the Baseline, and the Revised Mitigation Scenario is compared with Hybrid Option 3.
- 5.4.2 In 2037 for Hybrid Option 3 within Charnwood, vehicle distance increases by around 3-4% and vehicle delay increases by around 14%, resulting in a drop in average speed of around 4% in the AM and PM Peaks. These values are less pronounced in the Interpeak, with around a 2% increase in vehicle distance and 5% increase in vehicle delay, resulting in a 1% reduction in average speed.
- 5.4.3 As expected, most of the changes are seen in Charnwood, with smaller changes seen across Leicester City and Blaby due to the increase in traffic from the developments to the surrounding areas. Leicester City shows a 1% increase in vehicle distance across all three time periods, while Blaby shows a 1% increase in the AM Peak only. There is a small reduction in average speed in Leicester City in the AM and PM Peaks, with virtually no change in the Interpeak, and little to no change in Blaby across all three time periods.
- 5.4.4 The introduction of the mitigation schemes decreases the vehicle delay time across Charnwood by around 5% in the AM and PM Peaks, compared with Hybrid Option 3, while increasing the average speed by around 1% in the PM Peak. There are minimal changes in Leicester City due to the mitigation schemes, and across Leicestershire as a whole the effects of the mitigation are dampened due to the geographical aggregation. Blaby however sees around a 4% increase in vehicle distance and 3% increase in average speed in both the AM and PM Peaks; this is likely to be due to the capacity enhancing mitigation schemes on the M1 and at M1 Junction 21.

Table 5.7: Highway Network Statistics: AM Peak

AM Peak		2014 Base	2037 Baseline	% change from 2014	2037 Hybrid Option 3	% change from Baseline	2037 Mitigation	% change from Hybrid Option 3
Charnwood	Vehicle Distance (vehicle-km)	300,971	393,824	31%	407,628	4%	400,150	-2%
	Vehicle Delay-Time (vehicle-hours)	1,657	2,841	71%	3,239	14%	3,110	-4%
	Average Speed (kph)	48.2	44.4	-8%	42.9	-4%	43.1	0%
Leicester City	Vehicle Distance (vehicle-km)	268,130	312,566	17%	314,664	1%	314,162	0%
	Vehicle Delay-Time (vehicle-hours)	4,444	6,574	48%	6,751	3%	6,781	0%
	Average Speed (kph)	25.7	22.8	-11%	22.5	-1%	22.5	0%
Blaby	Vehicle Distance (veh-km)	279,999	335,446	20%	337,787	1%	351,248	4%
	Vehicle Delay-Time (vehicle-hours)	1,908	3,048	60%	3,074	1%	3,080	0%
	Average Speed (kph)	49.6	43.9	-11%	44.0	0%	45.1	3%
Leicestershire	Vehicle Distance (vehicle-km)	2,101,240	2,730,960	30%	2,756,375	1%	2,768,989	0%
	Vehicle Delay-Time (vehicle-hours)	11,627	19,121	64%	19,797	4%	19,485	-2%
	Average Speed (kph)	49.3	46.1	-7%	45.7	-1%	46.1	1%

Table 5.8: Highway Network Statistics: Interpeak

Interpeak		2014 Base	2037 Baseline	% change from 2014	2037 Hybrid Option 3	% change from Baseline	2037 Mitigation	% change from Hybrid Option 3
Charnwood	Vehicle Distance (vehicle-km)	192,894	276,967	44%	283,837	2%	280,885	-1%
	Vehicle Delay-Time (vehicle-hours)	811	1,344	66%	1,406	5%	1,376	-2%
	Average Speed (kph)	50.5	49.8	-1%	49.4	-1%	49.4	0%
Leicester City	Vehicle Distance (vehicle-km)	202,581	248,656	23%	250,129	1%	250,557	0%
	Vehicle Delay-Time (vehicle-hours)	2,745	3,937	43%	3,990	1%	3,997	0%
	Average Speed (kph)	27.7	26.0	-6%	26.0	0%	26.0	0%
Blaby	Vehicle Distance (vehicle-km)	188,566	263,494	40%	264,323	0%	269,071	2%
	Vehicle Delay-Time (vehicle-hours)	727	1,240	71%	1,251	1%	1,267	1%
	Average Speed (kph)	58.3	55.9	-4%	55.8	0%	56.2	1%
Leicestershire	Vehicle Distance (vehicle-km)	1,472,108	2,065,339	40%	2,079,411	1%	2,090,123	1%
	Vehicle Delay-Time (vehicle-hours)	6,179	10,092	63%	10,244	2%	10,117	-1%
	Average Speed (kph)	52.7	51.8	-2%	51.7	0%	52.0	1%

Table 5.9: Highway Network Statistics: PM Peak

PM Peak		2014 Base	2037 Baseline	% change from 2014	2037 Hybrid Option 3	% change from Baseline	2037 Mitigation	% change from Hybrid Option 3
Charnwood	Vehicle Distance (vehicle-km)	306,742	400,915	31%	414,495	3%	409,902	-1%
	Vehicle Delay-Time (vehicle-hours)	1,593	3,114	95%	3,552	14%	3,350	-6%
	Average Speed (kph)	49.5	43.7	-12%	42.1	-4%	42.7	1%
Leicester City	Vehicle Distance (vehicle-km)	266,222	307,609	16%	309,413	1%	310,902	0%
	Vehicle Delay-Time (vehicle-hours)	4,378	6,256	43%	6,370	2%	6,471	2%
	Average Speed (kph)	25.9	23.3	-10%	23.1	-1%	23.0	0%
Blaby	Vehicle Distance (vehicle-km)	288,701	348,722	21%	347,606	0%	360,335	4%
	Vehicle Delay-Time (vehicle-hours)	1,636	3,032	85%	3,013	-1%	2,983	-1%
	Average Speed (kph)	52.6	44.8	-15%	44.9	0%	46.0	3%
Leicestershire	Vehicle Distance (vehicle-km)	2,154,787	2,801,296	30%	2,825,184	1%	2,845,664	1%
	Vehicle Delay-Time (vehicle-hours)	11,485	19,580	70%	20,216	3%	19,922	-1%
	Average Speed (kph)	50.1	46.3	-8%	45.9	-1%	46.3	1%

5.5 Forecast Change in Highway Flows – Revised Mitigation Scenario vs Hybrid Option 3

- 5.5.1 Figure 5.7 and Figure 5.8 show the forecast changes in flow between the Hybrid Option 3 and Revised Mitigation Scenarios for the AM Peak and PM Peak. At a high level there is an increase in traffic on the M1 for both time periods, due to the inclusion of the Smart Motorway widening scheme. There is also a marked decrease in flow routing across Charnwood Forest in both the AM and PM Peaks highlighting the introduction of the mitigation schemes in and around Shepshed encouraging traffic to take more strategic and direct routes.
- 5.5.2 There is also an increase in both the AM and PM Peaks in traffic between Melton Mowbray and Loughborough travelling across east Charnwood, using the signed route along the A60, B676 and A6006. This is as a result of the mitigation measures introduced on Broome Lane which has encouraged cross-county traffic to use the preferred east-west routes.
- 5.5.3 There are more localised changes around specific mitigation schemes across both the AM and PM Peaks. There are increases and reductions in flow within Loughborough, indicating rerouting along more appropriate routes; there is also continuing instability in flow on the A46 and A50 near Anstey, but also changes in flow due to the inclusion of the A50/A46 dedicated slip road. Other large areas of change can be seen at Hobby Horse roundabout and M1 Junction 21 as a result of the strategic schemes introduced at these locations. The impact of the mitigation at specific locations is explored in more detail in Section 5.9.

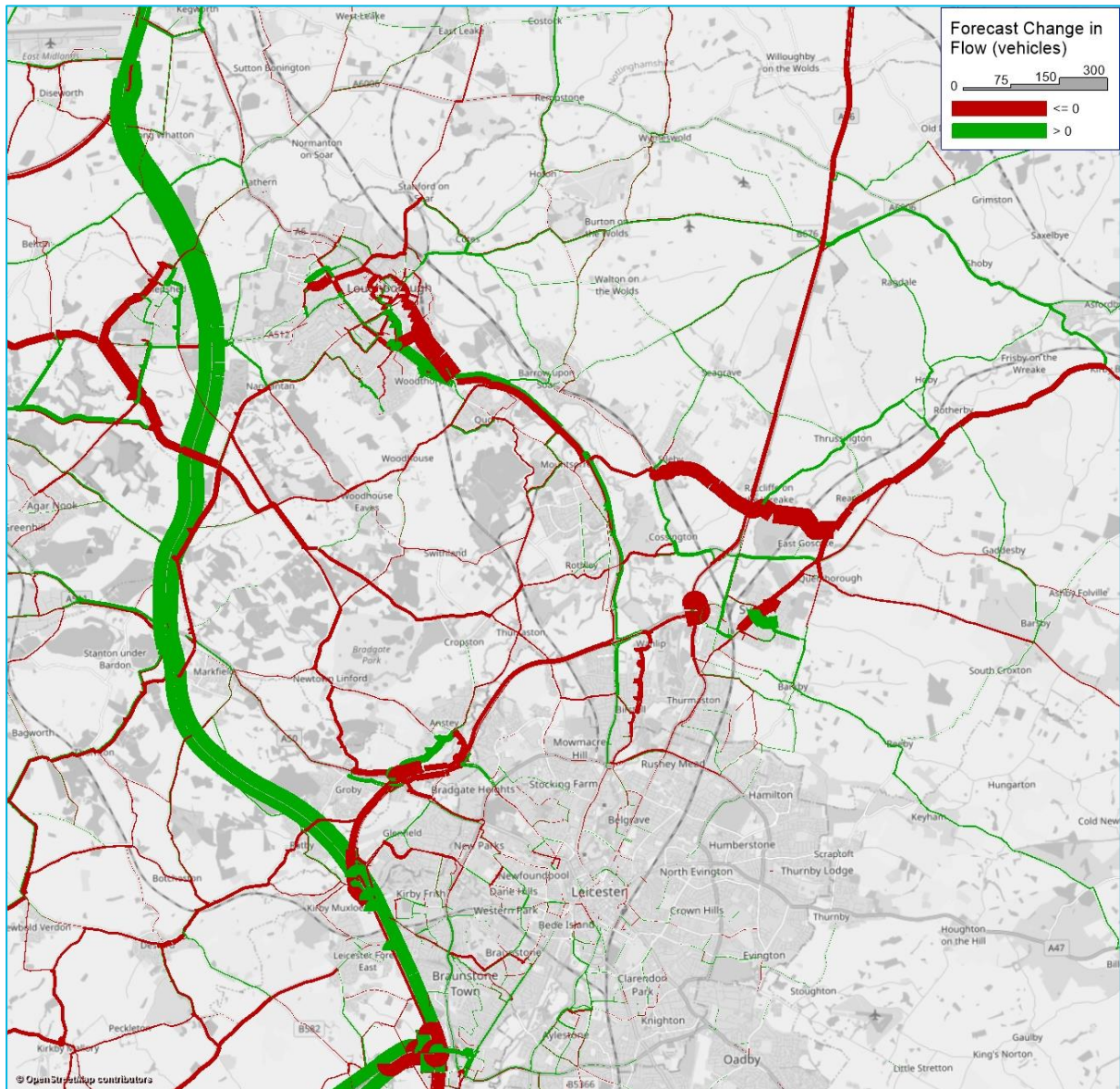


Figure 5.7: Highway Traffic Flow Change, Mitigation minus Hybrid Option 3, AM Peak

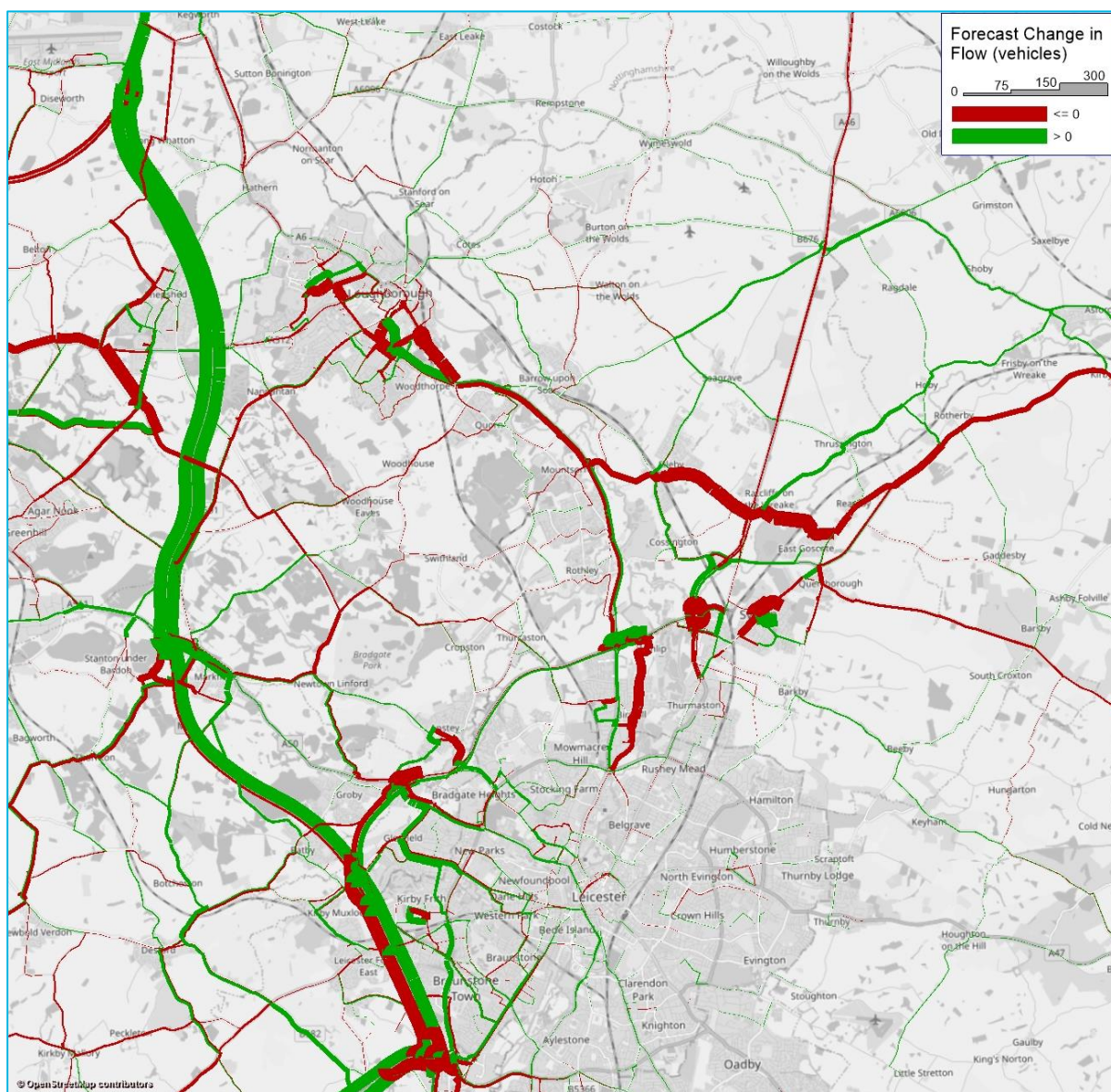


Figure 5.8: Highway Traffic Flow Change, Mitigation minus Hybrid Option 3, PM Peak

5.6 Forecast Change in Highway Flows – Revised Mitigation Scenario vs Baseline

- 5.6.1 Figure 5.9 and Figure 5.10 show the forecast changes in flow between the Revised Mitigation Scenario and the Baseline for the AM Peak and PM Peak. These plots are useful to show the impact of the inclusion of both the Local Plan development and the corresponding package of mitigations.
- 5.6.2 There are significant increases in traffic on the M1 in both the AM and PM Peaks. The increase in capacity on the M1 has allowed traffic to move off less suitable roads and use the more direct strategic routes. The increase in capacity will have also resulted in some induced traffic brought about by mode shift to car and the general lengthening of highway trips represented by the model. There are small reductions in traffic on the A46 to the north-east of Charnwood which are likely to be as a result of the M1 widening.
- 5.6.3 There is a reduction in routing across Charnwood Forest in the AM Peak as a result of the traffic calming measures introduced south of the A512 at Shepshed. The AM Peak benefits more than the PM Peak as the banned movement at Charley Road discourages southbound traffic towards Leicester, which is generally heavier in the AM Peak than the PM Peak.
- 5.6.4 There is also an increase in both the AM and PM Peaks in traffic between Melton Mowbray and Loughborough travelling across east Charnwood, using the signed route along the A60, B676 and A6006. This is as a result of the mitigation measures introduced on Broome Lane which has encouraged cross-county traffic to use the preferred east-west routes.

5.6.5 There are more localised changes around specific mitigation schemes across both the AM and PM Peaks. There are increases and reductions in flow within Loughborough, indicating rerouting along more appropriate routes; there is also continuing instability in flow on the A46 and A50 near Anstey, but also changes in flow due to the inclusion of the A50/A46 dedicated slip road. Other large areas of change can be seen at Hobby Horse roundabout, M1 Junction 21, and within Syston as a result of the mitigation schemes introduced at these locations. The impact of the mitigation at specific locations is explored in more detail in Section 5.9.

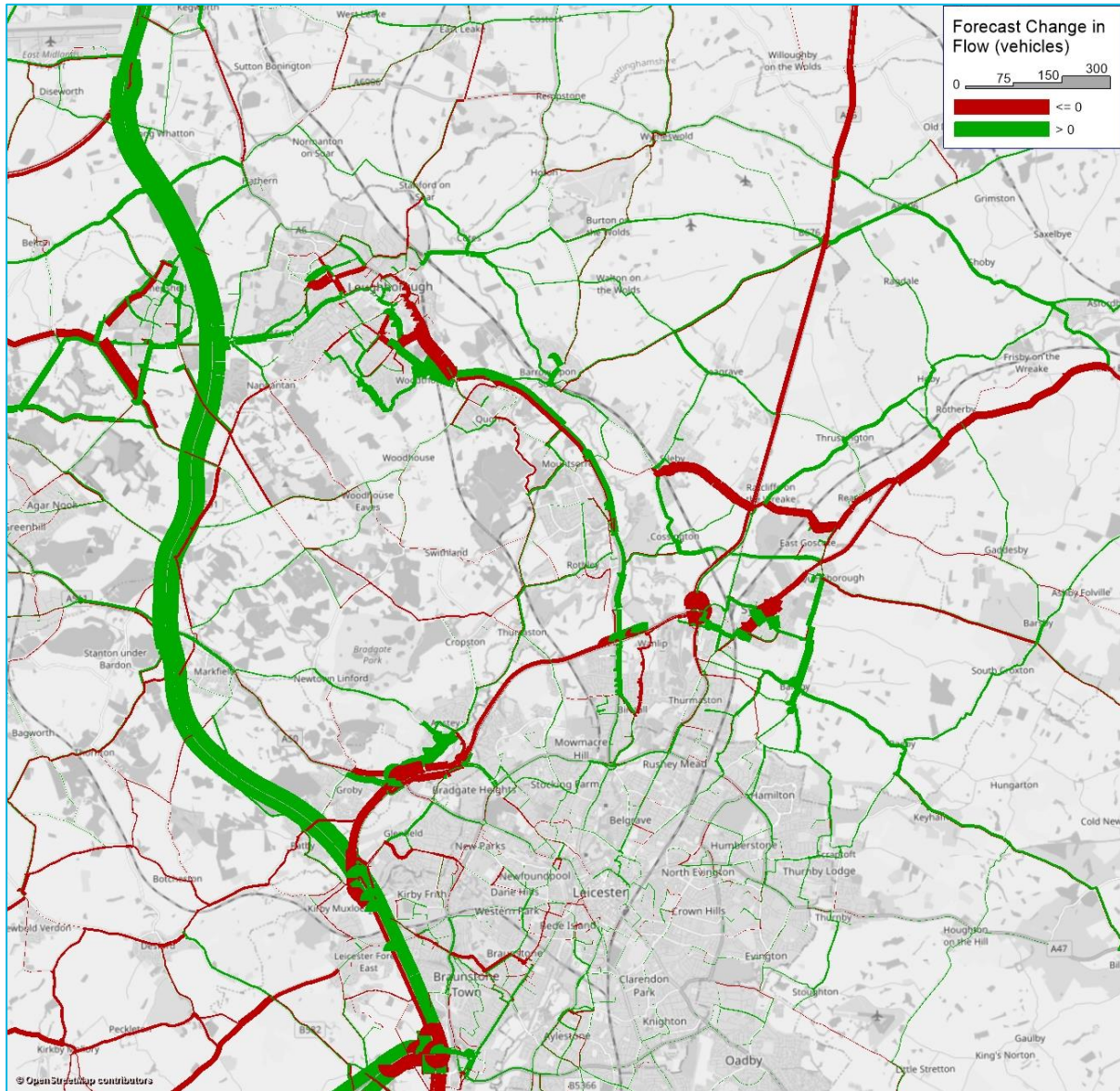


Figure 5.9: Highway Traffic Flow Change, Mitigation minus Baseline, AM Peak

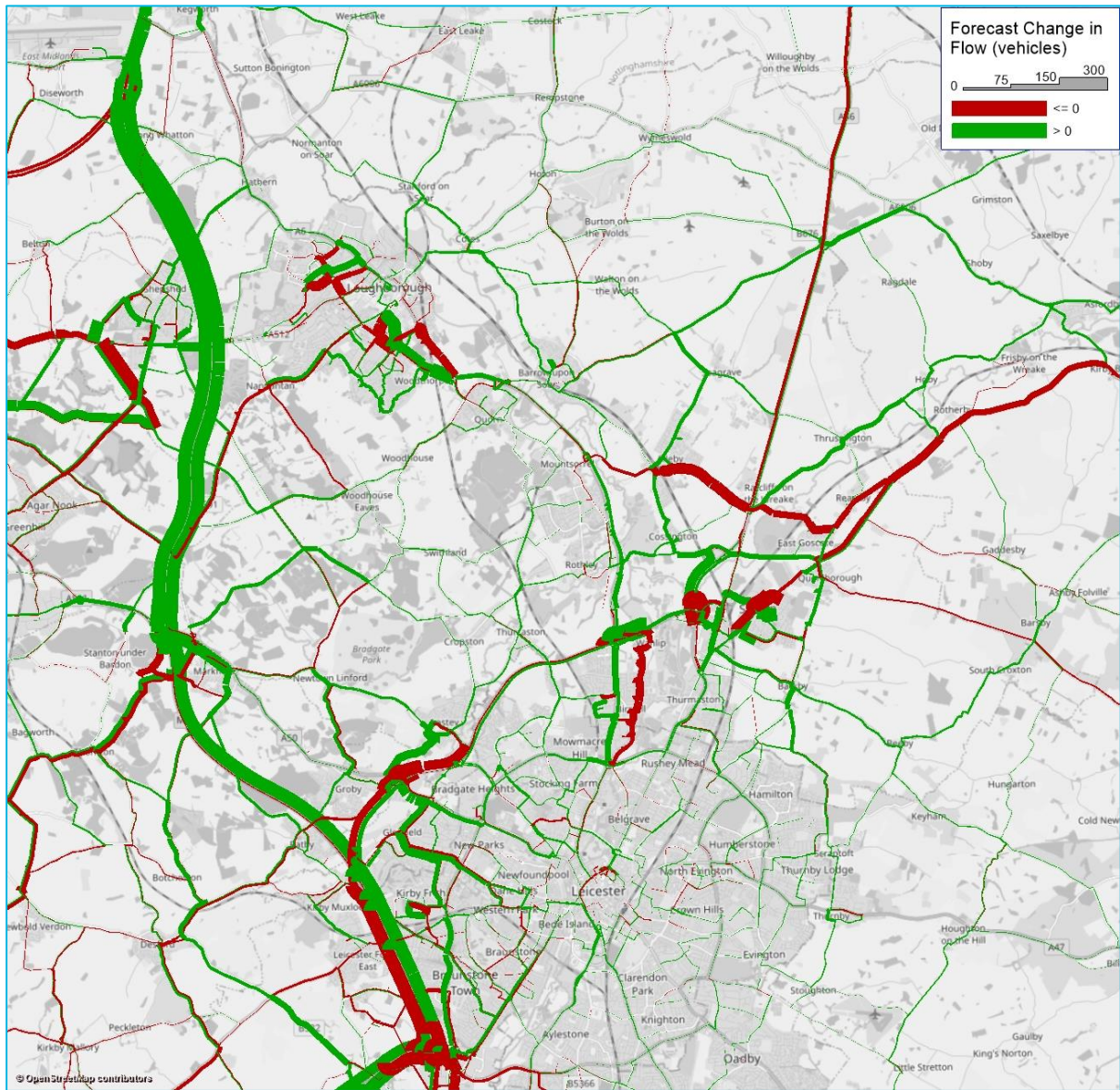


Figure 5.10: Highway Traffic Flow Change, Mitigation minus Baseline, PM Peak

5.7 Forecast Change in Highway Delays – Revised Mitigation Scenario vs Hybrid Option 3

- 5.7.1 Figure 5.11 and Figure 5.12 show the forecast changes in delay between the Hybrid Option 3 and Revised Mitigation Scenarios for the AM Peak and PM Peak. At a high level it can be seen that there are consistent reductions in delay along the M1, due to the smart motorway widening scheme.
- 5.7.2 There is a consistent reduction in delay within Loughborough town centre, due to the highway improvements and behavioural change schemes.
- 5.7.3 The other large delay changes can be seen at M1 Junction 21 and Junction 21a. The delay changes at Junction 21 are driven by the mitigation scheme at this location. The changes at Junction 21a are as a result of changes in capacity north of this junction and the layout of the A46 on-slip merge.
- 5.7.4 In the PM Peak there are large reductions in delay at the Hobby Horse roundabout, mainly from the southbound exit of the roundabout, due to the inclusion of the mitigation scheme at this location.

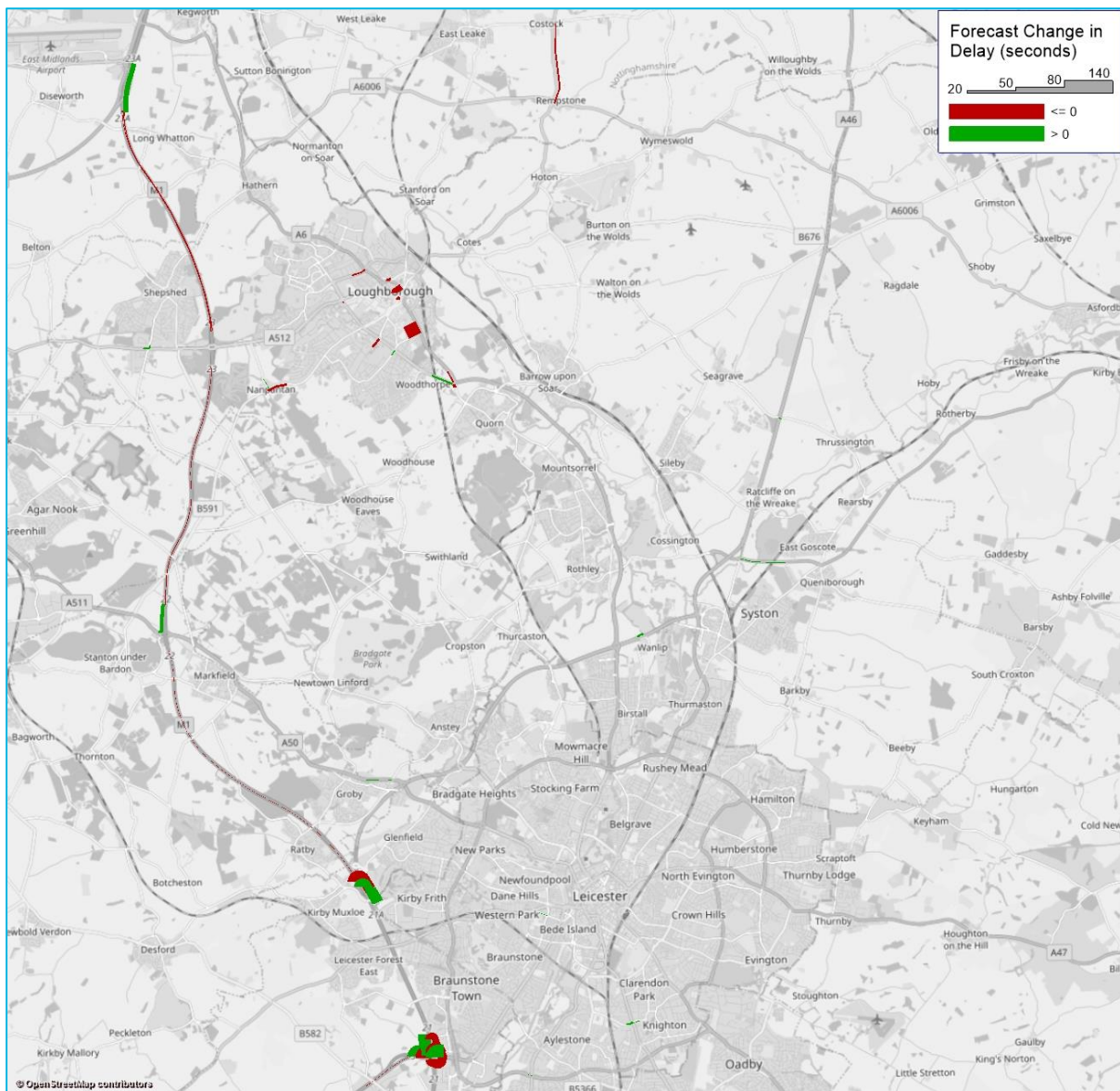


Figure 5.11: Highway Delay Change, Mitigation minus Hybrid Option 3, AM Peak

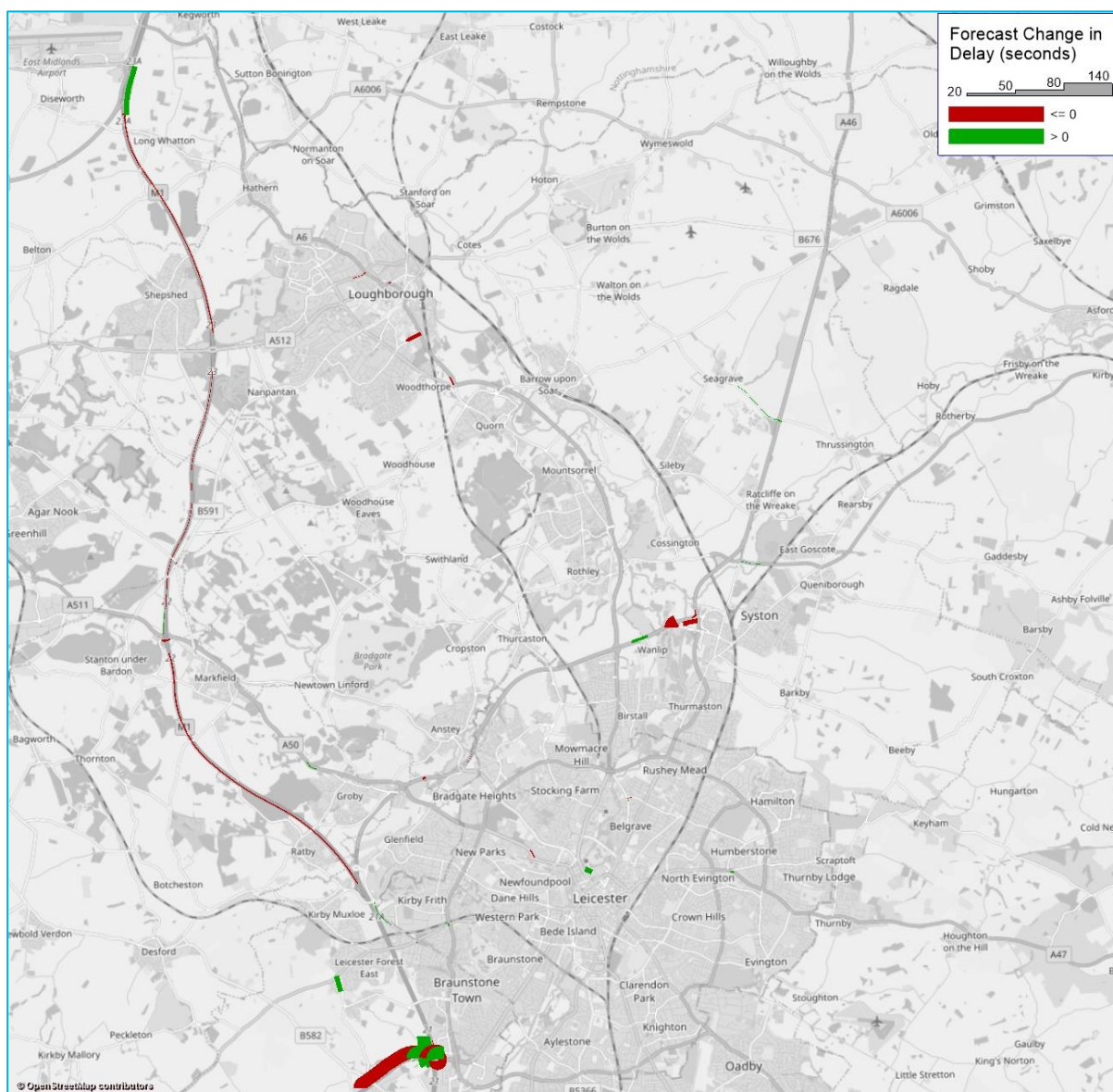


Figure 5.12: Highway Delay Change, Mitigation minus Hybrid Option 3, PM Peak

5.8 Forecast Change in Highway Delays – Revised Mitigation Scenario vs Baseline

- 5.8.1 Figure 5.13 and Figure 5.14 show the forecast changes in delay between the Revised Mitigation Scenario and the Baseline for the AM Peak and PM Peak. These plots are useful to show the impact of the inclusion of both the Local Plan development and the corresponding package of mitigations.
- 5.8.2 There are small reductions in delay along the M1 between Junction 21a and Junction 23a due to the increase in capacity. There are localised points of increased delay, at the Junction 22 northbound on-slip for example, due to the increase in flow on the M1; however, the scale of increase of flow is much greater than the scale of delay.
- 5.8.3 The other large delay changes can be seen at M1 Junction 21 and Junction 21a. These are as a result of the mitigation schemes introduced on the M1 and at Junction 21.
- 5.8.4 There are more localised changes around specific mitigation schemes across both the AM and PM Peaks. There are changes in delay within Loughborough, Syston, Shepshed, and at Hobby Horse roundabout. The impact of the mitigation at specific locations is explored in more detail in Section 5.9.

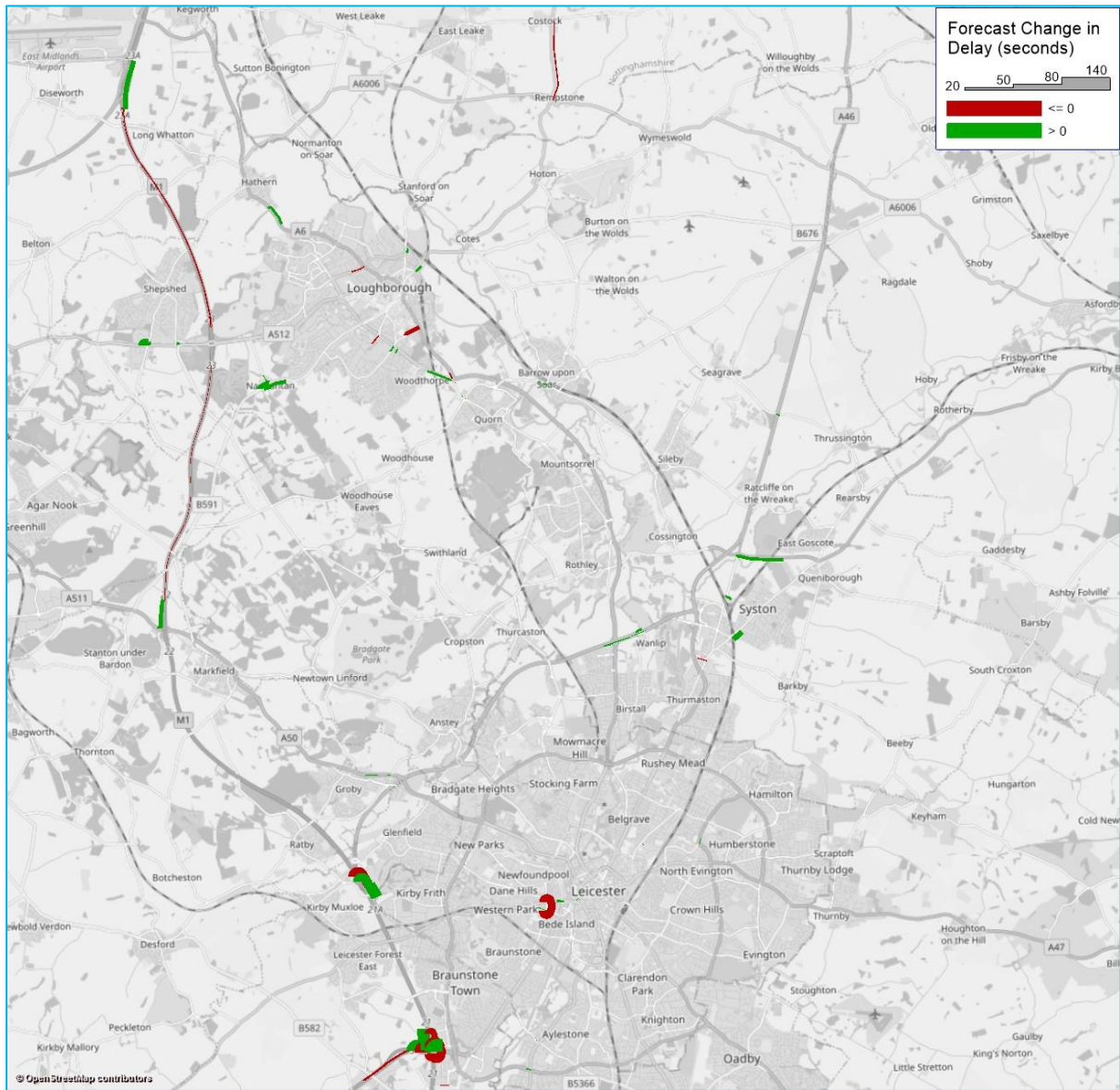


Figure 5.13: Highway Delay Change, Mitigation minus Baseline, AM Peak

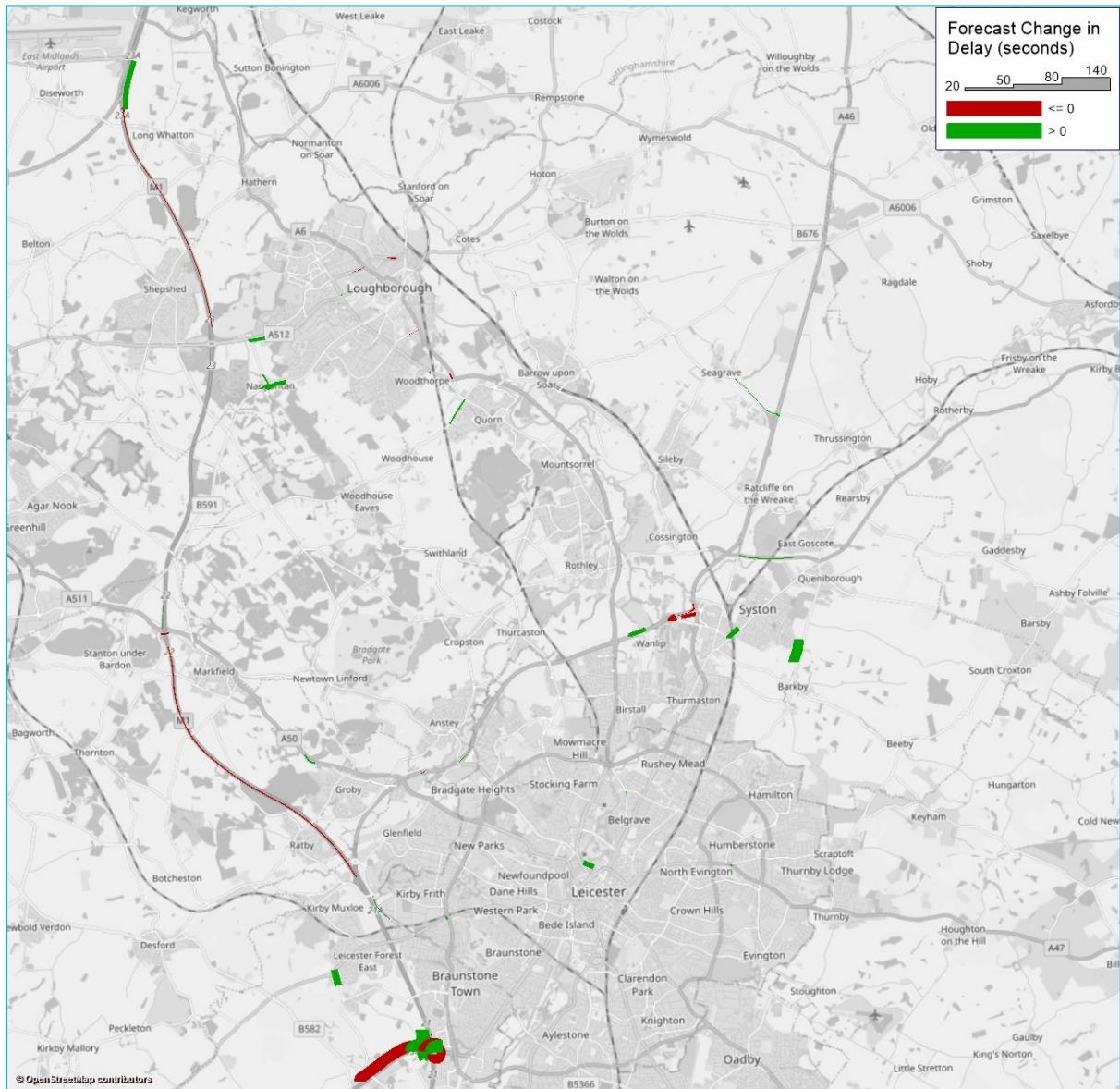


Figure 5.14: Highway Delay Change, Mitigation minus Baseline, PM Peak

5.9 Forecast Impact of Mitigation Measures at Identified Junctions

- 5.9.1 This section outlines the effects of the mitigation package on the junctions that have been identified as having VoC issues. Table 5.10 to Table 5.12 show the junctions and summarise the result of the mitigation interventions at each.
- 5.9.2 The existing Baseline issues, shown in Table 5.10, were identified through discussions with stakeholders and analysis of preferred routing.
- 5.9.3 The junctions in Table 5.11 and Table 5.12 were identified using the same criteria laid out in Section 3.8 of the Forecasting Report.
- 5.9.4 The colouring of the mitigation responses is as follows:
- **green** – conditions have improved through the introduction of the package of mitigations;
 - **amber** – the package of mitigations has resulted in a notable secondary impact; or
 - **none** – no significant change due to the introduction of the package of mitigations.

Table 5.10: Mitigation Response to Baseline Issues

Junction	Mitigation Response
Traffic from Shepshed using Charnwood Forest routes rather than M1 to travel southbound	Reduction in flow across Charnwood Forest from Shepshed and A512.
Traffic from Shepshed using Hathern route rather than A512 to access Loughborough north	Increase in traffic joining A512 from Shepshed and increase on A512 between Junction 23 and Loughborough, small increase in traffic to Hathern but this traffic is not accessing Loughborough.
Traffic from Thurcaston towards Loughborough choosing to route through Mountsorrel to join A6 at Sibley Road/Granite Way junctions (not at Rothley/Mountsorrel dumbbell junction)	Small reduction in flow approaching Granite Way junction, and across the area north of Thurcaston. Increase in Thurcaston traffic joining A6 at Rothley/Mountsorrel dumbbell junction.
Traffic from Syston to A46 routing along Wanlip Road rather than through Hobby Horse junction	Small reduction in traffic along Wanlip Road, and accessing the A46, with an increase accessing Hobby Horse roundabout in the PM Peak.
Traffic from Syston to A46 routing along Wanlip Road rather than through Hobby Horse junction	No significant change in the AM Peak.
Traffic between A607 Melton and A6 using Broome Lane rather than A607 Syston bypass	Significant reduction in traffic along Broome Lane and increase along Syston Northern Bypass.
Charley Road carrying significant strategic traffic	Significant reduction in traffic along Charley Road due to banned turning movements, small resulting increases in delay and flow seen at Iveshead Road, but overall traffic reduction through Charnwood Forest.
Cotes Road carrying significant strategic traffic	Small increase in flow along Cotes Road, likely due to rerouting brought about by the reduced attractiveness of Broome Lane, no significant change in VoC.
Beaumont Leys Lane traffic south of A563 routing along Strasbourg Drive to access A563 at Orwell Drive	Small variations in traffic along Beaumont Leys Lane and Strasbourg Drive between sections of the A563, no significant change.
Significant traffic using Birstall Road southbound towards Redhill Circle rather than A6	Significant reduction in traffic avoiding A6 due to traffic calming measures and A46/A6 junction improvements.
Westbound traffic on A563 to Ashton Green area using A6 rather than A563	Reduction in flow on Greengate Lane in the AM Peak, no significant change in the PM Peak.
Parker Drive carrying significant non-local levels of traffic	No significant change.

Table 5.11: Mitigation Response to Development Issues, AM Peak

Junction	Mitigation Response
Junction of Fosse Way and Syston High Street, Syston, Charnwood	No significant change.
Junction of Ling Road and Woodthorpe Road, Loughborough, Charnwood	Increase in flow but no increase in delay, no significant change in VoC.
Junction of Woodgate and Leicester Road/Loughborough High Street, Loughborough, Charnwood	Reduction in delay and flow in Loughborough town centre, due to the junction improvements and behavioural change measures implemented for the town, significant VoC decrease.
Junction of Iveshead Road/Charnwood Road and the A512 Ashby Road Central, Shepshed, Charnwood	Increase in delay and flow due to the banned turns at Charley Road.
Junction of Leicester Road and Shelthorpe Road, Loughborough, Charnwood	Reduction in delay and flow in Loughborough town centre, due to the junction improvements and behavioural change measures implemented for the town.
One Ash roundabout, Loughborough, Charnwood	Large increase in flow with small change in delay due to roundabout improvement and therefore additional capacity and routeing along A6004; significant reduction in VoC from Baseline.
Junction of Wanlip Road and Melton Road, Syston, Charnwood	Small increase in delay due to traffic calming measures through Syston and access from Syston developments, general decrease in Syston through traffic, no significant change to VoC.
Various Loughborough town centre locations	Reduction in delay and flow in Loughborough town centre, due to the junction improvements and behavioural change measures implemented for the town.
Junction of the A47 Uppingham Road and Humberstone Drive, Leicester	No significant change.
Junction of Spencefield Lane and Goodwood Road/Marydene Drive, Leicester	No significant change.
Junction of the A512 and Snell's Nook Lane, Nanpantan, Charnwood	Increase in flow but no increase in delay, no significant change to VoC.
Junction of Catherine Street and Brandon Street, Leicester	No significant change.
Junction of Arthur Street and Frederick Street, Loughborough, Charnwood	Reduction in delay and flow in Loughborough town centre, due to the junction improvements and behavioural change measures implemented for the town, small reduction in VoC.
Junction of Nottingham Road and Clarence Street, Loughborough, Charnwood	No significant change.
Access from the Wanlip Sewage Treatment Works onto the A46, Leicester	A46 still highly congested, VoC unstable in the AM and PM Peaks.
Junction of Queniborough Road and Barkby Road, Syston, Charnwood	Reduction in delay and increase in flow due to junction improvements.
Junction of Narborough Road and Braunstone Lane, Leicester	Increase in flow along Narborough Road but no increase in delay, reduction in VoC.

Table 5.12: Mitigation Response to Development Issues, PM Peak

Junction	Mitigation Response
Junction of Burleys Way/Vaughan Way and St. Margaret's Way, Leicester	No significant change.
Junction of School Lane and the A6 Loughborough Road, Leicester	Increase in flow on A6 due to junction improvements and traffic calming through Birstall, small increase in

Junction	Mitigation Response
	delay along School Lane, helps to discourage through traffic on unsuitable roads, significant reduction in VoC in PM Peak.
Junction of Melton Road and Fosse Way, Syston, Charnwood	Increase in flow but no increase in delay, no significant change in VoC.
Junction of Melton Road and Barkby Lane, Syston, Charnwood	Reduction in flow due to traffic calming measures, significant reduction in VoC.
Junction of Melton Road and Goodes Lane, Syston, Charnwood	Small increase in delay due to traffic calming measures through Syston, general reduction in Syston through traffic, small reduction in VoC.
Junction of the access to the Woodthorpe Development south of Loughborough and the A6004, Loughborough, Charnwood	Reduction in VoC due to Loughborough behavioural change measures, development specific access to be revisited in location specific transport assessments.
Junction of the B5330 and Beacon Road, Beacon Hill, Charnwood	Reduction in delay and flow through Charnwood Forest, reduction in VoC.
Approach to M1 Junction 23 from the A512 Ashby Road East, Shepshed, Charnwood	Increase in flow due to additional capacity at Junction 23 and on M1, small increase in VoC in PM Peak.
Exit of One Ash Roundabout to Terry Yardley Way northbound, Quorn, Charnwood	Reduction in delay due to additional capacity at roundabout, no significant change in VoC.
Approach to Ingleberry Road junction on the A512 Ashby Road East, Shepshed, Charnwood	Increase in flow due to traffic calming measures on Iveshead Road and Charley Road, no significant change in VoC.
Junction of Wanlip Road and Melton Road, Syston, Charnwood	Small increase in delay due to traffic calming measures through Syston, general reduction in Syston through traffic, no significant change to VoC.
Junction of Loughborough Road and Woodhouse Road/Farley Way, Quorn, Charnwood	No significant change.
Junction of Queniborough Road and Barkby Road, Syston, Charnwood	Northbound arm of junction has increase in delay, no significant change in VoC.
Junction of Glenfrith Way and Hallgate Drive, Leicester	Reduction in VoC.
Junction of Iveshead Road/Charnwood Road and the A512 Ashby Road Central, Shepshed, Charnwood	Small increase in delay and flow due to the banned turns at Charley Road, significant reduction in VoC.

5.9.5 Table 5.13 shows any junctions or broad locations that exhibit secondary impacts from the Revised Mitigation Scenario. The junctions have been identified using the same approach as in the Forecasting Report, and outlined above in Section 5.9.3. The junctions highlighted as secondary impacts in Table 5.13 are a direct result of a mitigation scheme, and in some cases refer to traffic rerouting to use the preferred route, and therefore may not be a *negative* secondary impact.

Table 5.13: New VoC Issues

Time period	Junction	Mitigation result
All	Access points to the M1 between Junction 21a and Junction 23a	Increased M1 capacity means more traffic, and hence some additional delay in junction access to the M1.
All	Junction of A50 and Anstey Lane, Groby, Hinckley and Bosworth	Increased traffic through Anstey as a result of congestion on the A46.
AM Peak	Junction of Terry Yardley Way and Ling Road, Loughborough, Charnwood	Junction improvements along Epinal Way causing increased flow along A6004 around Woodthorpe Development; development specific access to be revisited in location specific transport assessments.
AM Peak	M1 southbound merge from A46 at Junction 21a, Hinckley and Bosworth	Increased traffic as a result of M69 link road, causing increase in VoCs along the M1.
AM Peak	Junction of Shepshed Road and the A6 Derby Road, Hathern, Charnwood	Increased traffic between Shepshed and Hathern.
PM Peak	Junction of A6 Loughborough Road and Birstall Park-and-Ride, Leicester	Traffic calming measures along Wanlip Lane and improvements of the A6/A46 junction means increased flow along A6.
PM Peak	A46 slip road leaving eastbound to Leicester Road, Anstey, Charnwood	Roundabout improvements encouraging traffic to route via more strategic junctions, A46 remains highly congested.
PM Peak	Junction of Ling Road/Epinal Way and Park Road, Loughborough, Charnwood	Junction improvements along Epinal Way causing increased flow along A6004, and due to Woodthorpe Development, development specific access to be revisited in location specific transport assessments.
PM Peak	Junction of Johnson Road and the A6 Loughborough Road, Birstall, Leicester	Traffic calming measures along Wanlip Lane and improvements of the A6/A46 junction means increased flow along A6.
PM Peak	Roundabout access of the Anstey Lane development, Leicester	Small increases in VoC; development access to be revisited in location specific transport assessments.

5.10 Mitigation Results by Broad Mitigation Area

5.10.1 This section provides a more detailed commentary on the impact of the mitigation package on the broad locations which were identified as areas for mitigation in the Mitigation Report. As well as providing insights on how the mitigation has improved the issues brought up at specific locations, the below observations also comment on any secondary impacts of the mitigation package, and the potential underlying causes of these.

5.10.2 This section also provides a more detailed commentary on the impact of the mitigation package on the junctions laid out in Sections 5.9 by broad area. Local rerouting can be unstable and hence some junction issues may be misrepresentative of overall levels of congestion; this section looks to explore the overall junction capacities of each area and highlight any common themes.

Anstey

5.10.3 In the AM Peak there is a reduction in traffic using Leicester Road between Anstey and the A46 and on the A46 westbound. This is due to a slight increase in delay on the A46 main carriageway at the A50 junction westbound on-slip, and hence traffic heading towards the M1 southbound is choosing to route down Groby Road and Anstey Lane to access the A46 at the A50 junction to avoid this delay. This demonstrates that small changes in delay on the A46 results in unstable routing patterns.

5.10.4 There are small increases in delay southbound on the A50 at the junction with Anstey Lane. This is due to the additional traffic avoiding the A46 and routing via Anstey Lane to join the A46. In the AM Peak this small increase in delay is causing some southbound A50 traffic to route through Groby to access the A50/A46 roundabout.

5.10.5 There are increases in flow on the A50/A46 roundabout due to the improvement of the slip road access and additional slip road from the A50 to the A46 eastbound (the large reduction in flow is on the existing slip road). The capacity of the roundabout has therefore increased and the additional flow shows traffic is encouraged to use this as the main junction to enter Leicester, as opposed to finding a more rural route through Charnwood Forest.

Barrow-upon-Soar

5.10.6 The village of Barrow-upon-Soar has a small increase in through traffic across all time periods. This is likely to be due to the increase in east-west traffic routeing across the east of Charnwood to/from Loughborough, as mentioned in Section 5.5.2, and due to the priority changes at the roundabout of High Street, South Street, and Bridge Street; however, this has not caused any marked increase in delay within the village.

5.10.7 There are negligible increases in delay to the west of Barrow due to a slight increase in flow at the traffic signals on the Soar bridge.

Birstall

5.10.8 The introduction of traffic calming measures along Wanlip Lane to the east of the A6 has caused a significant reduction in traffic along this section of road in the AM and PM Peaks, particularly in the PM Peak. This, coupled with the increase in capacity introduced at the junction of the A6 and A46, has encouraged traffic to use the more strategic route along the A6 rather than the local alternative.

5.10.9 In the PM Peak there is also a reduction in flow further south on Birstall Road, however this is not reflected in the AM Peak. Figure 5.7 shows that the mitigation along Wanlip Lane has successfully reduced AM Peak traffic along Wanlip Lane and Birstall Road, however it has not fully stopped this routeing, implying that the A6 in the AM Peak remains congested and Birstall Road remains an attractive route into Leicester despite the additional measures.

5.10.10 The result of the traffic calming along Wanlip Lane and improved access to the A6 has encouraged traffic to use the preferred route, the A6. A result of this rerouting of traffic is that some of the junctions on the A6 have an increased VoC ratio.

5.10.11 There are also congestion issues on the A46, with unstable routeing of traffic at the A46/A6 junction, and the slip roads accessing and egressing the Sewage Treatment Plant. These changes in routeing on and off the A46 cause VoC ratios on the slip roads to fluctuate but point to the wider issue of managing traffic flow on the A46 itself.

Loughborough

5.10.12 Figure 5.11 to Figure 5.14 show there is a significant reduction in delay within Loughborough which is a result of the junction improvements, improved bus accessibility and scheduling, and the reduction in car travel due to the behavioural change measures. Traffic has been encouraged to use more sensible routes, such as the A6004 Epinal Way, as opposed to routeing through the town centre.

5.10.13 The improvements modelled at One Ash roundabout have resulted in a reduction in delay and increase in capacity. This, combined with the other roundabout improvements along Epinal Way, has encouraged routeing along the A6004 but has also resulted in a small increase in delay around the access of the Woodthorpe developments, just off the western roundabout arm. Development junction access will be revisited as part of the development specific transport assessments, and this issue will need to be considered as part of that assessment to inform an appropriate site-specific mitigation package.

5.10.14 Overall, due to the behavioural change schemes proposed for Loughborough town centre and the junction improvements along the A6004, many town centre junctions exhibit a reduction in VoC ratios. There are junctions which exhibit an increase in VoC ratio due to the improved routeing, particularly in the vicinity of the Woodthorpe Development, due to attractiveness of the A6004. Development junction access will be revisited as part of the development specific transport assessments, and this issue will need to be considered as part of that assessment to inform an appropriate site-specific mitigation package.

5.10.15 There are small increases in delay across all arms of the Nanpantan crossroads junction. There are also general reductions in flow through Nanpantan, with only one arm showing an increase in flow in the AM and PM Peaks. This implies the crossroads is already highly congested and a small change in delay or flow has significant impacts on the other. The delay increases are seen along the eastern arm, implying the route to and from Loughborough through Nanpantan is still relatively attractive despite the remaining congestion. Any improvements to the crossroads would encourage more traffic to route to Loughborough via Nanpantan, as opposed to using more suitable routes, and therefore this delay does not require this junction to be improved.

Shepshed

5.10.16 There are large decreases in southbound flow along Charley Road in both the AM and PM Peaks. This is due to the mitigation scheme restricting certain turns at the junction of Charley Road and the A512. There is a corresponding increase in delay in the AM Peak at the junction of Iveshead Road and the A512 due to traffic choosing to route via Iveshead Road instead of Charley Road.

5.10.17 Similarly, there is a small increase in delay in the AM Peak at the junction of Ingleberry Road and the A512. This is due to the traffic calming along Iveshead Road encouraging some traffic to continue further east on the A512 towards Junction 23, and the improvements at Junction 23 and the M1.

5.10.18 There is a small increase in flow on Iveshead Road, implying some traffic is still choosing to travel south towards Leicester via the more rural roads, and not use the M1 from Junction 23; however there is still an overall reduction in traffic routeing through Charnwood Forest compared with the Baseline.

5.10.19 The traffic calming along Charley Road and Iveshead Road has encouraged traffic to use more strategic routes to access Leicester and other urban areas. This has meant traffic is travelling further east along the A512 to use routes like Ingleberry Road and the M1 from Junction 23. The VoCs and delays of these junctions have therefore increased slightly since more traffic is now choosing to use the favoured routes.

5.10.20 The M1 Junction 23 roundabout has increased capacity at the junction approaches to the roundabout. This has allowed more traffic to use this junction which has encouraged more strategic routeing resulting in a small increase in delay and VoC ratio at these points. Effective traffic controls, like demand sensitive signals, would help with the management of the traffic flow to ensure any delay remains off the roundabout itself.

Syston and Sileby

5.10.21 There is a large reduction in traffic along Broome Lane, due to the introduction of traffic signals at the bridge over the Wreake, the speed reductions on the section of road just north of East Goscote, and the speed reductions on the eastern side of Sileby. There is also a corresponding increase in flow on the Syston Northern Bypass showing that the mitigation measures on Broome Lane are encouraging traffic to use more strategic routes to access the A46. This increase in flow on the bypass is also causing a small increase in delay. The level of increase seen along the bypass is not commensurate with the level of decrease along Broome Lane; this is due to some traffic routeing along the signed route across north-east Charnwood, as mentioned in Section 5.5.2.

5.10.22 There is some local rerouting of traffic, mainly due to access to and from the development sites within Syston and the location of the traffic calming measures, but overall there is a reduction in flow within Syston due to the town centre traffic calming measures, and traffic is choosing to use more appropriate routes.

5.10.23 The junctions that are exhibiting increases in VoC ratio and delays are junctions local to the substantial development south-east of Syston. The flow to and from the development is avoiding the traffic calming areas, and hence certain junctions are worsening. Development junction access will be revisited as part of the development-specific transport assessments, and this issue will need to be considered as part of that assessment to inform an appropriate site-specific mitigation package.

5.10.24 There is a reduction in traffic on the A46, to the north-east of Charnwood, and towards Sileby, on Ratcliffe Road, as a result of the increase in traffic between Melton Mowbray and Loughborough travelling via more northern routes, mentioned in Section 5.5.2. One underlying cause of this is the mitigation measures introduced at Broome Lane, which has encouraged traffic to disperse to alternative east-west routes, as well as improvements on the M1 which has resulted in some long-distance trips rerouting.

Strategic Road Network

- 5.10.25 The large flow and delay changes seen south-west of Leicester are due to improvements introduced at M1 Junction 21. There is a large reduction in flow around the existing roundabout due to traffic travelling between the M1 and M69 now having a free flow link, resulting in a reduction in congestion and delay. The existing congestion on the A46 and between M1 Junction 21 and Junction 21a, along with the effects of the M1 Junction 21 scheme, appears to be causing some rerouting of traffic in the south west of Leicester, using the A563 to access northern Leicester.
- 5.10.26 Delay on the M1 is reduced as a result of the additional capacity introduced between Junction 21a and Junction 23a.
- 5.10.27 The improvements at Hobby Horse roundabout comprising a dedicated southbound slip road between the two sections of the A46 produce a large reduction in flow, and corresponding reduction in delay, around the roundabout. Traffic is therefore encouraged to use this route from areas like Cossington and the Northern Syston Bypass to join the A46.
- 5.10.28 Changes in VoC ratios and delays along the M1 are at junctions where traffic merges with the main carriageway. The increase in flow on the M1 is resulting in traffic joining the motorway experiencing a slight increase in delay. A similar point of congestion is seen just north of Junction 23a where the carriageway returns to three lanes.
- 5.10.29 It is worth noting that by introducing significant capacity enhancements at these locations, one unintended impact will be to produce more highway traffic, either through trips shifting from other modes, or existing highway trips increasing in distance. The model does represent such effects and this will therefore have a potential detrimental impact on congestion in the wider area.

5.11 Summary of Findings

- 5.11.1 In summary, the model results show that in many cases the package of mitigation measures has resulted in an improvement to conditions at junctions impacted by the Local Plan growth. In addition, the mitigations have been effective in addressing concerns about existing and additional traffic using local routes.
- 5.11.2 Congestion at some of the junctions identified is unimproved either because targeted mitigations at these locations were considered unfeasible or unsuitable, or because secondary impacts of the package of mitigations have resulted in a change in traffic patterns which the package of mitigations was not tailored to. Some secondary impacts have also resulted in new junctions being identified, particularly in the case of the strategic mitigation schemes which result in significant changes in flow and delay across a wider area.
- 5.11.3 Considering the strategic nature of the model, none of the remaining or new congestion issues are considered severe. In the case of congestion local to specific developments, this will be assessed in more detail as part of each development's transport assessment when more information regarding development access points is available. Where these specific development issues have been identified, the findings of this assessment will be considered in the development specific transport assessment to inform an appropriate site-specific mitigation package.

Section 6 – Conclusions

6.1 Introduction

- 6.1.1 This report has set out the further work undertaken to assess the suitability of the proposed package of mitigations for the Charnwood Local Plan. This involved collating and responding to stakeholder feedback on the original proposed package of mitigations, developing the evidence base for any revisions to the proposed package of mitigations, and testing this Revised Mitigation Scenario to assess the effectiveness of the mitigation schemes.
- 6.1.2 This conclusion recaps on key findings and provides some recommendations for work going forward.

6.2 Revised Mitigation

- 6.2.1 Outputs from further analysis of modelling undertaken were used to guide the approach to responding to stakeholder comments and enhancing the mitigation package. Not all comments considered to be within scope resulted in changes to the mitigation package. The revised package of mitigations comprised three updates to the original package of mitigations, focusing on alleviating the main secondary impacts of the mitigation schemes brought up in the previous modelling results. These are:
- removal of some of the additional capacity at M1 Junction 23;
 - additional traffic calming measures on Iveshead Road; and
 - inclusion of additional cycle travel infrastructure between Anstey and Leicester.
- 6.2.2 The revisions at M1 Junction 23 meant that three of the measures in the initial preferred package at this location were removed. The other two measures for traffic calming and cycle infrastructure were at locations that were not previously considered for mitigation in the initial preferred package.
- 6.2.3 Additionally, revisions were made to the M1 widening scheme assumptions between Junction 21a and Junction 23a to reflect the most likely design of this scheme.

6.3 Modelling Results of the Revised Mitigation Scenario

- 6.3.1 Overall, the revised package of mitigations has a positive impact on the issues highlighted due to the Local Plan growth and the original package of mitigations. The benefits of the Broome Lane, Charley Road, and Wanlip Lane mitigation schemes are clear, as are improvements brought about by the strategic schemes. The mitigation schemes proposed at each of the broad mitigation locations have had the desired effect on the issue they were developed to address. There is a reduction in Loughborough town centre delay, a reduction in through traffic at Syston, and a reduction in Charnwood Forest traffic from Shepshed.
- 6.3.2 There are some issues which have not been addressed with the revised package of mitigations. Congestion on the A46 continues to result in unstable route choice at key junctions to the north and west of Leicester. Given the strategic nature of the model it was not possible to assess the benefits of introducing flow management on the A46 and further local modelling may be required to understand how this could improve traffic flow on this route. There is also an option to consider wider upgrades to the A46, in terms of capacity; however, this is not within the scope of Charnwood's Local Plan and requires an appreciation of the wider effects of growth and collaboration across a range of stakeholders to agree and deliver.
- 6.3.3 The modelling also indicated that the capacity increase on the M1 between Junction 21a and Junction 23a leads to an increase in traffic accessing the M1 from all junctions within the improved section; this has caused some additional delays and changes to VoC ratios at these points. These secondary effects of the strategic improvements should be considered when there is greater certainty about the scale of the M1 improvements.

6.4 Conclusion

- 6.4.1 One key concern not addressed in this report is the degree to which SRN mitigation is needed to support Local Plan growth. SRN improvements by their nature need to be evidenced by an understanding of user needs across a wider area well beyond the borders of Charnwood. The concern may be that changes proposed are disproportionate to need and, being more complex in nature than LRN schemes, carry extra risks to supporting delivery of the Local Plan.
- 6.4.2 As discussed in Sections 1.3.7 to 1.3.10, recognising the interrelated nature and functionality of the strategic and local road networks is an important feature of the approach to developing a suitable mitigation package. It would be artificial to assume Local Plan growth results in local traffic and local network impacts only and therefore the impact on the SRN and need for mitigation is an important consideration. Modelling strategic and local mitigation separately to understand how mitigation addresses growth would provide an artificial output.
- 6.4.3 In the absence of separate modelling of strategic and local interventions at this point, there is acknowledgment that SRN improvements may suggest mitigation which will benefit other areas and therefore could be considered in excess of Local Plan requirements. However, the belief is that the proposed SRN mitigation is important in helping to address pinch points on the LRN and supporting more efficient (desirable) routing of traffic.
- 6.4.4 In concluding, it is helpful to recognise that the scale of growth proposed is not significantly large – fewer than 10,000 additional homes and 5 ha of employment space, and the distribution of growth is relatively dispersed (not centralised into say a few strategic sites). The distribution of growth is tied mainly to existing urban areas such as Loughborough and Shepshed, and therefore has the potential to make best use of the existing transport network (not just highway but also bus and active travel). As a result, the impact of growth on the transport network is likely to be less significant and more dispersed than a centralised pattern of growth (e.g. a large urban extension or set of strategic sites). The likely impact of Charnwood's growth on the SRN is therefore expected to be relatively limited.
- 6.4.5 However, at a cumulative level the impact of growth across Charnwood and surrounding districts like Leicester and Blaby, will be greater. This points to a need to work strategically and collaboratively across districts and with county, and Highways England, to determine transport interventions which are effective in supporting long-term growth. This may involve, for example, the identification of transport improvements needed across the SRN and other major roads and transport infrastructure (e.g. rail, bus etc.) to support a strategic growth plan for the county.

