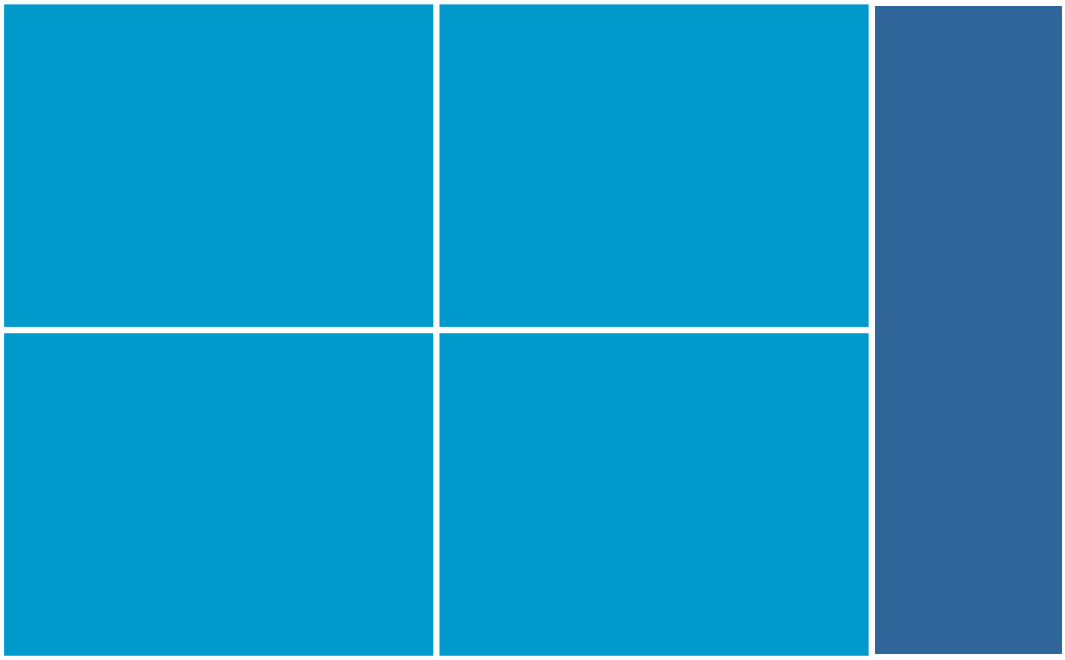
Derbyshire County Council

North Derbyshire Local Development Frameworks: Chesterfield

Stage 2: Traffic Impacts of Proposed Development

Draft
May 2010



Revision Schedule

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Rev	Date	Details	Prepared by	Reviewed by	Approved by
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Appendices

1 Introduction

1.1 The Local Development Framework Process

1.1.1 Under the Planning and Compulsory Purchase Act (2004), Local Development Frameworks (LDFs) will replace the existing system of Local, Structure and Unitary Plans. Within Derbyshire, the preparation of several LDFs is currently ongoing. This work is led by the District and Borough Councils with inputs from stakeholders (such as Derbyshire County Council, DCC, the local highway authority).

1.1.2 Unlike Local Plans, an LDF does not comprise a single planning document but rather consists of a portfolio of documents based around a Core Strategy and subsequently covering issues such as Housing, Employment and Retail.

1.1.3 All development plan documents prepared under the LDF will be subject to 'Examination in Public' and would need to pass a test of 'soundness'. As such, a wide-ranging evidence base is being prepared to support each LDF.

1.1.4 DCC has been asked for comments and analysis that would support the Core Strategies for the following areas in Derbyshire;

- Bolsover,
- Chesterfield,
- North East Derbyshire,
- High Peak and Derbyshire Dales[1].

1.1.5 As DCCs current framework partner, Scott Wilson Ltd has been commissioned to collate the relevant information that currently exists and to provide additional analysis where it is required. Following a meeting in late 2009, involving officers from the above District / Boroughs, it was determined that information is required in two broad stages;

- Broad comments on each of the District / Borough's development options to inform a set of Preferred Options, } Stage 1

- Traffic impact tests of the Preferred Options for each District individually,
- A test looking at the Preferred Options for each District in tandem and cumulatively,
- Identification of a package of potential transport / highway related mitigation. } Stage 2

[1] High Peak and Derbyshire Dales are preparing a joint Core Strategy

1.1.6 The work outlined in Stage 1, above, is contained within separate documents; one for the area comprising Chesterfield, Bolsover, and North East Derbyshire; and one for the area comprising the Derbyshire Dales and the High Peak.

1.1.7 The focus of this report (Stage 2) is to quantify the likely traffic impacts of the proposed LDF developments and give a broad indication of the mitigation schemes likely to be required to deliver the growth envisioned. This work is based on a particular option test for **Chesterfield**, which is outlined in Section 2.

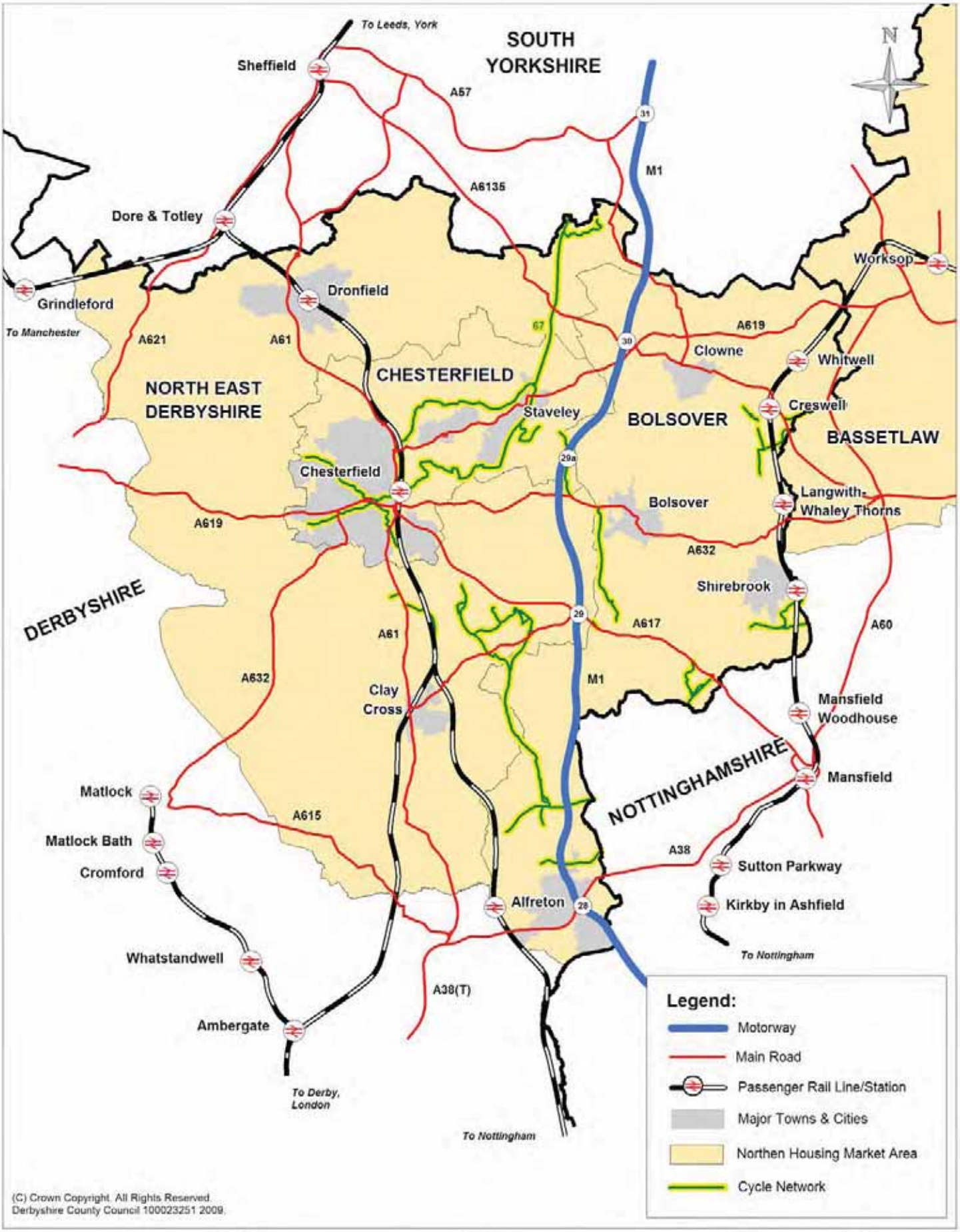
1.1.8 A further report identifies the joint impacts of the development proposed in Chesterfield, North Easy Derbyshire and Bolsover together. This separate report also includes consideration of development proposed outside of north-Derbyshire (i.e. within bordering authorities). As such, to gauge the transport impacts of the proposed LDF in Chesterfield consideration should be given to the findings of;

- The Stage 1 report which sets out the strategic impacts of the proposed development,
- The Stage 2 (Singular) report, which sets out the traffic impacts of that development proposed in Chesterfield,
- The Stage 2 (Cumulative) report, which sets out the traffic impacts of that development proposed in Chesterfield, North East Derbyshire Bolsover and neighbouring authorities, together.

1.1.9 As is suggested above, this document would also need to be read alongside other, non-transport evidence when judging the full range of issues posed by any future development aspirations within the LDF.

1.2 Study Area

1.2.1 The study area is shown within Figure 1.1, overleaf. This area is wider than the Chesterfield Borough administrative area, and also includes Bolsover and North East Derbyshire whose Authorities effectively surround Chesterfield; sharing much of the same local highway network.



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Project Title: **Northern HMA Transportation Issues**

Drawing Title: **Strategic Transport Links**

Date: Nov 2009

Scale: N.T.S.

Drawing No.: Figure 1

1.3 Transport Implications of Proposed Developments within the LDF

1.3.1 Both in terms of planning policy and the actual planning application process, there are several planning gateways through which prospective developments must pass before actual construction work gets underway.

1.3.2 The level of assessment required at these gateways varies. For a planning application (either outline or detailed), a formal Transport Assessment is usually submitted for developments above a certain threshold. Such a document sets out how the site will be accessed by all transport modes and what the impacts of the development's traffic would be on the wider highway network; both in terms of network capacity and road safety. The format and content of a Transport Assessment are governed by the Department for Transport's (DfT) *Guidance on Transport Assessment* (GTA, DfT, March 2007).

1.3.3 The GTA focuses on three aspects;

- Encouraging Environmental Sustainability,
- Managing the Existing Network,
- Mitigating Residual Impacts.

1.3.4 Importantly, a Transport Assessment is written to support a specific development scenario for which issues such as development location, size and access have been determined. For the LDF development scenarios, these aspects are not yet fixed. As such, the Stage 1 report assessed the potential for *Encouraging Environmental Sustainability* based on general development locations, whereas the Stage 2 report considers what may be described as a 'test' option to consider *Managing the Existing Network* and the potential for *Mitigating Residual Impacts*.

1.4 Methodology

1.4.1 The impact of the potential LDF development is of concern to two highway authorities; Derbyshire County Council (who are responsible for the local road network) and the Highways Agency (who are responsible for the trunk road, including motorway, network).

1.4.2 In order to assess the impacts of LDF development on the trunk road network, the Highways Agency have developed an analysis tool called DIAMOND (*Development Impact Assessment Model of Network Demand*).

1.4.3 DIAMOND is a strategic tool that uses traffic flow input to provide base year flows and stress levels (volume / capacity ratio) for links on the network. DIAMOND also assigns and distributes projected development trips onto the highway network in order to give future year stress and flow levels. Such flows incorporate background traffic growth. It has been used to analyse the strategic highway network across the UK; and its East Midlands variant has been used in this analysis. Importantly, the DIAMOND software is detailed to the 'B' road level and, as such, is also suitable to assess the local road network.

1.4.4 This tool is based on industry-standard processes and is described in detail, below;

1.4.5 DIAMOND estimates the number of trips that could be generated by a development by using the *Trip Rate Information Computer System* (TRICS). This is a database of surveys covering a variety of land-use types across the UK. For this analysis, weekend survey results and foreign and Greater London survey results have been excluded, which is standard practice.

1.4.6 DIAMOND performs the distribution of development trips onto the highway network by predicting the origins and destinations of those trips that the development generates. Trips to and from a development are calculated with respect to the population size of each zone and the distance between zones. Higher populations for example will attract / generate more trips to / from them. The greater the distance between zones, however, the lower the proportion of trips that will be attracted to / from them. This is a standard (Gravity Model) approach to estimating trip distribution. *Journey to Work* (JTW) 2001 Census data is used to calibrate this model.

1.4.7 With the trip distribution defined, the DIAMOND model then predicts the routes that these trips will take through the highway network. This is performed by the assignment model that operates over a number of iterations to calculate the route, or collection of routes, that drivers may take in light of the traffic conditions;

> In the first iteration, the model assumes all development journeys are made across the network using the fastest route under free-flow conditions. The link flows are then updated. In the second iteration, the model calculates the reduction in speed on the links as a result of the additional traffic. This relationship is given by speed/flow curves that differ by road type. The model then calculates a set of new fastest routes for all development trip movements and assigns a certain proportion of trips onto new faster routes. The algorithm continues iterating in this way until there is a negligible benefit for any vehicles to re-route.

1.4.8 Importantly, only the development trips are assigned in this way. In terms of the base flow (in this case taken as being the flow on the network as recorded / estimated in 2008) DIAMOND does recognise that the flow on the network now may not be the same as the flow that is experienced in future (i.e. it is recognised that background traffic growth occurs). As such, DIAMOND uses TEMPRO factors to calculate future traffic flows from base flows. However, this future year base traffic is not responsive to increasing congestion on the network (i.e. trips will not re-assign to other routes in the face of increasing journey times).

1.4.9 Notwithstanding the above, and as with any traffic model, the DIAMOND tool is underpinned by a number of assumptions, which include:

- **Zones:** Trips are loaded on a zone basis, rather than at specific development loading points. The zones are comparable to Census Output Areas. A Zoning Map is provided at Appendix A.
- **Base year conditions:** where no base year flows are available, flows are derived from average count values by road type in that area.
- **Background growth:** Growth is based on TEMPRO district level economic growth (no increase in households or employment).
- **Trip Generation:** Trip generation is based on user defined trip rates. RSS trips are based on RSS, LDF and Core Strategy information.
- **Trip Distribution:** The model uses Census 2001 to distribute traffic. It is assumed that workplace population and RSS employment growth are representative of trip attraction levels. It is also assumed that RSS housing growth and economic activity are representative of trip generation levels. The model assumes that route choice is limited to a modelled network of motorway, A and B and selected 'C' roads.
- **Trip assignment:** It is acknowledged that some drivers will use alternative routes given certain levels of congestion. It is assumed that all development traffic from one zone loads via its nearest zone onto the network.
- **General:** The AM peak is assumed to be 0800 – 0900hrs and the PM peak 1700 – 1800hrs.

1.4.10 The above assumptions mean that the following limitations of using the DIAMOND model should be noted:

- Mode choice is not explicitly modelled but mode shift impacts can be manually included;
- All trips are assumed to be independent when assessing collections of nearby individual developments (i.e. trip generation from one site will not be attracted to another new site). This ensures a worst-case scenario, in terms of network conditions, is considered;
- Junctions are not explicitly modelled;
- Infrastructure improvements can be tested, however, their impact on the base year traffic flows on neighbouring links is not re-assigned;
- Detailed localised assessments are limited by the density of the model zones and the highway network coverage;

- All development trips are assigned to the highway network on top of the existing fixed base year traffic flows;
- Since the base model consists of fixed link flows, the majority of which are observed, a traditional model validation is not required.
- Trip suppression / induction caused by changes in future year traffic conditions is not taken into account.

1.4.11 For this stage of assessment, the above assumptions and limitations are not unusual and, as such, they are noted for clarity and information only. The above does mean, however, that the strategic nature of the tool means that it is not as detailed a model as a SATURN or micro-simulation model which would be required to test large infrastructure improvements that could affect the assignment of background traffic.

1.4.12 For the avoidance of doubt, the modelling work undertaken using DIAMOND has been conducted by Aecom, consultants to the Highways Agency; in liaison with Derbyshire County Council and its framework partner, Scott Wilson Ltd.

1.4.13 A DIAMOND network diagram and zone map are provided at Appendix A.

2 Chesterfield Test Option

2.1.1 To inform the DIAMOND model, Chesterfield Borough Council provided a 'test' option based on its *Core Strategy Issues and Options* Consultation. As well as the proposed LDF development, this included details of all committed developments (i.e. those with planning permissions that could be enacted after 2010) as well as those developments that had been constructed during the period 2008 (the DIAMOND model base year) and 2010 (the year of reporting).

2.1.2 The Chesterfield 'test' option is summarised in Appendix B. However, Table 2.1 summarises the number of vehicle journeys that could be generated by those developments identified in Appendix B, and reports these by the zones to / from which these are loaded onto the network. It is noted, and as is identified in Table 2.2, that not all of these zones are identified specifically with Chesterfield Borough, but these were judged to be the most appropriate point onto which to load development trips.

Zone Number	Location	Sum of 2016 Generation	Sum of 2016 Attraction	Sum of 2026 Generation	Sum of 2026 Attraction
254	Birdholme	7	3	7	3
425	A61 (North)	196	342	295	551
426	Brimington / Staveley	1,451	990	1,664	1,558
428	northern Chesterfield	1,149	845	1,599	1,823
429	Newbold	533	830	596	999
430	Hasland	45	47	64	54
Total	**-**	**3,382**	**3,058**	**4,226**	**4,986**

Table 2.1: Trips loaded into the model by Zone

2.1.3 As can be seen from the above, most trips are loaded into Zones 426 (representing the Brimington / Staveley area along the A619) and Zone 428 (representing northern Chesterfield).

2.1.4 However, not all the trips identified in Table 2.1 are loaded into the DIAMOND highway network. This is due to the zonal structure of the model and the assumption that some trips are wholly contained within these zones. The proportions of such intra-zonal trips are provided in Table 2.2. The implication of this is discussed in more detail in Section 3.

Zone Number	Location	District	Intra Zonal Attraction	Intra Zonal Generation
254	Birdholme	Chesterfield District	8%	34%
425	A61 (North)	North East Derbyshire	21%	19%
426	Brimington / Staveley	Chesterfield District	21%	36%
428	northern Chesterfield	Chesterfield District	33%	22%
429	Newbold	Chesterfield District	18%	14%
430	Hasland	North East Derbyshire	21%	21%

Table 2.2: Intra Zonal Trip Proportions

3 Results

3.1 Overview

3.1.1 This Section establishes the effect of future development on network links and junctions in the Chesterfield area. Specifically, the results from the DIAMOND model have been examined to determine:

- which roads are likely to experience the highest increases in flow,
- changes in 'stress' on roads, and,
- associated impacts

3.2 Link Traffic Growth

3.2.1 Outputs from DIAMOND show the differences between the base (i.e. without development) and development (with development) in the future years of 2016 and 2026 on all links in the network.

3.2.2 Tables 3.1 and 3.2 detail which links would see the highest increases in traffic respectively; (i.e. those roads that see an increase of 100 vehicles or more). For clarity, only changes in the AM peak period (0800 – 0900hrs) have been provided which is normally taken as being the key operating hour of the highway network. In the PM peak, impacts could be expected to be similar.

Road	Without Dev Two Way Flow	With Dev Two Way Flow	Flow Difference	Percentage change
A61 (North of Hornsbridge) *Hornsbridge to Corporation Street slip road*	4,416	4,971	555	13%
Corporation Street slip road to Brewery Street	4,416	4,971	555	13%
Brewery Street to Rother Way	3,786	4,297	512	14%
Rother Way to Whittington Moor Roundabout	3,787	4,291	504	13%
Whittington Moor Roundabout to Dronfield	2,901	3,927	1,025	35%
A61 (South of Hornsbridge) *Clay Cross to B6036*	1,567	1,831	264	17%
A61 link (B6036 to B6014)	1,408	1,668	259	18%
B6014 to Higham	1,500	1,759	259	17%
Higham to Alfreton	1,335	1,587	252	19%
A619 (Chatsworth Road)	1,456	2,090	634	44%
A619 (Chesterfield Road) *Rother Way*	1,778	2,015	237	13%
Through Brimington	1,172	1,409	237	20%
Brimington to Staveley	1,767	2,018	251	14%
Staveley to Mastin Moor	1,494	1,714	220	15%
Mastin Moor Barlborough	1,172	1,284	112	10%
B6543 (Holywell Street)	892	1,122	230	26%
B6051 (Newbold Road)	892	1,165	273	31%
B6150 (St. John's Road)	892	1,553	661	74%
A617 Chesterfield to Mansfield *Chesterfield to Temple Normanton*	4,070	4,303	233	6%
Temple Normanton to M1 Junction 29	4,437	4,612	176	4%
M1 Junction 29 to Pleasley	1,978	2,151	173	9%
Pleasley to link road	2,591	2,825	234	9%
Link road to Abbott Road	1,849	1,996	147	8%
B6056 (Holmley Lane, Dronfield)	892	1,097	205	23%
B6057 (A61 to A61 via Unstone & Dronfield) *Chesterfield Road*	892	1,082	190	21%
Sheffield Road	892	1,288	396	44%
Bowshaw	892	1,052	160	18%
B6053 (Eckington Road / Staveley Lane)	892	1,128	236	26%
A6135 *A57 to Eckington*	2,523	2,759	236	9%
Through Eckington	1,648	1,884	236	14%

Table 3.1: Base and Design Flows 2016

Road	Without Dev Two Way Flow	With Dev Two Way Flow	Flow Difference	Percentage change
A61 (North of Hornsbridge) *Hornsbridge to Corporation Street slip road*	4,982	5,631	649	13%
Corporation Street slip road to Brewery Street	4,982	5,631	649	13%
Brewery Street to Rother Way	4,279	4,825	546	13%
Rother Way to Whittington Moor Roundabout	4,273	4,876	604	14%
Whittington Moor Roundabout to Dronfield	3,285	4,356	1,071	33%
A61 (South of Hornsbridge) *Clay Cross to B6036*	1,776	2,028	253	14%
A61 link (B6036 to B6014)	1,594	1,842	248	16%
B6014 to Higham	1,699	1,946	248	15%
Higham to Alfreton	1,512	1,753	240	16%
A619 (Chatsworth Road)	1,648	2,280	632	38%
A619 (Chesterfield Road) *Rother Way*	2,014	2,322	308	15%
Through Brimington	1,327	1,635	308	23%
Brimington to Staveley	2,002	2,310	308	15%
Staveley to Mastin Moor	1,693	1,929	236	14%
Mastin Moor Barlborough	1,327	1,458	131	10%
B6543 (Holywell Street)	1,009	1,180	171	17%
B6051 (Newbold Road)	1,009	1,283	274	27%
B6150 (St. John's Road)	1,009	1,642	633	63%
A617 Chesterfield to Mansfield *Chesterfield to Temple Normanton*	4,613	4,902	289	6%
Temple Normanton to M1 Junction 29	5,028	5,205	178	4%
M1 Junction 29 to Pleasley	2,241	2,419	178	8%
Pleasley to link road	2,935	3,171	237	8%
Link road to Abbott Road	2,088	2,237	149	7%
B6056 (Holmley Lane, Dronfield)	1,009	1,190	181	18%
B6057 (A61 to A61 via Unstone & Dronfield) *Chesterfield Road*	1,009	1,170	161	16%
Sheffield Road	1,009	1,351	342	34%
Bowshaw	1,009	1,114	105	10%
B6053 (Eckington Road / Staveley Lane)	1,009	1,208	199	20%
A6135 *A57 to Eckington*	2,853	3,053	199	7%
Through Eckington	1,863	2,063	199	11%

Table 3.2: Base and Design Flows 2026

3.2.3 Guidance published by the Institution of Highways and Transportation (IHT, 1994) identifies that a development could be described as being material (in traffic terms) if it induces a change in traffic of +10% (or +5% in a congested area). Since this guidance was published, the use of percentage change in the analysis of material traffic impacts has become less common due to its under representation of potential problems on congested links and, conversely, its over-estimation of potential problems on un-congested links. However, the above still provides a useful rule of thumb and suggests that the key issues would be along;

- **A61 (North of Hornsbridge)** *Whittington Moor Roundabout to Dronfield* 33%
- **A61 (South of Hornsbridge)** *Hornsbridge to Clay Cross* 39%
- **A619 (Chatsworth Road)** 38%
- **A619 (Chesterfield Road)** *Through Brimington* 23%
- **B6051 (Newbold Road)** 27%
- **B6150 (St. John's Road)** 63%
- **B6057** *Sheffield Road* 34%
- **B6053 (Eckington Road / Staveley Lane)** 20%

3.2.4 These roads are identified in Figure 3.1, overleaf. Of these roads, loading onto the B6057 is likely to be a response to increasing congestion on the A61 heading into southern Sheffield.

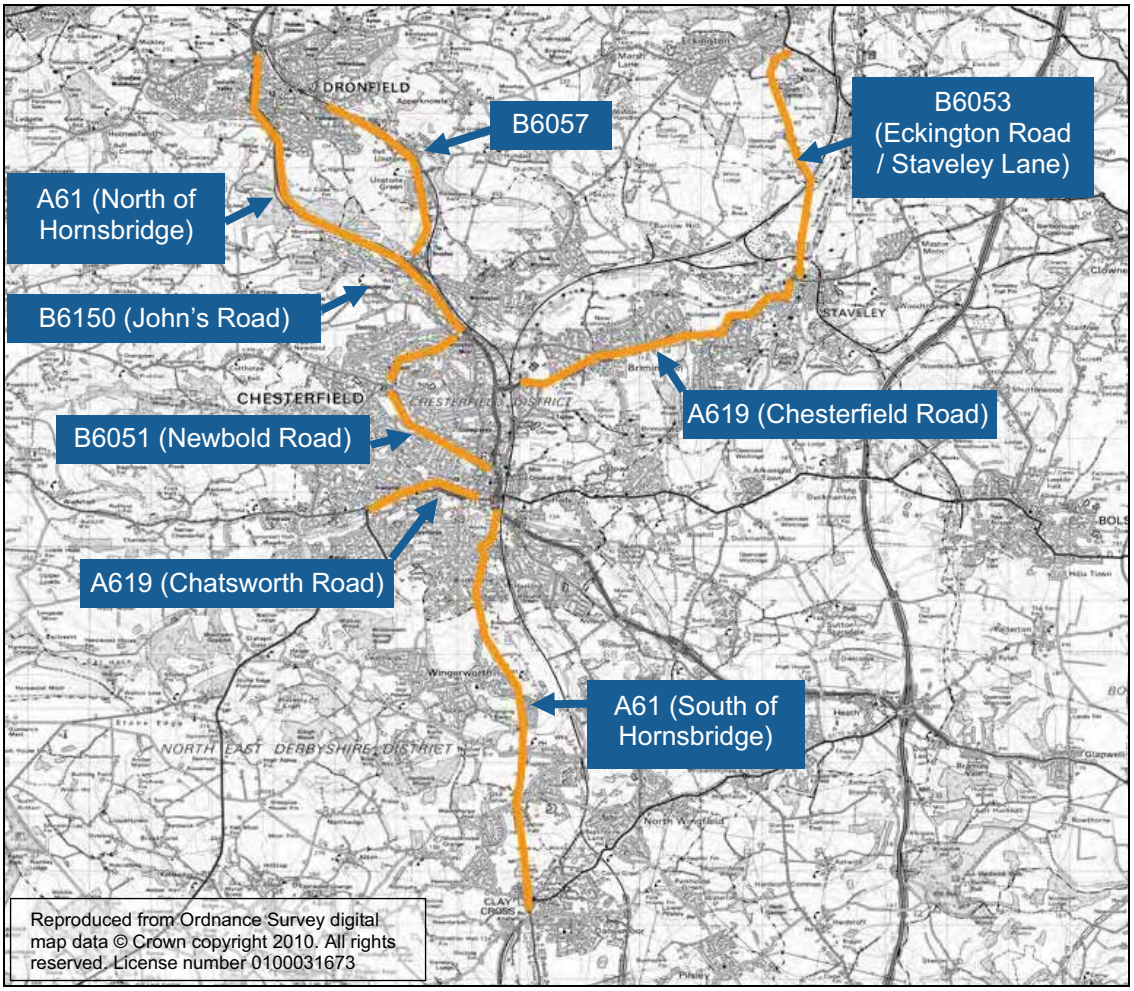


Figure 3.1: Links with likely high impact

3.3 Changes in Link Stress

3.3.1 As noted previously, the DIAMOND dynamic route allocation process (for development related traffic) works on the basis of a notional capacity of each road in the network. A comparison of each links capacity with the flow in the 'with' and 'without development' scenario therefore allows the change in the "stress" of a particular road to be identified.

Road	Link Capacity Reduction
A61 (North of Hornsbridge) *Hornsbridge to Corporation Street slip road*	7%
Corporation Street slip road to Brewery Street	7%
Brewery Street to Rother Way	6%
Rother Way to Whittington Moor Roundabout	6%
Whittington Moor Roundabout to Dronfield	12%
A61 (South of Hornsbridge) *Hornsbridge to Clay Cross*	8%
Clay Cross to B6036	8%
A61 link (B6036 to B6014)	8%
B6014 to Higham	8%
Higham to Alfreton	8%
A619 (Chatsworth Road)	20%
A619 (Chesterfield Road) *Rother Way*	3%
Through Brimington	7%
Brimington to Staveley	8%
Staveley to Mastin Moor	7%
Mastin Moor Barlborough	4%
B6543 (Holywell Street)	10%
B6051 (Newbold Road)	12%
B6150 (St. John's Road)	29%
A617 Chesterfield to Mansfield *Chesterfield to Temple Normanton*	3%
Temple Normanton to M1 Junction 29	2%
M1 Junction 29 to Pleasley	2%
Pleasley to link road	3%
Link road to Abbott Road	2%
B6056 (Holmley Lane, Dronfield)	9%
B6057 (A61 to A61 via Unstone & Dronfield) *Chesterfield Road*	8%
Sheffield Road	17%
Bowshaw	7%
B6053 (Eckington Road / Staveley Lane)	10%
A6135 *A57 to Eckington*	7%
Through Eckington	10%

Table 3.3: Link Capacity Reduction 2016

Road	Link Capacity Reduction
A61 (North of Hornsbridge) *Hornsbridge to Corporation Street slip road*	8%
Corporation Street slip road to Brewery Street	8%
Brewery Street to Rother Way	6%
Rother Way to Whittington Moor Roundabout	7%
Whittington Moor Roundabout to Dronfield	13%
A61 (South of Hornsbridge) *Hornsbridge to Clay Cross*	8%
Clay Cross to B6036	8%
A61 link (B6036 to B6014)	8%
B6014 to Higham	8%
Higham to Alfreton	8%
A619 (Chatsworth Road)	20%
A619 (Chesterfield Road) *Rother Way*	4%
Through Brimington	10%
Brimington to Staveley	10%
Staveley to Mastin Moor	7%
Mastin Moor Barlborough	4%
B6543 (Holywell Street)	7%
B6051 (Newbold Road)	12%
B6150 (St. John's Road)	28%
A617 Chesterfield to Mansfield *Chesterfield to Temple Normanton*	3%
Temple Normanton to M1 Junction 29	2%
M1 Junction 29 to Pleasley	2%
Pleasley to link road	3%
Link road to Abbott Road	2%
B6056 (Holmley Lane, Dronfield)	8%
B6057 (A61 to A61 via Unstone & Dronfield) *Chesterfield Road*	7%
Sheffield Road	15%
Bowshaw	5%
B6053 (Eckington Road / Staveley Lane)	9%
A6135 *A57 to Eckington*	6%
Through Eckington	9%

Table 3.4: Link Capacity Reduction 2026

3.3.2 The above Tables confirm that the following links are particularly effected by the proposed future year (2026) development in terms of link stress;

- **A61** *(from Sheffield through Chesterfield to the A38)*
- **A619 (Chatsworth Road)**
- **A619 (Chesterfield Road)**
  Through Brimington
- **B6150 (St. John's Road)**
- **B6057 (A61 to A61 via Unstone & Dronfield)**

3.3.3 It was also noted in Section 2 that not all trips are loaded onto the highway network but instead are retained within the individual zones. For Chesterfield, this means local trip making particularly within Zones 426 (Brimington – Staveley) and 428 (northern Chesterfield). Table 3.5 shows the potential additional trips that could be generated within these areas.

Zone	2026 Attraction	2026 Generation	Intra Zonal Attraction (%)	Intra Zonal Generation (%)	Intra Zonal Attraction (Car Trips)	Intra Zonal Generation (Car Trips)	Two-Way Intra-zonal Movements (Car Trips)
426	1,664	1,558	21%	36%	349	561	910
428	1,599	1,823	33%	22%	528	401	929

Table 3.5: Potential Intra-Zonal Trip Generation in Brimington / Staveley and Chesterfield

3.3.4 The trips noted in Table 3.5 would occur on the highway network within these zones and would be additional impacts to those noted in the above bullet list. For Zone 428 (northern Chesterfield), there is a greater highway network density (more route choice), though such trips are likely to be directed to use the B6051 (Newbold Road), the B6150 (Littlemoor) and the B6057 (Sheffield Road). For Zone 426 (Brimington / Staveley) these trips are likely to be to and from the A619.

3.3.5 From the results above, the further impact on the A619 represents a potential issue, since link capacity would further reduce which is likely to lead to congestion along this route (and at its junctions).

3.4 Likely Development Impacts

Congestion

3.4.1 It was noted in Section 1 that junctions are not explicitly modelled within the DIAMOND tool and that the above results relate principally to changes in flow on links. When considering such measures therefore, it is important to note the clarification given with respect to such congestion reference flows in the Design Manual for Roads and Bridges (DMRB Volume 5, Section 1 Part 3) which states that "*The CRF is a measure of the performance of a road link between junctions. The effect of junctions must be considered separately*."

3.4.2 In terms of link capacity, the modelling indicates that there could be link capacity issues on the local highway network in 2026 on the A6135 (Eckington) and A618 (Rotherham Road); though the latter does not appear to be the result of Chesterfield-based development flow as this link is not carrying a large quantum of such development flow.

3.4.3 It was also noted in the Stage 1 report that Derbyshire's highway teams had identified Chatsworth Road as being a source of regular queuing in the peak hours due to link friction issues (i.e. side roads movements, on-street parking, loading etc).

3.4.4 In terms of junction congestion, from the changes in link flows, the likely key impacted junctions would be;

Junction	Current Capacity	Potential Improvement
A61 / A617 (Hornsbridge) signalised roundabout	At capacity now demonstrated by recent signalisation scheme to enable development on the island.	Unlikely without significant works to adjacent bridge and / or re-routeing of traffic.
A61 / A619 signalised roundabout	At capacity now demonstrated by recent signalisation scheme to enable development on the island.	Unlikely without significant works, including land acquisition.
A61 / Sheffield Road roundabout	Flagged in the Stage 1 report by Derbyshire highway teams as being a current source of congestion.	Roundabout could be considered for signalisation.
A61 / St. Augustine's Road / Storforth Road junctions	Flagged in the Stage 1 report by Derbyshire highway teams as being a current source of congestion.	Unlikely without significant works, including land acquisition.
A619 (Brimington Gyratory)	Flagged in the Stage 1 report by Derbyshire highway teams as being a current source of congestion.	This junction has recently been improved via traffic management. Little further capacity is likely to be available due to pedestrian demands across the gyratory.

Table 3.6: Key Junctions that could be impacted by proposed Chesterfield LDF development

3.4.5 The assessment of impacts at the above junctions would require further consideration and detailed modelling at the appropriate time though the above would indicate congested A61 and A619 corridors; particularly since the two converge at a single junction.

3.4.6 Broad mitigation strategies and options are given in the following section.

Impacts on other Modes

3.4.7 It is noted that the A61 and A619 are important public transport corridors and, as such, any increase in congestion along these routes would impact on bus-based public transport's journey time and reliability.

3.4.8 A current route map is given as Appendix C.

3.4.9 It is also noted that the A619 (Chatsworth Road) contains bordering retail development. As such, any increase in flow along this route is likely to increase severance for pedestrians though formal pedestrian crossing facilities are provided along this route.

4 Discussion and Potential Mitigation

4.1 Overview

4.1.1 The results from the DIAMOND model show the main impacts of the proposed LDF developments in Chesterfield would be along the following routes (which are the key radials into and out of Chesterfield);

- A61 (and out of the Study Area, into southern Sheffield),
- A619 (Chatsworth Road), and,
- A619 (Staveley to Brimington).

4.1.2 Several 'B' roads would also experience large increases in traffic flows due to the points of loading onto the network and relative attractiveness of these routes over congested others. Also, the A6135 (Eckington) and A618 (Rotherham Road) are likely to be routes where traffic flows could exceed their link capacities.

4.1.3 It is noted that the development would likely lead to increases in traffic heading into Southern Sheffield and this effect may need to be considered by Sheffield City Council.

4.1.4 In terms of mitigation, the Stage 1 report identified that the first step in identifying a suitable mitigation package is to prepare a strategy for accommodating as many trips as practical by sustainable modes. These would have most impact on short-distance trips (i.e. within walking and cycling range) and those along public transport corridors and near to public transport nodes. Potential reductions in trips, as identified in the Stage 1 reports, lay within the range of up to 15%. For the analysis in this report, they would therefore have most potential in addressing the intra-zonal movements described in Table 3.5, as well as the total quantum of trips reported for the central Chesterfield zones (which are close to such public transport nodes and corridors).

4.1.5 It should be noted that the analysis contained within this report does not make allowance for mode shift, other than the base mode split inherent in the TRICS database analysis. This, therefore, provides a robust approach to impact identification since it provides a worst-case assessment and gives the highway authorities a view as to the likely impacts on the network in the case that sustainable mode intervention, for whatever reason, are not achieved. However, the locational impacts are likely to be the same even if the scope of impact is somewhat reduced.

4.2 Potential Schemes and Strategy

4.2.1 From the Stage 1 report, the most relevant historical highway-based scheme to address the likely network problems would be the Staveley Regeneration Route which is a relief road of the **A619** from Hall Lane, Staveley, to the Sainsbury's roundabout. This would provide a bypass of Hollingwood and Brimington. Given the lack of opportunities to connect into the proposed development land direct from the A619, some development of this route is likely to be required for access purposes, in any event. The provision of a full connecting route would provide the additional benefits of;

- Reducing congestion at key junctions along the existing route, and therefore,
- Providing faster, and more reliable, public transport services along the existing A619 (whose services would likely be effected by increasing car-based congestion on this route).

4.2.2 The Staveley Regeneration Route could therefore be seen as a supporting measure to the sustainable mode interventions described above, even if the queuing on the existing A619 was simply displaced to another part of the network.

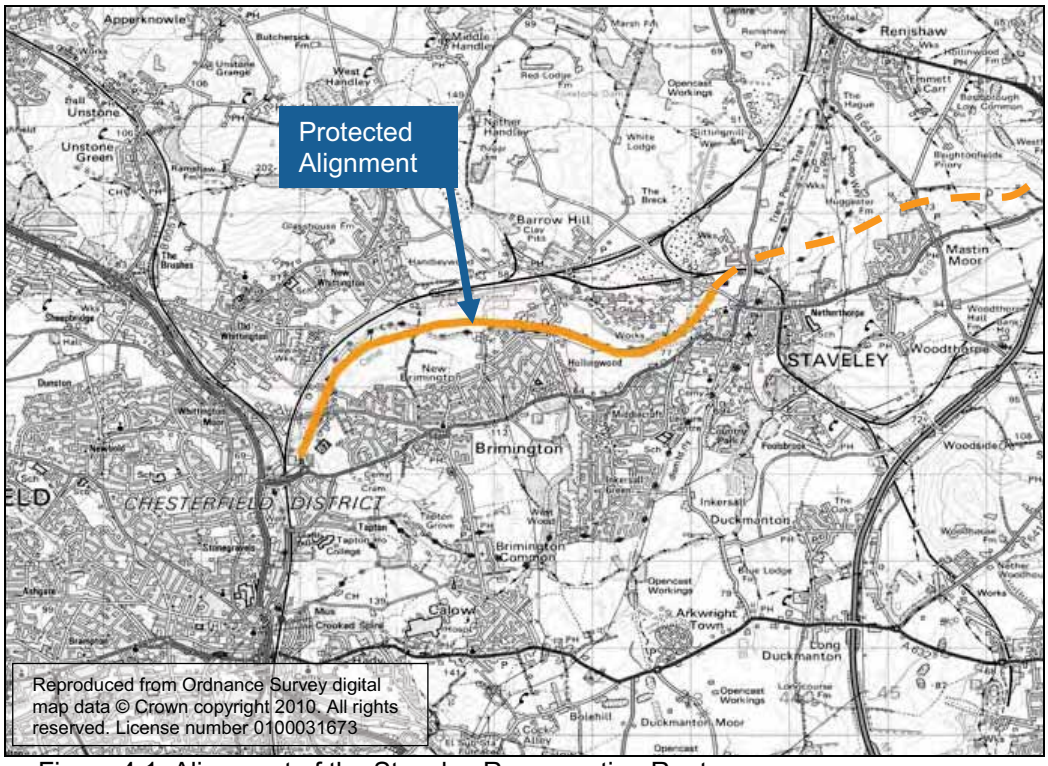


Figure 4.1: Alignment of the Staveley Regeneration Route

4.2.3 There is likely little scope for the further improvement of the junctions along the **A61** on at at-grade basis, since the 'Tesco' signalised roundabout and junction with the A617 have recently been upgraded. The roundabout junction with the Sheffield Road could be improved via a signalisation scheme though this is likely to have more benefits in safety terms than in journey times.

4.2.4 It is understood that there is the potential for an A61 – A617 link road south of Chesterfield (which is contained in the North East Derbyshire Local Plan) which could be used to provide a north-south bypass of the congested part of the A61 in southern Chesterfield by using part of the A617. Figure 4.2 shows an indicative alignment for this scheme and the potential re-routeing of A61 traffic. Given the long diversions for traffic on the A61, however, it would likely need to be accompanied by further measures to make the existing A61 corridor unattractive to traffic to gain the full measure of benefit from this route.

4.2.5 This road would also provide alternative routes to and from the M1 (Junction 29) from the immediate south of Chesterfield, without traffic having to first route through central Chesterfield via the congested A61 junctions.

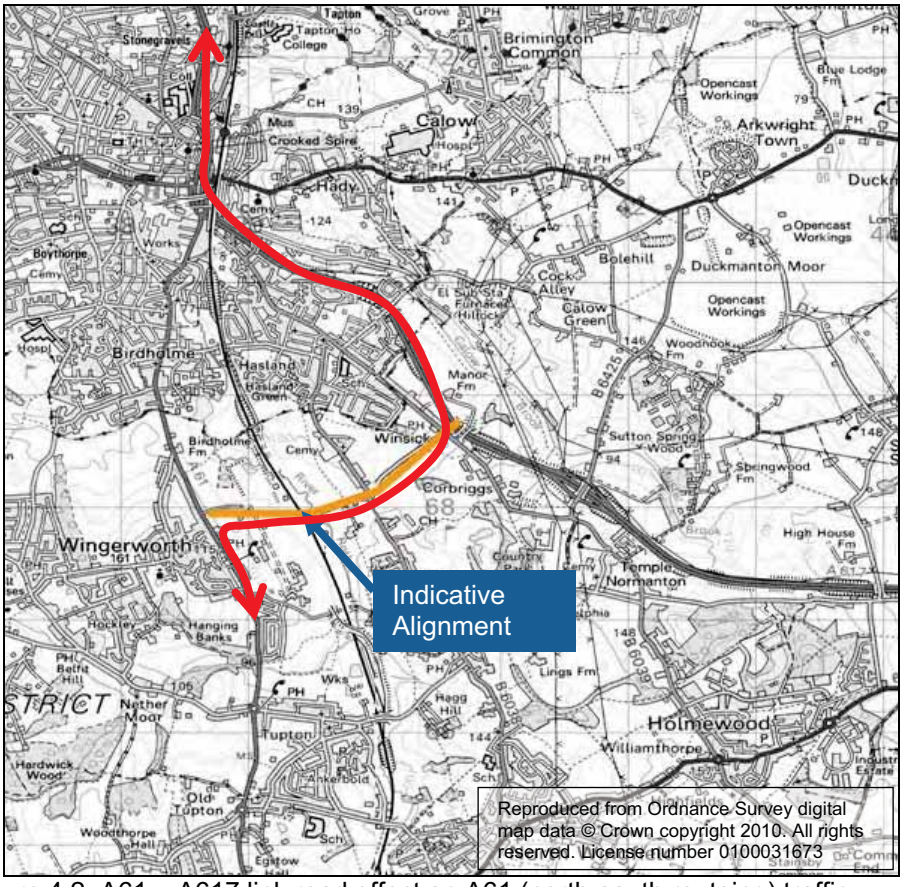


Figure 4.2: A61 – A617 link road effect on A61 (north-south routeing) traffic

4.2.6 If a congested network is accepted as being the likely future scenario for the local road network, then a **potential strategy** would be to ensure the good operation of central Chesterfield by holding queuing traffic on the inbound radials. The A61 (to the north of Whittington Moor), A617 and A619 (Chatsworth Road) provide good opportunities to do this since they do not have (or have little) bounding residential development that would be disturbed by such traffic. Again, the Staveley Regeneration Route would fit with this strategy by allowing the removal of queuing traffic from the centre of the existing settlement of Brimington. This strategy would best be accompanied by delivering public transport priority at key junctions (i.e. via hurry calls and green-time extensions) and along key links (via the provision of bus / HOV lanes). This would mean that public transport would not be caught in such queues, and provide supporting incentives to use these modes over the private car for journeys to and from the proposed development and central Chesterfield.

4.2.7 In terms of public transport specific schemes, it is noted that a railway line runs to the north of Brimington into central Chesterfield. Although investigation of the potential use of this line has not been conducted as part of this study, this would provide the potential for either a development-centred hub or Park and Rail service.

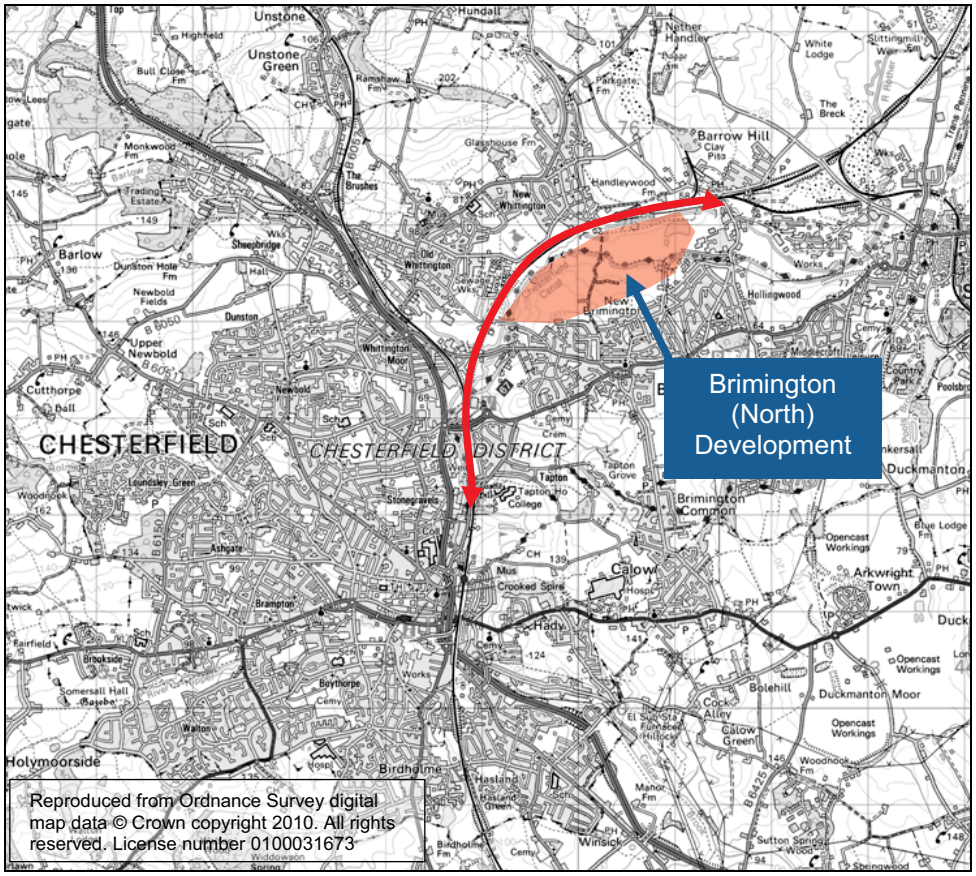


Figure 4.3: Potential use of rail-line to serve Brimington (North) development, or as wider mitigation for impacts on A619 and A61

4.3 Further Work and Funding

4.3.1 Given that the DIAMOND model does not re-assign base traffic from 2008, it is noted that the impacts of development traffic at Junction 30 are likely to be overestimated since links to Junction 29A would be available which would reduce traffic loading at this point. Indeed, and in order to test potential mitigation options further, a fully dynamic and responsive model of the Chesterfield area is likely to be required.

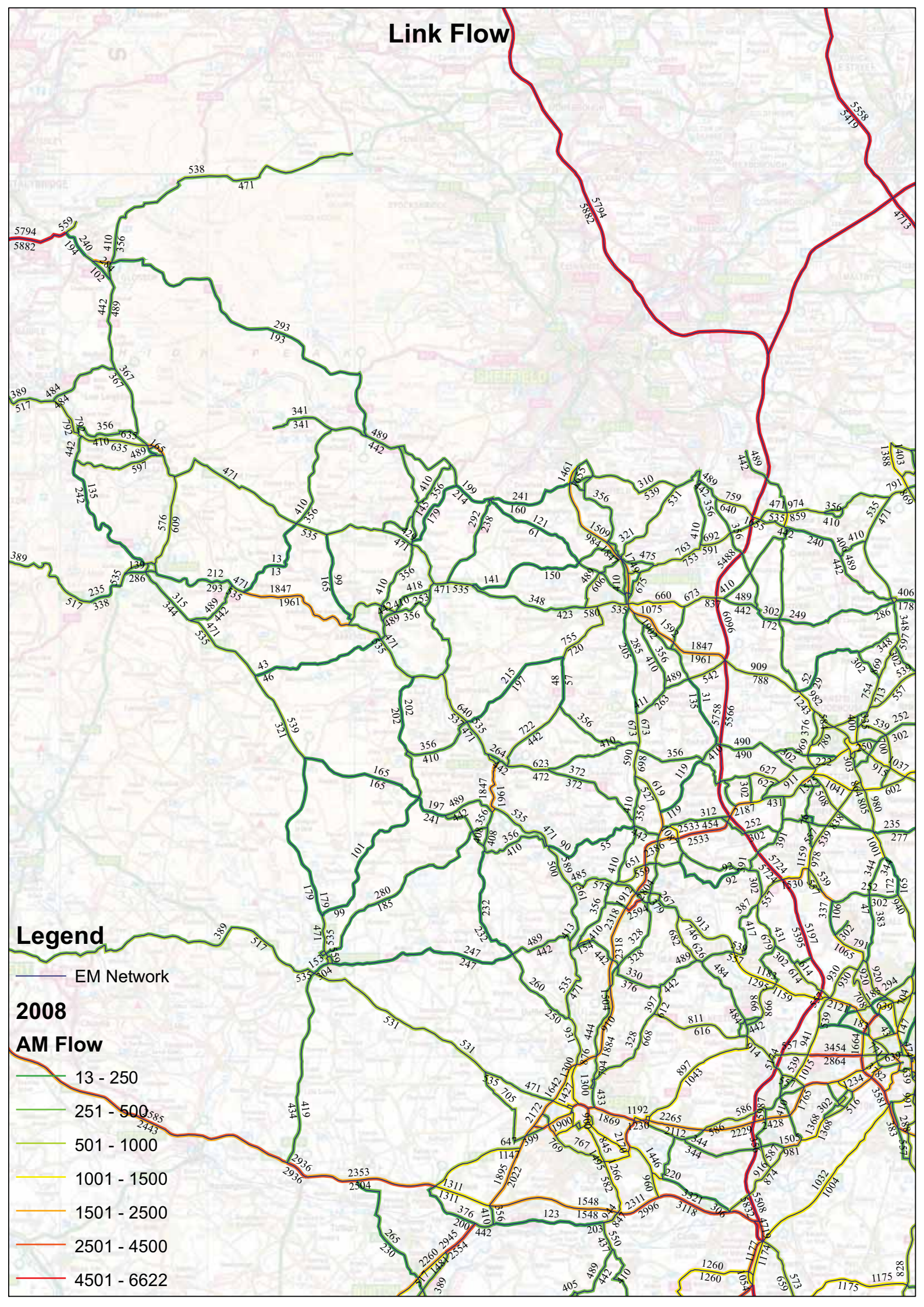
4.3.2 Given that this report has assessed the likely future operation of the network with all developments proposed in the Chesterfield LDF, it is likely that a co-ordinated approach to the funding of mitigation measures is likely to be required based on a contributory mechanism. Furthermore, it is noted that some roads impacted by this development lie outside of the Chesterfield administrative area; as such, the funding of mitigation may need to be cross-boundary. The issue of funding is discussed within the Stage 1 report.

5 Summary and Conclusions

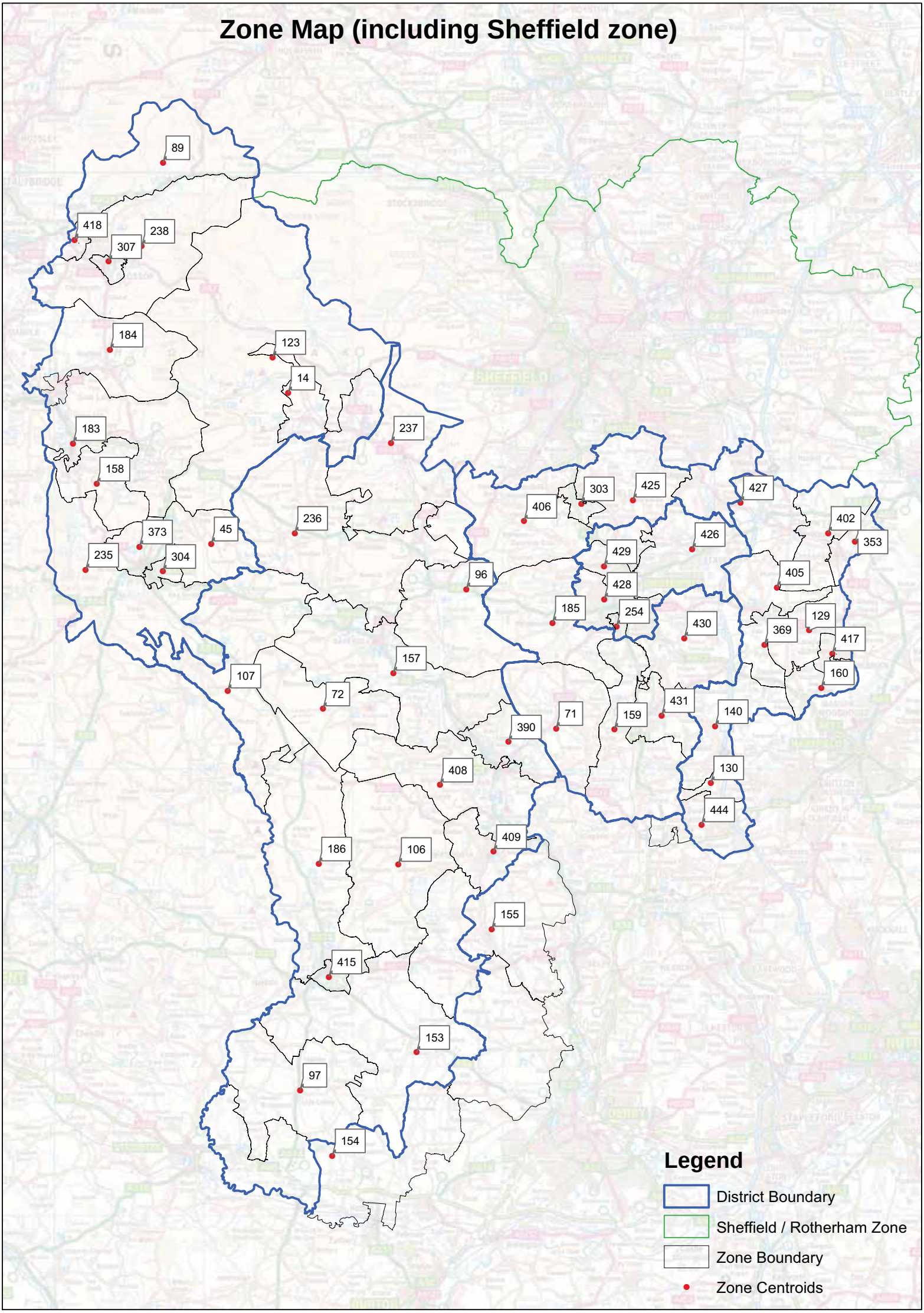
5.1.1 This report has quantified the likely impacts of the proposed LDF-related development using the Highways Agency's DIAMOND tool. The key impacts have been shown to be along the A61, A619 (Chesterfield Road) and A619 (Chatsworth Road). These impact locations are broadly similar to those manually identified in the Stage 1 report, though the likely changes in flow have been quantified in this report.

5.1.2 Following the identification of these impact locations, a strategy for the continued operation of the local highway network under congested conditions has been outlined; including the identification of supporting highway schemes which could assist public transport accessibility through existing urban centres. This would provide a good fit with current Government guidance and the overall strategy for the identification of sustainable mode interventions given in the Stage 1 report.

Appendix A
DIAMOND Zone and Network Diagrams


Link Flow
Legend
EM Network
2008
AM Flow
13 - 250
251 - 500
501 - 1000
1001 - 1500
1501 - 2500
2501 - 4500
4501 - 6622

Zone Map (including Sheffield zone)



Appendix B
Chesterfield Test Option

Development Name	Start Year	Completion Year	Should trips be prorated between start and completion? (Y or N)	Development Type (e.g. C3)*	Development Size (e.g. GFA or dwelling numbers)	Location (either model zone or easting/northing)	District	Trip rates if known (AM & PM, generation & attraction)
CS - SPITAL LANE	2010	2011	Y	C3	10	(438,192) (370,674)	CBC	
CS - WHITE BANK FARM	2011	2012	Y	C3	16	(438,917) (370,235)	CBC	
CS - FOOLOW COURT	2011	2012	Y	C3	18	(437,624) (370,112)	CBC	
CS - LAND OFF DOCK WALK	2011	2013	Y	C3	57	(437,384) (370,823)	CBC	
CS - BANK STREET	2012	2013	Y	C3	10	(437,409) (371,111)	CBC	
CS - SALTERGATE	2011	2014	Y	C3	96	(437,773) (371,517)	CBC	
CS - SHEFFIELD ROAD	2011	2014	Y	C3	85	(438,239) (372,367)	CBC	
CS - HIPPER HOUSE	2015	2020	Y	C3	18	(437,510) (370,896)	CBC	
CS - POST OFFICE DEPOT	2024 ONWARDS		Y	C3	30	(437,827) (371,054)	CBC	
CS - NEW BEETWELL STREET / MARKHAM ROAD	2015	2020	Y	C3	88	(438,072) (370,956)	CBC	
CS - KWIK FIT AND OFFICES MARKHAM ROAD	2015	2020	Y	C3	24	(438,490) (370,897)	CBC	
CS - SOUTH PLACE / HIPPER STREET	2015	2020	Y	C3	53	(438,370) (370,897)	CBC	
CS - NEWSPAPER OFFICE, STATION ROAD	2015	2020	Y	C3	64	(438,612) (371,103)	CBC	
CS - DURRANT ROAD CAR PAR	2015	2020	Y	C3	16	(438,567) (371,390)	CBC	
CS - ROSE HILL EAST AND WEST CAR PARKS	2015	2020	Y	C3	58	(438,036) (371,275)	CBC	
CS - MARSDEN STREET TIMBER YARD	2015	2020	Y	C3	39	(438,160) (371,424)	CBC	
CS - SPENCER STREET HEALTH CENTRE	2015	2020	Y	C3	50	(438,014) (371,438)	CBC	
CS - FRECHEVILLE STREET	2011	2012	Y	C3	24	(442,938) (374,069)	CBC	
CS - STAVELEY BASIN	2015	2020	Y	C3	10	(443,377) (375,157)	CBC	
CS - SHOPPING CENTRE, STAVELEY	2024 ONWARDS		Y	C3	20	(443,215) (374,609))	CBC	
CS - ASHBROOK HOSTEL	2011	2012	Y	C3	33	(436,357) (371,778)	CBC	
CS - REAR OF CHATSWORTH	2015	2020	Y	C3	20	(435,925) (370,481)	CBC	
CS - REAR OF 258 OLD ROAD	2024 ONWARDS		Y	C3	24	(436,090) (371,021)	CBC	
CS - TESCO, MELTHAM ROAD	2015	2020	Y	C3	30	(438,694) (372,692)	CBC	
CS - AMBULANCE STATION	2013	2014	Y	C3	11	(435,359) (371,455)	CBC	
CS - LINACRE ROAD	2015	2025	Y	C3	312	(435,425) (372,016)	CBC	
CS - ST PHILIPS DRIVE BUILDERS	2013	2014	Y	C3	15	(439,082) (369,514)	CBC	
CS - STORFORTH LANE	2024 ONWARDS		Y	C3	46	(439,135) (369,329)	CBC	
CS - STAVELEY WORKS AAP			Y	C3	2000	(441,708) (374,833)	CBC	
PA - WATERSIDE			Y	C3	1500	(438,772) (372,425)	CBC	
CS - MASTIN MOOR			Y	C3	400	(445,249) (375,263)	CBC	
CS - DUCKMANTON			Y	C3	400	(443,856) (371,964)	CBC	
CS - ASH GLEN	2011	2012	Y	C3	30	(437,584) (375,911	CBC	
CS - ABERCROMBIE SCHOOL	2011	2012	Y	C3	12	(438,192) (371,788)	CBC	
CS - DEATONS	2013	2015	Y	C3	50	(443,928) (374,357)	CBC	
CS - MILLER AVENUE	2011	2012	Y	C3	12	(445,309) (375,854)	CBC	
CS - 146-150 SPITAL LANE	2011	2013	Y	C3	50	(439,636) (370,272)	CBC	
CS - BROCKWELL COURT	2011	2012	Y	C3	28	(436,639) (372,642)	CBC	
CS - REAR OF STORRS ROAD	2013	2014	Y	C3	10	(435,616) (370,945)	CBC	
CS - MIDDLECROFT LEISURE CENTRE	2011	2012	Y	C3	15	(442,733) (373,459)	CBC	
CS - 66A AND 74 STORRS ROAD	2013	2014	Y	C3	19	(435,630) (371,003)	CBC	
CS - SHEFFIELD ROAD BOAT SALES	2011	2013	Y	C3	50	(437,589) (376,059)	CBC	
CS - LAND REAR OF HANDLEY ROAD	2015	2020	Y	C3	48	(439,776) (376,132)	CBC	
CS - INKERSALL GREEN ROAD	2024 ONWARDS		Y	C3	36	(441,951) (373,574)	CBC	
CS - 20-22 WOODTHORPE ROAD	2015	2020	Y	C3	14	(445,207) (374,560)	CBC	
CS - ST JOHN'S FARM, WOODTHORPE ROAD	2015	2020	Y	C3	10	(445,011) (374,523)	CBC	
COM - WALTON WORKS	2011	2013	Y	C3	200	(436,838) (370,739)	CBC	
COM - WHEATBRIDGE MILLS	2011	2013	Y	C3	70	(437,453) (370,939)	CBC	
COM - WALTON HOSPITAL NORTH	2011	2013	Y	C3	60	(437,187) (369,499)	CBC	

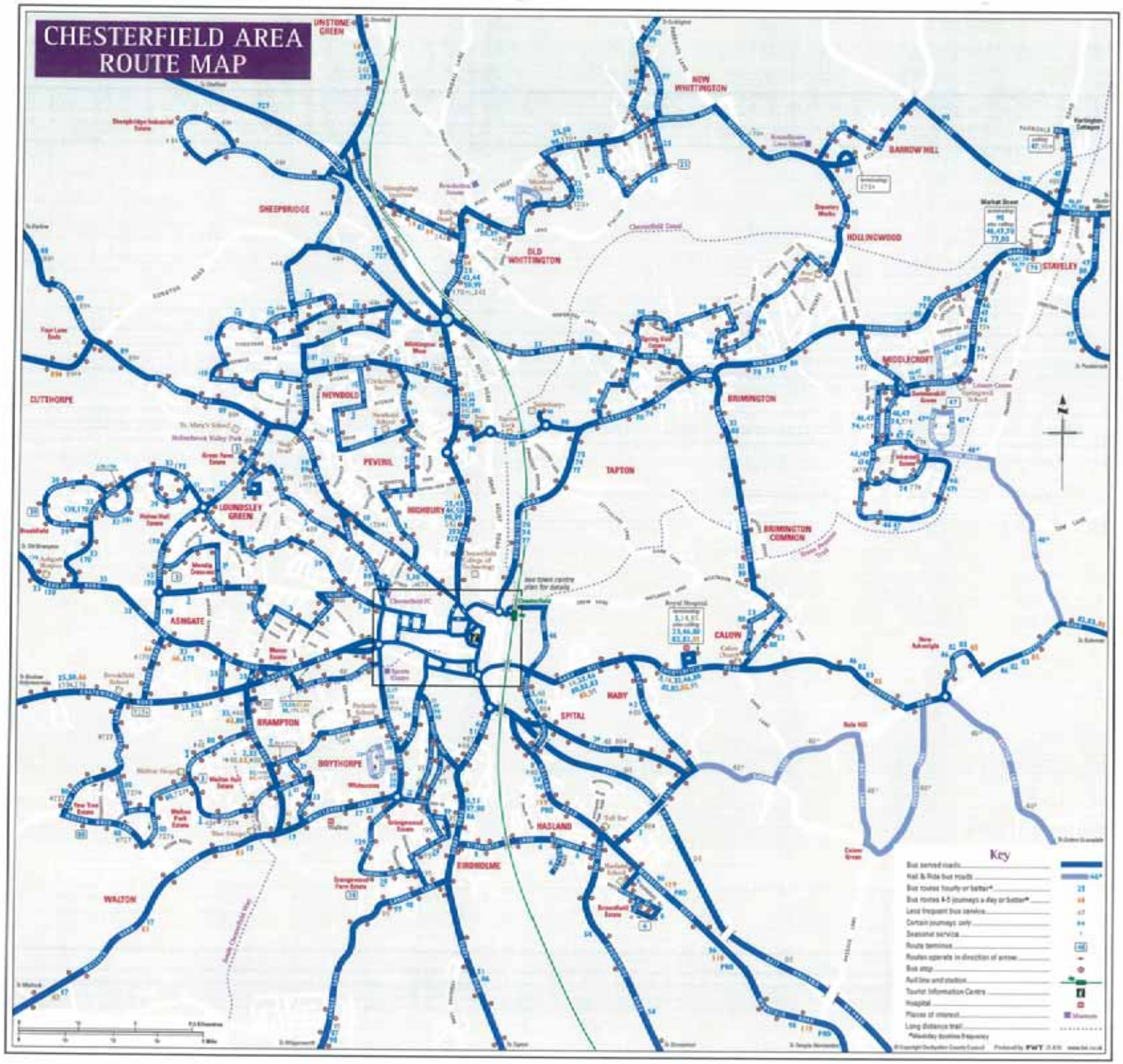
COM - WALTON HOSPITAL SOUTH	2011	2013	Y	C3	60	(437,527) (369,378)	CBC	
COM - ELM STREET	2011	2012	Y	C3	23	(440,953) (374,219)	CBC	
COM - LAND AT GATE INN	2011	2012	Y	C3	15	(445,428) (375,605)	CBC	
COM - NEWBOLD SCHOOL	2011	2013	Y	C3	60	(436,792) (372,860)	CBC	
COM - SHORTS BUILDER'S YARD	2011	2012	Y	C3	20	(438,329) (372,326)	CBC	
COM - SYCAMORE ROAD	2011	2012	Y	C3	18	(440,989) (374,074)	CBC	
COM - LAND ADJOINING ELM STREET	2010	2011	Y	C'3	21	(440938), (374212)	CBC	
COM - 216 OLD HALL ROAD	2010	2011	Y	C'3	10	(436714), (371389)	CBC	
COM - NEWBOLD ROAD	2010	2011	Y	C'3	16	(437808), (371915)	CBC	
COM - ASHGATE ROAD	2010	2011	Y	C'3	13	(437507), (371455)	CBC	
COM - DERBY ROAD	2010	2015	Y	C'3	199	(438502), (370281)	CBC	
COM - LAUREL CRESCENT	2010	2011	Y	C'3	42	(441338), (374222)	CBC	
COM - NETHERTHORPE	2010	2011	Y	C'3	22	(444104), (374617)	CBC	
PA - Dade Avenue	2011	2014	Y	C3	11	(442183), (372855)	CBC	

Development Name	Start Year	Completion Year	Should trips be prorated between start and completion? (Y or N)	Development Type (e.g. C3)*	Development Size (e.g. GFA or dwelling numbers)	Location (either model zone or easting/northing)	District	Trip rates if known (AM & PM, generation & attraction)
COM - Markham Vale	2010	2020	Y	B1a	25000	(444971), (372392)	CBC	
COM - Markham Vale	2010	2020	Y	B2	60000	(444971), (372392)	CBC	
COM - Markham Vale	2010	2020	Y	B8	180000	(444971), (372392)	CBC	
COM - Land at Donkins	2010	2020	Y	B1a	25952	(438514), (370449)	CBC	
CS - Stonegravels Bus Depot	2012	2017	Y	B1	3951	(438374), (372196)	CBC	
PA - Chesterfield Waterside	2015	2026	Y	B1a	36000	(438733), (371778)	CBC	
CS - Armytage Industrial Estate, Station Road	2010	2015	Y	B2	1702	(438927), (374502)	CBC	
CS - Armytage Industrial Estate, Station Road	2010	2015	Y	B2	2404	(439016), (374571)	CBC	
CS - Armytage Industrial Estate, Station Road	2015	2020	Y	B2	15912	(438874), (374275)	CBC	
CS - Chesterfield Town Centre Masterplan	2010	2026+	Y	B1a	84000	(438178), (371165)	CBC	
CS - Sheepbridge & Dunston Trading Estate	2010	2026	Y	B2	13745	(436613), (374896)	CBC	
CS - Sheepbridge & Dunston Trading Estate	2010	2026	Y	B8	13745	(436613), (374896)	CBC	
CS - GKN (Sheepbridge & Dunston Trading Estate)	2010	2026	Y	B2	17327	(437074), (374756)	CBC	
CS - GKN (Sheepbridge & Dunston Trading Estate)	2010	2026	Y	B8	17327	(437074), (374756)	CBC	
COM - Land at Dunston Road	2010	2015	Y	B1	7527	(437307), (374390)	CBC	
COM - Land at Dunston Road	2010	2015	Y	B2	7527	(437307), (374390)	CBC	
CS - Land at Whitting Valley Road	2010	2026	Y	B2	32376	(438858), (373970)	CBC	
CS - Land at Whitting Valley Road	2010	2018	Y	B1	8094	(438858), (373970)	CBC	
CS - Station Lane Industrial Estate, North Whittington	2010	2015	Y	B1	1948	(439946), (375015)	CBC	
CS - Station Lane Industrial Estate, North Whittington	2010	2015	Y	B2	7794	(439946), (375015)	CBC	
COM - Former Pearson Pottery	2010	2015	Y	B1	4160	(438621), (373361)	CBC	
COM - Former Pearson Pottery	2010	2015	Y	B2	4160	(438621), (373361)	CBC	
CS - Lockoford Lane	2010	2015	Y	B1c	1700	(438777), (373061)	CBC	
CS - Lockoford Lane	2010	2015	Y	B2	1700	(438777), (373061)	CBC	
CS - Former Tesco Superstore, Meltham Lane	2012	2020	Y	B1	12830	(438699), (372701)	CBC	
CS - Fire Station	2010	2015	Y	B1c	2153	(438238), (373168)	CBC	
CS - Boythorpe Works	2012	2022	Y	B1	23056	(436968), (370578)	CBC	
CS - Vanguard Trading Estate	2010	2016	Y	B2	3180	(438565), (369107)	CBC	
CS - Vanguard Trading Estate	2010	2016	Y	B2	3534	(438730), (369124)	CBC	
CS - Vanguard Trading Estate	2010	2016	Y	B2	1399	(438486), (368844)	CBC	

CS - Hartington Tip	2014	2020	Y	B2	10108	(443251), (375412)	CBC	
CS - Ireland Industrial Estate	2010	2016	Y	B2	8443	(443814), (374282)	CBC	
CS - Land at Station Road	2012	2020	Y	B2	11405	(437898), (374445)	CBC	
CS - Staveley Works Area Action Plan Area	2012	2026+	Y	B1	32000	(442312), (374916)	CBC	
CS - Staveley Works Area Action Plan Area	2012	2026+	Y	B2	16000	(442312), (374916)	CBC	
CS - Staveley Works Area Action Plan Area	2012	2026+	Y	B8	32000	(442312), (374916)	CBC	

Development Name	Start Year	Completion Year	Should trips be prorated between start and completion? (Y or N)	Development Type (e.g. C3)*	Development Size (e.g. GFA or dwelling numbers)	Location (either model zone or easting/northing)	District	Trip rates if known (AM & PM, generation & attraction)
Ecodome	2012	2017	N	D2	488 rooms, leisure facilities and championship golf course	(436744), (375964)	CBC	
Tesco	2008	2009	N	A1	12700 sqm Superstore	(438518), (373,006)	CBC	
Chesterfield Football Stadium	2009	2010	N	D2	10,600 (capacity)	(438373), (373093)	CBC	
Casa Hotel	2009	2010	N	C1	100 bedrooms	(438545), (372809)	CBC	

Appendix C
Derbyshire Bus Map


CHESTERFIELD AREA
ROUTE MAP
UNSTONE GREEN
NEW WHITTINGTON
BARROW HILL
SHEEPBRIDGE
OLD WHITTINGTON
HOLLINGWOOD
STAVELEY
MIDDLECROFT
CUTTHORPE
NEWBOLD
BRIMINGTON
PEVERIL
TAPTON
LOUNDSLEY GREEN
HIGHBURY
BRIMINGTON COMMON
ASHGATE
CALOW
HADY
SPITAL
BRAMPTON
BOYTHORPE
HASLAND
WALTON
BIRDHOLME
Key
Bus served roads
Hail & Ride bus roads
Bus routes hourly or better*
Bus routes 4-5 journeys a day or better*
Less frequent bus service
Certain journeys only
Seasonal service
Route terminus
Routes operate in direction of arrow
Bus stop
Rail line and station
Tourist Information Centre
Hospital
Places of interest
Long distance trail
*Weekday daytime frequency