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Mansfield District Transport Study

Stage 1: Baseline and Reference Case

October 2014

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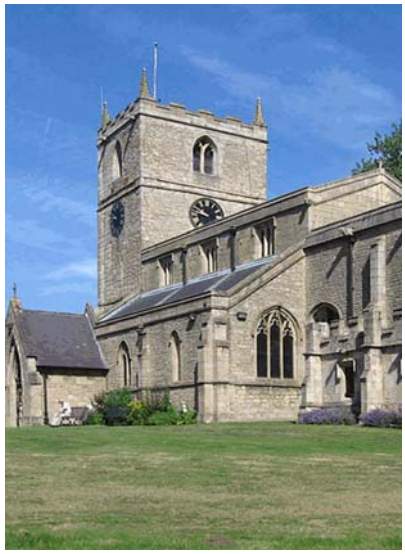
Prepared for:
Mansfield District Council

UNITED KINGDOM & IRELAND



REVISION SCHEDULE					
Rev	**Date**	**Details**	**Prepared by**	**Reviewed by**	**Approved by**
1	Sept 2012	Draft	Daniel Godfrey Principal Transport Planner Adam Hall Senior Transport Planner	David Elliott Associate	David Elliott Associate
2	Oct 2012	Final Draft	Daniel Godfrey Principal Transport Planner	David Elliott Associate	Clive Posford Technical Director
3	Jan 2013	Revised Final Draft	Daniel Godfrey Principal Transport Planner	David Elliott Associate	Clive Posford Technical Director
4	Mar 2013	Final	Lee Kennedy Transport Planner	David Elliott Associate	Clive Posford Technical Director
5	October 2014	Final following revisions made as detailed below	Lee Kennedy Transport Planner	David Elliott Associate	Clive Posford Technical Director

Changed	**Details of revision 5**
Para 1.3.3	Change of tense to reflect work completed.
Para 1.3.4	Paragraph added to explain need for revisions.
Page Numbers	Re-paginated after Page 2.
Table 4.2	A60 Leeming Lane / New Mill Lane junction assessed as “near to or at capacity” in 2012 PM peak.
Table 5.2	A60 Leeming Lane / Peafield Lane assessed as “near or at capacity” in 2012 PM peak (as Table 4.2) and in 2031 AM peak hour.
Table 5.3	Rounding changed to match Stage 2 report. PM peak % changes amended on A611.
Table 5.5 & Figure 5.9	Route 1 Journey Time path extended to include length over which queues occur in the Local Plan scenario in Stage 2 report. Route 2 redrawn to match Stage 2 report. Rounding of some timings changed to match Stage 2 report.
Para 5.6.4	Times revised to match those presented in Table 5.5
Appendix E	Signal timings, cycle times, lane allocations modified for compatibility with Stage 2 assessment at: • Chesterfield Road / Debdale Lane (Base Year + Reference Case) • Nottingham Road / Berry Hill Lane (Reference Case) • Carter Lane / Southwell Road / Windsor Road (Base Year) • Leeming Lane / New Mill Lane (Base Year + Reference Case) Reference Case mitigation strategies amended following discussions with NCC officers.
Appendix F	Map plot updated (as Figure 5.9) Route 1 updated to represent longer route (as Table 5.5)

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EXECUTIVE SUMMARY

Overview

Mansfield District Council is currently preparing a new local development plan to be known as the Mansfield District Local Plan. It will comprise two main parts. Part 1 will provide the overall planning strategy for the area through strategic policies dealing with the overall scale, broad distribution and timing of new development. Part 2 will take forward the strategy with policies that allocate land for development and designate specific areas for protection.

All development plan documents will be subject to 'Examination in Public'. As such, a wide-ranging evidence base is being prepared to support the new Mansfield Local Plan. This report has been prepared as part of this evidence base, and considers the transport context within which the potential development plan-related development would be brought forward. It considers how the transport network was observed to operate in 2012, and how it is likely to operate in future (2031) without the potential development plan-related proposals.

It is anticipated that this report will be followed by a Stage 2 report which will consider how the transport network is likely to operate in future *with* the potential development plan-related proposals in place.

Journey Patterns and Sustainable Transport

Similar to other towns in Nottinghamshire, there has been a reduction in traffic entering Mansfield town centre in recent years (see Table 1).

Table 1: Changes in Daily Traffic Entering Market Towns

Year	Worksop	Retford	Newark	Mansfield
2006	-5%	0%	0%	-2%
2007	-8%	-2%	0%	-3%
2008	-8%	-5%	-3%	-4%
2009	-12%	-2%	-6%	-8%
2010	-9%	-7%	-4%	-7%
2012	-14%	-7%	-10%	-10%

(Source: Nottinghamshire County Council)

This pattern can also be seen in long-term traffic count sites across Mansfield district (see Table 2).

Table 2: Nottinghamshire County Council Long-term Daily Traffic Trend Data – Mansfield District (Indexed to 2005)

Market Town	Year						
	2005	2006	2007	2008	2009	2010	2011
Mansfield / Sutton-in-Ashfield	100.0	99.3	99.9	98.6	98.1	95.3	93.9

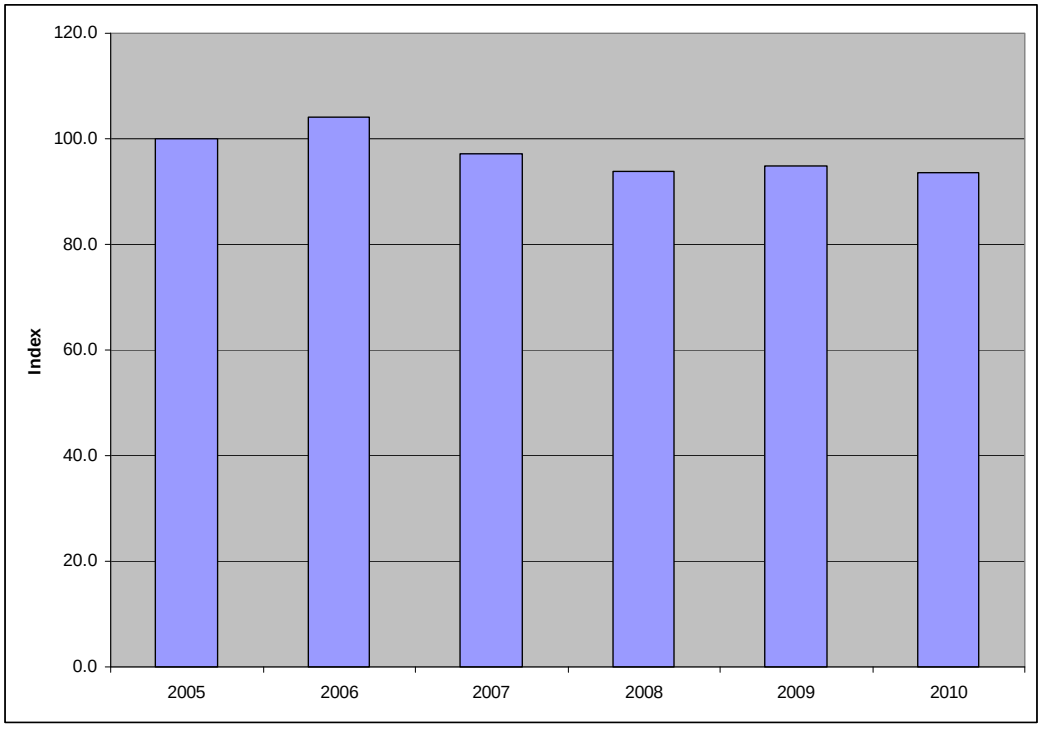
In terms of public transport, in 2013 a new transport interchange will be opened which will offer a major improvement to the quality of the bus waiting environment, and encourage more people to travel by public transport. The Third Nottinghamshire Local Transport Plan (LTP3) noted that rail patronage had also increased during the period to 2009. The most recent statistics identify (in Table 3) that although the stations in Mansfield experienced strong growth in 2009/10, some of this was lost in 2010/11 (the most recently available data).

Table 3: Annual Station Usage (Source: Office of Rail Regulation, 2012)

Station	07 - 08	08 - 09	09 - 10	10 - 11
Mansfield Town	343,907	348,680 1.4%	393,990 13.0%	366,054 -7.1%
Mansfield Woodhouse	129,774	142,426 9.7%	155,790 9.4%	146,054 -6.2%

In terms of non-motorised travel, the Nottinghamshire Cycle Strategy and 2001 census data identifies that levels of cycling in Mansfield remain low. Figure 1 also indicates that cycle usage has decreased over the period 2005 – 2010.

Figure 1: Cycle Usage in Mansfield – 2005 - 2010



Note: Annual growth factors provided by Nottinghamshire County Council. Indices are based on a 2005 base value (i.e. 2005 = 100).

The overall journey patterns in Mansfield, as measured by the proportion of those driving to work and accessibility to services and facilities, is comparable with the rest of Nottinghamshire. There are, however, some clear variations at a local level. For example some of the residential areas to the east and south of Mansfield are remote from schools and medical services in terms of the sustainable transport modes. Outside of Mansfield, the settlements of Church Warsop, Meden Vale and Warsop Vale are not as well served, in terms of their sustainable transport credentials, compared to Market Warsop which is well served.

Highway Network Modelling

Mansfield benefits from a SATURN traffic model of its highway network which has been developed over a number of years by Nottinghamshire County Council. To inform this report, this model has been updated to a 2012 base year. This has shown the following junctions are approaching capacity:

- Chesterfield Road / Debdale Lane;
- A60 Nottingham Road / Berry Hill Lane;
- Carter Lane / Southwell Road / Windsor Road;
- A60 Leeming Lane / New Mill Lane;
- A617 Mansfield Ashfield Regeneration Route (MARR) / A6191 Southwell Road;
- A60 Leeming Lane / Peafield Lane; and
- A60 Church Street / Wood Street, Market Warsop.

A 2031 Reference Case demand model has been built using planning assumptions provided by Mansfield District Council. The Reference Case includes all committed developments, land use assumptions and committed transport infrastructure projects; and therefore shows how the transport network could be expected to operate in 2031 without any further development plan-related proposals. In the 2031 Reference Case scenario, the following junctions are likely to approach or exceed capacity:

- Chesterfield Road / Debdale Lane;
- A60 Nottingham Road / Berry Hill Lane;
- Carter Lane / Southwell Road / Windsor Road;
- A60 Leeming Lane / New Mill Lane;
- A617 MARR / A6191 Southwell Road;
- A60 Leeming Lane / Peafield Lane;
- A38 Sutton Road / Skegby Lane; and
- A60 Church Street / Wood Street, Market Warsop.

The above locations are therefore sensitive to further increases in traffic flows which may be associated with development-plan related proposals. However, a further run of the traffic model to include such developments would confirm this, and identify any other locations which may be impacted. This analysis would be presented as part of the Stage 2 study and report.

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1 INTRODUCTION

1.1 Overview

1.1.1 Mansfield District Council is currently preparing a new local development plan to be known as the Mansfield District Local Plan. It will comprise two main parts. Part 1 will provide the overall planning strategy for the area through strategic policies dealing with the overall scale, broad distribution and timing of new development. Part 2 will take forward the strategy with policies that allocate land for development and designate specific areas for protection.

1.1.2 The new Local Plan will be subject to 'Examination in Public'. As such, a wide-ranging evidence base is being prepared to support the new Mansfield District Local Plan. This report has been prepared as part of this evidence base, and considers the transport context within which the potential development plan-related development would be brought forward. Although written as a stand-alone report, it should be read alongside the other documents comprising the evidence base as transport is only one consideration informing the new Local Plan and associated development allocations.

1.2 Reporting Structure

1.2.1 The transport assessment work has been undertaken via a 'stepped' approach. Broadly, these steps are:

Step 1:	How does the current transport network operate now?	Stage 1
Step 2:	How is the transport network likely to operate in future, with committed infrastructure schemes and land-use developments, but without the development identified in the development plan?	
Step 3:	How is the transport network likely to operate in future, with committed infrastructure schemes and land-use developments, and with development identified in the development plan?	Stage 2

1.2.2 From the above, comparison of the outputs from Stage 1 and Stage 2 will allow the impact of the proposed development identified in the development plan to be judged and appropriate mitigation identified.

1.3 Purpose of this Report

1.3.1 This report comprises Steps 1 and 2. It considers the transport network conditions in 2012, and how the transport network is likely to operate in future *without* the identified development sites in the development plan. A future year of 2031 has been considered as this represents the end of the development plan period.

1.3.2 Although the focus of the assessment work relates to the operation of roads and junctions, this report does consider all modes of transport within the district of Mansfield.

1.3.3 This Stage 1 report precedes the Stage 2 report, which considers how the transport network would be likely to operate in future *with* the development sites identified in the development plan in place.

1.3.4 Following completion of the Stage 2 report, it has been necessary to re-assess the work undertaken originally in the Stage 1 report (issue 4 was dated March 2013). The changes made are:

- The operational performance of the traffic signalled junctions has been reconsidered in terms of signal timings, cycle times and lane allocations. This review was undertaken to ensure consistent reporting between this Stage 1 report (October 2014) and the Local Plan development assessments undertaken for the Stage 2 report.
- Journey time analyses have been extended to include longer routes. The analyses were extended where this was necessary for the Stage 2 report to take account of the re-location of queues, which only become apparent after appraising the Local Plan growth scenario. To enable fair comparisons, these same Journey Time Routes have also been extended, retrospectively, in this Stage 1 report.
- The analysis of changes in traffic flows approaching the M1 has been corrected for one link in the PM Peak and rounding has been changed to be consistent with those reported in the Stage 2 report.

1.4 Study Area

1.4.1 The Study Area is shown in Figure 1.1 (at the end of this section) and covers Mansfield, Market Warsop and the surrounding area.

1.5 Methodology

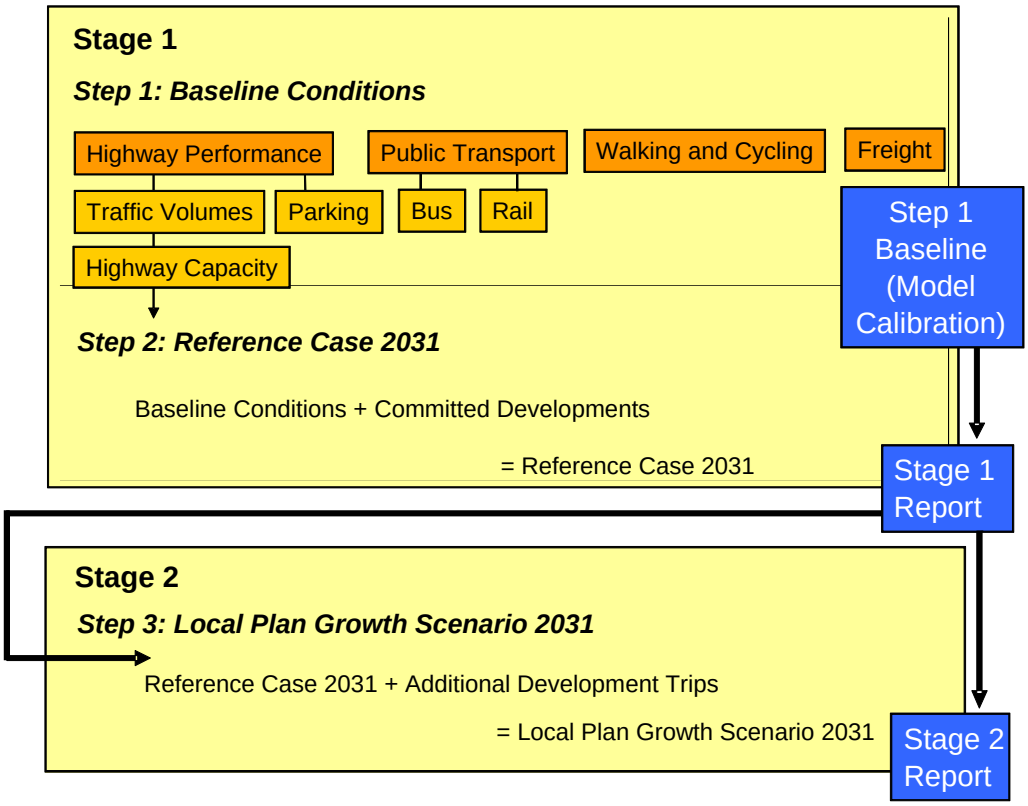
1.5.1 Figure 1.2 summarises the methodology employed for this study. Essentially there are three steps:

Step 1 collates data about the existing transport conditions and identifies a 'Baseline'.

Step 2 examines future conditions given the most likely projections of growth and committed developments (both transport infrastructure and land-use developments) that are likely to be implemented to 2031. This is a 'Reference Case' against which potential additional development can be judged.

Step 3 then examines the likely future conditions given the introduction of potential development plan-related proposals, and reviews this against the 'Reference Case'.

1.5.2 **Figure 1.2:** Study Methodology (Steps 1 – 3)



1.5.3 Data to inform the above steps have been obtained from both Mansfield District Council's planning department, and Nottinghamshire County Council (the local highway authority). In particular, the following information and data has been collated:

- Details of committed land-use developments to 2031;
- Details of committed transport-infrastructure improvements to 2031;
- Historic traffic count data from Nottinghamshire County Council including:
  - 19 Manual Classified Counts at junctions;
  - 16 Department for Transport (DfT) passing counts;
- New traffic count data has been commissioned for the following junctions during July 2012;
  - A60/B6035 Church St, Market Warsop;
  - A6075 Peafield Lane / B6035, South of Market Warsop;
  - A60 Leeming Lane North / A6075 Peafield Lane, Market Warsop;
  - A60 Leeming Lane / New Mill Lane (December 2012);
  - A6009 St Peter's Way / A60 Woodhouse Road/B6033 Bath Lane;

  - A6191 Rock Hill/Southwell Road West / Windsor Road / Carter Lane;
  - A6009 St Peter's Way / A60 Nottingham Road / Albert Street;
  - A60 Portland Street / A6009 St Peter's Way / Portland Retail Park;
- Cycle count data from Nottinghamshire County Council;
- Road Safety statistics from Nottinghamshire County Council;
- Census data from National Statistics; and
- Mansfield SATURN traffic model.

1.5.4 As noted in the last bullet point, Mansfield benefits from a SATURN model of its highway network which has been developed over a number of years by Nottinghamshire County Council. Although made available to Mansfield District Council for this work, it is noted that this model does not cover the full Study Area (as shown in Figure 1.1). As such, the Step 1 and 2 assessments of the highway network have been undertaken via a composite of baseline data from the SATURN traffic model and traffic count data in Market Warsop. Figure 1.3 shows the coverage of the SATURN traffic model. As can be seen from this figure, the model represents the main routes within the town (i.e. the model does not include minor roads and routes).

1.5.5 An introduction relating to how a SATURN model operates is also provided at the end of this section.

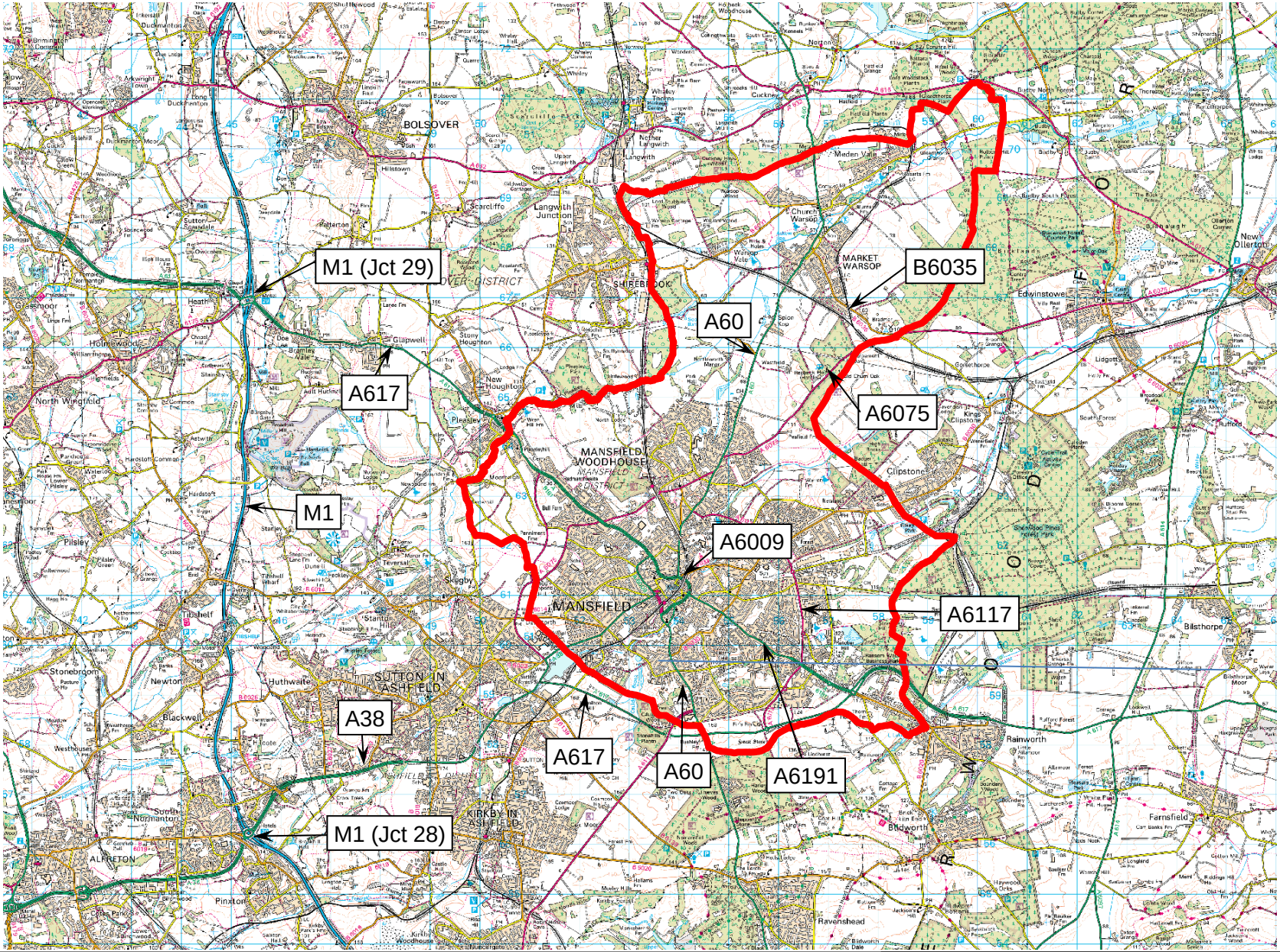


Figure 1.1: Study Area

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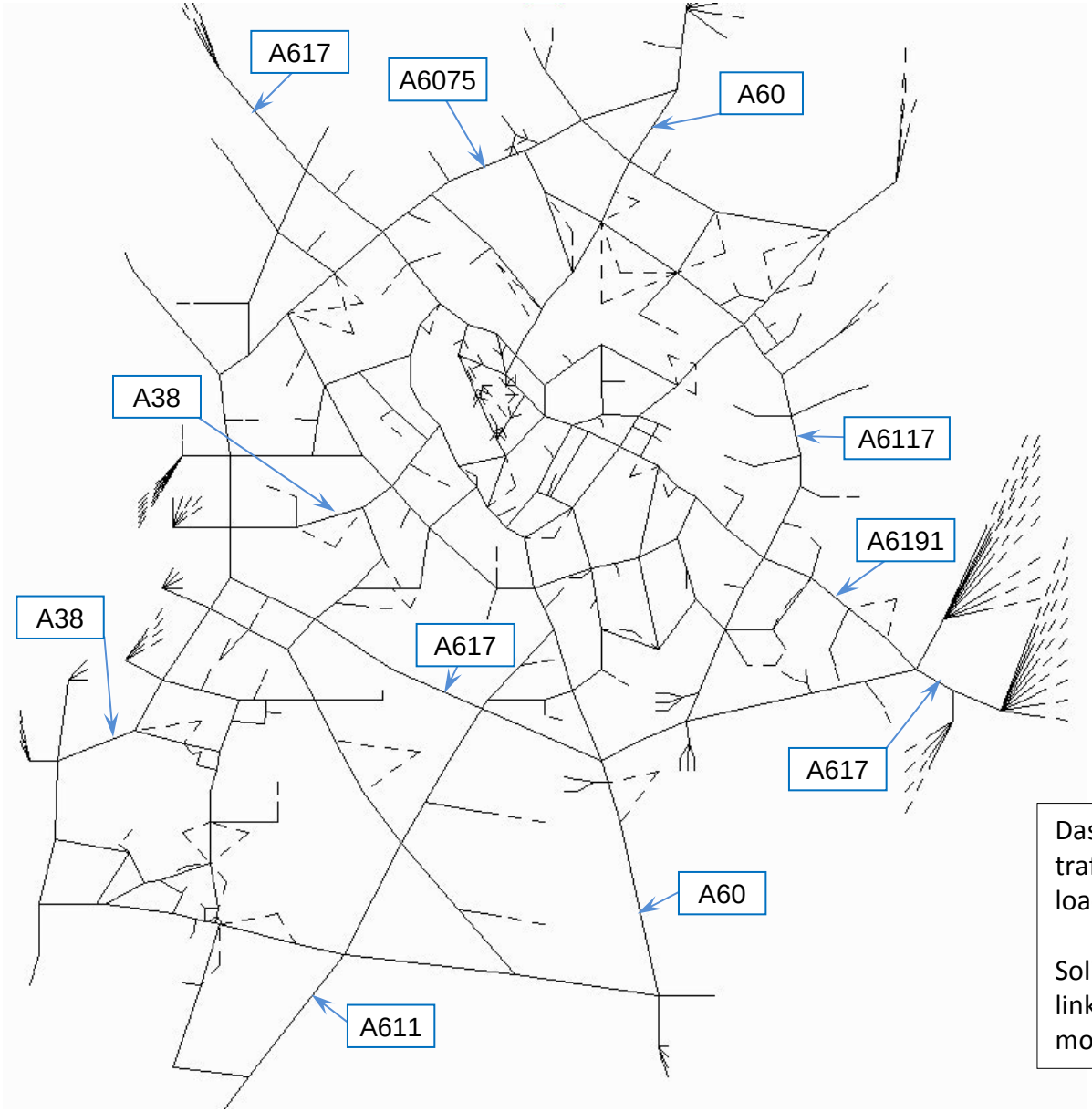

Dashed lines represent traffic model zones' loading points.

Solid lines are highway links in the traffic model.

Figure 1.3: SATURN Model Coverage

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What is a SATURN model?

SATURN (*Simulation and Assignment of Traffic in Urban Road Networks*) is a computer software package used to forecast changes in traffic associated with development or road schemes. It has been used to support many large infrastructure schemes, and is a DfT approved tool.

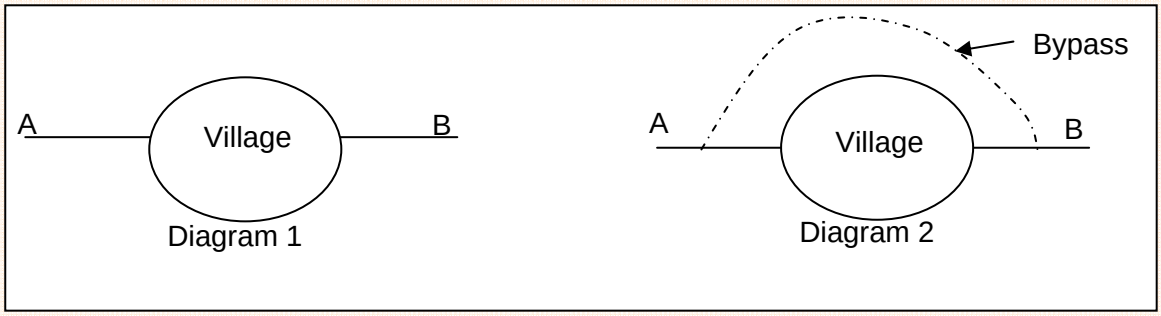
A SATURN model has two components:

- A **Supply Network;** which is a representation of the highway network including all its roads and junctions; and
- A **Demand Matrix;** which is a representation of the individual vehicles which would seek to route through the network.

The purpose of the SATURN model is to predict which specific route vehicles will choose to travel from their respective origins to their respective destinations given:

- Changes to the Supply Network (i.e. as new roads are opened, or junctions improved); and
- Changes to the Demand Matrix, i.e. as traffic levels increase (or decrease) in future.

For example:



In Diagram 1, traffic from A to B would route through the village centre as it is their only choice.

In Diagram 2, the choice of route has increased. Vehicles could either use the bypass, or continue to route through the village centre. Importantly, as more traffic uses the bypass, congestion in the village centre would decrease and this may make it a faster route for some traffic given the shorter distance.

SATURN solves the problem of '*how much traffic would use each route available*'. It bases these choices on journey cost and distance.

1.6 Relevant Terminology

1.6.1 To assist those reading this report that may not be familiar with transport planning terminology, a brief overview of some of the terms used within this document is given in a Glossary at the end of this report.

2 POLICY BACKGROUND

2.1 Overview

2.1.1 The development of the Local Plan Part 1 will provide the planning framework against which future developments will be judged at the local level. However, these documents are being formulated against the context of existing national planning policy and the Third Nottinghamshire Local Transport Plan (LTP3). The purpose of this section is to identify the relevant policy context in transport terms, and how this specifically relates to Mansfield.

2.2 National Planning Policy Framework (NPPF)

2.2.1 The NPPF sets out the Government's planning policies for England and provides a framework to develop localised planning strategies. The document identifies three key components which the planning system has to balance:

an economic role	contributing to building a strong, responsive and competitive economy, by ensuring that sufficient land of the right type is available in the right places and at the right time to support growth and innovation; and by identifying and coordinating development requirements, including the provision of infrastructure;
a social role	supporting strong, vibrant and healthy communities, by providing the supply of housing required to meet the needs of present and future generations; and by creating a high quality built environment, with accessible local services that reflect the community's needs and support its health, social and cultural well-being; and
an environmental role	contributing to protecting and enhancing our natural, built and historic environment; and, as part of this, helping to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate and adapt to climate change including moving to a low carbon economy.

2.2.2 With regard to transport, the document focuses on, and emphasises, the promotion of sustainable transport. For instance, the NPPF states that:

> *"Transport policies have an important role to play in facilitating sustainable development but also in contributing to wider sustainability and health objectives. Smarter use of technologies can reduce the need to travel. The transport system needs to be balanced in favour of sustainable transport modes, giving people a real choice about how they travel. However, the Government recognises that different policies and measures will be required in different communities and opportunities to maximise sustainable transport solutions will vary from urban to rural areas."*

2.2.3 The NPPF also states that plans and decisions should take account of whether:

- the opportunities for sustainable transport modes have been taken up depending on the nature and location of the site, to reduce the need for major transport infrastructure;
- safe and suitable access to the site can be achieved for all people; and
- improvements can be undertaken within the transport network that would limit the significant impacts of the development cost effectively. Development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe.

2.2.4 The NPPF also notes that plans should protect and exploit opportunities for the use of sustainable transport modes for the movement of goods or people. Therefore, developments should be located and designed where practical to:

- accommodate the efficient delivery of goods and supplies; and
- give priority to pedestrian and cycle movements, and have access to high quality public transport facilities.

2.2.5 Importantly, the NPPF confirms that all developments generating significant volumes of traffic should be supported by a Transport Assessment, and those trips resulting from such developments should be managed via the Travel Plan process. With regards this latter point, it is noted that Nottinghamshire County Council published its revised guidance on the preparation of Travel Plans for new development in September 2010, and that this document includes standard conditions pertaining to Travel Plans in order to secure such documents for varying types and levels of development.

2.3 Nottinghamshire Local Transport Plan 3

2.3.1 LTP3 was published in April 2011. It has been prepared to provide both a strategy and implementation plan for improvements to the local highway network up to March 2026. The objectives of the Nottinghamshire LTP3 are to:

- provide a reliable, resilient transport system which supports a thriving economy and growth;
- encourage sustainable and healthy travel;
- improve access to key services, particularly enabling employment and training opportunities;
- minimise the impacts of transport on people's lives; and
- maximise opportunities to improve the environment and help tackle carbon emissions.

2.3.2 The above policy objectives broadly align with the aspirations set by central government in the NPPF. The LTP3 document has been reviewed to identify schemes which could impact on this project, as described later in this report.

2.4 Summary

2.4.1 Policy at a national level stresses the importance of transport sustainability in both siting and assessing new development locations. The Travel Plan process is seen as key to managing trips to / from new developments in future.

3 BASELINE CONDITIONS – TRAVEL PATTERNS AND SUSTAINABLE TRANSPORT MODES

3.1 Overview

3.1.1 The purpose of this section is to describe the current transport conditions in the district of Mansfield. This section makes use of actual traffic data described in Section 1, site visit observations, and also outputs from the Mansfield SATURN model.

3.2 Travel Patterns

The Mansfield Travel to Work Area (TTWA)

3.2.1 The Nottinghamshire LTP3 identifies that the Mansfield TTWA includes all of Mansfield district, the majority of Ashfield and Newark & Sherwood districts, as well as the south western tip of Bassetlaw and the north of Gedling district. It also includes parts of eastern Derbyshire. This area is shown in Figure 3.1.

3.2.2 The 2001 census recorded home and work postcodes. From this information, comprehensive data relating to journeys to work are available on a ward-by-ward basis. For Mansfield, analysis of 2001 Census 'Journey To Work' data shows the key destinations of those travelling to work (including to work in Mansfield itself) from home addresses in Mansfield by all modes (Table 3.1), car driver (Table 3.2) and public transport (Table 3.3).

3.2.3 For the avoidance of doubt, journey to work data from the 2011 Census was not available at the time of writing, and the information in Tables 3.1 – 3.3 does not include those people who choose to work from home.

Table 3.1: Mansfield Residents' Journeys To Work – All Transport Modes (Mansfield and Top 10 Destinations)

District	% of all Trips
Mansfield	**51.1%**
Ashfield	16.4%
Nottingham	6.2%
Newark and Sherwood	6.2%
Bolsover	3.6%
Bassetlaw	2.9%
Gedling	2.1%
Amber Valley	1.7%
Derby	0.9%
Rushcliffe	0.8%
Chesterfield	0.8%

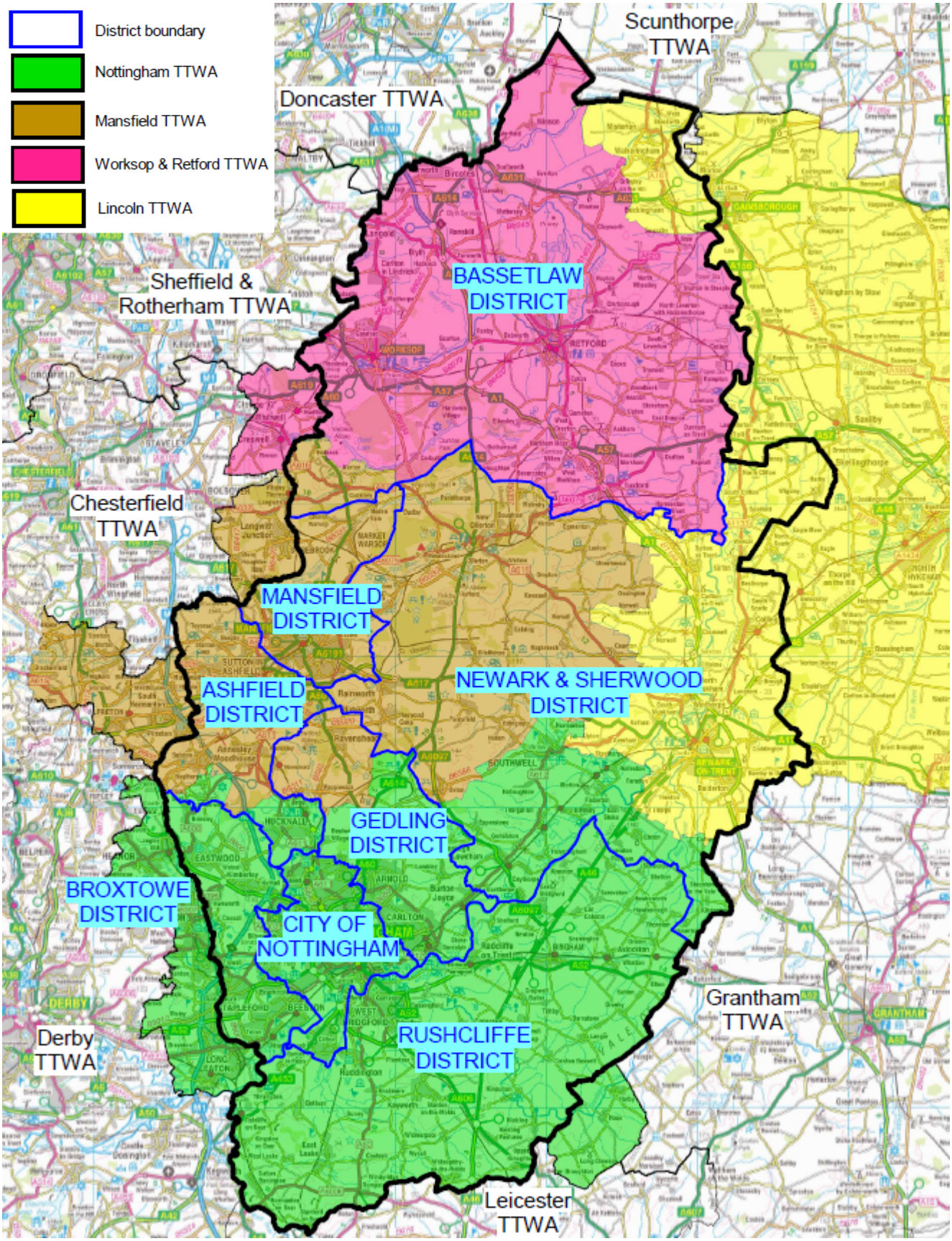


Figure 3.1: Mansfield Travel To Work Area (TTWA)

Table 3.2: Mansfield Residents' Journeys To Work – Car Driver Mode (Mansfield and Top 10 Destinations)

District	% of all Trips
Mansfield	**42.8%**
Ashfield	18.2%
Newark and Sherwood	7.4%
Nottingham	7.0%
Bolsover	4.2%
Bassetlaw	3.6%
Gedling	2.5%
Amber Valley	2.3%
Derby	1.2%
Chesterfield	1.1%
Broxtowe	1.0%

Table 3.3: Mansfield Residents' Journeys To Work – Public Transport Mode (Mansfield and Top 10 Destinations)

District	% of all Trips
Mansfield	**56.4%**
Ashfield	16.1%
Nottingham	12.0%
Newark and Sherwood	4.2%
Bolsover	2.3%
Gedling	2.0%
Bassetlaw	1.0%
Rushcliffe	0.7%
Chesterfield	0.6%
South Holland	0.5%
Amber Valley	0.4%

3.2.4 From the above tables, it can be seen that many intra-Mansfield trips are currently being made by car even though total journey distances are likely to be relatively short (less than 5km). Also, Derby appears as a 'Top 10' destination for car drivers but not for public transport users. It should be noted, however, that bus services are available to Derby as is described later in this report.

Transport Mode Choice

3.2.5 Table 3.4 identifies the usual mode choice of those travelling to work that live in Mansfield.

Table 3.4: Usual Main Mode of Travel to Work (excluding those who 'work from home')

Place of Residence (Mansfield Wards)	Train	Bus	Taxi	Car Driver	Car Psngr	Motor Cycle	Bicycle	Foot
Berry Hill	1.4%	4.5%	0.5%	74.6%	7.7%	0.5%	2.1%	8.7%
Birklands	0.9%	8.6%	0.4%	61.4%	11.0%	1.3%	2.6%	13.7%
Broomhill	1.2%	7.3%	0.6%	57.8%	12.9%	0.9%	2.1%	17.1%
Cumberlands	0.4%	7.4%	0.8%	59.0%	12.0%	0.6%	2.7%	17.0%
Eakring	1.6%	6.8%	0.8%	65.5%	10.6%	0.8%	2.1%	11.9%
Forest Town East	0.5%	8.1%	0.3%	70.2%	10.8%	0.9%	1.8%	7.4%
Forest Town West	1.1%	6.3%	0.3%	73.8%	9.1%	1.4%	1.8%	6.3%
Grange Farm	0.7%	6.8%	0.3%	66.3%	9.7%	1.2%	1.6%	13.3%
Ladybrook	0.7%	8.6%	0.7%	53.4%	11.6%	0.7%	3.6%	20.4%
Leeming	1.2%	7.1%	0.5%	75.5%	8.5%	0.8%	1.2%	5.3%
Lindhurst	0.5%	7.3%	0.0%	73.2%	9.9%	0.8%	1.0%	7.3%
Meden	0.4%	11.1%	0.4%	67.0%	9.5%	1.7%	1.1%	8.7%
Oak Tree	0.7%	8.9%	0.5%	72.2%	9.6%	1.0%	1.9%	5.3%
Pleasley Hill	0.9%	14.6%	0.8%	60.3%	10.6%	1.9%	2.2%	8.7%
Portland	1.2%	5.4%	0.8%	60.3%	10.9%	0.7%	1.8%	18.9%
Priory	1.1%	6.8%	0.7%	66.1%	9.7%	1.7%	2.7%	11.1%
Ravensdale	0.9%	10.5%	0.5%	55.5%	9.2%	1.0%	3.8%	18.7%
Robin Hood	1.8%	8.6%	0.6%	65.1%	11.0%	1.4%	1.8%	9.4%
Sherwood	1.3%	5.8%	0.4%	65.8%	8.5%	1.1%	1.3%	15.7%
England	8.2%	8.3%	0.6%	60.8%	6.8%	1.2%	3.1%	11.1%
East Midlands	1.2%	7.7%	0.5%	66.7%	7.7%	1.1%	3.6%	11.6%
Mansfield (Average)	**1.1%**	**7.6%**	**0.6%**	**66.6%**	**9.9%**	**1.1%**	**1.9%**	**11.2%**
Standard Deviation	***0.4%***	***2.3%***	***0.2%***	***6.7%***	***1.3%***	***0.4%***	***0.8%***	***4.9%***

Source: 2001 Census Data
Note: ward boundaries and names have changed since the 2001 Census

3.2.6 The lower four rows show the average (mean) mode choices of those living in, England, the East Midlands and Mansfield district and the 'standard deviation'[1] around the mean of mode choice in Mansfield based on the individual ward results.

3.2.7 The above table shows that there are wide variances in the use of car, and on-foot modes for the various wards within the Mansfield District. For example, for private car[2] modes, Ravensdale ward generated the least car use (65.2% comprising 0.5%

[1] Standard Deviation shows how much variation or "dispersion" exists from the average (mean, or expected value). A low standard deviation indicates that the data points tend to be very close to the mean, whereas high standard deviation indicates that the data points are spread out over a large range of values.
[2] Travel by private car is the sum of Car Driver, Car Passenger and Taxi modes

taxi, 55.5% car driver and 9.2% car passenger) for trips to work; and Leeming ward the most (84.5% comprising 0.5% taxi, 75.5% car driver and 8.5% car passenger). Leeming is also the ward that reports the least use of walking as the primary mode of travel to work (5.3%) with the largest main-mode for journeys to work on-foot are reported in Ladybrook ward (20.4%).

3.2.8 The highest variance in mode choice relates to car driver, pedestrians and public transport (bus). This would indicate that where people choose not to drive, or are unable to drive, they make a greater proportion of trips on foot or public transport. Where walking modes are high, these trips are likely to be shorter (given the smaller range of walking as a mode of transport).

3.2.9 Overall, trips in Mansfield appear very similar to the rest of the East Midlands region, with slightly more travelling to work as a car passenger, and slightly fewer choosing to cycle.

Car Ownership

3.2.10 Table 3.5 identifies the level of car ownership across Nottinghamshire.

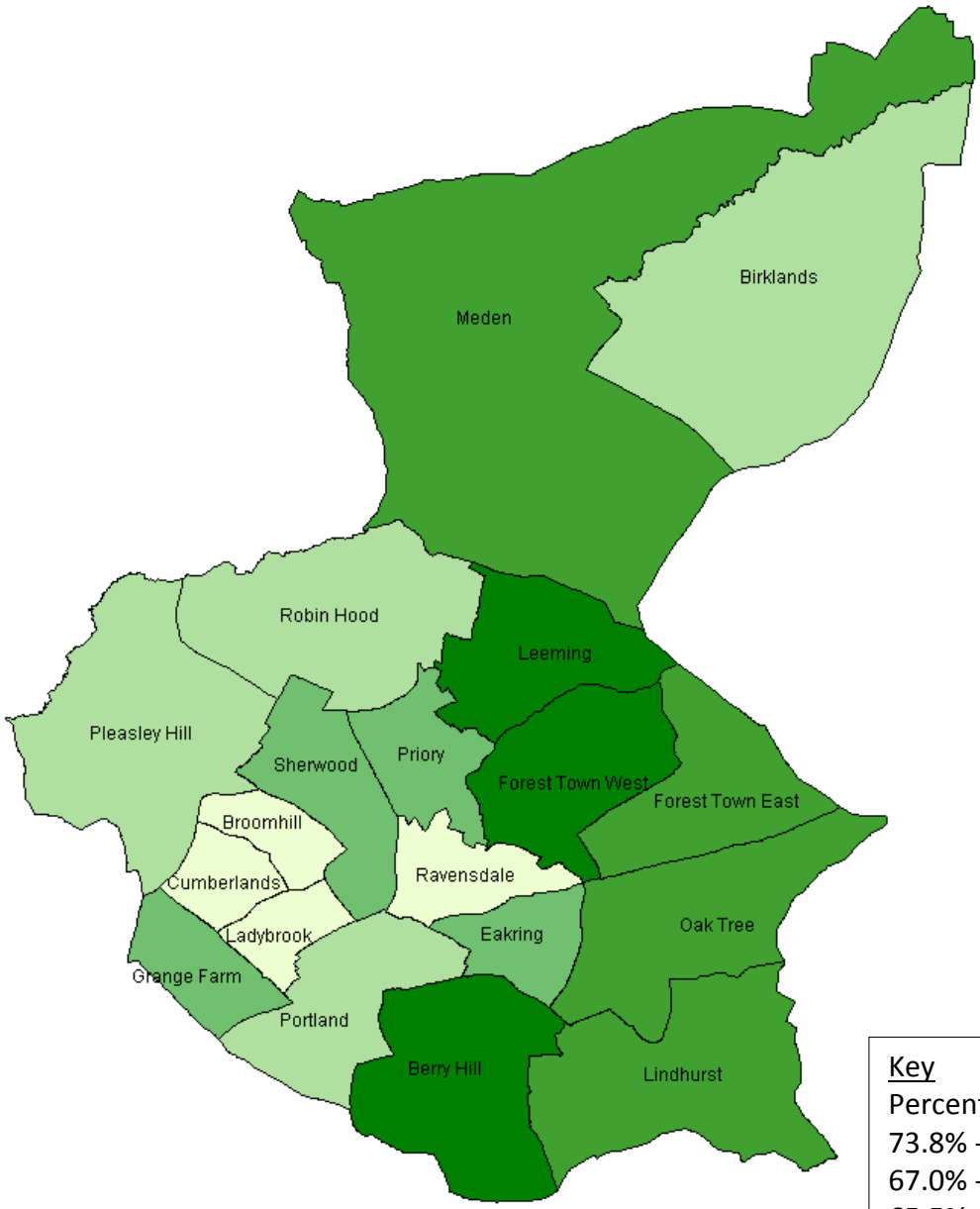
Table 3.5: Car Ownership (Reproduced from Nottinghamshire LTP3)

District	No. of households	Percentage of households with no car	Percentage of households with two or more cars
Ashfield	46,600	28%	26%
Bassetlaw	44,690	24%	31%
Broxtowe	45,445	23%	30%
Gedling	47,556	23%	30%
Mansfield	41,601	29%	26%
Newark & Sherwood	44,465	22%	33%
Rushcliffe	43,670	17%	40%
Nottinghamshire	314,027	24%	31%
England	20,451,427	27%	29%

Source: 2001 Census data

3.2.11 Within Nottinghamshire, Mansfield is the district with the highest proportion of households with no car. The proportion (29%) is greater than the national average (27%). Mansfield and Ashfield districts have the lowest proportion of households in Nottinghamshire with two or more cars. The proportion (26%) is lower than the national average (29%).

3.2.12 Figure 3.2 shows a density plot of the Mansfield District, which indicates those wards where residents make the most trips to work as car drivers. The wards of Leeming, Forest Town West and Berry Hill are in the highest quintile.



Key

Percentages

73.8% - 75.5%	
67.0% - 73.8%	
65.5% - 67.0%	
60.3% - 65.5%	
53.4% - 60.3%	

Equal intervals between lowest and highest percentages.

Source: 2001 Census data and wards
Note: Ward boundaries and names have changed since the 2001 census

Figure 3.2: Percentage of Car Drivers (main mode of travel to work) by Ward

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Traffic Growth

3.2.13 Within the transport-industry trade press, there has been recent debate regarding the issue of 'peak traffic' and whether or not traffic volumes will continue to grow. The DfT's long-term travel growth forecasts indicate that the majority of the predicted increase in trip growth will be driven, inter-alia, by two distinct factors:

- A predicted increase in the overall population, which would lead to an increase in the number of trips being made; and
- Traffic, measured as vehicle-kilometres, will increase as a result of longer trips being made in response to an increase in wealth relative to the future costs of travel.

3.2.14 Recently, this issue of traffic growth has been somewhat clouded by the recent recession, and higher fuel prices, which has had the effect of reducing traffic levels after 2008. Traffic growth in the Mansfield and Sutton-in-Ashfield urban areas between 2005 and 2011 has been identified from Nottinghamshire County Council's long term traffic counters (site locations shown in Figure 3.3) and is shown in Table 3.6, below.

Table 3.6: Nottinghamshire County Council Long Term Daily Traffic Trend Data – Mansfield District

	Year						
Market Town	2005	2006	2007	2008	2009	2010	2011
Mansfield / Sutton-in-Ashfield	100.0	99.3	99.9	98.6	98.1	95.3	93.9
Numbers are indices: 2005 = 100.0							

3.2.15 Town centre cordon monitoring, undertaken by Nottinghamshire County Council, confirms there has also been a reduction in traffic volumes entering Mansfield town centre since 2005 (see Table 3.7). This table also shows other large Nottinghamshire towns, for comparison. For the avoidance of doubt, Nottinghamshire County Council now collect cordon data every two years (no data was collected in 2011); the latest 2012 counts were obtained in the autumn.

Table 3.7: Changes in Daily Traffic Flows Entering Market Towns, Compared with 2005 levels

	Year						
Market Town	2005	2006	2007	2008	2009	2010	2012
Worksop	0%	-5%	-8%	-8%	-12%	-9%	-14%
Retford	0%	0%	-2%	-5%	-2%	-7%	-7%
Newark	0%	0%	0%	-3%	-6%	-4%	-10%
Mansfield	0%	-2%	-3%	-4%	-8%	-7%	-10%

3.2.16 The locations of the traffic monitoring sites on a cordon around the Mansfield town centre are indicated in Figure 3.4.

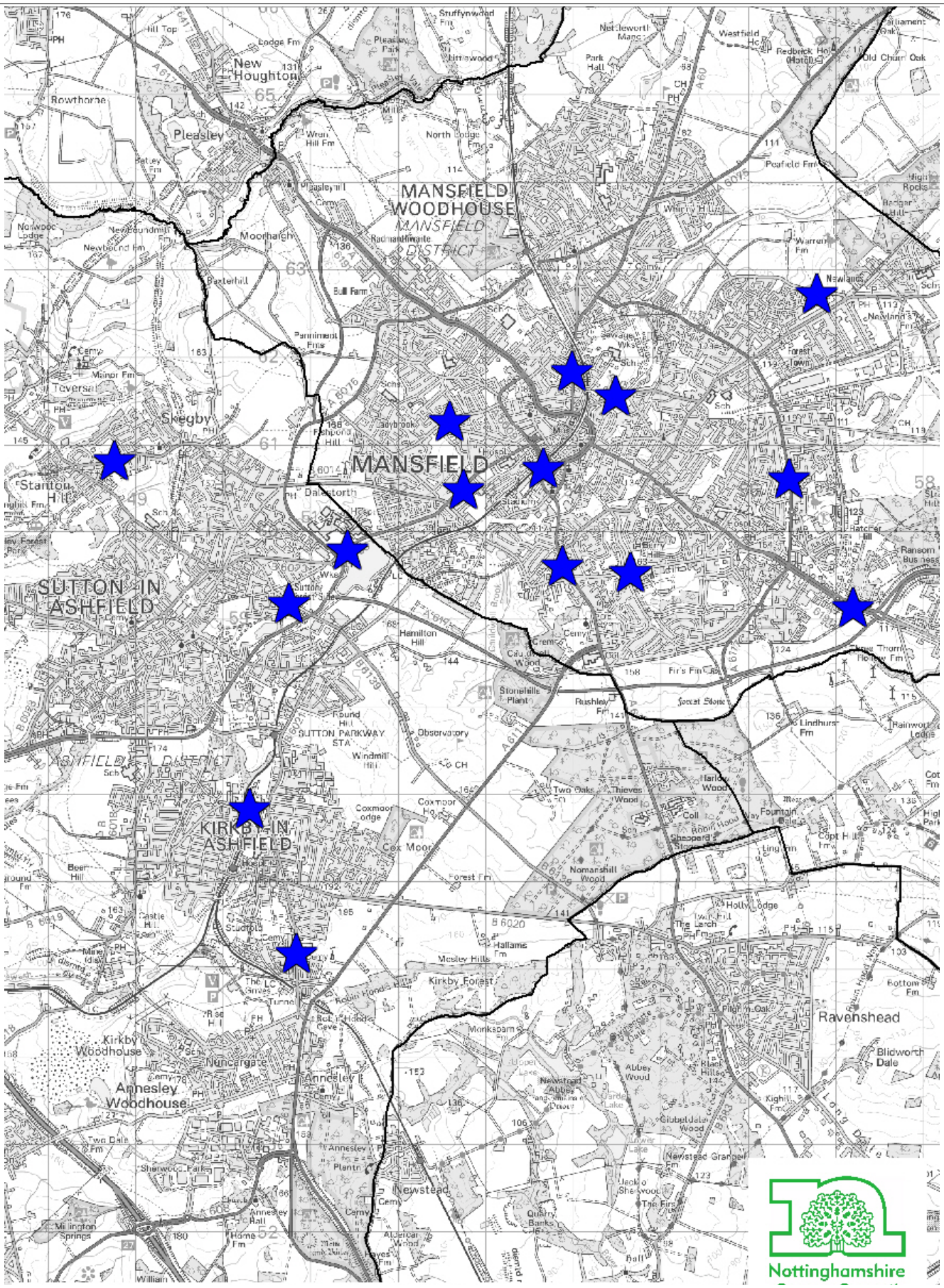

Figure 3.3: Traffic Monitoring Sites in the Mansfield and Sutton In Ashfield urban areas

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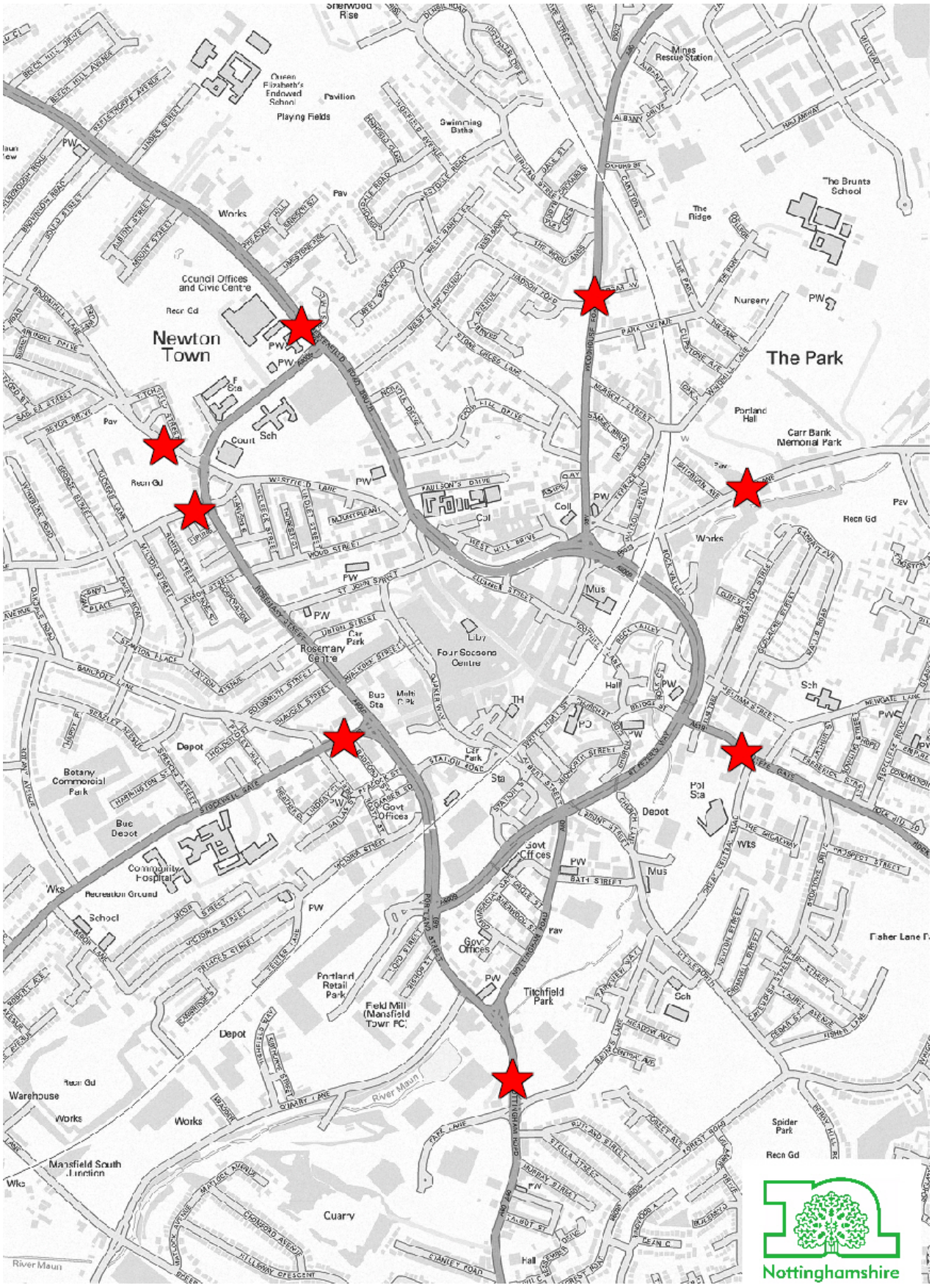

Figure 3.4: Locations of Traffic Monitoring Sites around Mansfield Town Centre

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3.3 Walking and Cycling

3.3.1 Figure 3.5, below, shows the existing cycle infrastructure within Mansfield, focusing on Mansfield town. This is taken from the document, *Cycling in Mansfield and Ashfield* (Nottinghamshire County Council, 2007). As can be seen from Figure 3.5, the existing cycling infrastructure is better developed to the south of the town than in the north.

3.3.2 In terms of longer distance routes, Mansfield is linked to Sutton-in-Ashfield town centre via the Timberland, and Teversal & Skegby Trails. These are multi-user routes, although there are several locations which require crossing of busy roads. The routes run east-west but, again, along the southern boundary of the town as shown in Figure 3.6 (and provides more specific detail to that shown in Figure 3.5).

3.3.3 Figure 3.7 is also taken from the document *Cycling in Mansfield and Ashfield*, but focuses on the Market Warsop area. It identifies east-west-linkages with the District of Bolsover (Shirebrook) and Sherwood Forest Country Park. Indeed, the Interim Planning Guidance Note 11 (Green Infrastructure, published by Mansfield District Council in April 2009) identifies that trails between Church Warsop and Market Warsop act as important recreation and commuting routes between the two areas and also ensure additional recreational access linkages from Warsop Vale to the National Cycle Network and Pleasley Vale to Meden Vale. Notwithstanding this, it is noted that, as recreational routes, these don't necessarily follow a direct route, and they are mostly surfaced with un-bonded aggregate (stone chips etc), are un-lit etc. While this doesn't prohibit their use as a commuter route, it can make them less attractive to commuters and result in lower or more seasonal demand.

3.3.4 Figure 3.8 shows cycle paths through the Meden Trail / Pleasley Vale, and Figure 3.9 shows routes from Mansfield Woodhouse to Shirebrook / Market Warsop.

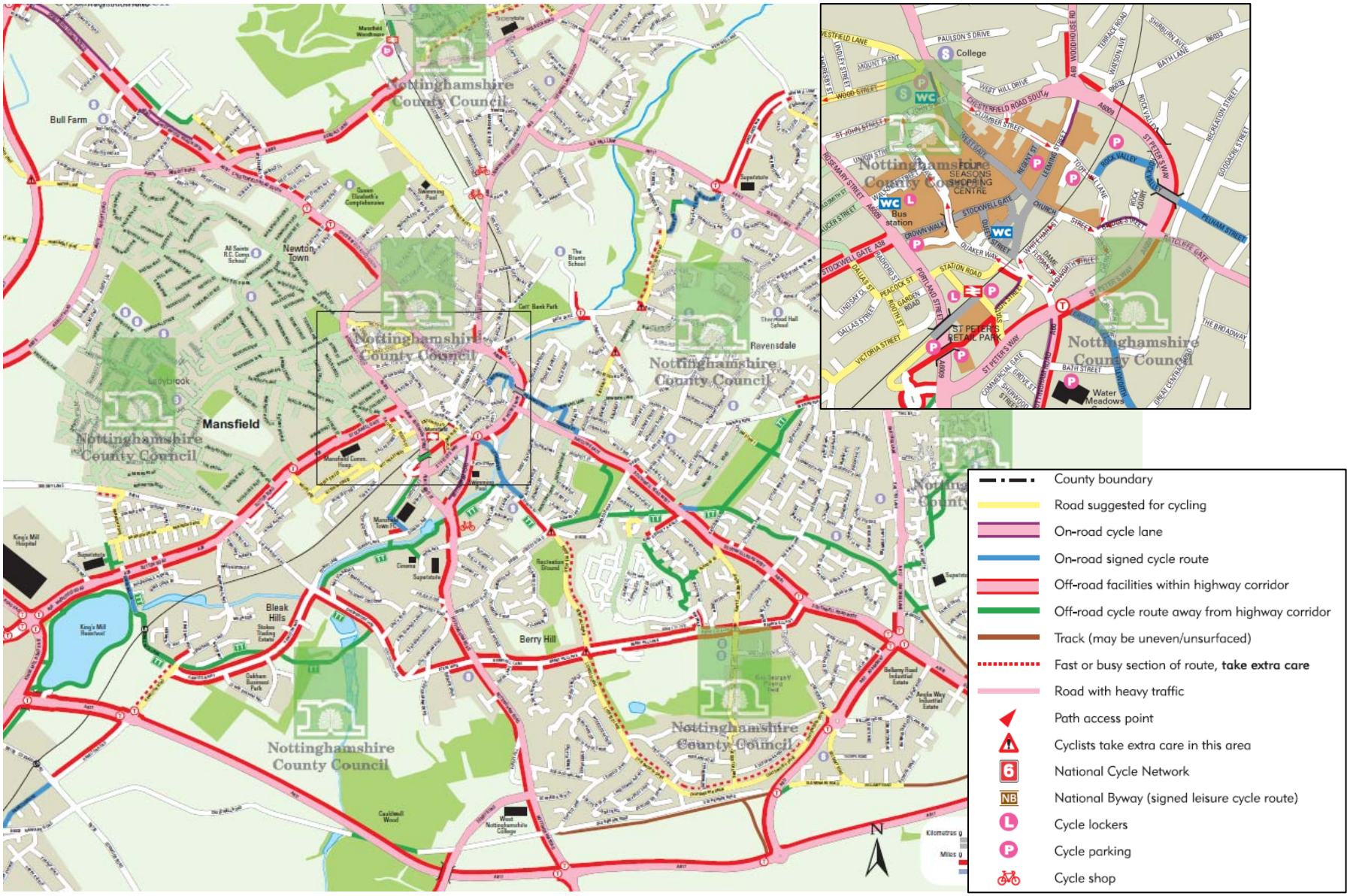

Figure 3.5: Mansfield Cycle Map

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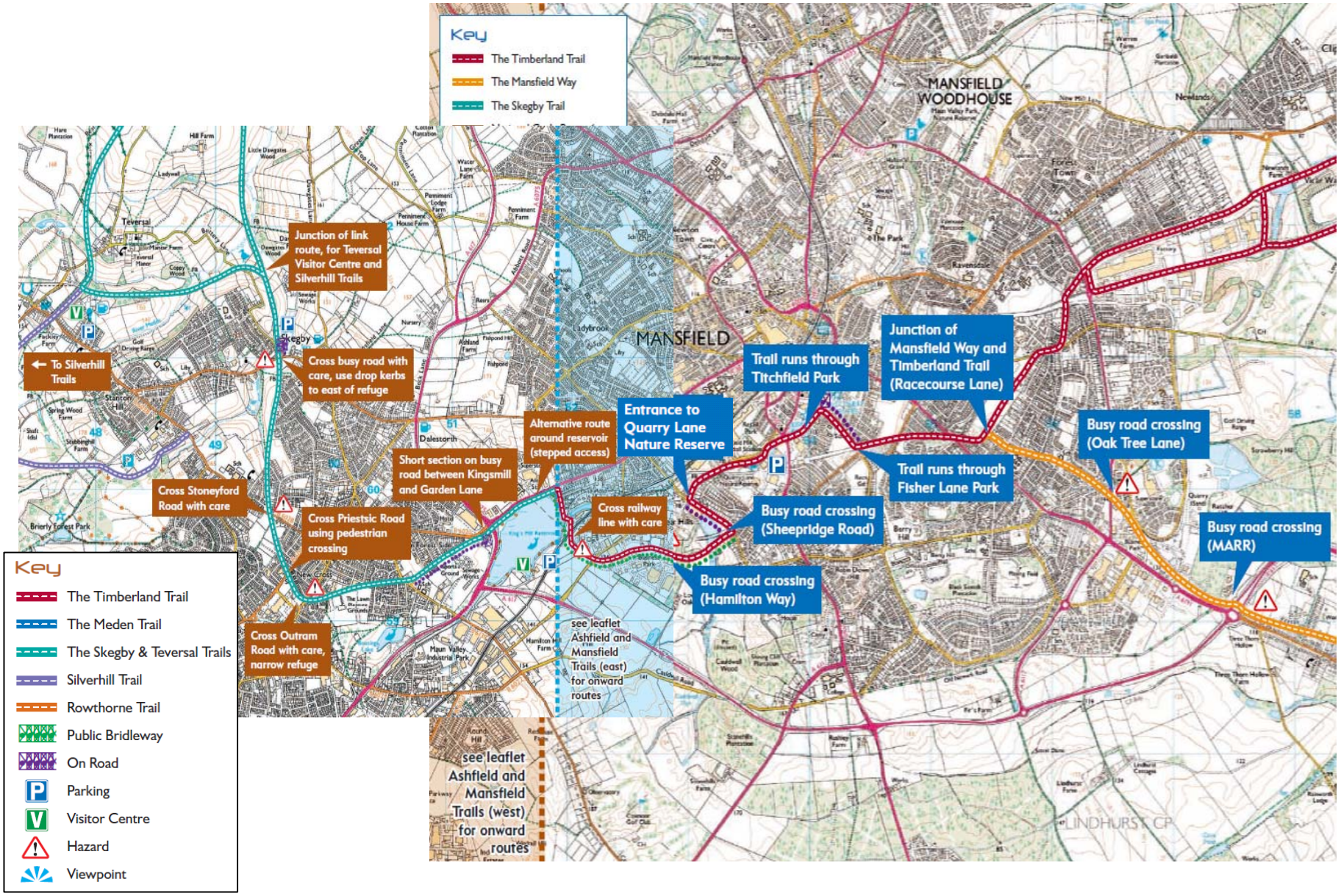

Figure 3.6: Ashfield and Mansfield Cycle Trails

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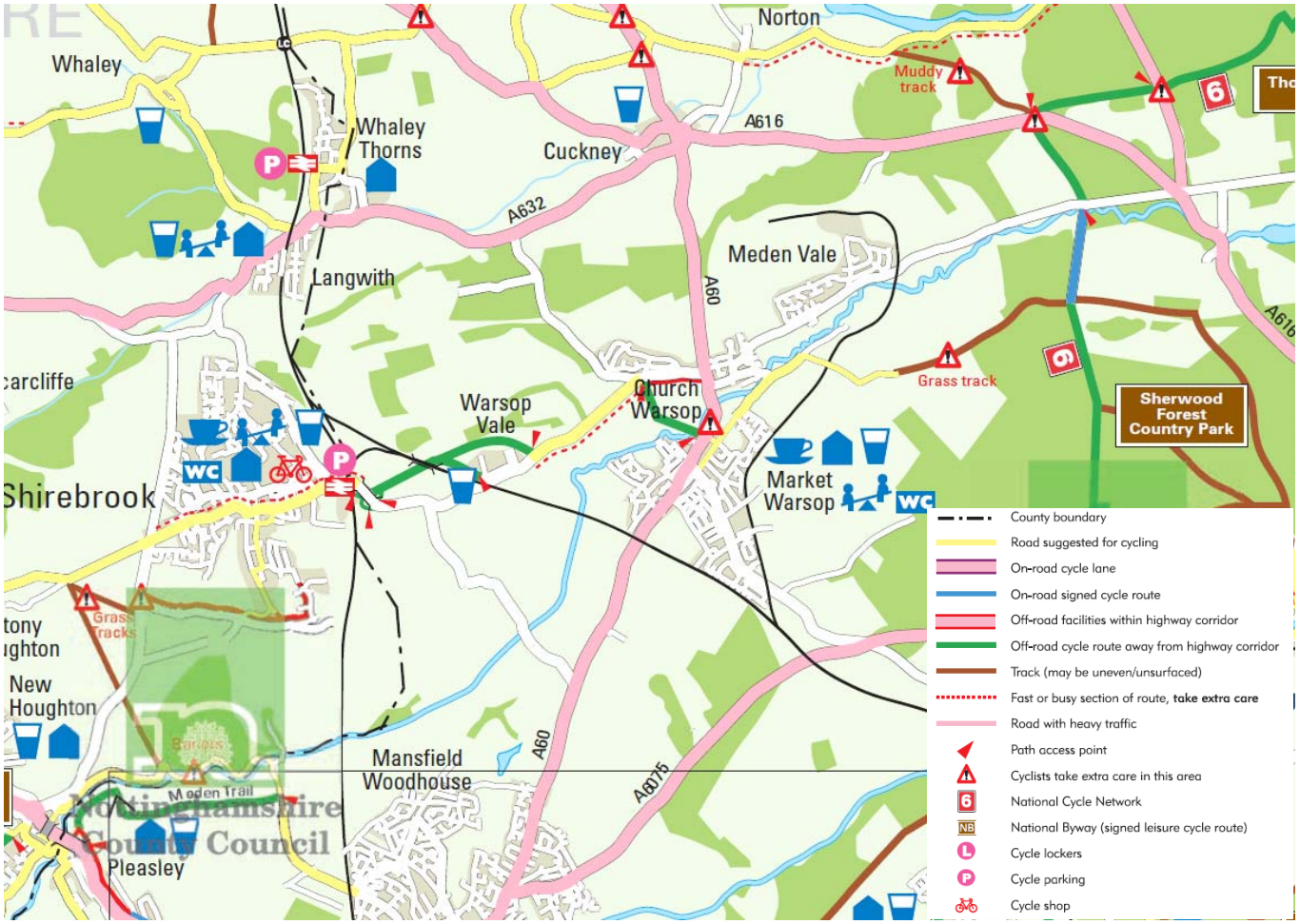

Figure 3.7: Mansfield Cycle Map – Market Warsop

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Figure 3.8: Cycle Paths Through the Meden Trail / Pleasley Vale

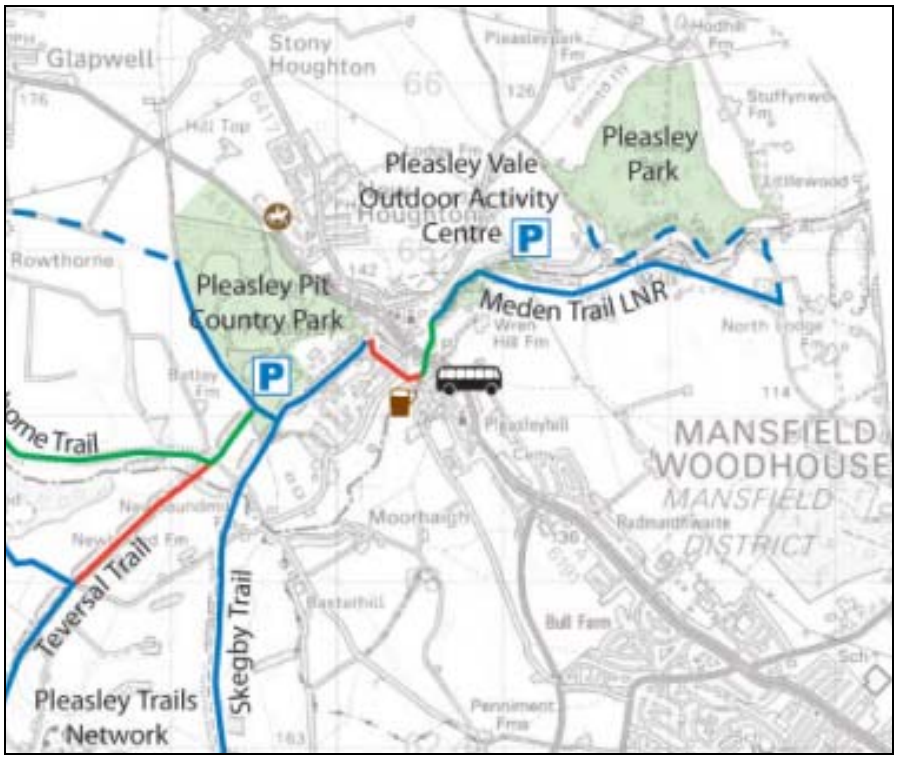
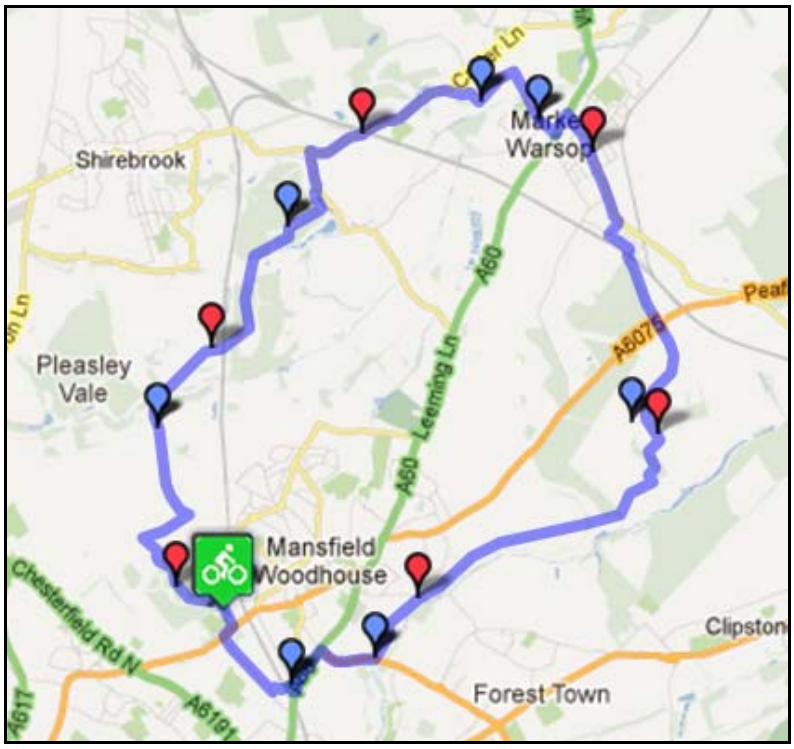


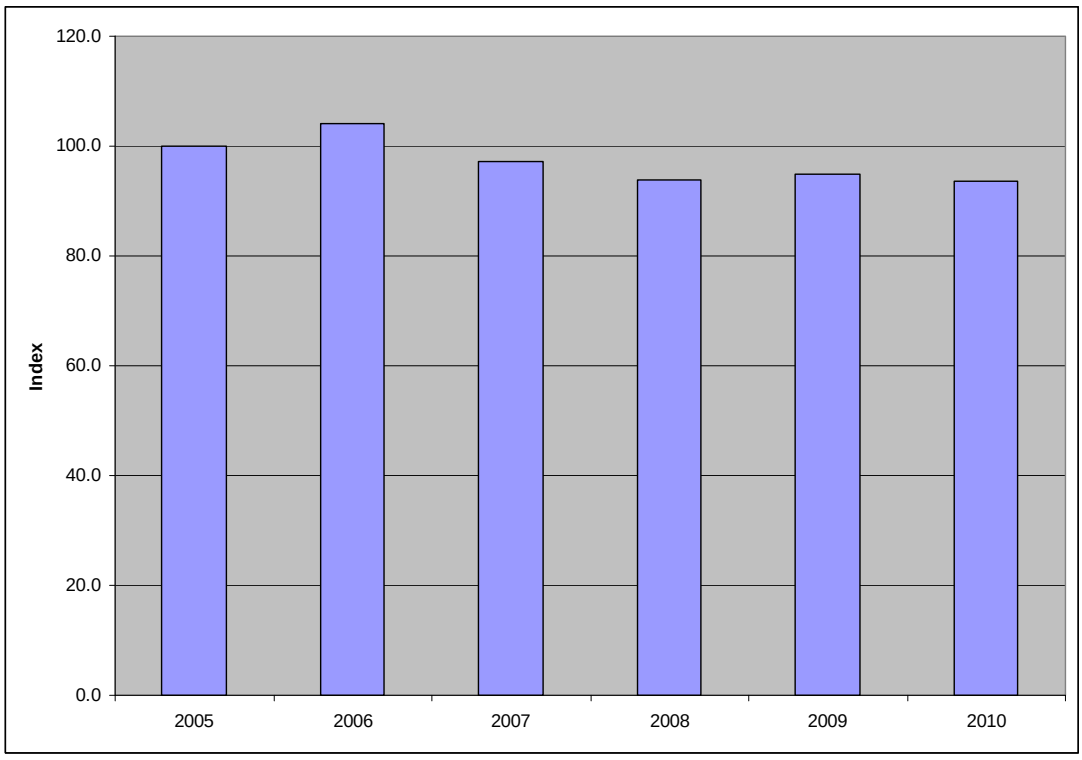
Figure 3.9: Cycle Paths Through the Meden Trail / Pleasley Vale
(Reproduced from: Cycle-Route.com)



3.3.5 Cycle linkages across the district are therefore available, although these have developed along specific corridors such that, for instance, there is sparse network development between the north and south of the district. In terms of usage, the Nottinghamshire Cycle Strategy (Nottinghamshire County Council, 2006 – 11) notes that levels of cycling in Mansfield remain low, even though surveys suggest there are relatively high levels of cycle ownership throughout the county. This matches the census data shown previously in Table 3.4 (although surveys conducted by Mansfield District Council in 2000 identified that up to 5% of staff could travel to work regularly by cycle).

3.3.6 The County Council monitors cycle usage at several sites, and undertook annual counts between 2005 and 2010. These counts are now being undertaken on a bi-annual basis and, as such, data for 2011 is not available (and 2012 has not yet been conducted). However, the graph at Figure 3.10 indicates that cycle usage has declined over the period 2005-2010, although it should be noted that the number of cycle counters in the area is limited.

Figure 3.10: Cycle Usage in Mansfield – 2005 - 2010



Note: Annual growth factors provided by Nottinghamshire County Council. Indices are based on a 2005 base value (i.e. 2005 = 100).

3.3.7 Notwithstanding the above changes in recorded cycle volumes, the Nottinghamshire Cycle Strategy identified some of the problems which may deter cycling:

- High traffic levels;
- Poor maintenance of routes;
- Danger of cycle theft / not enough secure cycle parking in the most convenient places;
- Real or perceived risk of injury;
- General ease and attractiveness, and perceived low cost of car use;
- Geography of certain areas – e.g. hills, spacing between facilities;
- Length of journey – may require interaction with public transport over longer commuting journeys;
- Severance of direct and attractive routes;
- Lack of rural links – resulting from the cost (due to length) verses lower benefits through smaller populations;
- Lack of designated facilities in smaller towns to main towns – resulting from cost versus benefits issue;
- Air and noise pollution; and
- Poor weather.

3.3.8 Many of the above issues are being addressed by Nottinghamshire County Council through both school and adult cycle training, and securing new cycling infrastructure via LTP funds or from developer contributions. The latter is the most important with respect to new sites coming forward via the Mansfield District Local Plan.

3.4 Public Transport

3.4.1 Nottinghamshire County Council is currently reviewing its bus strategy. Notwithstanding this, a bus strategy for North Nottinghamshire was published in 2006. This identified that:

- Accessibility in the more urbanised Mansfield/Ashfield and Worksop areas tends to be higher than the more rural Retford and Newark areas;
- A major redevelopment of Mansfield bus station is proposed; and
- Particular effort will be applied to working with police and bus operators in areas such as Mansfield where bus services play an important role in supporting the developing night-time economy.

3.4.2 With regards to the second bullet point, a new public transport interchange is currently being developed and is due to open in early 2013. According to the Nottinghamshire County Council website:

> "*This £9m scheme will provide a first class interchange for Mansfield and offer a major improvement to the quality of the bus waiting environment benefiting the existing five million passenger trips using the current bus station and encourage more people to travel by public transport*."

3.4.3 LTP3 identifies that public transport patronage at Mansfield's existing bus station has already increased by 10% between 2004 and 2009. It is understood that Nottinghamshire County Council is expecting a further 5 to 10% increase in patronage in the first year following opening of the new station (which reflects the experience of recent improvements to Retford bus station). It is also understood that Stagecoach will be improving its fleet to coincide with the opening of the new station.

3.4.4 It is also understood that Nottinghamshire County Council are pursuing the potential benefits of integrated ticketing and real time passenger information (RTPI) systems, and is also developing Bus Quality Partnerships (BQPs) with local operators to further improve services within the town (although no information was available regarding this BQP at the time of writing).

3.4.5 The local public transport services covering the Mansfield and Market Warsop area are shown in Figure 3.11.

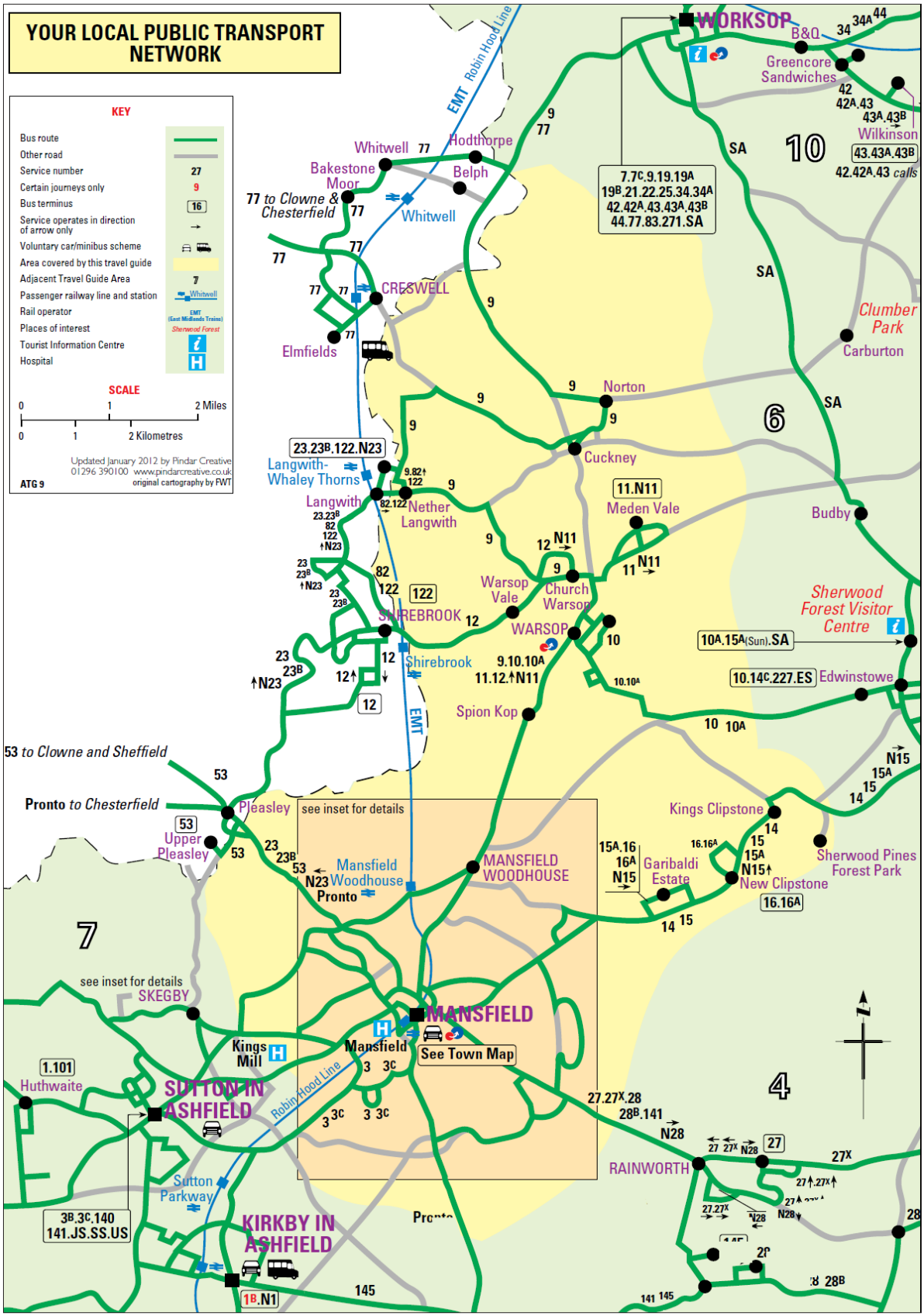
3.4.6 In terms of specific services, these are subject to periodic changes based on the requirements of the individual operators (e.g. Trent Barton, Stagecoach East Midlands, K & H Doyle and Yourbus) and will certainly change once the new bus station opens. Figure 3.12 shows the Mansfield bus map and generally shows a good coverage of services across the urban area, which link together via a town centre interchange.

3.4.7 The routes of the bus services in and around the Mansfield Town Centre are indicated in Figure 3.13. These routes relate to services in 2012. The opening of the new bus station will require some changes to these routes.

3.4.8 Of the commercial services, the key connections to Derby, Nottingham, Chesterfield and Sutton-in-Ashfield are available via the 'Nines', Rainbow and Pronto services which run at least every 60 minutes during the daytime.

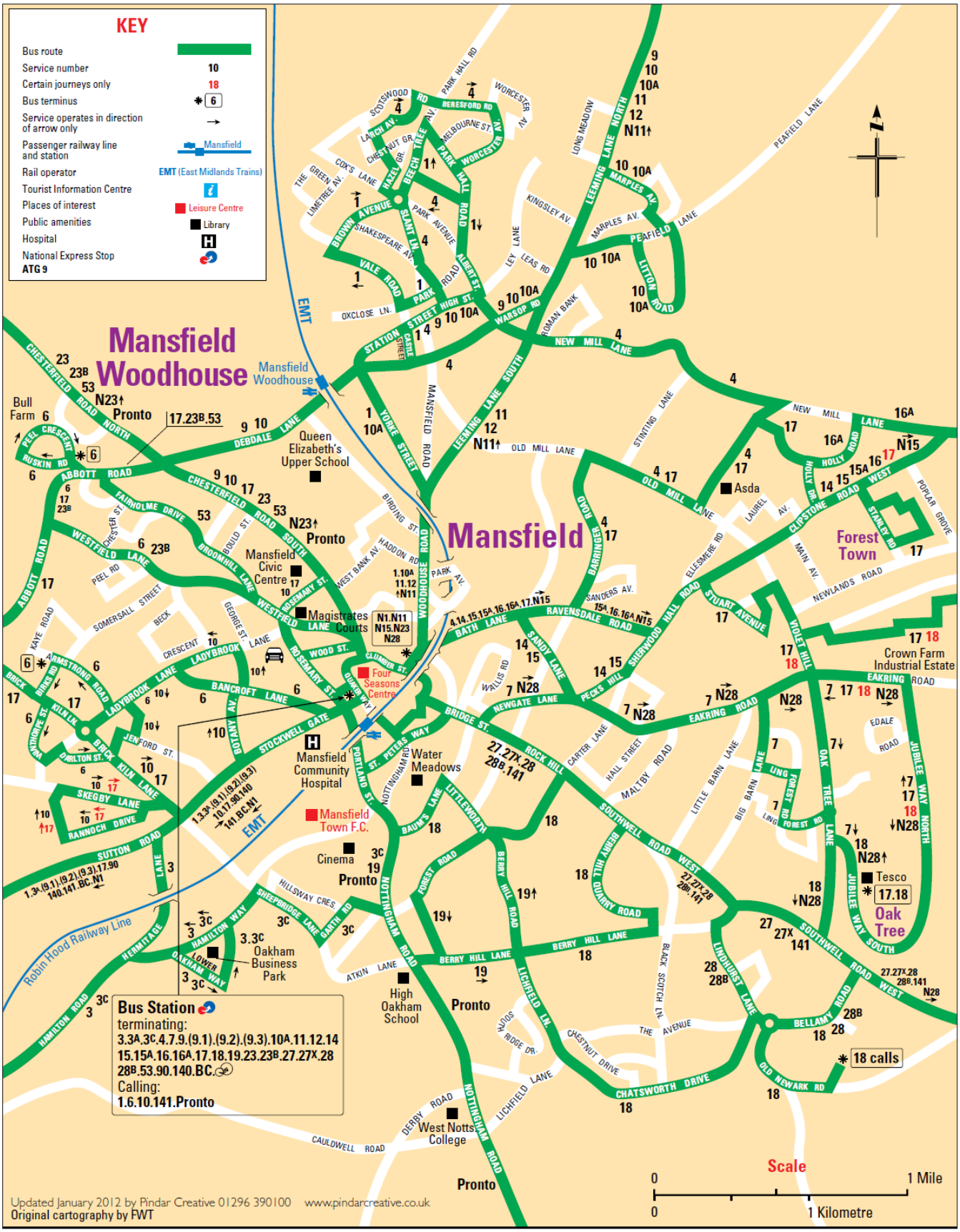
3.4.9 In addition to the commercial operators, Nottinghamshire County Council also supports a range of services within Mansfield including the following services:

- 4 – Mansfield to Mansfield Woodhouse
- 9 – Mansfield – Market Warsop – Worksop
- 10 - Ladybrook – Mansfield – Market Warsop – Edwinstowe
- 10A – Mansfield – Market Warsop – Edwinstowe – Sherwood Forest Visitor Centre
- 17 – Oak Tree – Forest Town – Mansfield – Sutton-in-Ashfield
- 18 – Mansfield – Berry Hill – Oak Tree – Crown Farm
- 19 – Mansfield – Berry Hill – Mansfield
- 140 – Mansfield – Skegby – Sutton-in-Ashfield



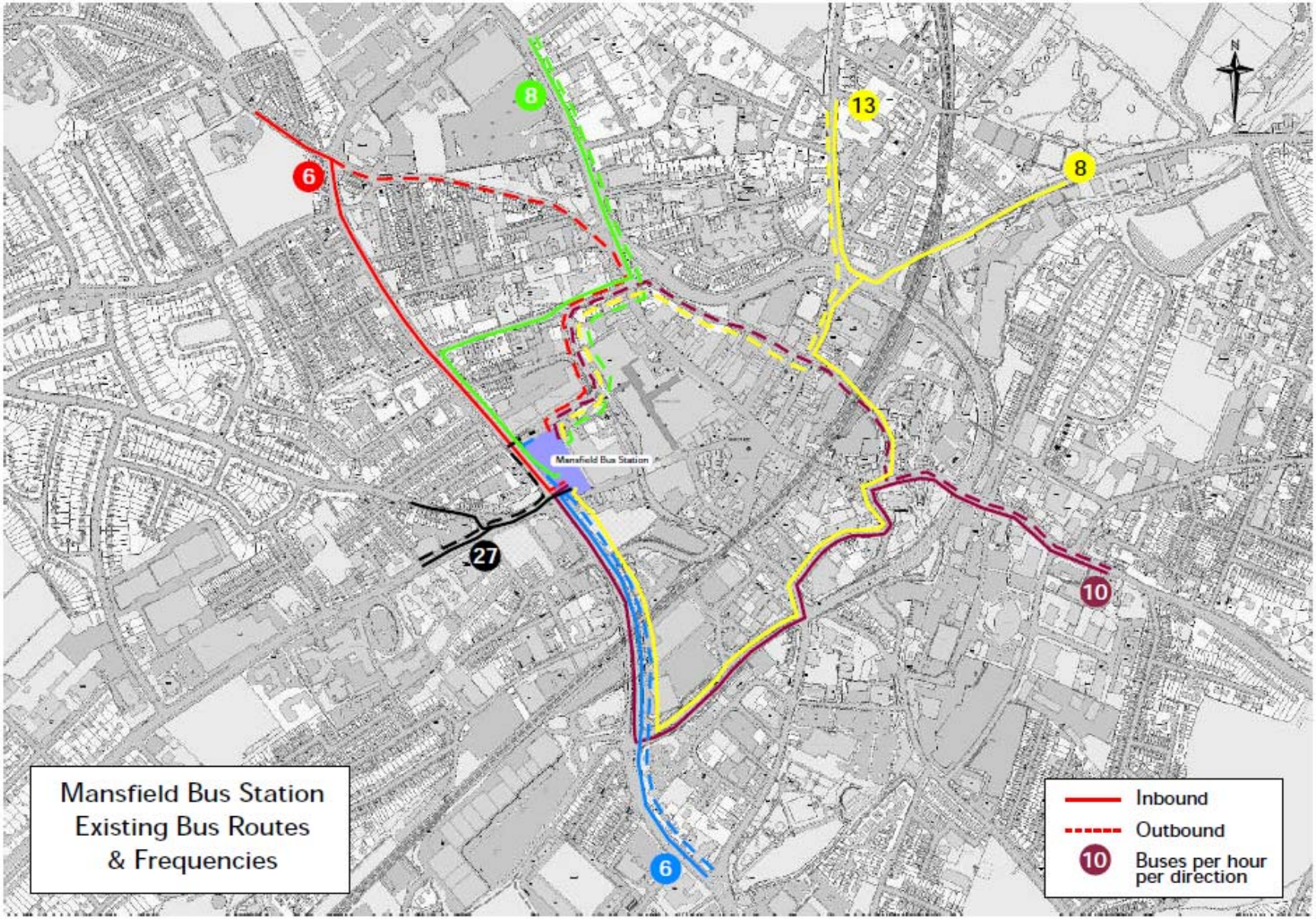
Extract from Nottinghamshire County Council's Area 9 local bus travel guide for Mansfield and Warsop area, dated March 2012.

Figure 3.11: Bus Services Map of district



Extract from Nottinghamshire County Council's Area 9 local bus travel guide for Mansfield and Warsop area, dated March 2012.

Figure 3.12: Bus Services Map of Mansfield



Information supplied by Nottinghamshire County Council for 2012.

Figure 3.13: Bus Service Routes in Mansfield Town Centre

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3.4.10 As at July 2012, the frequencies of the main bus services in the district of Mansfield are provided in Table 3.8:

Table 3.8: Frequencies of the main Bus Services

Service Number	Operator	Service Description		Frequency (mins)						
				Monday to Friday			Saturday		Sunday	
			First Dep. Time	Peak	Daytime	Evening	Daytime	Evening		Last Dep. Time
1	Stagecoach	Mansfield Woodhouse - Mansfield - Huthwaite - Alfreton	0450	10	10	15/30	10	15/30	30	2330
4	Doyles	Mansfield - Mansfield Woodhouse	0920		60		60			1420
6	Stagecoach	Ladybrook - Mansfield - Bull Farm	0550	15	15	2jnys	15	2jnys	60	1917
7	Stagecoach	Mansfield - Oak Tree - Mansfield	0530	15	15		15			1815
9	yourbus	Mansfield - Market Warsop - Worksop	0835	60	60		60			1830
10	Stagecoach	Ladybrook - Mansfield - Warsop - Edwinstowe	0715	60	60		60			1745
10A	Stagecoach	Mansfield - Warsop - Edwinstowe - Sherwood Forest Visitor Centre	0930						60	2225
11	Stagecoach	Mansfield - Meden Vale	0545	30	30	60	30	30	60	2245
12	Stagecoach	Mansfield - Shirebrook	0625	30	30	2jnys	30	2jnys	60	2005
14/15	Stagecoach	Mansfield - Ollerton - Kirton/Walesby	0545	30	30	60	30	60	60	2220
16	Stagecoach	Mansfield - Clipstone	0510	15	15		15		60	1753
17	Doyles	Oak Tree - Forest Town - Mansfield – Sutton-in-Ashfield	0720	60	60		60			1800
18	Doyles	Mansfield - Berry Hill - Oak Tree - Crown Farm	0650	60	60		60			1810
19	Doyles	Mansfield - Berry Hill	1020		60		60			1500
23	Stagecoach	Mansfield - Shirebrook - Langwith	0545	30	30	60	30	60	120	2215
27/28/ 141	Stagecoach/ Trent Barton	Mansfield - Rainworth	0515	15	15	3jnys	15	3jnys	60	2200
28/28B	Stagecoach	Mansfield - Blidworth - Bilsthorpe - Southwell - Newark	0515	30	30	1jny	30	1jny	60	1915
53	Stagecoach	Mansfield - Sheffield	0640	120	120		120			1735
140	Stagecoach	Mansfield - Skegby – Sutton-in-Ashfield	0945			3jnys		3jnys	60	2245
141	Trent Barton	Sutton-in-Ashfield - Mansfield - Blidworth - Hucknall - Nottingham	0600	60	60	120	60	120		2200
Black Cat	Trent Barton	Mansfield - Heanor - Ilkeston - Stanley - Derby	0620	60	60		60			1830
nines	Trent Barton	Mansfield – Sutton-in-Ashfield - Alfreton - Ripley - Derby	0615	15	15	30	15	30	30	2300
pronto	Stagecoach/ Trent Barton	Mansfield - Nottingham	0540	15	15	60	15	60	30	0215
pronto	Stagecoach/ Trent Barton	Mansfield - Chesterfield	0610	30	30	60	30	60	60	0210
threes	Trent Barton	Mansfield – Sutton-in-Ashfield - Kikby - Hucknall - Nottingham	0445	15	10	30	10	30	60	2306

3.4.11 All bus operators were contacted during the development of this study. Stagecoach provided a list of locations where it experiences delay to services and these are shown within Appendix A. In addition, Stagecoach commented that:

- "traffic lights that are not coordinated. On departing from Mansfield Bus Station heading towards Nottingham, a bus can take up to 7 minutes to get to Sainsbury's as there seems to be no 'green wave' at the 7 sets of traffic lights in that short distance.
- we have been asked to consider daytime services to the Berry Hill development and the housing estate between Tesco (Chesterfield Road) and Woodhouse Road.
- the high number of speed humps around Mansfield impact heavily on our services in causing delays where cars are parked preventing buses from straddling humps and also increasing wear and tear on suspension components".

3.4.12 Trent Barton commented that:

- "we see delays to our pronto service on the A60 between St Peters Way and Berry Hill Lane. This affects us during Peak in both directions with the sheer volume of traffic often at standstill for minutes. We also see heavy congestion at the Weekend, specifically at the junction of Baums Lane with traffic trying to access the retail park and Sainsbury's.
- delays on Ratcliffe Gate at the junction of St Peter's Way heading towards Mansfield are common, this affects our 141 service and delays of 5 minutes at the lights are normal.
- don't have any issues with "Problem Parking" in Mansfield and were not aware of any current gaps in services."

3.4.13 For those unable to use their own transport, or access public transport, Nottinghamshire County Council also allows users to search for community and social transport schemes via its website.[3]

Public Transport – Rail

3.4.14 Mansfield benefits from two rail stations: Mansfield and Mansfield Woodhouse. The locations of these stations are shown in Figure 3.14.

3.4.15 Mansfield station has a 103 space car park, and three uncovered cycle stands (which can accommodate up to six cycles).

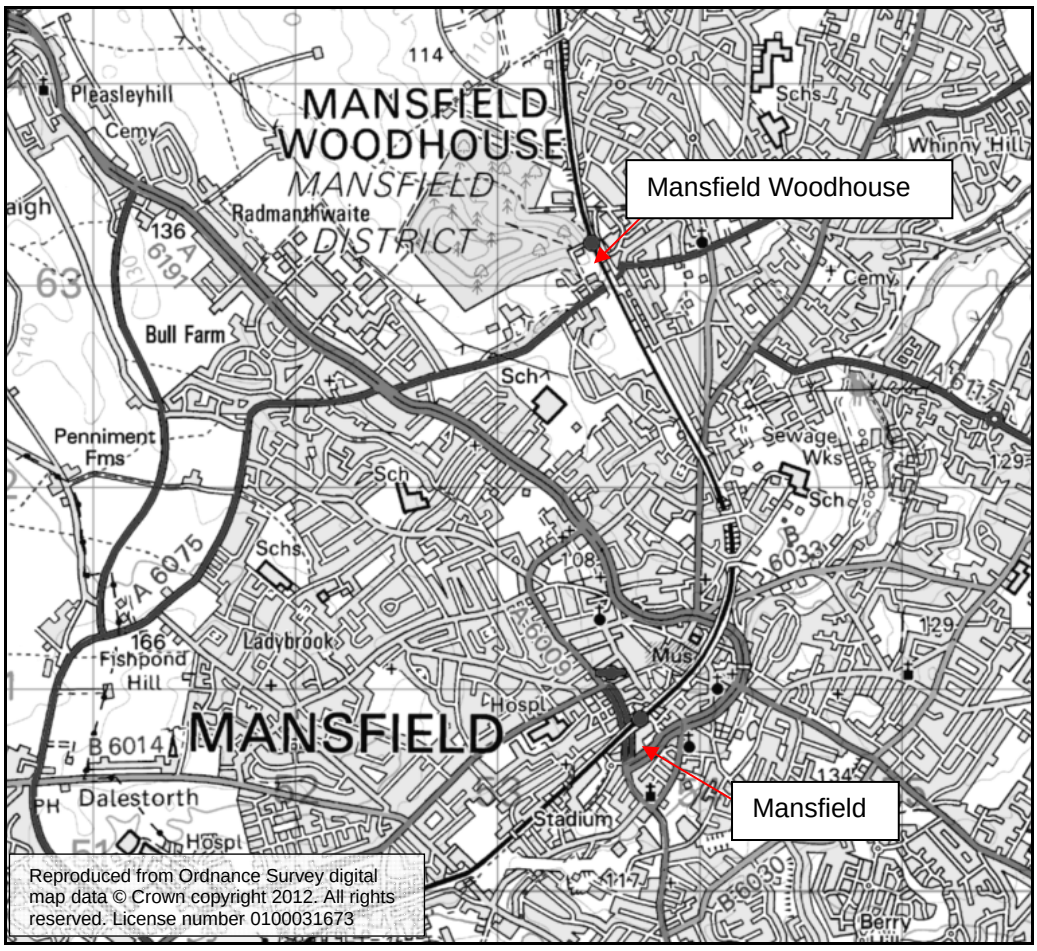
3.4.16 Mansfield Woodhouse has a 40 space car park, and five uncovered cycle stands (which can accommodate up to ten cycles).

3.4.17 Although no information is available for this study with regards to the trip purposes of those using the station, it is likely that both stations could benefit from the provision of

[3] Refer to web site: http://www.nottinghamshire.gov.uk/travelling/travel/communitytransport/

enhanced cycle facilities. It is, however, noted that both stations offer step free access to all platforms for less able users.

Figure 3.14: Mansfield District Rail Stations



3.4.18 In terms of services, Mansfield is served by the Robin Hood line. The towns and villages served by the route are listed below:

- Nottingham;
- Bulwell;
- Hucknall;
- Newstead;
- Kirkby-in-Ashfield;
- Sutton-in-Ashfield;
- Mansfield;
- Mansfield Woodhouse;
- Shirebrook;
- Langwith, Nether Langwith and Whaley Thorns;
- Creswell;
- Whitwell; and
- Worksop.

3.4.19 During the daytime between Monday and Saturday there is a half-hourly service from Mansfield Woodhouse, through to Nottingham (southbound) an hourly northbound service onwards to Worksop. There is an hourly service during the evenings between Nottingham and Worksop. Also, there is a service on Sundays.

3.4.20 Within the Nottinghamshire LTP3, it was noted that rail patronage had increased during the period to 2009. The most recent statistics published by the Office of Rail Regulation (ORR) provide more detail and identify (in Table 3.9) that although the stations in Mansfield experienced strong growth in 2009/10, some of this was lost in 2010/11 (the most recently available data). For comparison, data for Newark Castle railway station is also shown.

Table 3.9: Annual Station Usage (Source: Office of Rail Regulation, 2012)

Station	07 - 08	08 - 09	09 - 10	10 - 11
Mansfield Town	343,907	348,680 1.4%	393,990 13.0%	366,054 -7.1%
Mansfield Woodhouse	129,774	142,426 9.7%	155,790 9.4%	146,054 -6.2%
Newark Castle	324,150	345,128 6.5%	413,900 19.9%	348,938 -15.7%

3.5 Accessibility

3.5.1 The above sections demonstrate that the pattern of travel varies across the district of Mansfield and that the availability of sustainable transport infrastructure is also unevenly distributed.

3.5.2 These issues can be explored in further detail with reference to the Core Accessibility Indicators (CAI) published by the Government. The CAI provide a local-level measure

of the accessibility for key services (covering food stores, education, health care, town centres and employment centres) for the populations who use them. They estimate the proportion of the local population who can access key services within reasonable time limits by sustainable transport modes, and they are widely used in accessibility planning by local authorities.

3.5.3 Accessibility indicators are published by the DfT and Office for National Statistics for 16 to 74 year-old persons. In terms of access to employment, the accessibility indicators identify the percentage of 16 to 74 year olds with access to employment by a composite mode of transport (i.e. a combination of one or more of walking, cycling or public transport). Table 3.10 summarises these results for Mansfield and the wider area and shows that Mansfield performs similarly to the wider Nottinghamshire and East Midlands averages, but below that of Nottingham City (which is to be expected given Nottingham's size and status as a large employment destination).

Table 3.10: Percentage (%) of 16 to 74 Year Olds with Access to Employment by Composite Mode of Transport

Area	2007	2008	2009
Mansfield	80.4	80.7	81.3
Nottingham	85.3	85.4	85.6
Nottinghamshire	79.9	80.4	80.3
East Midlands	80.1	80.5	80.3

3.5.4 For access to services and facilities, core accessibility indictors have also been published by the Government based on the following criteria, which have then been combined into an overall composite score:

- % of a) pupils of compulsory school age; b) pupils of compulsory school age in receipt of free school meals within 15 and 30 minutes of a primary school by public transport/walking;
- % of a) pupils of compulsory school age; b) pupils of compulsory school age in receipt of free school meals within 20 and 40 minutes of a secondary school by public transport/walking and cycling;
- % of 16-19 year olds within 30 and 60 minutes of a further education establishment by public transport/walking and cycling;
- % of a) people of working age (16-74); b) people in receipt of Jobseekers' Allowance within 20 and 40 minutes of work by public transport/walking and cycling;
- % of a) households b) households without access to a car within 30 and 60 minutes of a hospital by public transport/walking;
- % of a) households b) households without access to a car within 15 and 30 minutes of a GP by public transport/walking; and
- % of a) households; b) households without access to a car within15 and 30 minutes of a supermarket by public transport/walking and cycling.

3.5.5 Table 3.11 compares the local composite score data for Mansfield and the wider area. For the composite data, lower scores generally indicate an area that is more accessible. This table again shows that Mansfield compares well with Nottinghamshire and the wider East Midlands.

Table 3.11: Composite Accessibility Scores – Mean and Median Averages

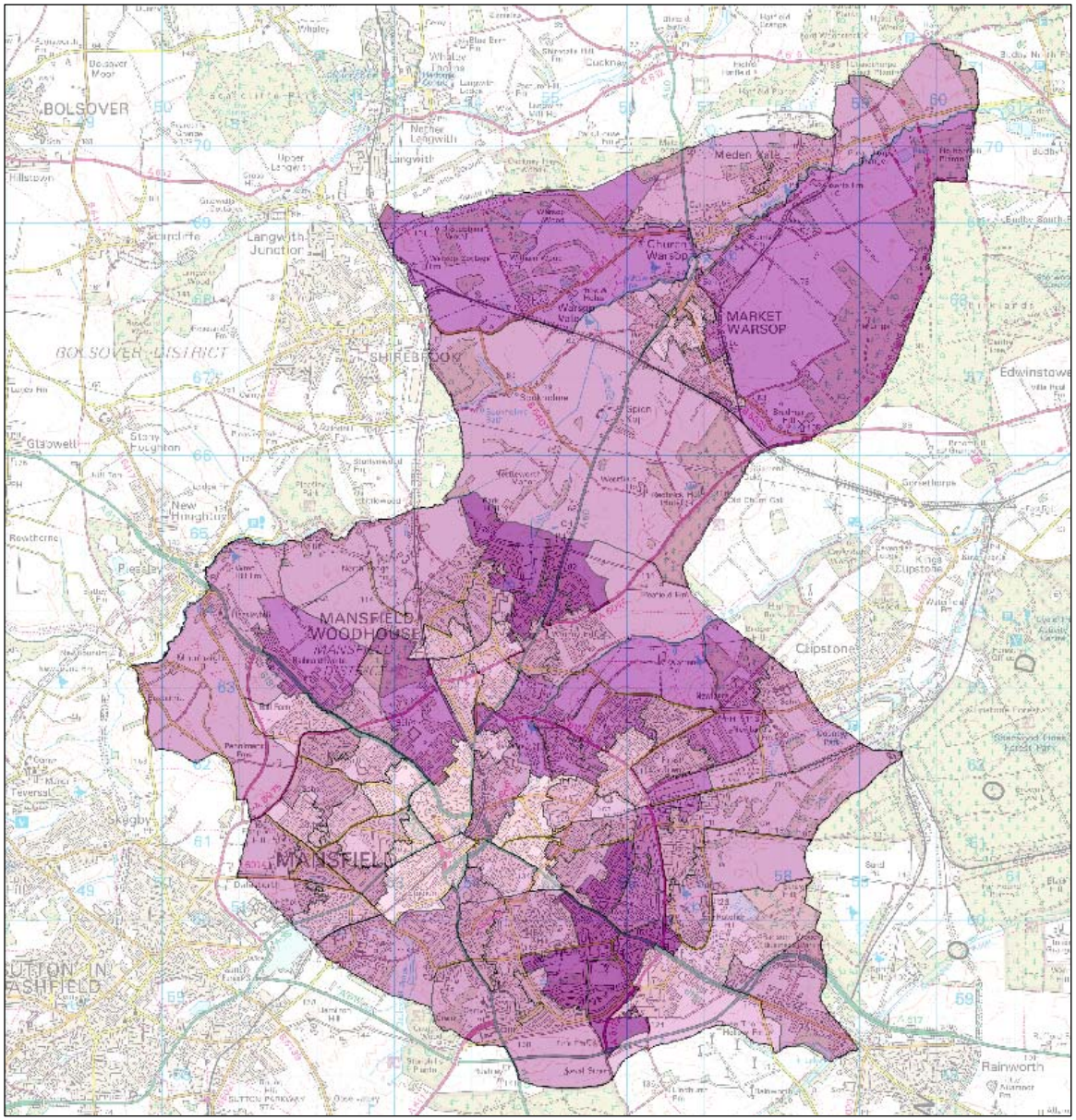
Area	Composite Score (Mean Average)	Composite Score (Median Average)
Mansfield	116	115
Nottingham	71	73
Nottinghamshire	117	118
East Midlands	116	118
England	110	111

3.5.6 Figure 3.15 provides a density plot for Mansfield at the Lower Super Output Area (LSOA) level. The darker colours on this Figure identify where the least accessible LSOA areas are located.

3.6 Freight

3.6.1 Nottinghamshire County Council has confirmed that no specific issues relating to freight in Mansfield were highlighted during the development of the LTP3 (by neither stakeholders or as part of the evidence base analysis).

3.6.2 A map showing those routes carrying the greatest number of HGV movements in the District is shown as Figure 3.16 and more detail for the Mansfield urban area is shown in Figure 3.17.



Key

- 95 to 119 (17)
- 72 to 95 (16)
- 49 to 72 (12)
- 26 to 49 (11)
- 3 to 26 (10)

Equal intervals between lowest and highest scores. Numbers in brackets indicate the number of LSOA in the interval.

Figure 3.15: Composite Accessibility scores by LSOA

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2011 Annual Average Daily HGV Flows (AADF's) for Mansfield District

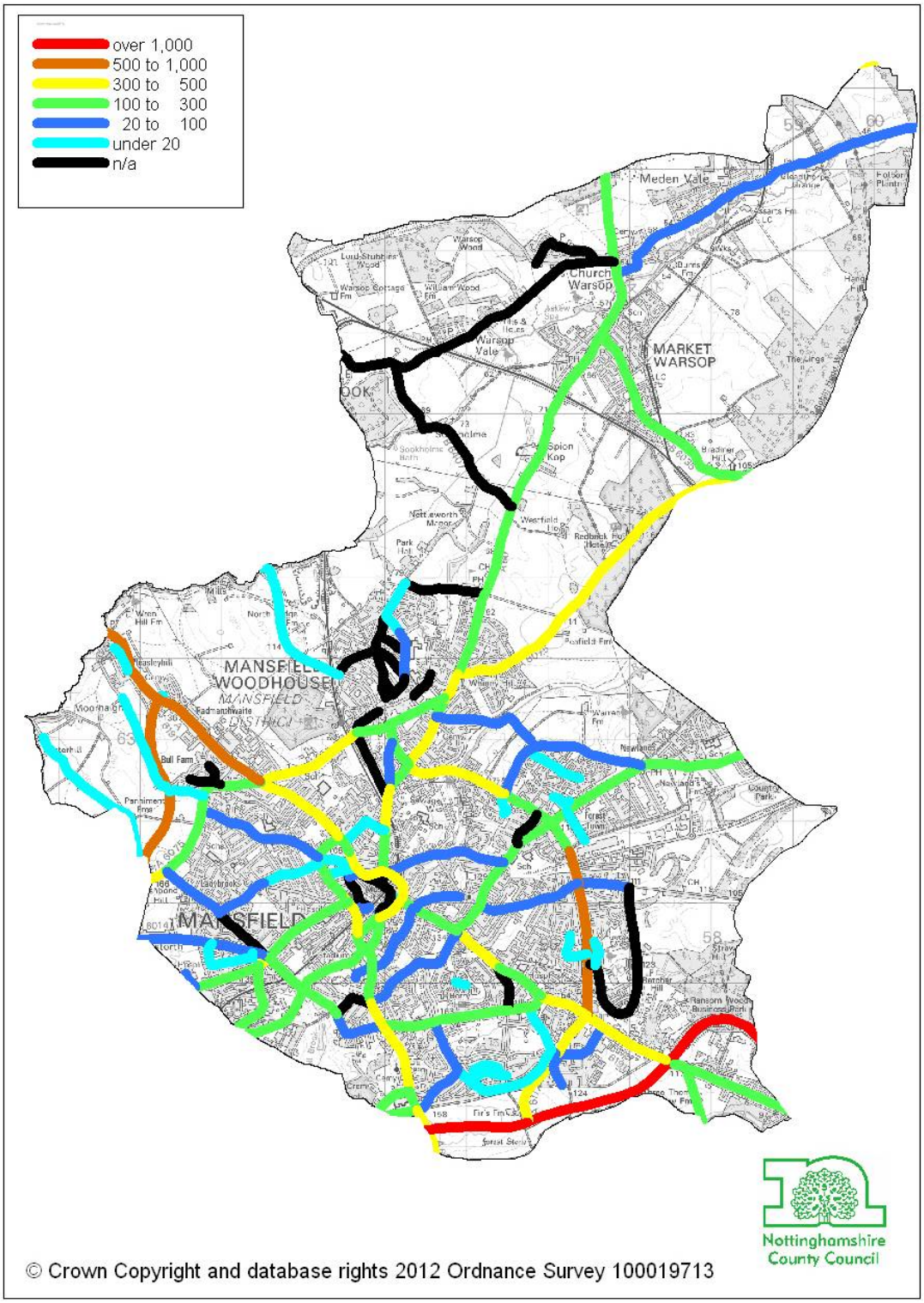

Figure 3.16: 2010 Annual Average Daily HGV Flows in District

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2011 Annual Average Daily HGV Flows (AADF's) for Mansfield

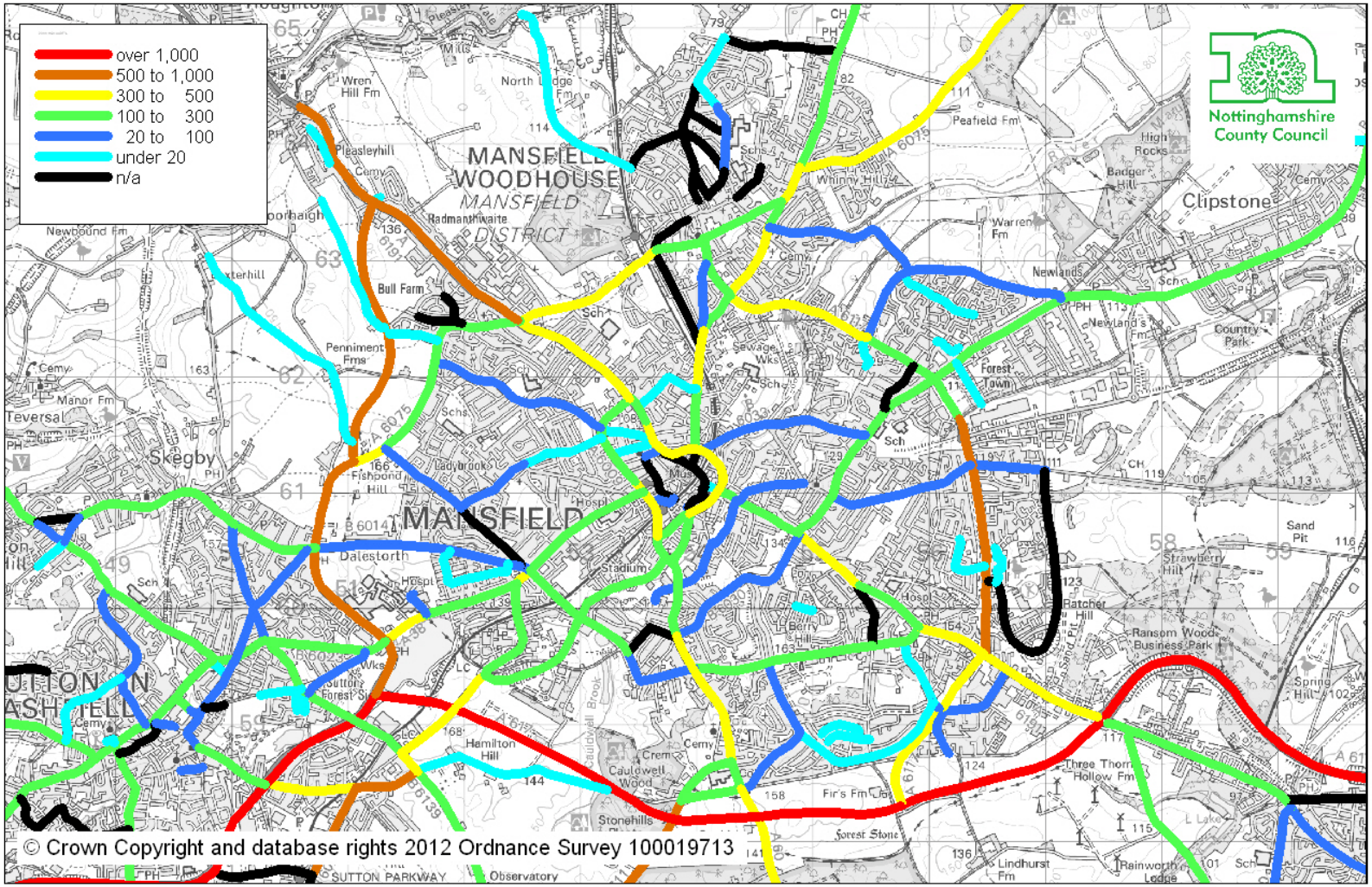

Figure 3.17: 2011 Annual Average Daily HGV Movements

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3.7 Summary

3.7.1 Similar to other towns in Nottinghamshire, there has been a reduction in traffic entering Mansfield town centre in recent years.

3.7.2 In terms of non-motorised travel, pedal cycle usage decreased in Mansfield over the period 2005 to 2010.

3.7.3 In spring 2013, there should be a major improvement in the provision of public transport within Mansfield via the opening of a new interchange within the town; however, the knock-on beneficial impact of this new facility upon bus services and bus patronage is currently not known.

3.7.4 The sustainable transport credentials of the district's main settlements may be linked to the frequency of public transport services and, more importantly, the range of services and destinations that may be accessed by public transport.

3.7.5 Although the district of Mansfield compares well with the rest of Nottinghamshire in terms of overall journey patterns (proportion of those driving to work, accessibility to services and facilities) there are variations between wards at a local level. There are variations in the use of the car, as a main model of travel to work, between wards as reported in Table 3.4 and Figure 3.2 above. For example, there is a higher proportion of residents in the Meden ward for who the main mode of travel to work is by car (refer to Figure 3.2 for car drivers) and motorcycle than in the Birklands ward that includes Market Warsop. Similar variations in accessibility to services between wards are indicated in Figure 3.15. These variations reflect the availability of sustainable transport infrastructure and access to employment, services and facilities by sustainable transport modes.

3.7.6 In terms of local transport and access to services, Mansfield town centre has more sustainable transport choices than some of its sub-urban areas to the south and east (refer to Figure 3.15). The residential areas of Mansfield Woodhouse and Market Warsop have slightly better than average sustainable transport credentials. However, the small communities in the north east, for example Church Warsop, Meden Vale and Warsop Vale have relatively less access to services by public transport modes.

3.7.7 The Mansfield urban area is served by two railway stations (refer Figure 3.14) that provide access to other settlements in Nottinghamshire. There are also long-distance commercial bus services between Mansfield town centre and Derby, Chesterfield and Nottingham. In this respect the Mansfield urban area has more sustainable transport choices than other settlements within the district of Mansfield.

3.7.8 The above summary allows the residential communities to be ranked in terms of their relative sustainable transport credentials within the district:

- Mansfield town centre;
- Mansfield Woodhouse;
- Market Warsop; and
- Church Warsop / Meden Vale / Warsop Vale.

4 BASELINE CONDITIONS – HIGHWAY NETWORK

4.1 Overview

4.1.1 The preceding sections have identified the current position with regards to overall travel patterns within Mansfield, and the availability of sustainable transport modes. The highway network carries a high proportion of trips in the Mansfield district whether by car, bus or as part of longer trips by train, cycle or on foot.

4.1.2 The purpose of this section is to identify the current operation of the highway network in terms of capacity and road safety.

4.1.3 In addition, information is presented regarding parking opportunities in Mansfield.

Description of the Highway Network

4.1.4 The main routes connecting Mansfield to the wider locality are:

- A38 – Sutton-in-Ashfield, M1 (Junction 28), Derby
- A60 – Worksop, Nottingham
- A617 – M1 (Junction 29), Chesterfield, Newark

4.1.5 In recent years, Mansfield has benefited from a major improvement to its highway network via the construction of the Mansfield Ashfield Regeneration Route (MARR). This connects the western end of the A617 Rainworth bypass and the A617 at Pleasley, passing by the south and west of Mansfield. Its purpose is to regenerate the area and essentially forms a bypass for Mansfield on the northwest to southeast axis.

4.1.6 Within Mansfield town centre itself, the A6009 forms an inner ring road within which is contained the key retail and civic centre of the district. The A60 is the key route through the Mansfield Woodhouse and Market Warsop areas of the Mansfield district and, given the above, carries high proportions of through traffic.

4.2 Highway Network Performance

Daily Traffic Flows

4.2.1 Annual Average Daily Traffic (AADT) flows on roads at 2012 levels were calculated from traffic counting sites and data held by Nottinghamshire County Council. These count sites included: permanent and temporary automatic traffic counters, manual classified passing counts and junction turning counts. Traffic flows will vary along each link and it is not feasible to undertake traffic counts at every location where the traffic flows change, therefore an AADT is calculated from data at a specific location but is used to represent the flow along the whole length of the road. AADT data is only available for those roads where traffic counts have been undertaken since 2001. The most recent traffic counts for each road were used to calculate the AADT for the road. Various adjustment factors (short period, daily, seasonal, etc.) were applied to the count data where no 2012 traffic counts have been undertaken and where counts cover only short durations. The margin of error will increase with time, particularly where adjustment factors have to account for short-period and aged counts.

4.2.2 Figures 4.1 shows AADT flows across the whole District and Figure 4.2 shows AADT flows in the Mansfield urban area.

2011 Annual Average Daily Traffic (AADT's) flows for Mansfield District

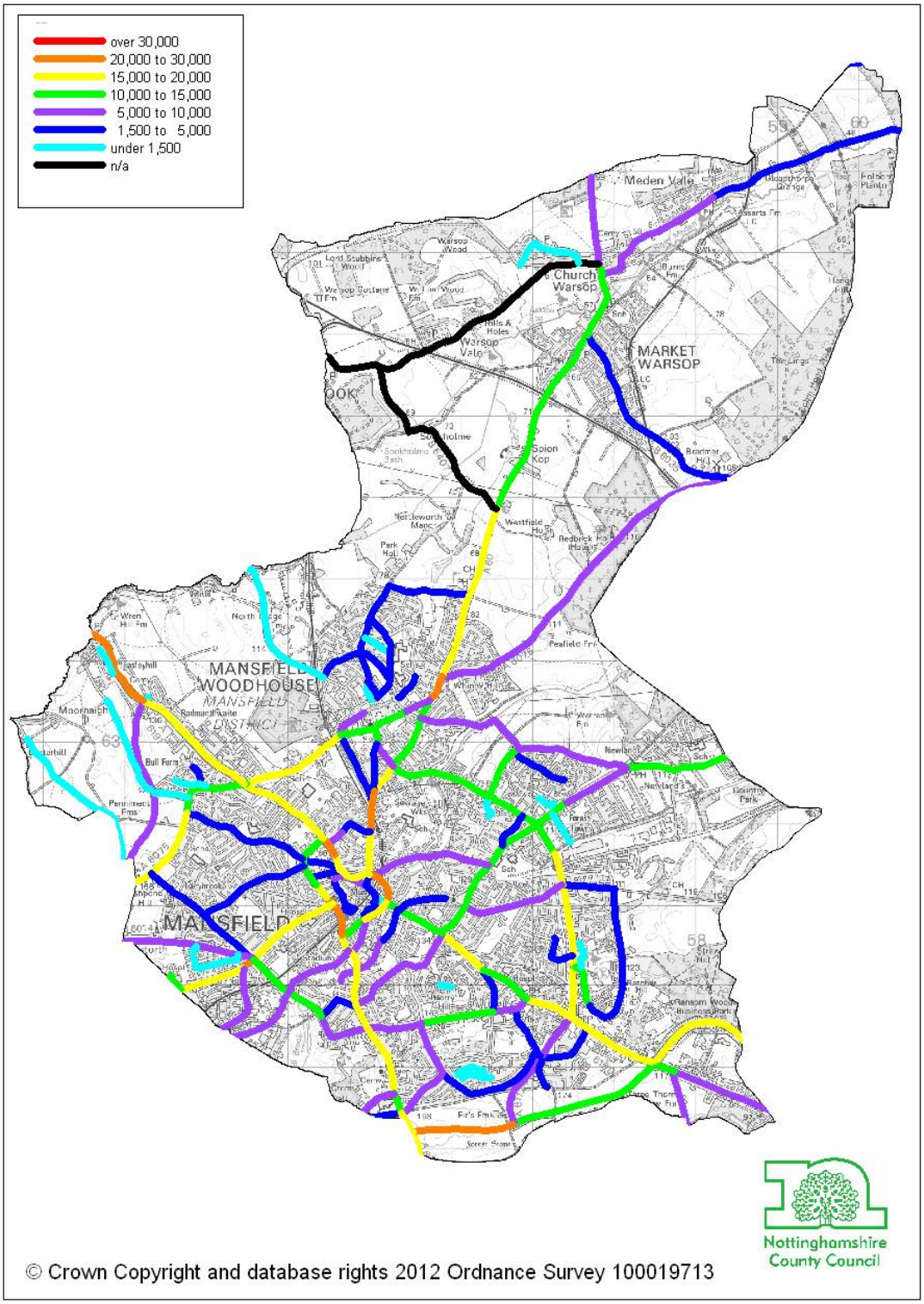

Figure 4.1: 2011 Annual Average Daily Flows in the District

2011 Annual Average Daily Traffic (AADT) flows for Mansfield

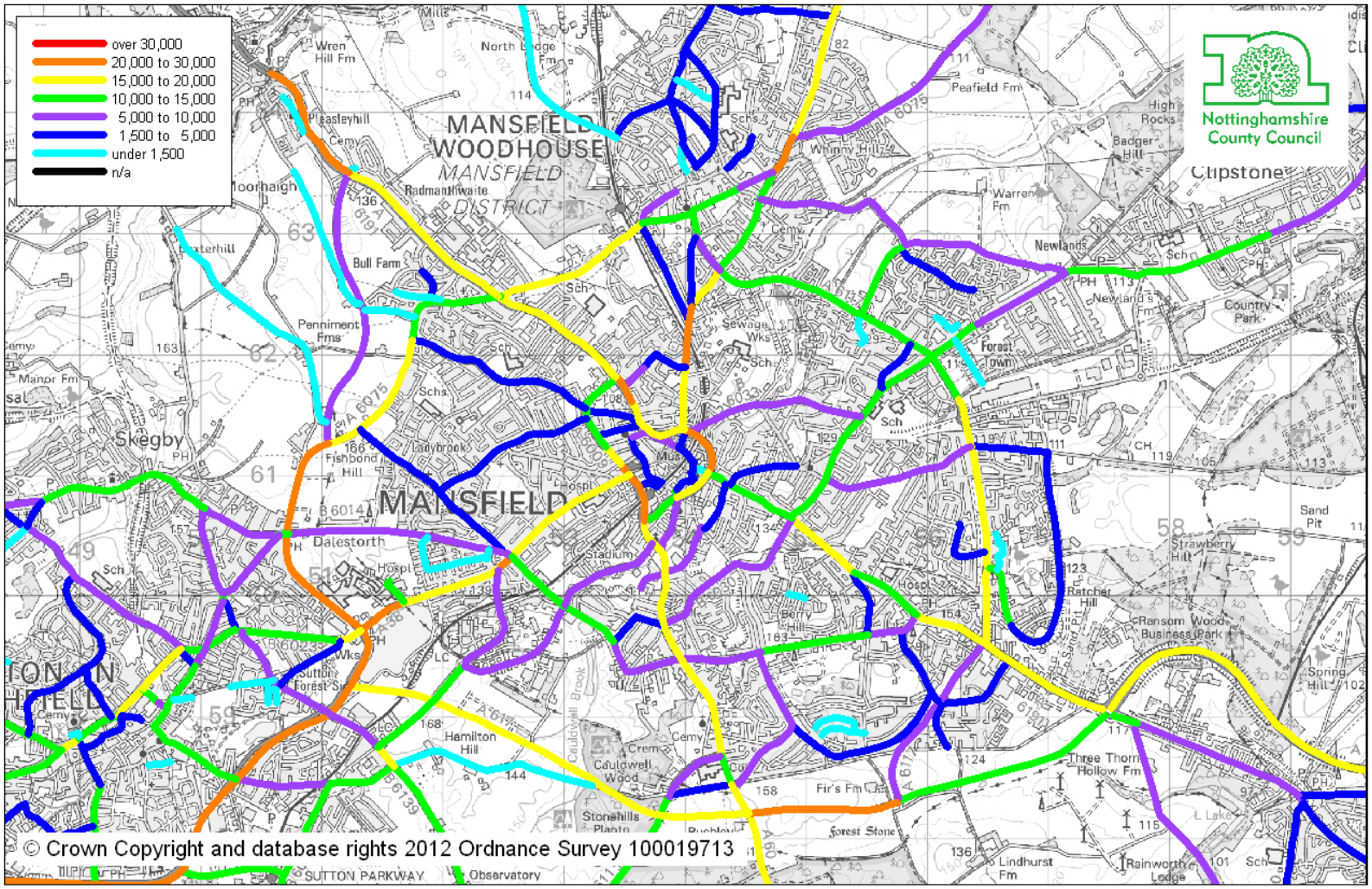

Figure 4.2: 2011 Annual Average Daily Flows in Mansfield

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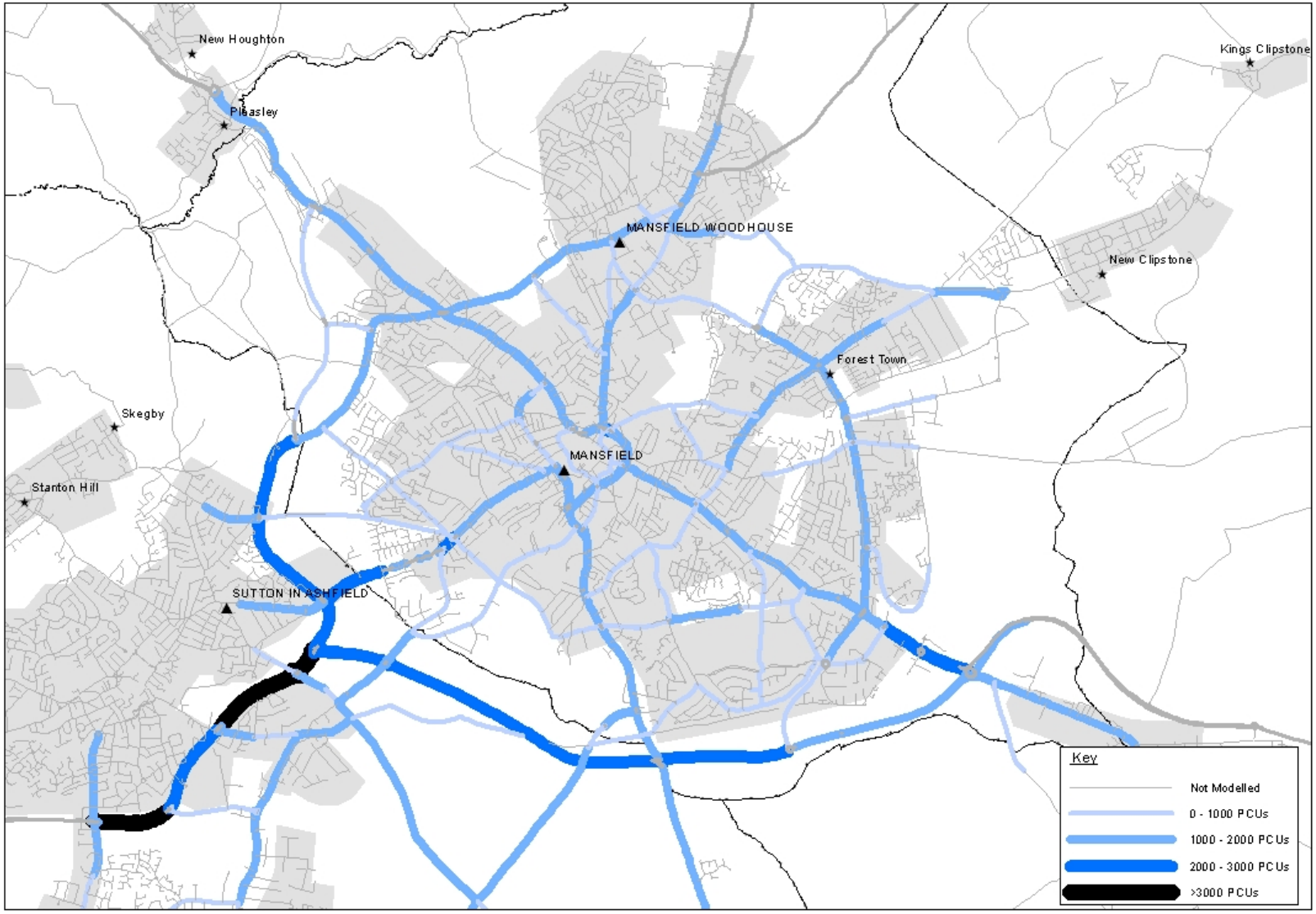
Peak Hour Traffic in the Mansfield Urban Area

4.2.3 As noted earlier in this report, the Mansfield urban area benefits from a SATURN traffic model. This model represents traffic conditions in both an AM (08:00 to 09:00) and PM (17:00 to 18:00) peak hour. To inform this report, this SATURN model has been updated to a 2012 base year using traffic count data provided by Nottinghamshire County Council and new counts commissioned at those junctions listed in Section 1.5.3. The detail of this updating work is described in Appendix B.

4.2.4 SATURN has the facility to report various indicators to identify how the highway network is performing. For the purpose of this report, the following outputs have been compiled and plotted:

- Total vehicular flow (Figure 4.3 & 4.4);
- Delay (Figure 4.5 & 4.6); and
- Volume / Capacity Ratios (Figure 4.7 & 4.8).

4.2.5 The Volume / Capacity (V/C) ratio of a road or junction is a measure of the traffic at the junction in relation to its ability to accommodate such flow. The V/C ratio is calculated by summing all the approach flows into a junction and dividing by the total available capacity on all approaches to the junction. A V/C value above 0.85 (or 85%) is likely to produce queues on some occasions during the peak hours. Above a V/C value of 1.0 (or 100%), a junction is more than likely to be at capacity (with resulting larger increases in queue length) during the peak hours. In Figures 4.7 and 4.8 the V/C values are grouped into coloured bands for plotting; junctions that are modelled to have over 50% V/C loading are shown yellow, junctions that are over 75% loading are plotted orange and junctions that are over 85% V/C loading are red or dark-red.



PCUs = Passenger Car Units. 1 Car = 1 PCU / 1 Bus = 2 PCUs etc.

Figure 4.3: Baseline (2012) AM Peak Hour Traffic Flows

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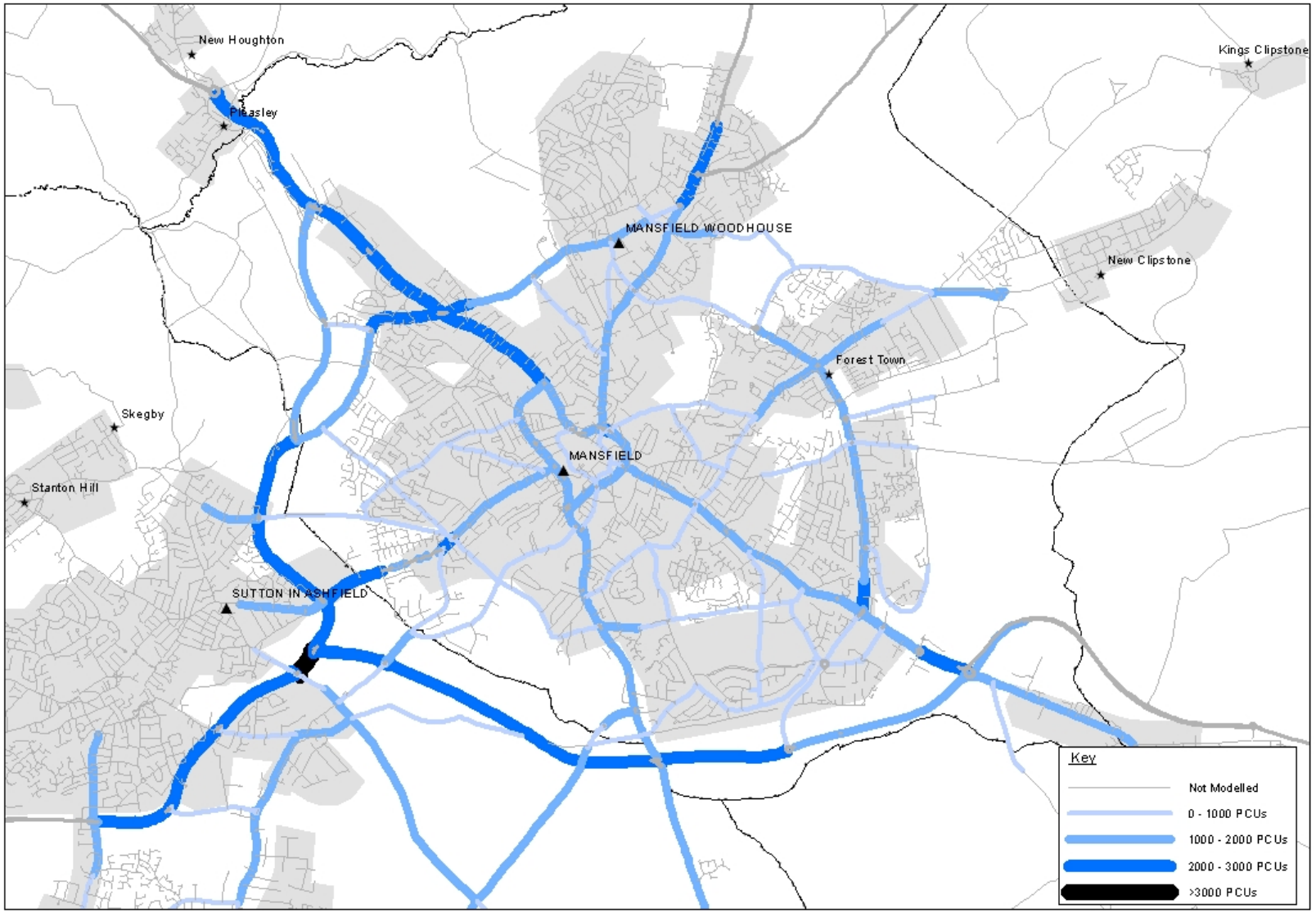

PCUs = Passenger Car Units. 1 Car = 1 PCU / 1 Bus = 2 PCUs etc.

Figure 4.4: Baseline (2012) PM Peak Hour Traffic Flows

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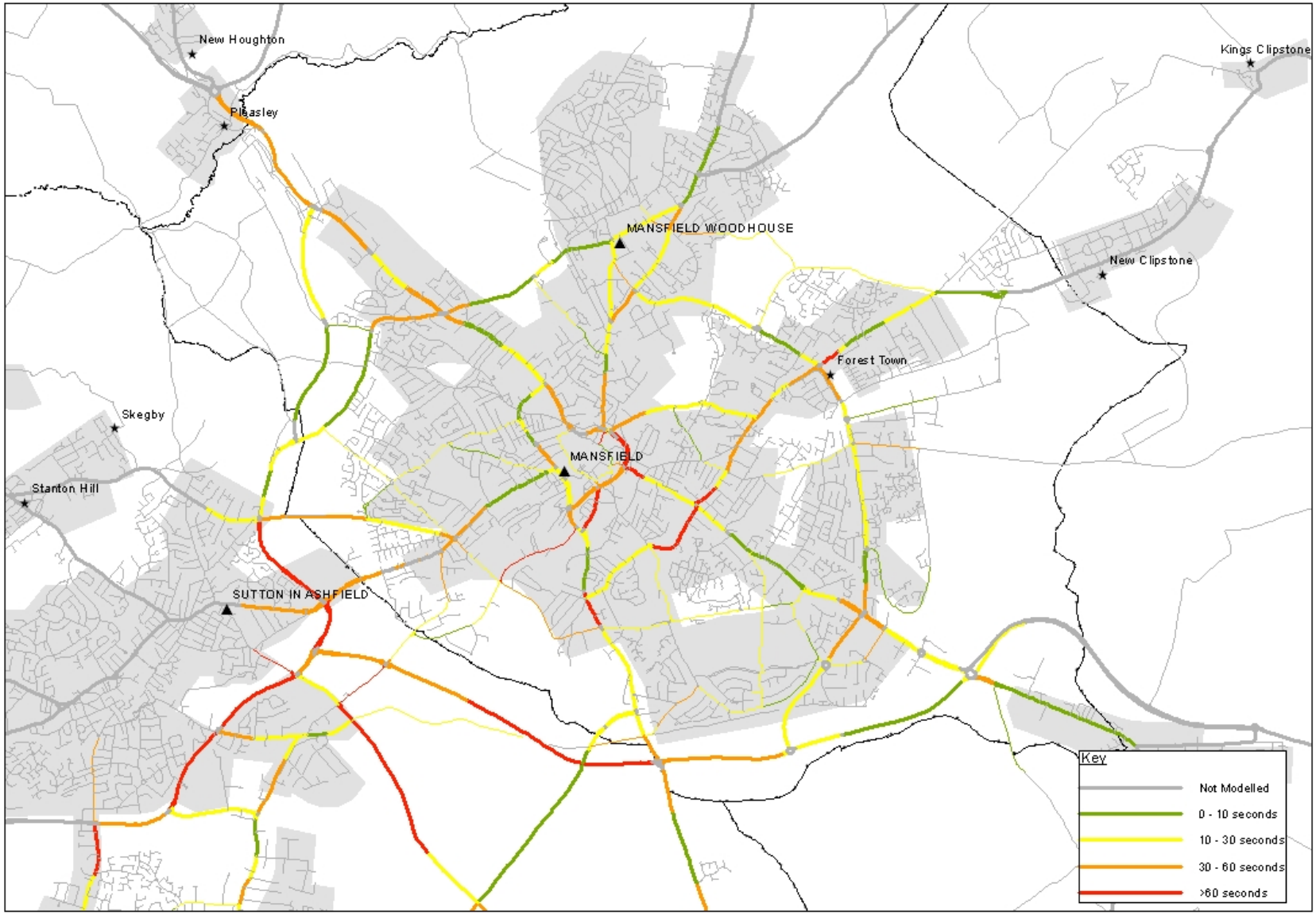

Figure 4.5: Baseline (2012) AM Peak Hour Delay

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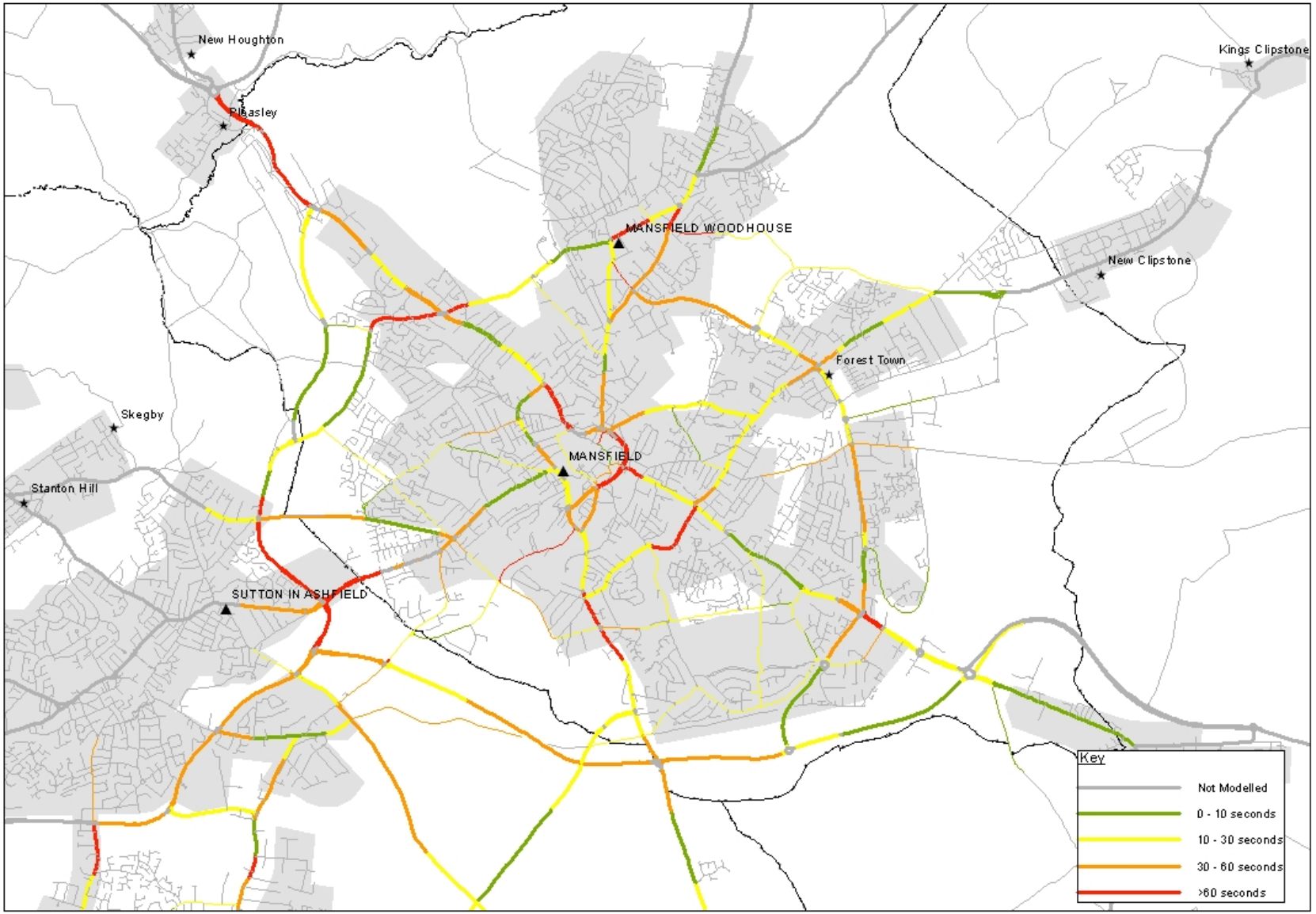

Figure 4.6: Baseline (2012) PM Peak Hour Delay

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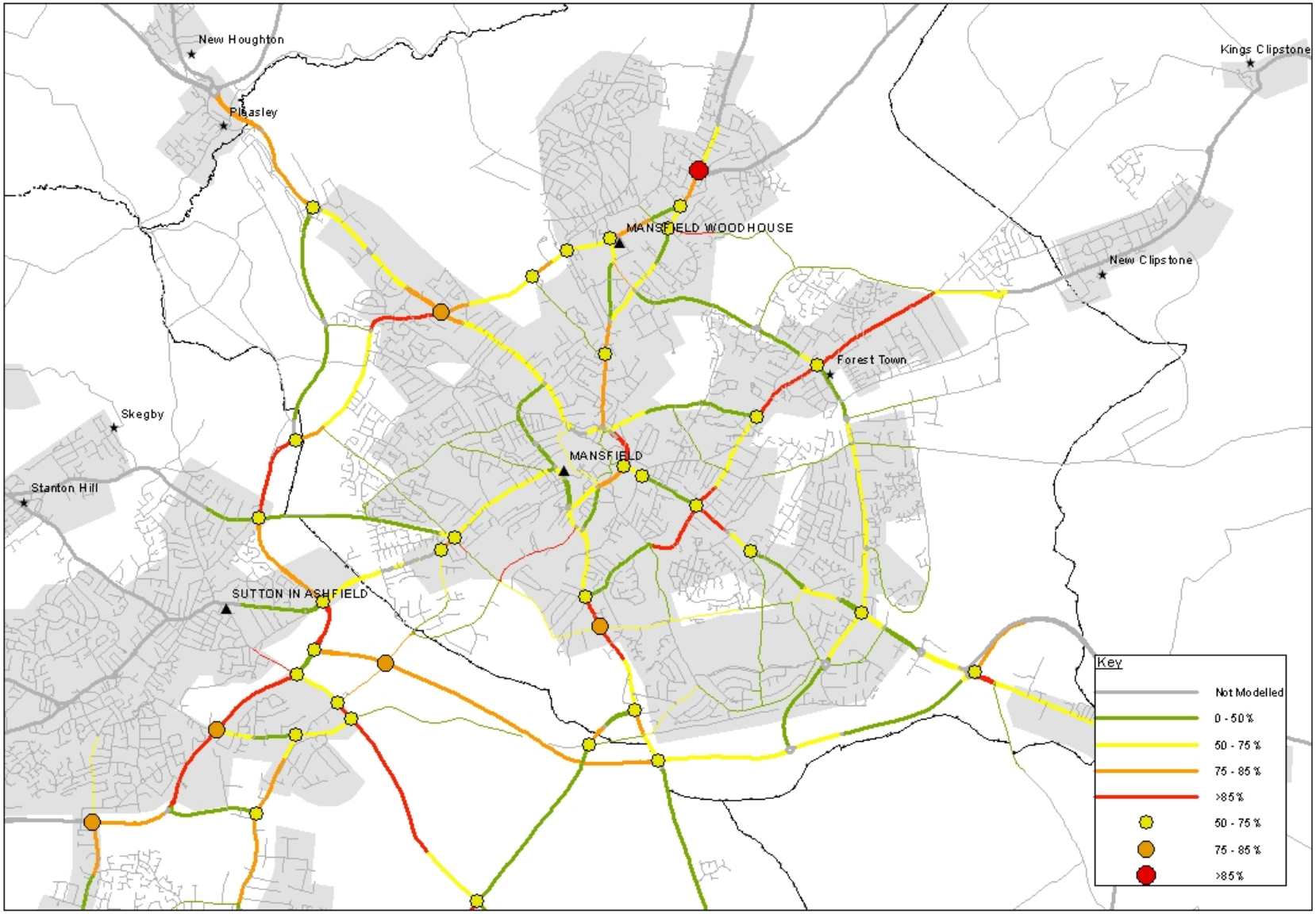

Figure 4.7: Baseline (2012) AM Peak Hour Volume / Capacity Ratio

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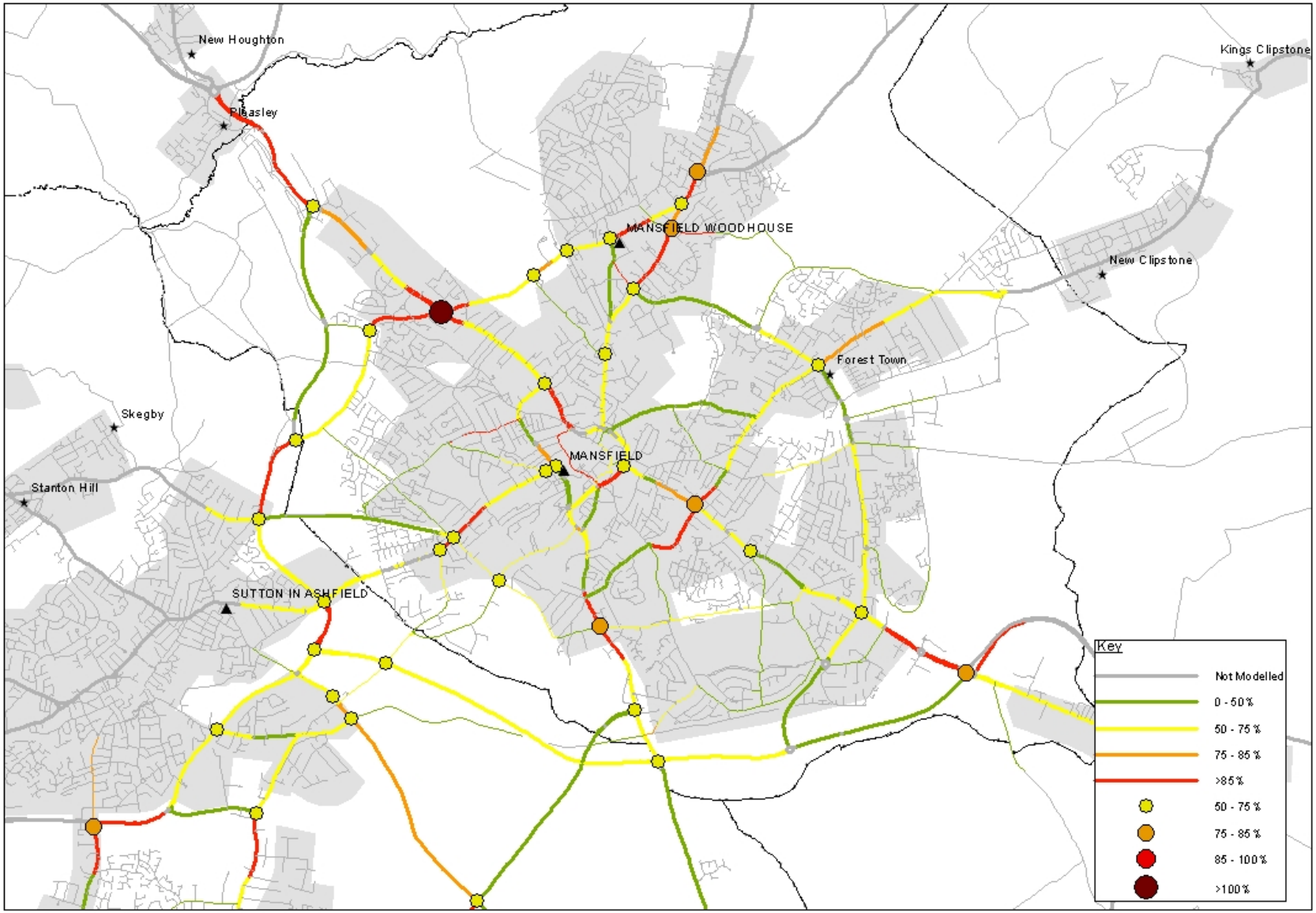

Figure 4.8: Baseline (2012) PM Peak Hour Volume / Capacity Ratio

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4.2.6 The AM and PM peak models were analysed to identify which junctions are approaching capacity in the Base Year. Those junctions with V/C threshold of 0.75 (or 75%) or greater were selected for analysis in the future years. This threshold was used to identify all junctions likely to be approaching capacity, as well as those junctions operating at capacity, in order to ensure that all the main junctions were captured and monitored for potential adverse traffic impacts in the future year analysis. This process highlighted the following six junctions within the Mansfield urban area covered by the traffic model:

- Chesterfield Road / Debdale Lane;
- A60 Nottingham Road / Berry Hill Lane;
- Carter Lane / Southwell Road / Windsor Road;
- A60 Leeming Lane / New Mill Lane;
- A617 MARR / A6191 Southwell Road; and
- A60 Leeming Lane / Peafield Lane.

Peak Hour Traffic in the Market Warsop Area

4.2.7 Site observations of the district's highway network by our traffic engineers indicated that only one junction outside of the Mansfield urban area was likely to be operating near to capacity such that queues and delays were occurring in the peak hours. This junction was at the A60 Church Street / Wood Street in Market Warsop. A traffic count was therefore commissioned at this junction.

4.2.8 The A6075 Peafield Lane and B6035 Forest Road, both to the east of Market Warsop, were of interest in terms of the volume of traffic using these roads. The flows on the four roads were obtained by commissioning a traffic count at the Peafield Lane / Forest Road double-roundabout junction.

4.2.9 Traffic count surveys were therefore commissioned in 2012 at two additional junctions, which are located as shown in Figure 4.9. The traffic flows on those highways adjacent to the surveyed junctions are indicated in Table 4.1.

Table 4.1: Flows Observed on Highways Outside of the Mansfield Urban Area

Road	Two Way Observed Flow (Vehicles per hour)	
	AM	PM
A60 North of B6035	1,150	1,200
A60 South of B6035	950	1,050
B6035 Church Street	550	550
Wood Street	50	50
B6035 Forest Road (North of A6075)	400	400
A6075 Peafield Lane (East of B6035)	650	750
B6035 (South of A6075)	300	300
A6075 Peafield Lane (West of B6035)	600	700

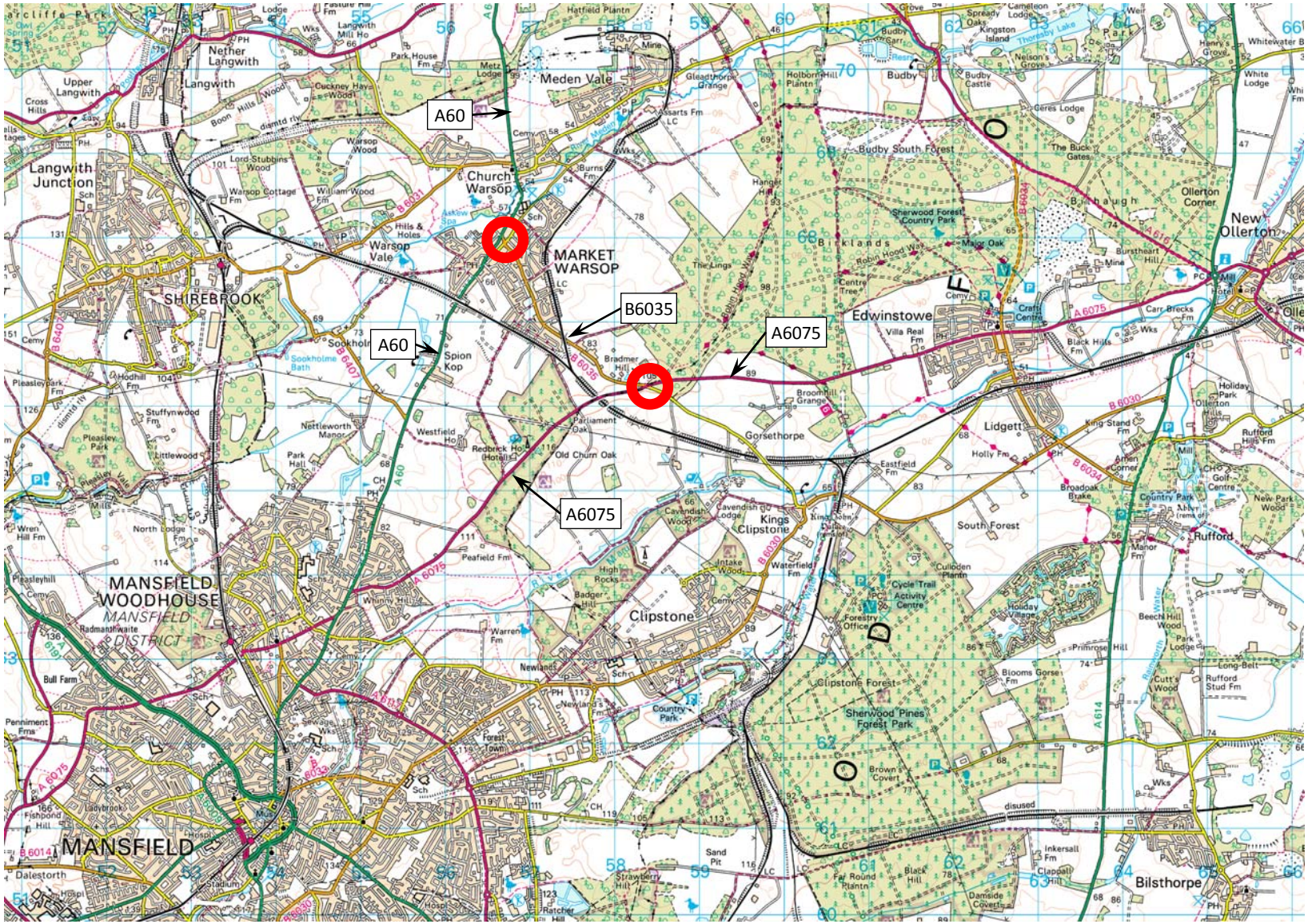

Figure 4.9: Traffic Count Locations in the Market Warsop area

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4.3 Detailed Junction Assessment

4.3.1 Being a network-wide model, the representation of junctions in SATURN is more limited than for junction specific software. As such, the above junctions, identified as operating above 0.75 (or 75%) in the Base Year, were next assessed in more detail using industry standard software for measuring the performance of isolated junctions. Specifically, the following software has been used:

- LINSIG3 – to identify the performance of signalised junctions;
- *Assessment of Roundabout Capacity and Delay* (ARCADY) – to identify the performance of roundabout junctions; and
- *Priority Capacity and Delay* (PICADY) – to identify the performance of priority junctions.

4.3.2 In general terms, the key inputs to the above models are geometrical parameters, signal stages/times and traffic flows. For the Mansfield work, geometrical parameters (e.g. road width etc.) have been taken from OS mapping. For the signalised junction, stage sequences and timings have also been obtained from Nottinghamshire County Council's traffic signals team where available, and on-site observations. Traffic flows were extracted from the 2012 Base Year SATURN model.

4.3.3 As previously noted, the SATURN model does not cover the Market Warsop area. As such, traffic flows at the A60 Church Street / Wood Street junction were obtained from Manual Classified Count (MCC) surveys and assessed using LINSIG3.

4.3.4 Table 4.2 summarises the results of the junction assessments, with full details provided in Appendix E.

Table 4.2: Junction Capacity Assessments – Base Year (2012)

Junction	AM Peak Hour	PM Peak Hour
Chesterfield Road / Debdale Lane	Near to or At Capacity	Over Capacity
A60 Nottingham Road / Berry Hill Lane	✓	✓
Carter Lane / Southwell Road / Windsor Road	✓	✓
A60 Leeming Lane / New Mill Lane	✓	Near to or At Capacity
A617 MARR / A6191 Southwell Road	✓	✓
A60 Leeming Lane / Peafield Lane	✓	✓
A60 Church Street / Wood Street	✓	✓

✓ Indicates that the operational performance of the junction is acceptable; i.e. ratio of flow to capacity (RFC) < 0.85 for a roundabout or Degree of Saturation less than 0.9 for a traffic signal junction.

4.3.5 Table 4.2 shows that, of the junctions identified by the SATURN model outputs and operation observed on site, the Chesterfield Road / Debdale Lane junction is a key location of both AM and PM peak congestion. The PM peak has higher flows on Chesterfield Road than the AM peak, which may be a reflection of its proximity to

Mansfield town centre. Such locations often contain a proportion of shopping and leisure trips that are not present in the morning peak.

4.4 Car Parking

4.4.1 In 2006/07, Mansfield District Council commissioned an assessment of the parking needs of the town. This identified:

- Peak occupancy of 69% on Friday and 78% on Saturday;
- The short-stay car parks were close to or at capacity at some stage on both Friday and Saturday, other than the Portland Retail car park and the temporary Meridian car park, both of which were only around 20-25% used on the Friday and around half full on the Saturday;
- Of the surface-level short-stay and long-stay car parks, only Rock Valley, Toothill Lane and Rosemary Centre were full at times on both days;
- Both the Four Seasons and Walkden Street multi-storey car parks had spare capacity on Friday (with maximum occupancies of 70% and 80% respectively), while on the Saturday the Four Seasons car park had a maximum occupancy of less than 50% and Walkden Street still had spare capacity with a maximum occupancy of just under 80%;
- Of the short / long stay car parks offering cheaper long-stay parking, the Swan Public House and White Hart Street were full on both days. Grove Street was observed to be full at times on the Friday but less well used on the Saturday (84% maximum occupancy). Note that the pattern of demand over the Saturday afternoon suggests that this car park is also used for parking for Mansfield Town football club; and
- In general, the Council-operated car parks (maximum occupancy 79% on Friday and Saturday) were more fully used than the privately-operated car parks (maximum occupancy 54% on Friday and 74% on Saturday).

4.4.2 The study also recommended consideration of electronic variable message signing (VMS), improved pedestrian links to / from car parks and possible rationalisation of some of the smaller car parks. However, not all the assumptions contained within the parking assessment, particularly for future years, have come to fruition. Nationally, this is not an unusual situation; especially given the recent recession which has hindered the property development sector.

4.4.3 Table 4.3 identifies the total number of spaces as identified in the 2007 assessment and the current quantum of parking provided within Mansfield. This table shows there are currently 210 more spaces than was forecast for 2011 or 2026, although much of this figure derives from differences in estimates relating to the availability of space at the civic centre (which is only available on Saturdays).

Table 4.3: Mansfield Car Park Capacity – 2007 Forecasts & 2012 Actual

Car Park	2007	Late 2007*	2008*	2011*	2026*	Actual 2012**
Public Car Parking						
Church Lane	65	65	65	65	65	76
Civic Centre***	250	250	250	250	250	400
Clumber St	129	129	129	129	129	114
Four Seasons	478	478	478	478	478	481
Garden Road	15	15	15	15	15	28
Grove St	50	50	50	50	50	90
Handley Arcade	24	0	0	24	24	24
Meridian (Temp)	100	100	0	0	0	0
Midland	42	0	0	0	0	0
Robin Hood	80	80	80	80	80	113
Rock Valley	54	54	54	0	0	0
Station Road	83	83	0	0	0	0
Toothill Lane	100	100	100	100	100	114
Toothill Road	84	84	84	84	84	84
Walkden St	424	424	424	0	0	455
Water Meadows	200	200	200	200	200	216
Old Town Hall	0	0	22	22	22	19
Service Area D	0	0	25	25	25	20
Sub Total	**2,178**	**2,112**	**1,976**	**1,522**	**1,522**	**2,234**
Private Car Parking						
Portland Retail Park	710	710	710	710	710	600
Rosemary Centre	124	124	124	124	124	117
St Peters Retail Park	304	304	304	304	304	338
Swan Public House	36	36	36	36	36	58
White Hart St	120	120	120	0	0	0
Tesco	581	581	581	581	581	
Belvedere	-	-	-	-	-	120
Portland Hotel Car Park	-	-	-	-	-	20
Sub Total	**1,875**	**1,875**	**1,875**	**1,755**	**1,755**	***1,253***
TOTAL	**4,053**	**3,987**	**3,851**	**3,277**	**3,277**	***3,487***

** - As forecast in the 2007 Mansfield Town Centre Car Parking Strategy Update*
*** - From Mansfield District Council website (http://www.mansfield.gov.uk/index.aspx?articleid=1437) accessed 19th June 2012*
**** - Civic Centre only available for public use on Saturdays*

4.4.4 In terms of usage, ticketing data provided by Mansfield District Council has identified a reduction in sales of 18.2% between 2010/11 and 2011/12. Ticket sales from April and May 2012 extrapolated forward over the current financial year would indicate a further drop of 13.4%.

4.4.5 It is noted that there have been several periods of free car parking around Christmas and New Year over the last few years to assist retailers. This would appear consistent within the findings of the Portas Review (2011) which supported the view that car parking was a key element of a vital town centre.

4.4.6 Table 4.4 identifies the overall ranking of the car parks in terms of their intensity of use (i.e. number of tickets divided by spaces) for 2011/12. The intensity ratio indicates the number of times that each space is used. The smaller car parks near to the town centre tend to rank the highest, although pricing will also have an influence.

Table 4.4: Mansfield Public Parking Intensity

Car Park	Spaces	Intensity Ratio	
Old Town Hall	19	5,644	Most Intensely Used
Clumber Street	114	1,553	
Service Area D	20	1,457	
Handley Arcade	24	1,235	
Garden Road	28	889	
Toothill Road	84	698	
Water Meadows	216	625	
Four Season	481	617	
Church Lane	76	543	
Toothill Lane	114	426	
Walkden Street	455	351	
Grove Street	90	263	
Robin Hood Line	113	73	Least Intensely Used
Civic Centre*	400	18	

** - Civic Centre only available for public use on Saturdays*

4.4.7 In terms of future potential changes, the Mansfield District Council Regeneration team is currently promoting a site known as "Belvedere Street Strategic Development Site". The information[4] supporting this scheme notes that the project aims to provide a new 250 space car park to meet a shortfall in parking spaces within the town centre. The options include a surface car park, or a more attractive option which would include a new commercial development fronting Portland Street and a new multi-storey car park to the rear of this site.

4.4.8 The 2006 Mansfield Parking Study also identified a development which would require the removal of the Walkden Street car park (though any future development is likely to require the provision of replacement parking).

4.5 Road Safety

4.5.1 According to the Nottinghamshire LTP3, between 2005 and 2009, the number of car driver and passengers killed and serious injury (KSI) casualties decreased in each of the districts except Mansfield, where the number of casualties increased in each of the last two years. The number of car driver and passenger KSI casualties in Mansfield (21 in 2009), however, remained low when compared to other districts.

4.5.2 For this study, road safety collision statistics have been obtained from Nottinghamshire County Council. The data obtained relates to those collisions that resulted in a personal injury and which were reported to the police. This data (known

[4] *http://www.thinkmansfield.com/default.aspx?page=18*

as STATS19 statistics) are generally recognised to be the most complete record of road collisions occurring on the local highway network. For the avoidance of doubt, and as is normal practice, they do not include statistics from collisions resulting in "damage-only" to vehicles.

4.5.3 Each collision resulting in a personal injury is classed as either 'Slight', 'Serious' or 'Fatal' by the police depending on the most serious injury resulting from the collision (i.e. a collision resulting in two 'Slight' injuries and one 'Serious' injury would be classed as a 'Serious' collision).

4.5.4 Tables 4.5 to 4.7 summarise the collisions and casualties which have occurred from 1st January 2009 to 31st December 2011 in the Mansfield area, and also in Nottinghamshire and across the UK for comparison. This is three full years of collision statistics.

Table 4.5: Road Collisions and Casualty Data for Mansfield Area (Source: Nottinghamshire County Council, 2012)

Year	Collisions				Casualties			
	Fatal	Serious	Slight	Total	Fatal	Serious	Slight	Total
2009	3	49	245	297	5	52	369	426
2010	1	38	215	254	1	40	303	344
2011	2	54	213	269	2	55	294	351

Table 4.6: Road Collisions and Casualty Data for Nottinghamshire County (Source: Nottinghamshire County Council)

Year	Collisions				Casualties			
	Fatal	Serious	Slight	Total	Fatal	Serious	Slight	Total
2009	30	368	1,843	2,241	42	407	2,672	3,121
2010	18	353	1,682	2,052	23	394	2,395	2,812
2011	35	377	1,612	2,042	36	417	2,332	2,785

Table 4.7: Road Collisions and Casualty Data for United Kingdom (Source: Department for Transport, RAS 10001 & 30001)

Year	Collisions				Casualties			
	Fatal	Serious	Slight	Total	Fatal	Serious	Slight	Total
2009	2,057	21,997	137,443	163,554	2,222	24,690	195,234	222,146
2010	1,731	20,440	132,243	154,414	1,850	22,660	184,138	208,648
2011	1,797	20,986	128,691	151,474	1,901	23,122	178,927	203,950

4.5.5 The above tables show there is no clear trend in the numbers of collisions (and associated casualties) within Mansfield and Nottinghamshire, whereas these have reduced year-on-year across the UK by 7.4% and 8.2% (from 2009 to 2011) respectively. However, the majority of reduction in the Nottinghamshire and the UK-wide data is driven by changes in collisions classed as "Slight". In this respect, Mansfield has also witnessed year on year reductions in 'Slight' accidents.

4.5.6 In terms of specific road safety interventions planned by the local highway authority, it is understood that schemes are to be progressed at the following locations:

- Old Mill Lane / Barringer Road - visibility improvements;
- A38 Kings Mill Road East / A617 MARR - signal modifications;
- Old Mill Lane / Ellesmere Road - signing & lining;
- A6009 Rosemary Street & Chesterfield Road South - speed limit reduction;
- A6117 Pump Hollow Road / Coronation Drive - signing & lining;
- A6117 Oak Tree Lane / Oakwood Drive - signing & lining; and
- St Peter's Way / St John Street - signal modification.

4.5.7 The above locations are shown in Figure 4.10.

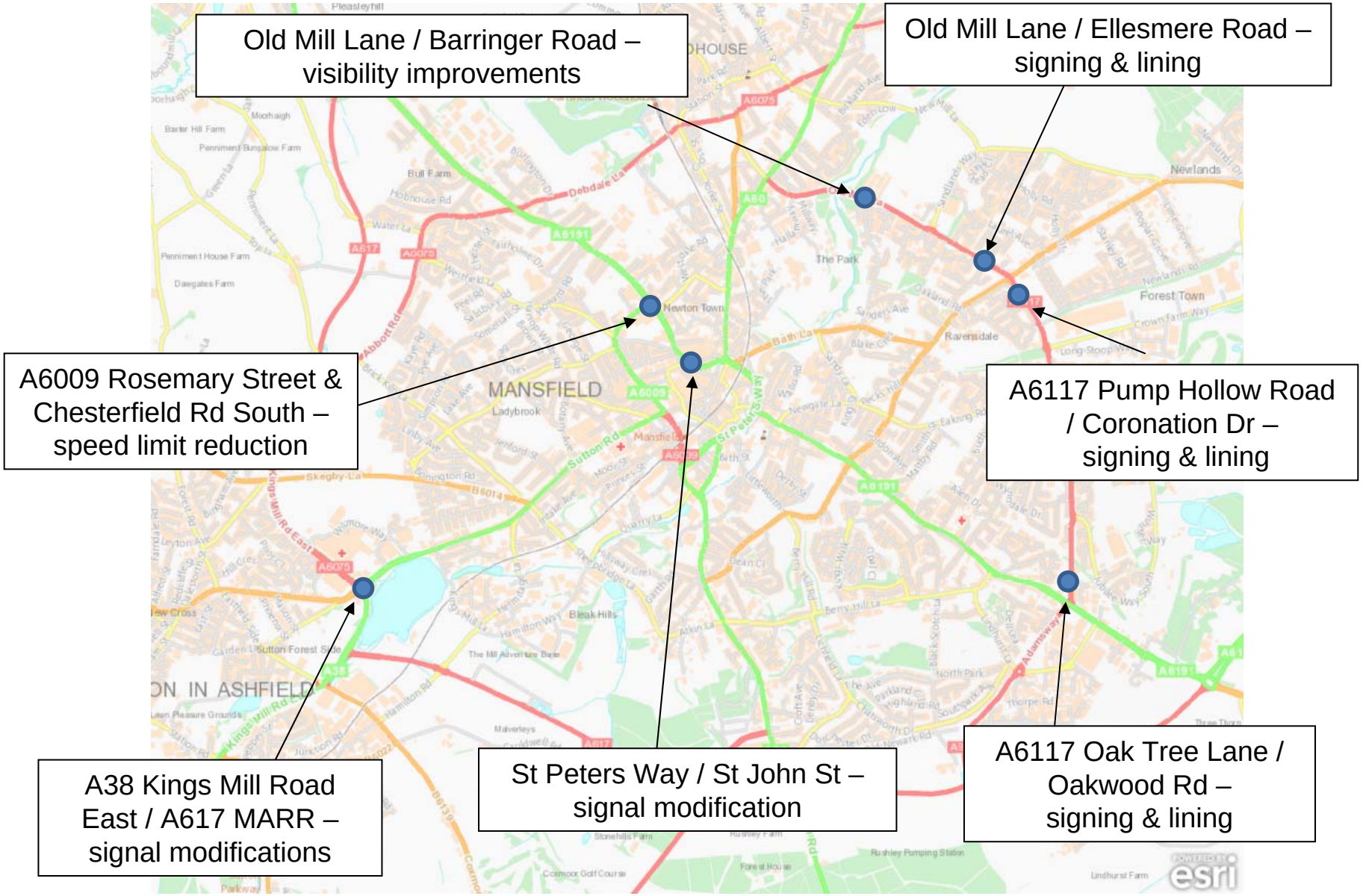

Figure 4.10: Programmed Nottinghamshire County Council Road Safety Schemes

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5 REFERENCE CASE CONDITIONS – HIGHWAY NETWORK

5.1 Overview

5.1.1 Having examined the Base Year conditions, Step 2 of the study examines the likely future conditions within Mansfield and Market Warsop, given the most likely projections of growth and committed developments (both transport infrastructure and land-use developments) that are likely to be implemented to 2031. This is a 'Reference Case' against which potential additional development sites within the development plan can be judged.

5.1.2 This section of the report will document the committed developments used to create a 2031 Reference Case forecast and, using the SATURN model, identifies any junctions that are likely to be approaching or exceeding capacity in 2031.

5.2 Committed Developments to 2031

5.2.1 The 2012 updated traffic model described above in Section 4 and in Appendix B was used to calculate likely 2031 forecast conditions. This required information about both interventions to the highway network and known development sites, which generate trips to be added to the demand traffic flows.

5.2.2 Only developments considered to be 'committed' were included in the forecasts. For the purposes of the Study committed developments are defined as major housing, commercial and retail sites with planning permission but not yet fully developed, sites with Council resolutions to grant planning permission for housing subject to signing Section 106 agreements, and other housing sites deemed suitable for development through the Strategic Housing Land Availability Assessment (SHLAA) process.

5.2.3 Committed Developments to 2031 were identified by type and size. Residential and commercial developments are shown below on a map base in Figure 5.1 for Mansfield and Figure 5.2 for Market Warsop. SHLAA sites expected within five years and pipeline schemes were also included as committed development. Details of these sites are included in Appendix C.

5.2.4 Major development sites incorporated in the Reference Case forecasts include:

- Sandlands Way (Housing);
- Clipstone Road East (Housing);
- Penniment Farm (Mixed Use); and
- Lindhurst (Mixed Use).

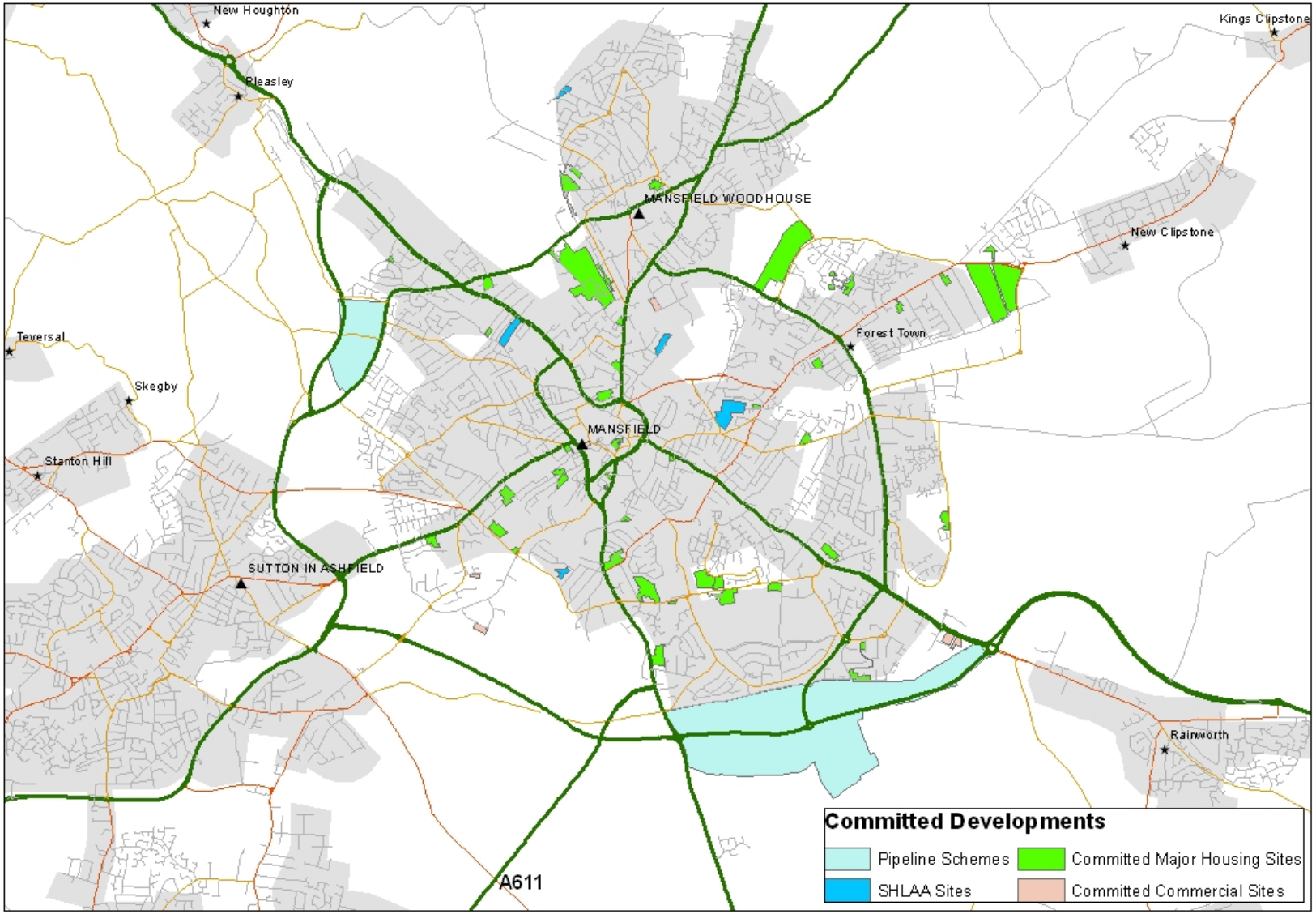

Figure 5.1: Committed Residential and Commercial Developments: Mansfield

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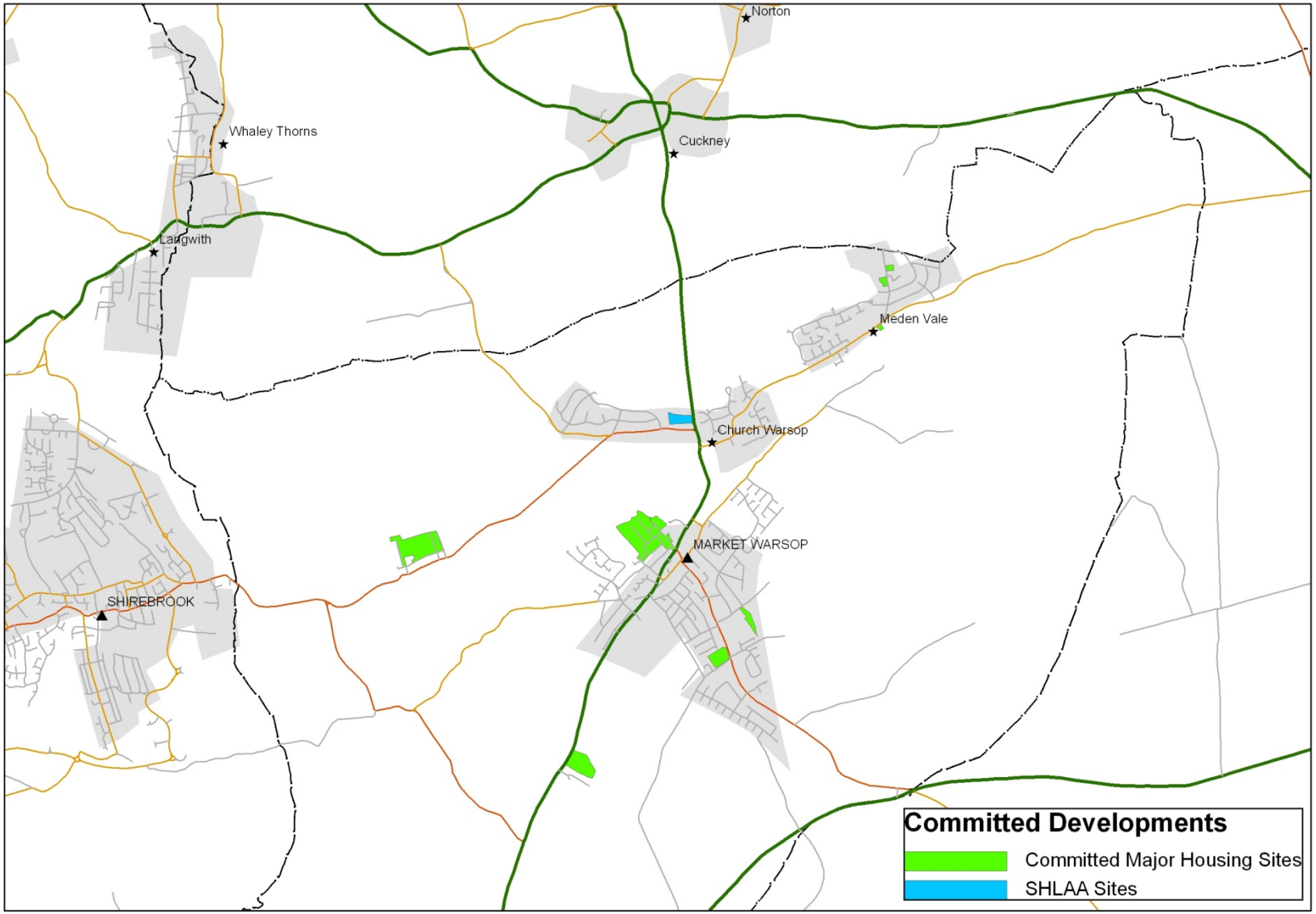

Figure 5.2: Committed Residential and Commercial Developments: Market Warsop

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5.2.5 The development of the 2031 Reference Case SATURN model is detailed in Appendix D. However, Table 5.1 below details the hourly trip total represented in the Base Year (2012) SATURN model. Also shown are the 2031 trip totals calculated using the DfT's National Trip End Model (NTEM) growth forecast and the trip totals for the Reference Case (based on committed developments in Mansfield District).

Table 5.1: Matrix Totals

Trip demand scenario	Total Trips	
	AM	PM
Base 2012	29,044	30,685
NTEM 2031	34,120	36,282
Reference Case 2031	34,148	36,007

5.2.6 This shows that the overall level of growth contained in NTEM growth assumptions is in line with Mansfield District Council's list of committed development, which gives confidence that the Reference Case forecast are compatible with national economic growth forecasts. The Reference Case forecasts represent a 17% increase in trips when compared to the 2012 Baseline traffic conditions.

5.3 Transport Infrastructure

5.3.1 No future year highway schemes were identified which would impact upon the existing network capacity. Some of the committed development sites had associated highway infrastructure associated with them. These included:

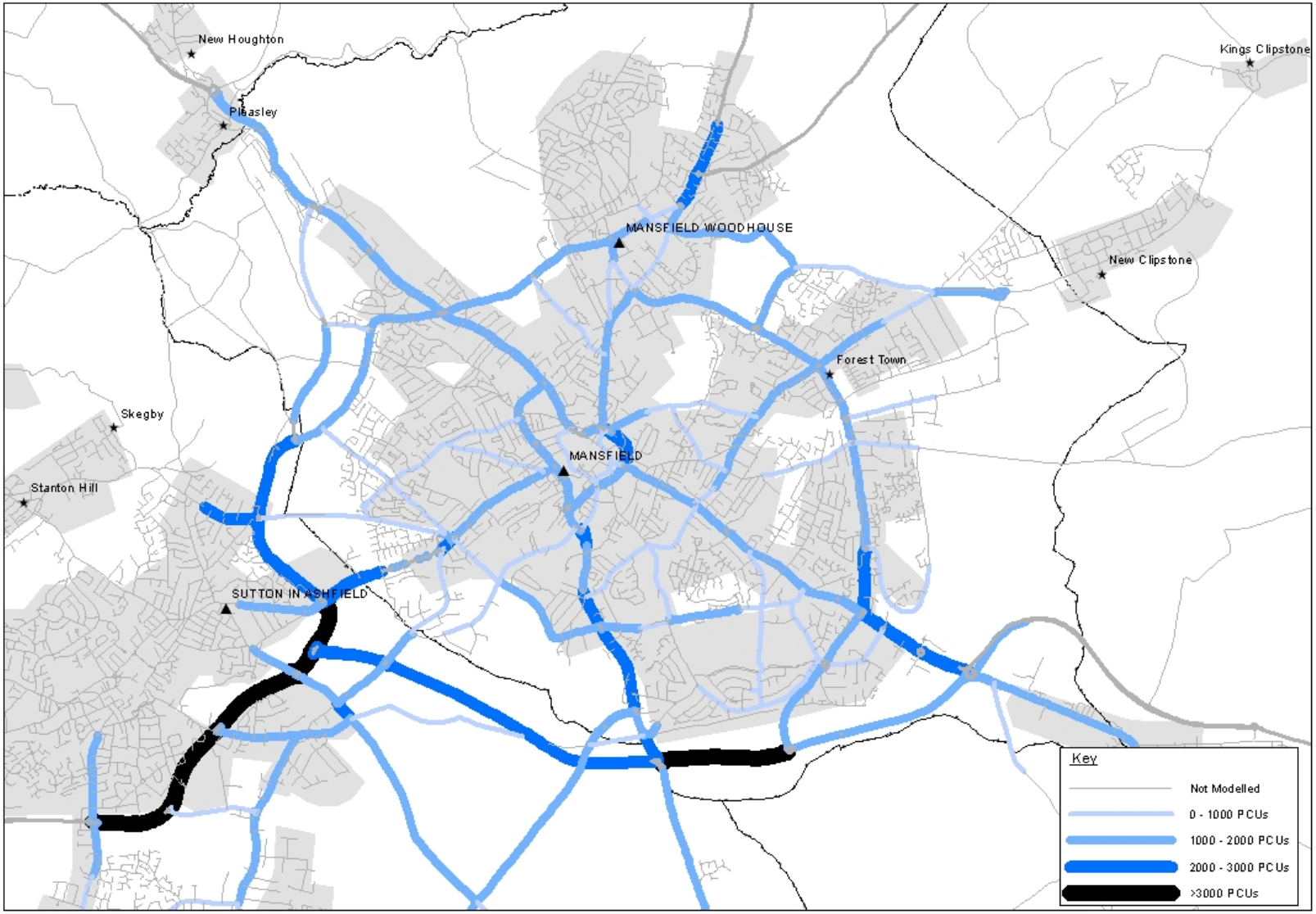
- Lindhurst (internal link roads and access points);
- Penniment Farm (access points); and
- Prologis Park (access points).

5.3.2 These highway improvements have been included within the 2031 Reference Case highway networks.

5.4 Operating Conditions

5.4.1 As for the Baseline (2012) analysis, the following indicators for the Reference Case (2031) highway network have been extracted from the SATURN model:

- Total vehicular flow (Figure 5.3 & 5.4);
- Delay (Figure 5.5 & 5.6); and
- Volume / Capacity Ratios (Figure 5.7 & 5.8).



PCUs = Passenger Car Units. 1 Car = 1 PCU / 1 Bus = 2 PCUs etc.

Figure 5.3: Reference Case (2031) AM Peak Hour Traffic Flows

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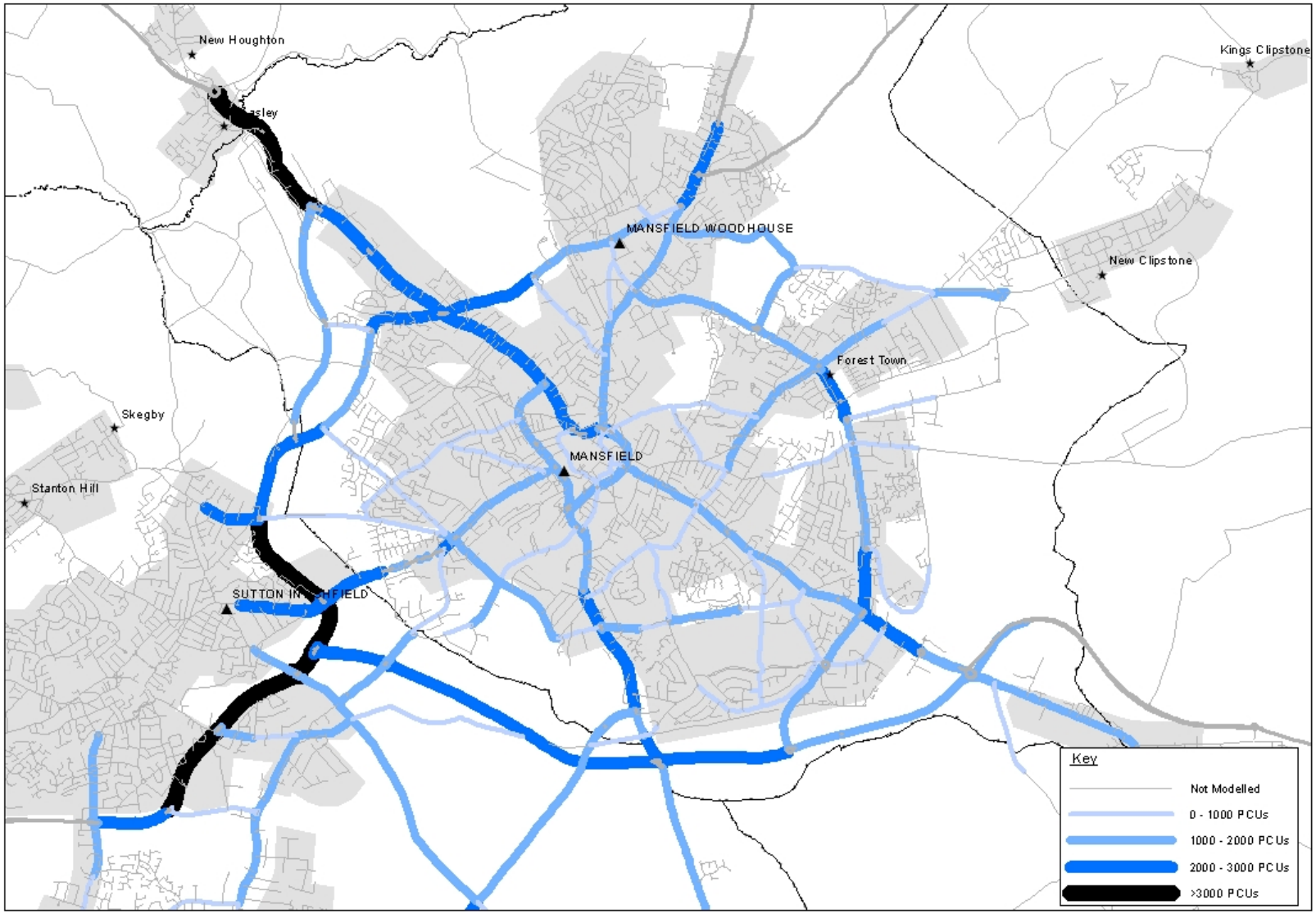

PCUs = Passenger Car Units. 1 Car = 1 PCU / 1 Bus = 2 PCUs etc.

Figure 5.4: Reference Case (2031) PM Peak Hour Traffic Flows

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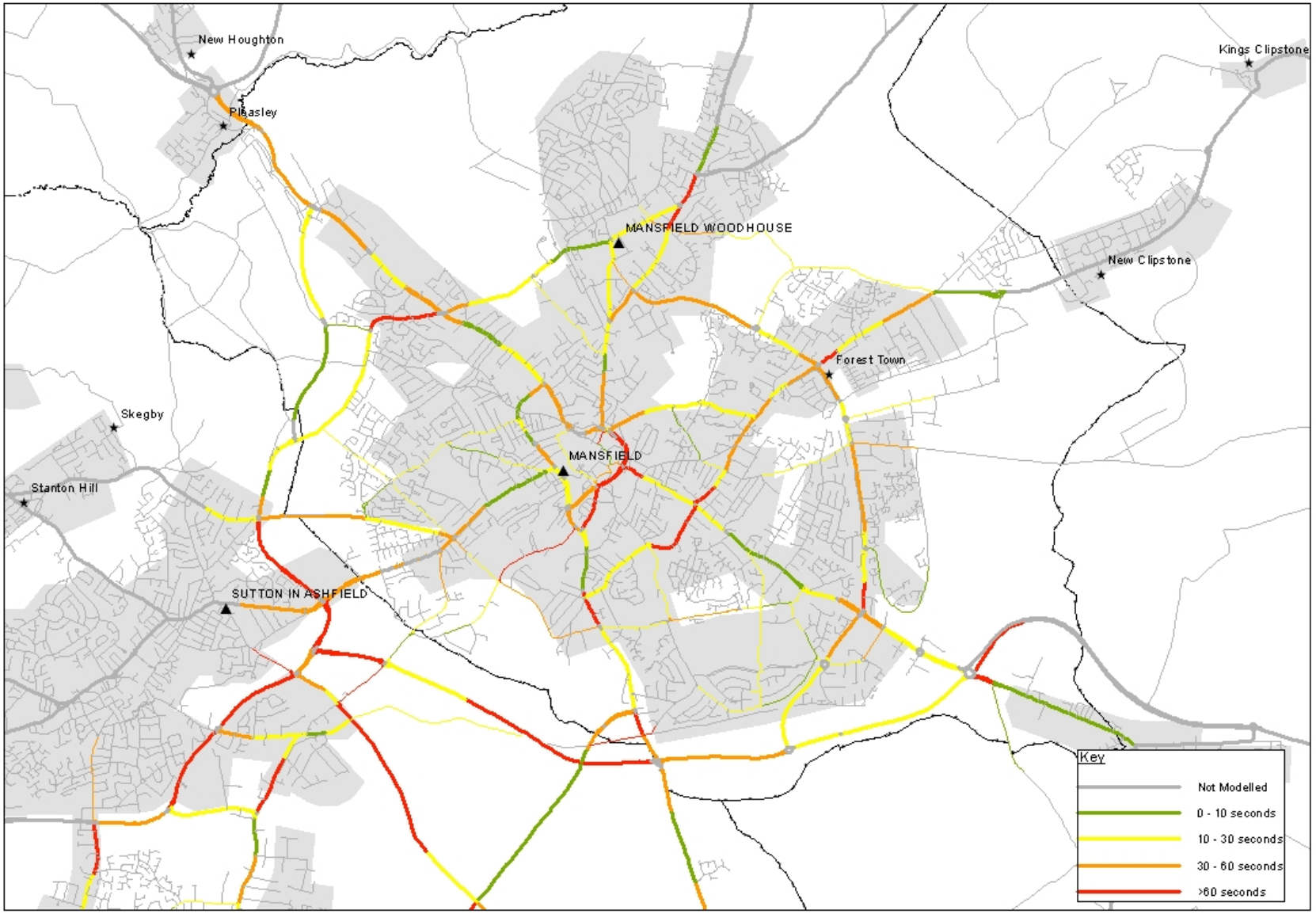

Figure 5.5: Reference Case (2031) AM Peak Hour Delays

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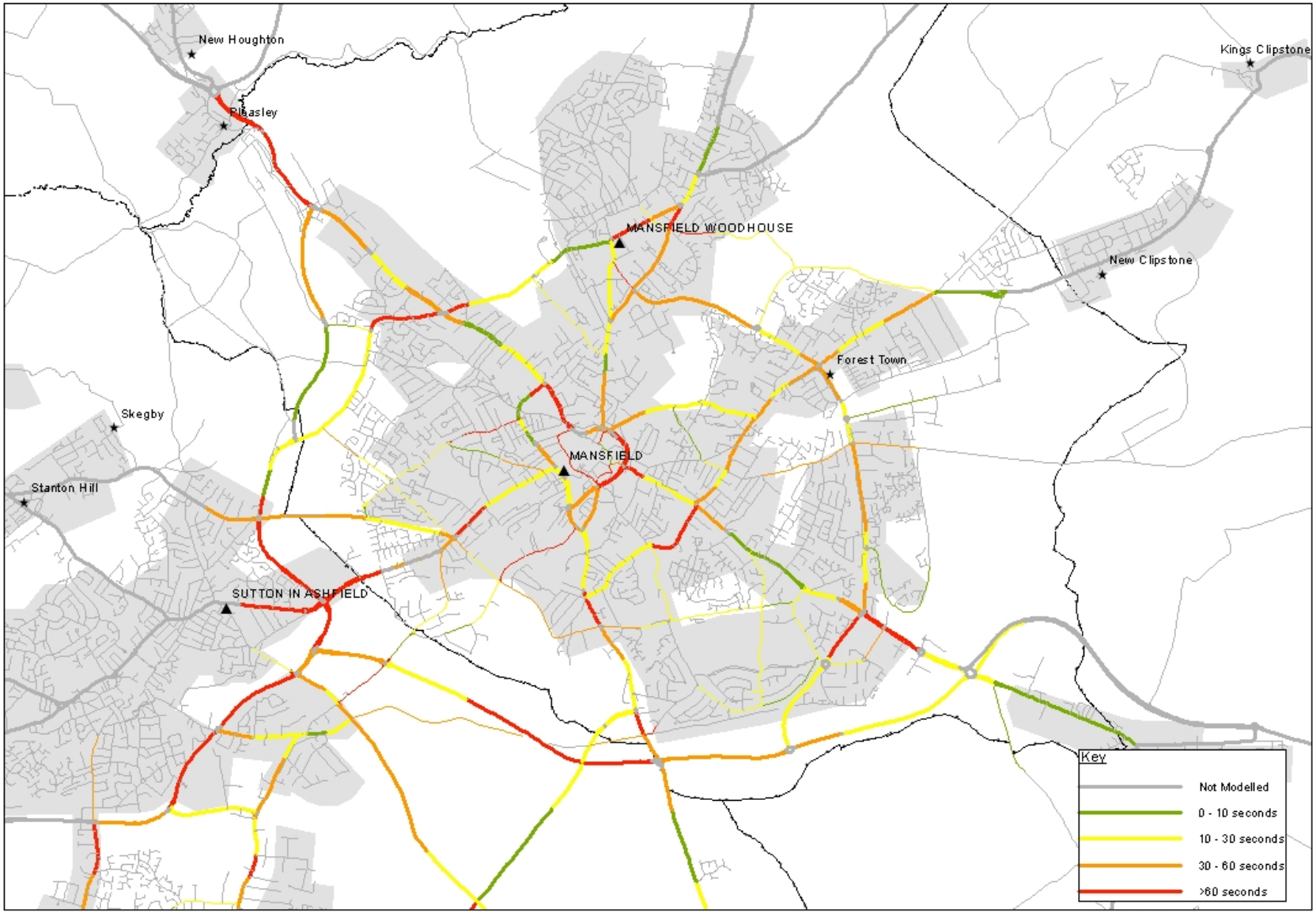

Figure 5.6: Reference Case (2031) PM Peak Hour Delays

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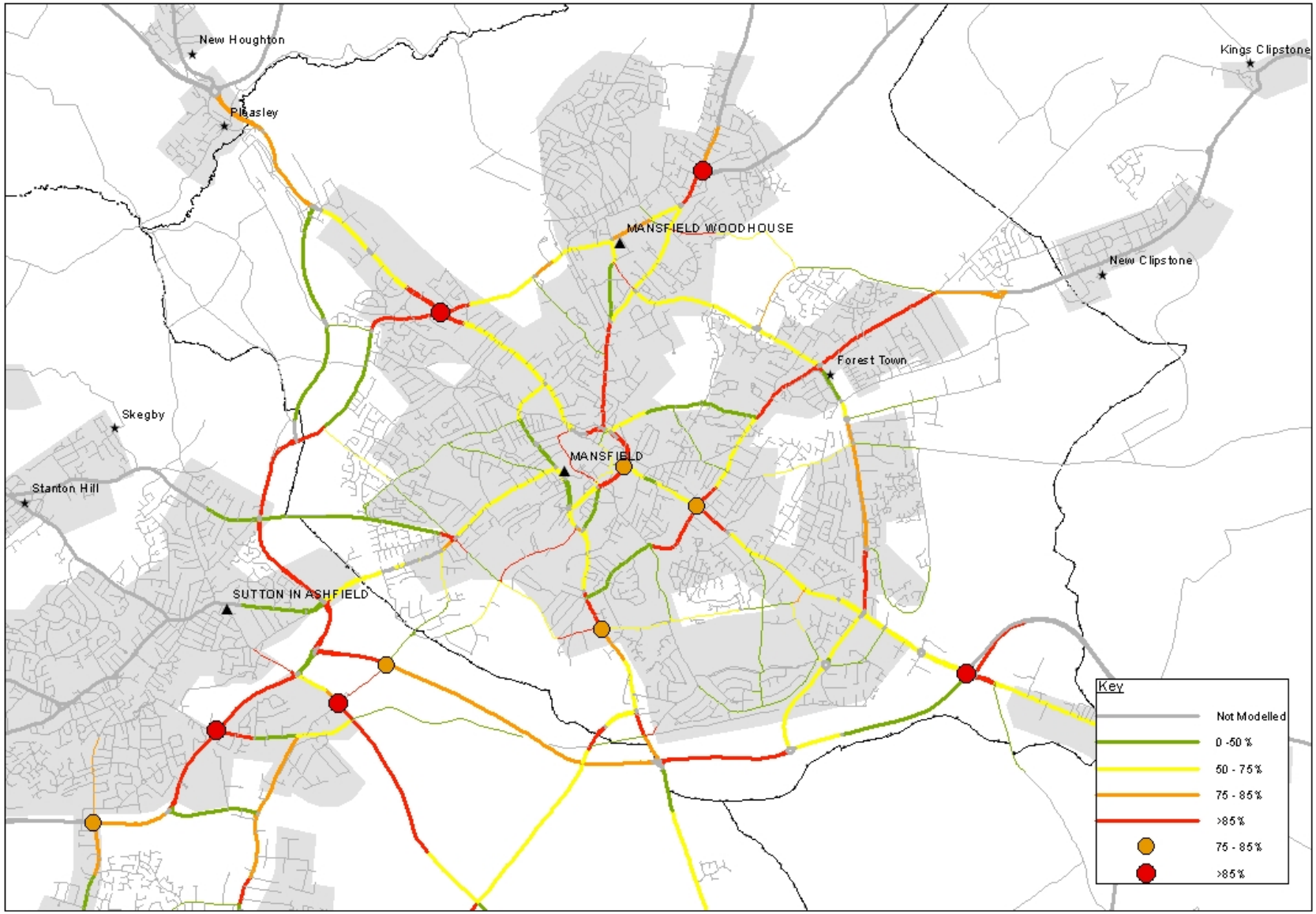

Figure 5.7: Reference Case (2031) AM Peak Hour Volume / Capacity Ratio

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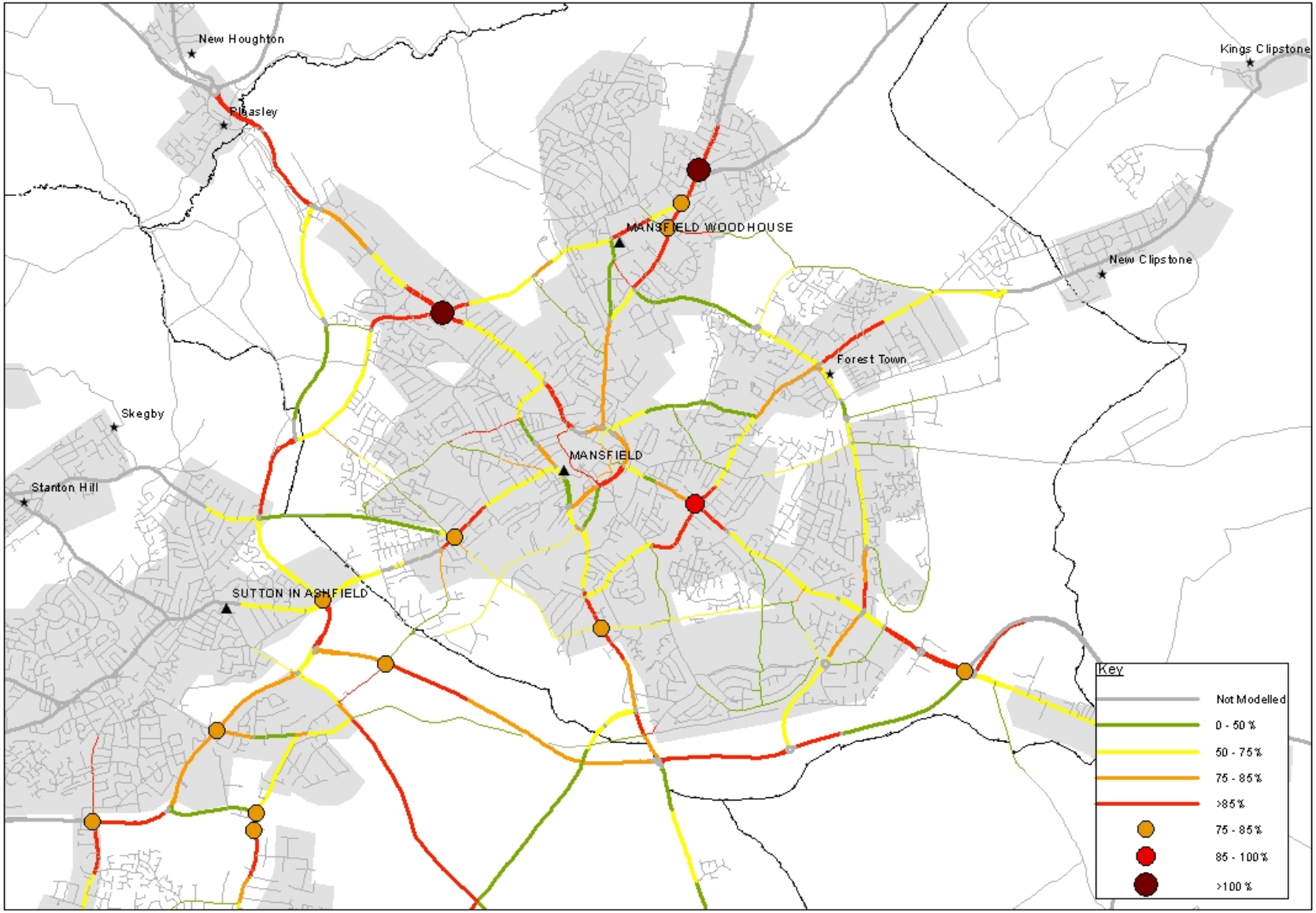

Figure 5.8: Reference Case (2031) PM Peak Hour Volume / Capacity Ratio

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5.4.2 The SATURN traffic model has been used to identify those junctions that would be operating at, or over capacity in the forecast year of 2031. Given that traffic growth is expected from the Baseline year of 2012 to the forecast 2031 Reference Case, then it is expected that junctions across the highway network will be more heavily loaded in future years. The traffic model was interrogated to determine those junctions with a traffic V/C ratio of more than 0.85 in the 2031 traffic model. Detailed junction modelling has been undertaken on the junctions identified from the base year analysis (in Section 4.3 of this report) plus any additional junctions that were identified from the forecast year 2031 analysis.

5.4.3 This process highlighted the following seven junctions within the Mansfield urban area:

- Chesterfield Road / Debdale Lane;
- A60 Nottingham Road / Berry Hill Lane;
- Carter Lane / Southwell Road / Windsor Road;
- A60 Leeming Lane / New Mill Lane;
- A617 MARR / A6191 Southwell Road;
- A60 Leeming Lane / Peafield Lane; and
- A38 Sutton Road / Skegby Lane.

5.4.4 Of the seven junctions identified above, only the A38 Sutton Road / Skegby Lane junction was not highlighted from the SATURN model outputs as approaching or at capacity in the Baseline analysis (2012). The other six junction models built in detail and described in the Baseline Case were updated with the Reference Case junction turning movements to assess operational performance in 2031. The additional seventh junction at A38 Sutton Road / Skegby Lane was modelled in detail with the 2012 Baseline and 2031 Reference Case forecasts assigned. This detailed modelling found that this junction was operating near to capacity in the baseline analysis.

5.4.5 Outside of the area of the traffic model, the traffic growth is likely to follow the Nottinghamshire rural growth. Our observations in the 2012 baseline assessments identified one junction in Market Warsop that was approaching capacity, which was the A60 Church Street / Wood Street traffic signalled junction. This junction was included within the detailed junction analysis.

5.4.6 The detailed junction assessment results for all eight of these junctions are summarised in Table 5.2. Appendix E provides further detail with regard to these junction assessments.

5.4.7 The detailed junction modelling results, presented in Table 5.2, confirm that most of the identified junctions would operate near to capacity or at capacity (Degree of saturation >90%) or over capacity in 2031. The only exception is A617 MARR / A6191 Southwell Road which would operate within capacity.

Table 5.2: Junction Capacity Assessments – Base and Reference Year

Junction	Base Year (2012)		Reference Case (2031)	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Chesterfield Road / Debdale Lane	Near to or At Capacity	Over Capacity	Over Capacity	Over Capacity
A60 Nottingham Road / Berry Hill Lane	✓	✓	Over Capacity	Near to or At Capacity
Carter Ln / Southwell Rd / Windsor Rd	✓	✓	✓	Near to or At Capacity
A60 Leeming Lane / New Mill Lane	✓	Near to or At Capacity	Near to or At Capacity	Over Capacity
A617 MARR / A6191 Southwell Road	✓	✓	✓	✓
A60 Leeming Lane / Peafield Lane	✓	✓	✓	✓
A38 Sutton Road / Skegby Lane	Near to or At Capacity	✓	Near to or At Capacity	Near to or At Capacity
A60 Church Street / Wood Street	✓	✓	Near to or At Capacity	Over Capacity

✓ Indicates that the operational performance of the junction would be acceptable; i.e. RFC less than 0.85 for a roundabout or Degree of Saturation less than 0.9 for a traffic signal junction.

5.5 Other Junctions Outside Of Mansfield District

5.5.1 An assessment of the Reference Case (2031) traffic entering the Strategic Road Network (SRN) was required as part of the Mansfield Transport Study Brief. There are no Strategic Roads within Mansfield District and the nearest one is the M1 motorway to the west. As the M1 is not included in the Mansfield traffic model, the percentage increase in flows on the A38 approaching Junction 28 and the A617 approaching Junction 29 is presented in Table 5.3 below. The A611 leaves the traffic modelled area on the south side of Mansfield and the A608 branches-off this A611 route to access the M1 at Junction 27.

Table 5.3: Changes in Traffic On Roads Approaching the M1 between the Baseline and Reference Case

		Change in traffic flows (%)	
		AM	PM
A38	Westbound	-0.5%	8.3%
	Eastbound	5.3%	4.9%
A617	Westbound	-1.2%	7.1%
	Eastbound	4.3%	4.4%
A611	Southbound	3.0%	11.9%
	Northbound	8.9%	6.7%

5.5.2 Any restrictions to the flows on these routes, due to capacity limitations of junctions along these routes, would limit the volume of traffic reaching the M1 motorway.

5.5.3 Further to the above, there are other junctions identified by the SATURN modelling which may experience capacity issues in the 2031 Reference Case (but which are located outside of the Mansfield District's Transport Study Area). These junctions fall within the A38 and the A617 corridors. Table 5.4 provides a qualitative assessment of these junctions:

Table 5.4: Changes in Traffic Approaching the M1

Junction	Qualitative Assessment
A617 MARR / Prologis Park development junction	This junction provides an access to a committed development. Reference should be made to the transport assessment for this site.
A617 MARR / Hamilton Road	The traffic model indicates that the V/C indicator would increase from 75% in 2012 to 79% in 2031. This indicates that potential need for improvement is marginal.
A38 / Kings Mill Road East / Mansfield Road	The traffic model indicates that the V/C indicator would increase from 72% in 2012 to 77% in 2031. This indicates that potential need for improvement is marginal. Detailed junction analysis suggests that the Degree of Saturation would be approximately 100% in the 2031 PM peak hour.
A38 Kings Mill Road East / B6022 Station Road	The traffic model indicates that the V/C indicator would increase from 82% in 2012 to 86% in 2031. This indicates that potential need for improvement is marginal.
A38 Kings Mill Road East / B6018 Sutton Road / Kirkby Road	The traffic model indicates that the V/C indicator is 84% in 2012 and would remain at 84% in the 2031 Reference Case.

5.6 Impact on Public Transport Services

5.6.1 The changes in journey time may impact on public transport services. Table 5.5, below summarises the modelled journey times (excluding stops) extracted from the SATURN model for vehicles travelling along on key routes (as identified in Figure 5.9) in the Baseline (2012) and Reference Case (2031).

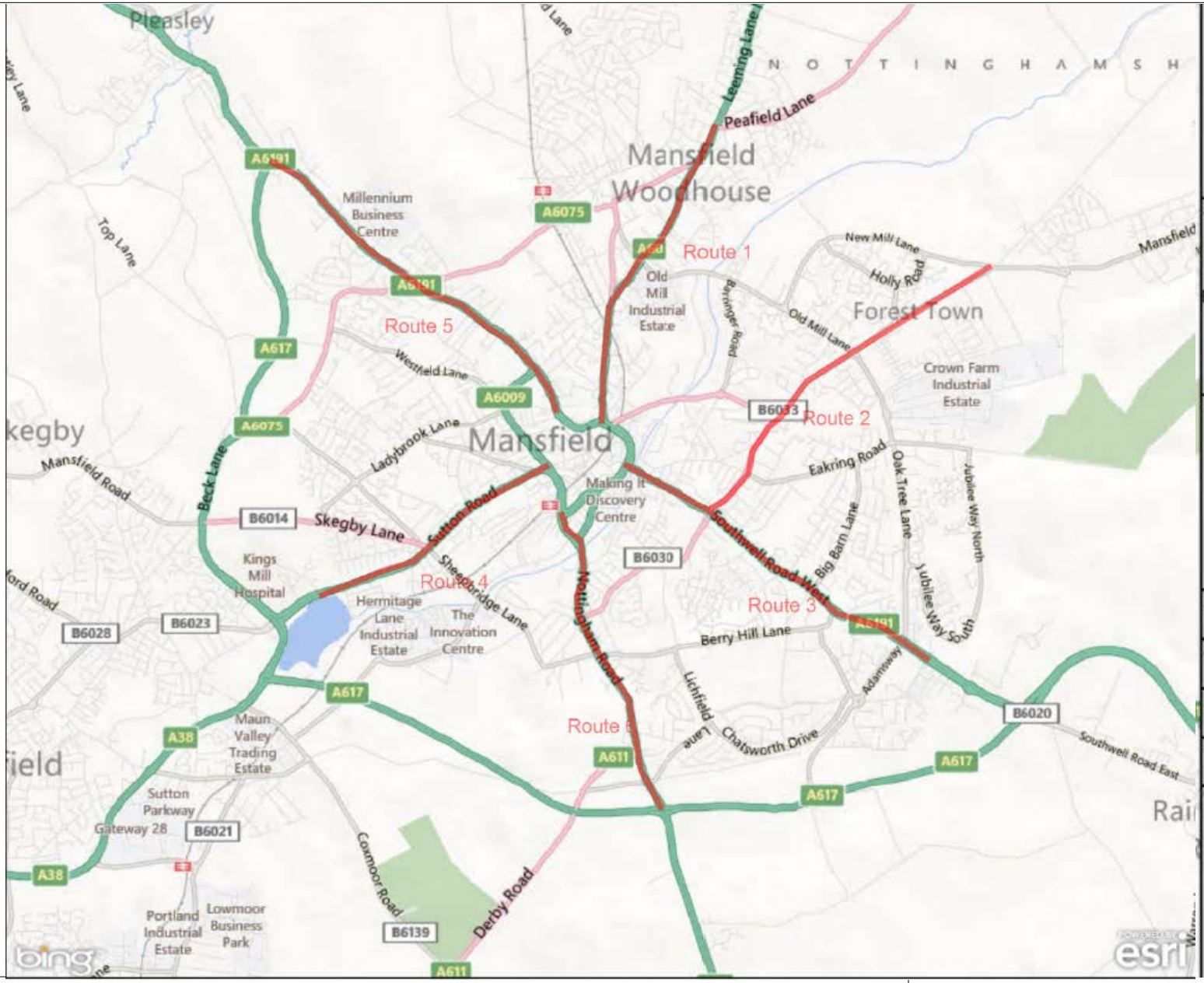
Table 5.5: Changes in Journey Time (seconds) on Key Routes (shown on Figure 5.9)

Bus Route		AM Peak				PM Peak			
		2012	2031	Time Increase	% change	2012	2031	Time Increase	% change
Route 1	Inbound	351	502	151	43.0	335	401	66	19.7
	Outbound	236	252	16	6.8	314	338	24	7.6
Route 2	Inbound	534	597	63	11.8	404	427	23	5.7
	Outbound	368	378	10	2.7	423	469	46	10.9
Route 3	Inbound	410	409	-1	-0.2	388	420	32	8.2
	Outbound	319	331	12	3.8	319	322	3	0.9
Route 4	Inbound	258	260	2	0.8	264	271	7	2.7
	Outbound	250	258	8	3.2	278	288	10	3.6
Route 5	Inbound	389	399	10	2.6	399	404	5	1.3
	Outbound	396	397	1	0.3	448	472	24	5.4
Route 6	Inbound	330	371	41	12.4	389	390	1	0.3
	Outbound	342	363	21	6.1	418	390	-28	-6.7
Journey times are in seconds (s)									

5.6.2 Detailed journey time–distance charts for the above routes are provided in Appendix F.

5.6.3 To accommodate longer travel times, bus operators would either have to adjust their timetables or add extra buses to the service to in order to compensate for the extra time that buses spend in travelling.

5.6.4 The travelling journey time for bus services, excluding waiting time at stops, would increase by between 1 minute and 1 minute - 30 seconds for buses on a round trip along the radial Routes 1 and 2. On radial routes 3, 4 and 5 the increase in round-trip journey times would be no greater than 32 seconds (see charts at Appendix F).



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Drawing Title	MDC - Journey Time Routes
Drawn	
Approved	
Drawing No.	NA
Status	

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Figure 5.9: Public Transport Journey Times (relating to Table 5.5)

6 SECURING SUSTAINABLE TRANSPORT

6.1 Overview

6.1.1 As a precursor to the Stage 2 Report, this section sets out an approach to securing sustainable transport in relation to development plans.

6.1.2 In the last ten years, there has been a much greater focus on securing transport sustainability. This has now been fully articulated in both the DfT's Guidance on Transport Assessment and the Delivering a Sustainable Transport System strategy.

6.1.3 The most widely quoted definition of sustainability and sustainable development was developed by the Brundtland Commission of the United Nations which stated that;

"sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

6.1.4 In transport terms, sustainability is often taken as being the ability to access development without the use of a private car - with a particular focus on reducing single-occupancy car trips[5]. As such, it is focused on providing opportunities to make cycling, walking and public transport the modes of choice. In order for this to be successful, these modes must be made more convenient than the private car for the majority of trips.

6.1.5 The more trips that can be accommodated by sustainable means, the less private car traffic a development would generate. This section identifies how sustainable transport choices could be secured and locked-in to the developments via the planning process (i.e. how sites could enhance their sustainable transport-mode shares).

6.1.6 This approach is consistent with the Guidance on Transport Assessment, which seeks to maximise transport sustainability prior to the identification of measures to accommodate residual trips.

6.2 Development Location and Mix

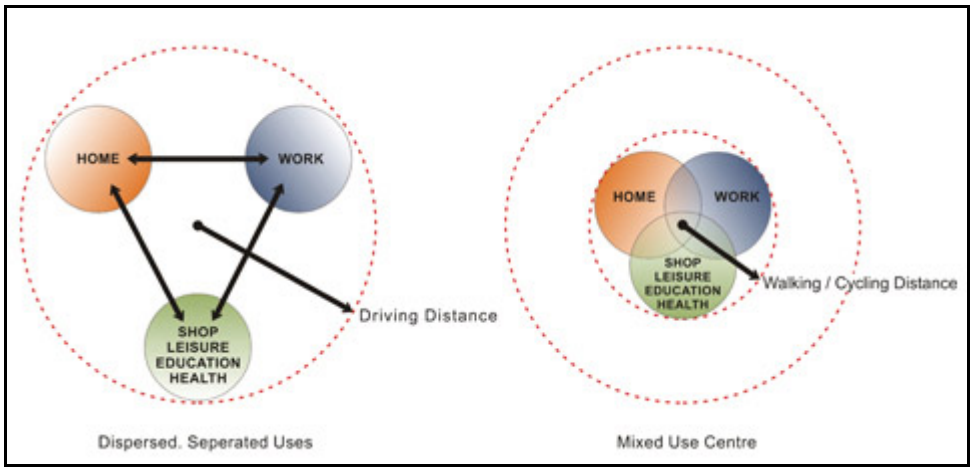
6.2.1 It is recognised that the requirement to interchange during a particular trip is an important dissuasive factor when selecting overall mode choice. Following from this, it is important to note that the most "door-to-door" trips over medium to long distances are provided only by the private car.

6.2.2 Walking and cycling modes are "door-to-door" over short distances (normally taken to be up to 2km and 5km respectively) and public transport has traditionally been effective at moving people within defined corridors of movement.

6.2.3 As such, ensuring that different land-uses (including key services and facilities) are contained within a geographic area (either the development itself or the proximate neighbourhood) is often taken as being a key enabler of sustainable-mode trips such that real mode choice is available to those wishing to travel. This is illustrated within Figure 6.1, below.

[5] Transport Sustainability is often mistaken for "anti-car" policies; though Travel Planning often encourages car sharing schemes that seek to minimise single-occupancy trips by replacing these with multi-occupant car journeys.

Figure 6.1: Mixed Use Development (taken from www.plan4sustainabletravel.org)



6.2.4 From the above figure, it can be seen that having several land uses within a defined area is to allow multiple activities to occur from one trip, to shorten trip lengths and to encourage non-motorised trips by making common destinations available within walking / cycling distance.

6.2.5 Table 6.1 indicates how various land-use design features are estimated to reduce per capita vehicle trip generation compared with conventional development that lacks these features;

Table 6.1: Travel Impacts of Land Use Design Features
(Source: Victoria Transport Policy Institute, 2001, from DISTILLATE - Design and Implementation Support Tools for Integrated Local Land use, Transport and the Environment, April 2006)

Design Feature	Reduced Vehicle Travel
Residential development around public transport nodes	10%
Commercial development around public transport nodes	15%
Residential development along public transport corridor	5%
Commercial development along public transport corridor	7%
Residential mixed-use development around public transport nodes	15%
Commercial mixed-use development around public transport nodes	20%
Residential mixed-use development around public transport corridor	7%
Commercial mixed-use development around public transport corridor	10%
Residential mixed-use development	5%
Commercial mixed-use development	7%

Notes (1) In this table, “residential mixed-use development” would indicate a residential development with our land-use integrated into the development form, whereas residential development indicates a wholly residential development
(2) public transport node = bus or train station

6.2.6 Table 6.1 shows the relative importance of mixed-use development, public transport corridors and public transport nodes; with the latter (i.e. bus and train stations) having the greatest impact.

6.2.7 Research into the impacts of providing a mix of land-use types within a neighbourhood has found that;

- The presence of local facilities has a positive effect on mode choice (i.e. more non-car trips) but more so on car ownership, particularly multiple car ownership (Dargay and Hanly, 2004).
- Diversity of services and facilities in close proximity to households reduces distance travelled (Banister, 1996; Farthing et al, 1995, 1997; Hickman and Banister, 2007a)
- Work trip distances and times are shorter in areas of higher population density, higher employment density and greater land use mix (Frank and Pivo, 1994).
- Trip lengths are shorter in 'traditional urban settings'. Walking and, to a lesser degree, public transport mode share is also higher in 'traditional urban settings' (Ewing and Cervero, 2001).
- The use of public transport and walk / bike modes is more likely where commercial and non-residential uses are nearby (within 300 feet of residence). Also, walking, cycling and public transport mode shares are greater in locations where shops are located close to office buildings (Cervero, 1989).

(taken from www.plan4sustainabletravel.org)

6.2.8 Given the above, according to the Commission for Integrated Transport (CFIT), an initial basis for securing sustainable development in transport terms is the selection of a good site location where:

- Good accessibility is available, or can be developed, by sustainable modes to:
  - employment and other main facilities in the main towns or immediate vicinities;
  - a rail station or other public transport interchange where good services are available to other (larger) centres within the sub-region; and
  - community facilities within the development or the surrounding neighbourhood.
- Opportunities exist to:
  - promote the use of walking, cycling and public transport;
  - provide an attractive level of public transport service which does not depend on (additional) subsidy over the longer term; and
  - utilise and support existing public transport services and community facilities in the locality.

6.2.9 According to Inclusive Mobility (DfT, 2002) bus services should be within 400m of a development in order to be considered accessible - though without specific development sites, this level of analysis is not available at this stage. However, this section does give indication of public transport density and therefore potential for servicing.

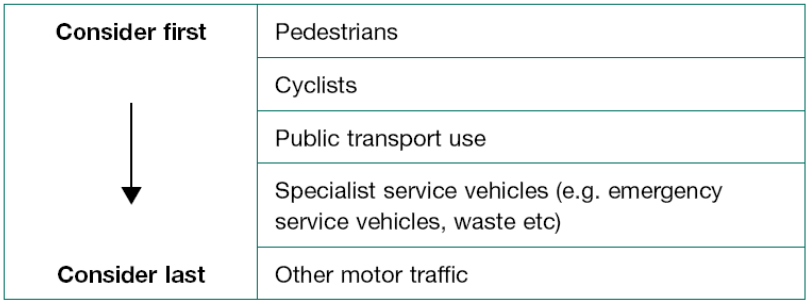
6.3 On-Site Development Infrastructure

6.3.1 According to the Government publication, Building Sustainable Transport into New Developments (DfT, April 2008), *"the layout of a development has a significant impact on how people choose to travel."*

6.3.2 Indeed, a year before this document was issued, the benefits of good design on mode choice was recognised in the DfT publication Manual for Streets which sought to directly influence the layout of new residential development.

6.3.3 The Manual for Streets replaced the previous guidance (DB32 and the accompanying Places, Streets and Movement) that was focused on providing for the car. By comparison, Manual for Streets provided a new hierarchy for the provision of infrastructure within the development envelope (as summarised in Figure 6.2 below) which placed the needs of pedestrians and cyclists at the forefront of design.

Figure 6.2: Development-Envelope Design Hierarchy
(Source; Manual for Streets)



6.3.4 In the above, it is acknowledged that the attractiveness of walking and cycling is not only influenced by distance but also the quality of the walking and cycling environment.

6.4 Assessment of the Sustainability of New Development

6.4.1 The preceding sections have identified that opportunities to serve new development by sustainable modes vary across the district of Mansfield. Once the development plan-related proposals are known, they can be compared with the sustainable-transport context identified in this baseline report.

6.4.2 Where developments co-incide with opportunities for sustainable travel, it is likely that the proportion of those travelling to / from employment (and other services and facilities) by car will be naturally lower than where such opportunities do not exist. However, this is not meant to imply that developments in other areas should not proceed. Rather it identifies which developments would need additional support

through development specific measures such as bus services, cycle routes and / or the wider Travel Planning process.

7 SUMMARY AND CONCLUSIONS

7.1.1 Mansfield District Council is currently preparing a new Local Plan. This report has been prepared to support the traffic analysis and impacts of the developments in the Local Plan and considers the transport context within which the development sites identified within the development plan would be brought forward.

7.1.2 Baseline (2012) conditions in terms of existing travel patterns, mode choice, car ownership, public transport patronage, walking and cycling and accessibility in Mansfield and Market Warsop have been examined.

7.1.3 Although the district of Mansfield compares well with the rest of Nottinghamshire in terms of overall journey patterns (proportion of those driving to work, accessibility to services and facilities) there are variations between wards at a local level. There are variations in the use of the car, as a main model of travel to work, between wards as reported in Table 3.4 and Figure 3.2 above. For example, there is a higher proportion of residents in the Meden ward for who the main mode of travel to work is by car (refer to Figure 3.2 for car drivers) and motorcycle than in the Birklands ward which includes Market Warsop. Similar variations in accessibility to services between wards were indicated in Figure 3.15. These variations reflect the availability of sustainable transport infrastructure and access to employment, services and facilities by sustainable transport modes.

7.1.4 Similar to other towns in Nottinghamshire, there has been a reduction in traffic entering Mansfield town centre in recent years. In 2013, there should be an improvement in public transport facilities within Mansfield via the opening of a new interchange within the town; however, the knock-on benefits of this station opening on services is currently not proven.

7.1.5 There is an existing traffic model of Mansfield, based upon the SATURN software package, which has been utilised in this study. The model has been updated to 2012 flow levels using existing and new traffic count data in order to represent a baseline of trip patterns and traffic volumes in Mansfield.

7.1.6 The 2012 Baseline model was used to examine the performance of the highway network and identify any junctions that were approaching capacity and thus causing delays and congestion. This process identified the following junctions:

- Chesterfield Road / Debdale Lane;
- A60 Nottingham Road / Berry Hill Lane;
- Carter Lane / Southwell Road/Windsor Road;
- A60 Leeming Lane / New Mill Lane;
- A617 MARR / A6191 Southwell Road;
- A60 Leeming Lane / Peafield Lane; and
- A60 Church Street / Wood Street.

7.1.7 Detailed models of the above junctions were built to examine their performance in the Base Year. Where junctions were found to be operating close to or above capacity the scale of the potential mitigation measures have been suggested (the descriptive text is provided in Appendix E for each junction).

7.1.8 Having examined the Base Year conditions, the project examined the future conditions within Mansfield and Market Warsop, given the most likely projections of growth and committed developments (both transport infrastructure and land-use developments) that are likely to be implemented before 2031. This is a 'Reference Case' against which potential additional development can be judged.

7.1.9 As with the Baseline analysis, the Reference Case traffic model was used to identify those junctions within the highway network that were likely to be approaching capacity in 2031. This process identified the following junctions for more detailed analysis:

- Chesterfield Road / Debdale Lane;
- A60 Nottingham Road / Berry Hill Lane;
- Carter Lane / Southwell Road/Windsor Road;
- A60 Leeming Lane / New Mill Lane;
- A617 MARR / A6191 Southwell Road;
- A60 Leeming Lane / Peafield Lane;
- A60 Church Street / Wood Street; and
- A38 Sutton Road / Skegby Lane.

7.1.10 The majority of these junctions were identified as approaching capacity in the Base Year. Detailed junction modelling using the 2031 Reference Case forecast traffic flows identified that the performance of the Chesterfield Road / Debdale Lane junction in particular was likely to operate above capacity in the 2031. This would result in vehicle queues accumulating on all arms of the junction in at least one of the peak hour periods.

7.1.11 Other junctions were identified as operating close to or slightly above capacity in the Reference Case. Some small improvements could be required at these junctions for them to operate without excessive queuing and delays in the Reference Case.

7.1.12 The Baseline and Reference Case analysis has highlighted key areas where possible future local plan growth may be sensitive. However, a further run of the traffic model to include the development plan related proposals would confirm this, and identify any other locations which may be impacted. This analysis should be part of the Stage 2 study and report.

GLOSSARY

ARCADY	*Assessment of Roundabout Capacity and DelaY*. A software tool used to assess the capacity of roundabouts under differing traffic scenarios.
Design Manual for Roads and Bridges	The UK highway design guide, commonly used for analysis and design of the trunk road network but also used for local roads, where appropriate.
Degree of Saturation (DoS)	A measure of the operational performance of a signalled junction, with measures 100% or above indicating that a junction is operating above capacity.
Guidance on Transport Assessment (GTA)	A guidance document prepared by the DfT setting out how a Transport Assessment should be prepared.
Junction Capacity	The number of vehicles which can be accommodated by a junction within a given period. Normally calculated using software such as ARCADY, PICADY or LINSIG. Where a junction is operating "at capacity", queues are likely to form since the number of vehicles approaching the junction is more than that which can pass through it.
LINSIG	A computer programme used for modelling traffic at traffic signal junctions. LINSIG allows engineers to model junctions in a way which closely follows the behaviour of on-site signal control equipment.
Local Highway Authority	The body responsible for the local road network in a particular area, in particular with regards network improvements and the control of development that could affect the local highway.
Local Plan	A document produced by Local Authorities containing the development plans and policy documents for the local area.
Local Transport Plan	The Transport Act 2000 required Local Highway Authorities to produce and maintain an LTP. The LTP sets out transport strategies and policies for a given area and how these will be implemented. The plans cover a defined period and are used by the DfT to make decisions on capital funding, and for Local Authorities to monitor the delivery of key

	objectives and targets. The current LTP document covers the period 2011- 2026.
Manual Classified Count (MCC)	A count of traffic on a particular road, or at a junction, which is usually undertaken by a team of enumerators, usually over a 12-hour period. Traffic is classified by vehicle type.
MOVA	*Microprocessor Optimised Vehicle Actuation* is an adaptive signal control system. It uses advanced traffic control algorithms to increase capacity and minimise delay at traffic signals. It is used at a range of junctions from high speed to smaller suburban and urban sites.
NTEM	The *National Trip End Model* is a transport planning tool that was developed by the DfT, which produces projections of trip numbers across England and Wales. The forecasts are derived from local and regional planning projections of jobs, employment, population and household numbers in combination with travel growth factors from the national transport model.
PCU	Passenger Car Units are used to measure the capacity of roads and junctions whereby vehicle flows are converted to a standard unit using factors, e.g. car = 1 PCU, bus = 2 PCUs.
PICADY	*Priority Intersection Capacity and Delay.* A software tool that predicts capacities, queue lengths and delays at non-signalised major/minor priority junctions.
Ratio of Flow to Capacity (RFC)	A measure of the performance of a junction, with a measure of 1.0 or above indicating that a junction is operating above capacity.
SATURN	A software tool used to model traffic flows on a highway network that is responsive to congestion and reassignment issues.
TEMPRO	Is the software used to calculate and present NTEM trip growth factors for defined local areas.
Transport Analysis Guidance (TAG)	A set of documents (or Units) published by the Department for Transport which sets out how a particular transport scheme should be assessed, principally in terms of economic analysis and calculating a Benefit:Cost ratio. Guidance on the assessment of environmental impacts of highway

	schemes are also contained in the guidance. Sometimes referred to as WebTAG.
Transport Assessment (TA)	A document submitted in support of a planning application which sets out the likely impact of a proposed development on the transport network. Guidance on the content of a Transport Assessment is provided in the GTA.
Travel Plan	A document submitted in support of a planning application which sets out how trips to / from a development would be managed on opening. Its objective is usually to reduce single occupancy car trips by promoting sustainable travel options.
Trip Rate Information Computer System (TRICS)	A software tool which contains traffic survey data classified by land-use type and size. It is used to estimate the number of trips that could be generated by a proposed development based on experience elsewhere in the UK, and is recommended for this purpose in the GTA.
Trip Assignment	A stage in the estimation of future traffic conditions. The process of "assigning" traffic flows to particular links and junctions to and from a particular destination. It is preceded by Trip Distribution.
Trip Distribution	A stage in the estimation of future traffic conditions. The process of determining the likely origins and destinations of traffic to and from a proposed development. This stage does not make any assumptions about routeing, and is followed by Trip Assignment.
Trip End Model Program (TEMPRO)	The TEMPRO database contains information relating to land-use developments across the United Kingdom. It is used to forecast traffic growth in / from specific areas.
Trip Generation	A stage in the estimation of future traffic conditions. Trip Generation is an estimate of the total arrivals and departures that could be generated by a development within a specific time period. The software tool TRICS is commonly used to inform this stage. This stage is followed by Trip Distribution and Trip Assignment.
WebTAG	See TAG.

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APPENDIX A
Locations Of Delay For Bus Services

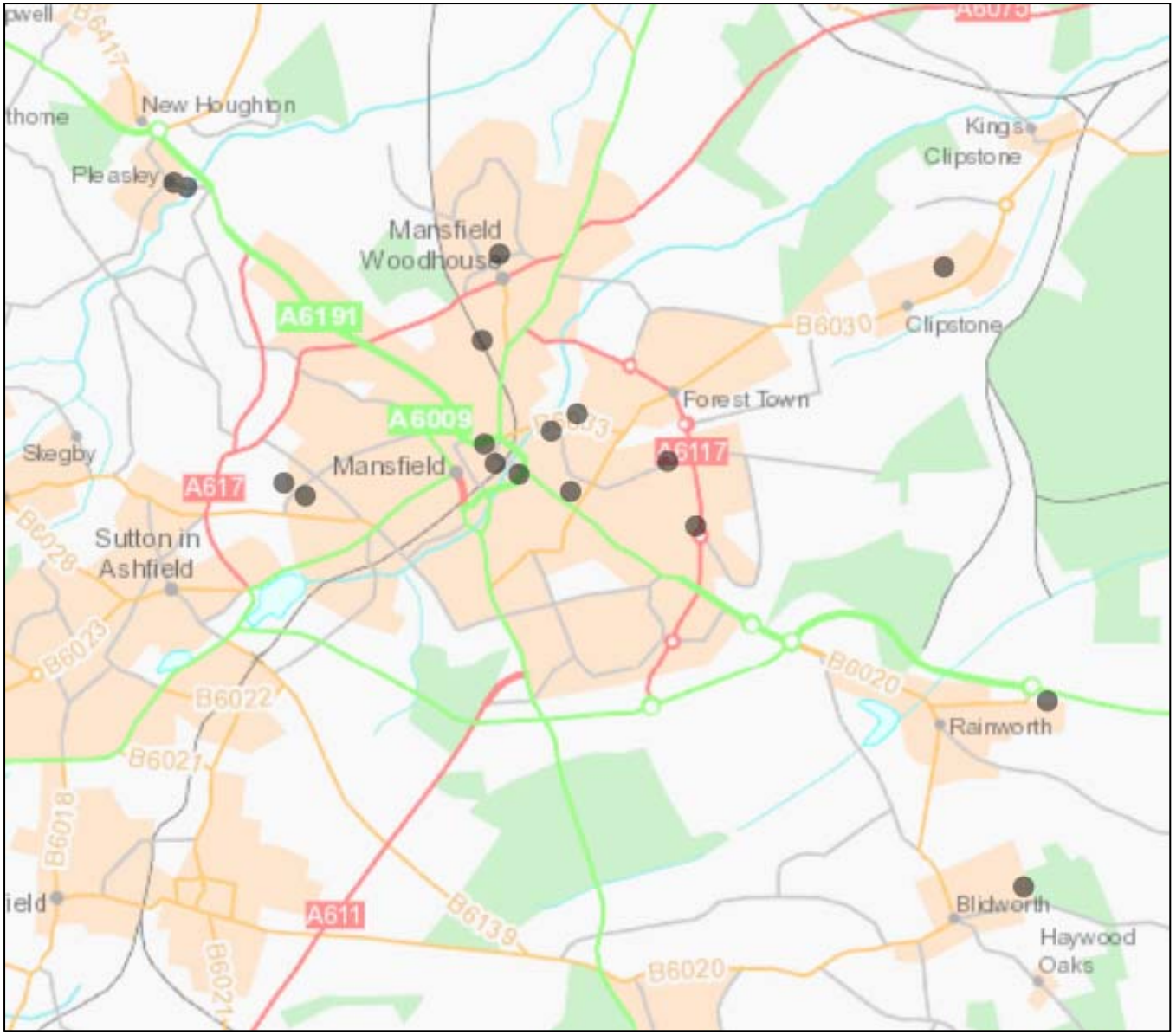

Figure 1: Locations of PT Issues Raised by Stagecoach (Overview)

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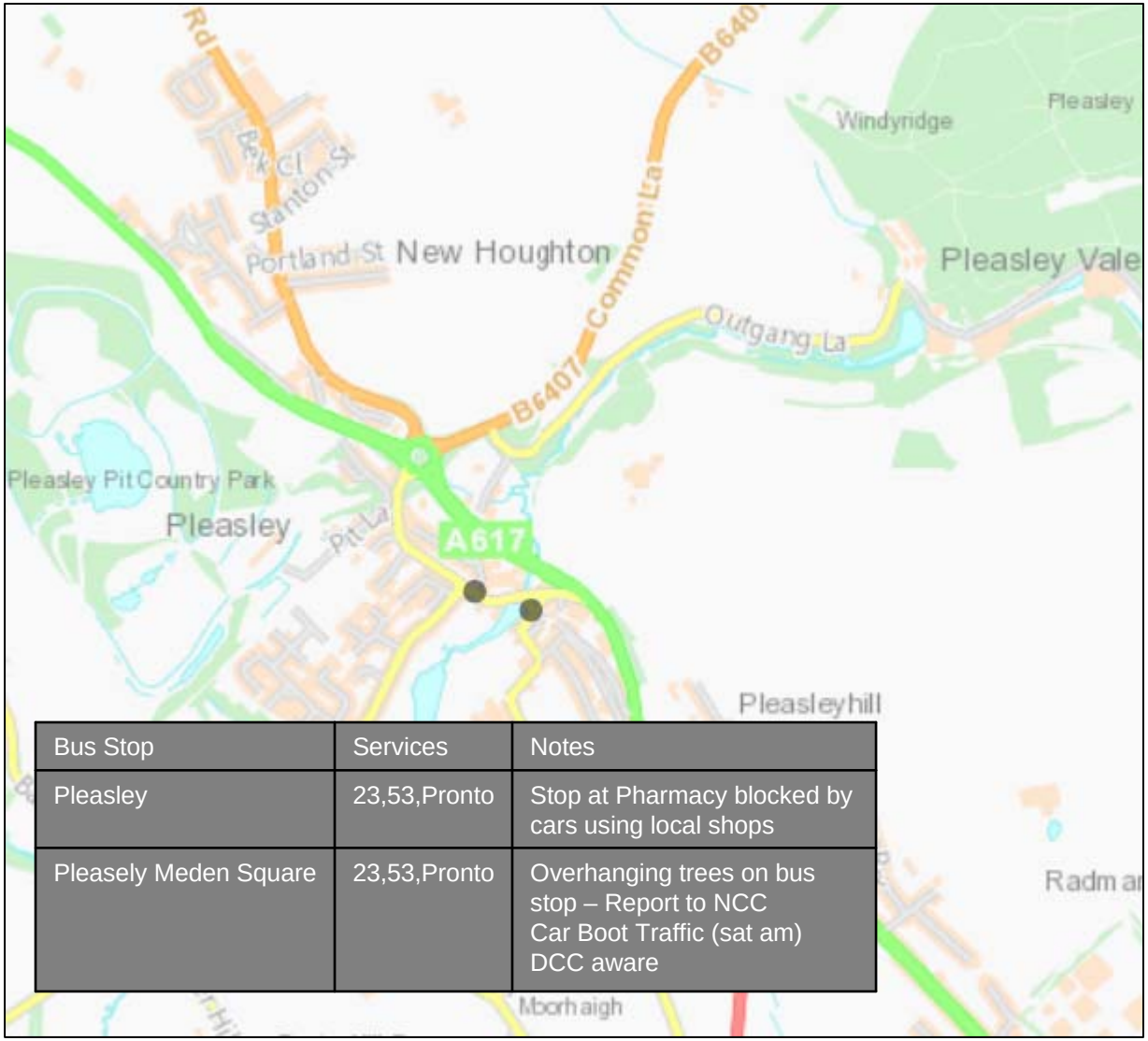
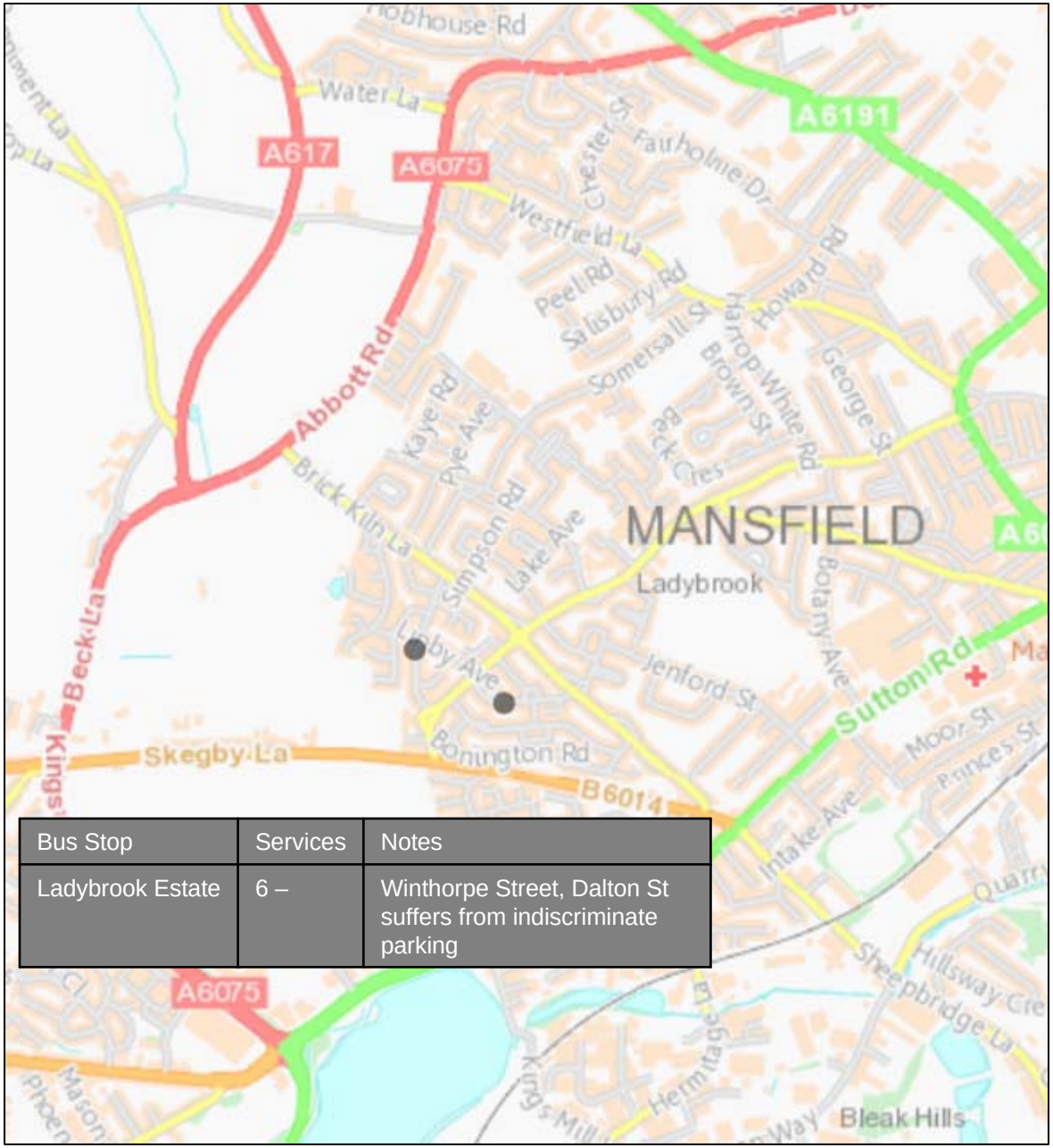
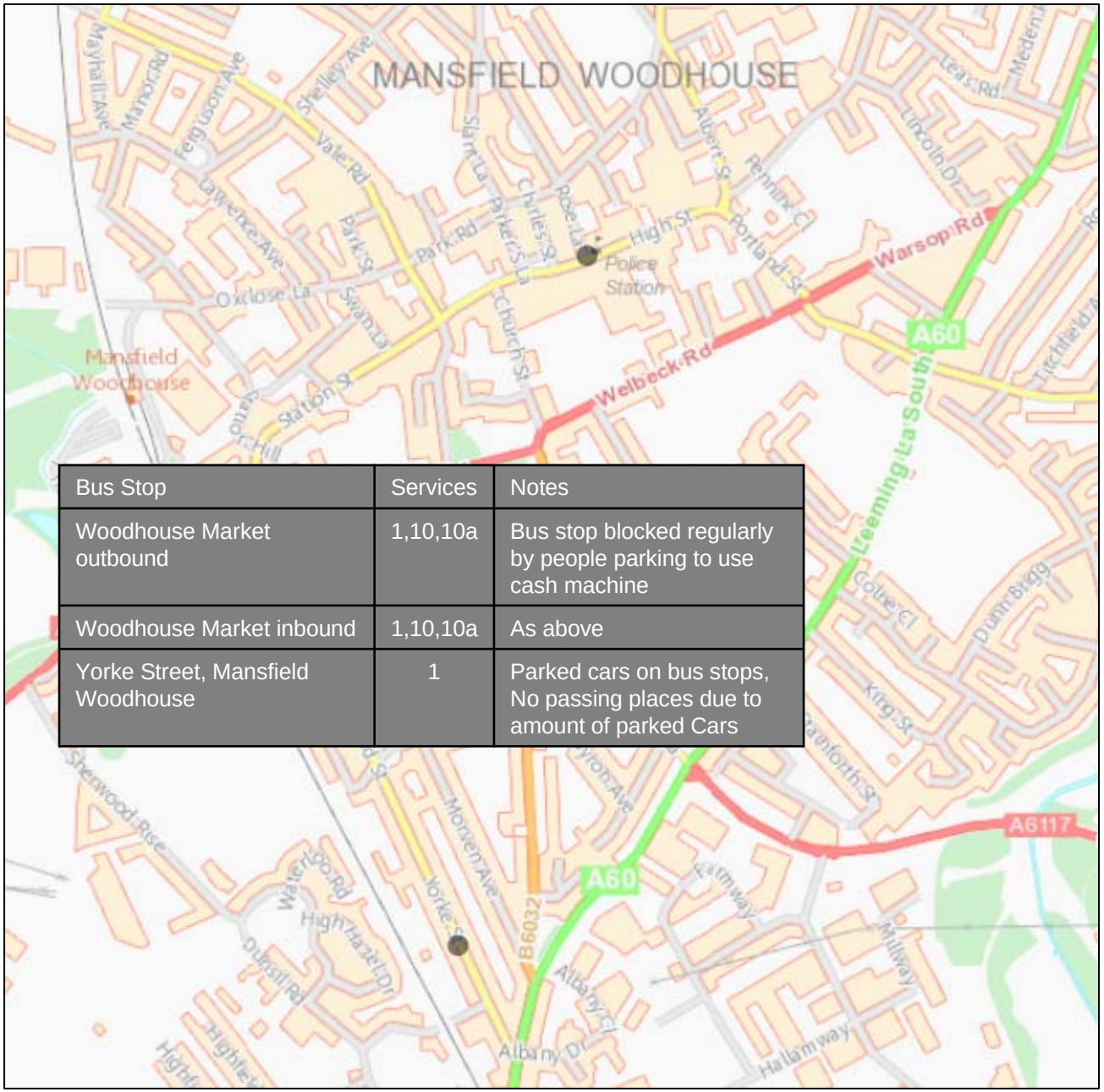


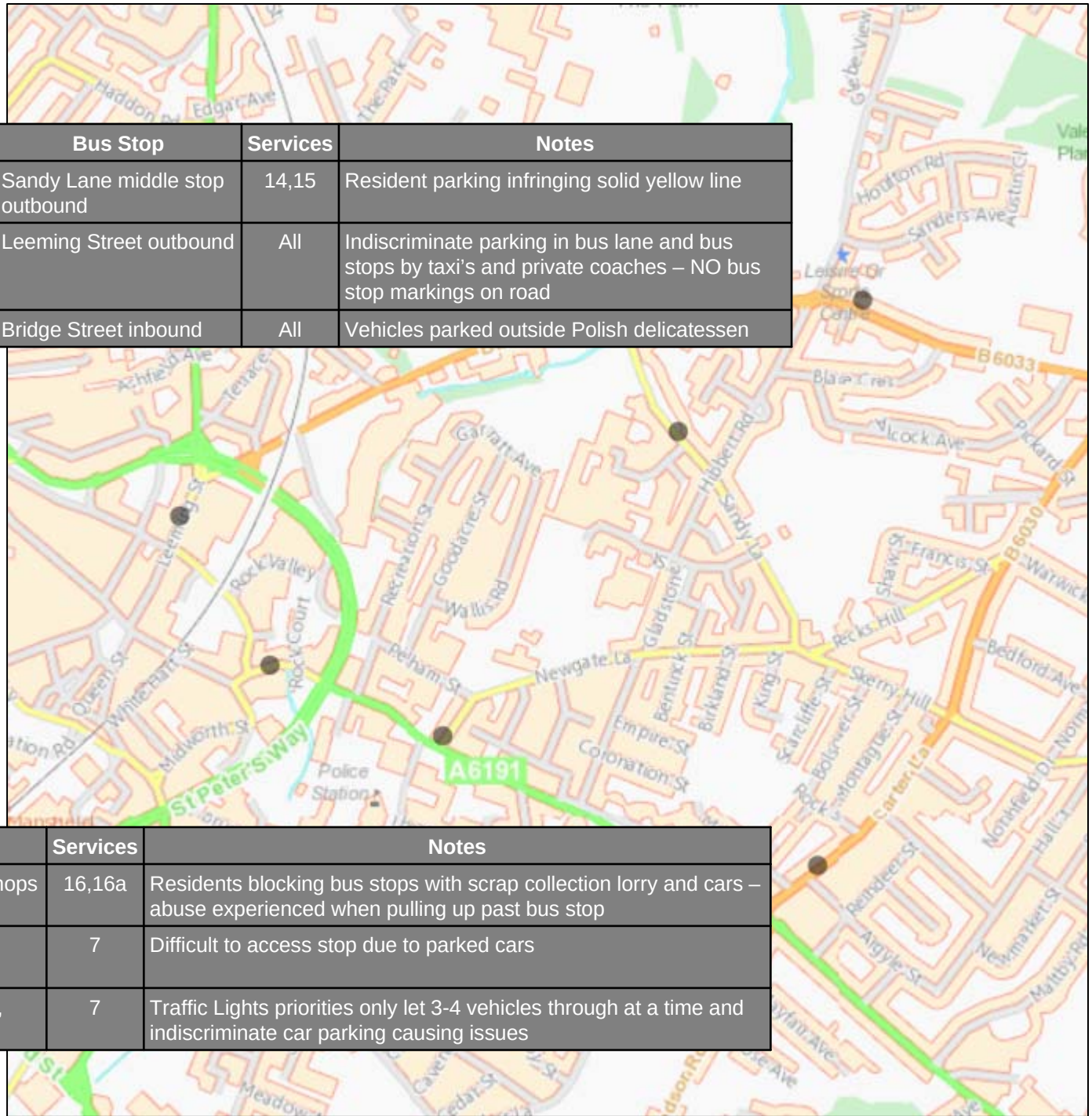
Bus Stop	Services	Notes
Pleasley	23,53,Pronto	Stop at Pharmacy blocked by cars using local shops
Pleasely Meden Square	23,53,Pronto	Overhanging trees on bus stop – Report to NCC Car Boot Traffic (sat am) DCC aware



Bus Stop	Services	Notes
Ladybrook Estate	6 –	Winthorpe Street, Dalton St suffers from indiscriminate parking

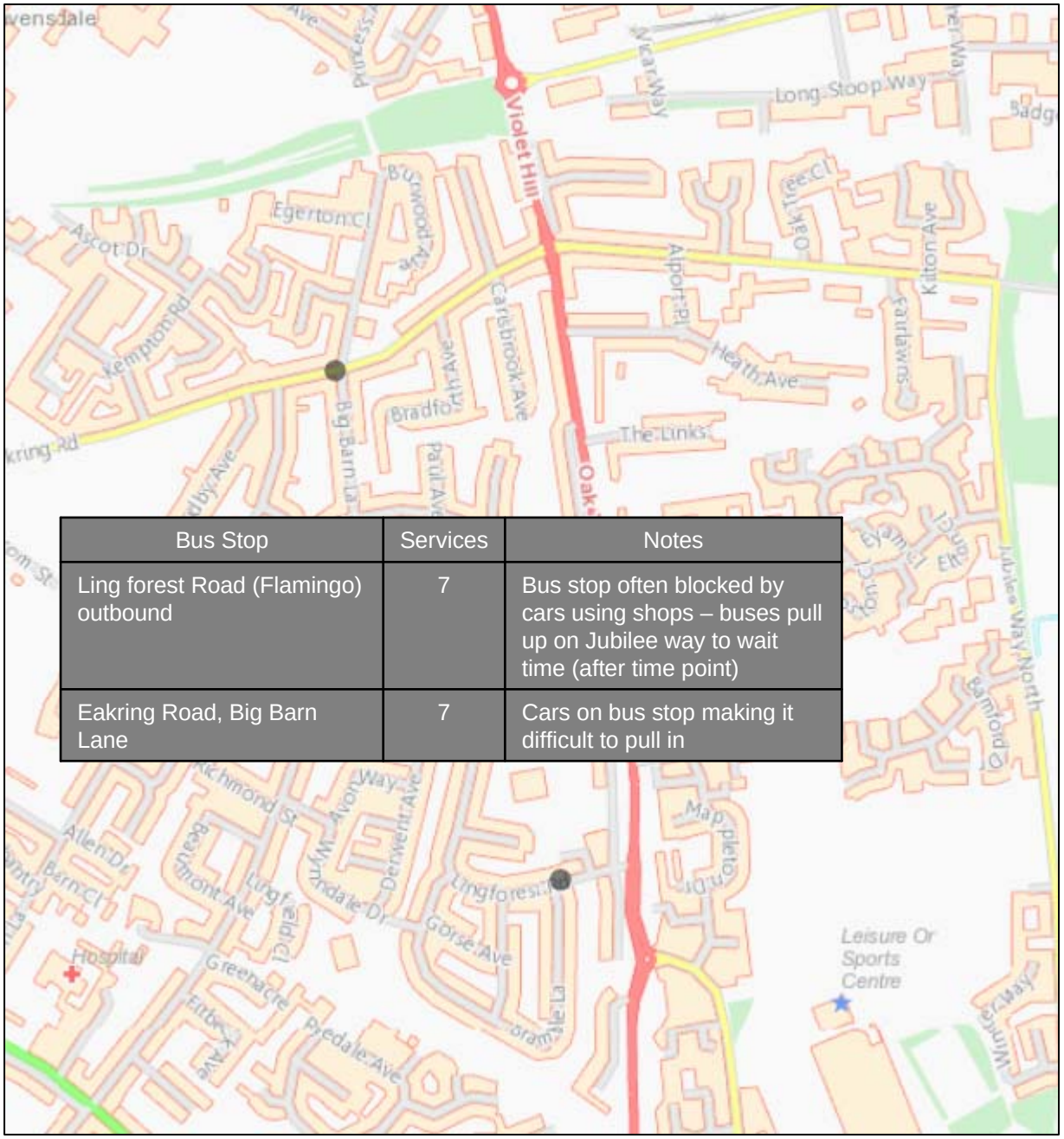


Bus Stop	Services	Notes
Woodhouse Market outbound	1,10,10a	Bus stop blocked regularly by people parking to use cash machine
Woodhouse Market inbound	1,10,10a	As above
Yorke Street, Mansfield Woodhouse	1	Parked cars on bus stops, No passing places due to amount of parked Cars

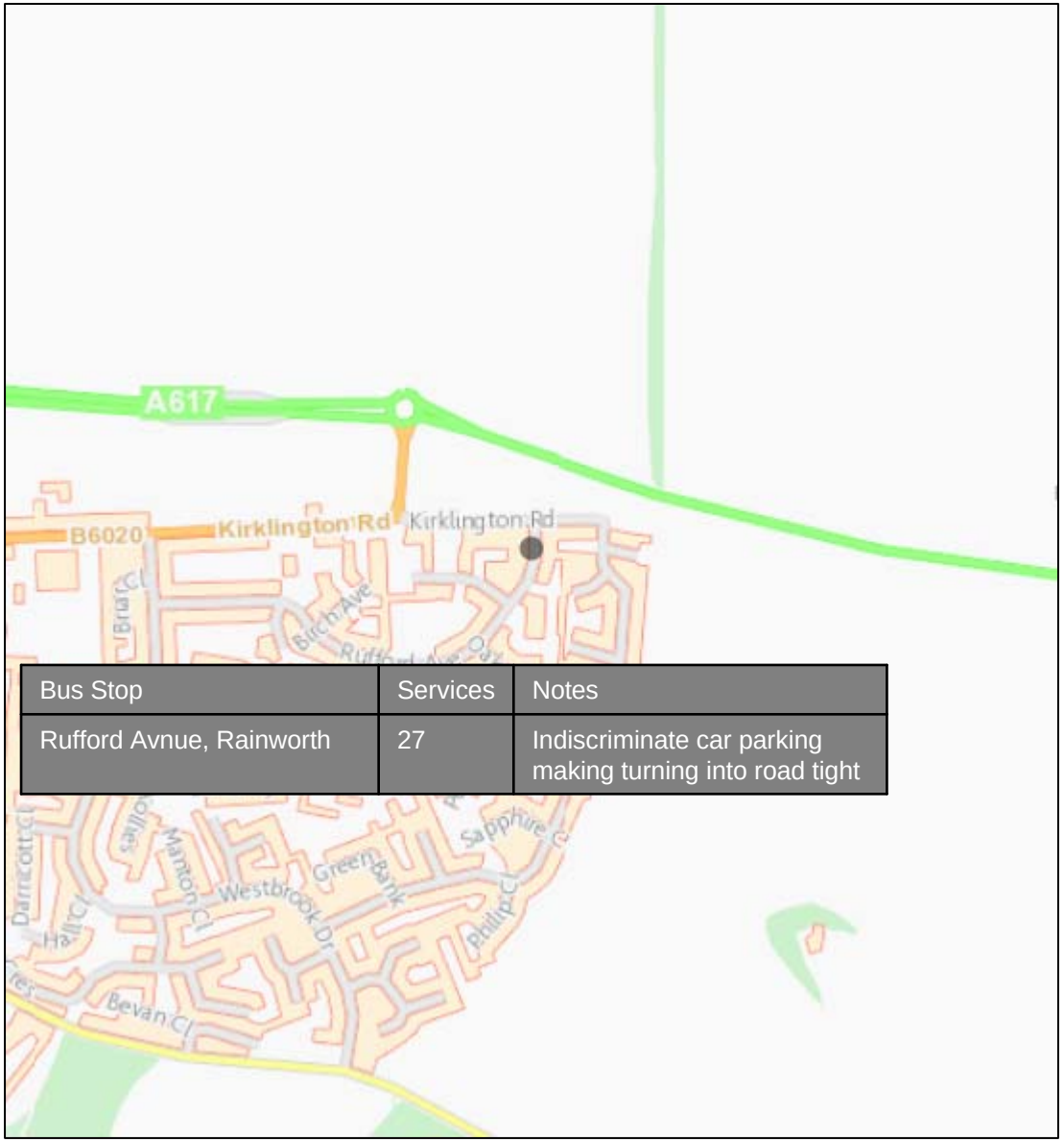


Bus Stop	Services	Notes
Sandy Lane middle stop outbound	14,15	Resident parking infringing solid yellow line
Leeming Street outbound	All	Indiscriminate parking in bus lane and bus stops by taxi's and private coaches – NO bus stop markings on road
Bridge Street inbound	All	Vehicles parked outside Polish delicatessen

Bus Stop	Services	Notes
Ravensdale Shops outbound	16,16a	Residents blocking bus stops with scrap collection lorry and cars – abuse experienced when pulling up past bus stop
Carter Lane inbound	7	Difficult to access stop due to parked cars
Newgate Lane, Mansfield	7	Traffic Lights priorities only let 3-4 vehicles through at a time and indiscriminate car parking causing issues

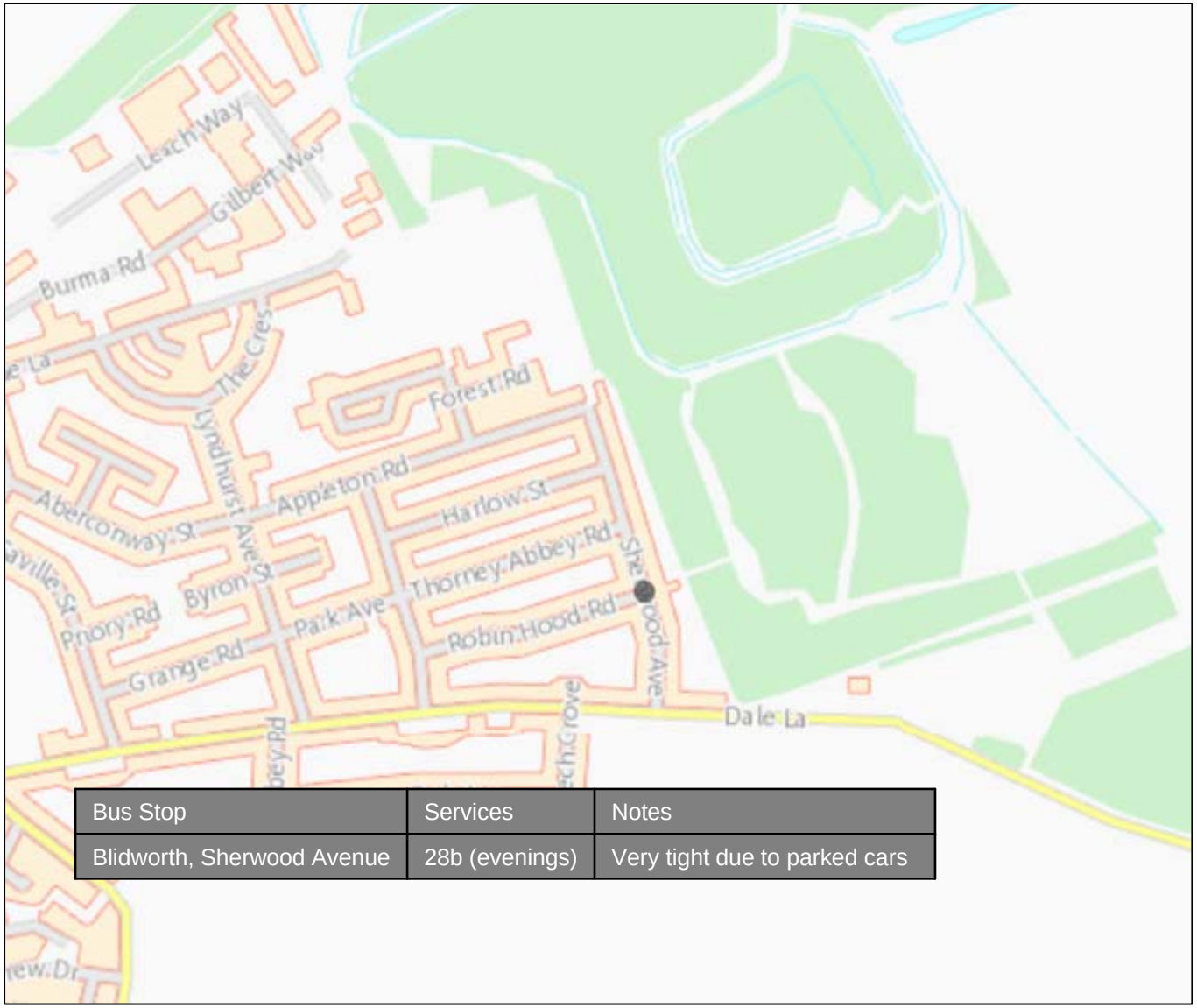


Bus Stop	Services	Notes
Ling forest Road (Flamingo) outbound	7	Bus stop often blocked by cars using shops – buses pull up on Jubilee way to wait time (after time point)
Eakring Road, Big Barn Lane	7	Cars on bus stop making it difficult to pull in



Bus Stop	Services	Notes
Rufford Avnue, Rainworth	27	Indiscriminate car parking making turning into road tight

Bus Stop	Services	Notes
First Avenue, ClipstoneHolly Drive	16,16a16,16a	High levels of congestion around school opening/closing times



Bus Stop	Services	Notes
Blidworth, Sherwood Avenue	28b (evenings)	Very tight due to parked cars

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APPENDIX B
Technical Note on Model Updating

URS

Mansfield Transport Study

Technical Note: Model Calibration

March 2013

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Prepared for:
Mansfield District Council

UNITED KINGDOM & IRELAND

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REVISION SCHEDULE					
Rev	**Date**	**Details**	**Prepared by**	**Reviewed by**	**Approved by**
1	August 12	Draft	Adam Hall Senior Transport Planner	David Elliott Associate	David Elliott Associate
2	January 2013	Final	AH	DJE	DE
3	March 2013	Final – Revisions: TAG reference modified (paragraph 1.2.5), count site location plot added (paragraph 1.4.1), and assignment convergence text and tables added (section 2.3)	LK		DJE

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TRAFFIC MODEL CALIBRATION
TECHNICAL NOTE

October 2014

APPENDIX B

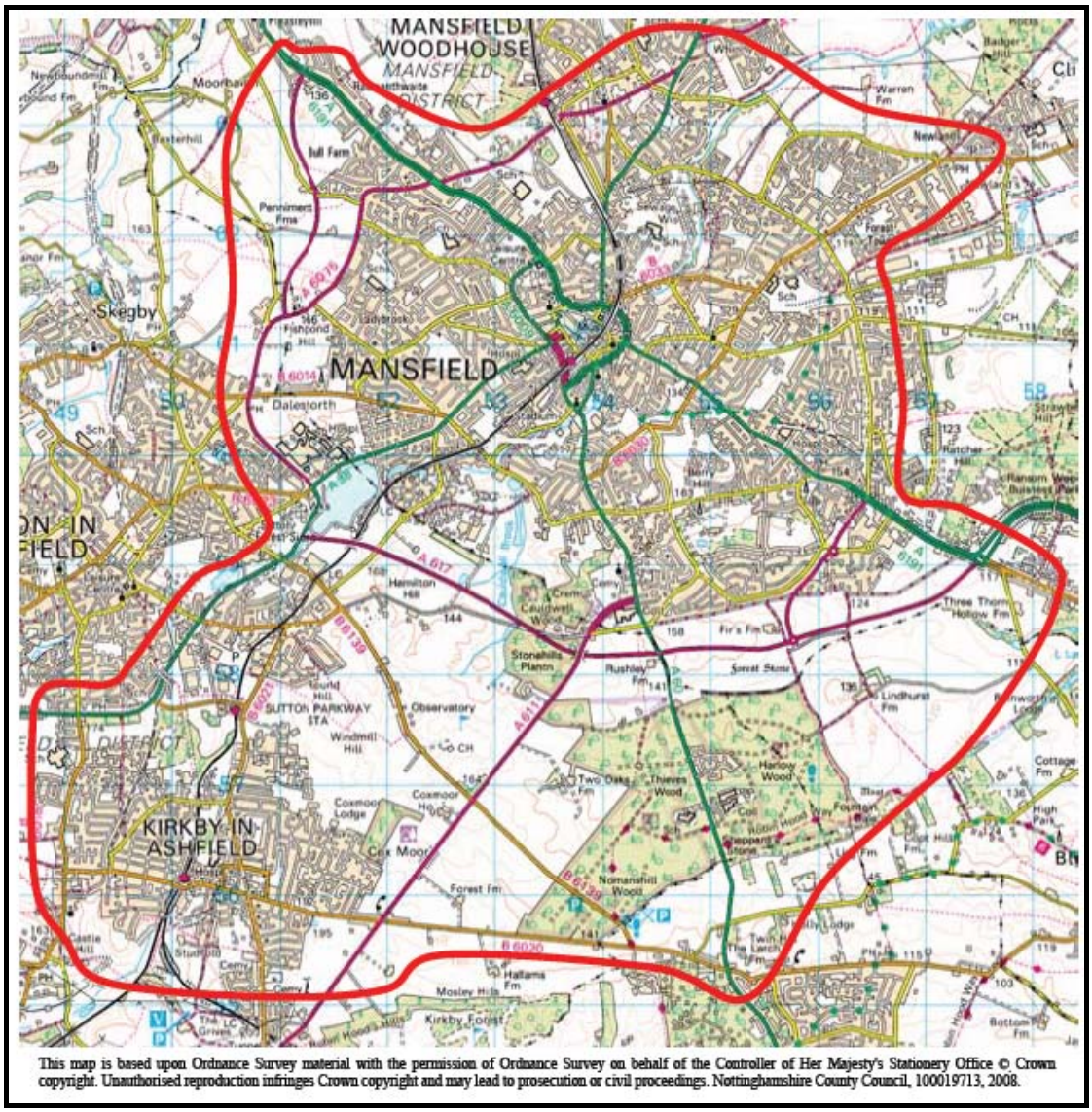
1 HIGHWAY NETWORK

1.1 Introduction

1.1.1 A SATURN traffic model was built in 2008 by Scott Wilson (now URS) to represent the Mansfield urban area and to test various development proposals. The model represents a 2007 base year and the validation of this model is described in detail in the Local Model Validation Report (ref: D119455/TP/02).

1.1.2 The extent of the SATURN highway model is shown below in Figure 1.

Figure 1: Geographical extent of the Mansfield SATURN traffic model



This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Nottinghamshire County Council, 100019713, 2008.

1.1.3 The model groups the various vehicle types into six separate vehicle classes by utilising two matrix levels: lights and heavies. Vehicles are then assigned to the highway network as six user classes to allow the different vehicle classes to be routed through the network along suitable paths. Modelling different user classes also provides the ability to ban heavy vehicles from travelling along certain routes where there may be a weight limit or obstacles such as low bridges. The user classes in the Mansfield traffic model are defined as:

-Level 1

- User Class 1 – Car (Work)
- User Class 2 – Car (Commute)
- User Class 3 – Car (Other)
- User Class 4 – LGV (All)

-Level 2

- User Class 5 – OGV1 (other goods vehicle: rigid chassis or up to three axles)
- User Class 6 – OGV2 (other goods vehicle: articulated with four axles plus)

1.1.4 The model was built to assess two time periods; AM peak (0800-0900) and PM peak (1700-1800).

1.1.5 The model was originally developed and calibrated to traffic data in a 2007 base year. Five years on, there is a need to check the validation and recalibrate the existing model against new 2012 traffic data to ensure that the model represents trip volumes and patterns in Mansfield.

1.1.6 Since 2007 Mansfield District will have potentially experienced changes in traffic, development completions and highway network changes. These have been reviewed and implemented into an update of the traffic model.

1.1.7 There have also been updates to various government guidance since the 2007 base model was built and the SATURN suite of software has also been updated, to version 11.1.09.

1.1.8 TEMPRO is a software programme, which is used with the DfT's National Trip End Model (NTEM) database, to forecast the growth in trip ends for planning districts across England. TEMPRO is regularly updated based upon emerging patterns of planned residential development and employment opportunities. The latest version of NTEM is version 6.2 and was issued by the Department for Transport in April 2012.

1.2 2012 Network building

1.2.1 The highway network was reviewed to identify any changes to the road network made since 2007. Changes may be due to developments modifying access arrangements, links being added or removed and alterations to traffic signal junction's phase timings and lane allocations. Information relating to possible highway network changes were collected and included to form a 2012 base year network.

1.2.2 Sherwood Rise/Birding Street was identified as a link that would need to be added to the modelled highway network. This was because additional development had been added nearby and associated junction changes had been implemented at the Debdale Lane end of the route.

1.2.3 Several traffic signal junctions required changes to phase times and/or lane allocations modifying. An extra traffic signalled junction was coded to represent the access arrangements into the new Mansfield bus station.

1.2.4 The traffic signalled junctions modified were:

- Ratcliffe Gate/Great Central Road
- St Peters Way/Ratcliffe Gate/Bridge Street
- A6009 Belvedere Street/Mansfield Bus Station
- A60 Nottingham Road/Portland Street
- A60 Nottingham Road/Baum's Lane
- Portland Street/Quarry Lane
- Old Mill Lane/Leeming Lane South
- A6075 Debdale Lane/Sherwood Rise
- Clipstone Road West/Old Mill Lane/Pump Hollow Road
- Eakring Road/Oak Tree Lane
- Bellamy Road/Southwell Road West

1.2.5 The traffic model uses generalised costs to calculate the best route through the highway network. Generalised cost is a function of the cost of time (pence per minute - PPM) and the cost of distance (pence per kilometre – PPK). The parameters used in the calculation of generalised cost were updated by the Department for Transport in the DfT's draft TAG unit 3.5.6 of June 2012. These values were use to update the generalised costs for the base model.

1.2.6 Using different values for PPM and PPK may encourage different route patterns through the model and therefore differences in traffic volumes on certain links. The PPM and PPK parameters used in both the 2007 and 2012 base models are presented below in Table 3 and Table 4 for the AM and PM peak time period.

Table 3: AM Peak generalised cost parameters

User Class	PPM (2007)	PPM (2012)	PPK (2007)	PPK (2012)
UC1	58.15	54.59	10.15	14.32
UC2	10.77	12.35	8.80	7.67
UC3	13.98	15.75	8.80	7.67
UC4	21.83	20.67	12.35	16.14
UC5	19.26	18.20	27.61	33.17
UC6	19.26	18.20	43.33	62.56

Table 4: PM Peak generalised cost parameters

User Class	PPM (2007)	PPM (2012)	PPK (2007)	PPK (2012)
UC1	58.15	54.59	10.15	14.37
UC2	10.77	12.35	8.80	7.69
UC3	13.98	15.75	8.80	7.69
UC4	21.83	20.67	12.35	16.16
UC5	19.26	18.20	27.61	33.32
UC6	19.26	18.20	43.33	62.85

1.2.7 Tables 3 and 4 above show that the change in PPM and PPK values in 2012 are generally close to the 2007 values. This gives confidence that there will not be excessive reassignment as a result of the new PPM and PPK values.

1.3 2012 Matrix Building

1.3.1 Traffic growth in the Mansfield area between 2005 and 2011 (2012 data was unavailable) was identified by Nottinghamshire County Council's long term traffic counters to be -6.1% as shown in Table 5 below. The 2007 base matrix was therefore reduced to represent the lower volumes of traffic in 2011.

Table 5: NCC long term traffic trend data in Mansfield

GROWTH IN ANNUAL AVERAGE DAILY TRAFFIC: 2005 TO 2011							
AREA / LOCATION	2005	2006	2007	2008	2009	2010	2011
Mansfield / Sutton	100.0	99.3	99.9	98.6	98.1	95.3	93.9

1.3.2 Housing and employment developments in Mansfield District that were delivered between 2007 and 2012 were identified. This was in terms of the numbers of houses built for residential sites and the gross floor area for employment sites. Trip rates for housing and employment were extracted from the TRICS database and applied to the individual developments. All identified developments within Mansfield District were allocated to their relevant model zone based upon OS coordinates. The trip patterns for the

model zones were applied to the new development trips, which is a reasonable assumption as land uses were generally similar to the development being added. The development trips generated, added to each specific model zone, are given below in Table 6.

Table 6: Development trips added; 2007 - 2012

Model Zone		AM Peak		PM Peak	
Name	No.	Out	In	Out	In
Warsop	11	75	23	42	6
New Clipstone	21	7	34	29	5
Berry Hill (UDM Centre)	25	4	1	2	4
Bellamy Rd (res)	26	4	3	3	3
Anglia Way	27	4	28	24	4
Berry Hill Quarry	31	56	17	31	47
Forest Rd/Berry Hill Rd	32	20	6	11	16
Oak Tree Lane (East)	33	10	3	6	8
Fisher Lane	37	1	2	2	1
Carter Lane (West)	39	6	2	3	5
Crown Farm	41	1	4	4	1
Old Mill Lane S.	45	4	1	2	3
Forest Town (East)	48	6	2	3	5
Old Mill Lane N.	50	52	16	29	44
Mans. Woodhouse (Mans. Rd)	56	7	2	4	6
The Park/Queen Eliz. G.S. (Girls)	63	20	6	11	16
Kings Mill (East)	64	2	12	10	2
Ladybrook (North)	67	8	3	5	7
Ladybrook (South)	69	5	2	3	5
Sheepbridge Lane (South)	72	9	3	5	8
Town Centre (North)	84	6	2	3	5
Town Centre (East)	88	6	2	3	5
Carr Bank	90	40	12	22	34
Southwell Road (Car dealerships)	170	5	28	24	4
Oakham Business Park	175	6	23	19	4
The Pastures Area	179	8	3	5	7
Mansfield Woodhouse Stn/Grove Way Area	183	25	8	14	21

1.3.3 Implementing traffic growth and interim developments resulted in a 2012 prior matrix. The prior matrix totals are presented below in Table 7.

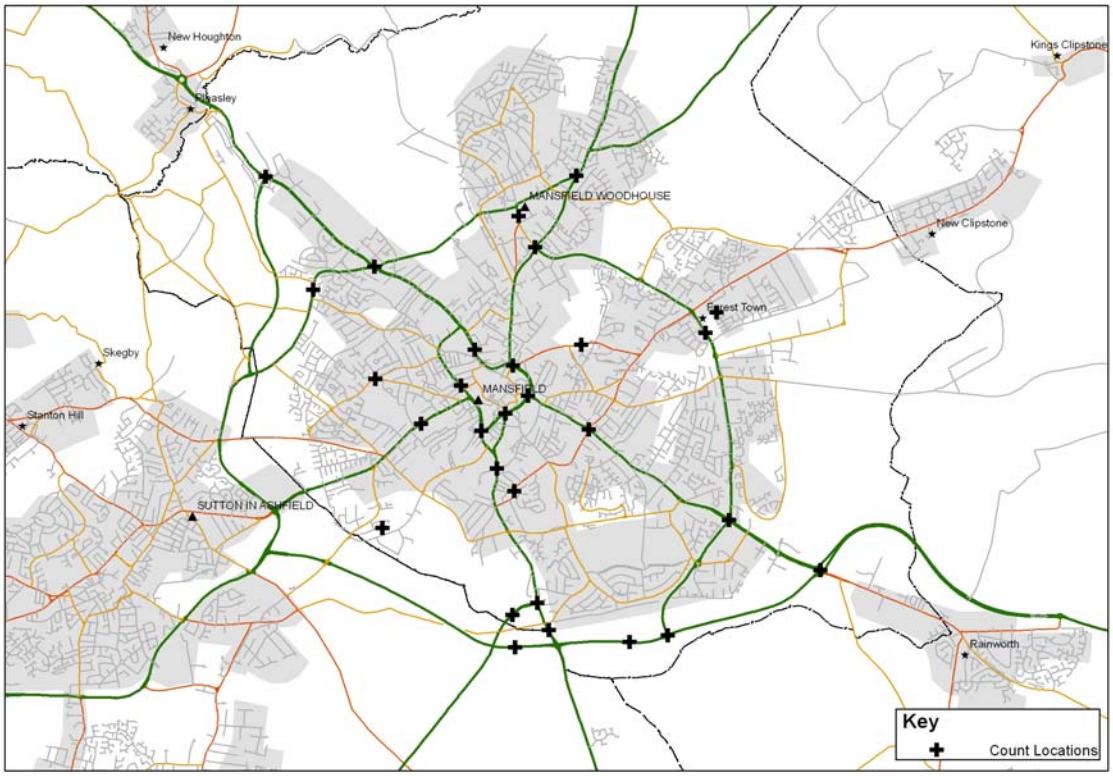
Table 7: 2012 Prior matrix totals

Area	AM Peak	PM Peak
User Class (UC) 1	804	863
UC2	20,373	21,865
UC3	3,217	3,452
UC4	2,413	2,589
UC5	919	301
UC6	1,123	369
Total	28,848	29,440

1.4 Assignment Of Prior Matrix

1.4.1 To check how realistic the 2012 base network and prior matrix are, it was necessary to check link and junction flows against observed count data. Previously the Mansfield SATURN traffic model was validated to 2007 counts where it provided a good level of fit and satisfied the Design Manual for Roads and Bridges (DMRB) validation criteria. More recent counts were collected between 2008 and 2012 in the form of DfT passing counts and permanent traffic counts operated by Nottinghamshire County Council. A set of new junction counts were also commissioned as part of this study in July 2012. A plot of count locations is indicated in Figure 2.

Figure 2: Location of Traffic Count Sites (2008 to 2012)



1.4.2 The 2012 assignments were compared against these newer counts to identify the level of validation within the model. The criteria for what constitutes acceptable flow differences between a traffic model and count data is defined by DMRB and shown below in Table 8.

Table 8: DMRB Validation criteria

Criterion	Measure	Acceptable
Flow Criteria		
1. Observed flow < 700 vph	Modelled flow within ±100	>85% of links
Observed flow 700 to	Modelled flow within	>85% of links
Observed flow > 2,700 vph	Modelled flow within ±400	>85% of links
2. Total screen line (>5 links)	Within ±5%	All or nearly all screen lines
GEH Criteria		
3. GEH statistics for individual	GEH < 5	>85% of links
4. GEH statistic for screen line totals	GEH < 4	All (or nearly all) screen lines
Note: 1. Screen lines containing high flow routes such as motorways should be presented both including and excluding such routes. 2. All comparisons to be based on directional hourly flows.		

1.4.3 The results of this comparison (using industry standard HA/DfT validation criteria of "GEH statistic" and "Flow match") are provided in the following table:

Table 9: Prior Validation Statistics

Summary of Links (from Turns) and DfT Passing				
	AM	% of link counts	PM	% of link counts
Total link counts	126		126	
GEH Pass	91	72.2	89	70.6
Flow Pass	91	72.2	86	68.3

1.4.4 The prior matrix assignment did not meet the DMRB criteria because 72.2% of links in the AM peak and 70.6% of links in the PM passed the GEH criteria and the target is 85% of links. Having established a 2012 matrix based upon observed data and including new traffic flow information and known developments, it is good practice to see if highway network adjustments can improve the fit before looking at matrix manipulation.

1.4.5 The network was reviewed again to but it was deemed to be representative of the highway network and so adjustments to the matrix were required.

2 2012 MATRIX ESTIMATION

2.1 ME2 Method

2.1.1 Within the SATURN suite of software, there is a facility to run matrix estimation. This process requires count data as an input and adjusts the prior matrix to meet the specified link counts by selectively factoring the appropriate zones. As advised in the SATURN manual: "SATME2 should only be applied after all other possible forms of validation on the network and original trip matrix have been carried out."

2.1.2 Having considered network coding and routeing patterns in the previous section, matrix estimation was considered the best way forward to provide a suitably calibrated matrix for assignment onto the highway network.

2.1.3 All the 2012 counts were entered into the matrix estimation procedure and to limit the amount of adjustment made to the prior matrix the maximum balancing factor was limited to 2. At each pass any cell can only be factored in the range of ½ to 2. This was to ensure that cell values do not change by an excessive amount when attempting to match to a count.

2.1.4 The calibration results are presented below for the AM and PM peak period.

AM Peak

Flow > 2700: Modelled within 400 of observed = No links in this criteria

Flow > 700: Modelled within 15% of observed = 87.5% - 14 out of 16

Flow < 700: Modelled within 100 of observed = 97.1% - 133 out of 137

All links - GEH statistic < 5.0 = 85.7% - 132 out of 154

PM peak

Flow > 2700: Modelled within 400 of observed = No links in this criteria

Flow > 700: Modelled within 15% of observed = 80.1% - 17 out of 21

Flow < 700: Modelled within 100 of observed = 97.0% - 128 out of 132

All links - GEH statistic < 5.0 = 88.3% - 136 out of 154

2.2 ME2 Checks

2.2.1 After matrix estimation the AM and PM peak models meet the DMRB guidelines and provide a good level of fit against the 2012 observed count set.

2.2.2 To ensure that the outputs of the matrix estimation process has not distorted the matrix unacceptably several checks were undertaken. The matrix totals are presented below.

Table 10: 2012 Post ME Base matrix totals

Area	AM Peak	PM Peak
User Class (UC) 1	823	904
UC2	20,847	22,903
UC3	3,292	3,616
UC4	2,469	2,712
UC5	726	247
UC6	887	303
Total	29,044	30,685

2.2.3 Compared with the prior matrix totals in Table 7, the Post matrix estimation totals show small differences in the overall size of the matrices, +0.7% in the AM Peak and +4.2% in the PM Peak overall. It is noted that the PM Peak increase is almost equal to the reduction in growth applied earlier, however the earlier reduction was applied globally to the whole matrix but the matrix estimation has increased individual cells by different amounts.

2.2.4 Each matrix cell can be analysed to identify the changes between pre and post matrix estimation. The number of cells changed identify whether the changes are widespread. To identify the significance of the cell changes, it is necessary to identify the number of trips changed. There could be large percentage changes to cells containing a small, or even fractional, number of trips. Matrix changes for the AM Peak period are given in Figures 3 and 4 below. PM Peak period matrix changes are presented in Figures 5 and 6.

Figure 3: Matrix changes, cell by cell, AM Peak Period

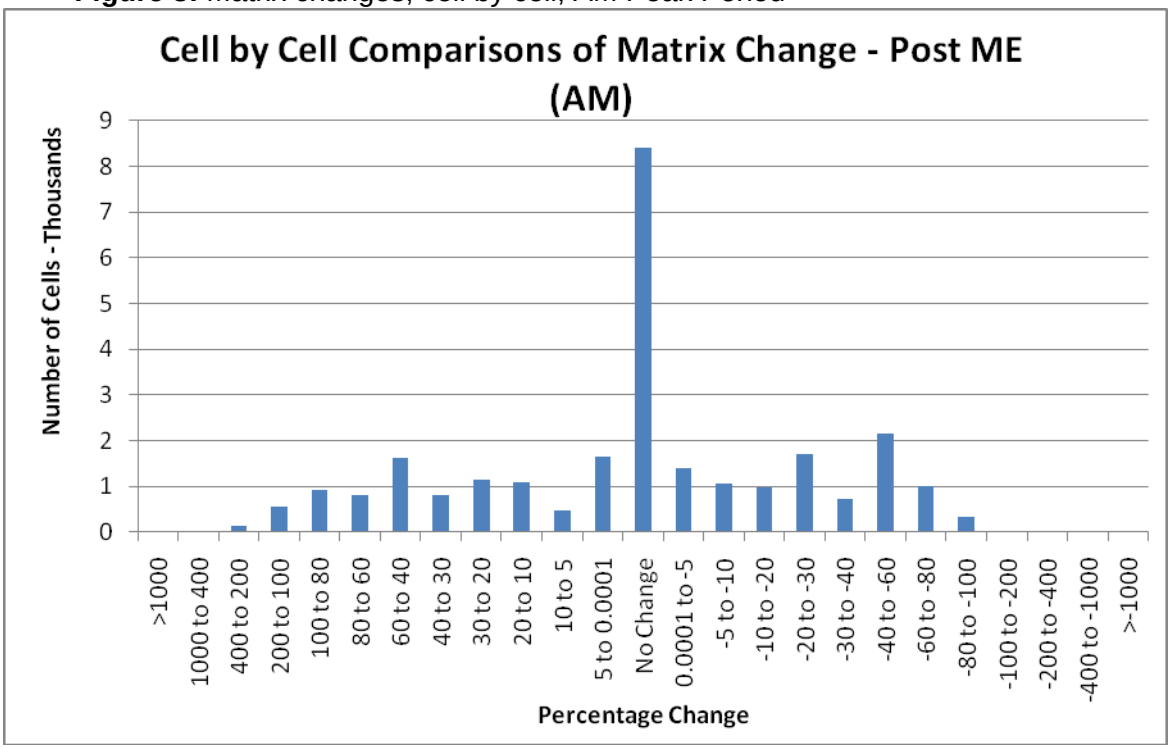


Figure 4: Matrix changes, number of trips, AM Peak Period

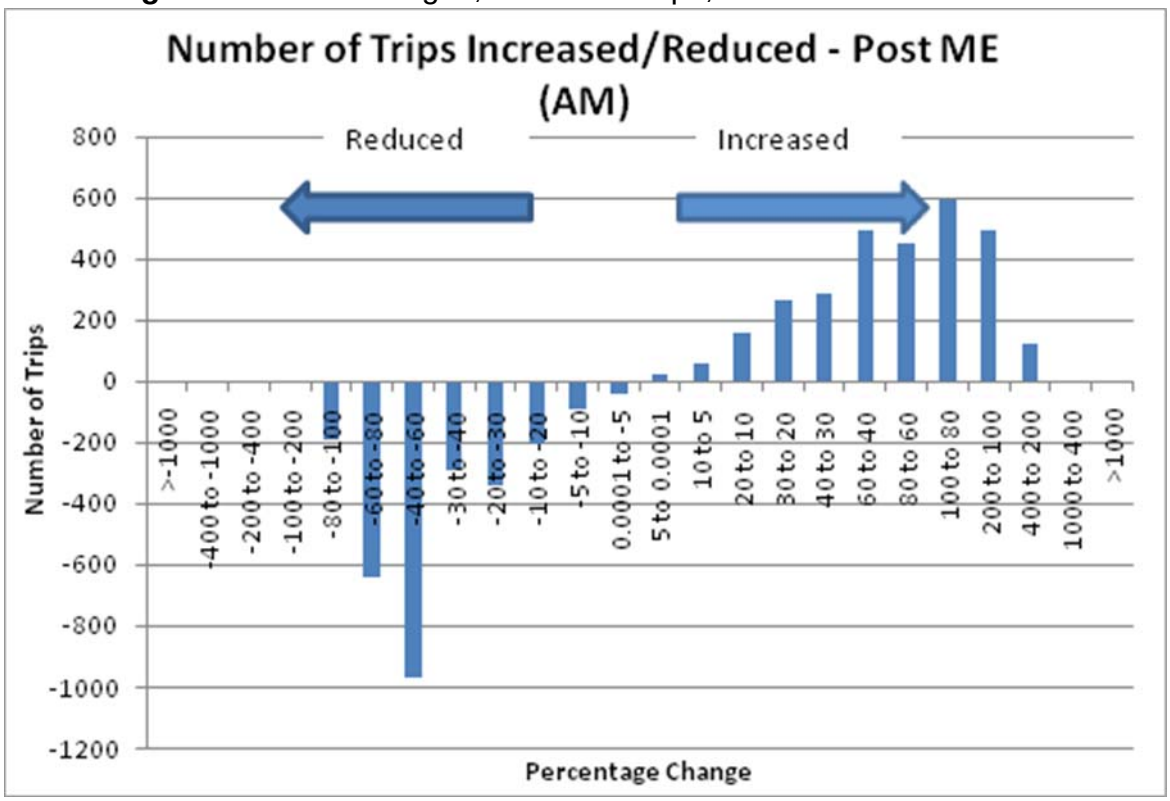


Figure 5: Matrix changes, cell by cell, PM Peak Period

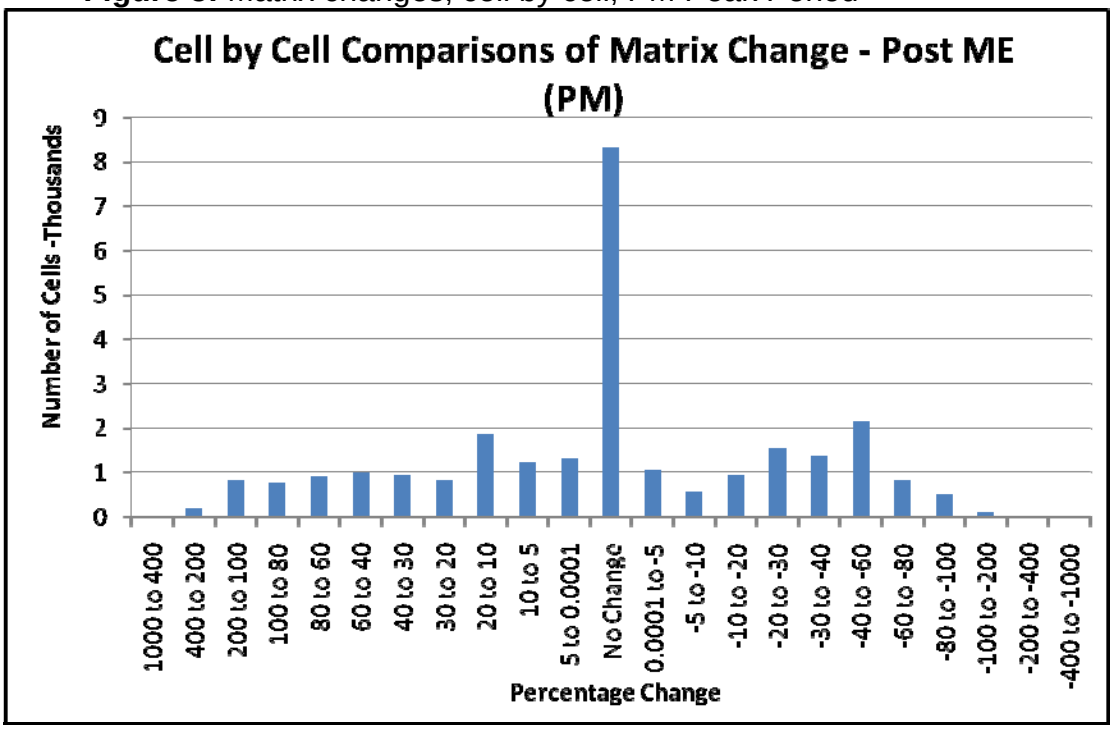
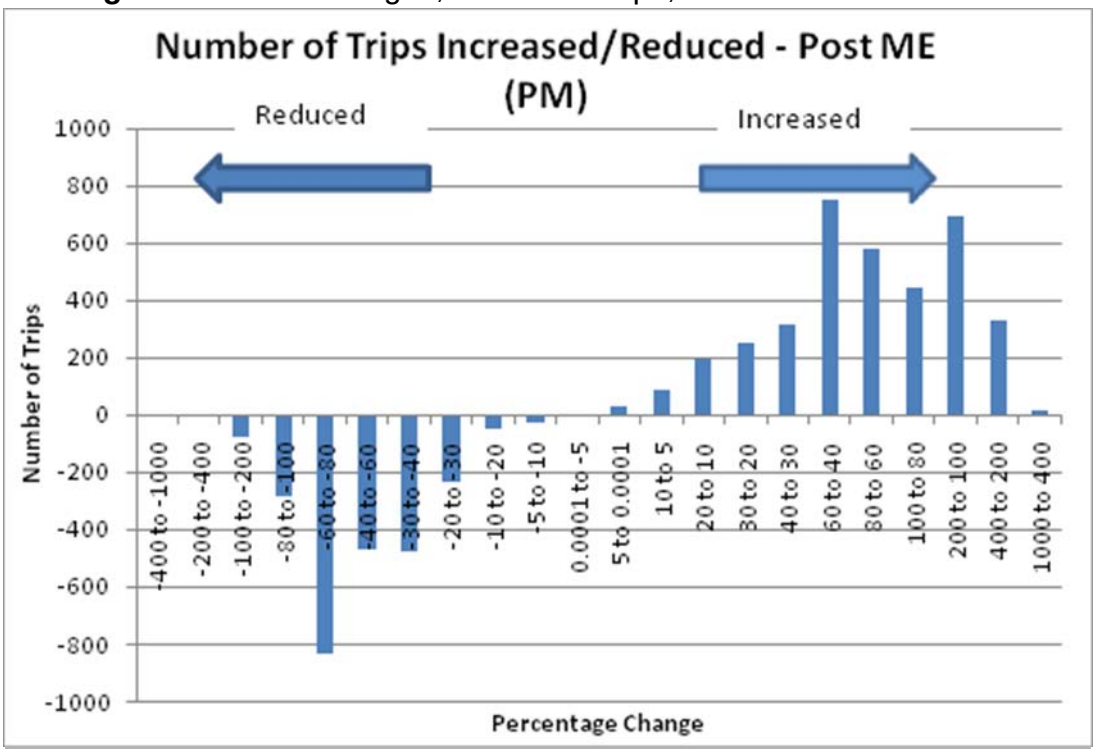


Figure 6: Matrix changes, number of trips, PM Peak Period



2.2.5 Overall individual matrix cell changes are generally less than ±100% of trips. This occurs, despite the balancing factor being 2, because the matrix estimation process makes adjustments to the matrix on assessment of each count.

2.2.6 The numbers of trips increased or reduced are not biased towards the larger percentage change bands suggesting that adjustments are being made across the matrix and are not limited to large changes to a small number of individual movements.

2.2.7 The Trip Length Distribution was analysed for differences occurring between the pre and post matrix estimation process. The analysis is presented below in Figures 7 and 8 for the AM and PM Peak respectively.

Figure 7: AM Peak Trip Length Distribution Comparison

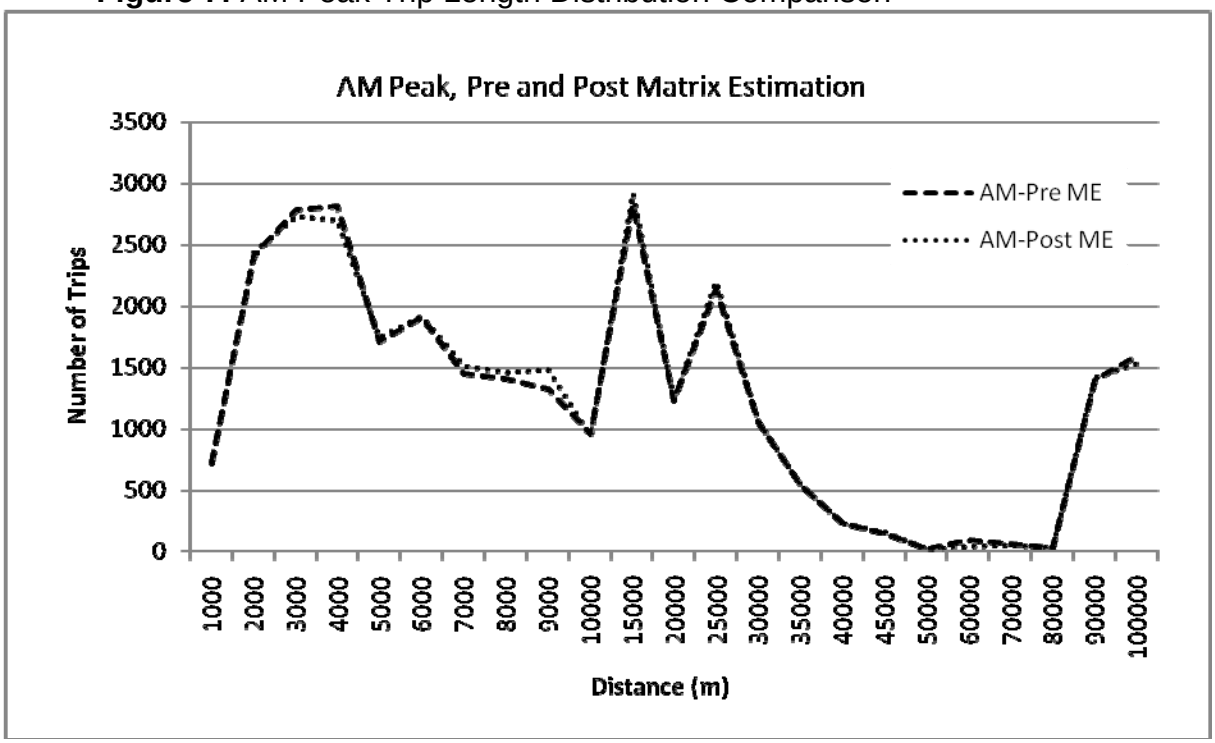
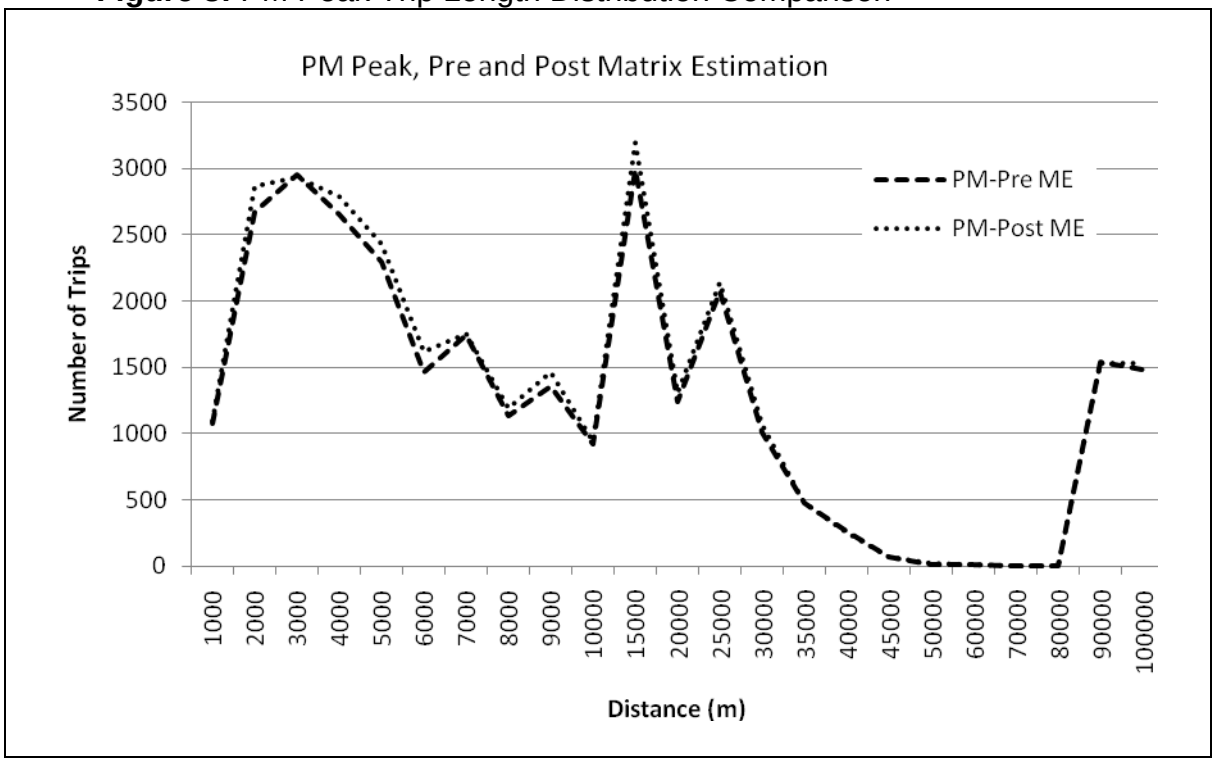


Figure 8: PM Peak Trip Length Distribution Comparison



2.2.8 The AM and PM Peak trip length distributions show that the matrices have not been distorted towards either shorter or longer distance trips after matrix estimation. Overall trip length distribution patterns are similar across all distance bands.

2.2.9 Following the checks on the post matrix estimation outputs, the process appears to have created matrices which are reasonable and suggests that small adjustments have been made and comply with the statement in the SATURN manual:

2.2.10 "The changes introduced by ME2 should therefore be relatively minor and incremental in nature rather than large scale changes which considerably distort the prior trip matrix".

2.3 Assignment Convergence

2.3.1 The AM and PM peak hour model assignments were prepared by assigning the updated base year trip demand matrices to the updated base year networks of Mansfield. The 'Wardrop equilibrium assignment' method was used to route each trip along the minimum travel-cost paths. Because the path taken by each trip can alter the speed of traffic and the capacity of

junctions in the network then this will impact upon the cost of travel for other trips. The trip assignment and junction simulation process therefore has to be repeated through successive loops until a stable condition is found in which all trips are consistently routing along the same paths and every trip is on its minimum travel-cost path.

2.3.2 Convergence parametric outputs are used to provide an objective view of the assignment's stability. The parametric outputs relating to convergence of the 2012 baseline year AM and PM peak hour assignments are summarised in Table 11.

Table 11: Baseline 2012 Assignment Convergence Parametric Outputs

2012 Modelled Time Period	Final Loop	No of Assignment Iterations	Last Iteration Delta (%)	% Flow-Change	% Delay
AM peak hour	9	4	0.10	99.2	99.7
PM peak hour	11	4	0.07	97.7	99.0

2.3.3 The final delta values are in the range 0.07% to 0.10%. As no value exceeds the DMRB target of 1%, this indicates a stable equilibrium assignment traffic model, which is not subject to wide route choice variations or large flow variations due to assignment iteration differences.

2.3.4 The percentage flow-change statistic from the last assignment iteration of the final loop range from 97.7% to 99.2%. This is the percentage of links for which the flows differ by less than 5% between successive assignments.

2.3.5 The DMRB states that the percentage flow-change statistic should exceed 90% for the last four iterations. The model parameter NISTOP was set at 4, which ensured that this condition was met in all of the forecasting models.

2.3.6 The percentage delays statistic for the AM peak and PM peak assignments range from 99.0% to 99.7%. This statistic reports the percentage of turning movements fro which the delays vary by more than 5% after the junction simulation process in the final loop. These percentage delay results exceed the DMRB requirement of 90% and indicates a stable model.

2.3.7 The traffic model's convergence parameters exceed (i.e. are better than) the convergence requirements of DMRB. Differences in model output when examining different networks will therefore be due to scheme differences rather than model instability.

3 CONCLUSION

3.1.1 The 2007 base model network was updated with new traffic signal information where available. Other network adjustments were also made to incorporate changes to the highway network since 2007.

3.1.2 Traffic count data from Nottinghamshire County Council identified traffic flow decreases across the Mansfield area between 2007 and 2012. This was applied to the matrix. Completed post-2007 developments were added into the matrix and this was assigned onto the network.

3.1.3 Whilst the 2007 Mansfield traffic model provided a good level of fit with the 2007 traffic counts, entering the new 2012 count set to the 2012 assignment provided a lower level of validation.

3.1.4 A series of adjustments were made to the network to achieve a greater level of fit against the DMRB guidelines, however matrix estimation was deemed necessary.

3.1.5 Following matrix estimation, the 2012 assignment provides a good level of fit against the counts in both the AM and PM peaks as shown in Table 12 below. The matrices were checked for realism and considered to be acceptable.

Table 12: Final Calibration Statistics

	AM	% of link counts	PM	% of link counts
Total link counts	154		154	
GEH Pass	132	85.7	136	88.3
Flow Pass	148	96.1	145	94.1

3.1.6 The 2012 networks and assignments provide a realistic representation of the modelled links in Mansfield and therefore can be used for onward work and informing decisions in the ‘Mansfield Transport Study’.

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APPENDIX C
Committed Development Sites

Appendix C

Committed Major Housing Development Sites

Planning Ref.	Housing Ref.	Development Name	Site Area (Ha)	Total Dwellings	Not Started	Under Construction	Completed	Easting	Northing	Address Prefix	Address 1	Address 4	Postcode	Proposal	Highway Improvements
2006/0671/ST	H-Be014(J)	Berry Hill Quarry (Area J)	1.00	22	0	1	21	454898	359658		LAND OFF BERRY HILL PARK	MANSFIELD		RESIDENTIAL DEVELOPMENT OF 22 NO. DWELLINGS - RESUBMISSION	New traffic signalised junction on Berry Hill Lane providing link through development to Southwell Road West. - Completed some years ago.
2003/0768/ET	H-Be033	Berry Hill Hall	2.18	95	2	92	1	455011	359542	BERRY HILL HALL	BERRY HILL LANE	MANSFIELD	NG184JR	CONVERSION AND EXTENSION OF BERRY HILL HALL AND OUTBUILDINGS TO FORM 36 NO. APARTMENTS AND THE ERECTION OF 76 NO APARTMENTS	New access into site
2005/0904/ST	H-Be034	Nottingham Road/Forest Road	1.81	78	0	3	75	453952	359914		LAND OFF NOTTINGHAM ROAD/ FOREST ROAD	MANSFIELD		APPROVAL OF RESERVED MATTERS APPLICATION FOR ERECTION OF 78 NO. DWELLINGS WITH ASSOCIATED ACCESS, PARKING AND LANDSCAPING	New access into site
2009/0397/ST	H-Be035a	Baums Lane/Forest Road	0.30	14	14	0	0	454023	360275	(FORMER) BAGGALEY HOUSE SITE	BAUMS LANE	MANSFIELD	NG18 2RA	14 NO. HOUSES - AMENDMENT TO PART OF RESERVED MATTERS APPROVAL 2005/0602/ET	
2007/0457/ST	H-Be047	Land off Kings Walk (Phase 2&3) Berry Hill Quarry	2.49	109	24	23	62	454725	359692		LAND OFF KINGS WALK, (PHASE 2 & 3), FORMER BERRY HILL QUARRY, MANSFIELD			RESIDENTIAL DEVELOPMENT OF 109 UNITS	New junction completed.
2008/0287/ST	H-Be050	Former Peter Donnelly Site Black Scotch Lane	0.85	11	0	11	0	455431	359627	FORMER SITE OF THE PETER DONNELLY CENTRE	BLACK SCOTCH LANE	MANSFIELD	NG18 4JW	CONSTRUCTION OF 11 NO. DETACHED DWELLINGS	New traffic signalised junction on A60 - completed some yeqars ago.
2009/0655/ST	H-Be056	Former Mansfield Sand Co Sandhurst Avenue	3.35	107	107	0	0	454213	359593	MANSFIELD SAND COMPANY LTD	SANDHURST AVENUE	MANSFIELD	NG18 4BE	OUTLINE APPLICATION WITH SOME MATTERS RESERVED FOR RESIDENTIAL DEVELOPMENT (107 NO. UNITS)	Creation of new access onto Sandhurst Avenue. Installation of a MOVA on traffic lights at Berry Hill Lane / Nottingham Road junction.
2010/0271/ST	H-Be059	Former Evans Halshaw Nottingham Road	1.92	80	80	0	0	454323	358995	FORMER EVANS HALSHAW SITE,	NOTTINGHAM ROAD	MANSFIELD	NG18 4SG	OUTLINE PLANNING APPLICATION INCLUDING THE RESERVED MATTER OF ACCESS FOR RESIDENTIAL DEVELOPMENT COMPRISING OF A MAXIMUM OF 80 NO. DWELLINGS (85,350 SQUARE FEET NET INTERNAL FLOOR AREA)	Creation of new access into site from Nottingham Road. Removal of parking bays and introduction of TRO to protect visibility splays. Installation of interactive speed sign. Amend central hatching on Nottingham Rd and right turn harbourage.
2006/0441/ST	H-Be060	76 Berry Hill Lane	0.19	19	19	0	0	454462	359468		LAND AT 76 BERRY HILL LANE	MANSFIELD	NG184BW	APPROVAL OF RESERVED MATTERS APPLICATION FOR RESIDENTIAL DEVELOPMENT	New junction to access site
2006/0079/NT	H-Bi017	Land off King Road and Wood Street	7.24	271	130	23	118	456551	368034		OFF KING ROAD, MARKET WARSOP	MANSFIELD	NG200BQ	PROPOSED RESIDENTIAL DEVELOPMENT 263 DWELLINGS AND ASSOCIATED WORKS	
2009/0236/NT	H-Bi045	Goose Farm Wood Street	0.69	24	24	0	0	456537	368180	GOOSE FARM	WOOD STREET	WARSOP	NG20 0AX	RESIDENTIAL DEVELOPMENT OF 24 UNITS	
2008/0197/NT	H-Bi046	Land off Sherwood Street and Oakfield Lane	1.35	52	33	19	0	456987	367223	LAND OFF	SHERWOOD STREET AND OAKFIELD LANE	WARSOP	NG20 0JY	CONSTRUCTION OF 52 NO. DWELLINGS AND ANCILLARY WORKS	
2009/0235/NT	H-Bi047	Land at the rear of Cherry Paddocks	0.70	19	19	0	0	457180	367524	LAND AT/TO THE REAR OF CHERRY PADDOCKS	CHERRY GROVE	WARSOP	NG20 0JZ	OUTLINE APPLICATION FOR A RESIDENTIAL DEVELOPMENT OF 19 DWELLINGS (INCLUDING ACCESS) WITH DEMOLITION OF CRANWELL	
2008/0862/ST	H-Br027	Site of former Green Dragon Pub Marlborough Road	0.25	12	9	3	0	452717	362038	SITE OF FORMER GREEN DRAGON PUBLIC HOUSE	CORNER OF MARLBOROUGH ROAD/BROOMHILL LANE	MANSFIELD		6 NO. DETACHED 4 BEDROOM HOUSES AND 6 NO. SEMI-DETACHED 3 BEDROOM HOUSES	Creation of vehicle access crossing for new dwellings. Repositioning of traffic calming features (speed bumps) within Broomhill Lane (adjacent plots 11-12) and Marlborough Road (adjacent plot 7).
2004/1212/ET	H-Ea039	Eakring Road/Eakring Close	0.67	31	0	3	28	455743	361038		LAND AT CORNER OF EAKRING ROAD AND EAKRING CLOSE	MANSFIELD		REVISED APPLICATION FOR APARTMENT BLOCK AND PARKING COURT ONLY	
2006/0849/NT	H-Fte019	Land at 110-114 Clipstone Road West	0.63	24	0	11	13	457012	362558		LAND AT 110 - 112 CLIPSTONE ROAD WEST	FOREST TOWN	NG19 0HL	PROPOSED RESIDENTIAL DEVELOPMENT OF 23 PROPERTIES (RESUBMISSION OF APPLICATION 2006/0582/NT).	New access onto Clipstone Road West
2007/0843/NT	H-Fte026	Land to the rear of 66-70 Clipstone Road West	0.42	11	11	0	0	456592	362277	LAND TO THE REAR OF	66-70 CLIPSTONE ROAD WEST	FOREST TOWN	NG19 0BU	OUTLINE APPLICATION FOR RESIDENTIAL DEVELOPMENT (11 DWELLINGS)	
2008/0056/NT	H-Fte034	Langwell Drive	0.55	18	18	0	0	457475	362818	LAND AT NEWLANDS	OFF CLIPSTONE ROAD EAST	FOREST TOWN	NG19 0HT	OUTLINE APPLICATION FOR 18 SEMI-DETACHED HOUSES, INCLUDING ACCESS AND LAYOUT	
2005/0802/NT	H-Ftw003	Land fronting Holly Road	1.82	159	0	2	157	456093	362571		LAND OFF HOLLY ROAD	MANSFIELD	NG190RB	RESIDENTIAL DEVELOPMENT CONSISTING OF 40 NO. 3 AND 4 BEDROOM PROPERTIES	New traffic island at Old Mill Lane/Sandlands Way - completed some years ago.
2007/1120/NT & 2008/0869/NT	H-Ftw008 & H-Ftw038	Land off Sandlands Way South (Parcel A & Parcel B)	13.46	329	303	15	11	455525	362770	LAND OFF	SANDLANDS WAY	FOREST TOWN	NG19 0HA	RESIDENTIAL DEVELOPMENT AND ASSOCIATED ROADS, SEWERS AND OPEN SPACE - RESUBMISSION	see above
2010/0163/NT	H-Ftw042	Former Daleside Care Home Stuart Avenue	0.62	22	14	8	0	455840	361741	FORMER DALESIDE CARE HOME	STUART AVENUE	FOREST TOWN	NG19 0AD	DEMOLITION OF EXISTING CARE HOME, CONSTRUCTION OF 22 NO. RESIDENTIAL DWELLINGS AND ANCILLARY WORKS	
2007/0320/ST	H-Gf012	Vauxhall Grage Sutton Road	0.87	41	41	0	0	452213	360062	VAUXHALL GARAGE	SUTTON ROAD	MANSFIELD		OUTLINE APPLICATION FOR RESIDENTIAL DEVELOPMENT COMPRISING 41 NO. UNITS AND FORMATION OF NEW MEANS OF ACCESS FROM SUTTON ROAD	Alteration of markings on Sutton Road to provide right turn lane into site. Provision of new access onto Sutton Road.
2009/0678/ST	H-Li032	Bellamy Road Estate	1.38	43	19	14	10	456215	358792		BELLAMY ROAD	MANSFIELD		PROPOSED ERECTION OF 43 NO. DWELLINGS ON 4 NO. SEPARATE SITES WITHIN THE BELLAMY ROAD ESTATE - REGULATION 3 APPLICATION	
2006/0071/NT	H-Me028	Land at West St and King St Warsop Vale	5.20	129	41	13	75	454846	368055	LAND BOUNDED BY KING STREET, HEWETT STREET, WEST STREET	AND WHEATSHEAF TERRACE, WARSOP VALE	MANSFIELD		APPROVAL OF RESERVED MATTERS FOR RESIDENTIAL DEVELOPMENT COMPRISING OF 129 NO. NEW UNITS AND PUBLIC OPEN SPACE	
2011/0318/NT	H-Me040	Site at former Wood Bros Mansfield Road	2.49	58	58	0	0	455944	366448	FORMER WOOD BROS. TIMBER YARD	MANSFIELD ROAD	SPION KOP	NG20 0EQ	MIXED USE DEVELOPMENT COMPRISING OF 1 NO. 40 BEDROOM CARE HOME AND 58 NO. DWELLINGS TOGETHER WITH ACCESS, LANDSCAPING AND PUBLIC OPEN SPACE. (RE-SUBMISSION 2010/ 0468/NT)	Realignment of the A60 outside of the site to include a right turn filter lane. A further filter lane is proposed to the south of the site to access the proposed golf leisure complex to the west.
2008/0265/NT	H-Me042	Elkesley House Elkesley Road	0.21	10	10	0	0	458233	370050	ELKESLEY HOUSE	ELKESLEY ROAD	MEDEN VALE	NG20 9PS	OUTLINE APPLICATION FOR RESIDENTIAL DEVELOPMENT, INCLUDING ACCESS	
2008/0027/NT	H-Me046	Netherfield Lane	0.12	12	12	0	0	458144	369604	WELBECK SERVICE STATION	NETHERFIELD LANE	MEDEN VALE	NG20 9PA	PROPOSED RESIDENTIAL DEVELOPMENT OF 12 NO. APARTMENTS	
2010/0523/NT	H-Me049	Welbeck Colliery Elkesley Road	0.29	17	17	0	0	458175	369945	WELBECK COLLIERY MINERS WELFARE INSTITUTE	ELKESLEY ROAD	MEDEN VALE	NG20 9PS	2 NO. PAIRS OF SEMI-DETACHED HOUSES AND 13 NO. FLATS / APARTMENTS -APPLICATION TO REPLACE AN EXTANT PLANNING PERMISSION (2007/0550/NT) IN ORDER TO EXTEND THE TIME LIMIT FOR IMPLEMENTATION.	

Planning Ref.	Housing Ref.	Development Name	Site Area (Ha)	Total Dwellings	Not Started	Under Construction	Completed	Easting	Northing	Address Prefix	Address 1	Address 4	Postcode	Proposal	Highway Improvements
2006/0601/ST	H-Ot007	Jubilee Way South	1.04	32	0	5	27	457041	360253		LAND OFF WINSTER WAY AND JUBILEE WAY SOUTH	MANSFIELD		CONSTRUCTION OF 32 NO. DWELLINGS AND ANCILLARY WORKS	New junction completed.
2007/0267/ST	H-Ot021	Land off Briar Lane	1.27	30	30	0	0	455950	359965		LAND OFF BRIAR LANE	MANSFIELD	NG18 3HS	ERECTION OF 30 DWELLINGS ON LAND FORMERLY OCCUPIED BY ARTIFICIAL TENNIS COURTS, PLUS THE RECONFIGURATION OF BANNATYNE FITNESS'S CAR PARK AND NEW ACCESS ROAD TO SERVE BOTH DEVELOPMENTS - RESUBMISSION	
2010/0394/ST	H-Ph032	Land at Booth Crescent/Peel Crescent	0.21	12	12	0	0	451792	362726		LAND AT BOOTH CRESCENT/PEEL CRESCENT	MANSFIELD	NG19 7LF	OUTLINE APPLICATION INCLUDING THE RESERVED MATTERS OF ACCESS, LAYOUT AND SCALE FOR THE CONSTRUCTION OF 12 NO. TWO STOREY HOUSES	
2003/0847/WT	H-Po014	Moor Lane	1.51	49	0	5	44	452875	360533	MAUN INDUSTRIES LTD	MOOR LANE	MANSFIELD		PROPOSED DEMOLITION OF EXISTING WORKS AND ERECTION OF 49 NO DWELLINGS AND ESTATE ROAD	
2005/1015/ST	H-Po022	Stockwell Gate	0.39	83	0	83	0	453485	360934	FORMER SHOE CO SITE	STOCKWELL GATE	MANSFIELD		DEMOLITION OF EXISTING BUILDINGS AND CONSTRUCTION OF OFFICES, 78 NO. APARTMENTS AND 4 NO. HOUSES WITH ASSOCIATED CAR PARKING	
2007/0675/ST	H-Po032	Land astride Victoria St 56-60 and 49-73	1.33	43	43	0	0	453446	360677		LAND ASTRIDE VICTORIA STREET, (56 - 60 EVEN AND 49 - 73 ODD)	MANSFIELD	NG18 5RR	OUTLINE APPLICATION FOR THE DEMOLITION/CLEARANCE OF EXISTING BUILDINGS, THE ERECTION OF UP TO 58 DWELLINGS AND EMPLOYMENT USES. ALL MATTERS RESERVED - RESUBMISSION	
2008/0224/ST	H-Po033	Former Speeds Garage Nottingham Road	0.24	41	41	0	0	453868	360664	FORMER SPEEDS GARAGE	NOTTINGHAM ROAD	MANSFIELD		MIXED USE DEVELOPMENT COMPRISING OFFICE ACCOMMODATION (1542M SQ) AND 41 NO. RESIDENTIAL UNITS	
2008/0167/ST	H-Po036	Quarry Lane	0.25	21	21	0	0	452974	359979	SITE OF FORMER LORD BYRON PH	QUARRY LANE	MANSFIELD	NG18 5DD	CONSTRUCTION OF 21 NO. TWO AND THREE BEDROOM APARTMENTS TOGETHER WITH ASSOCIATED PARKING AND SITE DEVELOPMENT WORKS	New junction to access site
2009/0141/ST	H-Po037	52 Ratcliffe Gate	0.19	16	16	0	0	454446	360848		52 RATCLIFFE GATE	MANSFIELD	NG18 2JL	OUTLINE APPLICATION (WITH ALL MATTERS RESERVED) FOR 16 NO. FLATS	
2009/0504/ST	H-Po038	Sherwood Street Day Centre	0.09	15	15	0	0	453836	360579	SHERWOOD STREET DAY CENTRE	SHERWOOD STREET	MANSFIELD	NG18 1ER	15 NO. ONE BEDROOM ONE PERSON FLATS IN PROPOSED SECOND AND THIRD STOREYS TO EXISTING DAY CENTRE. SINGLE STOREY GROUND FLOOR EXTENSION FOR MEETING/TRAINING ROOM	
2010/0851/ST	H-Po040	Sheepbridge Lane/Gibbons Road	1.38	48	48	0	0	452767	360166		SHEEPBRIDGE LANE / GIBBONS ROAD	MANSFIELD		OUTLINE APPLICATION (INCLUDING ACCESS) FOR DEMOLITION OF EXISTING BUILDINGS AND CONSTRUCTION OF NEW RESIDENTIAL DEVELOPMENT (MAXIMUM 48 DWELLINGS)	New site access. Financial contribution secured by S106 to improve pedestrian crossing facilities at Sheepbridge Lane
2007/1125/NT	H-Pr010	Portland Street (West)	0.82	32	32	0	0	454347	363431	LAND OFF	PORTLAND STREET	M'FIELD WOODHOUSE	NG19 8BG	CONSTRUCTION OF 32 NO. DWELLING HOUSES AND ANCILLIARY WORKS	
2009/0783/NT	H-Pr033	Land to rear of Yorke St / Blake St	0.59	22	22	0	0	453806	362603		LAND TO REAR OF YORKE STREET/BLAKE STREET	M'FIELD WOODHOUSE		OUTLINE APPLICATION FOR 22 HOUSES WITH ALL MATTERS RESERVED	
2009/0560/ST	H-Ra058	Sherwood Garden Centre 7-9 Sherwood Hall Rd	0.26	14	14	0	0	455272	361334	SHERWOODS GARDEN CENTRE	7-9 SHERWOOD HALL ROAD, FOREST TOWN	MANSFIELD	NG18 2NH	RESIDENTIAL DEVELOPMENT COMPRISING 5 NO. APARTMENTS AND 9 NO. HOUSES - RESUBMISSION	
2006/0115/NT	H-Rh010	Land at Thoresby Avenue/Lawrence Avenue	2.64	104	5	8	91	453421	363505		THORESBY ROAD/ LAWRENCE AVENUE, MANSFIELD WOODHOUSE	MANSFIELD	NG198DD	APPROVAL OF RESERVED MATTERS FOR RESIDENTIAL DEVELOPMENT COMPRISING 101 NO. NEW UNITS	Traffic calming measures on local distributor roads.
2005/0906/NT	H-Sh013	Former Mansfield Hospital, West Hill Drive	1.14	133	133	0	0	453833	361421		WEST HILL DRIVE	MANSFIELD	NG181PL	OUTLINE PLANNING APPLICATION FOR RESIDENTIAL USE	
2003/0595/WT	H-Sh019	Former Sherwood Colliery	15.30	298	68	31	199	453623	362689	SHERWOOD COLLIERY PHASE 2	DEBDALE LANE/SHERWOOD RISE, MANSFIELD WOODHOUSE	MANSFIELD		APPROVAL OF RESERVED MATTERS APPLICATION FOR PUBLIC OPEN SPACE (LANDSCAPING DETAILS) AND DISCHARGE CONDITIONS 3, 9, 10, 11, 12, 13, 14 & 29 ON OUTLINE PLANNING PERMISSION 2000/195/WT	New signalised junction on Debadale Lane/Sherwood Rise
1998/0716/P	H-Sh025	Former Queen Elizabeth School, Woodhouse Road	0.59	11	0	10	1	453933	361730		FORMER QUEEN ELIZABETH GIRLS SCHOOL, MANSFIELD.			REFURBISHMENT OF EXISTING SCHOOL BUILDING TO FORM 11 NO. RESIDENTIAL UNITS.	
2006/0222/NT	H-Sh039	Land at Little Debdale Lane	0.91	31	16	9	6	452695	362484		LAND AT LITTLE DEBDALE LANE	MANSFIELD	NG197EU	CONSTRUCTION OF 31NO DWELLINGS AND ANCILLARY WORKS	
2008/0245/NT	H-Sh055	Birding Street	0.35	19	19	0	0	453970	362149		BIRDING STREET	MANSFIELD	NG19 7DT	RESIDENTIAL REDEVELOPMENT OF PUBLIC HOUSE, INCLUDING DEMOLITION OF ALL EXISTING BUILDINGS AND ERECTION OF 19 DWELLINGS INCLUDING 2 FLATS, 5 THREE STOREY DWELLINGS AND 12 TWO STOREY DWELLINGS, ASSOCIATED GARAGES, PARKING, LANDSCAPING AND ACCESS.	
2010/0197/NT	H-Nl011	Land South of Clipstone Road East	7.20	215	215	0	0	457631	362538		LAND AT CLIPSTONE ROAD EAST AND CROWN FARM WAY	FOREST TOWN		OUTLINE PLANNING PERMISSION (INCLUDING ACCESS) FOR THE ERECTION OF A MAXIMUM OF 215 DWELLINGS	2 No. new access points onto Crown Farm Way
2010/0432/NT	H-Nl005	Land South of Clipstone Road East	10.56	313	313	0	0	457370	362568		LAND TO THE SOUTH OF CLIPSTONE ROAD EAST	FOREST TOWN		OUTLINE PLANNING APPLICATION INCLUDING AN ACCESS OFF CLIPSTONE ROAD EAST TO PROVIDE UP TO 313 DWELLINGS TOGETHER WITH ASSOCIATED ROADS AND SEWERS AND ANCILLARY LOCAL PUBLIC OPEN SPACE	New access onto Clipstone Road East

Committed Commercial Sites

Planning Ref.	ELMR Ref.	Development Name	Site Area (Ha)	Floorspace (m2)	Type	Easting	Northing	Address Prefix	Address 1	Address 4	Postcode	Proposal	Highway Improvements
2007/0630/ST		Land at Belvedere St/Stockwell Gate/Quaker Way	0.50	3970	A1	453626	360956		LAND AT BELVEDERE ST/STOCKWELL GATE/QUAKER WAY	MANSFIELD		OUTLINE APPLICATION(ALL MATTERS RESERVED) FOR DEVELOPMENT FOR USE CLASSES A1, A2, A3, A4, A5, B1A, D1, D2, C1 - RESUBMISSION	Development will require highway works, but at this stage their form is unkown.
2008/0191/ST	E-Rw001	Sherwood Oaks Business Park	0.94	2308	SG	457089	359147	SHERWOOD OAKS BUSINESS PARK	SOUTHWELL ROAD WEST	MANSFIELD	NG18 4GT	PROPOSED NEW BUILD SHOWROOM WITH WORKSHOP AND BODYSHOP FACILITIES	New access into site from existing distributor roads within business park
2008/0254/NT	E-Yh001	Old Mill Lane Industrial Park	0.74	2770	B1a/B1c	454292	362295		LAND AT HALLAMWAY, OLD MILL LANE INDUSTRIAL ESTATE	MANSFIELD	NG19 9BG	ERECTION OF OFFICE AND LIGHT INDUSTRIAL BUILDINGS (CLASS B1), STORAGE (CLASS B8) AND ASSOCIATED VEHICLE PARKING	New access into site from existing distributor roads within business park
2010/0280/ST		Former Queens Head PH	0.09	311 533	A1/A3 B1a	453749	360996	SITE OF THE FORMER QUEENS HEAD PH	QUEEN STREET	MANSFIELD	NG18 1JL	REGULATION 4 APPLICATION FOR ERECTION OF A MIXED USE RETAIL AND OFFICE BUILDING INCLUDING SHOPS (A1), PROFESSIONAL/FINANCIAL SERVICES (A2), RESTAURANT/CAFES (A3) AND BUSINESS (B1)	
2010/0388/ST	2010/0388/ST	Land Adjacent 5 Goodacre Street	0.02	84	B8	454316	361143		LAND ADJACENT 5 GOODACRE STREET	MANSFIELD	NG18 2HH	ERECTION OF A STORAGE UNIT FOR B8 USE	New access into site
2010/0417/ST	E-Oa001	Oakham Business Park	0.69	1994	B1a/B2	452635	359244		LOWER OAKHAM WAY	MANSFIELD	NG18 5BY	CONSTRUCTION OF LIGHT INDUSTRY WORKSHOP AND ASSOCIATED TWO-STOREY OFFICES WITH TWO NEW HIGHWAY ACCESS POINTS, CAR PARKING AND WORKSHOP YARD	New access into site from existing distributor roads within business park
2010/0767/ST	2010/0767/ST	Maunside	0.27	1050	B1c/B8	452596	359735		MAUNSIDE	MANSFIELD		PROPOSED B1 (LIGHT INDUSTRY) AND B8 (STORAGE) INDUSTRIAL UNITS	4 new vehicle access points into the site
2010/0784/NT	E-Wh001	Oxclose Lane	0.62	947	B1a/B1c	453485	363257	LAND ADJ. M'FIELD WOODHOUSE TRAIN STATION	DEBDALE LANE	M'FIELD WOODHOUSE		REGULATION 4 APPROVAL FOR THE CONSTRUCTION OF 1 NO. TWO STOREY OFFICE BUILDING WITH 6 NO. STARTER OFFICE UNITS, 2 NO. SINGLE STOREY (CLASS B1 USE) BUILDINGS WITH 4 NO. UNITS IN EACH BUILDING AND A SMALL PUBLIC PARK.	New access into site
2012/0018/ST	2012/0018/ST	Sherwood Oaks Business Park	0.66	929	SG	457165	359110		SHERWOOD OAKS BUSINESS PARK	MANSFIELD		ERECTION OF A BUILDING FOR USE AS A BUILDERS MERCHANTS	New access into site from existing distributor roads within business park

Pipeline Schemes

Planning Ref.	Development Name	Site Area (Ha)	Total Dwellings	Floorspace (m2)	Type	Easting	Northing	Address Prefix	Proposal	Highway Improvements
2010/0805/ST	Penniment Farm	31.40	430	36000	B2/B8	451536	361956	LAND AT PENNIMENT FARM, ABBOTT ROAD, MANSFIELD	OUTLINE PLANNING APPLICATION (INCLUDING THE RESERVED MATTER OF ACCESS) FOR MIXED USE DEVELOPMENT COMPRISING HOUSING (MAXIMUM 430 UNITS) & EMPLOYMENT (USE CLASSES B1, B2 AND B8 - UP TO 39,216 SQ M) RETAIL (USE CLASS A1 - UP TO 84 SQ M), OPEN SPACE, LANDSCA	Creation of access onto Abbott Road - signalled controlled T-junction. Provision of right turn lane into Abbott Lea from Abbott Road. Creation of priortiy T-junction onto Water Lane. Creation of access into employment element from MARR - ghost island T-junction. Upgrade of Abbott Road and Water Lane to signalled controlled junction Island re-shaped at MARR/Abbott Road junction and lane allocation chnaged to allow for 2 right hand turn lanes from MARR. Carriageway widened at Kings Mill Road/Skegby Lane junction to provide 4 lanes with right hand turn lane.
				3300	B1a					
				84	A1					
2010/0089/ST	Lindhurst	169.36	1700	60000 30000 10000 1000 New School	B1 B2 B8 A1 D1	454580	358433	LAND ADJACENT TO THE A617 MANSFIELD ASHFIELD REGENERATION ROUTE (MARR), MANSFIELD	OUTLINE PLANNING APPLICATION (INCLUDING THE RESERVED MATTER OF ACCESS) FOR THE DEVELOPMENT OF 169.3 HECTARES OF LAND FOR EMPLOYMENT, COMMERCIAL, RESIDENTIAL, RETAIL, HEALTHCARE, COMMUNITY, EDUCATIONAL AND LEISURE USES INCLUDING THE PROVISION OF A NEW PRIM	Various works including carriageway widening, creation of roundabouts and installation/improvements of traffic signalisation

SHLAA Sites

SHLAA Ref.	Site Area (Ha)	Easting	Northing	Total Dwellings	Address 1	Address 2
16	1.19	456647	368946	39	Land at Moorefield Farm Bishops Walk	Church Warsop
34	1.95	452924	362040	61	Bould/Chesterfield Rd South	Mansfield
86	4.33	454998	361278	130	Sandy Lane	Mansfield
25	0.36	453405	364282	11	Land at Northfield Lane	Mansfield Woodhouse
111	0.65	453423	359764	20	Land to the rear of Garth Road / Hillsway Crescent	Mansfield
113	1.27	454366	361925	38	Land at Windmill Lane	Mansfield
118	0.32	453467	364339	9	Land at Cox's Lane	Mansfield Woodhouse

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APPENDIX D
Reference Case Forecasting

URS

Mansfield Transport Study

Technical Note: Reference Case Forecasts

January 2013

47062950

Prepared for:
Mansfield District Council

UNITED KINGDOM & IRELAND

REVISION SCHEDULE					
Rev	**Date**	**Details**	**Prepared by**	**Reviewed by**	**Approved by**
1	Sept. 12	Draft	Adam Hall Senior Transport Planner	David Elliott Associate	David Elliott Associate
2	January 2013	Final	AH	DE	DE

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REFERENCE CASE FORECASTS
TECHNICAL NOTE
October 2014

APPENDIX D

Limitations

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The methodology adopted and the sources of information used by URS in providing its services are outlined in this Report. The work described in this Report was undertaken between **May 2012** and **August 2012** and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

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1 REFERENCE CASE FORECASTS

1.1 Introduction

1.1.1 Having examined the Base Year conditions, Step 2 of the Mansfield Transport Study examines the future conditions within Mansfield and Market Warsop. To assess the Local Plan Part 1 Mansfield District Council require a forecast traffic model, the future year is 2031. Using most likely projections of growth and committed developments (both transport infrastructure and land-use developments) that are likely to be implemented up to the year 2031 gives a 'reference case' against which potential additional development can be judged.

1.1.2 This section of the report will document the committed developments used to create a 2031 Reference Case forecast and the processes used to prepare it. The forecast SATURN traffic model will be used to identify any junctions that are likely to be approaching capacity in 2031.

1.2 Base Model

1.2.1 The forecast network and matrices are built upon the 2012 base model network and matrices. The 2012 base traffic model is detailed in the Model Calibration Technical Note, where the model is described as providing a realistic representation of the modelled links in Mansfield.

1.2.2 The user classes in the 2012 Mansfield traffic model are split between two matrix levels and are defined as:

Level 1

- User Class 1 – Car (Work)
- User Class 2 – Car (Commute)
- User Class 3 – Car (Other)
- User Class 4 – LGV (All)

Level 2

- User Class 5 – OGV1 (other goods vehicle: rigid chassis or up to three axles)
- User Class 6 – OGV2 (other goods vehicle: articulated with four axles plus)

1.2.3 The model was built to assess two time periods; AM peak (0800-0900) and PM peak (1700-1800).

1.2.4 The base model is fully calibrated with up to date count data, and satisfies DMRB criteria.

1.3 Committed Developments to 2031

1.3.1 To update the model to 2031 forecast conditions requires both interventions made to the highway network and known development trips to be entered into the matrix. Only developments considered to be 'committed' by Mansfield District Council were added.

1.3.2 Committed Developments to 2031 were identified by type and size. Residential and commercial developments are shown below on a map base in Figure 1.1 for Mansfield and Figure 1.2 for settlements in the northern part of the District, including Market Warsop. SHLAA sites expected within 5 years and pipeline schemes were also included. All proposed developments included in Figure 1.1 and 1.2 are represented in the forecast matrix.

Figure 1.1: Committed Residential and Commercial Developments: Mansfield

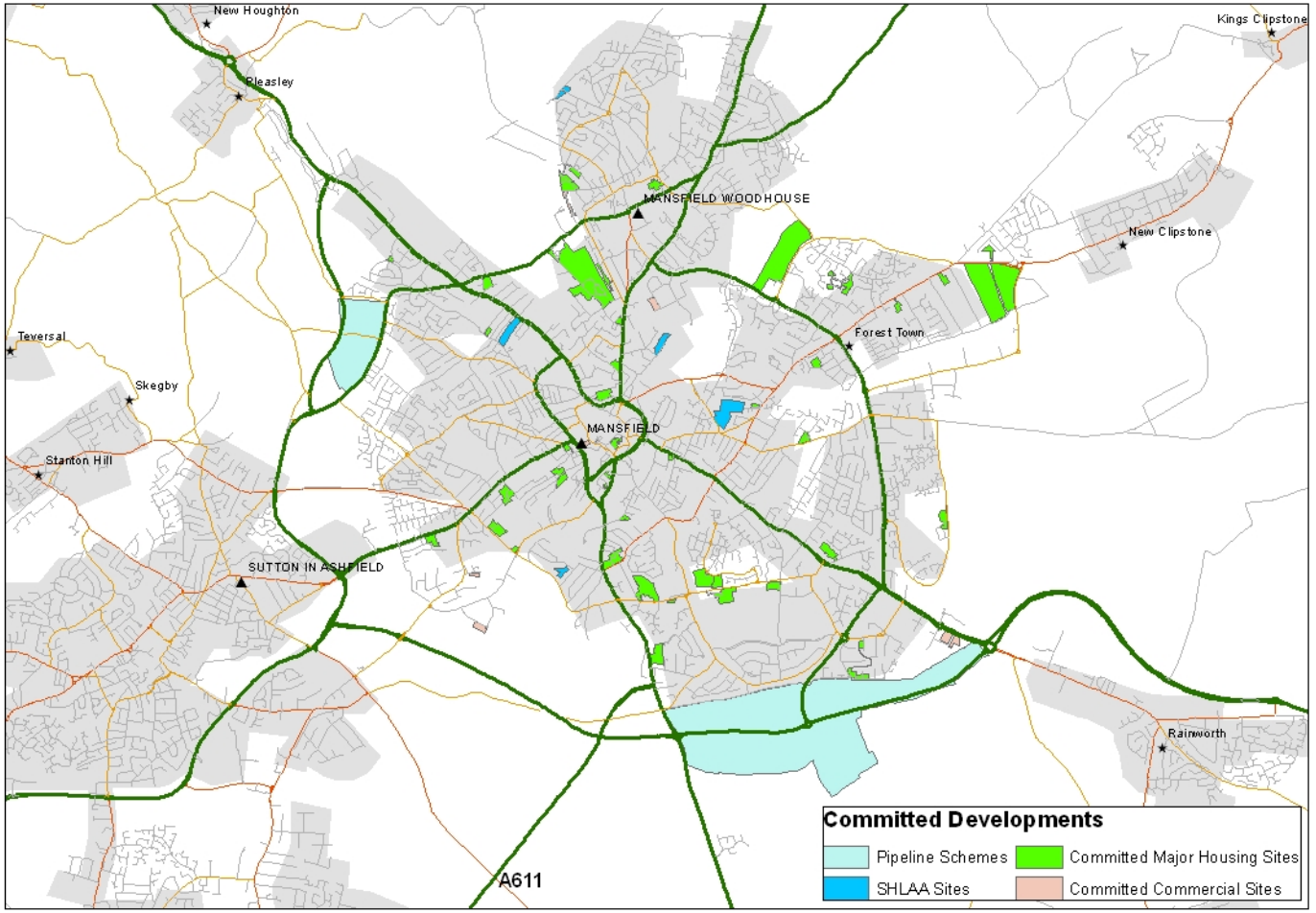
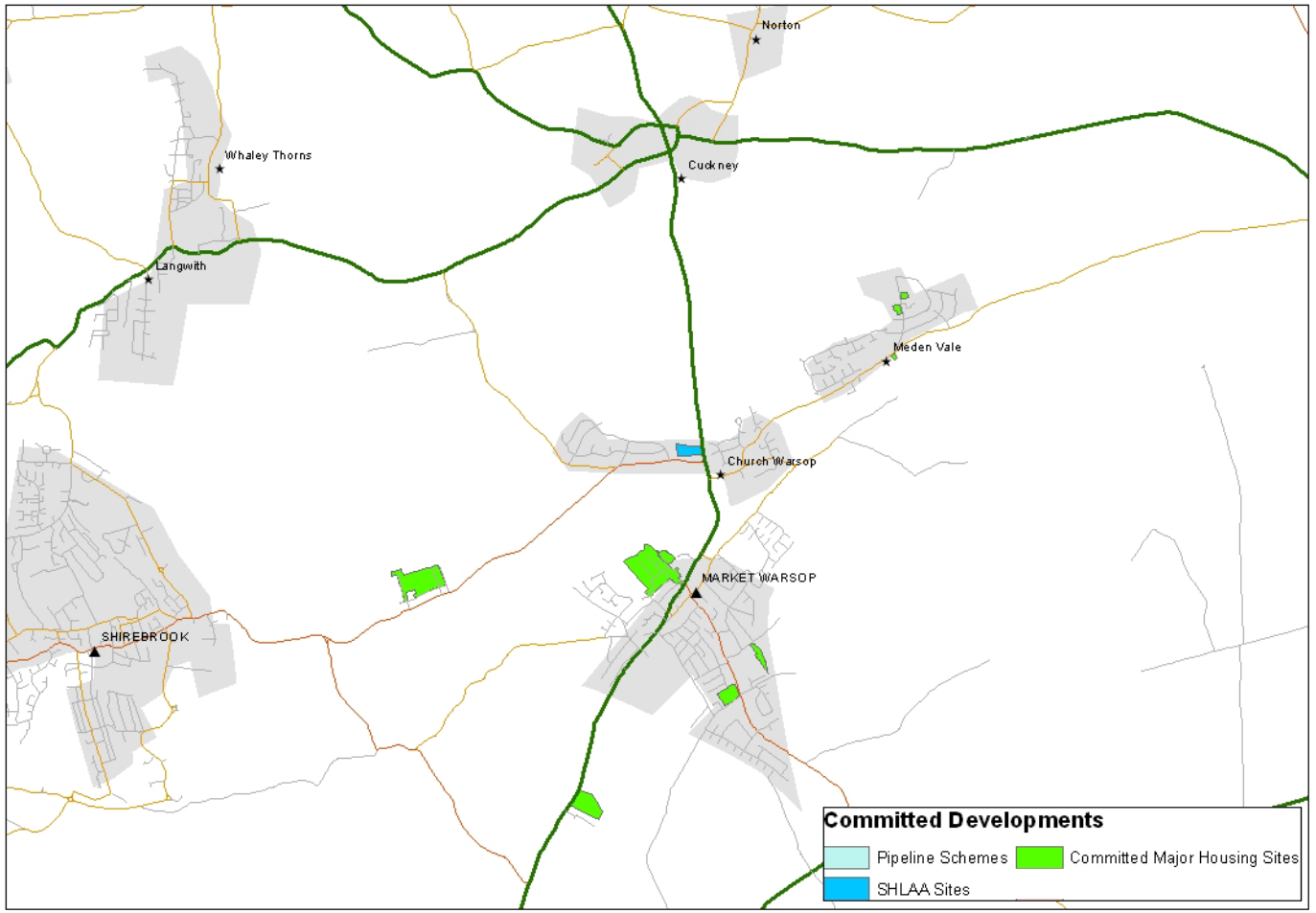


Figure 1.2: Committed Residential and Commercial Developments: Market Warsop, Church Warsop, Meden Vale, Warsop Vale & Spion Kop



1.3.3 No future year highway schemes were identified which would impact upon capacity. Bus lanes, where implemented, would operate alongside existing capacity. Some of the larger committed development sites had associated highway infrastructure modifications included as part of their construction. These included:

- Lindhurst (internal link roads and access points),
- Penniment Farm (access points),
- Prologis Park (access points).

1.3.4 These developments have highway schemes which have been coded into the 2031 Reference Case highway networks, given their potential to impact upon the existing highway network.

1.3.5 Committed developments were allocated a Mansfield traffic model zone based upon the location of each development. The total number of new committed residential units (for housing) and total gross floor area (for commercial) was calculated for each model zone.

1.3.6 Trip Rate Information Computer Systems (TRICS) is a database of trip generations, collected by regular surveys undertaken throughout the country of different types of development and is the industry standard method of calculating trip rates for new developments. TRICS 50th percentile rates represent average trips rates generated by similar developments and are suitable for use in calculating new trip generations as part of this study. TRICS 50th percentile rates were applied by type to these developments to give origin and destination trip ends for the AM and PM peak.

1.3.7 Substantial forecasting work had already been undertaken for the Lindhurst and Penniment Farm developments where trip numbers and distributions had been given considerable attention. Trip rates and distributions for these developments have therefore been taken from the previous forecasting work from their respective models used to support the respective planning applications.

1.3.8 The numbers of development trips to be assigned to the highway assignment model by each individual model zone are given below in Table 1.1 for all vehicle classes.

Table 1.1: Committed Development Trip ends by model zone and time period

Model Zone	Trip End Number			
	AM Origin	AM Destination	PM Origin	PM Destination
11	147	46	82	123
21	210	65	116	176
24	7	2	4	6
25	1	0	0	1
26	7	2	4	6
27	12	26	21	9
28	31	10	17	26
29	12	4	6	10
31	9	3	5	8
32	41	13	23	34
37	12	4	6	10
38	22	7	12	18
44	55	17	31	46
46	5	2	3	5
48	4	1	2	4
50	117	36	65	98
56	42	13	23	35
62	6	37	31	5
64	16	5	9	13
66	6	2	3	5
72	35	11	19	29
73	8	3	4	7
77	8	2	4	6
81	1	8	7	1
84	51	16	28	43
87	181	201	228	218
88	8	15	18	14
90	15	5	8	12
93	5	1	3	4
114	4	20	17	3
116	27	8	15	23
132	243	90	155	243
168	12	4	7	10
171	94	256	229	86
172	0	0	0	0
182	8	2	4	6
183	4	13	12	3
187	115	756	564	61
188	82	307	247	39
189	405	447	440	331
190	249	127	151	247
191	233	119	141	231
192	344	155	212	303
193	232	308	276	221
194	190	717	575	94
195	0	0	0	0
196	248	539	354	108
TOTAL	**3,565**	**4,422**	**4,183**	**2,981**

Note: Model Zone names are not sequentially numbered. Where zero values are shown, no trips from committed developments were assigned to that model zone in 2031.

1.3.9 The trip ends allocated to the development zones, listed in Table 1, were distributed to traffic model zones using the information contained within the base matrix. The locations of these development sites were checked against the base model to ensure that development types were similar, i.e. housing developments were in model zones already containing housing. Where developments were not similar; i.e. commercial trips being placed in a model zone previously dominated by residential uses, appropriate distributions were taken from nearby zones with similar land-use.

1.3.10 In addition to trips generated by the identified new development sites, there will be traffic growth associated with those trips already on the highway network (i.e. background trips). TEMPRO is a software programme and database which contains details on trip numbers, journey mileage, car ownership and population/workforce numbers from the National Trip End Model (NTEM). Data from NTEM is available at the census output area level and has been manipulated based on area to provide model zone factors. It is necessary to produce future year forecasts with growth up to NTEM levels. TEMPRO 6.2 was used to calculate background trip-end growth factors to apply to the base matrix light vehicles (Level 1).

1.3.11 The heavy vehicle matrix, Level 2, was subject to factoring according to the National Transport Model (NTM). NTM provides forecast factors for heavy vehicle traffic across regions of the UK. Factors for the East Midlands were used for this study. After applying the TEMPRO and NTM background growth factors, the matrix totals were as presented below in Table 1.2.

Table 1.2: Matrix Totals, Base and TEMPRO/NTM Growth

Model Zone	Number of Trips	
	AM	PM
Base year (2012)	29,044	30,685
TEMPRO/NTM (to 2031)	**34,120**	**36,282**
Growth	5,076	5,597

1.3.12 TEMPRO 6.2 allows the user to apply 'alternative assumptions' into the programme. This allows the user to define their own planning assumptions based upon housing or employment growth in the modelled area. Given the committed development is known in more detail than in the NTEM forecasts, alternative planning assumptions were calculated assuming no growth in employment or housing numbers within the Mansfield District between 2012 and 2031. The trips generated by the identified committed development sites could then be treated as additional to that background growth; calculated using TEMPRO with no land-use changes assumed after 2012.

1.3.13 Using the alternative assumption trip end factors and applying these to the 2012 base matrices results in the background-growth trip-matrix totals given in Table 1.3. Note that the values in Table 3.1 do not include trips from the

Committed Developments; the trips represented are simply the base year (2012) travel movements with the appropriate 'alternative assumption' growth factors applied to the trips between each of the traffic model zones.

Table 1.3: Matrix Totals, TEMPRO Background growth

Matrix Totals		
	AM	PM
Base matrix	29,044	30,685
2031 with background trip growth	28,537	30,732

1.3.14 It is necessary to apply additional factors to the matrices to account for the effect of income growth and the changes to the affordability of personal vehicle travel. As travel becomes relatively cheaper compared to personal income and travel becomes more efficient, travel distances per person will tend to increase. These effects are accounted for by applying the fuel and income adjustment factors. Fuel and income adjustment factors are provided in Table 1 of WebTAG 3.15.2 and the relevant factors for the Mansfield traffic model forecasting are presented below in Table 1.4

Table 1.4: Fuel and Income Adjustment Factors

Period	Fuel Factor	Income Factor	Combined
2012-2031	1.060	1.015	1.076

1.3.15 The combined factor is applied across the whole light vehicle matrix (Level 1). The same factor is applied to both the AM and PM peaks. The factors were not applied to heavy vehicles (level 2). After processing of the light vehicle matrices and adding these to the heavy vehicle matrices, the following matrix totals were obtained:

Table 1.5: NTEM Alternative Planning Assumptions and Fuel and Income Adjustment

Matrix Totals		
	AM	PM
2031 Forecast	30,583	33,026

1.3.16 The committed development sites identified in Figures 1.1 to 1.2 generate trips as given in Table 1.1. These trips were added on a cell-by-cell basis, into the trip matrices with the background growth and adjustment factors applied. The final matrix totals, which include the trips from Committed Developments, are given in Table 1.6.

Table 1.6: Final Matrix Totals

Matrix Totals		
	AM	PM
Base year (2012)	29,044	30,685
2031	**34,148**	**36,007**
Growth	5,104	5,322

1.3.17 The matrix totals in Table 1.6 are numerically similar to the TEMPRO/NTM factored matrix totals given in Table 1.2. This indicates that the additional trips generated by the Committed Development sites plus the effects of background traffic growth are compatible with the growth forecast for Mansfield produced by the DfT's national travel models.

2 CONCLUSION

2.1.1 The Mansfield traffic model, with updates to 2012 baseline conditions applied, was the starting point for building the forecast models.

2.1.2 The forecast year is 2031 and the model has been provided in both an AM and PM peak.

2.1.3 Highway improvements to the network were considered in the forecast year.

2.1.4 Alternative planning assumptions and fuel and income growth were applied to the non development matrices.

2.1.5 Matrices were updated based upon known committed development sites, as identified by Mansfield District Council. Committed Development sites plus the effects of background traffic growth are compatible with the growth forecast for Mansfield produced by the DfT's national travel models.

2.1.6 The forecast matrices can be assigned to the forecast networks to assess highway capacity impacts in the future year.

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APPENDIX E

Junction Operational Capacity Assessments
Baseline (2012) and Reference Case (2031)

Appendix E

Introduction

This Appendix summarises the detailed Baseline (2012) and Reference Case (2031) junction assessments described in the main body of the report.

LINSIG3 has been used to assess signalised junctions. LINSIG3 software provides outputs for both individual approaches and for the junction as a whole. For the individual approaches, the outputs are Degree of Saturation (DoS) and Mean Maximum Queue Length (MMQ). A total-junction statistic known as the Practical Reserve Capacity (PRC) is also reported, which shows the percentage of "spare" capacity left at the junction.

LINSIG works on the basis that a junction is considered to be near to or at capacity when the DoS value on an individual junction approach exceeds 90%. Below this threshold, queues begin to increase slowly as the DoS increases. Above this threshold, queues begin to elongate rapidly. As the DoS on any approach increases, the PRC remaining at the junction decreases.

ARCADY has been used to assess roundabout junctions. The ARCADY software has been run using a synthesised profile and provides outputs in the form of *Ratio of Flow to Capacity* (RFC) and *queue length* (Q). A synthesised profile includes a 12.5% mid-peak increase in traffic demand to robustly test the performance of the junction. For a new roundabout, a target RFC value of 0.85 on the worst-approach during a single time segment is preferred as this minimises the chance that queuing will occur at a new junction on opening. For existing junctions, RFC values above 0.85 are likely to produce queues which increase slowly. Above an RFC value of 1.0, a junction is more than likely to be at capacity (with resulting larger increases in queue length).

Chesterfield Road / Debdale Lane

This is a signalised junction and, as such, has been assessed using LINSIG3. Chesterfield Road is a key route between the M1 and Mansfield town centre. Abbott Road leads to local housing estates and links into MARR providing routes to Sutton in Ashfield and the A38. Debdale Lane provides routes to Mansfield Woodhouse.

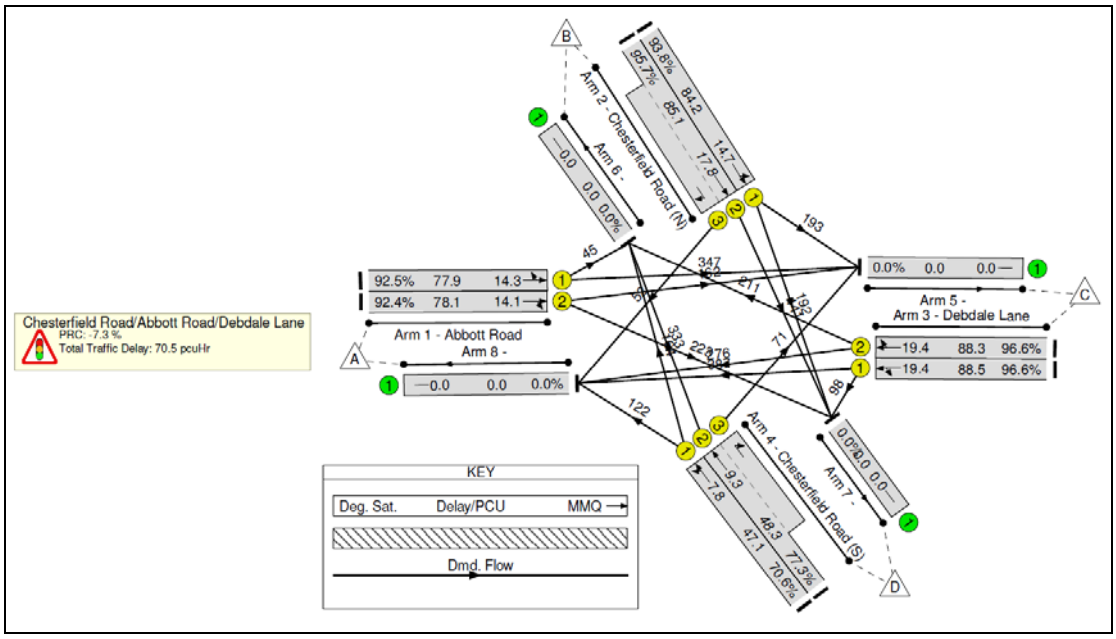


Table 1A: Performance of Chesterfield Road / Debdale Lane (Base Year)

Approach Lane (and flare)	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	DoS	MMQ	DoS	MMQ
Abbott Road Left Ahead	92.5%	14.3	116.7%	61.6
Abbott Road Ahead Right	92.4%	14.1	116.6%	61.3
Chesterfield Road (N) Left Ahead	93.8%	14.7	112.4%	35.5
Chesterfield Road (N) Ahead Right	95.7%	17.8	112.9%	51.6
Debdale Lane Left Ahead	96.6%	19.4	121.6%	66.1
Debdale Lane Ahead Right	96.6%	19.4	121.6%	65.6
Chesterfield Road (S) Left Ahead	70.6%	7.8	119.2%	55.1
Chesterfield Road (S) Ahead Right	77.3%	9.3	119.7%	74.2
Junction Summary	PRC	-7.3	PRC	-35.1
	Veh Delay (PCU Hrs)	70.52	Veh Delay (PCU Hrs)	419.45

Notes: DoS = Degree of Saturation. A measure of the trafficking of an approach to the junction in relation to its ability to accommodate such flow.
MMQ = Mean Maximum Queue reported on a per arm basis and measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU / 1 bus = 2 PCU etc.
PRC = Practical Reserve Capacity. A measure of the overall percentage "spare" capacity at a junction.
Delay = Vehicle Delay in PCU-hours per hour.

As can be seen from Table 1A, the LINSIG analysis identifies that the junction is currently operating at capacity. Abbott Road, Debdale Lane and Chesterfield Road (N) are operating at greater than 90% capacity in the AM peak hour. All approaches have a degree of saturation in excess of 100% in the PM peak hour resulting in large queuing delays.

It should also be noted that the junction is operating under Microprocessor Optimised Vehicle Actuation (MOVA) control. This is an advanced form of signal control and, as

such, there is unlikely to be any room for improvement in terms of amending the junction timing.

In conclusion, a substantial improvement will be required if the junction is to operate with minimal delays and queues in the PM peak hour. It is likely that additional highway areas would need to be acquired from adjacent land holdings if a substantial capacity improvement is to be implemented at the junction. Alternative solutions might seek to remove some of the traffic movements from the junction, i.e. by banning turning movements and providing alternative diversion routes.

Table 1B: Performance of Chesterfield Road / Debdale Lane (Reference Case)

Approach	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	DoS	MMQ	DoS	MMQ
Abbott Road Left Ahead	104.9%	27.6	128.5%	91.2
Abbott Road Ahead Right	105.1%	27.5	128.5%	89.2
Chesterfield Road (N) Left Ahead	102.2%	24.6	108.5%	35.3
Chesterfield Road (N) Ahead Right	102.6%	28.4	108.8%	42.9
Debdale Lane Left Ahead	105.4%	34.2	127.1%	79.0
Debdale Lane Ahead Right	105.6%	34.8	127.2%	78.8
Chesterfield Road (S) Left Ahead	73.9%	8.5	126.0%	72.7
Chesterfield Road (S) Ahead Right	80.1%	10.4	126.3%	97.6
Junction Summary	PRC	-17.4	PRC	-42.8
	Veh Delay (PCU Hrs)	144.81	Veh Delay (PCU Hrs)	526.94

Notes: DoS = Degree of Saturation. A measure of the trafficking of an approach to the junction in relation to its ability to accommodate such flow.
MMQ = Mean Maximum Queue reported on a per arm basis and measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU / 1 bus = 2 PCUs etc.
PRC = Practical Reserve Capacity. A measure of the overall percentage "spare" capacity at a junction.
Delay = Vehicle Delay in PCU/hrs.

As expected from the analysis of the 2012 Base network, the increased demand in the Reference Case results in this junction being over capacity. All approaches, with the exception of Chesterfield Road (S), have a degree of saturation in excess of 100% in both the AM and PM peak hours. This means that in 2031 Reference Case, with committed developments in place, this junction would experience large delays and queuing.

It is noted that in the PM peak hour the degrees of saturation and queues on Chesterfield Road (N) reduce in the Reference Case when compared with the Base Year. Traffic flows used in the LINSIG assessment have been taken from the Reference Case SATURN model. This is a dynamic model which assigns traffic to the network based upon lowest cost paths. In this case, trips that were using Chesterfield Road (N) in the Base Year have rerouted onto alternative roads to avoid large delays (costs).

Localised widening could be undertaken, although any expansion is restrained by the petrol filling station, the public house and local businesses on three corners of the junction. Further capacity improvement will be difficult and/or expensive as it would require land take. A detailed design of junction options would need to be developed in order to assess the feasibility of any potential junction improvements and the impact upon adjacent land owners.

Some alternative solutions have been considered, such as banning small turning movements and providing diversion routes for these in order to eliminate traffic signal phases from their cycle times. Such an approach would increase the available green-light time that may be allocated to the remaining traffic movements. However, Nottinghamshire County Council do not support these types of solution where such turning movement bans may not be complied with.

The traffic related impacts upon this junction should be considered in the light of the Committed Developments which are planned in the vicinity and are expected to have the greatest impacts. Final trip rates, vehicle routing patterns and the possibility for developer funding contributions should be considered in the Transport Assessment, where appropriate, and agreed with the Local Authority. The developments most likely to impact upon this junction are; Penniment Farm, Former Sherwood Colliery and Little Debdale Lane.

A60 Nottingham Road / Berry Hill Lane

This is a signalised junction and, as such, has been assessed using LINSIG3. The A60 Nottingham Road is a key arterial route between Mansfield and Nottingham. Berry Hill Lane leads to local housing and provides a route for east-west movements across Mansfield. Atkin Lane links to local housing and business parks. There is a school located on the corner of Atkin Lane which leads to localised parking/capacity issues at peak times.

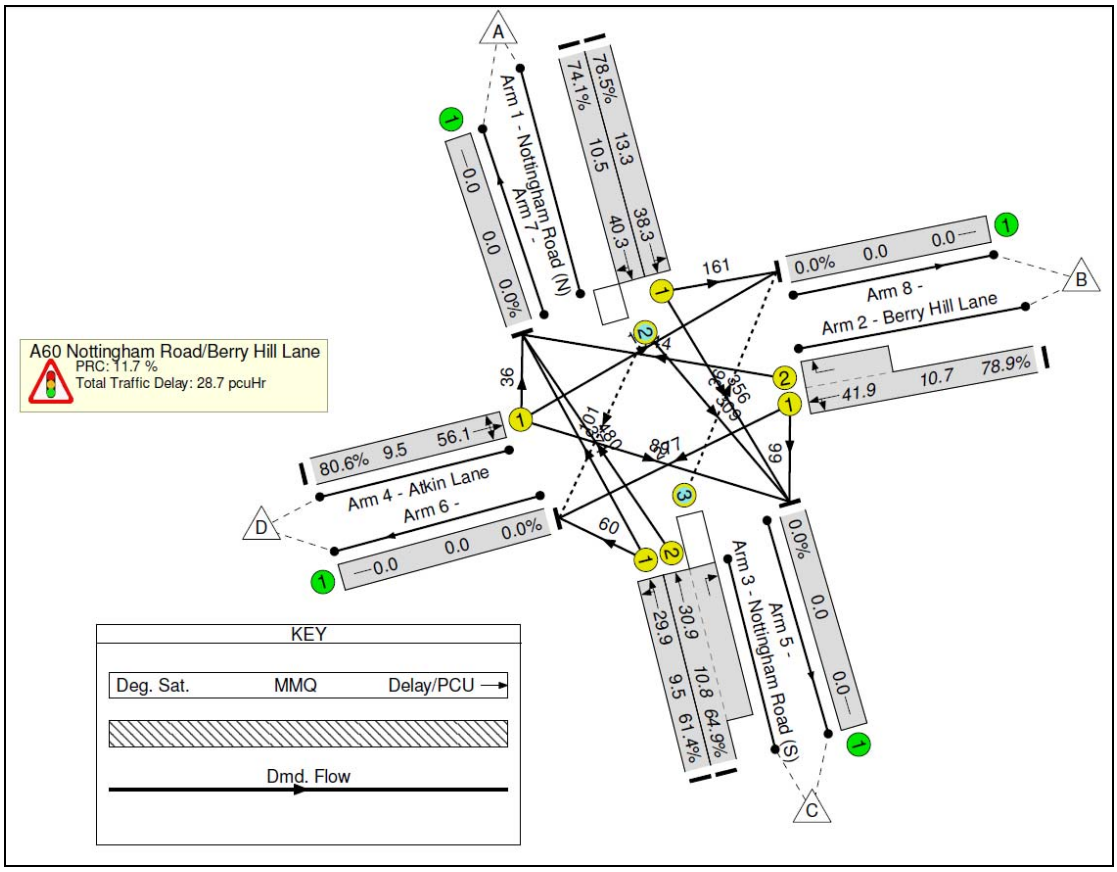


Table 2A: Performance of A60 Nottingham Road / Berry Hill Lane (Base Year)

Approach Lane (and flare)	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	DoS	MMQ	DoS	MMQ
Nottingham Road (N) Left Ahead	78.5%	13.3	76.1%	10.1
Nottingham Road (N) Ahead Right	74.1%	10.5	77.2%	10.8
Berry Hill Lane Left Ahead Right	78.9%	10.7	76.0%	9.9
Nottingham Road (S) Left Ahead	61.4%	9.5	68.1%	9.1
Nottingham Road (S) Ahead Right	64.9%	10.8	75.0%	10.5
Atkin Lane Right Left Ahead	80.6%	9.5	77.2%	10.7
Junction Summary	PRC	11.7	PRC	16.6
	Veh Delay (PCU Hrs)	28.72	Veh Delay (PCU Hrs)	29.97

Notes: DoS = Degree of Saturation. A measure of the trafficking of an approach to the junction in relation to its ability to accommodate such flow.
MMQ = Mean Maximum Queue reported on a per arm basis and measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU / 1 bus = 2 PCU etc.
PRC = Practical Reserve Capacity. A measure of the overall percentage "spare" capacity at a junction.
Delay = Vehicle Delay in PCU-hours per hour.

Table 2A shows the results from the LINSIG analysis and identifies that the junction is currently operating within capacity. As LINSIG uses a flat profile (i.e. there is no variation within the assessment period), there may be some transient queuing during the peak hour. Because the maximum Degree of Saturation is less than the target value of 90% then the operational performance of the junction is acceptable.

Table 2B: Performance of A60 Nottingham Road / Berry Hill Lane (Reference Case)

Approach Lane (and flare)	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	DoS	MMQ	DoS	MMQ
Nottingham Road (N) Left Ahead	108.5%	57.9	94.2%	19.1
Nottingham Road (N) Ahead Right	104.6%	22.2	96.3%	21.8
Berry Hill Lane Left Ahead Right	110.3%	44.8	96.7%	18.4
Nottingham Road (S) Left Ahead	74.0%	13.3	84.9%	14.6
Nottingham Road (S) Ahead Right	78.3%	14.2	93.8%	20.6
Atkin Lane Left Ahead Right	111.3%	42.6	97.7%	22.0
Junction Summary	PRC	-23.7	PRC	-8.5
	Veh Delay (PCU Hrs)	147.72	Veh Delay (PCU Hrs)	69.05

Notes: DoS = Degree of Saturation. A measure of the trafficking of an approach to the junction in relation to its ability to accommodate such flow.
MMQ = Mean Maximum Queue reported on a per arm basis and measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU / 1 bus = 2 PCU etc.
PRC = Practical Reserve Capacity. A measure of the overall percentage "spare" capacity at a junction.
Delay = Vehicle Delay in PCU-hours per hour.

Table 2B above shows that the increased demand in the Reference Case scenario results in some approaches to the junction operating over capacity. Nottingham Road (N), Berry Hill Lane and Atkin Lane are all have degrees of saturation in excess of 100% in the AM peak hour. Nottingham Road, Berry Hill Lane and Atkin Lane all have degrees of saturation in excess of the 90% target DoS in the PM peak.

This junction currently does not operate under MOVA control but this is an option for the Reference Case, the installation of MOVA typically costs in the range of £40,000 to £100,000 dependent upon existing conditions and equipment. The degree of saturation in the Reference Case AM peak hour indicates that, even after the optimisation of the signal timings, one or more arms would be over capacity, particularly in the AM peak hour.

Compact approaches to the junction (narrow lanes) and lack of adjacent land to use for widening of the carriageway would restrict the amount of physical mitigation that could be undertaken, for example in terms of further lane widening. It may be possible to examine the closure of some shared lane right turn movements to increase capacity for the ahead-movements, but liaison with Mansfield District Council and Nottinghamshire County Council determined that this solution would not be acceptable in terms of the routing of the displaced vehicles and is therefore discounted as a solution.

A more significant scheme is therefore required, i.e. including land take. The funding for such works could be partially sourced from nearby Committed Development schemes which would be expected to have a traffic impact at this location. The following developments are most likely to impact this junction; Lindhurst, Former Evans Halshaw – Nottingham Road, Former Mansfield Sand Company, Kings Walk – Berry Hill Quarry and Berry Hill Hall. The relevant Transport Assessments should highlight the likely impact of each development and the potential for funding contributions should be agreed between the developer and the Local Authority.

Carter Lane / Southwell Road / Windsor Road

This is a signalised junction and, as such, has been assessed using LINSIG3. Southwell Road is an arterial route to/from Mansfield town centre. Carter Lane accesses local housing but also provides routes to Forest Town and Clipstone to the east of Mansfield.

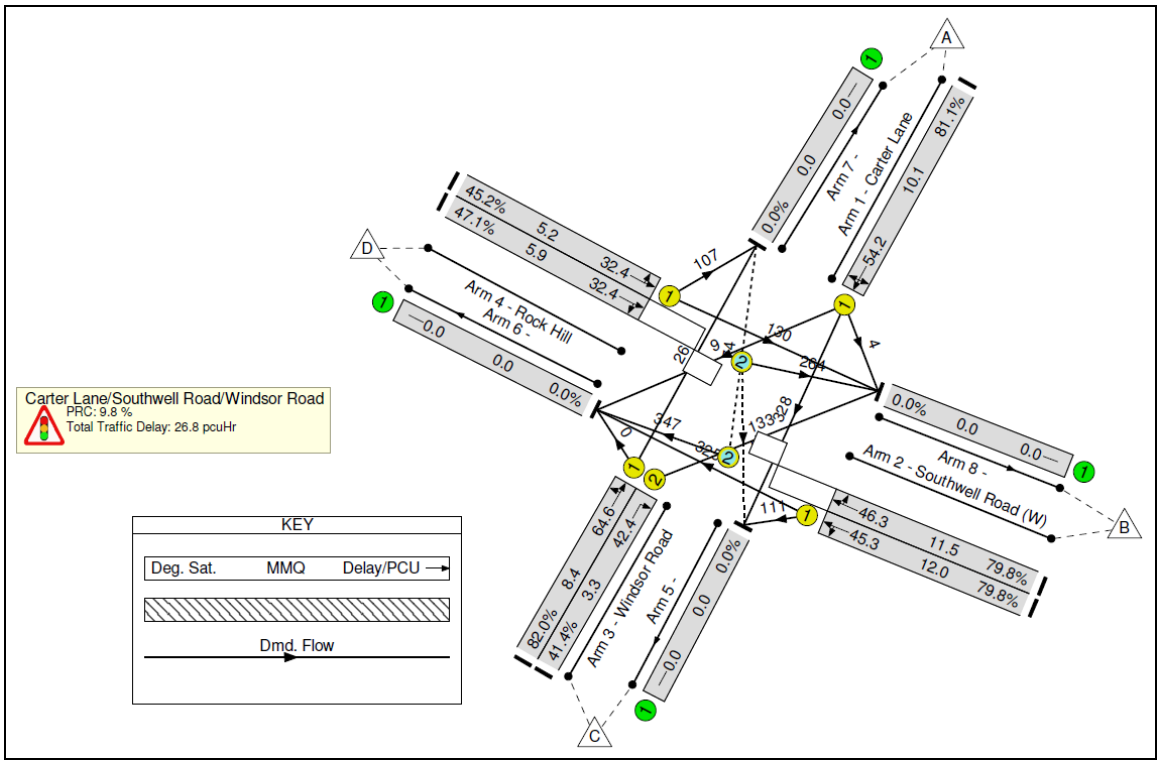


Table 3A: Performance of Carter Lane / Southwell Road / Windsor Rd (Base Year)

Approach Lane	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	DoS	MMQ	DoS	MMQ
Carter Lane Left Ahead Right	81.1%	10.1	88.3%	10.3
Southwell Road (W) Left Ahead	79.8%	12.0	87.1%	5.0
Southwell Road (W) Ahead Right	79.8%	11.5	71.5%	3.5
Windsor Road Left Ahead	82.0%	8.4	88.4%	8.6
Windsor Road Right	43.3%	3.3	70.8%	5.9
Rock Hill Left Ahead	45.2%	5.2	61.3%	9.0
Rock Hill Ahead Right	47.1%	5.9	62.1%	9.4
Junction Summary	PRC	9.8	PRC	1.8
	Veh Delay (PCU Hrs)	26.93	Veh Delay (PCU Hrs)	32.33

Notes: DoS = Degree of Saturation. A measure of the trafficking of an approach to the junction in relation to its ability to accommodate such flow.
MMQ = Mean Maximum Queue reported on a per arm basis and measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU / 1 bus = 2 PCU etc.
PRC = Practical Reserve Capacity. A measure of the overall percentage "spare" capacity at a junction.
Delay = Vehicle Delay in PCU-hours per hour.

Table 3A shows the results from the LINSIG analysis, which identifies that the junction is currently operating within capacity. As LINSIG uses a flat profile (i.e. there is no variation within the assessment period), there may be some transient queuing during the peak hour.

All approaches are operating below the target Degree of Saturation of 90% and the operational performance of the junction is considered to be acceptable.

Table 3B: Performance of Carter Lane / Southwell Rd / Windsor Rd (Reference Case)

Approach Lane	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	DoS	MMQ	DoS	MMQ
Carter Lane Left Ahead Right	84.1%	10.8	99.0%	16.5
Southwell Road (W) Left Ahead	83.0%	12.5	79.8%	14.4
Southwell Road (W) Ahead Right	83.8%	12.7	101.9%	9.1
Windsor Road Left Ahead	82.7%	9.0	104.3%	18.7
Windsor Road Right	44.9%	3.8	80.2%	6.9
Rock Hill Left Ahead	56.8%	6.8	61.8%	9.2
Rock Hill Ahead Right	59.4%	7.6	63.7%	10.2
Junction Summary	PRC	7.0	PRC	-15.9
	Veh Delay (PCU Hrs)	30.93	Veh Delay (PCU Hrs)	52.31

Notes: DoS = Degree of Saturation. A measure of the trafficking of an approach to the junction in relation to its ability to accommodate such flow.
MMQ = Mean Maximum Queue reported on a per arm basis and measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU / 1 bus = 2 PCU etc.
PRC = Practical Reserve Capacity. A measure of the overall percentage "spare" capacity at a junction.
Delay = Vehicle Delay in PC- hours per hour.

Table 3B indicates that the junction would operate within capacity in the 2031 Reference Case in the AM peak hour, although Carter Lane, Southwell Road and Windsor Road would be heavily loaded approaches.

The PM peak hour results indicate that Carter Lane, Southwell Road and Windsor Road would have degrees of saturation of greater than the target value of 90% and would be approximately 100%.

It may be acceptable to the Highway and District authorities to allow queuing on the non strategic routes (Carter Lane and Windsor Road) in order to give additional capacity to the strategic traffic to/from Mansfield (Southwell Road). A detailed review at this traffic signal junction might show that fine tuning of the signal timings would resolve some of the capacity issues associated with the Reference Case traffic without physical works at the junction.

Although two of the approaches would appear to be operating slightly over capacity in the PM peak, the overall assessment is that the operational performance of this junction would be acceptable in the AM peak and at capacity in the PM peak.

A60 Leeming Lane / New Mill Lane

This is a signalised junction and, as such, has been assessed using LINSIG3. The A60 Leeming Lane is an arterial route linking Mansfield and Market Warsop. New Mill Lane links Mansfield Woodhouse to the west and Forest Town to the east.

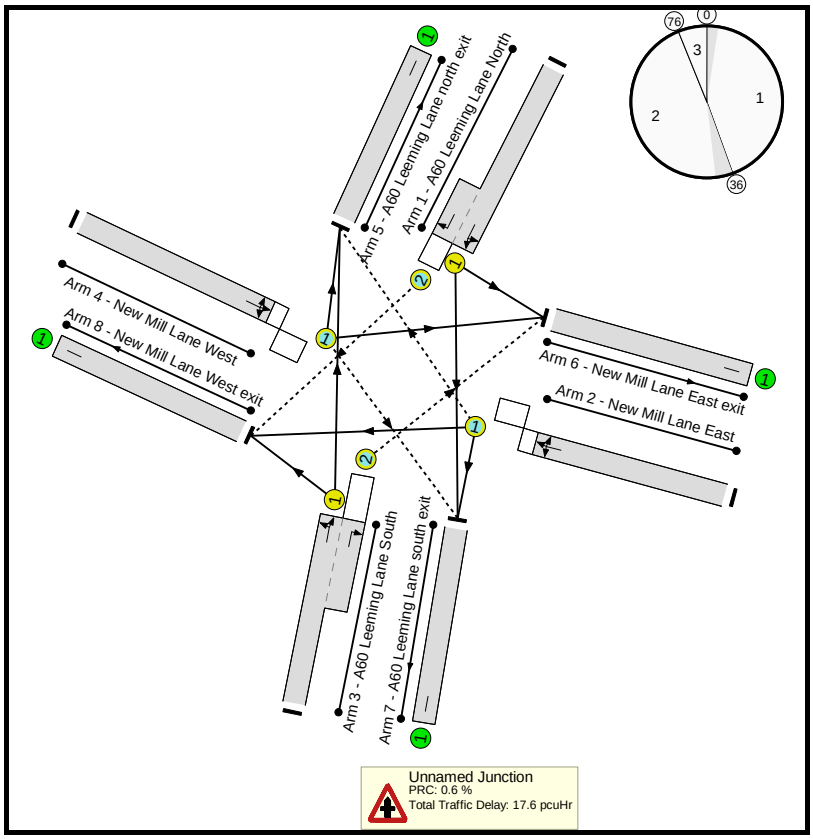


Table 4A: Performance of A60 Leeming Lane / New Mill Lane (Base Year)

Approach Lane (and flare)	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	DoS	MMQ	DoS	MMQ
A60 Leeming Lane (N) Left Ahead Right	84.4%	11.9	82.4%	10.1
New Mill Lane (E) Left Ahead Right	81.0%	7.8	91.9%	10.9
A60 Leeming Lane (S) Left Ahead Right	64.4%	7.3	99.6%	24.2
New Mill Lane (W) Left Ahead Right	44.0%	3.3	51.9%	4.5
Junction Summary	PRC	6.6	PRC	-10.7
	Veh Delay (PCU Hrs)	13.81	Veh Delay (PCU Hrs)	30.36

Notes: DoS = Degree of Saturation. A measure of the trafficking of an approach to the junction in relation to its ability to accommodate such flow.
MMQ = Mean Maximum Queue reported on a per arm basis and measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU / 1 bus = 2 PCU etc.
PRC = Practical Reserve Capacity. A measure of the overall percentage "spare" capacity at a junction.
Delay = Vehicle Delay in PCU-hours per hour

Table 4A shows the results from the LINSIG analysis and identifies that the junction is currently operating within capacity. As LINSIG uses a flat profile (i.e. there is no variation within the assessment period), there may also be some transient queuing during the peak hour.

In the PM peak hour the approach from A60 Leeming Lane (S) has the highest degree of saturation. With the degree of saturation approaching 100%, the junction is considered to be operating near to or at capacity.

Table 4B: Performance of A60 Leeming Lane / New Mill Lane (Reference Case)

Approach Lane (and flare)	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	DoS	MMQ	DoS	MMQ
A60 Leeming Lane (N) Left Ahead Right	95.2%	18.5	94.1%	16.2
New Mill Lane (E) Left Ahead Right	95.7%	13.1	111.0%	34.9
A60 Leeming Lane (S) Left Ahead Right	68.3%	7.9	107.6%	51.2
New Mill Lane (W) Left Ahead Right	39.4%	2.9	54.6%	4.7
Junction Summary	PRC	-6.4	PRC	-23.3
	Veh Delay (PCU Hrs)	24.23	Veh Delay (PCU Hrs)	84.39

Notes: DoS = Degree of Saturation. A measure of the trafficking of an approach to the junction in relation to its ability to accommodate such flow.
MMQ = Mean Maximum Queue reported on a per arm basis and measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU / 1 bus = 2 PCU etc.
PRC = Practical Reserve Capacity. A measure of the overall percentage "spare" capacity at a junction.
Delay = Vehicle Delay in PCU-hours per hour.

Table 4B shows the results from the LINSIG analysis and identifies that the junction would not operate within capacity in the 2031 Reference Case in the PM peak; with one of the opposing arms over capacity in each stage. In the AM Peak the junction would be near to capacity.

Operational performance of this junction could be improved by extending cycle times, from 55 seconds to 78 seconds in the AM peak and to 90 seconds in the PM peak. This would result in the junction operating below capacity in the AM peak, but remain near to or at capacity in the PM peak. However this would cause adverse impacts for pedestrians, in the PM peak they might have to wait for an additional 35 seconds. Given that the junction operates on MOVA control, this is likely to occur in response to the increased demand.

To address queues further, one potential solution would be to discourage trips from using New Mill Lane and use Old Mill Lane instead, which is classified as an A-road (A6117). This strategy would allow more green time to be allocated to the A60 movements. However, the A60 Leeming Lane / Old Mill Lane / Butt Lane junction is also constrained from substantial capacity improvement by adjacent land-uses, albeit to a lesser extent than the New Mill Lane junction. Nottinghamshire County Council do not consider this to be an appropriate mitigation strategy because the potential traffic increases on the diversion routes are perceived to be too severe.

Further intervention is likely to be needed at this junction, particularly to the New Mill Lane approach from the east. The potential to widen the New Mill Lane carriageway is limited by the existing adjacent land use. However, if funding could be sought from Committed Development sites that have an impact upon this junction, it may be possible for the necessary land to be acquired. Given the location of this site, the developments most likely to have an impact upon junction's operation are; Former Wood Bros and King Street/Wood Street located towards Market Warsop.

A bus priority scheme along the A60 from Peafield Lane to Mansfield centre is planned; this could be supplemented by a GPS based bus detection system at this junction. Sustainable transport policies suggest that the need for junction

improvements may be reduced if bus transit times can be adequately addressed by these other means.

A617 MARR / A6191 Southwell Road

The A617 MARR route provides links to Mansfield, the M1 and Nottingham to the west and Newark to the east. The A6191 provides links to Mansfield to the north and Rainworth to the south. This is a roundabout junction and, as such, has been assessed using ARCADY.

Table 5A: A617 MARR / A6191 Southwell Road (Base Year)

Approach	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	RFC	Q	RFC	Q
A6191 Southwell Road	0.499	1.0	0.811	4.1
A617 Rainworth Bypass	0.646	1.8	0.579	1.4
B6020	0.626	1.7	0.369	0.6
A617 MARR	0.607	1.5	0.548	1.2

Notes: RFC = Ratio of Flow to Capacity. A measure of the trafficking at the junction in relation to its ability to accommodate such flow, reported on a worst-arm basis. Q = Mean Maximum Vehicle Queue, reported on a worst arm basis. It is measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU; 1 bus = 2 PCU etc.

In the AM peak hour the junction works within capacity. In the AM peak, the maximum RFC of 0.646 occurs on A617 Rainworth Bypass resulting in a minimal queue. In the PM peak hour the RFC of 0.811 is produced on the A6191 Southwell Road (W) approach. It is noted that the queue disperses within the modelled hour. The operational performance of the roundabout is considered to be acceptable in both peak hours.

Table 5B: A617 MARR / A6191 Southwell Road (Reference Case)

Approach	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	RFC	Q	RFC	Q
A6191 Southwell Road	0.780	3.4	0.745	2.8
A617 Rainworth Bypass	0.741	2.8	0.584	1.4
B6020	0.729	2.6	0.379	0.6
A617 MARR	0.530	1.1	0.601	1.5

Notes: RFC = Ratio of Flow to Capacity. A measure of the trafficking at the junction in relation to its ability to accommodate such flow, reported on a worst-arm basis. Q = Mean Maximum Vehicle Queue, reported on a worst arm basis. It is measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU; 1 bus = 2 PCU etc.

In the both the AM and PM peak hour Southwell Road (E) operates with the highest RFC values, however only slight queues form on this approach. All approaches are less than the target RFC value of 0.85. The operational performance of the junction is considered to be acceptable in both peak hour periods.

A60 Leeming Lane / Peafield Lane

This is a signalised junction and, as such, has been assessed using LINSIG3. The A60 provides a link between Mansfield and Market Warsop. Peafield Lane provides a route to Edwinstowe.

Signal timings and phasing at this junction have been based upon on-site observations and timings. It is noted that this traffic signal junction operates under MOVA control.

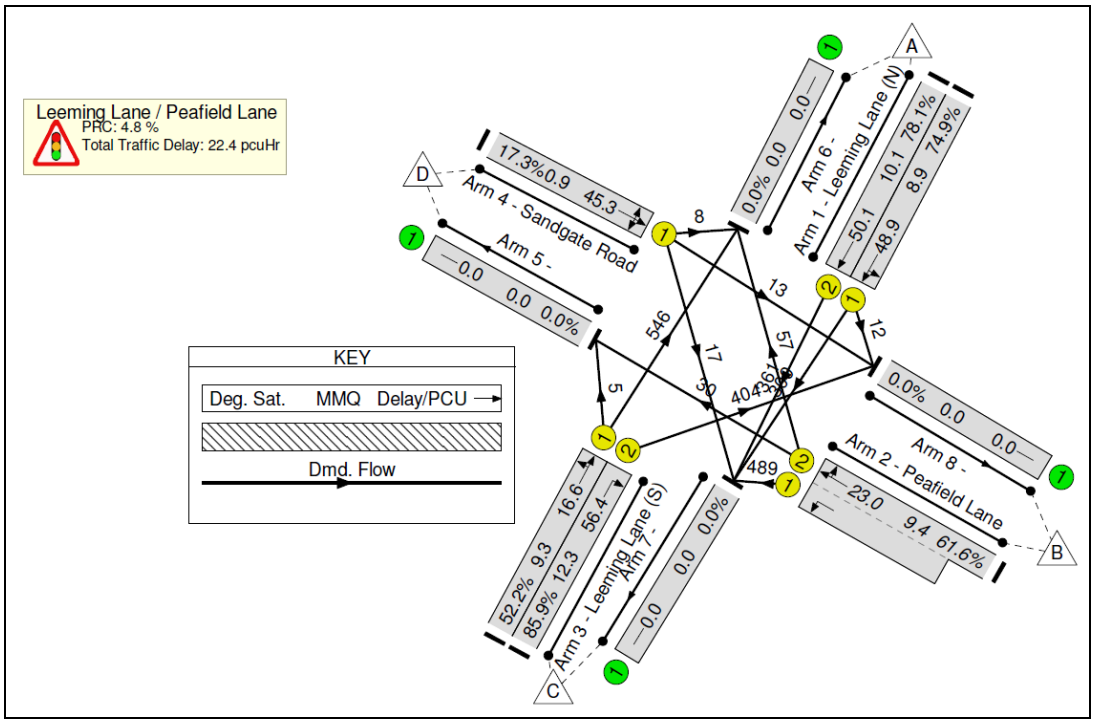


Table 6A: Performance of A60 Leeming Lane / Peafield Lane (Base Year)

Approach Lane (and flare)	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	DoS	MMQ	DoS	MMQ
Leeming Lane (N) Left Ahead	84.7%	7.8	85.6%	7.6
Leeming Lane (N) Ahead	84.7%	7.8	85.4%	7.5
Peafield Lane Left Ahead Right	67.1%	8.3	46.6%	5.6
Leeming Lane (S) Left Ahead	50.6%	4.8	68.6%	8.8
Leeming Lane (S) Right	85.3%	8.5	86.2%	10.7
Sandgate Road Left Ahead Right	13.4%	0.6	16.4%	0.7
Junction Summary	PRC	5.5	PRC	4.4
	Veh Delay (PCU Hrs)	18.46	Veh Delay (PCU Hrs)	19.28

Notes: DoS = Degree of Saturation. A measure of the trafficking of an approach to the junction in relation to its ability to accommodate such flow.
MMQ = Mean Maximum Queue reported on a per arm basis and measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU / 1 bus = 2 PCU etc.
PRC = Practical Reserve Capacity. A measure of the overall percentage "spare" capacity at a junction.
Delay = Vehicle Delay in PCU-hours per hour.

Table 6A shows the results of the LINSIG analysis and identifies that the junction is currently operating within capacity, although several approachs are at 85% capacity. As LINSIG uses a flat profile (i.e. there is no variation within the assessment period), there may be some transient queuing during the peak hour at this junction.

The right turn from Leeming Lane (S) into Peafield Lane has the highest degree of saturation at the junction. Because this value is less than the target Degree of Saturation of 90% the operational performance of the junction is considered to be acceptable.

Table 6B: Performance of A60 Leeming Lane / Peafield Lane (Reference Case)

Approach Lane (and flare)	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	DoS	MMQ	DoS	MMQ
Leeming Lane (N) Left Ahead	84.8%	12.1	86.7%	13.2
Leeming Lane (N) Ahead	84.8%	12.1	84.5%	12.4
Peafield Lane Left Ahead Right	84.1%	15.9	57.9%	10.5
Leeming Lane (S) Left Ahead	55.8%	7.3	75.8%	15.7
Leeming Lane (S) Right	84.8%	13.3	87.1%	19.7
Sandgate Road Left Ahead Right	25.5%	1.1	35.0%	1.6
Junction Summary	PRC	6.1	PRC	3.3
	Veh Delay (PCU Hrs)	26.20	Veh Delay (PCU Hrs)	27.97

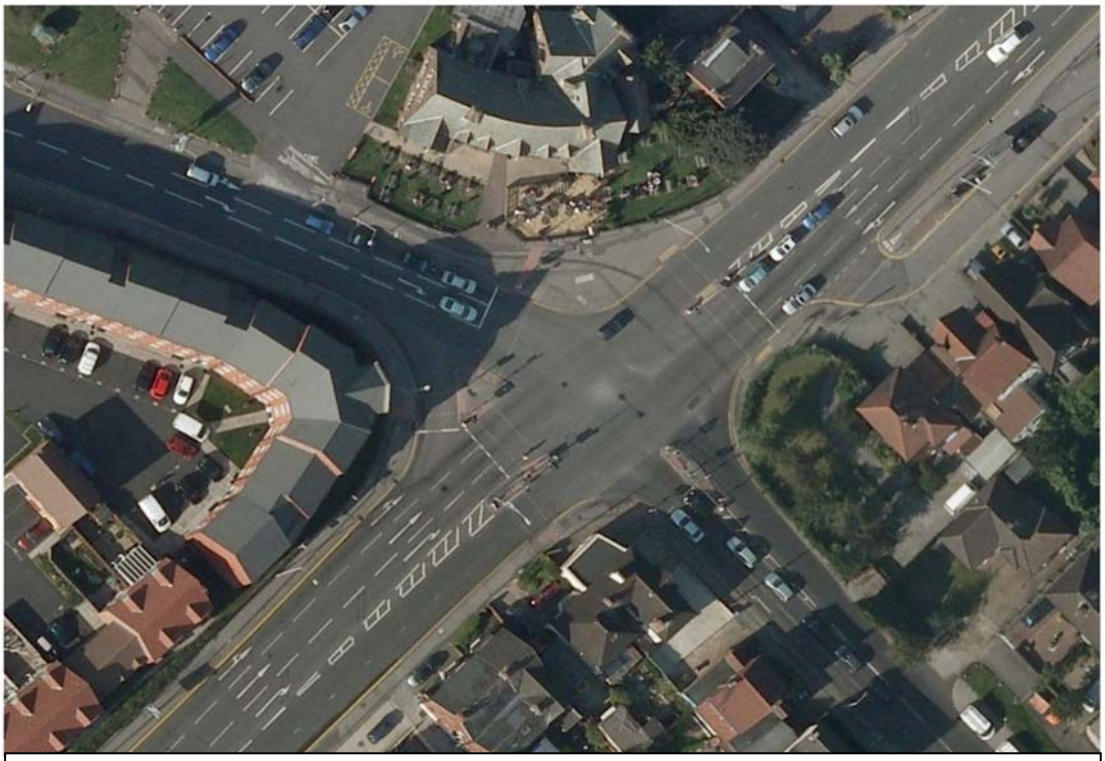
Notes: DoS = Degree of Saturation. A measure of the trafficking of an approach to the junction in relation to its ability to accommodate such flow.
MMQ = Mean Maximum Queue reported on a per arm basis and measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU / 1 bus = 2 PCU etc.
PRC = Practical Reserve Capacity. A measure of the overall percentage "spare" capacity at a junction.
Delay = Vehicle Delay in PCU-hours per hour.

Table 6B shows the results of the LINSIG analysis and identifies that the junction would operate within capacity in the 2031 Reference Case in both the AM and PM peak hour.

The PM peak hour results show that Leeming Lane (N) and the right turn from Leeming Lane (S) into Peafield Lane have degrees of saturation of approaching 90%. Overall this junction is considered to be operating within capacity in the Reference Case scenario.

A38 Sutton Road / Skegby Lane

This is a signalised junction and, as such, has been assessed using LINSIG3. The A38 forms the south west radial route into Mansfield town centre. Skegby Lane on the west side of the junction provides a link to the northern part of Sutton in Ashfield. Sheepbridge Lane to the south east of the junction provides a route to the Berry Hill area of Mansfield. The results of the operational analysis are presented in Table 7A and 7B.



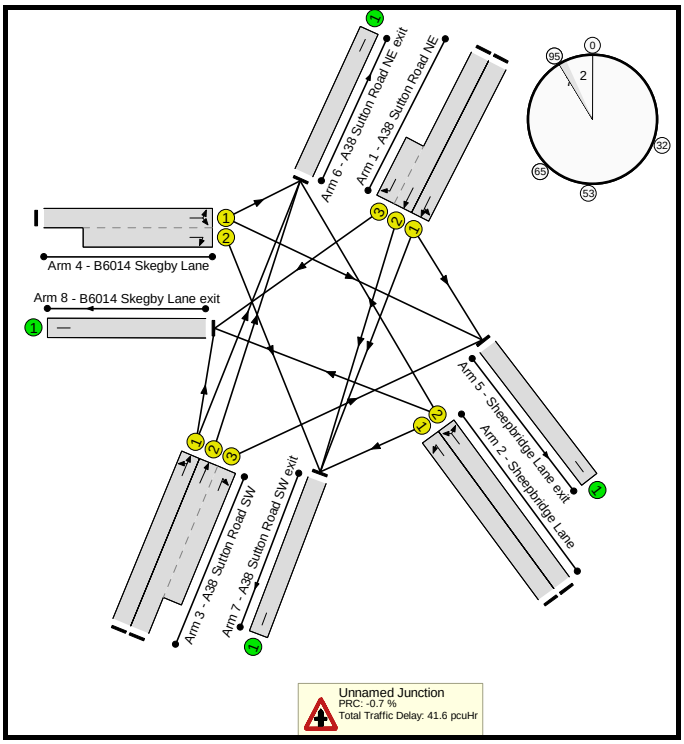


Table 7A: Performance of A38 Sutton Road / Skegby Lane (Base Year)

Approach Lane (and flare)	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	DoS	MMQ	DoS	MMQ
A38 Sutton Road NE Left Ahead	52.3%	8.2	74.9%	15.1
A38 Sutton Road NE Ahead Right	55.7%	8.4	69.7%	4.0
Sheepbridge Lane Left	78.8%	7.9	42.5%	4.0
Sheepbridge Lane Left2 Right	69.8%	7.0	84.7%	11.1
A38 Sutton Road SW Left Ahead	66.3%	10.9	82.5%	19.4
A38 Sutton Road SW Ahead Right	72.1%	11.3	84.4%	8.3
B6014 Skegby Lane Left Right Right2	97.2%	20.8	87.0%	10.9
Junction Summary	PRC	-8.1	PRC	3.5
	Veh Delay (PCU Hrs)	41.53	Veh Delay (PCU Hrs)	37.87

Notes: DoS = Degree of Saturation. A measure of the trafficking of an approach to the junction in relation to its ability to accommodate such flow.
MMQ = Mean Maximum Queue reported on a per arm basis and measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU / 1 bus = 2 PCU etc.
PRC = Practical Reserve Capacity. A measure of the overall percentage "spare" capacity at a junction.
Delay = Vehicle Delay in PCU-hours per hour.

Table 7A shows that the junction is operating within its capacity in the Baseline Case although B6014 Skegby Lane is approaching capacity with a DoS above 90% in the AM peak. In the PM peak, the Skegby Lane approach has the highest Degree of Saturation at 87%.

One DoS value is greater than the target value of 90% on one approach and below 100% on all approaches. Overall, the operational performance of the junction is considered to be operating near to capacity in the AM peak hour.

Table 7B: Performance of A38 Sutton Road / Skegby Lane (Reference Case)

Approach Lane (and flare)	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	DoS	MMQ	DoS	MMQ
A38 Sutton Road NE Left Ahead	52.2%	8.8	64.1%	10.7
A38 Sutton Road NE Ahead Right	68.2%	9.4	67.3%	11.1
Sheepbridge Lane Left2 Right	81.5%	9.1	90.5%	13.7
A38 Sutton Road SW Left Ahead	77.9%	15.6	83.9%	17.9
A38 Sutton Road SW Ahead Right	81.0%	16.1	87.5%	19.2
B6014 Skegby Lane Left Right Right2	90.6%	15.6	92.0%	15.0
Junction Summary	PRC	-0.7	PRC	-2.2
	Veh Delay (PCU Hrs)	41.63	Veh Delay (PCU Hrs)	48.61

Notes: DoS = Degree of Saturation. A measure of the trafficking of an approach to the junction in relation to its ability to accommodate such flow.
MMQ = Mean Maximum Queue reported on a per arm basis and measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU / 1 bus = 2 PCU etc.
PRC = Practical Reserve Capacity. A measure of the overall percentage "spare" capacity at a junction.
Delay = Vehicle Delay in PCU-hour per hour.

Table 7B shows that the junction would operate within capacity in the 2031 Reference Case AM peak hour, although B6014 Skegby Lane is approaching capacity with a DoS above 90% in the AM peak.

In the PM peak, Skegby Lane approach has the highest Degree of Saturation at 92%. Skegby Lane and Sheepbridge Lane are approaching capacity even with the signal timings optimised during the analysis.

Where DoS values are greater than the target value of 90%, all DoS are below 100%. The operational performance of the junction is considered to be operating near to capacity in the PM peak hour.

The junction has residential and public house premises on the four corners so localised widening of the approaches would be likely to require the acquisition of property. Cycle times at the junction could be extended to increase vehicle capacity but this would come with a disbenefit to pedestrian wait times.

A60 Church Street / Wood Street

This is a signalised junction and, as such, has been assessed using LINSIG3. The A60 Church Street provides links to Mansfield to the south and Worksop to the north. Church Street to the east provides local access to Market Warsop town centre and car parking. Signal timings and phasing for this junction have been based on on-site observations and timings.

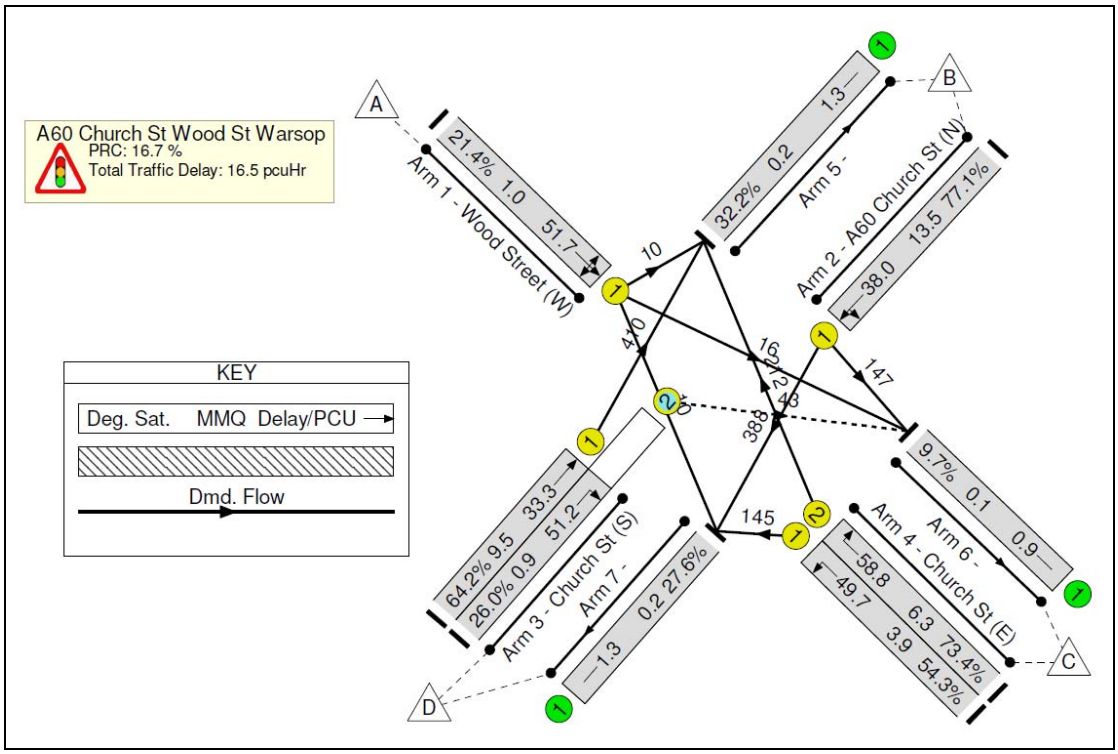


Table 8A: Performance of A60 Church Street / Wood Street (Base Year)

Approach Lane	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	DoS	MMQ	DoS	MMQ
Wood Street (W) Left Ahead Right	21.4%	1.0	12.5%	0.5
A60 Church St (N) Left Ahead	77.1%	13.5	85.7%	17.0
Church St (S) Ahead	64.2%	9.5	57.9%	8.4
Church St (S) Right	26.0%	0.9	29.0%	0.8
Church St (E) Left	54.3%	3.9	64.9%	4.7
Church St (E) Right	73.4%	6.3	80.9%	7.2
Junction Summary	PRC	16.7	PRC	5.0
	Veh Delay (PCU Hrs)	16.52	Veh Delay (PCU Hrs)	18.93

Notes: DoS = Degree of Saturation. A measure of the trafficking of an approach to the junction in relation to its ability to accommodate such flow.
MMQ = Mean Maximum Queue reported on a per arm basis and measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU / 1 bus = 2 PCU etc.
PRC = Practical Reserve Capacity. A measure of the overall percentage "spare" capacity at a junction.
Delay = Vehicle Delay in PCU-hours per hour.

Table 8A shows the results of the LINSIG analysis and identifies that the junction is currently operating within capacity, although one approach is at 86% capacity. As LINSIG uses a flat profile (i.e. there is no variation within the assessment period), there may be some transient queuing during the peak hour at this junction.

The A60 Church Street (N) approach of the junction has the highest degree of saturation (77.1% in the AM peak hour and 85.7% in the PM Peak hour). This is less than the target value of 90% and therefore the operational performance of the junction is considered to be acceptable.

Table 8B: Performance of A60 Church Street / Wood Street (Reference Case)

Approach Lane	AM (0800 – 0900hrs)		PM (1700 – 1800hrs)	
	DoS	MMQ	DoS	MMQ
Wood Street (W) Left Ahead Right	27.9%	1.3	16.6%	0.7
A60 Church St (N) Left Ahead	102.2%	35.8	114.5%	78.8
Church St (S) Ahead	84.9%	15.2	77.5%	13.0
Church St (S) Right	71.3%	2.1	63.8%	1.7
Church St (E) Left	71.9%	5.8	87.1%	8.1
Church St (E) Right	97.2%	13.6	108.1%	23.3
Junction Summary	PRC	-13.6	PRC	-27.2
	Veh Delay (PCU Hrs)	47.12	Veh Delay (PCU Hrs)	99.26

Notes: DoS = Degree of Saturation. A measure of the trafficking of an approach to the junction in relation to its ability to accommodate such flow.
MMQ = Mean Maximum Queue reported on a per arm basis and measured in PCUs.
PCU = Passenger Car Unit. 1 car = 1 PCU; 1 bus = 2 PCU etc.
PRC = Practical Reserve Capacity. A measure of the overall percentage "spare" capacity at a junction.
Delay = Vehicle Delay in PCU-hours per hour.

Table 8B shows that the A60 Church Street (N) and Church Street (E) approaches to the junction would operate with a degree of saturation close to 100% in the 2031 Reference Case AM peak hour. In the AM peak, the junction would operate at capacity.

The PM peak hour results show that A60 Church Street (N) and Church Street (E) would have degrees of saturation in excess of 100%, which indicates that the junction would be over capacity.

Given that the degrees of saturation on the remaining approaches are lower in both the AM and PM peak hours, the optimisation of the traffic signals timings is likely to resolve some of the capacity issues at this junction. In addition, it is noted that the Base Year phasing arrangements included an 'all red' pedestrian stage. This could be reviewed so as to incorporate pedestrian crossing movements in combination with green light phases for traffic movements. This would require the installation of pedestrian refuge islands in the centre of the road and would require a detailed design to ensure that there is sufficient road space to install these. Nottinghamshire County Council rejected this proposal as the resulting stage sequences would be less desirable.

Another option considered would be to add MOVA system to the traffic controller at the junction. The cost would be approximately £40,000 to £100,000 and MOVA typically reduces delays by 13%, which may be sufficient for this junction to operate more efficiently in the PM Peak. Funding for this type of improvement could be secured from developer contributions from the Committed developments most likely to impact upon this junction; King Street/Wood Street, Goose Farm Wood Street, Former Wood Bros, Sherwood Street and Oakfield Lane, Rear of Cherry Paddocks and Moorefield Farm Bishops Walk. This would be in the form of an agreement between the Local Authority and the developer and based upon the size of the traffic impacts highlighted in the Transport Assessment for each site.

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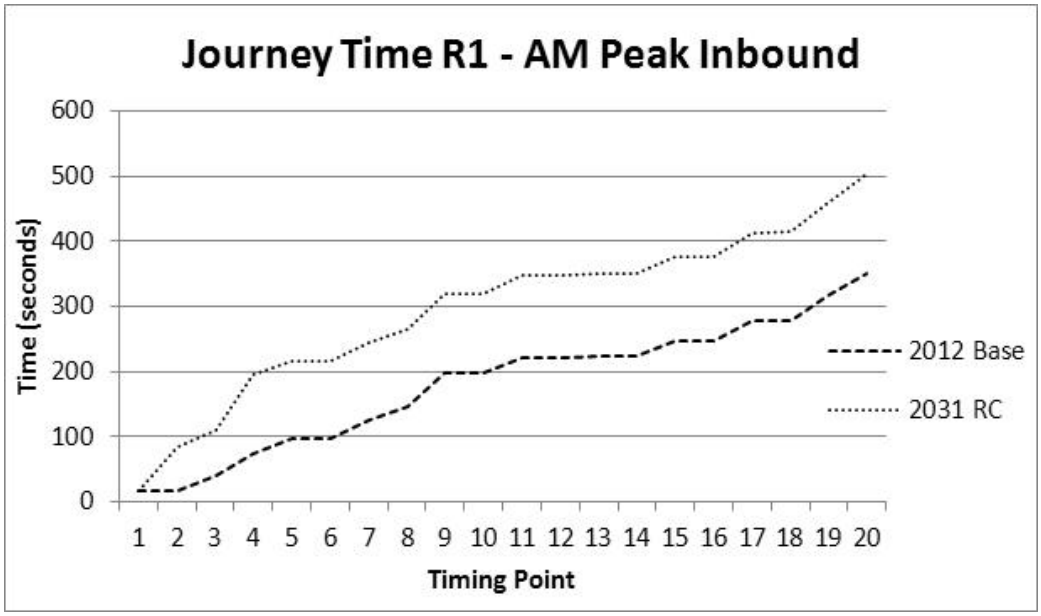
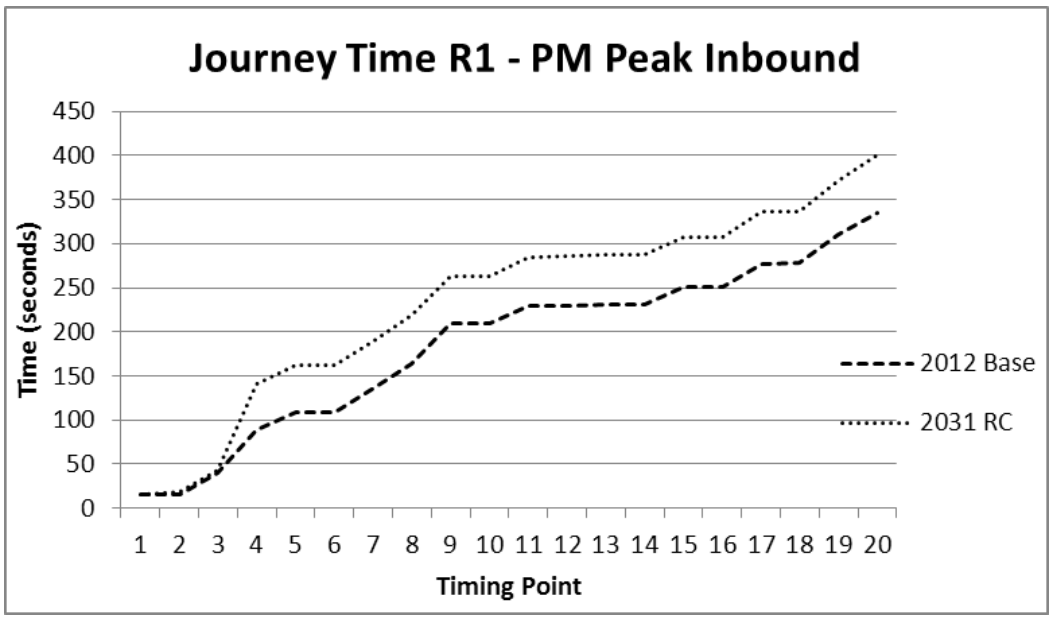
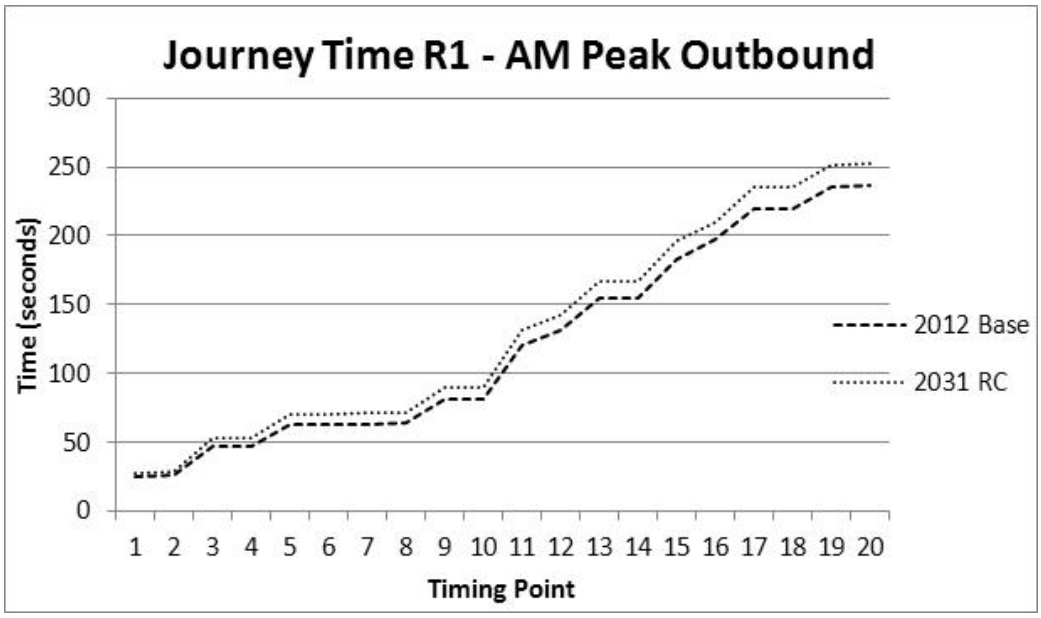
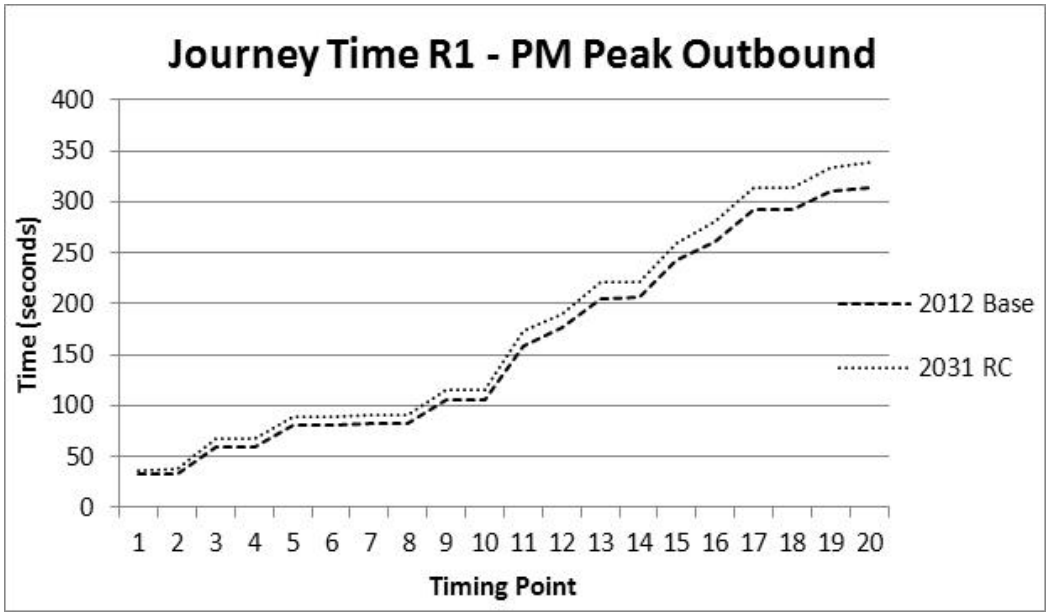
APPENDIX F
Route Time-Distance Plots

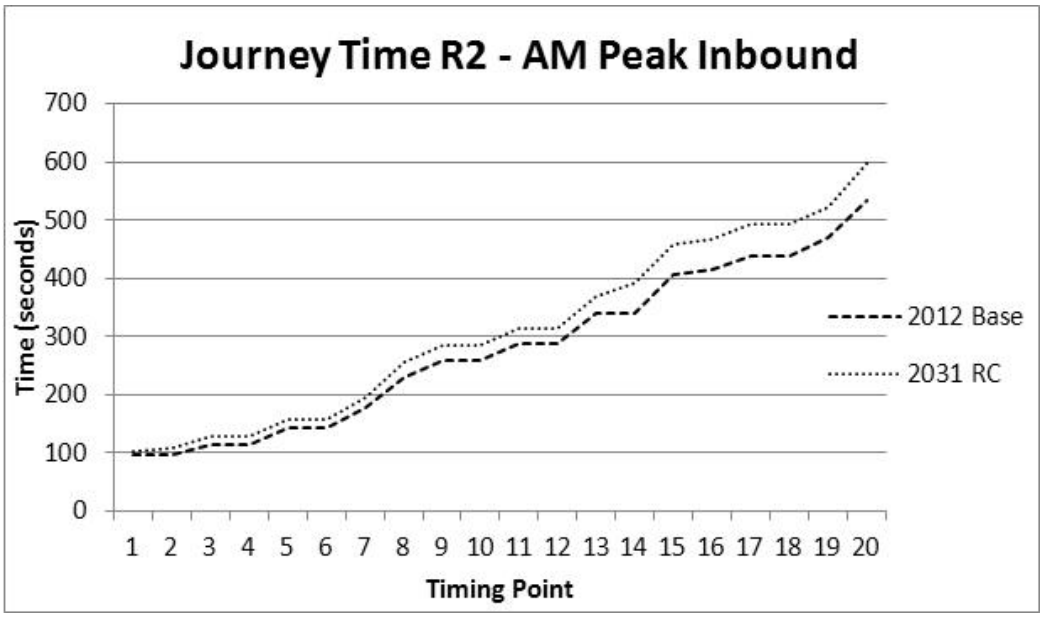
Appendix F: Journey Time Route Charts






Journey Time R1 - AM Peak Outbound
Time (seconds)
300
250
200
150
100
50
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Timing Point
2012 Base
2031 RC


Journey Time R1 - PM Peak Outbound
Time (seconds)
400
350
300
250
200
150
100
50
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Timing Point
2012 Base
2031 RC


Journey Time R2 - AM Peak Inbound
Time (seconds)
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600
500
400
300
200
100
0
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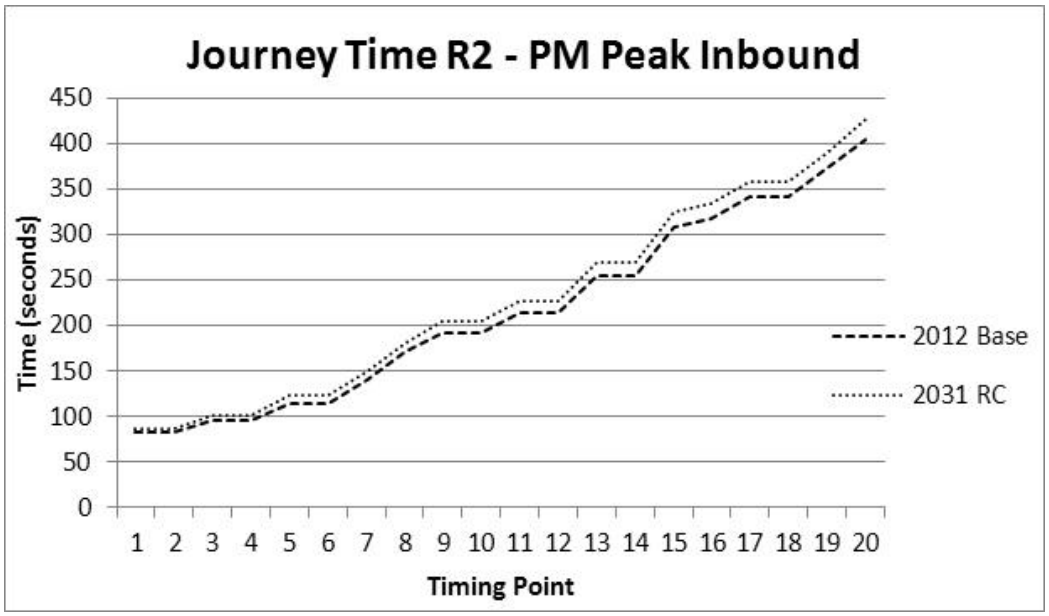
Timing Point
2012 Base
2031 RC


Journey Time R2 - PM Peak Inbound
Time (seconds)
450
400
350
300
250
200
150
100
50
0
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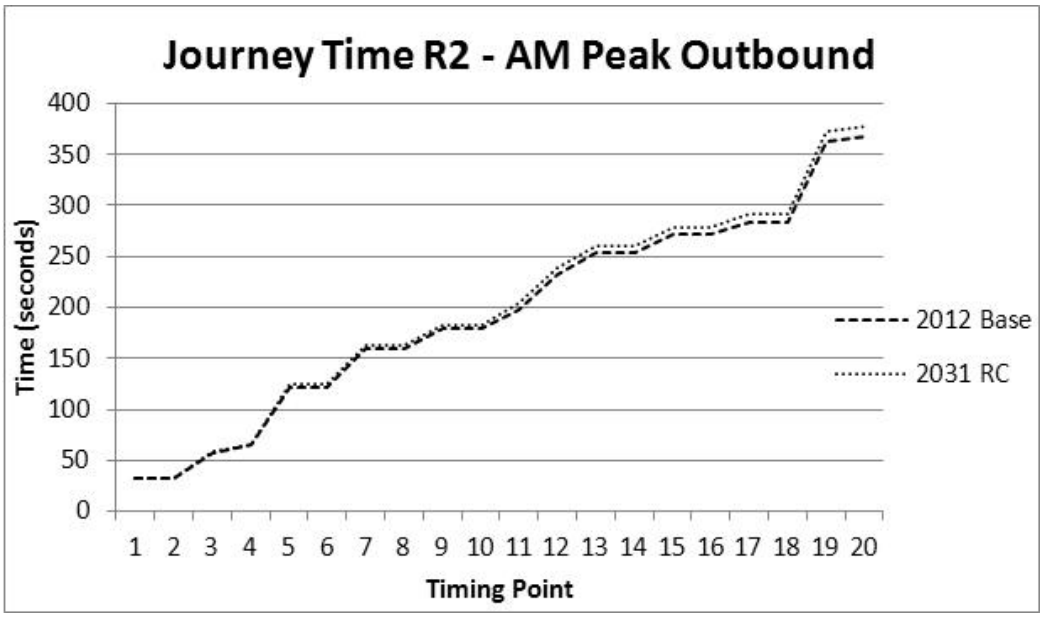
Timing Point
2012 Base
2031 RC


Journey Time R2 - AM Peak Outbound
Time (seconds)
400
350
300
250
200
150
100
50
0
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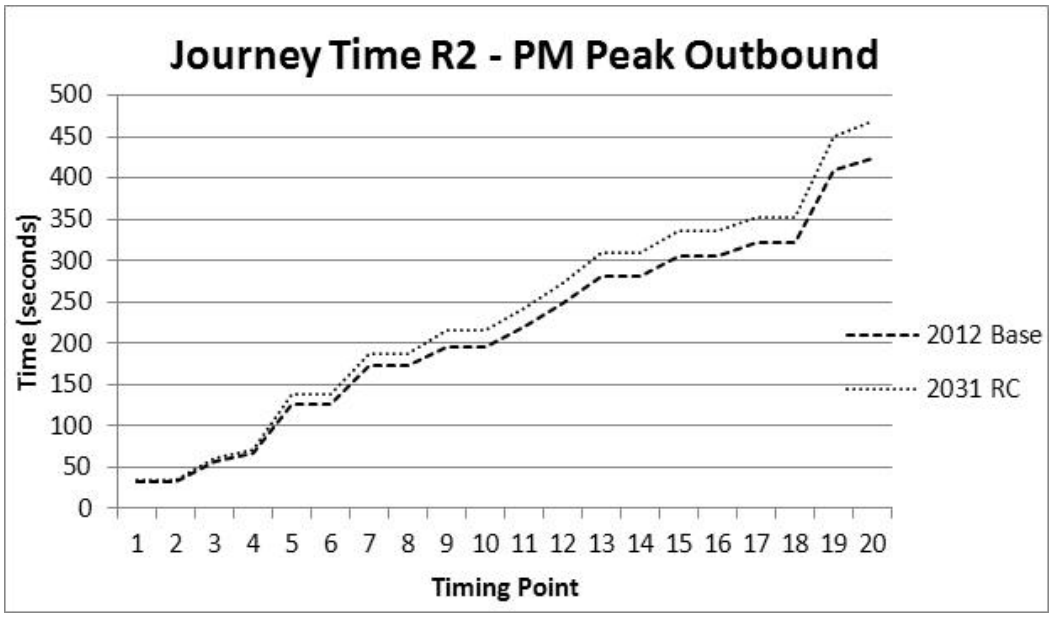
Timing Point
2012 Base
2031 RC


Journey Time R2 - PM Peak Outbound
Time (seconds)
500
450
400
350
300
250
200
150
100
50
0
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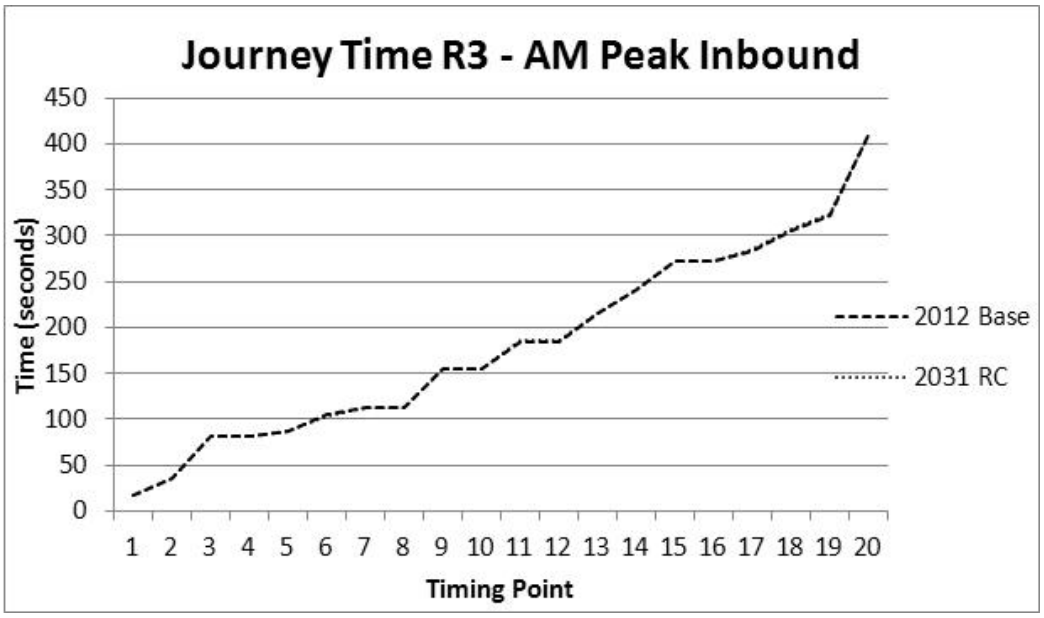
Timing Point
2012 Base
2031 RC


Journey Time R3 - AM Peak Inbound
Time (seconds)
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400
350
300
250
200
150
100
50
0
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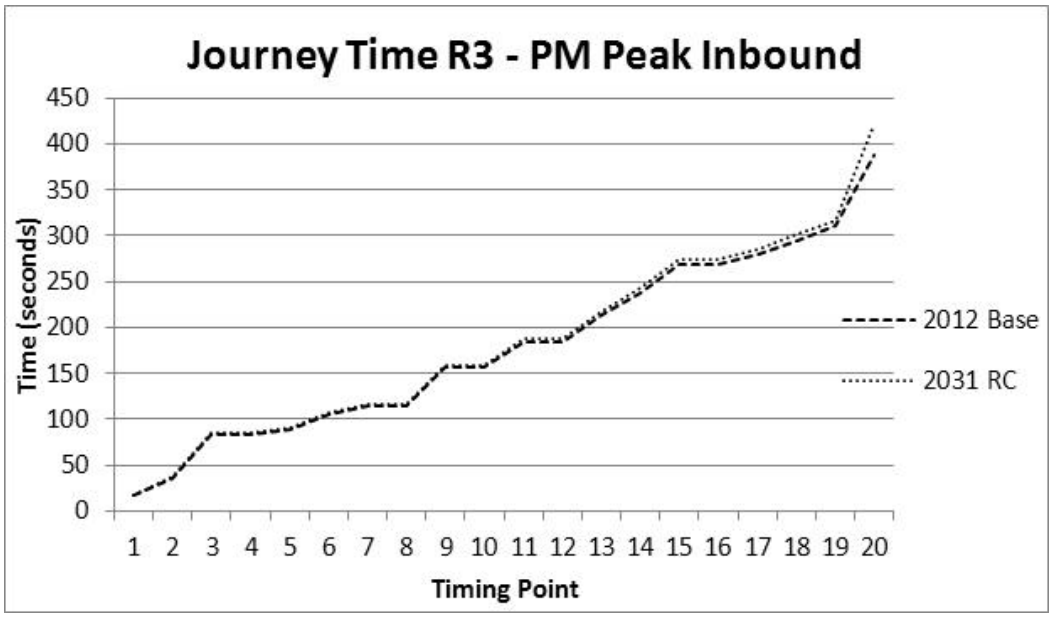
Timing Point
2012 Base
2031 RC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Time (seconds)
450
400
350
300
250
200
150
100
50
0
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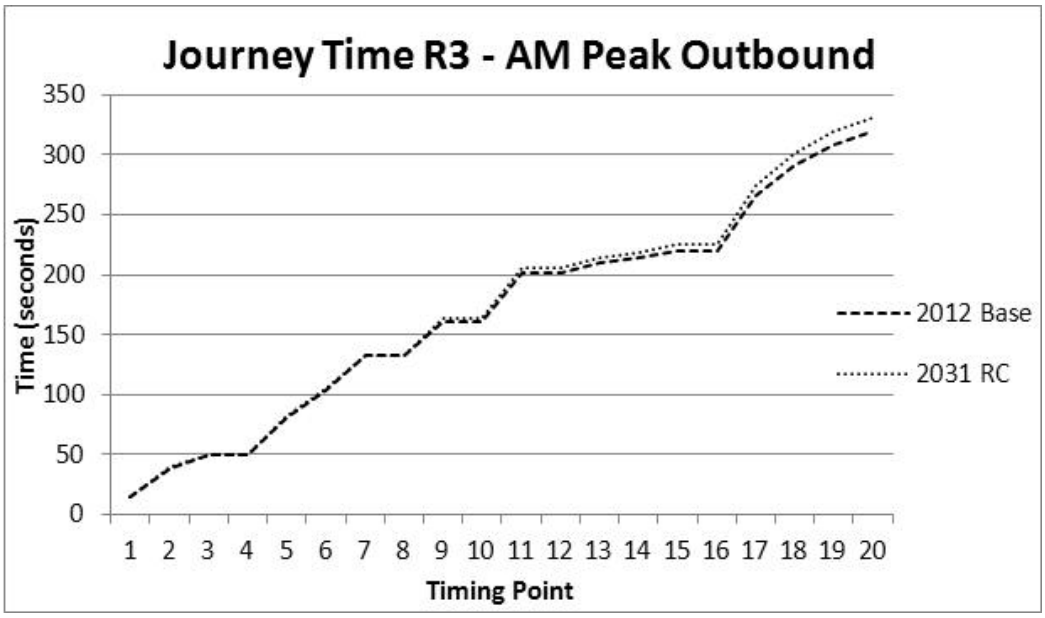
Timing Point
2012 Base
2031 RC


Journey Time R3 - AM Peak Outbound
Time (seconds)
0
50
100
150
200
250
300
350
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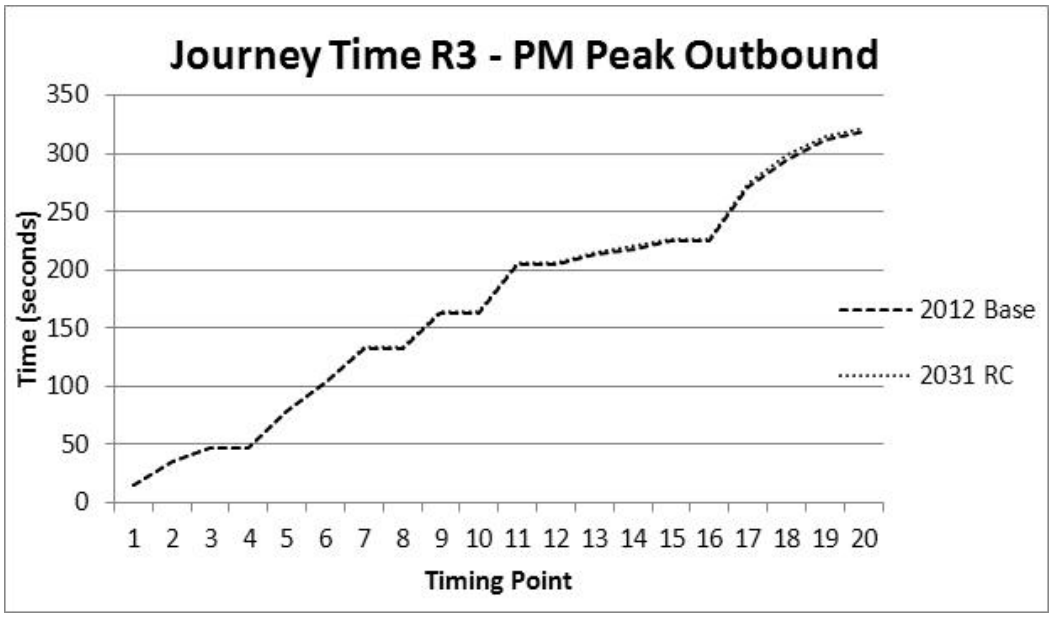
Timing Point
2012 Base
2031 RC


Journey Time R3 - PM Peak Outbound
Time (seconds)
0
50
100
150
200
250
300
350
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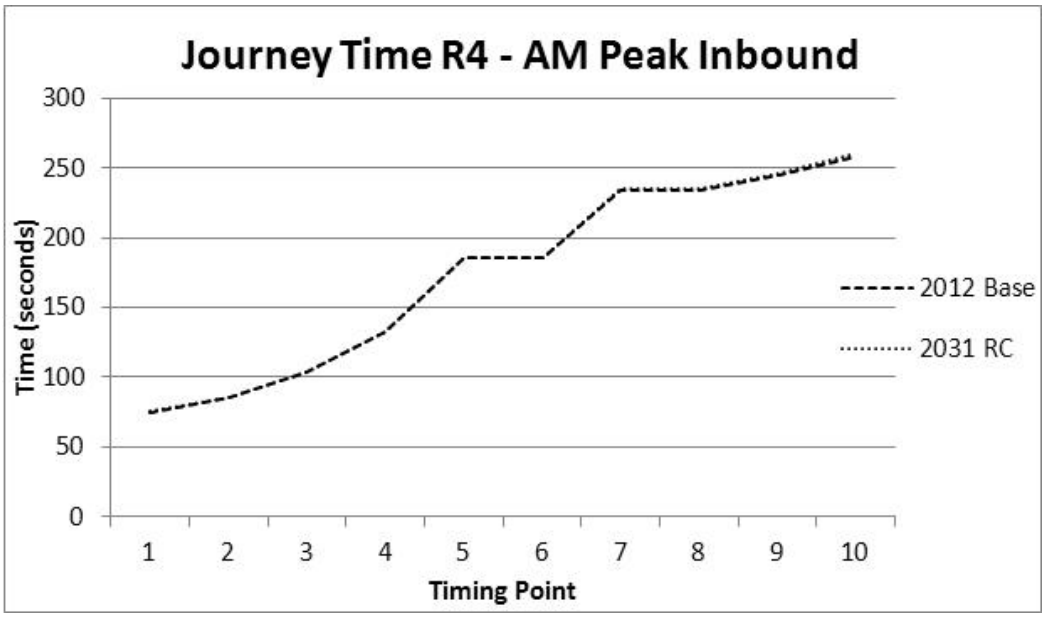
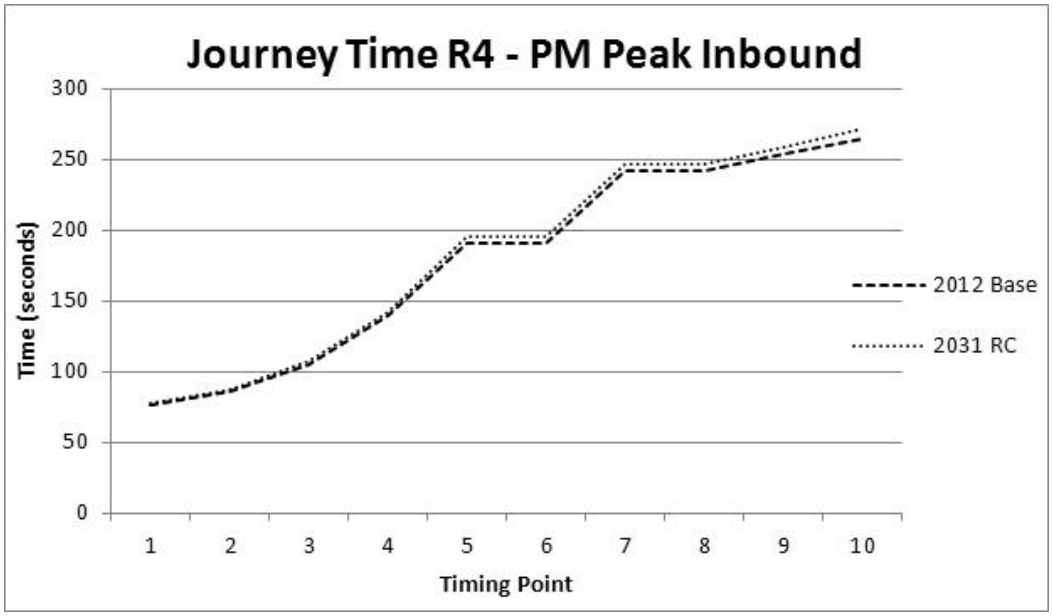
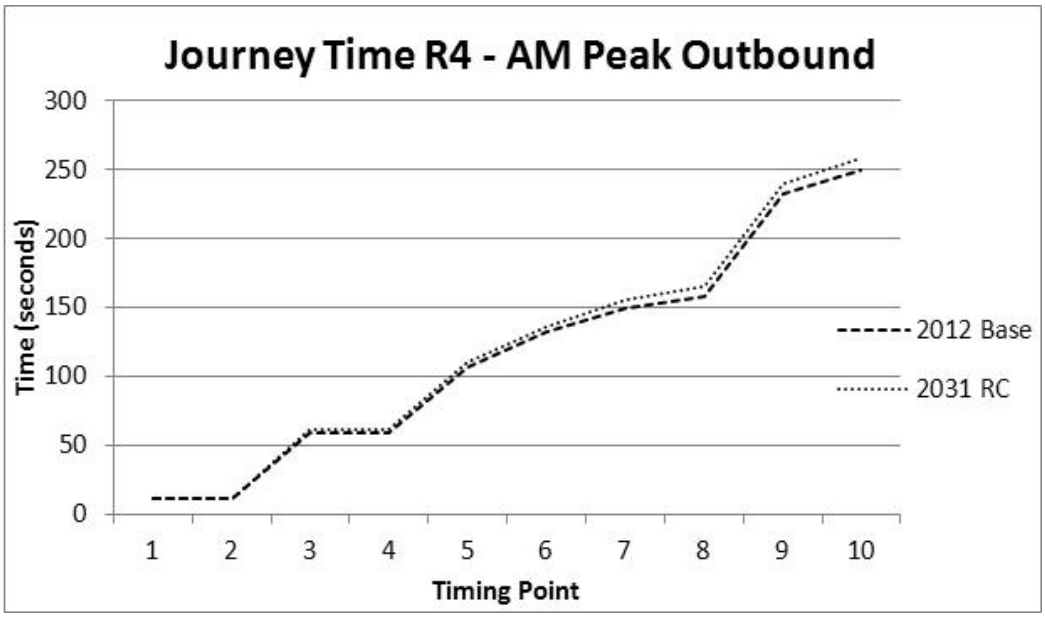
Timing Point
2012 Base
2031 RC


Journey Time R4 - AM Peak Inbound
300
250
200
150
100
50
0
Time (seconds)
1
2
3
4
5
6
7
8
9
10
Timing Point
2012 Base
2031 RC


Journey Time R4 - PM Peak Inbound
300
250
200
150
100
50
0
Time (seconds)
1
2
3
4
5
6
7
8
9
10
Timing Point
2012 Base
2031 RC


Journey Time R4 - AM Peak Outbound
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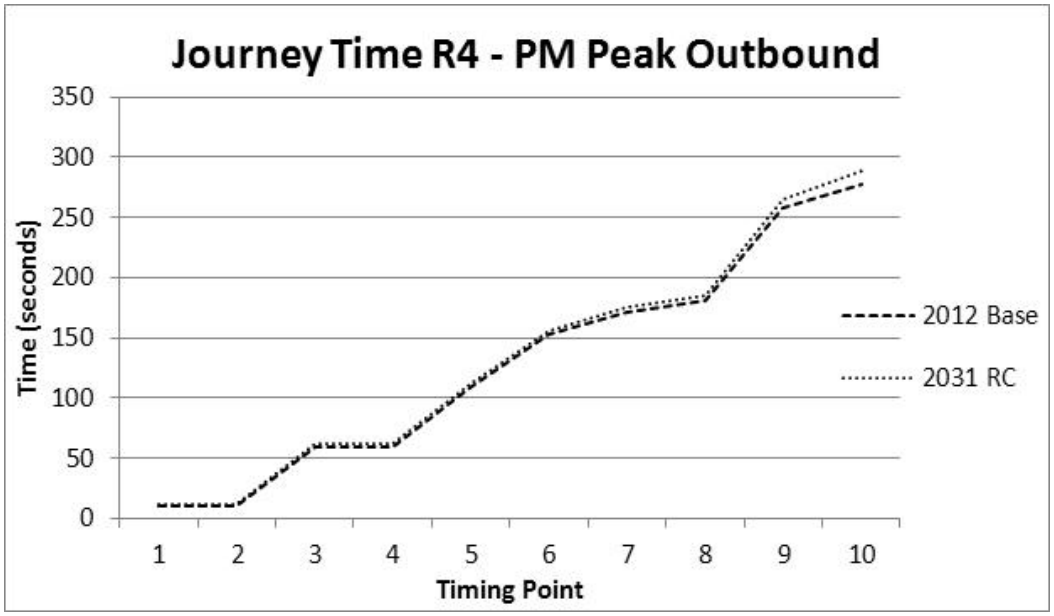
250
200
150
100
50
0
Time (seconds)
1
2
3
4
5
6
7
8
9
10
Timing Point
2012 Base
2031 RC


Journey Time R4 - PM Peak Outbound
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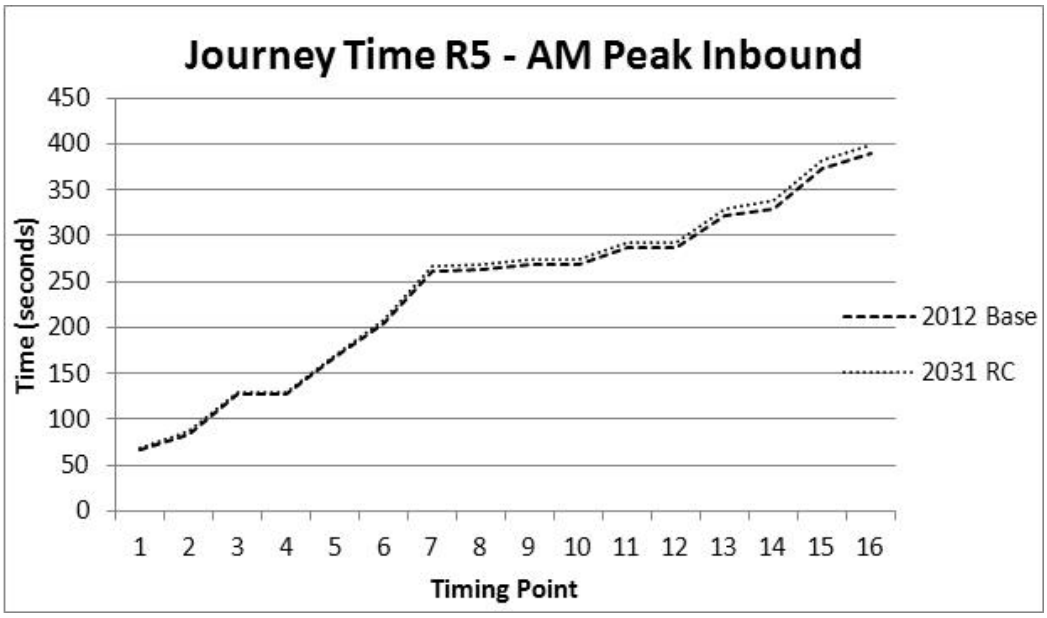
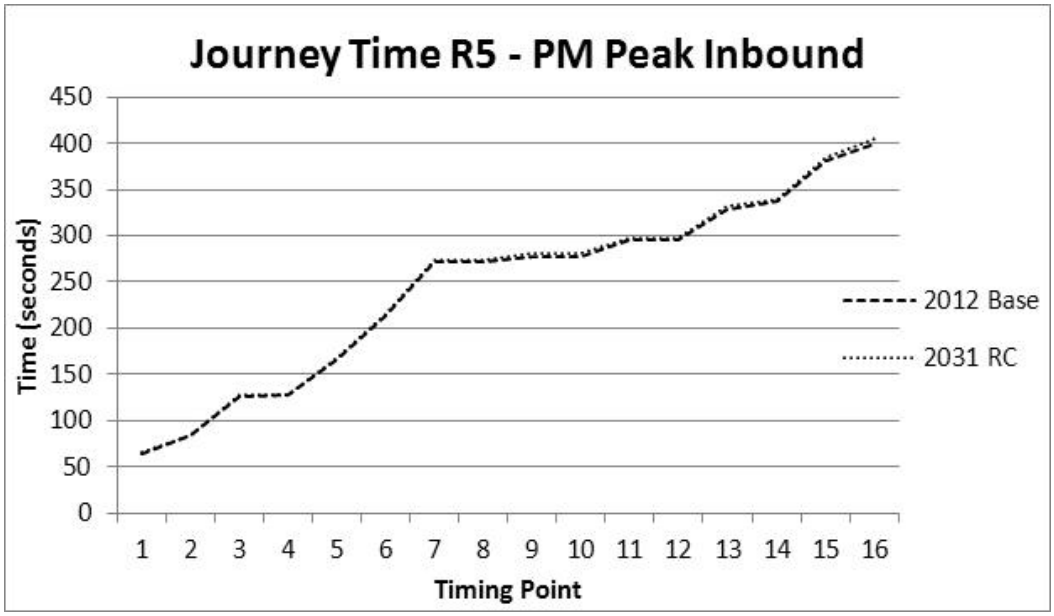
300
250
200
150
100
50
0
Time (seconds)
1
2
3
4
5
6
7
8
9
10
Timing Point
2012 Base
2031 RC


Journey Time R5 - AM Peak Inbound
Time (seconds)
450
400
350
300
250
200
150
100
50
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Timing Point
2012 Base
2031 RC


Journey Time R5 - PM Peak Inbound
Time (seconds)
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300
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200
150
100
50
0
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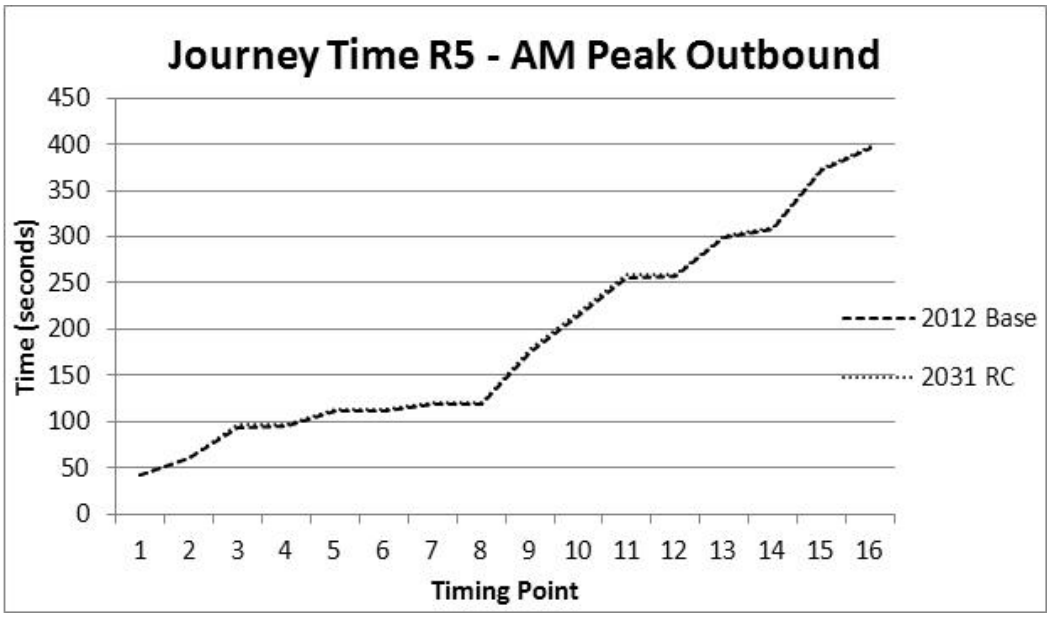
Timing Point
2012 Base
2031 RC


Journey Time R5 - AM Peak Outbound
Time (seconds)
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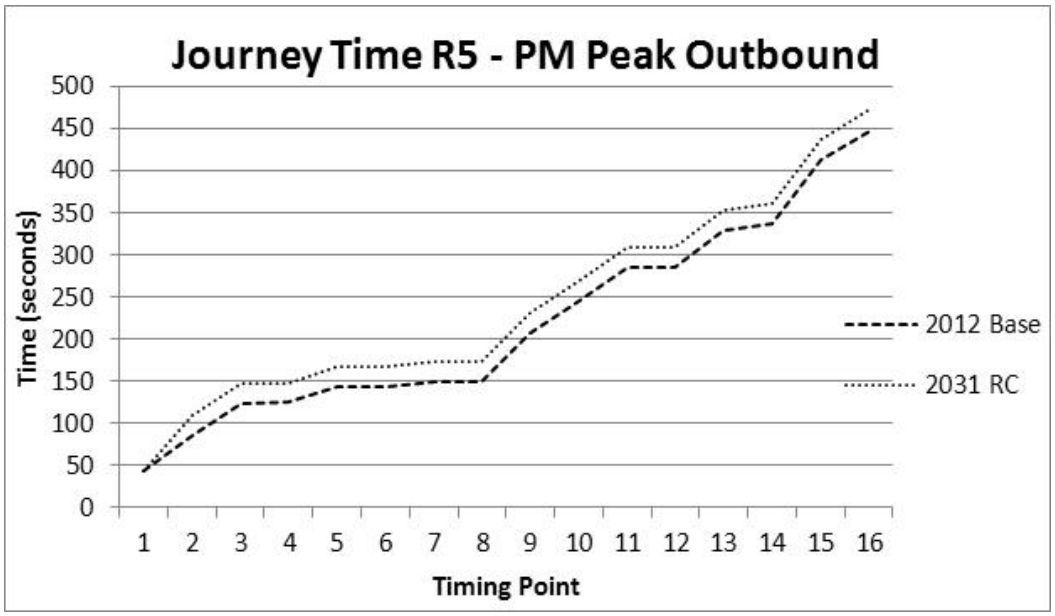
Timing Point
2012 Base
2031 RC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Time (seconds)
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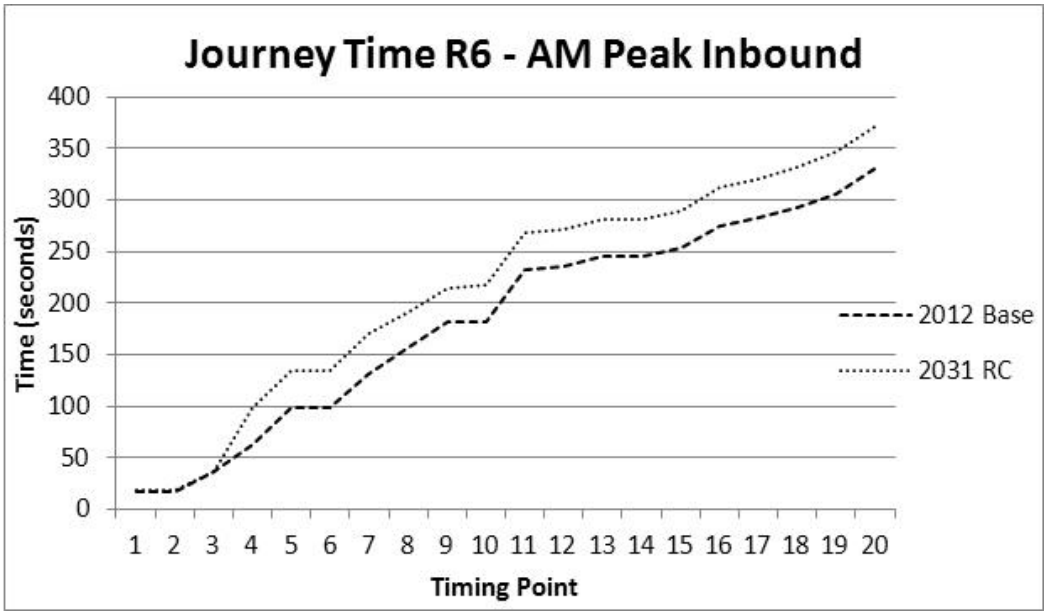
Timing Point
2012 Base
2031 RC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Time (seconds)
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200
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100
50
0
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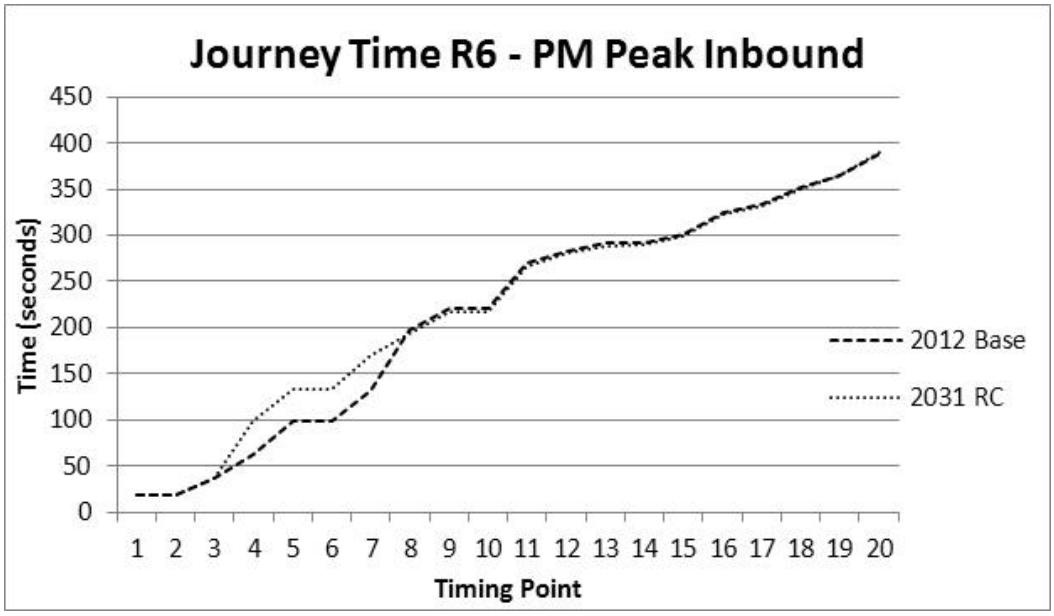
Timing Point
2012 Base
2031 RC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Time (seconds)
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150
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Timing Point
2012 Base
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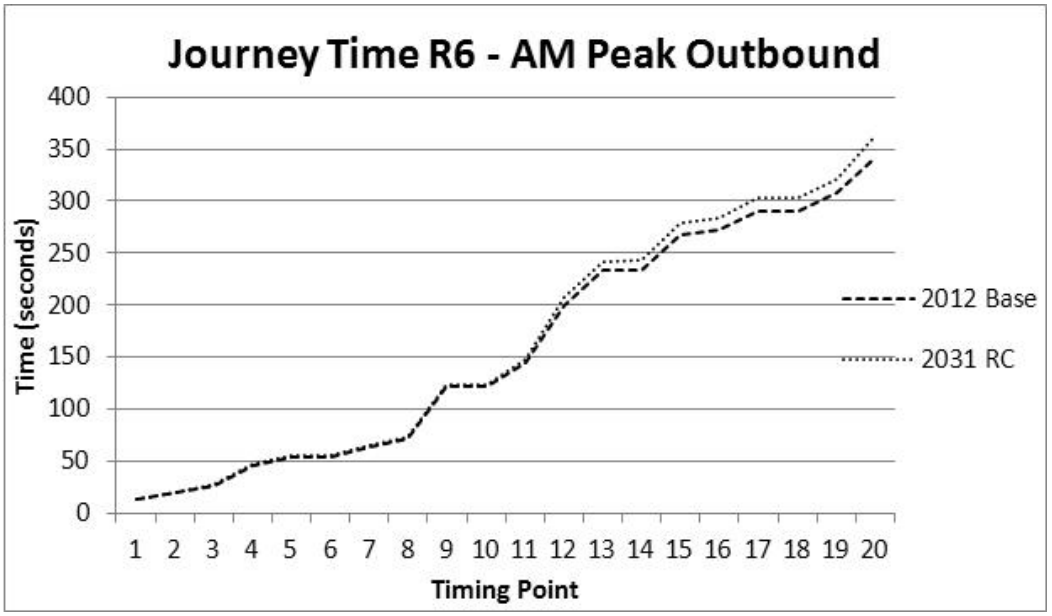
Journey Time R6 - AM Peak Outbound
Time (seconds)
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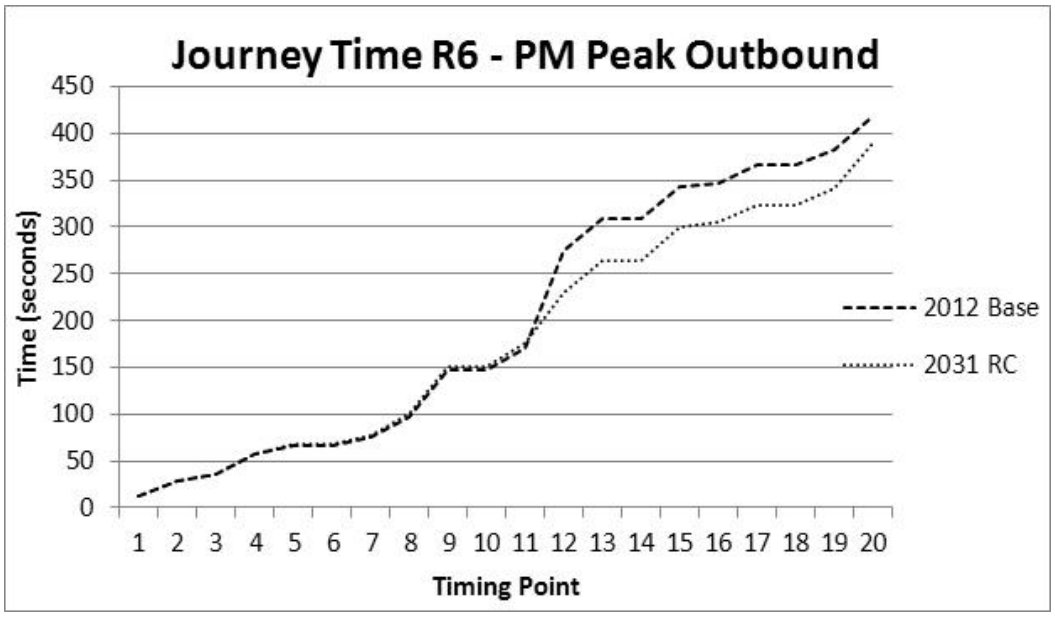
300
250
200
150
100
50
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Timing Point
2012 Base
2031 RC


Journey Time R6 - PM Peak Outbound
Time (seconds)
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400
350
300
250
200
150
100
50
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Timing Point
2012 Base
2031 RC

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