Lincoln Eastern Bypass

Transport Assessment

November 2012

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1 Introduction

1.1 Purpose of the report

The Technical Services Partnership (TSP) has been commissioned to produce a Transport Assessment (TA) that examines the transport and highways implications of a new Lincoln Eastern Bypass (LEB) that will take traffic out of Lincoln city centre and facilitate economic regeneration.

As part of this commission, Mouchel has been tasked with utilising the Greater Lincoln Traffic Model (GLTM), a VISUM model that was used when providing evidence to the Department for Transport (DfT), in order to secure funding for the scheme, to quantify traffic impacts of the scheme. These impacts are presented in this TA.

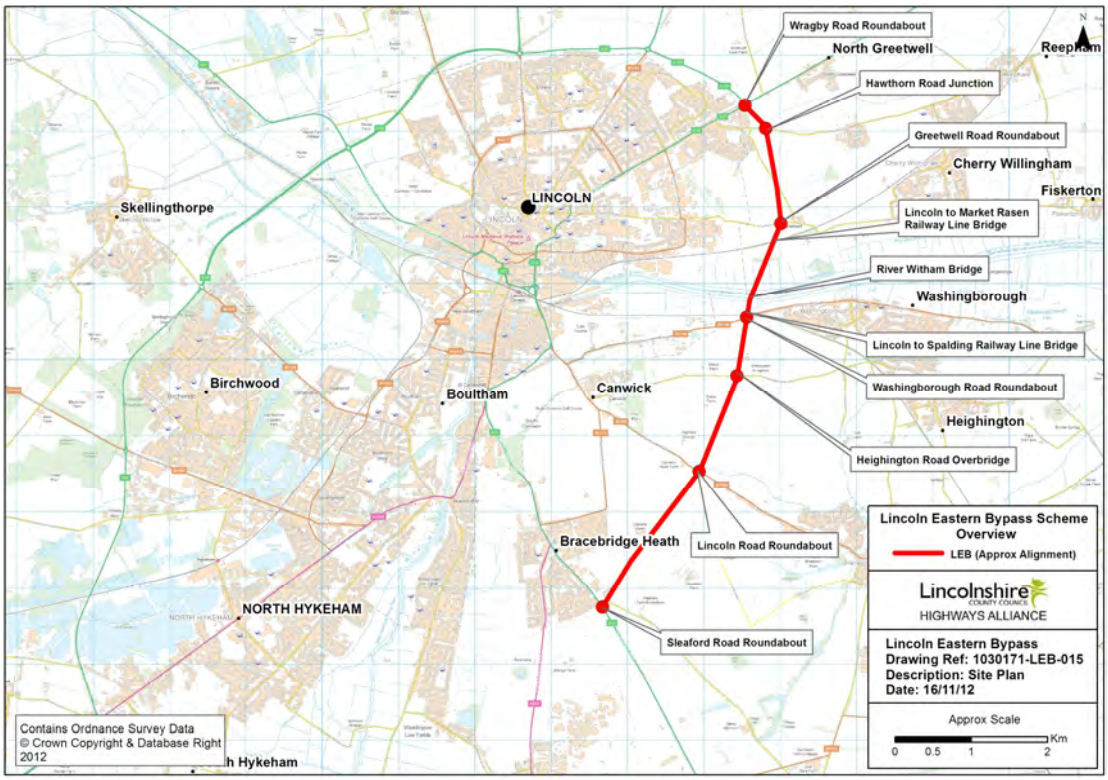
This TA accompanies a full planning application, submitted on the Council's behalf, for a single carriageway Lincoln Eastern Bypass (LEB).

1.2 Scheme Summary

The proposed scheme is a single carriageway road through an area of predominantly arable land (the scheme is shown in detail in the drawings in Appendix A). The scheme would be located to the east of the city of Lincoln and the villages of Canwick and Bracebridge Heath and to the west of the outlying villages of North Greetwell, Cherry Willingham, Washingborough and Branston (see Figure 1-1).

The scheme comprises a 7.5km road linking the existing Northern Relief Road at the junction of the A15 and A158 Wragby Road to the north of Lincoln to the A15 Sleaford Road in the South. It will also provide a crossing of the River Witham, the Lincoln to Market Rasen Railway Line and the Lincoln to Spalding Railway Line.

Figure 1-1 – LEB Overview



1.3 Secured finance, planning consent and future-proofing

The LEB has been granted Programme Entry Status by the DfT and as such (subject to Full Approval from DfT) Lincolnshire County Council (LCC) has secured government funding that will help deliver the single carriageway scheme.

However, LCC aims to ensure that, if required at some time in the future, the scheme can be upgraded to a dual carriageway in the most cost effective manner with minimum disruption. As a result the LEB has been designed to incorporate a number of future proofing design elements that offer best value for the single carriageway scheme design and for any future upgrades or scheme changes. The single carriageway scheme that this assessment considers includes features (such as junction geometries) that will allow it to be upgraded to a dual carriageway in the future.

It is important to note that the dual carriageway LEB scheme was granted planning consent in 2010.

1.4 Structure

This TA has been prepared in consultation with LCC and conforms to DfT 2007 TA guidelines; the document therefore includes the following sections:

- **Section 2:** Route Rationale & Objectives
- **Section 3:** Policy Context

- **Section 4:** Site Context
- **Section 5:** Existing Highway Network
- **Section 6:** Public Transport Review
- **Section 7:** Existing Non-Motorised Users Network
- **Section 8:** Safety Assessment
- **Section 9:** Proposed Scheme
- **Section 10:** Traffic Impact Assessment (Strategic Modelling)
- **Section 11:** Traffic Impact Assessment (Junction Modelling)
- **Section 12:** Social and Distributional Impact Assessment
- **Section 13:** Summary & Conclusions

2 Route Rationale & Objectives

2.1 Introduction

The LEB scheme is a long term aspiration that is intrinsic to delivering local policy and strategy objectives. This section summarises the existing transport related problems and issues within Lincoln that support the case for the LEB before considering the transport challenges Lincoln will face in the future. These problems and issues have allowed the local authorities to establish a clear set of objectives for the LEB and these are also presented in this section.

2.2 Transport Problems & Issues

2.2.1 Existing

Lincoln suffers from a number of transport related problems and issues that have a significant impact on journey reliability, journey times and network reliability throughout the city. These, in turn, have a negative impact on the wider Lincoln economy and act as a restraint to regeneration and the city's development aspirations. A number of the problems are long-standing and were identified and investigated as part of the development of the Lincoln Transport Strategy (LTS).

Lincoln's city centre currently suffers from high levels of congestion from local and strategic traffic movements which; impacts on the quality of life for local residents; acts as a constraint on the economy and reduces the attractiveness of the city for visitors and investors. Traffic currently using the city centre increases congestion, impacts on air and noise quality and reduces the quality of life for residents.

A lack of route choice has long been identified as a problem for north-south movements. A number of key strategic north-south routes converge on the city centre and with no viable alternative routes this results in significant levels of strategic traffic being forced to travel through the centre of Lincoln.

In addition the lack of alternative river crossings means that strategic traffic, including long distance HGVs converge on the A15 within the city centre. This intrusion of strategic traffic has been identified as a key constraint on Lincoln's continued success and is a key driver for the promotion of the LTS, and in particular the LEB.

The relevant transport problems and challenges that have been identified within the LTS which the LEB could help to alleviate are summarised in Table 2-1 below.

Table 2-1 Key Transport Problems and Issues Identified in the LTS

Area	Identified Transport Problems & Issues
Highways & Infrastructure	• Lack of suitable route choice for transport to the south & east of the study area • Congestion in the city centre and on radial routes leads to unreliable journey times and delays • Over-dependence on the private car across Lincoln • Waterways form a natural constraint with few crossing points • Railways create a constraint, particularly the two level crossings in the city centre
Walking & Cycling	• Busy roads with narrow footways make pedestrian routes unattractive • Pedestrian severance between residential areas and the city centre
Environment	• The historic 'uphill' area of the city centre has many historic buildings and narrow streets • High noise levels on some strategic routes • Poor air quality in the city centre
Safety	• High accident occurrence in several areas over recent years due to unsuitable traffic levels • Susceptibility of cyclists and pedestrians to accidents in the city centre
Public Transport	• Congestion leads to reduced levels of bus service

2.2.2 *Future*

A number of the transport problems and challenges facing Lincoln are expected to increase over the mid to long term and this will place further stress on the highway network and is likely have an impact on the local economy and Lincoln's development aspirations.

Traffic levels are forecast to continue to grow within the Lincoln Area and this will lead to increased problems and pressure on the highway network. A continued lack of route choice will exacerbate the problems on existing routes through the city centre.

It is also important to note that significant housing and economic development is targeted for the Lincoln area. In July 2008 Lincoln was granted 'Growth Point Status' by the Government. Regional and local housing targets are for an additional 42,800 dwellings and 210 ha of employment land within the Lincoln and wider Central Lincolnshire area by 2031. The North East and South East Quadrant development sites and the Western Gateway Corridor located to the east and west of Lincoln are key to the delivery of these growth aspirations. These urban extensions have the potential to accommodate a significant level of development within the Lincoln area and the LTS (including LEB) will be necessary to facilitate and support their delivery.

The additional development will place further pressure on the existing transport infrastructure and exacerbate the problems and challenges detailed earlier. An increase in travel demands, particularly at peak periods is likely to result in increased congestion on the network, longer peak periods, and increased suppressed demand.

Failure to provide appropriate infrastructure increases the risk of Lincoln not attaining the prosperity promoted in regional and local plans.

2.3 Scheme Objectives

As described, the LEB forms an intrinsic part of the LTS and is a key intervention that will help achieve the transport aims and objectives identified in the strategy as well as the development aspirations of LCC.

The LEB scheme has the following three objectives:

- **Objective 1:** To support the delivery of sustainable economic growth and the Growth Point agenda within the Lincoln Policy Area through the provision of reliable and efficient transport infrastructure.
- **Objective 2:** To improve the attractiveness and liveability of central Lincoln for residents, workers and visitors by creating a safe, attractive and accessible environment through the removal of strategic through traffic (particularly HGVs).
- **Objective 3:** To reduce congestion, carbon emissions, improve air and noise quality within the Lincoln Policy Area, especially in the Air Quality Management Area in central Lincoln, by the removal of strategic through traffic (particularly HGVs).

The scheme will have an important impact on Lincoln and will achieve the above objectives by:

- Facilitating sustainable economic development by improving access to potential growth areas and underpinning the LTS which will deliver more sustainable and reliable transport options in the area.
- The scheme is forecast to remove up to 26% of traffic from key routes in the city centre and allow LCC and its partners to “lock in” benefits for sustainable transport and the environment in the city.
- The scheme will remove up to 26% of traffic from city centre and analysis concludes that there will be benefits to air quality within the city of Lincoln.

It is also important to note that the LTS also includes a large number of sustainable transport measures designed to improve conditions in the city and to assist businesses with their economic growth strategies. The LEB has an important role to play in the successful delivery of the other measures outlined by the LTS by removing extraneous traffic from the centre and creating the conditions necessary for their implementation.

3 Policy Context

3.1 Introduction

This section presents a review of policies and other relevant documents to demonstrate how the proposed LEB scheme is consistent with and will contribute to national, regional and local policies, objectives and priorities.

3.2 National Policy

3.2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF), published in March 2012, provides guidance on national planning policy and replaces most of the previous Planning Policy Statements (PPS) and Planning Policy Guidance (PPG). The NPPF places emphasis on supporting sustainable development, advising that environmental conditions should be considered alongside economic and social matters.

In terms of **plan making** the NPPF states that*:*

- *Local planning authorities should positively seek opportunities to meet the development needs of their area…*

*For **decision taking** the NPPF encourages:*

- *Approving development proposals that accord with the development plan without delay…*

The LEB will provide opportunity to meet development needs in Lincoln as it supports sustainable economic growth and the 'Growth Point Agenda' through providing reliable and efficient transport infrastructure. The road will also remove traffic from Lincoln city centre improving the attractiveness of the city to new potential investors and to those existing Lincoln based businesses and institutions that want to expand.

The NPPF goes on to say that decision makers should approve *"development proposals that accord with the development plan".* The LEB has long featured in Local planning policy documents, not least the Local Plan and the Transport Strategy for the Lincoln Area.

The NPPF states that there are *"three dimensions to sustainable development: economic, social and environmental".* The LEB scheme is consistent with these as follows:

- The economic role – the LEB will contribute towards building a strong, responsive and competitive economy by providing transport infrastructure that will support the development aspirations of the area.

- The social role – the LEB will support the development of strong, vibrant and healthy communities by improving the attractiveness and liveability of central

Lincoln for residents, workers and visitors by creating a safe, attractive and accessible environment through removing strategic through traffic (including HGVs).

- The environmental role – the LEB will reduce pollution in Lincoln city centre by removing of strategic through traffic (including HGVs).

3.2.2 Creating Growth, Cutting Carbon

This document outlines the Government's transport vision which is:

> *"for a transport system that is an engine for economic growth, but one that is also greener and safer and improves quality of life in our communities."*

The document goes on to state that; *"economic growth is one of our biggest challenges"*;

The LEB contributes towards the delivery of this vision as it will aid in the delivery of sustainable economic growth and the 'Growth Point Agenda' within the Lincoln Policy Area through the provision of reliable and efficient transport infrastructure. It will also allow the strategic traffic (including HGVs) to avoid the city centre. As noted earlier, this will reduce congestion which will lead to a reduction in the level of carbon emissions, an improvement in air quality and therefore an improved living environment in the city centre.

3.2.3 The Future of Urban Transport

Published in November 2009 by the DfT, The Future of Urban Transport presents an analysis of how transport can best support the success of urban areas and outlines a vision for the future of urban transport. The paper highlights the impact of transport systems on the economy, health and urban environment and challenges decision makers to identify ways to improve these three areas simultaneously; resulting in what is referred to as "triple win" outcomes.

The LEB scheme would result in a "triple win" outcome as it will provide people and business in Lincoln with:

- Enhanced mobility – The proposed scheme would improve accessibility both into and around Lincoln. The reduction in city centre traffic will also improve the efficiency of the bus network.

- Better health – The LEB would remove strategic traffic from the city centre, therefore improving both air and noise quality. The reduction in vehicle numbers will also lead to an improvement in pedestrian and cycle safety within the city centre.

- Regeneration – The scheme would also contribute to the regeneration of the local area providing increased access to existing and potential employment sites, particularly those accessed via the LEB route.

3.3 Local Policy

3.3.1 A Transport Strategy for the Lincoln Area

The Strategy recognises the need for investment in transport infrastructure to support the continued growth of Lincoln with particular emphasis on housing, economic growth, tourism, social inclusion and environmental enhancement. The LEB is one of the key improvements that this strategy proposes.

The strategy notes that the LEB would create; *"a strategic north/south route of County and regional significance and provide an alternative route for traffic which currently has to pass through the city centre".*

The realisation of many of the outcomes of this document can be supported by the LEB scheme; these are summarised below:

Table 3-1 Local Transport Strategy – Outcomes

Outcome		How supported by LEB
Outcome 1	*A reduction of 'through trips' within the urban area, particularly: trips passing through the city centre and HGV trips.*	The LEB will remove strategic traffic from the city centre (including HGVs).
Outcome 4	*An improvement in air quality within the urban area (particularly the AQMA within central Lincoln.*	The LEB will benefit air quality within the Lincoln Policy Area, especially in the Air Quality Management Area in central Lincoln, by the removal of strategic through traffic.
Outcome 5	*A reduction in casualties, particularly: involving vulnerable road users and in locations significantly used by children.*	The LEB will remove strategic traffic from the city centre (including HGVs).
Outcome 10	*An improvement in the liveability and quality of Life within the Lincoln area.*	
Outcome 11	*A reduction in noise levels caused by traffic (particularly for sensitive receptors such as schools and hospitals).*	The LEB will reduce carbon emissions, improve air and noise quality within the Lincoln Policy Area.
Outcome 12	*An increase in the vitality of Lincoln as a sub-regional centre by encouraging trips for tourism, leisure, business and shopping.*	The LEB will support the delivery of sustainable economic growth and the Growth Point agenda within the Lincoln Policy Area.
Outcome 13	*A city that operates effectively for trade and service vehicles.*	
Outcome 14	*The provision of appropriate access to development sites with minimised impact of increased traffic on the local area.*	
Outcome 15	*The protection of the historic environment from traffic impacts.*	The LEB will remove strategic traffic from the city centre (including HGVs).

3.4 Saved City Of Lincoln Local Plan

It is noted that *"While the Local Development Framework is being prepared, the Local Plan will continue to be the main planning document for Lincoln. Once the Local Development Framework is adopted it will replace the Local Plan"*

Policy 14 (Strategic and Major Road Proposals) of the 'saved' plan highlights the importance of the LEB by stating that;

> *"Land required for the construction of the Eastern By-pass will be safeguarded and planning permission will not be granted for any development which would hinder the construction of that road"*

In this document it is noted that the Council's support for further road building will be limited to schemes that will form 'Missing Links' and reduce traffic congestion and pollution or take traffic away from more sensitive areas (e.g. residential areas, the historic core, the city centre). The 'missing link' schemes supported in this Local Plan include the LEB which will enable:

- Through-traffic (including heavy goods traffic) to be removed from the city centre and residential and mixed-use areas adjacent to radial routes.
- The reduction of environmental damage caused by excessive traffic, especially in historic streets and other sensitive areas.
- Stimulating regeneration and economic development.
- The removal of through traffic from the upper High Street area, thereby strengthening retail and other links between the Historic Core, the Top-of-High Street and the Central Shopping Core.

The document, recognising the benefits of the scheme, endorses the route stating that although only a very small section of the proposed LEB will be within the city boundary, "*the City Council supports the construction of the whole By-pass as soon as possible".*

3.4.1 Lincolnshire 3rd Local Transport Plan

The 3rd Local Transport Plan (LTP3) covers the period between 2011 and 2013 (it is noted that the priorities in LTP4 have recently been consulted on however this consultation period ended July 2012 and, at time of writing, no further information is available); this document identifies the LEB in the major projects section stating that it is a key element of the adopted Lincoln Transport Strategy.

It is noted in LTP3 that the LEB would create; *"a strategic north south route around the city centre, removing through traffic (most notably on the A15) and freeing space to 'lock-in' the benefit and enable the delivery of other sustainable travel elements of the strategy within the city centre".*

It is therefore recognised that the LEB would help to allow the delivery of more sustainable mode interventions in Lincoln.

3.5 Summary

The LEB conforms to the objectives and aspirations of national planning guidance. Furthermore, it is specifically identified in Local Policy documents as a key scheme that will;

- Support the delivery of sustainable economic growth.
- Improve the attractiveness and liveability of central Lincoln.
- Reduce congestion, carbon emissions, improve air and noise quality within Lincoln.

4 Site Context

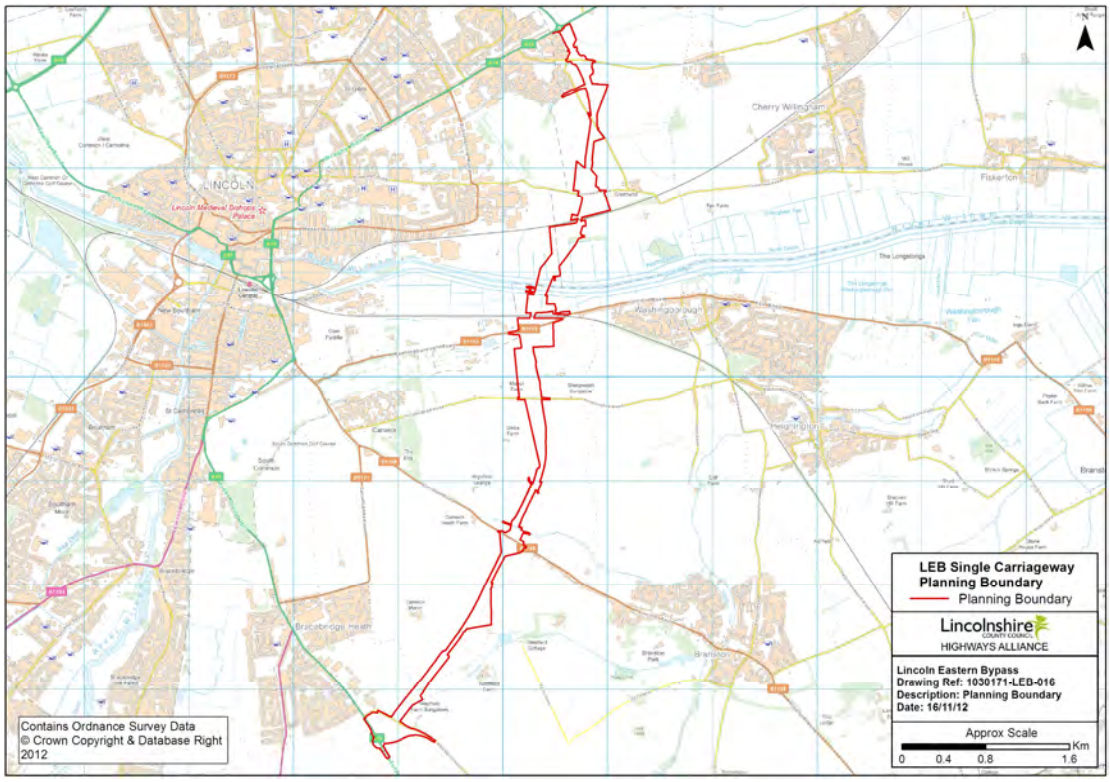
4.1 Introduction

This section puts the LEB into geographical context by showing the LEB planning boundary and the scheme study area. As noted earlier, a full set of scheme plans are provided as part of this planning submission alongside this document.

4.2 Scheme footprint

The proposed scheme would be located to the east of Lincoln city centre within the Eastern sub-area of the East Midlands region. Figure 4-1 presents the footprint of the LEB and demonstrates that the scheme will located in an area of predominantly arable land.

Figure 4-1 LEB Planning Boundary



4.3 Study Area

There are two TA study areas; the first is where the direct transport impacts of the scheme have been assessed and a second includes the wider highway network which has been used in the traffic modelling (this wider network is described in more detail in the model Local Model Validation Report contained in Appendix C). These two study areas are shown in figures 4-2 and 4-3.

Figure 4-2 Transport Assessment Study Area

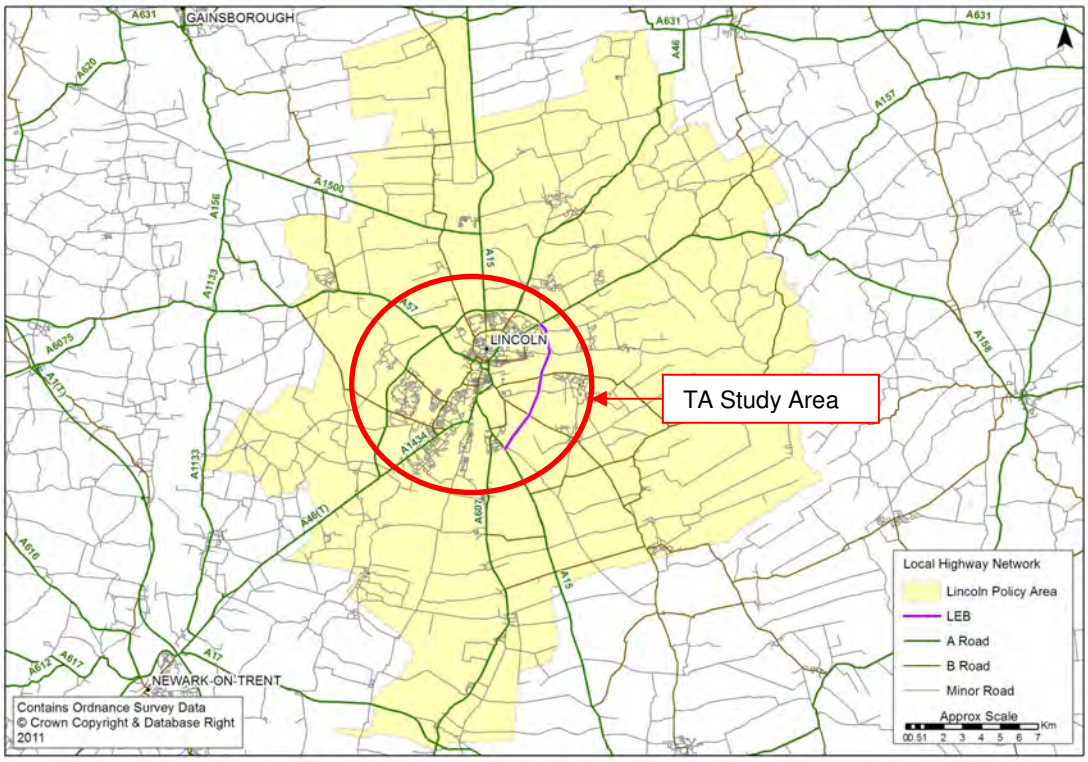
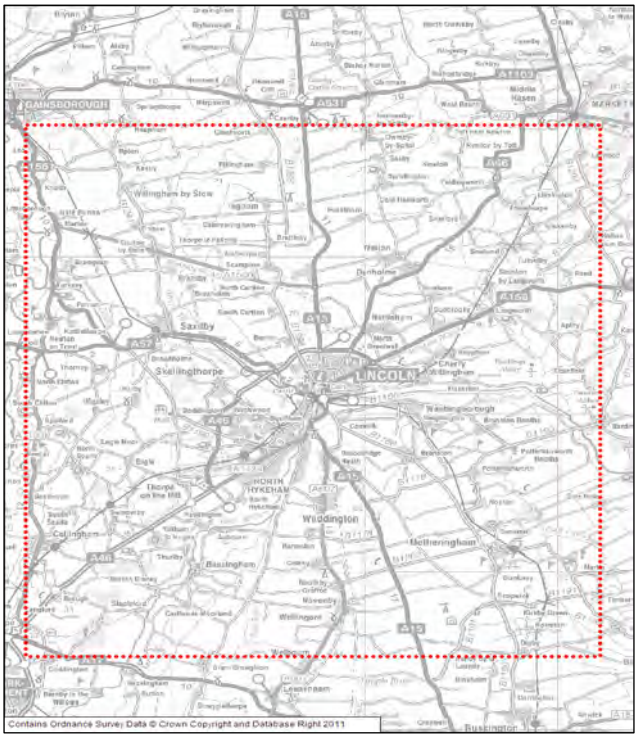


Figure 4-3 Modelling Assessment Wider Study Area



5 Without LEB - Highway Network

5.1 Introduction

As noted earlier the Greater Lincoln Traffic Model (GLTM) has been developed for the study area; this model allows the volume of traffic on the local base network to be quantified. The LMVR in Appendix C provides more detail on how these base flows have been modelled and validated, however this section provides a summary and identifies the key traffic issues on the strategic and local highway network.

5.2 Strategic Network

5.2.1 Description of Existing Network

Lincoln is located approximately 20 miles south of the M180 motorway via the A15 and 40 miles east of the M1 and M18 motorways via the A57. There is an exiting northern by-pass (the A46/A158) which helps to reduce the need for traffic travelling east/west between Sheffield/Doncaster and Grimsby/Skegness to travel through Lincoln city centre. There is also an existing western by-pass (via the A46) which caters for some traffic travelling north-south to/from locations such as Leicester/Nottingham and Scunthorpe/Grimsby. There are significant volumes of traffic travelling north/south to/from the ports on the river Humber; for much of this traffic there is little alternative to travelling along the A15 through the centre of Lincoln.

5.2.2 Issues

- A lack of route choice has long been identified by the local authorities in the area as a problem for north-south movements. A number of key strategic north-south routes (such as the A15, A46 and A158) converge on the city centre and with no viable alternative routes, this results in significant levels of strategic traffic being forced to travel through the centre of Lincoln.

- The lack of alternative river crossings means that strategic traffic, including large numbers of HGVs are forced to converge on the A15 within the city centre.

- The city centre suffers from high levels of traffic and congestion, caused by the interaction of local, regional and strategic traffic.

- The high levels of traffic flow and congestion within the city centre reduces the attractiveness of the city as a tourist destination, and also as a place to live and work.

5.3 City Centre

5.3.1 Description

There are several B-roads which provide a link between the strategic routes of the A15/A46 and the local roads within the city centre, with the B1273 providing a route along the west and north of the city centre.

High Street has been identified by the local authorities as being of particular importance to the successful operation of the local network. It presents an important route to Lincoln city centre from the south providing a direct link between the A15/A1434 St Catherine's to the A57 St Mary's Street. Just before reaching the A57 St Mary's Street, High Street crosses the railway line at-grade and therefore requires the use of a level crossing.

5.3.2 Issues

- There is no defined route through the centre with the strategic traffic focusing on the A15 or the B1273. The road network focuses strategic traffic along a limited number of key routes.
- The current railway level crossing barrier downtimes, which cover approximately 20 minutes per hour, significantly impacts upon pedestrians, cyclists and vehicular traffic travelling through the city centre.
- It is understood that, as the barrier downtime increases as a result of the Network Rail plans to boost freight traffic along the Peterborough and Doncaster railway line, the impact of the level crossing on the local traffic will be exacerbated. This will encourage drivers to re-assess their route choice, and could lead to an increase in traffic using roads such as the A15 Canwick Road, which includes a bridge crossing over the railway line. This will therefore add further pressure to the city centre routes currently used by the regional and strategic traffic.

5.4 Key Areas of Congestion

The GLTM model has identified that there will be a problem with queuing, congestion and vehicle delay within the study area under the Do Minimum scenario (where the LEB is not provided) by 2017. The issues are felt across the study area, but show a particular problem along the following roads:

- The north-west section of the A46 between the A57 Saxilby Road and the A15.
- A15 Broadgate and A15 Canwick Road
- B1188 Canwick Hill
- The section of the A57 Saxilby Road between the A46 and the B1273.

The problems with queuing, congestion and delay within the city centre is shown to worsen in future years, as increased traffic levels are forced along already congested roads within a constrained network.

6 Public Transport

6.1 Introduction

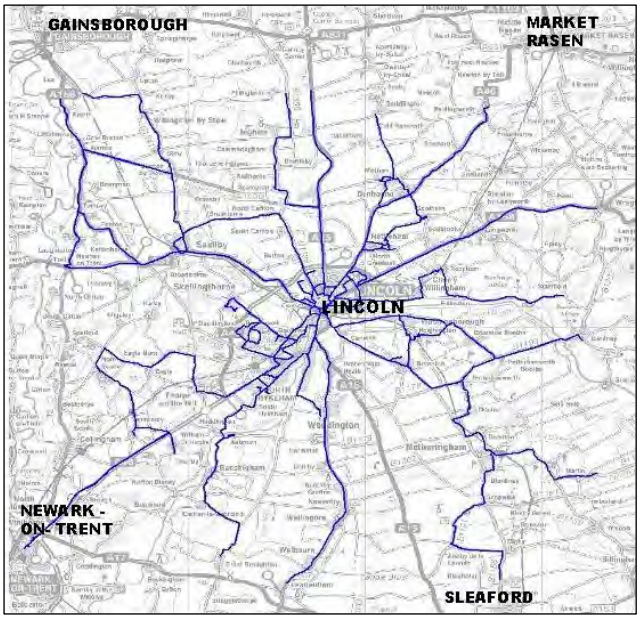
The purpose of this section of the report is to provide an overview of the existing public transport provision and identify any current issues within the study area.

6.2 Local Bus Network

6.2.1 Description

Lincoln bus station is located within the city centre, off the A15 Melville Street, and provides 17 pick-up stands. Figure 6-1 shows the coverage of bus routes within the study area.

Figure 6-1 Extent of Bus Routes in Lincolnshire



6.2.2 Issues

Consultation with bus operators indicate that they believe that congestion within Lincoln is acting as a constraint to further bus use growth which is leading to increased costs to maintain existing bus punctuality. Stagecoach have advised that "*over the last 15 years bus running times have been increased by 25% simply to account for traffic delays"*, and they support the LEB acknowledging that it will free up capacity in the city centre consequently allowing improved bus service operation and offer opportunities for bus improvement in the city.

6.2.3 Impact on Transport Modelling

Public bus routes and frequencies have been represented in the model so that the impact of bus services on link and junction capacities can be taken into account.

It is not considered that the provision of the LEB would lead to any changes in route choice for the existing bus services.

6.3 Rail Network

6.3.1 Description

Lincoln train station is the only railway station within the study area. It is located within the city centre, a short distance away from the bus station, and can be accessed via the A57 (St Mary's Street). The railway line travels east-west through the city centre. The majority of the A- and B-roads within the city centre cross the railway line via a bridge, with the exception of the B1262 (High Street), which requires a level crossing.

6.3.2 Impact on Transport Modelling

The south-west of the study area includes several level crossings that affect traffic movements along sections of the highway network during the modelled hours when the gates across the crossing are lowered. These level crossings have been represented in the model as signalised junctions with a common set of signal timings at each level crossing. The signal timings have been established during the development of the base year model.

6.3.3 Issues

The presence of a railway line which dissects the city centre brings with it several issues which impact on the traffic flow through the area, these are:

- The High Street railway level crossing adversely impacts on vehicular traffic, bus services reliability and pedestrians and cyclists movements in the city centre.
- Work has been commenced by Network Rail on upgrading the line between Peterborough and Doncaster which it is understood will allow more freight traffic to use the route to free up space on the East Coast Main Line for further high speed trains. It is expected (based on information provided by the local authority) that this will result in increased barrier downtime.
- It is understood that the level crossing barriers are currently down for an average of approximately 20 minutes per hour between 07:00 and 19:00 and that this is likely to increase to 27 minutes per hour, with the barriers down for over 31 minutes in the railway line peak hour.

7 Non-Motorised Users

7.1 Introduction

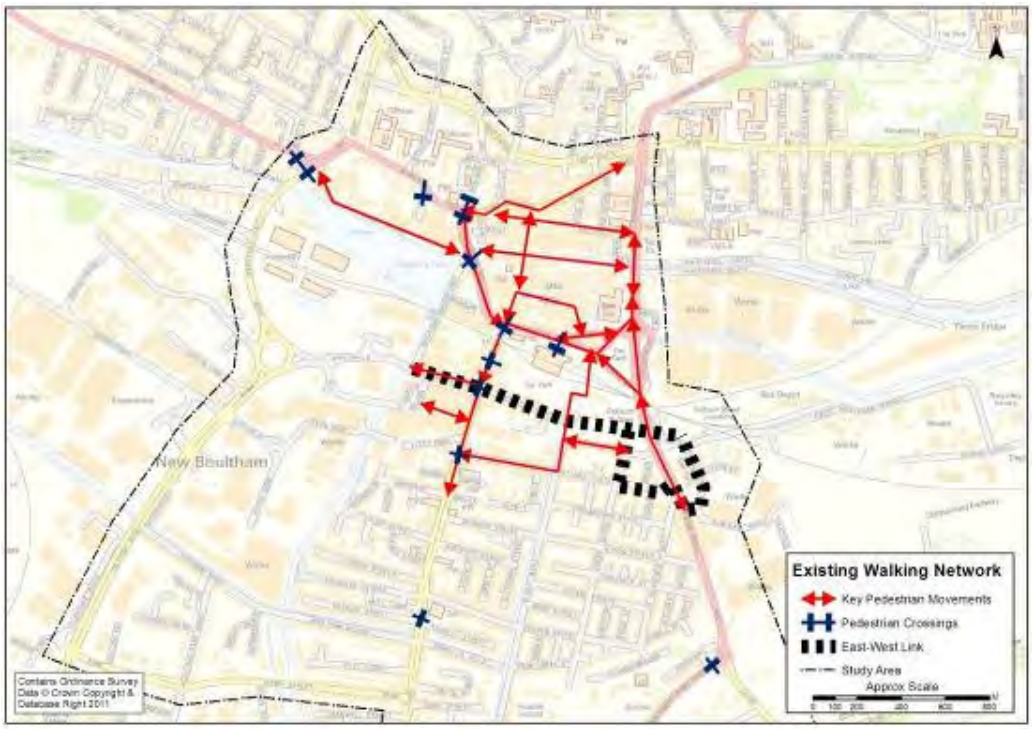
The LEB with have an indirect and direct impact on both walking and cycling in the centre of Lincoln (where traffic flows will be reduced). This section provides an overview of the existing non-motorised user provision and identifies any issues.

7.2 Pedestrian Analysis

7.2.1 Description of existing facilities (city centre)

Having analysed town centre pedestrian movements for another study (the East West Link scheme which was undertaken in consultation with LCC) key pedestrian demand routes in the city centre have been identified, these are shown in Figure 7-1 below (for information, the route of the proposed Lincoln East-West bypass is also shown for context as this road will provide additional walking and cycling infrastructure).

Figure 7-1 City Centre Key Pedestrian Movements and Crossing Points



7.2.2 Issues

A number of the key pedestrian routes identified above also cross and interact with the primary routes through the city centre; this makes the area less attractive for pedestrians, with high levels of traffic having a negative impact on air quality.

7.2.3 Description of existing facilities (area around the LEB scheme)

The proposed LEB would be constructed to the east of the city centre, through an area of land that is mainly arable in nature. There is currently little by way of

pedestrian movement through this area and therefore limited provision for pedestrians; in summary:

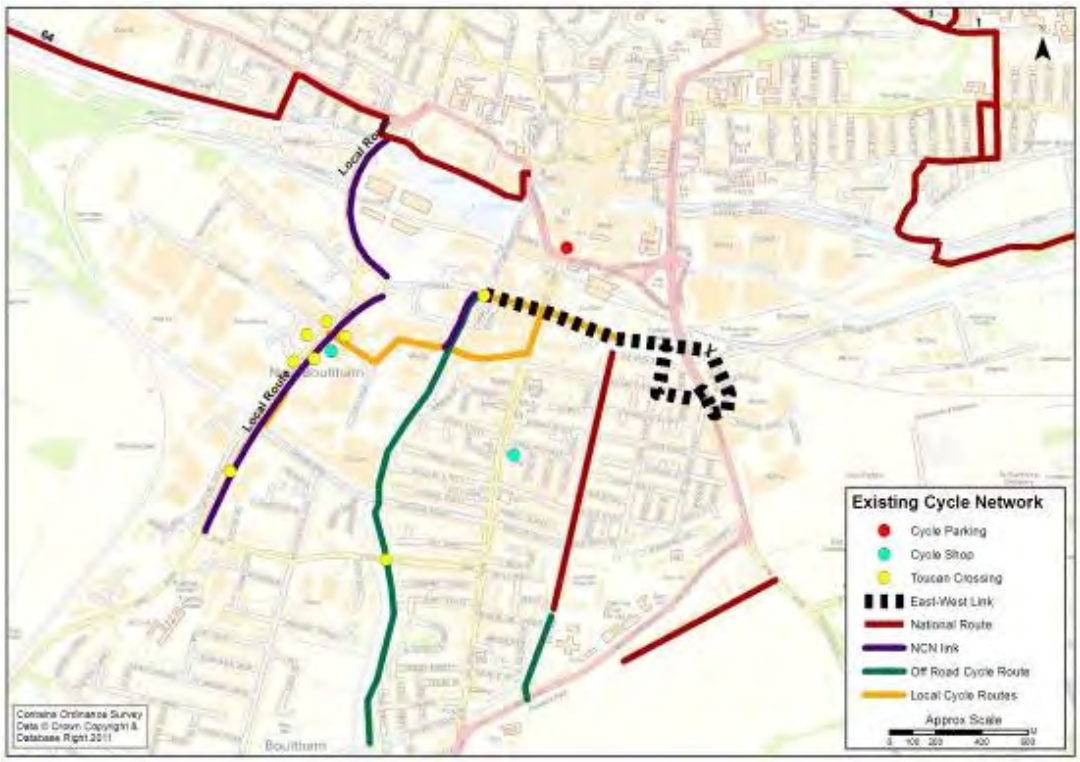
- A narrow footway is provided along the north side of Greetwell Road. Two bus stops (one on the north and the other on the south side of the carriageway), with associated waiting areas, are also provided approximately 100m west of Sunnyside Cottage.
- A shared pedestrian / cycleway runs alongside the River Witham.
- A footway is provided along the northern side of Washingborough Rd.
- A wide verge is provided along both sides of Heighington road; this could potentially accommodate pedestrians, but no defined footway is provided.
- A narrow shared footway/cycleway is provided along the north side of Lincoln Road.
- A narrow footway is provided on both the north and south side of Sleaford Road as it passes through Bracebridge Heath. The southern footway finishes at Sycamore Grove (approximately 100m north of Bloxholm Lane) and the northern footway ends at the junction with Bloxholm Lane.

7.3 Cycle Analysis

7.3.1 Description of existing facilities (city centre)

Figure 7-2 shows the existing cycling facilities located in the city centre.

Figure 7-2 Existing Cycling Facilities

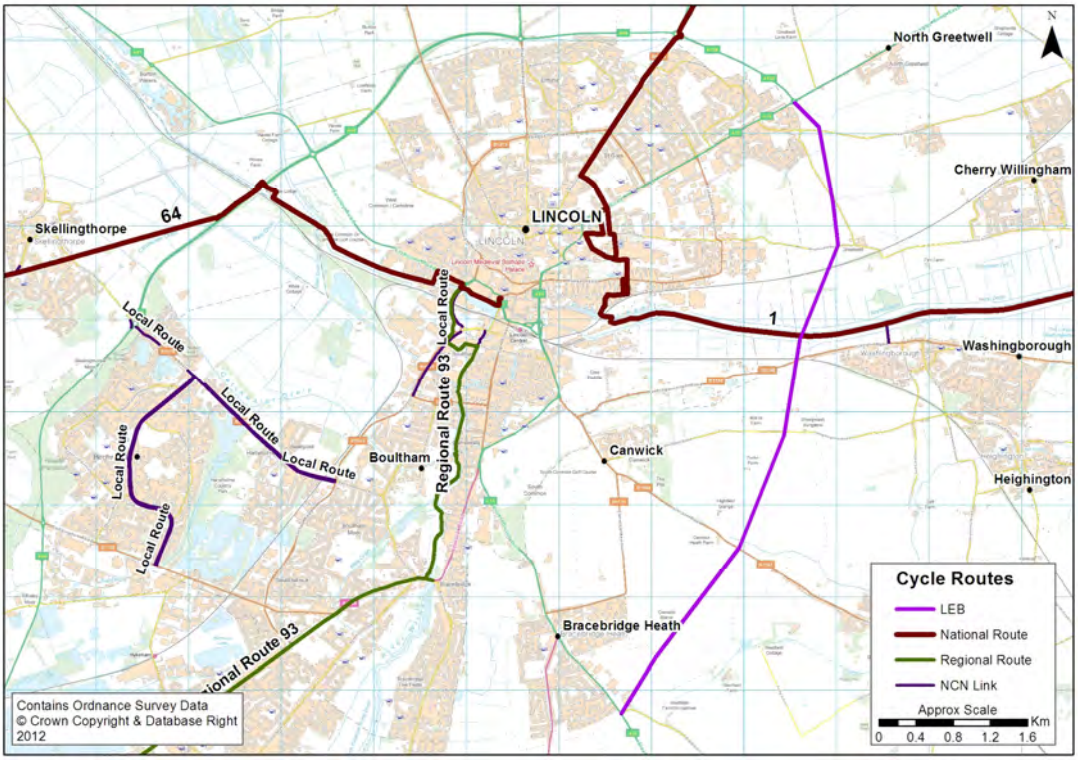


The figure above indicates that a number of official cycle routes serve central Lincoln but there are limited north south routes that provide a continuous link through the centre of the city. Considering general cycle parking provision, cycle parking stands are available at a range of locations within Lincoln city centre, including at the Central Railway Station, the County Offices, the City Hall and the Lincoln Castle. Cycle parking lockers are available at the Bus Station.

7.3.2 Description of existing facilities (area around the LEB scheme)

Taking a wider view, Figure 7-3 shows the existing cycle routes outside of central Lincoln.

Figure 7-3 Existing cycle routes within Lincoln



As shown above, the majority of the cycle routes are focused to the west and south of Lincoln. National Route 1 is the only defined cycle route that passes through the path of the proposed LEB; this provides a link from Boston, through Lincoln to Market Rasen. A section of this route runs along the River Witham, and crosses the proposed path of the LEB close to Washingborough.

8 Safety Assessment

8.1 Introduction

This section reviews safety in terms of the personal injury accidents recorded over the last five year period (1st May 2007- 30th April 2012). This assessment covers the following two areas:

- Social & Distributional Impacts – Safety: In response to the DfT requirement to measure the social and distributional impacts of major schemes, the safety impact of the scheme was assessed in 2011 as part of the bid for Programme Entry Status. This assessed the safety implications across the Lincoln Policy Area and is used within this study to demonstrate the wider impacts.

- LEB Collision Study Area: A 1km study area surrounding the LEB was identified as the primary location within which there is likely to be an impact as a result of the scheme proposals. As traffic flows would change to the west of the LEB with the scheme (i.e. strategic traffic travelling from the north through Lincoln would now head towards and use the LEB), this 1km zone was extended westwards. This study area was agreed with LCC and the number, severity and type of collisions within this area assessed (the data assessed is in Appendix B).

8.2 Social & Distributional Impacts

A Social and Distributional Impacts assessment (SDI) of the LEB was undertaken in 2011 with the aim to identify the impact of transport interventions spatially, socially and economically with particular reference to disadvantaged groups.

To assess the impact of the LEB on safety within the Lincoln Policy Area (LPA) the assessment looked at the locations of collisions over a five year period, the changes in traffic flow as a result of the LEB on key links and the results from the Cost Benefit Analysis (COBA) also undertaken to support the wider economic impact assessment. The assessment specifically looked at the relationship between the location of collisions over the study period, the demographic and socio economic status of the study area and the relationship with changes in traffic flow as a result of the LEB.

The analysis demonstrated that there would be significant accident benefits across the study area with the COBA appraisal **identifying up to £39m of accident benefits over a 60 period**. To further analyse the potential spatial impact of the LEB on accidents within the LPA, the accident data was combined with the traffic flow data to show specific links where a change in number or severity of accidents may occur as a result of a change in flow. The links with a forecast increase or reduction in flow where analysed in conjunction with the number of accidents, to highlight roads or areas where accident rates may change as a result of a change in traffic flow. The data showed that a number of accident clusters were located on roads

where there is forecast to be a reduction in traffic flow. It also showed that a significant number of these links were located within Lincoln city centre.

With the forecast reduction in HGV flow and strategic traffic in and around Lincoln city centre onto more appropriate routes i.e. the LEB, the assessment highlighted that **pedestrian severance and the accident record of a number of road links within the area would likely be improved**.

The analysis also identified that it would be expected that the LEB would positively impact on the number and severity of accidents i.e. reduction in accidents, to both vehicular and non-motorised users as a result of the scheme in a number of areas within Lincoln city centre. This will likely have a positive impact on a number of socio-economic groups located within these areas

The traffic flow data, accident data and data detailing the number of benefit claimants were also combined to look at the relationship between the LEB, improvements in safety and areas with higher numbers of benefit claimants. The data showed that there are several areas that have both a large number of benefit claimants and significant numbers of accident clusters on road links. The data also showed that these areas are also forecast to have a reduction in traffic flow as a result of the LEB.

8.3 Collisions Located within 1km of the Scheme

The collision data for the last 5 year period (1st May 2007 – 30th April 2012) has been collated and reviewed for the LPA and for key links located in the 1km collision study area. The area incorporates a 1km buffer around the LEB scheme and the A46 located to the north of Lincoln. The aim of this analysis is to ascertain whether there are any existing safety concerns which may require further study and mitigation measures as a result of the scheme proposals.

Collisions have been assessed based on their severity, frequency and causal factors in order to establish any trends which may indicate a safety concern. Additionally any collisions involving vulnerable road users, (pedestrians and cyclists) are identified and investigated to identify whether or not there are any common circumstances. Figure 8-1 illustrates the location and severity of the recorded collisions in proximity to the proposed scheme with an overview of the collisions recorded by year in

Table 8-1. The data demonstrates that the majority of collisions have been slight in their severity (86%).

Figure 8-1 Adjacent Links Collision Analysis

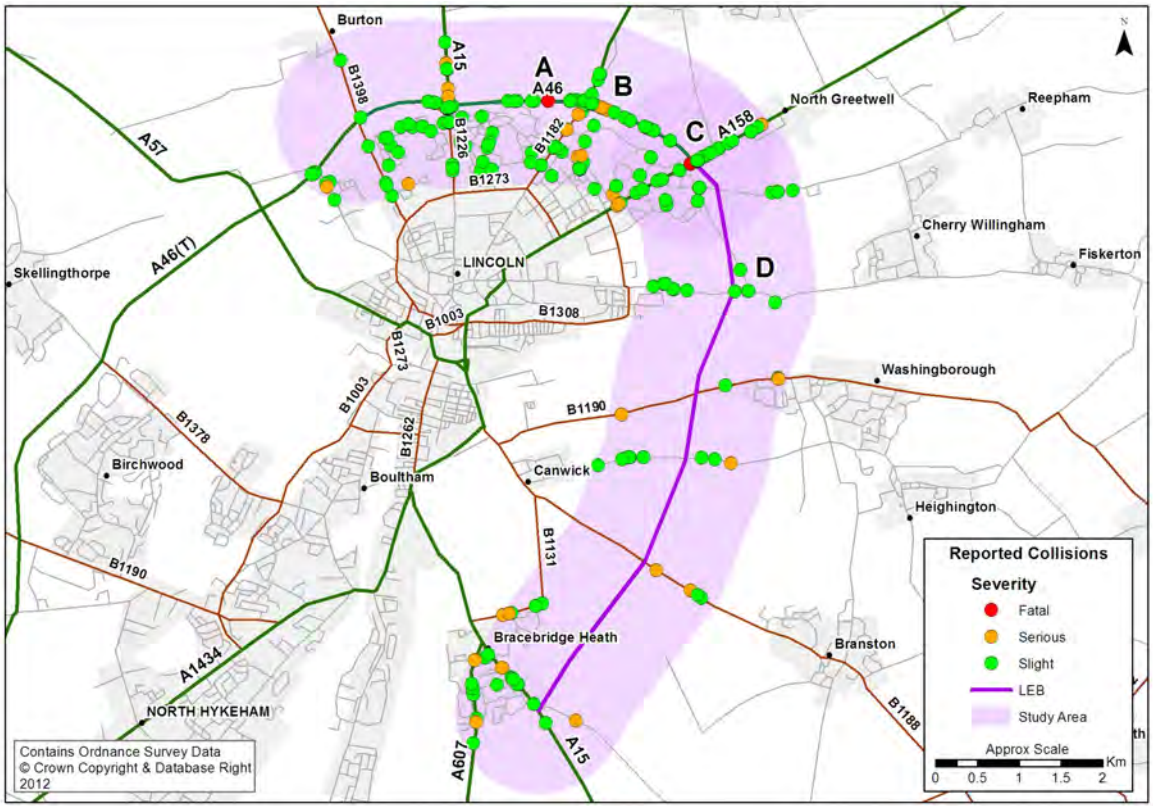


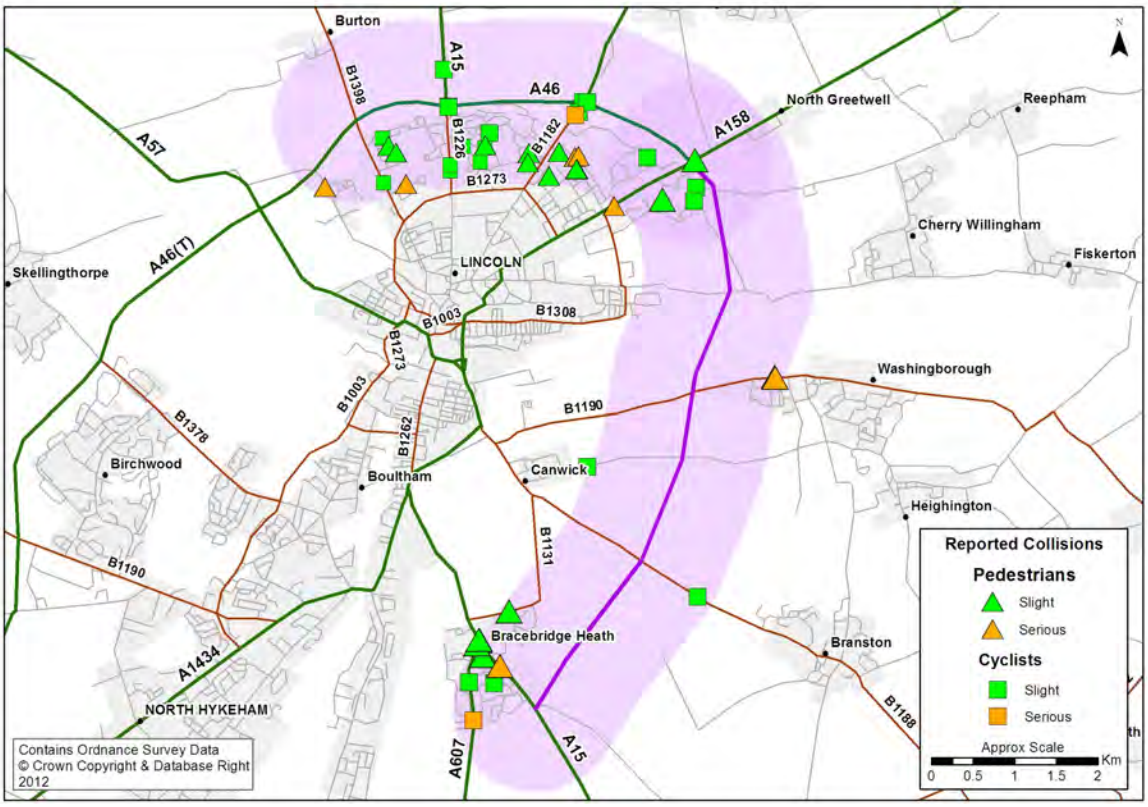
Table 8-1 Recorded Collisions – Adjacent Links

Recorded Collisions – Adjacent Links							
Severity	**May - Dec 2007**	**2008**	**2009**	**2010**	**2011**	**Jan – April 2012**	**Total**
Fatal	0	2	1	1	0	0	**4**
Serious	3	6	5	9	9	2	**34**
Slight	22	35	53	46	52	17	**225**
Total	**25**	**43**	**59**	**56**	**61**	**19**	**263**

8.3.1 *Vulnerable Road Users*

All collisions involving pedestrians or cyclists in the defined area over the last five years has been highlighted in Figure 8-2 below. The data shows that there have been 11 collisions involving pedestrians and 16 involving cyclists, 85% of which have been slight in their severity. The collisions have been relatively sporadic in their location with some clustering at major junctions with A-Roads.

Figure 8-2 Vulnerable User Accidents



The frequency of collisions involving vulnerable users can be seen in Table 8-2.

Table 8-2 Study Area – Vulnerable User Collisions

Study Area – Pedestrian and Cyclist Collisions							
	May - Dec 2007	2008	2009	2010	2011	Jan – April 2012	Total
Pedestrian	3	5	4	5	8	1	**26**
Cyclist	1	4	6	6	5	1	**23**
Total	**4**	**9**	**10**	**11**	**13**	**2**	**49**

In assessing the causal and contributory factors of collisions involving pedestrians, these have been attributed to pedestrians failing to look properly, suffering from illness or being impaired by alcohol. The factors attributed to collisions involving cyclists include a failure to look, poor judgement and disobeying road markings/signals. These factors are predominantly behavioural in their nature.

8.4 Summary

This section has reviewed safety in terms of the collision history of a number of links and junctions in the Lincoln Policy Area. This analysis builds on previous social and distributional impact data which concluded that the scheme would have a positive impact on Lincoln through the removal of strategic traffic from the city centre.

An analysis of links adjacent to the proposed scheme has revealed no significant safety issues or trends which would call for further study or require any additional mitigation measures over and above the design proposals.

9 Proposed Scheme

9.1 Introduction

This section describes the recent evolution of the scheme. It describes the scheme ethos before summarising the public and stakeholder consultation exercises that were undertaken to gauge wider support for the project. The scheme is then described section by section before the key design considerations that lead to its current proposed form are detailed. Finally, non-motorised improvements in Lincoln that the Local Highway Authority has indicated will be made possible by the implementation of the LEB are described.

9.2 Scheme Ethos

The objectives of the project have formed the basis for the design decisions made during this evolution of this scheme. Further to this, due regard has been given to relevant guidance and design standards including those prescribed in the Design Manual for Roads and Bridges (DMRB). An important element of the scheme design has been the inclusion of future proofing measures. These ensure that the scheme design offers best value for LCC and minimises the disruption connected to any future upgrades or scheme changes.

9.3 Consultation Exercises

This scheme has been subject to extensive public and stakeholder consultation and is approved by Lincolnshire County Council (LCC), City of Lincoln Council (CoLC), West Lindsey District Council (WLDC) and North Kesteven District Council (NKDC). A summary of this consultation is provided below.

In 2008 LCC sought the views of elected members, stakeholders and the public on three alternative routes for the LEB. The aim was to help inform which route would be the subject of the 2010 planning application (the dual carriageway route which was granted planning approval). Table 9-1 details the consultation activities undertaken during this period.

Table 9-1 2008 Consultation Activities

Activity	Date
County News Articles	Jan 2008
LCC staff briefing	Feb 2008
Distribution of posters	Feb 2008
Invitation to stakeholders, Members and media	Feb 2008
Questionnaires (25,000 in Lincoln area)	Feb 2008
LEB preview	Feb 2008
Lincolnshire Echo 4 page colour supplement	Feb 2008
LEB consultation material on website	Feb 2008
Public consultation exhibitions	Feb 2008
Seldom heard form groups	Feb/March 2008

Activity	Date
Deadline for submitting questionnaires	Feb/March 2008

The following levels of response were received:

- Over 1,400 visitors to the public exhibitions.
- 4,200 completed questionnaires.
- Over 63 letters, emails and telephone calls.
- 42 comments in a "comments book".

The consultation was reported on and on the general feeling towards the scheme the report stated;

> *'The consultation outputs demonstrated general support for the LEB per se, from both within the study area and Lincoln as a whole.'*

Furthermore, it concluded that:

> *'The feedback received…indicates widespread support exists for a LEB.'*

The consultation report was submitted to DfT and in view of the widespread support for the scheme; DfT indicated that it was not necessary to undertake a second public consultation exercise in support of the eventual best and final bid process.

However, as funding was sought in 2011, it was considered appropriate by DfT to conduct a limited, but focused, exercise to ensure that the scheme remains relevant to the regeneration plans of local stakeholders and represents a good use of limited funds. This consultation exercise was focused, with the specific aim of ensuring that the single carriageway scheme remains relevant to the sustainable economic regeneration and other key plans of major local stakeholders. Based on previous consultation exercises and a consideration of the economic conditions prevailing in Lincoln and Lincolnshire, it was decided to target the stakeholders detailed in Table 9-2.

Table 9-2 - Identified Consultees

Group	Consultees
Local Enterprise Partnership	• Lincolnshire Local Enterprise Partnership
Business and Enterprise Umbrella Groups	• Lincoln Business Improvement Group • Federation of Small Businesses • Lincoln Chamber of Commerce • Lincolnshire Forum for Agriculture and Horticulture • Bailgate Guild
Major individual businesses or operations	• Siemens • Lincolnshire Co-op

Group	Consultees
	• Lincolnshire Agricultural Society • Denby Transport • RASE
Visitor/Tourist organisations	• Historic Lincoln Partnership • Lincoln Cathedral • Visit Lincoln
Educational Establishments	• University of Lincoln • Lincoln College • Employment and Skills Board
Health Authorities	• Primary Care Trust • United Lincolnshire Hospitals
Emergency Services	• Police • Fire and Rescue • Ambulance trust
Public Transport Operators	• Stagecoach
Environmental Groups	• Campaign for Better Transport
District Councils	• City of Lincoln Council • Central Lincolnshire Joint Strategic Planning Committee • North Kesteven District Council • West-Lindsey District Council

The majority of those consulted responded in writing to LCC giving their views on the existing situation and what impact LEB would have. These responses are summarised in the Statement of Community Involvement which accompanies the LEB planning application. In addition, Karl McCartney MP has written to the Minister for Transport outlining his support for the scheme. This letter is also summarised in the Statement of Community Involvement.

There was, generally, overwhelming support for the single carriageway scheme from those stakeholders who responded and a clear willingness from the private sector to build on the opportunity presented by the scheme by investing in infrastructure and jobs.

9.4 Scheme Description

The following section provides an overview of the proposed scheme and a broad description of the future proofing measures that have been included within the scheme design. The drawings submitted alongside this document show the scheme in more detail.

9.4.1 Lincoln Eastern Bypass – Overview

The proposed LEB will provide a new 7.5km single carriageway relief road that will link the junction of the A15 and A158 Wragby Road to the A15 Sleaford Road. The new route will have a design speed of 100kph (and a speed limit of 60mph) and a

separate 3m wide combined cycle and pedestrian right of way (located on the western side of the carriageway) provided along the full length of the scheme to link up with existing public rights of way. The scheme will comprise of the following elements (north to south starting from the Wragby Road Roundabout):

Wragby Road Roundabout to Greetwell Road (0-1,500m, Drawing Ref 1030171/100/023D):

1. Wragby Road Roundabout: From A158 Wragby Road the single carriageway layout follows the horizontal alignment of the northbound side of the A158 which allows the LEB to tie into the existing roundabout as a fourth arm. The diameter of the existing roundabout remains unaltered.

2. Hawthorn Road Junction: The western side (residential side) of Hawthorn Road will be stopped up and a turning head provided. A left in left out only junction with auxiliary diverge lane and tapered merging lane on the eastern side with the LEB will be added and a segregation island included to block right turns.

3. The existing footpath located to the north of Hawthorn Road will be stopped up and access provided to the LEB NMU route on the western side of the LEB.

4. Greetwell Road Footbridge: A footbridge on the north side of the Greetwell Road Roundabout over the LEB will provide access to the LEB NMU route and maintain the current NMU provision along Greetwell Road.

Greetwell Road Roundabout to Washingborough Road Roundabout (1,500m – 3,000m, Drawing Ref 1030171/100/024C):

5. Greetwell Road Roundabout: A new four arm roundabout will provide a link from the LEB to the B1308 Greetwell Road.

6. Lincoln to Market Rasen Railway Underbridge: The structure will carry the LEB over the Lincoln to Market Rasen railway line and the Viking Way. A link will be provided to the Viking Way from the LEB NMU route.

7. Northbound overtaking lane provided between the River Witham Bridge and Greetwell Road Roundabout.

8. River Witham Underbridge: The River Witham Underbridge is the largest structure on the scheme and will cross the River Witham floodplain on an embankment, with a bridge travelling over the North Delph, River Witham, and South Delph.

9. Lincoln to Spalding Railway Overbridge: To the south of the river, the bypass will cross under the Lincoln to Spalding railway line.

10. South Delph Footbridge: The footbridge will cross the South Delph watercourse away from the northbound carriageway and provide access to the existing Sustrans cycleway/ footway that runs parallel to the River Witham.

Washingborough Road Roundabout to 1500m south of Heighington Overbridge (3000m – 4500m, Drawing Ref 1030171/100/025/B):

11. Washingborough Road Roundabout: The LEB joins the B1190 Washingborough Road at a new four arm roundabout.

12. A climbing lane has been provided on the southbound exit from Washingborough Road roundabout with an 8% gradient.

13. Heightington Road Overbridge: The LEB will pass under Heightington Road through a new overbridge, with only NMU access to Heighington Road.

4500m – 6000m (Drawing Ref 1030171/100/026B):

14. Lincoln Road Roundabout: A new four arm roundabout will be constructed where the LEB crosses the B1188 Lincoln Road.

15. Lincoln Road Subway: An underpass is proposed for non-motorised users to cross the LEB at Lincoln Road.

6000m – 7500m (Drawing Ref 1030171/100/027B):

16. Bloxholm Lane Footbridge: A new footbridge will be provided over the LEB at Bloxholm Lane.

17. Sleaford Road Roundabout: A new four arm roundabout will be constructed to join the LEB with the A15 Sleaford Road and the realigned Bloxholm Lane.

9.4.2 Lincoln Eastern Bypass – Future Proofing

LCC aim to ensure that, if required, the scheme can be upgraded in the most cost effective manner with minimum disruption. As a result the LEB has been designed to incorporate a number of future proofing design elements that offer best value for the single carriageway scheme design and minimises disruption for any future upgrades or scheme changes. As a result the scheme design process identified a number of elements where it would be beneficial to build in future proofing measures; they are as follows:

- Greetwell Road Roundabout/ Washingborough Road Roundabout/ Lincoln Road Rounabout/ Sleaford Road Roundabout: All roundabouts are larger than normally required for a standard single carriageway design to allow the carriageway to be widened with minimum disruption.

- The western leg of Greetwell Road Roundabout will have provision for the future dualling of Greetwell Road to accommodate development in the area.

- Greetwell Road Footbridge: It is proposed to build the footbridge as a dual carriageway width structure to allow any future widening of the LEB to be accommodated without having to rebuild the footbridge.
- Lincoln to Market Rasen Railway Underbridge: The underbridge design contains a wider northbound verge that will allow for the longer sightline for future widening of the LEB albeit with a departure from current standards.
- Heightington Road Overbridge: The bridge has been designed to accommodate a widened LEB carriageway.
- Lincoln to Spalding Railway Overbridge: The overbridge design contains a two span box structure to allow and simplify any future widening of the carriageway.
- Bloxholm Lane Footbridge: It is proposed to build the footbridge as a dual carriageway width structure to allow for any future widening of the LEB.
- The Lincoln Road Subway: It is proposed to build the subway as a dual carriageway width structure to accommodate any future widening of the carriageway.
- The drainage (including catchment ponds) has been designed to allow for future widening of the carriageway.
- The carriageway crossfalls are traditionally designed to have a 'crown' in the middle, i.e. each lane falls away from the centreline. In the case of this scheme the carriageway is designed to fall to the outside edge of the road.
- The large cutting south of the Washingborough Road Roundabout has been designed so that future widening can be completed within the proposed landtake.

9.5 Key Design Decisions & Design Rationale

There have been a number of stages of the design process when a key design decision has been necessary. The section below describes the rationale behind the key design decisions made during the preparation of the single carriageway design and following the scheme being granted programme entry status by DfT. It is important to note that all design decisions made prior to this were justified during the dual carriageway scheme planning application.

Table 9-3 Scheme Programme Entry Key Design Decisions & Rationale

Ref	Design Decision	Rationale
Route & Layout	To reduce the main carriageway to a single carriageway way road.	DfT advised that funding would not be provided for a dual carriageway scheme and as part of the value engineering process the scheme was redesigned to a single carriageway to reduce the overall scheme cost. The delivery of the successful Best & Final Bid

Ref	Design Decision	Rationale
		Business Case demonstrated that the single carriageway scheme would still deliver stated scheme objectives. The single carriageway design also includes future proofing measures to allow the LEB to be upgraded with minimum disruption and cost.
	To introduce a northbound overtaking lane between River Witham Bridge and Greetwell Road Roundabout.	Following a review of the design it was decided that an overtaking lane was required to ensure that there are overtaking opportunities along the northern sections of the route.
	To remove the Greetwell Road Improvement Scheme from the LEB scheme	LCC decided as part of the value engineering process that the scheme should no longer form part of the LEB scheme to reduce the overall scheme cost.
	To introduce a climbing lane from Washingborough Road Roundabout on southbound route	In line with national standards the gradient of the route south of the roundabout justifies the inclusion of a climbing lane.
Junction	**Hawthorn Road:** To provide a left in/left out junction on the eastern side of the bypass and stop up the western side	The left in/left out junction was proposed as part of the value engineering process to remove the need for an underbridge and associated earthworks.
	Greetwell Road/Washingborough/ Lincoln Road/Sleaford Road roundabouts: To incorporate larger roundabouts into scheme design	The roundabouts are larger than for a standard single carriageway design to provide additional capacity and allow the carriageway to be widened with minimum disruption and in the most cost effective way.
Structures	**Greetwell Road Footbridge:** The structure will be built to a dual carriageway width.	This will ensure that the structure is future proofed and any expansion of the LEB can be completed with minimum disruption and in the most cost effective manner.
	Single Carriageway River Witham Underbridge	A single carriageway structure remains most cost effective solution.
	Lincoln to Spalding Railway Overbridge	The bridge carries the proposed carriageway under the Lincoln to Spalding rail line. It was decided that due to complexities and cost in constructing under this rail route that the structure be future proofed by including a two span box structure.
	Heighington Road Overbridge	The bridge has been designed to accommodate a widened LEB carriageway.
	Lincoln Road Subway: To design the structure to accommodate any widening of the LEB.	It was decided that providing a single carriageway structure would offer little benefit as the cost saving for this would be minimal compared with the cost of future widening of the carriageway.
	Bloxham Lane Footbridge: To design the structure to accommodate a dual carriageway in future, as necessary.	This will ensure that the structure is future proofed and any expansion of the LEB can be completed with minimum disruption and in the most cost effective manner.

9.6 Proposed improvements for NMUs

9.6.1 City Centre

As discussed in further detail within Sections 10 and 11, the provision of the proposed LEB would lead to a significant reduction (up to 26%) in traffic travelling through the city centre. This would also lead to a reduction in queuing and congestion, thus making the city centre a much more attractive and accessible area for residents, workers and visitors as both pedestrians and cyclists. The reduction in the number of HGVs travelling through the city centre will be of particular benefit to cyclists, and may encourage more people to make use of this mode of transport in order to travel to/from the city centre.

Specific improvements include:

- The East West Link will deliver an enhanced walking and cycling link east to west and enhanced links with existing routes north to south
- The pedestrianisation of High Street between Tentercroft Street and St Marys Street.
- Lincoln Park and Ride
- Canwick Road/ Washingborough Road Junction improvements. Thus will include improvements to the alignment and routing and the addition of a new pedestrian crossing facility.
- There are planned walking and cycling link improvements links to / from the LN6 (i.e. the area around Teal Park / Doddington Road area and North Hykeham and Birchwood) area and city centre as part of the Local Sustainable Transport Fund (LSTF) improvements.

9.6.2 Area in and around the proposed LEB

There will be a number of provisions made within the design proposals for NMUs, as detailed below:

- A shared cycle/ footway will be provided along the western side of the LEB carriageway to cater for any demand from pedestrians and cyclists. The off-road nature of this facility will ensure that cyclists are segregated from the motorised traffic; the route is therefore considered to be safe and attractive to users.
- A footbridge will be provided across the northern arm of the proposed junction of the LEB with Greetwell Road. This will ensure that a provision is maintained for those travelling to/from Lincoln-Fiskerton.
- A connection will be provided between the footway/cycleway provided on the western side of the LEB carriageway, to the existing ‘Boston-Lincoln- Market Rasen’ footway / cycle route, just to the north of the Washingborough Road

roundabout (parallel to the River Witham). This will improve the connectivity between the city centre and the outlying regions such as Bardney.

- A bridge will be provided to carry Heighington Road over the proposed LEB; this will include a footway/cycleway on both sides of the carriageway in order to ensure the continued provision for NMUs travelling between Lincoln and outlying regions such as Heighington.

- A subway will be provided underneath the northern arm of the proposed junction of the LEB/Lincoln Road in order to maintain the connectivity between Lincoln and outlying areas such as Branston.

- A footbridge will be provided over the LEB arm of the proposed junction of the LEB/Sleaford Road roundabout; this will ensure continuity of provision for NMUs.

The provision of a shared cycle/footway along the western side of the proposed LEB will ensure that pedestrians and cyclists will be catered for should the proposed scheme be granted planning permission. It would also future proof the scheme such that if the proposed development areas located towards the northern and southern end of the LEB come forward there would be a provision for pedestrians and cyclists within the area.

10 Traffic Impact Assessment (Strategic Modelling)

10.1 Introduction

The traffic impact of the LEB single carriageway scheme has been modelled using the GLTM. This chapter of the report provides an overview of the steps taken to develop the traffic forecasting support of this TA and the strategic traffic impacts of the LEB.

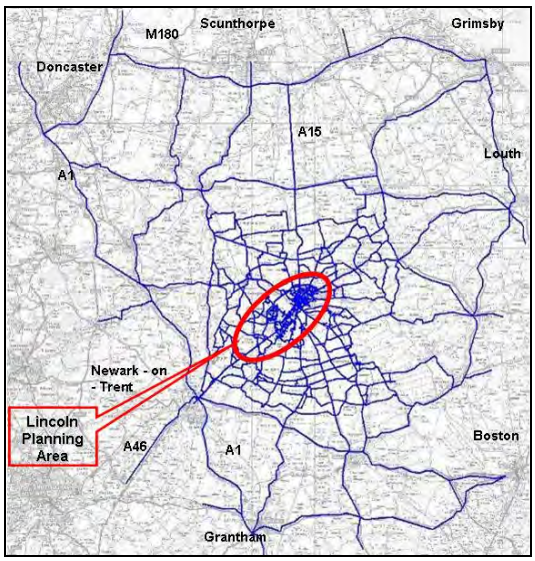
More detailed information on the transport modelling and forecasting process is contained within the Local Model Validation Report (LMVR) and Forecasting Report (see Appendix C and Appendix D respectively). The forecasting model has been developed in accordance with the latest guidance provided by the DfT in the WebTAG series of documents and in collaboration with LCC.

10.2 Modelling overview

The GLTM model has been developed using PTV VISUM modelling software V12.01-09, the model covers the Lincoln urban area and the surrounding countryside and includes the Lincoln Planning Area (LPA) (see Figure 10-1).

As agreed as part of the LEB Best and Final Bid (BaFB), the model represents typical weekday (Tuesday-Thursday) conditions with separate models developed for the AM Peak hour (08:00-09:00), PM peak hour (17:00-18:00) and an average inter-peak hour (10:00-16:00).

Figure 10-1 Extent of Highway Network and Lincoln Planning Area



10.2.1 Extent of Highway Network

The highway network within the model consists of two distinct areas; the area included in the Lincoln Planning Area (LPA) and the area outside of the LPA. Inside the study area it includes all 'A' and 'B' class roads and most of the minor roads within Lincoln. Residential roads that act as distributor routes have also been

included. All junctions within the study area have been coded in detail in order to reproduce the effects of traffic queues and delays on vehicle routing patterns.

Outside of the LPA, a network of links has been defined to include all major 'A' roads; this ensures that all long distance traffic is given adequate route choice in and around the Lincoln area. The coverage of the Highway Network and approximate boundary of the LPA is shown in Figure 10-1.

10.2.2 Modelled Time Periods & Vehicle Classes

Using survey data, the peak weekday traffic periods have been identified and agreed with LCC; these are;

- AM Peak hour (08:00 – 09:00)
- PM Peak hour (17:00 – 18:00)
- The average Inter Peak hour (10:00 – 16:00).

The highest demand on the highway network is experienced during the AM and PM weekday peaks; these scenarios therefore represent the worst case situation. The inter-peak has also been included in order to represent the different travel patterns that exist during a typical weekday.

10.2.3 Model Calibration & Validation

The calibration of the Base Year (2006) traffic models involved adjusting the network to ensure that the model realistically replicated routeing and vehicle speeds through the study area. The model was validated using link flows, journey times, route options and queue lengths. In all cases, the model compared extremely well with the observed situation, and met the DMRB validation criteria.

10.3 Traffic Forecasting Process

The forecasting process used within this TA follows the latest guidance provided by the DfT in the WebTAG series of documents and comprised of the following stages:

- Define future year travel Scenarios.
- Define future year intervention Strategies.
- Undertake Do-Minimum and Do-Something forecasting.

10.3.1 Future Year Travel Scenarios

The principal requirement of the traffic model was the provision of traffic forecasts for the LEB scheme for the scheme Opening Year (2017) and the scheme Design Year (2032). Future travel demands at these dates take into account the existing traffic flows together with the effects of traffic growth and the additional traffic due to new development activity.

In addition it takes into account any future developments in the highway network. These include the initial Do-Minimum (or Without-Intervention case) networks and

subsequent Do-Something (or With-Intervention case) networks for both Opening and Design Year. In summary, the following two networks have been considered as part of this TA:

1. Do-Minimum (DM) – The validated base Lincoln road network 2006, plus DM schemes. The network also includes new access links to Sustainable Urban Extension developments.

2. Do-Something (DS) – The DM networks plus the single carriageway LEB and all LEB dependent development.

10.3.2 Committed Developments

A number of committed developments have been considered as part of the transport future year modelling with all information provided by the Central Lincolnshire Joint Planning Unit (CLJPU). The land use forecasting assumptions were based on two broad key land use types, these were:

- Employment – Measured by site area (hectares); and

- Housing – Measured by number of dwellings.

A detailed development log was generated to collate all developments built, proposed or planned for the LPA covering the period from 2006 through to the opening year (2017) and design year (2032). All development data has been taken from the Strategic Housing Land Allocation Assessment (SHLAA) database (June 2012) with guidance from the CLJPU. The SHLAA database is broken down as follows:

- Class A – Sites which are expected to come forward within the next five years, these mainly have extant planning permission or are under construction.

- Class B – Developable sites, which in terms of the NPPF cannot be said to be deliverable but there are no specific known constraints to their development, are expected to come forward in years 2016/17 to 2020/21.

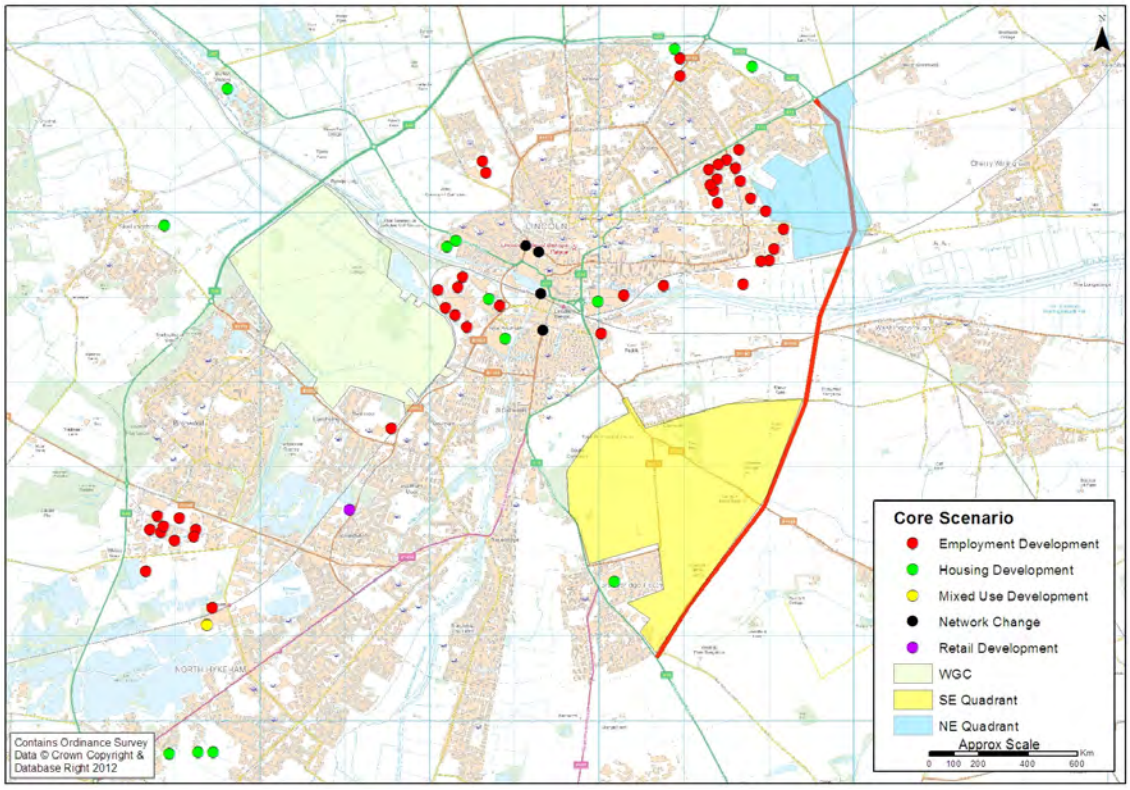
- Class C – These are proposed Sustainable Urban Extensions. In Central Lincolnshire this includes the Western Growth Corridor (WGC), North East Quadrant (NEQ) and the South East Quadrant (SEQ).

- Class D – Sites which are considered to be constrained in some way and it is unknown if those constraints can be overcome at the current time.

It was agreed with the CLJPU to filter the SHLAA database to include developments that are inside the study area and to only include housing developments above 200 units in size. The local impact of smaller developments is considered negligible and the overall additional traffic associated with these developments will be accounted for by TEMPRO growth.

The key developments include a range of residential, retail, leisure, employment land and highway improvement schemes and will have a significant cumulative impact on the transport network. Figure 10-2 provides an overview of their location in relation to the LEB.

Figure 10-2 Location of Committed Developments



10.3.3 Treatment of Committed Developments

All developments within the database were assessed to determine their relationship with the LEB and how they should be treated within the traffic modelling. Each development was classified according to the 'certainty' criteria detailed in Table 10-1 and categorised and assigned to one of the travel scenarios detailed in Table 10-2. It was agreed with the LCC Principal Transportation Projects Officer that only those developments that formed the Core Scenario would be included within the assessment.

Table 10-1 Certainty Log Criteria

Certainty Log:	
90-100%	Certain/Nr Certain
70-90%	More than Likely
50-70%	Reasonably Foreseeable

Table 10-2 Development Scenario Classification

Development Scenario:	
Certain/Nr Certain	Pessimistic
Pessimistic + More than Likely	Core
Core + Reasonably Foreseeable	Optimistic

10.3.4 LEB Dependent Developments

The scoping work for the Transport Assessment also identified two key developments that were dependent on the LEB; these were the North East Quadrant (NEQ) and South East Quadrant (SEQ) sustainable urban extension sites. In this instance it was decided in conjunction with LCC that the Do Something Scenario should include the LEB dependent developments as this would provide the most robust set of forecasts that would be in line with the emerging Core Strategy.

10.3.5 Development Assumptions

The Core Scenario development assumptions that are included within the traffic forecasts are summarised in Table 10-3.

Table 10-3 Committed Development Summary

Committed Development: Location & Description	Size (ha)	Size (units)	Scheme Depen-dency	Site Open Date	Do Min/ Do Something	Fore-cast Years
Development: North East Quadrant, Centre bounded by LEB. 48.5% B1, 33.5% B2, 18% B8 + housing	5	2,000	LEB	2031	Do Something	Design Year
Development: Teal Park - Whisby Road/ Station Rd SW Lincoln. Phase 1: B1, B2, B8 (Siemens) 21,140sqm, 6,500 hotel, public house, restaurant, 14,300 sqm trade counters, showrooms, leisure.	10		N/A	2016	Do Minimum	Opening Year
Development: Western Growth Corridor (WGC) - W & SW of Lincoln city centre. C3 Residential Units, 5,750sqm (A1, A2,A3,A4), 36ha B1/B8, 6.35ha D1, 3.1ha Park & Ride	36	2,700	N/A	2031	Do Minimum	Design Year
Network Change: Part of the WGC. From A46 to Tritton Road with a connection to the Skellingthorpe Road/Birchwood Avenue junction			N/A	2016	Do Minimum	Opening Year
Development: South East Quadrant; SE of Lincoln between Bracebridge Heath and Canwick between the A15 and the B1188. 19 ha of employment land and 2,800 homes by 2031	19	2,800	LEB	2031	Do Something	Design Year
Development: Employment Land Review Sites - By 2016. 33 individual sites ranging from 0.05ha – 2 ha	1.19		N/A	2016	Do Minimum	Opening Year
Development: Employment Land Review Sites - By 2026. 7 individual sites ranging from 0.14 – 2.79	0.64		N/A	2026	Do Minimum	Design Year
Network Change: Clasketgate one-way from Broadgate to West Parade Lincoln City Centre.			N/A	2009	Do Minimum	Opening Year

Committed Development: Location & Description	Size (ha)	Size (units)	Scheme Depen-dency	Site Open Date	Do Min/ Do Something	Fore-cast Years
Highway improvement scheme.						
Network Change: Beaumont Fee one-way from West Parade Lincoln City Centre. Highway improvement scheme. Now signalised junction between West parade/ Clasketgate/ Beaumont Fee			N/A	2009	Do Minimum	Opening Year
Network Change: High Street environment improvements (from Portland Street to St Catherines). Now formalising parking by reducing footway and creating two lanes including informal bus priority lane.			N/A	2011	Do Minimum	Opening Year
Development: Lindongate development, Lincoln City Centre. Approx 34,000sqm of A1 retail, 4,000sqm of A3 restaurant & bar use, 21 apartments of C3 residential, New Bus station, up to 900 space carpark (680 short stay, 20 residential, 150 long stay network rail)	3.8	21	N/A	2015	Do Minimum	Opening Year
Network Change: East West Link Phase 1 - Lincoln City Centre			N/A	2014	Do Minimum	Opening Year
Network Changes/Development: Sainsbury's, Tritton Road, Lincoln. Expansion of the existing store from 3,756 to 9,170 sqm and redevelopment of the Tritton Road/ Doddington Road Junction.			N/A	2010	Do Minimum	Opening Year
Network Changes: Railway Crossings, Brayford Wharf East. Barrier downtime increased to 27min/hr			N/A	2014	Do Minimum	Opening Year
Development: Carholme Road, Lincoln. Ex industrial site now being redeveloped for housing		244	N/A	2012	Do Minimum	Opening Year
Development: Ruston Works, Pelham Street, Lincoln (CL533)		819	N/A	2021	Do Minimum	Design Year
Development: Land at Firth Road (CL534)		200	N/A	2021	Do Minimum	Design Year
Development: Mill Lane/Newark Road, North Hykeham (CL1113)		314	N/A	2016	Do Minimum	Opening Year
Development: BW(M)1 (part of remaining capacity) (CL1535)		302	N/A	2016	Do Minimum	Opening Year
Development: G11 Foxby Lane, Park Springs Road (CL1633)		275	N/A	2016	Do Minimum	Opening Year
Development: LF2/3 Land off Wolsey Way (CL1687)		374	N/A	2016	Do Minimum	Opening Year
Development: Former Lincoln Castings Site A, Plot 1, Station Road, North Hykeham (CL2098)	10.3	310	N/A	2021	Do Minimum	Design Year
Development: Former Lincoln Castings Site A, Plot 1, Station Road, North Hykeham (CL248)		229	N/A	2021	Do Minimum	Design Year
Development: Local Plan Allocation H9, Land North-West of Nettleham Road (CL515)		213	N/A	2016	Do Minimum	Opening Year
Development: Land between, Newark Road/Mill Lane, North Hykeham, Lincoln (CL58)		206	N/A	2016	Do Minimum	Opening Year

Committed Development: Location & Description	Size (ha)	Size (units)	Scheme Depen-dency	Site Open Date	Do Min/ Do Something	Fore-cast Years
Development: Land at Ruston Way, Brayford Enterprise Park, Lincoln LN6 7FS (CL607)		226	N/A	2016	Do Minimum	Opening Year
Development: E2V Engineering works, Carholme Road, Lincoln (CL770)		255	N/A	2016	Do Minimum	Opening Year
Development: Cardinal Grange, 544 Newark road , North Hykeham, Lincoln (CL81)		322	N/A	2016	Do Minimum	Opening Year
Development: Former Lincoln Castings Site B, Station Road, North Hykeham (CL927)	1.02		N/A	2016	Do Minimum	Opening Year
Development: Land east of Lincoln Road, Skellingthorpe (CL994)		207	N/A	2016	Do Minimum	Opening Year

10.4 Growth Factors

10.4.1 Trip Rate Extraction

Using the development data presented in Table 10-3, trip rates were calculated using the TRICS software package. All developments contained within the development log were classified into the TRICS land uses and their respective trip rates generated. All housing was classified as privately owned households and the different land uses within the wider development zones (e.g. NEQ, SEQ, WGC, SWQ) were treated separately and then combined to generate a total number of trips arriving/leaving at each site.

10.4.2 Gravity Model

A gravity model was used to produce a trip distribution for new development sites. Distributions were calculated by taking into account the level of development at each zone, the generalised cost between each set of zones and the likely trip distribution for each trip purpose.

For the Do Minimum strategy, generalised costs were taken from the calibrated base year models, whilst for the Do Something strategy generalised costs were taken from a “base plus LEB” strategy that allowed for changes in generalised that would happen following opening of LEB. Further details of how the gravity model was constructed are provided in Appendix D Forecasting Report.

10.4.3 TEMPRO Growth Factors & Application

The second source of traffic growth was extracted from the Trip End Model Program (TEMPRO) software. TEMPRO provides projections of growth over time for use in local and regional transport models. The TEMPRO 6.2 dataset was used to forecast growth at local zone level with growth factors being obtained for the four different levels of Geographic Area available in TEMPRO (Region, County, Local Authority, and TEMPRO Zone).

The growth in each local traffic zone was adjusted to allow for new developments and was ultimately controlled to the TEMPRO target growth total at district level. Applying TEMPRO growth to the development scenarios involved a two stage

process; this included constraining development growth at TEMPRO zone level and by purpose and time period, and then constraining to the TEMPRO by District growth and by time period.

10.4.4 LGV & HGV Growth Factors

Growth factors for Light and Heavy goods vehicles were obtained from the 'Road Transport Forecasts 2009' document which can be found on DfT's website. The forecasts are produced by the DfT using the National Transport Model (NTM). The NTM provides detailed growth factors at regional level.

10.5 Scheme Impacts

The remainder of this chapter summarises the results of the scheme impact analysis. Specifically the following section provides an overview of LEB AADT flows across the opening and design years, the AADT flows and flow differences on primary roads within the study area and summarises the key impacts across the network.

10.5.1 LEB Traffic Flow Forecasts

The forecast network AADT flows for the study area are provided in Appendix A and for the purposes of this assessment the LEB has been divided into four sections (defined by the roundabout junctions), with the most northern section being split into two parts either side of Hawthorn Road. Table 10-4 details the forecast two-way AADT flows on each section of LEB for the opening year and the design year. By way of comparison Table 10-5 provides an overview of the observed and modelled flows on other key links within Lincoln (these include the A46 Western Bypass and A158 to the north of the LEB's proposed location as they provide a similar standard of carriageway with which to make a comparison).

Table 10-4 – LEB AADT (two-way) Demand Flows (2017 and 2032)

LEB Single Carriageway Sections	Forecast AADT Flows	
	2017	2032
Section 1a – Wragby Road Roundabout to Hawthorn Road	20,000	24,000
Section 1b – Hawthorn Road to Greetwell Road Roundabout	20,000	23,000
Section 2 – Greetwell Road Roundabout to Washingborough Road Roundabout	26,000	32,000
Section 3 – Washingborough Road Roundabout to Lincoln Road Roundabout	18,000	23,000
Section 4 – Lincoln Road Roundabout to Sleaford Road Roundabout	18,000	22,000

Table 10-5 – Comparison AADT (two-way) Demand Flows, Observed & Forecast on A46 (2006, 2017& 2032)

Section	Obs.		Forecast	
	2006 Base		LEB Single Do-Some Scenario	
	Lanes	Flows	2017	2032
A46 (A57 Saxilby Rd to Skell' Rd)	2	29,000	35,000	39,000
A46 (Skellin' Rd to Dodd Rd)	1	23,000	27,000	28,000
A158 (A46 to Wragby Rd E)	1	14,000	21,000	22,000

When considering the single carriageway LEB scheme, the tables above highlight the following:

- All sections of the LEB are forecast to carry high levels of flow for a single carriageway from opening year (2017) onwards.
- Section 2 (the river crossing) is forecast to carry the highest flows from opening year onwards.
- However, it should be noted that forecast flows on all sections of LEB up to 2025, except Section 2, are lower than the 2006 flows on the A46 western Bypass (Skellingthorpe Road to Doddington Rd), which is a single carriageway. In addition, only Section 2 is forecast to have flows at design year which are higher than the 2006 flows on dual 2 lane section of the A46 between the A57 and Skellingthorpe Road.

Congestion Reference Flow (CRF) analysis is explained fully in DMRB Volume 5 Annex D, but in brief the Congestion Reference Flow of a link is an estimate of the Annual Average Daily Traffic (AADT) flow at which the carriageway is likely to be 'congested' in the peak periods on an average day. Congestion is defined as the situation when the hourly traffic demand exceeds the maximum sustainable hourly throughput of the link and at this point flows on the link are likely to break down, average speeds will drop significantly and queues will start to form. For this to occur on an 'average' day will mean, of course, that on some days the situation will be better and on some it will be worse. Expressing the forecast AADT as a percentage of the CRF provides an indication of how likely it is that flows on the links will break down more often than not. It is also important to note that links of the same standard will have different CRF values determined by the proportion of heavy vehicles, the peak to daily ratio, the peak hour directional split and the weekday/ weekly flow ratio. Indeed, the CRF for a link may vary between years as some of these variables are forecast to change.

The CRF calculation assumes a single carriageway LEB and is a measure of the performance of a road link between junctions, it is important to note that it does not

measure the effect of junctions located along each road link. The CRF calculations are summarised in Table 3.4 below.

Table 10-6 – Comparison of AADT Forecast Flows and CRF, LEB Single, 2017, 2025 & 2032

Section	2017			2032		
LEB Link	AADT	CRF	AADT/ CRF	AADT	CRF	AADT/ CRF
1a	20,000	23,763	84%	24,000	23,794	101%
1b	20,000	20,853	96%	23,000	22,770	101%
2	26,000	25,436	102%	32,000	27,491	116%
3	18,000	25,533	70%	23,000	26,179	88%
4	18,000	23,194	78%	22,000	24,678	88%

The table above suggests that all sections will have future year flows which are close to the CRF and that traffic conditions are likely to frequently breakdown in peak periods on some sections from 2017 onwards. Section 2 will likely have flows that are close to or are at the CRF from 2017 onwards and by 2032 all links will have flows approaching or exceeding the CRF, although Sections 3 and 4 have more capacity to accept additional flows.

It is important to note however that the calculation of the CRF is heavily influenced by the width of the carriageway. These calculations assume that the LEB Single has a uniform carriageway width of 7.3, when in fact section 2 northbound and section 3 southbound contain crawler lanes. The guidance that relates to the calculation of CRF flows does not specify how to treat crawler lanes in the calculation.

10.5.2 Network Flow Changes

An overview of the traffic flow changes across the wider network that result from the addition LEB are summarised in Appendix A. In addition the change in flows for north south movements across Lincoln have also been calculated to demonstrate the impact of the LEB. Lincoln is crossed by the River Witham which forms a convenient screenline that can be used to measure north south movements through the city (see Figure 6-1 and 6-2, Appendix D). Including the LEB six points have been used to measure these movements including two wider screenlines which have been used to capture and summarise the movements to the east and west of the city.

The change in AADT flows across each of the crossing points between the Do Minimum Scenario and LEB Single Carriageway Do Something Scenario are shown in Table 10-6 for 2017 and 2032.

Table 10-7 – AADT Screenline Demand Flows – Do Min & Do Something 2017 & 2032

Part of Cordon	Do Min	Do Some	Difference	% Difference
2017				
West of Lincoln	62,000	60,000	-2,000	-3%
A46	37,000	35,000	-2,000	-5%
City Centre - Brayford Way	30,000	27,000	-3,000	-10%

Part of Cordon	Do Min	Do Some	Difference	% Difference
City Centre - Wigford Way	17,000	16,000	-1,000	-6%
City Centre - A15 Broadgate	47,000	35,000	-12,000	-26%
LEB Section 2	0	26,000	26,000	-
East of Lincoln	14,000	13,000	-1,000	-7%
Total	**207,000**	**212,000**	**5,000***	**2%**
2032				
West of Lincoln	78,000	75,000	-3,000	-4%
A46	42,000	39,000	-3,000	-7%
City Centre - Brayford Way	35,000	32,000	-3,000	-9%
City Centre - Wigford Way	20,000	20,000	0	0%
City Centre - A15 Broadgate	54,000	43,000	-11,000	-20%
LEB Section 2	0	32,000	32,000	-
East of Lincoln	18,000	15,000	-3,000	-17%
Total	**247,000**	**256,000**	**9,000***	**4%**

** Note that the small net increase in AADT Flow crossing the north south screenline is due to a quirk in the model that affects the way in which trips from external model zones enter the network with the addition of the LEB. Within the GLTM the screenline is bridged by three sets of zone connectors at the east and west extremities of the network that carry high volumes of trips from external zones onto the network. The addition of the LEB can result in changes to the way that trips from these external zones enter the network and this can affect how the volume of trips are measured across the screenline. In the case of the GLTM for example, in the Do Minimum scenario, a trip may enter the network using the zone connector south of the screenline and cross the screenline to travel to its destination. In the Do Something test, this trip may enter the network using the zone connector north of the screenline and may not cross the screenline at all."*

The analysis demonstrates the following:

- The links benefiting from the most significant decrease in traffic flow as a result of the LEB is the A15 Broadgate.
- The existing A46 also benefits from some traffic relief in both the opening and design year as does Wigford Way and Brayford Way.
- The inclusion of the LEB also has an effect on strategic traffic moving between areas to the far north of Lincoln and the far south of Lincoln.
- The existing links where there are increases in flow as a result of the LEB include the A158 to the north of LEB and A15 south of the LEB (see Appendix D).
- The pattern of traffic relief at the majority of screenline points is relatively consistent across 2017 and 2032. However by 2032, the impact of the major developments located at the northern and southern end of the LEB impacts on the volume of north south traffic movements.

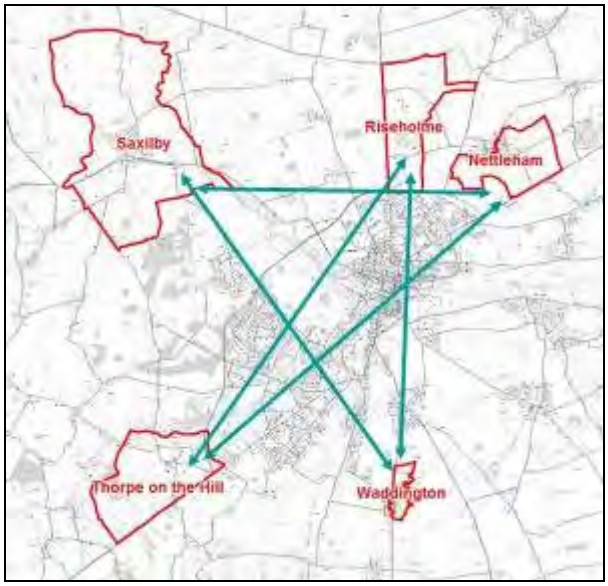
10.5.3 Selected Travel Time Changes

In order to measure the effects of the LEB on the wider network the travel time changes for journeys across the city have been assessed for the AM and PM peak hours. The following six locations were chosen to judge the impact that the LEB will have on travel times across Lincoln:

- University of Lincoln
- Waddington
- Nettleham
- Riseholme
- Saxilby
- Thorpe on the Hill

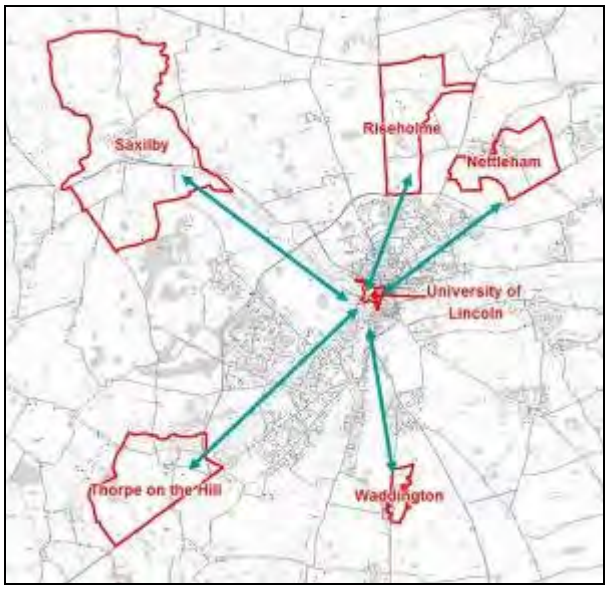
The analysis considered two types of journey; cross city movements and typical movements to and from a representative city centre location. The cross city travel times were assessed through the journeys to and from the locations detailed in Figure 10-3.

Figure 10-3 – Cross City Journeys



In order to measure the travel to and from Lincoln City Centre the University of Lincoln (adjacent to Brayford Way) was chosen to represent a typical city centre Zone. The journeys used in the analysis are shown in Figure 10-4.

Figure 10-4 – City Centre Journeys



Selected cross city and city centre journey times for the 2017 and 2032 models have been reported in Tables 10-8 and 10-9 respectively.

Table 10-8 – Cross City & City Centre Journey Times – 2017

Corridor/Area		AM			PM		
From	To	Do Min (mins)	Do Some (mins)	Change	Do Min (mins)	Do Some (mins)	Change
Cross City Travel Times							
Thorpe on the Hill	Riseholme	27	26	-1min / -4%	22	23	+1min / 5%
	Nettleham	30	29	-1min / -3%	26	27	+1min / 4%
Saxilby	Nettleham	20	19	-1min / -5%	20	20	-
	Waddington	43	38	-5min / -12%	40	34	-6min / -15%
Riseholme	Thorpe o' Hill	31	30	-1min / -3%	33	32	-1min / -3%
	Waddington	39	28	-11min / -28%	36	25	-11min / -31%
Nettleham	Thorpe o' Hill	36	35	-1min / -3%	31	30	-1min / -3%
	Saxilby	22	22	-	21	22	+1min / 5%
Waddington	Saxilby	38	35	-3min / -8%	51	42	-9min / -18%
	Riseholme	36	27	-9min / -25%	41	27	-14min / -34%
City Centre Journey Times							
City Centre	Thorpe o' Hill	25	25	-	28	29	+1min / 4%
	Saxilby	19	18	-1min / -5%	24	26	+2min / 8%
	Riseholme	18	17	-1min / -6%	24	26	+2min / 8%
	Nettleham	19	21	+2min / 11%	25	22	-3min / -12%
	Waddington	18	16	-2min / -11%	23	18	-5min / -22%
Thorpe o' Hill	City Centre	33	26	-7min / -21%	24	25	+1min / 4%
Saxilby		27	26	-1min / -4%	19	17	-2min / -11%
Riseholme		23	27	+4min / 17%	20	18	-2min / -10%
Nettleham		31	24	-7min / -23%	18	16	-2min / -11%
Waddington		20	18	-2min / -10%	20	17	-3min / -15%

The table above illustrates the following for 2017:

- **AM Peak Cross City Journey Times -** LEB provides the biggest benefit for cross city journey times from Riseholme to Waddington (-11mins -28%) and from Waddington to Riseholme (-9mins -25%).
- **AM Peak City Centre Journey Times –** LEB provides the biggest benefit for city centre times from Nettleham to City Centre (-7mins -23%).
- **PM Peak Cross City Journey Times -** LEB provides the biggest benefit for cross city journey times from Riseholme to Waddington (-11mins -31%) and from Waddington to Riseholme (-14mins -34%).
- **PM Peak City Centre Journey Times -** LEB provides the biggest benefit for city centre times from city centre to Waddington (-5mins -22%).

Table 10-9 – Cross City & City Centre Journey Times – 2032

Corridor/Area		AM			PM		
From	To	Do Min (mins)	Do Some (mins)	Change	Do Min (mins)	Do Some (mins)	Change
Cross City Travel Times							
Thorpe on the Hill	Riseholme	32	30	-2min / -6%	22	22	-
	Nettleham	36	34	-2min / -6%	26	26	-
Saxilby	Nettleham	21	21	-	20	20	-
	Waddington	53	49	-4min / -8%	47	48	+1min / 2%
Riseholme	Thorpe o' Hill	34	40	+6min / 18%	28	30	+2min / 7%
	Waddington	43	36	-7min / -16%	39	30	-9min / -23%
Nettleham	Thorpe o' Hill	38	39	+1min / 3%	34	31	-3min / -9%
	Saxilby	25	27	+2min / 8%	23	25	+2min / 9%
Waddington	Saxilby	45	41	-4min / -9%	47	46	-1min / -2%
	Riseholme	38	31	-7min / -18%	48	32	-16min / -33%
City Centre Journey Times							
City Centre	Thorpe o' Hill	31	30	-1min / -3%	33	33	-
	Saxilby	22	23	+1min / 5%	30	29	-1min / -3%
	Riseholme	20	22	+2min / 10%	29	28	-1min / -3%
	Nettleham	24	26	+2min / 8%	28	28	-
	Waddington	22	23	+1min / 5%	23	22	-1min / -4%
Thorpe o' Hill	City Centre	32	30	-2min / -6%	29	29	-
Saxilby		30	33	+3min / 10%	26	26	-
Riseholme		32	42	+10min / 31%	24	22	-2min / -8%
Nettleham		30	27	-3min / -10%	22	19	-3min / -14%
Waddington		24	19	-5min / -21%	27	22	-5min / -19%

The table above illustrates the following for 2032:

- **AM Peak Cross City Journey Times** - LEB provides the biggest benefit for cross city journey times from Riseholme to Waddington (-7mins -16%) and from Waddington to Riseholme (-7mins -18%).

- **AM Peak City Centre Journey Times** - the model indicates that in the DS Scenario there increase in city centre travel times between Riseholme and the city centre (+10mins +31%). It is important to note that by 2032 the DS Scenario also includes LEB dependent development and this will have an impact on city centre journey times.

- **PM Peak Cross City Journey Times** - LEB provides the biggest benefit for cross city journey times from Riseholme to Waddington (-9mins -23%) and from Waddington to Riseholme (-16mins -33%).

- **PM Peak City Centre Journey Times** - LEB provides the biggest benefit for city centre times from Waddington to city centre (-5mins -22%).

10.6 Scheme Impact Summary

The analysis of the forecast flows on the single carriageway LEB has shown that it will support the scheme objectives; specifically the analysis shows following:

Objective 1

- It will facilitate sustainable economic development by improving access to potential growth areas and underpinning the LTS which will deliver more sustainable and reliable transport options in the area.

- Journey time analysis has been undertaken across a selection of cross city and city centre journey times for 2017 and 2032 AM and PM peak hour models. Analysis indicates that at LEB opening year (2017), LEB results in an overall reduction on journey times.

- For 2032 a number of cross city routes show a decrease in journey times in both the AM and PM peak periods. In addition there are a number of decreases for city centre journey times. However although a number of city centre journey times indicate an increase by 2032, most of these experience an increase of 2 minutes or less and so the material change to these journey times can be considered minimal. It is also important to note that by 2032 the LEB dependent developments will impact on journey times across and to the city centre.

Objective 2

- The trip transfer analysis demonstrates that the scheme is forecast to remove up to 26% of traffic from key routes in the city centre.
- Specifically the LEB will reduce traffic flows on existing key city centre routes, including the A15 Broadgate, B1273 Brayford Way and A57 Wigford Way. It will also reduce flows on the existing A46 Western Bypass.

- The pattern of traffic relief at the majority of screenline points is relatively consistent across 2017 and 2032.
- The inclusion of the LEB also has an effect on strategic traffic moving between areas to the far north of Lincoln and the far south of Lincoln.
- By 2032, the impact of the major developments located at the northern and southern end of the LEB impacts on the volume of north south traffic movements.

Objective 3

- The forecast reduction of up to 26% of traffic from in the city centre routes will reduce congestion and improve air and noise quality within the Lincoln Policy Area.

11 Traffic Impact Assessment (Focus)

11.1 Introduction

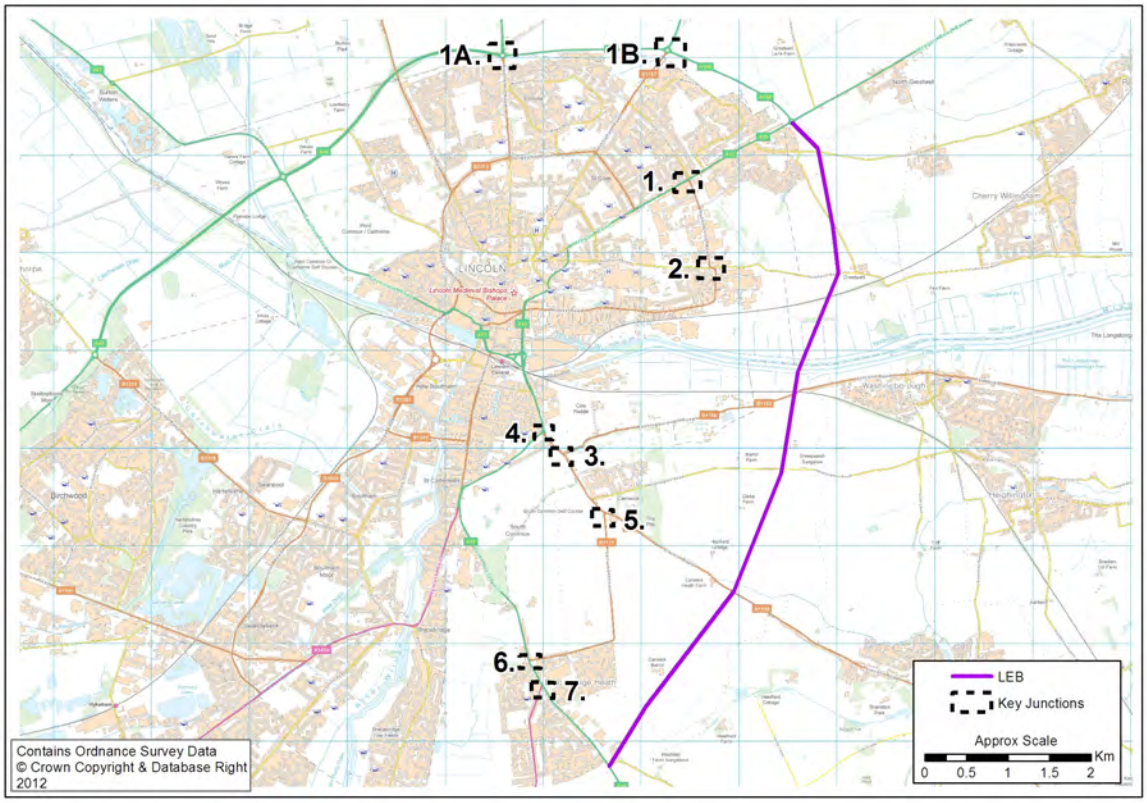
As described, the strategic modelling software VISUM has been used to model the impact of the LEB and help determine whether the scheme objectives will be met. To recap, this model has produced results that compare the road traffic network with and without the LEB in 2017 and 2032 (opening and design years); these model scenarios are summarised thus:

- **Do-Minimum (DM) –**
  - No LEB.
  - No NEQ and SEQ development.
- **Do-Something (DS) –**
  - LEB.
  - Two LEB dependent key developments - the North East Quadrant (NEQ) and South East Quadrant (SEQ).

11.2 Scope

When scoping out this TA the LCC Highway Alliance identified two existing key junctions (Junctions 1a and 1b – see below) that may be affected by the LEB. In response to the scoping process, Lincolnshire County Council (LCC) Highways department identified a further 7 key junctions (Junctions 1 – 7) that they felt also needed consideration. These 9 junctions are shown in Figure 11-1 below.

Figure 11-1 Key junctions as identified by LCC



This section assesses the impact of the scheme on these 'existing network' junctions and summarises the assessment of the 'new' junctions on the proposed LEB.

11.3 Existing Network Junctions

LEB objectives 2 and 3 (detailed in Section 2) state that the scheme will improve conditions in central Lincoln by relocating strategic traffic onto the bypass. It therefore follows that many junctions within Lincoln should, with the LEB in place, have less traffic using them. Outputs from the VISUM model have been used to determine this.

Traffic flow outputs from the VISUM model are summarised below to identify which junctions will see an increase in traffic and which will see a reduction. To do this, DS and DM flows for each junction have been compared for the AM and PM peak periods in 2017 and 2032. Where traffic flows are expected to increase, queues generated by the VISUM model are also considered.

11.3.1 LEB Impact

A summary of the AM and PM traffic flows in the DM and DS scenarios at the 9 junctions is provided in Table 11-1 and Table 11-2 below; red highlight identifies where flows are expected to increased at the junction by 5% or more. It should be noted that some of the junctions have been split into a number of sections in order to reflect the junction design.

Table 11-1 2017 and 2032 Flow Comparison – AM

Junction Reference	Junction Type	Approach	AM					
			2017			2032		
			DM	DS	Diff	DM	DS	Diff
Junction 1 (A15 outer ring road)	**Signalised**	**N**	182	187	5	198	187	-11
		E	931	624	-307	942	784	-158
		S	487	402	-85	577	591	14
		W	253	204	-49	285	266	-19
		Total	***1853***	***1416***	***-24%***	***2003***	***1828***	***-9%***
Junction 1A (A46/A15)	**Roundabout**	**N**	906	994	87	873	947	74
		E	950	912	-39	993	964	-29
		S	693	695	2	726	753	28
		W	1086	904	-182	1185	1135	-50
		Total	**3635**	**3504**	***-4%***	**3777**	**3799**	***1%***
Junction 1B (A16/A46/A158)	**Roundabout**	**N**	978	1066	89	983	1079	96
		E	668	810	141	624	828	204
		S	593	546	-47	766	701	-65
		W	844	868	24	828	846	18
		Total	**3083**	**3290**	***7%***	**3201**	**3453**	***8%***
Junction 2-1 (B130/Greetwell Road)	**Mini-roundabout**	**N**	519	519	0	566	708	142
		E	323	728	405	337	705	368
		W	232	266	34	230	305	75
		Total	***1074***	***1513***	***41%***	***1132***	***1718***	***52%***
Junction 2-2 (B130/Greetwell	**Mini-roundabout**	**W**	387	521	135	409	687	278
		S	193	198	4	195	225	30
		E	496	975	479	491	962	471

Junction Reference	Junction Type	Approach	AM					
			2017			2032		
			DM	DS	Diff	DM	DS	Diff
Road)		**Total**	***1076***	***1693***	***57%***	***1096***	***1875***	***71%***
Junction 3 (Canwick Road/B1190)	**Signalised**	**N**	702	851	149	719	847	128
		E	630	640	10	574	623	48
		S	1327	999	-327	1366	1288	-78
		Total	***2659***	***2490***	***-6%***	***2659***	***2757***	***4%***
Junction 4 (Canwick Road/Park Aveunue)	**Signalised**	**N**	1200	1113	-87	1200	1200	0
		S	1900	1630	-270	1899	1801	-97
		W	917	1062	145	911	1004	93
		Total	***4017***	***3805***	***-5%***	***4010***	***4006***	***0%***
Junction 5-1	**Priority**	**N**	623	581	-42	647	625	-22
		E	690	547	-143	869	695	-173
		S	576	308	-268	480	407	-73
		Total	***1889***	***1437***	***-24%***	***1996***	***1728***	***-13%***
Junction 5-2	**Priority**	**W**	238	299	61	212	314	101
		S	21	49	27	60	71	10
		E	777	616	-160	941	814	-128
		Total	1036	964	***-7%***	1214	1198	***-1%***
Junction 5-3 (B1188/B1131)	**Priority**	**N**	385	282	-103	435	312	-123
		E	87	70	-17	72	118	46
		S	601	357	-244	544	478	-67
		Total	***1074***	***708***	***-34%***	***1052***	***908***	***-14%***
Junction 6 (London Road/Canwick Avenue)	**Signalised**	**N**	435	295	-140	540	474	-66
		E	406	328	-78	445	458	13
		S	887	558	-329	901	620	-281
		Total	***1728***	***1181***	***-32%***	***1886***	***1552***	***-18%***
Junction 7 (London Road/Sleaford Road)	**Signalised**	**N**	714	434	-280	746	534	-212
		S	755	694	-61	777	742	-35
		W	579	613	35	686	653	-33
		Total	***2047***	***1741***	***-15%***	***2209***	***1929***	***-13%***

Table 11-1 shows that, in the AM peak period, the flows across the 9 junctions generally decreases with the LEB in place except for Junction 1b (the A16/A46/A158 roundabout) and Junction 2 (B130/Greetwell Road mini - dumbbell roundabout).

Junction 1b is a large roundabout and is expected that it will need to accommodate more traffic with the LEB, particularly on the north and eastbound approach as more people travel to and from the new link. The model predicts that the junction will experience a 7% increase in traffic flows compared to Do Minimum by 2017 and an 8% increase by 2032. Although these increases are over 5%, an 8% increase from the base in 2032 is not considered significant, particularly as, at this time, it is assumed that the NEQ and SEQ developments are open.

On initial inspection, the percentage increases in flows at Junction 2 (which is a mini dumbbell roundabout on Greetwell Road) appear significant; although it is expected that some traffic will divert along Greetwell Road to access the LEB (it should also be

noted that some people may also use this route to circumnavigate the bridge crossing in the urban area). However, it should be noted that by 2032 the DS scenario includes the NEQ which it is expected will contribute towards flows on this road. Figure 11-2 shows the proximity the junction in relation to the NEQ, SEQ and other modelled development proposals.

Figure 11-2 Modelled Development Proposals

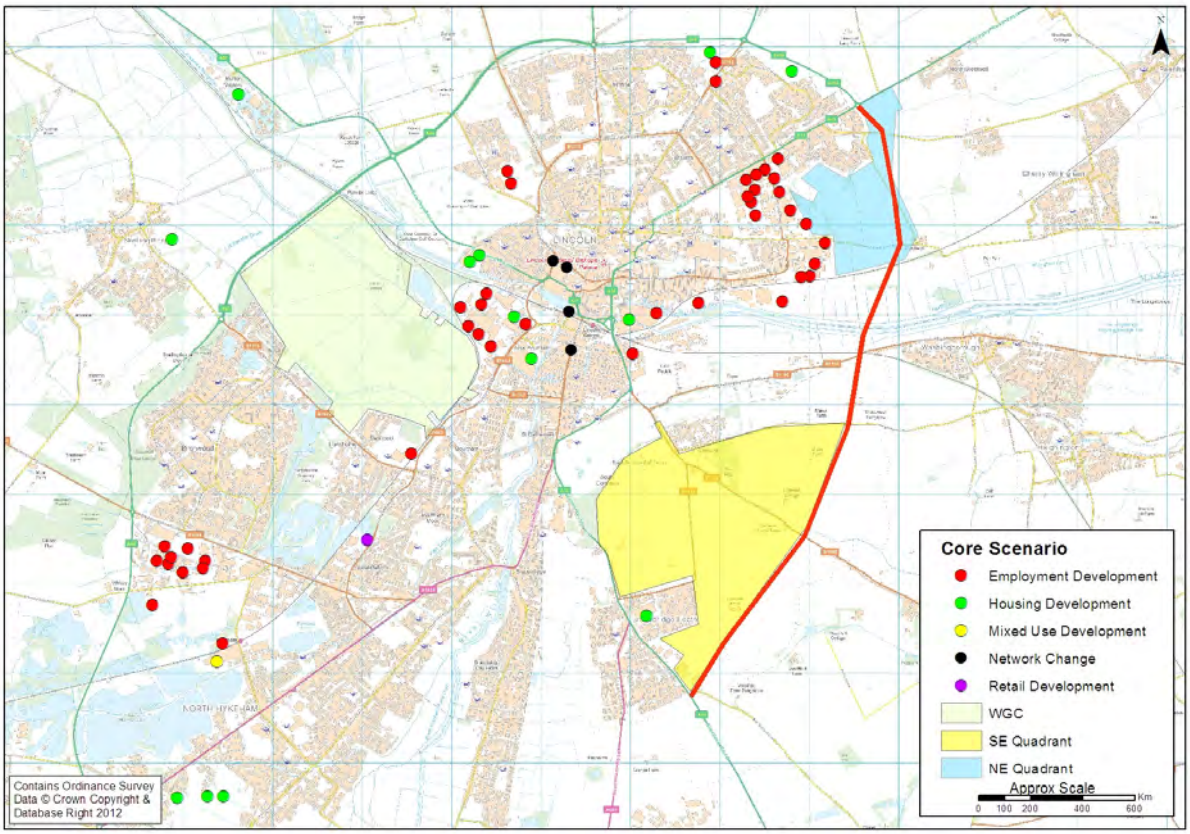


Table 11-2 compares the flows at the 9 junctions in the PM peak.

Table 11-2 2017 and 2032 Flow comparison - PM

Junction Reference	Junction Type	Approach	PM					
			2017			2032		
			DM	DS	Diff	DM	DS	Diff
Junction 1	**Signalised**	**N**	171	175	4	173	183	9
		E	429	278	-151	513	336	-177
		S	881	631	-249	1000	854	-146
		W	645	578	-68	642	603	-39
		Total	***2125***	***1662***	***-22%***	***2328***	***1975***	***-15%***
Junction 1A	**Roundabout**	**N**	713	856	143	754	918	164
		E	1097	1078	-19	1138	1117	-21
		S	571	624	53	558	566	8
		W	1209	1095	-114	1222	1076	-146
		Total	**3589**	**3653**	***2%***	**3672**	**3677**	***0%***
Junction 1B	**Roundabout**	**N**	605	732	127	788	935	147
		E	800	855	55	770	883	112

Junction Reference	Junction Type	Approach	PM					
			2017			2032		
			DM	DS	Diff	DM	DS	Diff
		S	1012	945	-67	990	931	-59
		W	762	819	57	788	821	33
		Total	**3178**	**3351**	***5%***	**3337**	**3570**	***7%***
Junction 2-1	**Mini-roundabout**	N	441	654	213	508	729	221
		E	209	268	59	220	352	132
		W	279	407	128	308	409	101
		Total	***929***	***1329***	***43%***	***1037***	***1490***	***44%***
Junction 2-2	**Mini-roundabout**	W	327	779	451	360	690	330
		S	446	433	-13	430	428	-2
		E	108	201	94	116	263	148
		Total	***881***	***1413***	***60%***	***906***	***1381***	***52%***
Junction 3	**Signalised**	N	1500	1458	-42	1476	1422	-54
		E	300	328	28	321	381	60
		S	749	583	-167	811	793	-17
		Total	***2549***	***2369***	***-7%***	***2607***	***2596***	***0%***
Junction 4	**Signalised**	N	2223	1951	-273	2210	2004	-206
		S	932	896	-36	981	986	5
		W	726	865	139	606	700	94
		Total	***3882***	***3712***	***-4%***	***3797***	***3690***	***-3%***
Junction 5-1	**Priority**	N	1094	938	-156	1081	1037	-45
		E	367	351	-16	450	408	-43
		S	558	271	-288	551	456	-95
		Total	***2019***	***1559***	***-23%***	***2082***	***1900***	***-9%***
Junction 5-2	**Priority**	W	575	562	-13	498	523	24
		S	88	0	-88	110	0	-110
		E	407	371	-36	498	485	-12
		Total	1070	933	***-13%***	1106	1008	***-9%***
Junction 5-3	**Priority**	N	519	376	-143	583	514	-69
		E	40	20	-19	47	78	31
		S	646	271	-376	661	456	-205
		Total	***1205***	***667***	***-45%***	***1291***	***1048***	***-19%***
Junction 6	**Signalised**	N	831	561	-270	947	805	-142
		E	374	287	-87	427	484	57
		S	897	511	-386	831	646	-185
		Total	***2103***	***1359***	***-35%***	***2205***	***1935***	***-12%***
Junction 7	**Signalised**	N	953	700	-254	1044	880	-164
		S	420	377	-43	458	452	-6
		W	713	636	-77	673	738	65
		Total	***2086***	***1713***	***-18%***	***2175***	***2071***	***-5%***

Table 11-2 shows that, as with the AM, Junctions 1B and 2 are expected to experience increases in traffic flow with the bypass. To determine the impact of these extra flows at these two junctions, VISUM queue model outputs have been reviewed the results from this analysis are considered below in Table 11-3 and Table 11-4 which show queuing PCU numbers.

Table 11-3 2017 and 2032 Queue Comparison - AM

Junction Reference	Junction Type	Approach	AM					
			2017			2032		
			DM	DS	Diff	DM	DS	Diff
Junction 1B	**Roundabout**	**N**	29	44	15	31	48	16
		E	23	24	1	25	27	2
		S	11	10	-1	12	11	-1
		W	26	32	7	26	32	6
Junction 2-1	**Mini-roundabout**	**N**	1	1	0	1	2	1
		E	1	2	1	1	2	1
		W	0	1	0	0	1	0
Junction 2-2	**Mini-roundabout**	**W**	1	1	0	1	2	1
		S	0	1	0	0	1	0
		E	1	4	2	1	3	2

Table 11-3 shows queues are expected to increase on the northern and western arms of Junction 1B (although not significantly on the western approach). It should be noted, however, the north approach (Lincoln Road) has two lanes on entry extending back over 60m so the total length of the queue along Lincoln Road would in fact not be as long as would be expected for the 44 PCUs in a single lane as indicated by the 2017 DS output. Notwithstanding this, the model shows that vehicle queues would extend past these two approach lanes in both the DM and DS scenarios in the AM. The PM is considered below.

Table 11-4 2017 and 2032 Queue Comparison - PM

Junction Reference	Junction Type	Approach	PM					
			2017			2032		
			DM	DS	Diff	DM	DS	Diff
Junction 1B	**Roundabout**	**N**	3	4	0	7	8	1
		E	22	20	-1	29	31	2
		S	31	27	-4	33	32	-2
		W	17	18	1	17	24	6
Junction 2-1	**Mini-roundabout**	**N**	1	2	2	1	2	1
		E	0	1	0	0	1	0
		W	1	1	0	1	1	0
Junction 2-2	**Mini-roundabout**	**W**	0	4	4	1	2	2
		S	0	1	1	1	1	0
		E	0	0	0	0	0	0

Table 11-4 shows that with the LEB there is not significant change in queuing at either Junction 1B or Junction 2 in the PM peak period compared with the DM scenario.

11.3.2 Summary

The assessment shows that, with the LEB, general traffic flows will increase compared to the DM at 2 of the 9 assessed junctions based on flows from the VISUM model (although it should be noted that the DM and DS comparisons have been undertaken for the 2032 design year which is some time in the future). These

are Junction 1b (the A16/A46/A158 roundabout) and Junction 2 (B130/Greetwell Road mini - dumbbell roundabout).

Queues have been assessed for these 2 junctions and using VISUM outputs and these show that in the AM the queues are worst on the northern approach to Junction 1b. However, it should be noted that:

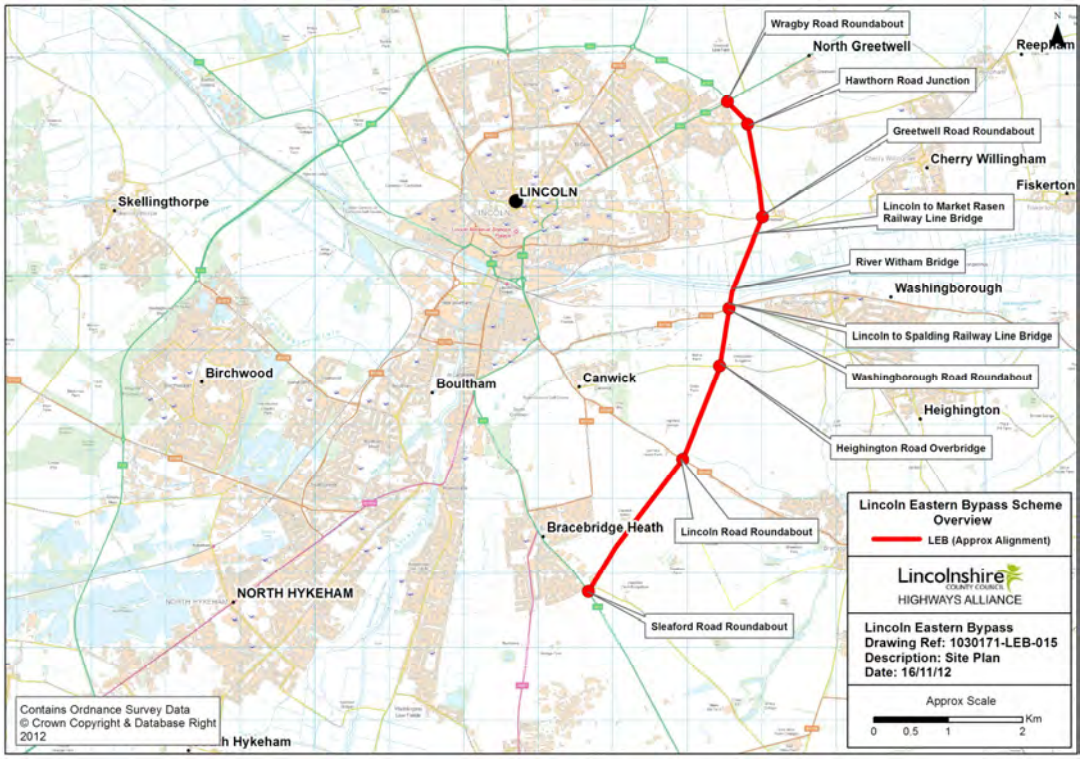
- There are already significant queues on this arm at present.
- There are queues in the DM.
- The DS includes major developments forecast for eastern Lincoln.

Queues at Junction 2 are not significant with or without the scheme, the extra flows are therefore not expected to manifest in long queuing. There are also no significant changes in queuing with the LEB scheme at these junctions in the PM.

11.4 New Junctions

Figure 11-3 shows the 5 roundabouts that form part of the LEB link (the 2 other nodes on the link are left-in/left-out priority junction and a fly-over).

Figure 11-3 LEB Junction Summary



As noted earlier, provision has been made in the design of the LEB to allow for dualling in the future; this includes the five roundabout junctions. However, the text below provides a summary analysis of their operation with the proposed single carriageway scheme.

These junctions have been modelled in ARCADY using flows from the VISUM model. ARCADY analysis can be undertaken in two ways; using a flat flow profile, where demands are assumed to be constant over an hour or using a peaked profile, where the demand at the junction is assumed to vary over the modelled hour. A flat profile is possible in some circumstances, but for most situations a peaked profile is considered more robust. Junction performance can be very sensitive to the profile of demand on the approaches and a flat profile can result in an optimistic junction performance compared to a peaked profile. A peaked profile is considered a realistic scenario and will result in ARCADY highlighting more capacity issues than a flat profile. ARCADY analysis using both peaked and flat profiles has been undertaken for the LEB Single scheme to illustrate the range of impacts and to provide a robust overview of each junction.

Results are shown in Appendix E and are presented for 2017, 2025 and 2032. It should be noted that all new roundabouts are proposed to be constructed to dual standard from the outset. The existing A158 Wragby Road roundabout will only be increased in size should dualling be required.

[Note - If a movement has an RFC (ratio of flow to capacity) greater than 0.85 then the junction exceeds practical reserve capacity and queues can develop very easily. The RFC threshold is generally taken to define the onset of significant congestion]

The table below summarises the performance of each junction for both the flat and peaked profiles.

Table 11-5 – ARCADY Summary Table LEB Single Carriageway

Scenario	LEB Single			
Profile	Flat Flow Profile		Peaked Flow Profile	
Time Period	AM	PM	AM	PM
2017				
J1 - Wragby Rd Roundabout	-	-	✓	✓
J2 - Greetwell Rd Roundabout	-	-	-	-
J3 - Washingb' Roundabout	-	-	✓	✓
J4 - Lincoln Rd Roundabout	-	-	-	-
J5 - Sleaford Rd Roundabout	-	-	-	-
2025				
J1 - Wragby Rd Roundabout	✓	✓	✓	✓
J2 - Greetwell Rd Roundabout	✓	✓	✓	✓
J3 - Washingb' Roundabout	✓	✓	✓	✓
J4 - Lincoln Rd Roundabout	✓	✓	✓	✓
J5 - Sleaford Rd Roundabout	✓	✓	✓	✓
2032				
J1 - Wragby Rd Roundabout	✓	✓	✓	✓
J2 - Greetwell Rd Roundabout	✓	✓	×	✓
J3 - Washingb' Roundabout	✓	✓	×	✓
J4 - Lincoln Rd Roundabout	✓	✓	×	×
J5 - Sleaford Rd Roundabout	✓	✓	×	✓

Key

✓	Signifies that arms at the junction have RFC values less than 0.85
×	Signifies that one or more arm at junction has an RFC value greater than 0.85

The results demonstrate that all junctions on the single carriageway scheme are predicted to operate within capacity at opening year and by 2025 across both the peaked and flat profile. The flat profile method also shows that the junctions are expected to operate satisfactorily in 2032; however, some junctions are forecast to have capacity issues within the peak flow scenario. However, by 2032 the SEQ and NEQ developments are assumed to be in place and fully open.

12 Social and Distributional Impacts

12.1 Introduction

Transport Assessment Guidance suggests that it can be appropriate to undertake a New Approach to Transport Appraisal (NATA) as part of a Transport Assessment, However, a Social and Distributional Impacts (SDI) report was prepared (in accordance with the DfT's WebTAG guidance) as supporting information for the Best and Final Bid offer for the Lincoln Eastern Bypass; this was subsequently submitted to the Department for Transport (DfT).

The SDI represents a more detailed assessment than the NATA that would normally be found in a Transport Assessment, therefore this section summarises the key findings of the SDI of the LEB.

12.2 SDI Background

The purpose of SDI analysis is to identify the impact of a transport intervention spatially, socially and economically with particular reference to disadvantaged groups. Specifically the social impacts relate to the social change resulting from introducing the transport intervention (the LEB) whilst distributional impacts relate to the extent to which the impacts of the intervention differ across the various socio-economic groups located within the Lincoln study area.

12.3 SDI Summary

The SDI considered a range of issues including; User Benefit, Noise; Air Quality; Accidents; Security; Accessibility and Affordability. A summary of the LEB impact on each of these areas is outlined below.

12.3.1 User Benefits

The SDI concludes that the scheme would benefit low income and vulnerable groups located within Lincoln.

The reduction in congestion would improve access, severance and improve the quality of life particularly for communities located close to areas of high congestion.

Furthermore, it is noted that the county suffers from a skills shortage with a large proportion of employment in the low skill sectors. The scheme will also improve access to the key skill centres of Lincoln University and Lincoln College.

The LEB will reduce congestion in key areas of Lincoln that will benefit the wider transport network. Significantly it will benefit a wide range of transport users and the scheme is supported by Stagecoach, the bus operator.

12.3.2 Noise

The SDI states that there is no known significant and concentrated noise impact caused by the LEB.

The redistribution of strategic traffic away from Lincoln city centre will have a positive impact on noise and the communities located within Lincoln. It is noted that these communities will include vulnerable members of society and low income groups.

12.3.3 Air Quality

The SDI also stated that there is no known significant and concentrated air quality impact caused by the LEB.

The redistribution of strategic traffic away from the Lincoln will have a positive impact on air quality within the communities located within Lincoln – these communities will include vulnerable members of society and low income groups.

12.3.4 Accidents

A reduction in strategic traffic and congestion in the city centre could improve the accident record within those areas that currently experience high levels of congestion.

A reduction in accidents caused by the removal of strategic traffic and reduction in congestion could benefit all those living in and around Lincoln this would include low income and vulnerable groups.

12.3.5 Security

The SDI contends that security improvements will be concentrated in the city Centre through the transfer of traffic to the new road.

The transfer of traffic to the new road will improve security conditions in Lincoln city centre through the reduction of congestion and slow moving traffic. This will benefit those communities living in the city centre including low income and vulnerable groups.

12.3.6 Accessibility

The opening of the LEB will allow strategic through traffic to divert away from Lincoln city centre. Removal of through traffic will increase journey time reliability both for traffic using the bypass and local traffic using routes in Lincoln.

Pedestrian/NMU accessibility along/close to the A15 may improve as will other key routes in to the city centre.

12.3.7 Affordability

The positive impacts will be Lincoln wide and not concentrated or associated with a specific geographic area. However, the LEB would allow further improvements to other areas of the transport network allowing improvements to a wider range of transport and thereby providing a viable range of transport options. This will help reduce the reliance on private vehicles improving the affordability of travel for low income groups.

13 Summary and Conclusions

The following points summarises the findings of the LEB TA:

- The LEB scheme is a long term aspiration that is intrinsic to delivering local policy and strategy objectives. As such local authorities have been able to establish a clear set of objectives for the LEB which this TA shows the scheme will meet.

- The LEB conforms with the objectives and aspirations of national planning guidance. Furthermore, it is specifically identified in Local Policy documents as a key scheme that will; support the delivery of sustainable economic growth; improve the attractiveness and liveability of central Lincoln and reduce congestion, carbon emissions, improve air and noise quality within the Lincoln.

- Traffic levels in Lincoln have an adverse impact on public transport operations and the attractiveness of the area for pedestrians and cyclists.

- A robust assessment of road traffic accidents has been summarised. This assessment considered a Lincoln wide analysis presented in the scheme business case (i.e. within the Social and Distributional Impacts assessment that was submitted to DfT) and an investigation into road traffic accidents 1km around where the proposed scheme would be. This analysis concluded that;

    - There would be significant accident benefits across the study area with the COBA appraisal **identifying up to £39m of accident benefits over a 60 period** and;

    - With the forecast reduction in HGV flow and strategic traffic in and around Lincoln city centre onto more appropriate routes i.e. the LEB, the assessment highlighted that **pedestrian severance and the accident record of a number of road links within the area would likely be improved**.

    - The analysis of links adjacent to the proposed scheme has revealed no significant safety issues or trends which would call for further study or require any additional mitigation measures over and above the design proposals.

- The scheme has been designed with due consideration of relevant standards (e.g. DMRB) and has received wide ranging support from both public and stakeholder consultation exercises. It has also been designed so that in the future it can be upgraded to a dual carriageway route (it is noted planning consent already exists for a dual carriageway LEB).

- The scheme is forecast to remove up to 26% of traffic from key routes in the city centre. Specifically the LEB will reduce traffic flows on existing key city centre routes, including the A15 Broadgate, B1273 Brayford Way and A57 Wigford Way. It will also reduce flows on the existing A46 Western Bypass.

- The inclusion of the LEB also has an effect on strategic traffic moving between areas to the far north of Lincoln and the far south of Lincoln.

- The existing links where there are increases in flow as a result of the LEB include the A158 to the north of LEB and A15 south of the LEB.

- By 2032, the impact of the major developments located at the northern and southern end of the LEB impacts on the volume of north south traffic movements.

- The impact the LEB is expected to have at 9 existing junctions on the highway network (as identified by the Local Highway Authority as needing consideration) has been assessed. The assessment shows that, with the LEB, general traffic flows will increase compared to the DM at 2 of the 9 assessed junctions based on flows from the VISUM model. These are Junction 1b (the A16/A46/A158 roundabout) and Junction 2 (B130/Greetwell Road mini - dumbbell roundabout).

- Queues have been assessed for these 2 junctions, the queue assessment from VISUM shows that in the AM the queues are worst on the northern approach to Junction 1b. However, it should be noted that:

    - There are already significant queues on this arm at present.

    - There are queues in the DM.

    - The DS includes major developments forecast for eastern Lincoln.

- Furthermore, queues at Junction 2 are not significant with or without the scheme, the extra flows are therefore not expected to manifest in long queuing. There are also no significant changes in queuing with the LEB scheme at these junctions in the PM.

- The 5 new roundabouts on the LEB have been modelled using two methods of ARCADY analysis. This has been done for 2017, 2025 and 2032. The first method of analysis shows that all junctions will operate in the AM and PM in all assessment years. The second (more robust) method shows them working in 2017 and 2025 AM and PM and 2032 PM (save for one junction). In 2032 AM the second method shows some capacity issues on some of these junctions. By 2032 the SEQ and NEQ developments are assumed to be in place.

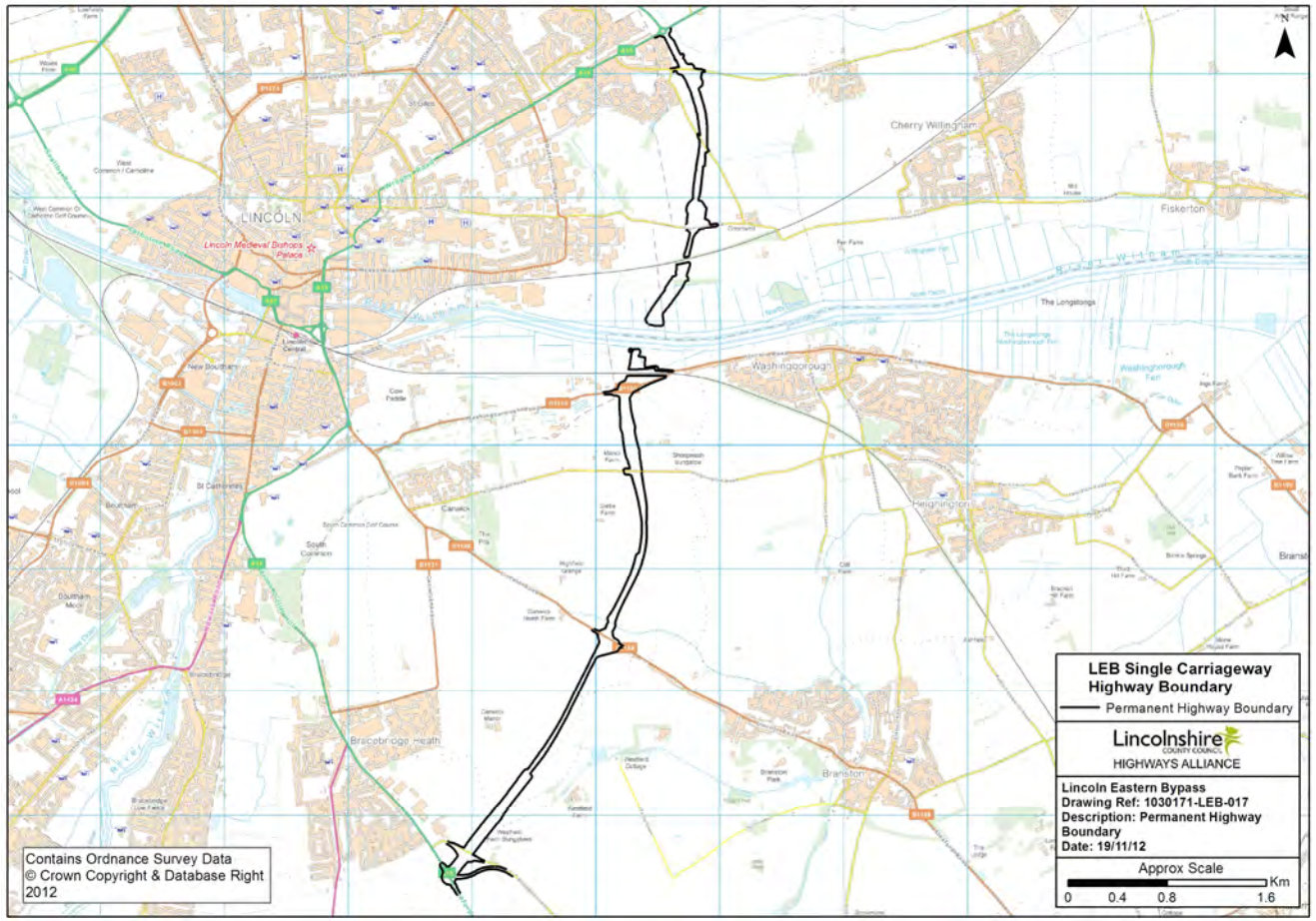
- A Social and Distributional Impacts assessment has been written for the DfT to support the LEB Best and Final Bid (which sought funding). This assessment considered a range of issues including; User Benefit, Noise; Air Quality; Accidents; Security; Accessibility and Affordability. The analysis concluded that the LEB would have a positive impact benefits for these areas.

In conclusion; **overall, there are no transport related reasons why planning approval for this scheme should not be granted.**

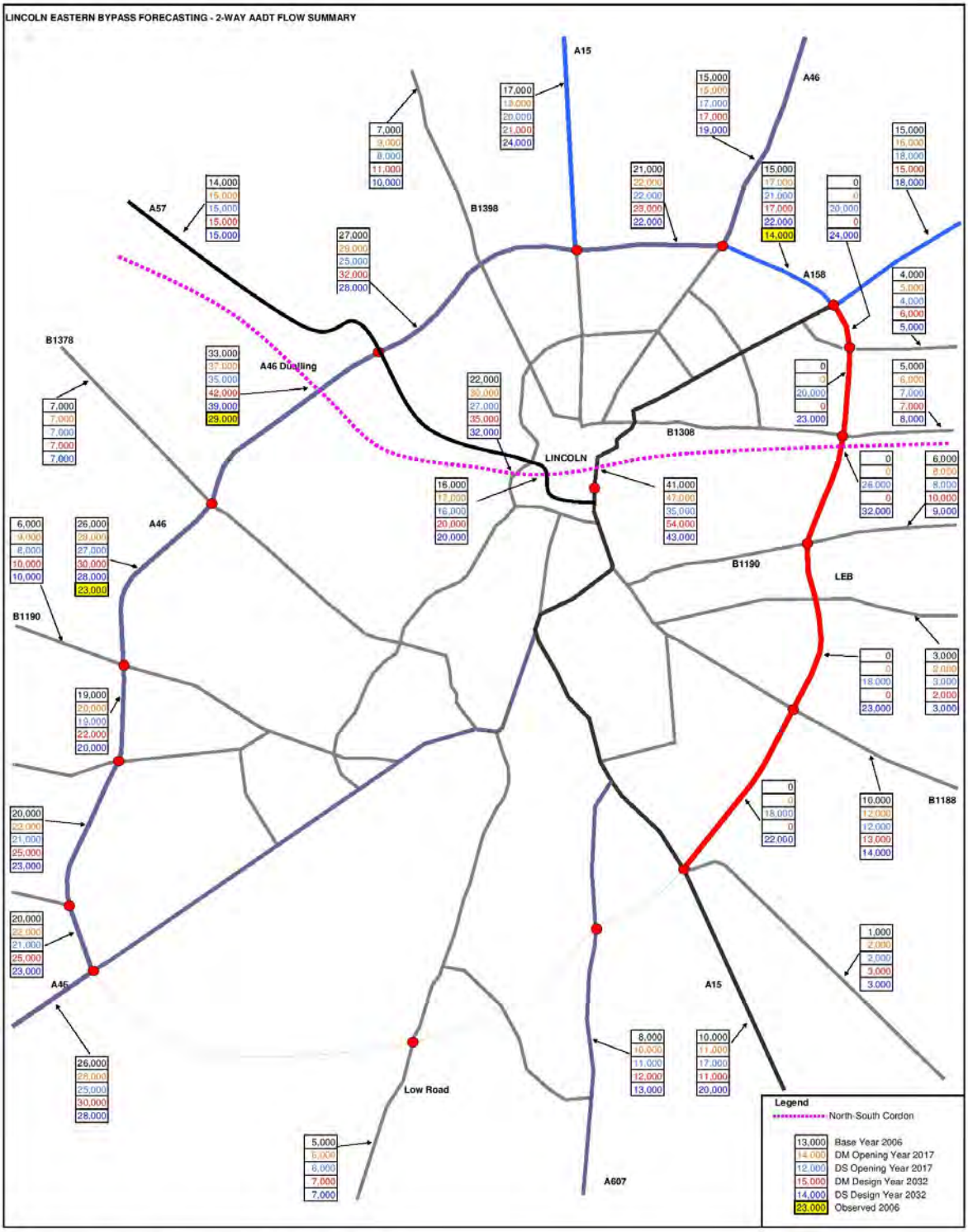
We have used our reasonable endeavours to provide information that is correct and accurate and have discussed above the reasonable conclusions that can be reached on the basis of the information available. Having issued the range of conclusions it is for the client to decide how to proceed with this project

Appendix A – Figures

LEB Site Location



Do Minimum/ Do Something AADT Demand FLows



Appendix B – Accident Data

YEAR	ACCREF_	C_FACTOR_1	CYCLIST	DAY	PED	SEVERITY	SURFACE_CO	TIME
2009	D016009	Illness or disability, mental or physical	N	Monday	N	Fatal	Wet or Damp	711
2010	D065010	Failed to look properly	N	Friday	N	Fatal	Dry	1123
2008	D379208	Poor turn or manoeuvre	N	Saturday	N	Fatal	Wet or Damp	2230
2008	D383708	Impaired by alcohol	N	Monday	N	Fatal	Dry	141
2011	D011611	Fatigue	N	Friday	N	Serious	Dry	1937
2010	D015110	Slippery road (due to weather)	N	Wednesday	N	Serious	Frost or Ice	823
2011	D015311	Visor or windscreen dirty or scratched	N	Friday	N	Serious	Dry	805
2010	D019610	Loss of control	N	Wednesday	N	Serious	Wet or Damp	1903
2011	D034811	Loss of control	N	Wednesday	N	Serious	Dry	30
2011	D051211	Failed to look properly (Pedestrian)	N	Friday	Y	Serious	Dry	925
2011	D053211	Loss of control	Y	Sunday	N	Serious	Dry	1458
2011	D067011	Failed to look properly (Pedestrian)	N	Monday	Y	Serious	Dry	835
2010	D087710	Failed to look properly	N	Friday	N	Serious	Dry	1820
2009	D092509	Travelling too fast for conditions	N	Tuesday	Y	Serious	Dry	2010
2010	D093110	Failed to judge other person's path or speed	N	Tuesday	N	Serious	Wet or Damp	1305
2009	D093809	Failed to judge other person's path or speed	N	Sunday	N	Serious	Dry	1721
2010	D115410	Failed to look properly	N	Friday	N	Serious	Dry	811
2008	D122808	Poor turn or manoeuvre	N	Wednesday	N	Serious	Wet or Damp	2040
2010	D127710	Failed to look properly	N	Saturday	N	Serious	Dry	1139
2008	D154108	Careless/Reckless/In a hurry	N	Wednesday	N	Serious	Dry	948
2008	D185908	Vehicle travelling along pavement	N	Wednesday	Y	Serious	Dry	1110
2009	D193209	Loss of control	N	Monday	N	Serious	Wet or Damp	1639
2010	D230810	Failed to look properly	Y	Wednesday	N	Serious	Dry	2130
2009	D237809	Failed to look properly	N	Thursday	N	Serious	Dry	1223
2010	D249010	Fatigue	N	Sunday	N	Serious	Dry	1642
2010	D257710	Aggressive driving	N	Saturday	N	Serious	Dry	1037
2007	D274907	Failed to look properly	N	Wednesday	N	Serious	Dry	1554
2008	D298908	Failed to look properly	N	Wednesday	Y	Serious	Wet or Damp	1026
2008	D325108	Slippery road (due to weather)	N	Thursday	N	Serious	Wet or Damp	1755
2008	D355708	Careless/Reckless/In a hurry	N	Monday	N	Serious	Wet or Damp	1215
2007	D367107	Inexperienced or learner driver/rider	N	Thursday	N	Serious	Wet or Damp	1258
2009	D370809	Failed to judge other person's path or speed	N	Friday	N	Serious	Dry	1320
2007	D418907	Failed to look properly (Pedestrian)	N	Thursday	Y	Serious	Dry	1658
2012	L077812	Failed to look properly	N	Friday	N	Serious	Dry	1950

2012	L084412	Swerved	N	Wednesday	N	Serious	Dry	2140
2011	L178411		N	Monday	N	Serious	Dry	1725
2011	L329511	Failed to look properly	N	Saturday	Y	Serious		1425
2011	N364011	Animal or object in carriageway	N	Thursday	N	Serious	Wet or Damp	2030
2008	B325908	Overloaded or poorly loaded vehicle or traile	N	Thursday	N	Slight	Wet or Damp	1045
2010	D001210	Impaired by alcohol (Pedestrian)	N	Friday	Y	Slight	Wet or Damp	301
2010	D001310	Slippery road (due to weather)	N	Friday	N	Slight	Frost or Ice	1056
2011	D006911	Careless/Reckless/In a hurry	N	Thursday	N	Slight		1837
2011	D012211	Nervous/Uncertain/ Panic	N	Thursday	N	Slight	Dry	1715
2011	D013811	Slippery road (due to weather)	N	Saturday	N	Slight	Wet or Damp	655
2009	D015809	Failed to look properly	N	Tuesday	N	Slight	Wet or Damp	1130
2010	D016510	Loss of control	N	Saturday	N	Slight	Wet or Damp	1525
2010	D017010	Failed to look properly	N	Monday	N	Slight	Dry	1453
2010	D020410	Distraction in vehicle	N	Thursday	N	Slight	Dry	746
2008	D020608	Failed to look properly (Pedestrian)	N	Saturday	Y	Slight	Dry	2015
2009	D024409	Poor turn or manoeuvre	N	Friday	N	Slight	Wet or Damp	1130
2011	D026411	Failed to look properly	N	Friday	N	Slight	Dry	910
2008	D028708	Failed to judge other person's path or speed	N	Monday	N	Slight	Wet or Damp	1654
2008	D029508	Failed to look properly	N	Thursday	N	Slight	Wet or Damp	1739
2009	D033109	Impaired by alcohol	N	Monday	N	Slight	Snow	2135
2011	D035511	Junction restart	N	Friday	N	Slight	Wet or Damp	1800
2009	D038809	Slippery road (due to weather)	N	Monday	N	Slight	Frost or Ice	830
2011	D038811	Failed to look properly	N	Tuesday	N	Slight	Dry	1320
2011	D041111	Failed to look properly	Y	Monday	N	Slight	Dry	1155
2009	D043609	Slippery road (due to weather)	N	Thursday	N	Slight	Frost or Ice	900
2008	D046108	Exceeding speed limit	N	Tuesday	N	Slight	Wet or Damp	1350
2010	D047210	Loss of control	N	Wednesday	N	Slight	Dry	640
2008	D053108	Slippery road (due to weather)	N	Monday	N	Slight	Wet or Damp	830
2011	D054111	Failed to judge other person's path or speed	N	Wednesday	N	Slight	Wet or Damp	900
2009	D054309	Failed to look properly	N	Wednesday	N	Slight	Wet or Damp	1327
2010	D054710	Failed to judge other person's path or speed	N	Saturday	N	Slight	Wet or Damp	945
2008	D056308	Poor turn or manoeuvre	N	Saturday	N	Slight	Dry	1350
2008	D060708	Slippery road (due to weather)	N	Tuesday	N	Slight	Snow	634
2009	D066609	Failed to judge other person's path or speed	Y	Wednesday	N	Slight	Dry	925
2009	D068709	Dangerous action in carriageway (eg playing)	N	Saturday	Y	Slight	Dry	1505

2011	D070411	Failed to look properly	N	Wednesday	Y	Slight	Dry	1830
2011	D075011	Defective brakes	N	Thursday	N	Slight	Dry	1030
2008	D077908	Exceeding speed limit	N	Sunday	N	Slight	Wet or Damp	1222
2008	D078308	Poor turn or manoeuvre	N	Monday	N	Slight	Wet or Damp	1303
2011	D079311	Failed to judge other person's path or speed	N	Thursday	N	Slight		1345
2009	D085609	Following too close	N	Sunday	N	Slight	Dry	1800
2010	D087010	Failed to look properly	N	Monday	N	Slight	Dry	1720
2010	D087910	Failed to look properly	N	Sunday	N	Slight	Dry	1209
2010	D093210	Deposit on road (eg. oil, mud, chippings)	N	Monday	N	Slight	Wet or Damp	1550
2008	D094208	Exceeding speed limit	N	Sunday	N	Slight	Dry	1037
2008	D095808	Disobeyed automatic traffic signal	N	Friday	N	Slight	Wet or Damp	1500
2008	D097208	Swerved	N	Sunday	N	Slight	Dry	1805
2009	D101209	Careless/Reckless/In a hurry	N	Tuesday	N	Slight	Dry	1345
2010	D105910	Inexperienced or learner driver/rider	N	Friday	N	Slight	Dry	1720
2011	D105911	Failed to look properly	Y	Friday	N	Slight	Dry	1855
2011	D110211	Failed to look properly	N	Monday	N	Slight	Dry	1412
2010	D110610	Slippery road (due to weather)	N	Monday	N	Slight	Wet or Damp	2120
2011	D111111	Failed to look properly	N	Wednesday	N	Slight	Wet or Damp	614
2008	D111208	Junction restart	N	Wednesday	N	Slight	Wet or Damp	945
2008	D111408	Distraction in vehicle	N	Saturday	N	Slight	Dry	1545
2010	D112410	Failed to look properly	N	Monday	N	Slight		1749
2010	D116110	Following too close	N	Thursday	N	Slight	Dry	740
2009	D117609	Traffic calming (eg speed cushions, road hump	N	Sunday	N	Slight	Dry	1626
2009	D119309	Impaired by alcohol	N	Monday	N	Slight	Dry	2130
2011	D120311	Road layout (eg bend, hill, narrow carriagewa	N	Friday	N	Slight	Dry	330
2011	D123011	Overloaded or poorly loaded vehicle or traile	N	Wednesday	N	Slight		1515
2010	D125010	Failed to judge other person's path or speed	N	Wednesday	N	Slight	Dry	1159
2010	D132710	Failed to judge other person's path or speed	N	Wednesday	N	Slight	Dry	1445
2011	D135411	Failed to look properly	N	Tuesday	N	Slight	Dry	702
2010	D136210	Junction restart	N	Wednesday	N	Slight	Dry	1434
2010	D137510	Failed to look properly	Y	Thursday	N	Slight	Dry	1520
2010	D137810	Failed to judge other person's path or speed	N	Thursday	N	Slight	Dry	855
2007	D141407	Junction restart	N	Thursday	N	Slight	Dry	1650
2007	D142107	Inexperienced or learner driver/rider	N	Monday	N	Slight	Dry	1735
2011	D143511	Failed to look properly	N	Tuesday	N	Slight	Dry	915

2009	D146509	Overloaded or poorly loaded vehicle or traile	N	Monday	N	Slight	Dry	1655
2010	D151610	Loss of control	N	Thursday	N	Slight	Dry	1155
2010	D154010	Passing too close to cyclist, horse rider or	Y	Thursday	N	Slight	Dry	1535
2011	D156611	Slippery road (due to weather)	N	Thursday	N	Slight	Wet or Damp	1606
2008	D157608	Dazzling sun	N	Wednesday	N	Slight	Dry	1814
2008	D159108	Failed to judge other person's path or speed	N	Sunday	N	Slight	Dry	1253
2009	D159209	Swerved	N	Sunday	N	Slight	Dry	2127
2010	D162610	Failed to look properly	N	Thursday	N	Slight	Dry	1618
2010	D162710	Poor turn or manoeuvre	N	Thursday	N	Slight	Dry	837
2010	D162810	Following too close	N	Thursday	N	Slight	Dry	1400
2009	D169309	Slippery road (due to weather)	N	Monday	N	Slight	Wet or Damp	2340
2009	D176009	Failed to look properly	N	Tuesday	N	Slight	Dry	905
2008	D177808	Illness or disability, mental or physical	N	Wednesday	N	Slight	Dry	1620
2010	D182210	Following too close	N	Friday	N	Slight	Dry	1420
2009	D186409	Failed to look properly	N	Tuesday	N	Slight	Dry	1725
2010	D188210	Failed to look properly	Y	Monday	N	Slight	Dry	1540
2009	D193809	Slippery road (due to weather)	N	Monday	N	Slight	Wet or Damp	1915
2010	D198810	Failed to look properly	N	Thursday	N	Slight	Dry	925
2009	D202509	Following too close	N	Monday	N	Slight	Dry	1120
2007	D202807	Impaired by alcohol (Pedestrian)	N	Friday	Y	Slight	Wet or Damp	1345
2010	D202910	Junction restart	N	Wednesday	N	Slight	Dry	1420
2007	D219607	Failed to look properly	N	Sunday	N	Slight	Dry	1100
2009	D224809	Following too close	N	Saturday	N	Slight	Dry	1345
2008	D225808	Failed to look properly	Y	Sunday	N	Slight	Dry	2100
2010	D225910	Failed to look properly	N	Saturday	N	Slight	Dry	215
2009	D243009	Careless/Reckless/In a hurry	N	Friday	N	Slight	Wet or Damp	1235
2008	D246808	Failed to judge other person's path or speed	N	Thursday	N	Slight	Dry	810
2009	D247709	Failed to look properly	N	Wednesday	N	Slight	Wet or Damp	1402
2008	D250808	Following too close	N	Tuesday	N	Slight	Dry	156
2008	D252508	Failed to look properly	N	Tuesday	N	Slight	Dry	1000
2009	D253009	Failed to look properly	N	Sunday	N	Slight	Dry	1655
2009	D253709	Failed to look properly	N	Saturday	N	Slight	Dry	1115
2007	D255007	Failed to look properly	N	Wednesday	N	Slight	Dry	1820
2009	D256709	Disobeyed pedestrian crossing facility	Y	Monday	N	Slight	Dry	1510
2008	D256908	Travelling too fast for conditions	N	Sunday	N	Slight	Dry	1503
2009	D257609	Careless/Reckless/In a hurry	N	Saturday	N	Slight	Dry	1130

2010	D261110	Failed to judge other person's path or speed	N	Thursday	N	Slight	Dry	1632
2008	D262408	Failed to judge other person's path or speed	N	Thursday	N	Slight	Dry	2119
2008	D265208	Failed to judge other person's path or speed	N	Wednesday	N	Slight	Dry	1348
2010	D273510	Failed to judge other person's path or speed	N	Monday	N	Slight	Dry	1425
2009	D274609	Loss of control	Y	Thursday	N	Slight	Dry	148
2009	D275709	Failed to look properly	N	Thursday	N	Slight	Dry	1110
2007	D276107	Travelling too fast for conditions	N	Monday	N	Slight	Dry	1812
2009	D279309	Failed to judge other person's path or speed	N	Sunday	N	Slight	Dry	1641
2010	D279310	Failed to look properly	N	Saturday	N	Slight	Dry	1950
2010	D283810	Failed to judge other person's path or speed	N	Tuesday	N	Slight	Dry	1025
2007	D284107	Sudden braking	N	Sunday	N	Slight	Wet or Damp	2215
2009	D287309	Road layout (eg. bend, winding road, hill cre	N	Sunday	N	Slight	Dry	1308
2010	D289310	Sudden braking	N	Sunday	N	Slight	Dry	1230
2009	D290909	Disobeyed automatic traffic signal	N	Tuesday	N	Slight	Dry	1400
2007	D292907	Overloaded or poorly loaded vehicle or traile	N	Friday	N	Slight	Dry	1410
2010	D296310	Failed to judge other person's path or speed	Y	Saturday	N	Slight	Dry	1535
2009	D301709	Pedestrian wearing dark clothing at night	N	Thursday	Y	Slight	Wet or Damp	430
2009	D302009	Cyclist entering road from pavement	Y	Saturday	N	Slight	Dry	1335
2009	D302709	Failed to look properly	N	Thursday	N	Slight	Dry	1545
2009	D308209	Slippery road (due to weather)	N	Wednesday	N	Slight	Wet or Damp	940
2007	D308707	Inexperienced or learner driver/rider	N	Thursday	N	Slight	Wet or Damp	730
2009	D311809	Inexperienced or learner driver/rider	N	Monday	N	Slight	Dry	1830
2009	D314109	Sudden braking	N	Saturday	N	Slight	Dry	1215
2008	D317208	Slippery road (due to weather)	N	Saturday	N	Slight	Wet or Damp	935
2009	D317609	Failed to judge other person's path or speed	N	Friday	N	Slight	Dry	1145
2009	D318809	Slippery road (due to weather)	N	Saturday	N	Slight	Wet or Damp	1200
2008	D320008	Failed to look properly	N	Saturday	N	Slight	Wet or Damp	1045
2009	D325409	Impaired by alcohol	N	Sunday	N	Slight	Dry	1740
2009	D326209	Slippery road (due to weather)	N	Tuesday	N	Slight	Wet or Damp	2200
2008	D326408	Illness or disability, mental or physical	N	Sunday	N	Slight	Wet or Damp	1805
2009	D328209	Slippery road (due to weather)	N	Friday	N	Slight	Wet or Damp	1700
2009	D328909	Failed to judge other person's path or speed	N	Saturday	N	Slight	Dry	907

2009	D333809	Failed to look properly	N	Tuesday	N	Slight	Wet or Damp	1713
2010	D335010	Failed to judge other person's path or speed	N	Thursday	N	Slight	Wet or Damp	1915
2008	D337508	Stationary or parked vehicle(s)	Y	Friday	N	Slight	Dry	1608
2009	D338909	Aggressive driving	N	Friday	N	Slight	Wet or Damp	1548
2010	D339710	Careless/Reckless/In a hurry	Y	Wednesday	N	Slight	Wet or Damp	845
2007	D341807	Failed to look properly	N	Tuesday	N	Slight	Wet or Damp	1630
2010	D341910	Failed to look properly	N	Monday	N	Slight	Wet or Damp	1650
2010	D342210	Failed to look properly	N	Tuesday	Y	Slight	Wet or Damp	927
2008	D344408	Poor turn or manoeuvre	Y	Saturday	N	Slight	Dry	1300
2008	D344908	Slippery road (due to weather)	N	Sunday	N	Slight	Frost or Ice	2139
2010	D345510	Failed to judge other person's path or speed	N	Sunday	N	Slight	Dry	1600
2008	D346908	Cyclist wearing dark clothing at night	Y	Wednesday	N	Slight	Wet or Damp	1830
2008	D350708	Failed to look properly (Pedestrian)	N	Thursday	Y	Slight	Wet or Damp	1640
2007	D351707	Poor turn or manoeuvre	N	Thursday	Y	Slight	Dry	1015
2010	D353310	Failed to look properly	N	Wednesday	N	Slight	Dry	1939
2010	D355510	Failed to look properly	N	Saturday	N	Slight	Dry	1720
2010	D356210	Failed to look properly	N	Tuesday	N	Slight	Dry	1745
2009	D359409	Failed to look properly	N	Wednesday	N	Slight	Wet or Damp	1725
2009	D359609	Slippery road (due to weather)	N	Tuesday	N	Slight	Wet or Damp	1525
2008	D361008	Failed to look properly	N	Friday	N	Slight	Wet or Damp	1640
2010	D361810	Failed to judge other person's path or speed	N	Wednesday	N	Slight	Wet or Damp	1010
2007	D366607	Cyclist wearing dark clothing at night	Y	Thursday	N	Slight	Dry	1817
2010	D367110	Impaired by alcohol	N	Saturday	N	Slight	Wet or Damp	1055
2009	D367509	Failed to look properly	N	Tuesday	N	Slight	Wet or Damp	2155
2009	D369709	Failed to look properly	Y	Thursday	N	Slight		1632
2009	D371209	Inexperienced or learner driver/rider	N	Friday	N	Slight	Wet or Damp	847
2010	D372110	Poor or defective road surface	N	Tuesday	N	Slight	Snow	800
2009	D372709	Buildings, road signs, street furniture	Y	Saturday	N	Slight	Wet or Damp	1707
2008	D375008	Passing too close to cyclist, horse rider or	N	Wednesday	Y	Slight	Wet or Damp	1330
2009	D380609	Failed to look properly	N	Tuesday	N	Slight		1645
2007	D384507	Impaired by alcohol	N	Saturday	N	Slight	Wet or Damp	1810
2009	D389109	Dangerous action in carriageway (eg playing)	N	Friday	Y	Slight	Frost or Ice	1450
2007	D392607	Dazzling sun	N	Thursday	N	Slight	Wet or Damp	849
2007	D397007	Failed to look properly	N	Tuesday	N	Slight	Wet or Damp	1815
2007	D398407	Following too close	N	Thursday	N	Slight	Dry	1725

2007	D410607	Travelling too fast for conditions	N	Thursday	N	Slight	Frost or Ice	1615
2007	D413607	Failed to look properly	N	Tuesday	N	Slight	Wet or Damp	1620
2007	D415907	Deposit on road (eg. oil, mud, chippings)	N	Tuesday	N	Slight	Wet or Damp	2325
2007	D421107	Poor turn or manoeuvre	N	Thursday	N	Slight	Wet or Damp	2105
2007	D424607	Poor turn or manoeuvre	N	Sunday	N	Slight	Wet or Damp	2037
2007	D430907	Failed to look properly	N	Sunday	N	Slight	Dry	1830
2012	L012912	Failed to judge other person's path or speed	N	Tuesday	N	Slight	Wet or Damp	1915
2012	L024012	Wrong use of pedestrian crossing facility	N	Tuesday	Y	Slight	Dry	1801
2012	L051112	Failed to look properly	N	Thursday	N	Slight	Dry	900
2012	L053112	Failed to look properly (Pedestrian)	N	Wednesday	N	Slight	Dry	1440
2012	L062212	Swerved	N	Tuesday	N	Slight	Dry	1730
2012	L066812	Failed to look properly	N	Monday	N	Slight	Dry	845
2012	L071412	Disobeyed Give Way or Stop sign or markings	Y	Friday	N	Slight	Dry	1700
2012	L078612	Failed to look properly	N	Monday	N	Slight	Dry	1915
2012	L086212	Failed to judge other person's path or speed	N	Friday	N	Slight		1440
2012	L087212	Disobeyed automatic traffic signal	N	Saturday	N	Slight	Dry	1104
2012	L088612	Slippery road (due to weather)	N	Monday	N	Slight	Wet or Damp	1245
2012	L090412	Failed to look properly	N	Wednesday	N	Slight	Wet or Damp	1023
2012	L094812	Following too close	N	Wednesday	N	Slight	Dry	944
2012	L098512	Exceeding speed limit	N	Thursday	N	Slight	Dry	1425
2012	L113012	Poor turn or manoeuvre	N	Sunday	N	Slight	Wet or Damp	1529
2011	L172111	Dazzling sun	N	Sunday	N	Slight	Dry	1910
2011	L190711	Failed to look properly	N	Saturday	N	Slight	Wet or Damp	1054
2011	L194711	Following too close	N	Monday	N	Slight	Dry	1345
2011	L196411	Disability or illness, mental or physical	N	Tuesday	Y	Slight	Wet or Damp	1537
2011	L201511	Failed to look properly	N	Friday	N	Slight	Dry	1818
2011	L210811	Failed to look properly	N	Sunday	N	Slight	Dry	2044
2011	L214011	Impaired by alcohol	N	Tuesday	N	Slight	Dry	1530
2011	L218111	Failed to look properly	N	Wednesday	N	Slight	Dry	1510
2011	L226411	Following too close	N	Tuesday	N	Slight	Dry	1645
2011	L240311	Failed to look properly (Pedestrian)	N	Tuesday	Y	Slight	Dry	1630
2011	L246011	Passing too close to cyclist, horse rider or	Y	Monday	N	Slight		2340
2011	L247411	Poor turn or manoeuvre	N	Monday	N	Slight	Dry	1235
2011	L248611	Failed to look properly	N	Friday	N	Slight	Dry	1800
2011	L261911	Failed to judge other person's path or speed	N	Wednesday	N	Slight	Dry	1655

2011	L262011	Failed to look properly	N	Wednesday	N	Slight	Dry	1700
2011	L267511	Following too close	N	Sunday	N	Slight	Dry	1300
2011	L267811	Impaired by alcohol (Pedestrian)	N	Saturday	Y	Slight	Dry	2323
2011	L273511	Poor turn or manoeuvre	N	Wednesday	N	Slight	Dry	1000
2011	L279011	Failed to judge other person's path or speed	N	Sunday	N	Slight	Dry	1810
2011	L279311	Slippery road (due to weather)	N	Sunday	N	Slight	Wet or Damp	1719
2011	L281211	Defective lights or indicators	N	Monday	N	Slight	Dry	1924
2011	L290811	Loss of control	N	Thursday	N	Slight	Dry	1331
2011	L309811		N	Friday	N	Slight	Dry	1051
2011	L338911	Inexperienced or learner driver/rider	N	Saturday	N	Slight	Wet or Damp	239
2011	L347911	Failed to judge other person's path or speed	N	Monday	N	Slight	Dry	1445
2011	L372011	Distraction outside vehicle	N	Monday	N	Slight	Wet or Damp	1212
2011	L377111	Aggressive driving	N	Wednesday	N	Slight	Dry	1547
2012	N092912	Impaired by alcohol	N	Monday	N	Slight	Dry	425
2012	N108112	Failed to look properly	N	Saturday	N	Slight	Dry	1225
2011	N196811	Exceeding speed limit	N	Friday	N	Slight	Dry	410
2011	N219611	Aggressive driving	N	Thursday	N	Slight	Wet or Damp	1953
2011	N222111	Slippery road (due to weather)	N	Sunday	N	Slight	Dry	1930
2011	N260211	Distraction outside vehicle	N	Sunday	N	Slight	Dry	1010
2011	N293111	Failed to look properly	Y	Tuesday	N	Slight	Wet or Damp	1217
2011	N359911	Slippery road (due to weather)	N	Friday	N	Slight	Wet or Damp	1445