Lincolnshire County Council

NORTH HYKEHAM RELIEF ROAD

Strategic Case - Outline Business Case

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Lincolnshire County Council
Crown House
Grantham Street
Lincoln
LN2 1BD

WSP.com

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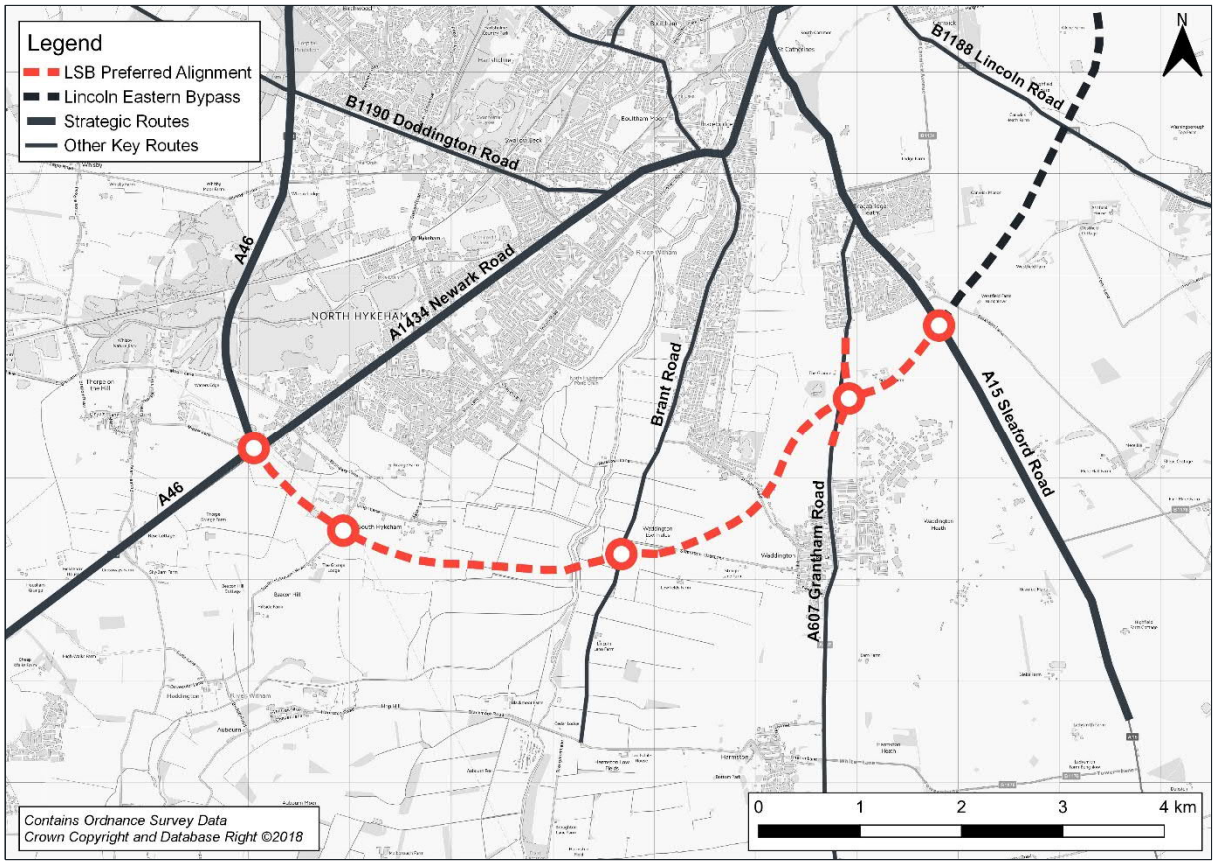
1 INTRODUCTION

1.1 NORTH HYKEHAM RELIEF ROAD

The proposed North Hykeham Relief Road (NHRR) is situated in the semi-rural south of Lincoln encompassing the south west section of the A46 and the key radial routes of the A1434 Newark Road, Brant Road, Grantham Road and the A15 Sleaford Road (as illustrated within Figure 1-1). Within the immediate vicinity of the NHRR is the southern extent of the Lincoln urban area including North Hykeham, South Hykeham, Swallow Beck and Bracebridge, and also the rural settlements of Waddington and Bracebridge Heath.

Figure 1-1 - North Hykeham Relief Road



The NHRR will provide a new link road that ties into the existing at-grade five arm roundabout at A46 Western Relief Road/A1434 Newark Road/A46 (T)/Middle Lane and joins the A15/Lincoln Eastern Bypass (LEB) junction on the eastern side of Lincoln through an additional fourth arm. In addition, the NHRR will include:

- Four-arm at grade roundabout junctions with the key radial routes it intersects (South Hykeham Road; Brant Road; and the A607 Grantham Road);
- A bridge structure over the River Witham and another over Station Road; and
- Grade separated Non-Motorised User (NMU) structures at the A46/NHRR roundabout; Wath Lane; and Viking Way/A607 Grantham Road.

The LEB, which joins the eastern side of the NHRR, is currently under construction and consists of a 7.5 kilometre single carriageway linking the A15 Sleaford Road to the A158 Wragby Road East junction. Together with the NHRR it will complete the orbital route of Lincoln.

As shown in Figure 1-1, the existing road network in Lincoln consists of a number of regionally important routes through and around the city, as well as major routes into the city centre and local roads. The main orbital and strategic routes include:

- the A46 Western Relief Road/Northern Relief Road which forms part of the Strategic Road Network (SRN) managed by Highways England (HE);
- the A57 Saxilby Road/Carholme Road on the western side of Lincoln which provides a key east-west route into the city;
- the A15 which provides a major north-south route through Lincoln and provides a link to the Humber Ports; and
- the A1434 which again provides a route into the city from the south west and passes through several residential areas, including North Hykeham.

However, due to existing limited route choice for traffic wishing to travel north-south and east-west, especially in the south of the Lincoln urban area, traffic is forced to use either the A46 Western Relief Road (WRR) or A1434 and A15 to pass by or through the city. On the local network, several routes in the North Hykeham area experience relatively high traffic volumes for their design standard, this again can be attributed to the lack of east-west and north-south connectivity.

There is also a poor level of network resilience and this is a key problem on the SRN. The lack of alternatives to the existing orbital ring road (A46 WRR) and major routes through the city mean that traffic is diverted through urban and residential areas which are not suited to the additional volumes of traffic.

Several important sections of the existing network are also operating either at capacity or are expected to reach capacity in the short to medium term. This includes the A46 WRR, the A15 and the A1434, with congestion resulting in poor average speeds, variable journey times and delay in both peak periods and to some extent also in off peak periods. For example, peak period average speeds on the A46, which has a national speed limit, are approximately 30mph.

Crucially, the government has committed to the creation of a Major Road Network (MRN) across England, which will incorporate the country's busiest and most economically important 'A' roads. Within Lincoln, there are aspirations for the inclusion of the A15, A57 and A46. The existing issues on the network will limit the ability of these routes to operate effectively as part of the MRN.

Furthermore, future land-use policies identify significant levels of planned growth up to 2036. This includes the development of the four Sustainable Urban Extensions (SUEs) which will contribute to a 50% increase in dwellings in Lincoln by 2036. In particular, a new link is required to the south west of the city to unlock the South West Quadrant, which is planned to deliver 2,000 new homes and five hectares of employment land by 2036. The increase in travel demand generated by the SUEs will put further pressure on the existing road network and, without further investment, it will be difficult for the existing highway network to accommodate any additional growth.

1.2 OUTLINE BUSINESS CASE

The NHRR is one of Lincolnshire County Council's (LCC) priority infrastructure projects, which has been an aspiration of LCC and local authority partners for many years. The scheme is part of the Lincoln Integrated Transport Strategy (LITS) and LCC is now in a position to progress the scheme as the last major highway project under the Strategy following the commencement of construction on the Lincoln Eastern Bypass.

As a result, in the summer of 2017, LCC commissioned WSP to commence the development of the Outline Business Case (OBC). The first step in this process was the formulation of an Option Assessment Report 2018 (OAR). The OAR builds on earlier feasibility work, which established the need for the scheme and the route alignment, and considered the highway standard, junction NMU strategies and assessed the need for the scheme against the current issues and future challenges. This assessment identified the preferred approach for the NHRR and provides the foundation of technical analysis upon which this OBC has been developed (further details are provided within Appendix A).

1.3 PURPOSE OF THIS CASE

This section of the OBC provides the Strategic Case for the NHRR. It outlines how the scheme aligns with national, regional and local priorities, and describes the significant benefits the proposal is anticipated to deliver. It also presents evidence of the issues and problems currently affecting Lincoln, and how these problems are anticipated to worsen if no action is taken, which will affect housing delivery and Lincoln's future economic development and growth potential.

The Department for Transport (DfT) guidance document 'The Transport Business Case' states that the Strategic Case should demonstrate whether an investment is needed, outlining a clear rationale for making the investment, including its strategic fit, and detail how the investment will further the aims and objectives of the organisation, in this case, LCC. The guidance outlines the elements that should be covered within the Strategic Case for a scheme, which are summarised in Table 1-1 along with a reference guide to the chapter(s) in which each element is addressed.

Table 1-1 - DfT Strategic Case Requirements

Strategic Case Elements	DfT Requirements	Chapter(s)
Business strategy & policy fit	Provide the context for the business case by describing the strategic aims and responsibilities of the organisation responsible for the proposal e.g. the DfT, Highways England, Local Authority etc. The Business Case will also provide details on how the proposal aligns with the Transport Investment Strategy (TIS) which sets out DfT's objectives and priorities for investment.	Chapter 2
Problem identified	Describe the problem identified. What is the evidence base underpinning this? Is there justification for Government intervention?	Chapters 3 & 4
Impact of not changing & Drivers for change	What is the impact of not changing?	Chapters 5 & 6

Strategic Case Elements	DfT Requirements	Chapter(s)
Objectives	Establish specific, measurable, achievable, realistic and time-bound objectives that will solve the problem identified. Ensure that they align with the organisation's strategic aims.	Chapter 7
Measures for success	Set out what constitutes successful delivery of the objectives.	Chapter 8
Scope	Explain what the project will deliver and also what is out of scope.	Chapter 9
Constraints	High level internal/external constraints e.g. technological environment, is there capability to deliver in-house, major contracts with provider, etc.	Chapter 10
Inter-dependencies	Internal/external factors upon which the successful delivery of project are dependent.	Chapter 10
Stakeholders	Outline the main stakeholder groups and their contribution to the project. Note any potential conflicts between different stakeholder groups and their demands.	Chapter 11
Options	Set out all the options identified (including do minimum) and evaluate their impact on the proposal's objectives and wider public policy objectives. Risks associated with each option should be identified as should any risks common to all options.	Chapter 12

2 BUSINESS STRATEGY & POLICY FIT

2.1 INTRODUCTION

The NHRR is being promoted by LCC. The scheme is situated within an area administered by a two-tiered structure of local government; falling within the administrative boundaries of North Kesteven District Council (NKDC) and LCC.

At a strategic level, the NHRR falls within the Midlands Connect, Greater Lincolnshire Local Enterprise Partnership (GLLEP) and Central Lincolnshire Joint Strategic Planning Committee areas (CLJSPC) and has been developed in line with the key strategic goals of these organisations. The scheme will also support the District Councils' aims and objectives including the City of Lincoln Council (CoLC) and West Lindsey District Council (WLDC) as well as the Neighbourhood Plans within the vicinity of the scheme.

Importantly, there are also aspirations for the inclusion of the A15, A57 and A46 as part of the government's proposed MRN. There is an opportunity for the NHRR to support these aspirations by aligning with the strategic goals highlighted for eligibility of routes set out by the DfT.

The NHRR is therefore of strategic importance to several organisations, due to the contribution it can make to achieving their strategies, aims and objectives. The following section presents the key points from relevant policy documents, setting out the aims, objectives and strategies being progressed by each organisation and how the NHRR is critical to supporting the delivery of these. It also puts the scheme in the context of key national strategies and policies. Further details are provided in Appendix A.

Lincolnshire County Council

- Lincolnshire Local Transport Plan 4 (2013)
- Lincoln Integrated Transport Strategy (2013)

Central Lincolnshire Joint Strategic Planning Committee

- Central Lincolnshire Local Plan (2012 - 2036)

City of Lincoln Council

- City of Lincoln Council Strategic Plan Vision 2020

North Kesteven District Council

- North Kesteven Strategic Plan
- Neighbourhood Plans

Greater Lincolnshire Local Enterprise Partnership

- Greater Lincolnshire Strategic Infrastructure Delivery Plan
- Greater Lincolnshire Strategic Economic Plan 2014 – 2030 (Spring 2016)

Midlands Connect

- Midlands Engine Strategy (Mach 2017)
- Midlands Connect Strategy: Powering the Midlands engine (March 2017)

Highways England

- Highways England Delivery Plan 2015 – 2020

2.2 LINCOLNSHIRE COUNTY COUNCIL

LCC is promoting the development of the NHRR and there are a number of policies and strategies being delivered and managed by LCC which set out the wider vision for the County and Lincoln as well as providing the rationale and context for promoting the NHRR.

The key local policy and strategy documents include the Lincolnshire **Local Transport Plan 4 (2013)** and the **Lincoln Integrated Transport Strategy**.

The **Lincolnshire Local Transport Plan 4** highlights the need for transport investment to support sustainable economic growth and improve accessibility to jobs and services. The plan specifically mentions the NHRR and how it will provide a missing link to create a full orbital road around the city.

It identifies a number of key issues, including the following:

- Supporting growth and the local economy - Population growth in Lincolnshire has been substantially above that recorded both regionally and nationally. Increasing development to accommodate this growth will put further pressures on existing transport networks across the county;
- Improving access to employment, training and key services – 12% of Lincolnshire's population live within the 20% most deprived areas of England;
- Contributing to a healthier community – The proportion of obese adults and children in Lincolnshire is higher than the national average; and
- Improving road safety – Since 2008, Killed and Seriously Injured (KSI) casualties have increased in the county, reaching 483 in 2011.
- The environmental impact of transport - A city-wide Air Quality Management Area (AQMA) was declared in Lincoln in February 2008 following assessment of fine particulates (PM10) at key junctions across the city.

The document sets out detailed objectives and policies to address issues highlighted above:

- To assist the sustainable economic growth of Lincolnshire, and the wider region, through improvements to the transport network;
- To improve access to employment and key services by widening travel choices, especially for those without access to a car;
- To make travel for all modes safer and, in particular, reduce the number and severity of road casualties;
- To maintain the transport system to standards which allow safe and efficient movement of people and goods;
- To protect and enhance the built and natural environment of the county by reducing the adverse impacts of traffic, including HGVs;
- To improve the quality of public spaces for residents, workers and visitors by creating a safe, attractive and accessible environment;
- To improve the quality of life and health of residents and visitors by encouraging active travel and tackling air quality and noise problems; and
- To minimise carbon emissions from transport across the county.

NHRR has been identified within the strategy as part of a programme of transport improvements looking forward to 2026 and beyond. It notes that a new southern route will complete the full orbital

relief road around the city, and that a preferred route was adopted in December 2006 to protect the alignment from future development.

The Lincoln Integrated Transport Strategy (LITS) also recognises the need for investment in transport infrastructure and has highlighted the NHRR as a key established intervention. Its main aims are:

- To improve the management of traffic, to protect the environment and promote efficient and convenient movement by various modes of transport;
- To reduce the negative impacts of through traffic, particularly heavy goods vehicles, in the centre of Lincoln;
- To develop transport infrastructure schemes which enhance sustainable economic development, safety and local amenity;
- To encourage and develop movement by public transport, cycling and walking as part of an overall strategy designed to increase transport choice;
- To increase accessibility for all sections of the community, providing more options to travel throughout the Lincoln area; and
- To develop transport infrastructure that enables sustainable economic development and addresses priority areas for economic regeneration in the Lincoln Area.

It identifies that delivery of the LITS and the identified schemes including the NHRR will result in:

- City centre benefits brought through the reallocation of road space following the removal of unnecessary traffic;
- Accessibility benefits for all transport users associated with providing more options to travel throughout the Lincoln Area;
- Environmental benefits for the Lincoln area such as improved air quality and improved public realm;
- Safety benefits resulting from the transfer of traffic onto more appropriate routes and reducing conflict with cyclists and pedestrians; and
- Economic and regeneration benefits through supporting existing land uses and proposed developments.

Lincolnshire Local Transport Plan 4 (2013) and the ***Lincoln Integrated Transport Strategy*** both highlight the need to deliver the NHRR. The objectives of the NHRR align with many of the key issues highlighted within both policy documents including but not limited to:

- Removing unnecessary traffic from the city centre;
- Supporting economic growth; and
- Improving access to services and employment opportunities.

2.3 CENTRAL LINCOLNSHIRE JOINT PLANNING COMMITTEE

Central Lincolnshire refers to the combined area covered by the City of Lincoln, North Kesteven and West Lindsey. These three councils have come together in a formal partnership with Lincolnshire County Council to prepare a joint Local Plan for the area. The Committee has representatives from each of the four partner Councils and has full decision-making powers on planning policy matters.

The committee adopted the **Central Lincolnshire Local Plan (CLLP)** in 2017 and sets out the policies and allocations for the growth and regeneration of Central Lincolnshire over the next 20 years. The CLLP sets out the aspiration for growth between 2012 and 2036 and highlights the fundamental need to deliver this within central Lincolnshire. The vision for the area over the period 2012 to 2036 is that *"Central Lincolnshire will be a location of positive growth. Its city, market towns and many of its villages will see new homes built, new jobs created and improved infrastructure developed."* It goes on to state that, although this growth will focus on Lincoln, Sleaford and Gainsborough, villages will not be left behind, with *"appropriate and sensitive development being permitted to ensure they remain sustainable, thriving local communities."*

The Plan sets out the following specific aspirations:

Policy LP3: Level and Distribution of Growth

The Local Plan's strategic aim is to facilitate the delivery of 36,960 new dwellings and the creation of 11,894 Full Time Equivalent (FTE) net new jobs over the plan period 2012–2036, distributed as follows:

a. Lincoln Strategy Area – around 64% (23,654) of the total homes and employment land needed, delivered through a combined strategy of (and in priority order):

i. Urban regeneration;

ii. Sustainable urban extensions to Lincoln; and

iii. Growth at settlements which serve, and are serviced by, Lincoln."

The Plan also sets out the location of SUEs in the Greater Lincoln area, which are:

- Lincoln Western Growth Corridor (WGC): Includes the delivery of approximately 3,200 dwellings and 20 hectares of employment and leisure land;
- Lincoln South East Quadrant (SEQ): Includes the delivery of approximately 6,000 homes (3,600 in the plan period up to 2036) and 7 hectares of employment land;
- Lincoln North East Quadrant (NEQ): Approximately 1,400 homes and 5 hectares of employment land; and
- Lincoln South West Quadrant (SWQ): Approximately 2,000 homes and 5 hectares of employment land.

In relation to the SWQ, the Plan states that it will be developed up to the existing North Hykeham settlement boundary and down to the line of the NHRR and as such the development should not prejudice the potential delivery of the bypass or the dualling of the bypass in the future. Policy LP36 states that all developments should demonstrate, where appropriate, that they contribute to supporting the NHRR which will reduce congestion, improve air quality and encourage regeneration of the city.

NHRR will support the ***CLLP*** objectives by:

- Providing the necessary infrastructure improvements to the strategic network to support the necessary planned growth;
- Reducing congestion on key parts of the network; and
- Supporting the delivery of the SWQ by providing direct access.

2.4 GREATER LINCOLNSHIRE LEP

The Greater Lincolnshire Local Enterprise Partnership (LEP) consists of the unitary authorities of North Lincolnshire and North-East Lincolnshire together with the county of Lincolnshire and its seven districts.

Its key strategy is the **Greater Lincolnshire Strategic Economic Plan (SEP) 2014 - 2030**, which identifies Lincoln a major centre for Lincolnshire's strongest economic sectors including manufacturing and the visitor economy. It is home to global manufacturing businesses as well as important visitor attractions such as Lincoln Castle and Cathedral. The SEP identifies that improving Lincolnshire's connectivity and transport infrastructure is vital to achieving growth and the economic aims and objectives outlined in the SEP. It sets out a number of challenges:

- Poor road connections to priority national markets;
- Demand for the movement of people and goods will continue to grow across Greater Lincolnshire, putting increased stress on existing transport network; and
- Over four million lorry loads of goods per year add to pinch points in traffic congestion and poor access will weaken the future sustainability of the economy.

It also includes the following priorities:

- To drive the growth of the area's defining and strongest sectors which offer the most competitive advantage (agri-food; advanced manufacturing and engineering; the low carbon economy; and visitor economy);
- To grow specific opportunities identified as future defining features of the area (health and care sector; and ports and logistics);
- To drive growth by expanding into new markets and infrastructure improvements;
- To promote Greater Lincolnshire as a place for sustainable growth through improved transport infrastructure to enhance connectivity with national and international markets; and
- To recognise the need for new housing for the existing local population and potential movers to the area, and support balanced housing and economic development through promoting the area's capacity to deliver high-quality growth.

The SEP also identifies the A46 as a key corridor around Lincoln and emphasises that priority must be given to, amongst other priorities:

- Promoting Greater Lincolnshire as a place for sustainable growth through improved transport infrastructure to connect us with national and international markets; and
- Recognising the need for new housing for the existing local population and potential movers to the area, and supporting balanced housing and economic development through promoting the area's capacity to deliver high quality growth.

NHRR will support the ***SEP*** objectives by:

- Completing the ring road and in doing so support priority sectors within Lincoln and the wider Lincolnshire economy including agri-food; advanced manufacturing and engineering; the low carbon industry, with a particular focus on renewable energy; and the visitor economy.
- Support the delivery of the SWQ by providing direct highway access.

2.5 GREATER LINCOLNSHIRE LEADERSHIP BOARD

The Greater Lincolnshire Strategic Infrastructure Delivery Plan, which has been ratified by the Greater Lincolnshire Leadership Board with responsibility for the devolution deal with government, states that whilst Greater Lincolnshire has a comprehensive road network, it faces a number of key challenges, including:

- Tackling rising congestion in town centres and at key pinch points across the region;
- Accommodating housing growth through investment in urban distributor roads and associated infrastructure; and
- Increasing accessibility across Greater Lincolnshire to areas that are currently inaccessible for employment and freight journeys.

Included amongst the medium-term road schemes listed within the delivery plan is the NHRR. The plan identifies the need for the provision of a bypass around Lincoln's southern quadrant to address existing congestion as well as enable the development of housing around the area. Further to this, the plan emphasises how a new link will:

- Support agricultural businesses in and around Lincoln;
- Support business growth through improved connectivity;
- Improve air quality within the urban area; and
- Unlock proposed South West Quadrant with around 2,000 homes.

The Greater Lincolnshire Strategic Infrastructure Delivery Plan highlights the NHRR as a medium-term road scheme.

2.6 CITY OF LINCOLN COUNCIL & NORTH KESTEVEN DISTRICT COUNCIL

On a smaller geography the policy and strategy documents covering Lincoln and North Kesteven include the **City of Lincoln Council Strategic Plan Vision 2020** and **The North Kesteven Plan 2018-21.**

The **City of Lincoln Council Strategic Plan Vision 2020** sets out the following issues:

- Increased rail traffic through the city centre results in longer waiting times for road traffic at the two rail crossings;
- The need to improve connectivity between Lincoln, Central Lincolnshire and the Humber area, which is experiencing significant growth;
- There are two AQMAs in the city, which can have an impact on the health of the population with traffic accounting for around 13% of Lincoln's CO_2 emissions;

- Inequality of access to services and opportunities; and
- Over 2,000 households on the affordable housing waiting list in Lincoln.

The Strategic Plan calls for further development in transport infrastructure to improve regional and national connectivity as well as the need to support economic growth and the delivery of quality homes. It states that by 2020 it aims to:

- Drive economic growth;
- Deliver quality housing;
- Reduce inequality; and
- Enhance our remarkable place.

It cites a southern relief road bypass as being key to facilitating growth and opening up employment opportunities in addition to being pivotal in completing the ring road around the city.

The North Kesteven Plan 2018-21 identifies poor and limited transport infrastructure as resulting in a perception that the district is remote. The plan aims to:

- Facilitate the delivery of new jobs, homes and infrastructure to support long term growth;
- Work in partnership to improve the quality of life, economic performance and environmental sustainability;
- Inspire community participation to deliver local aspirations; and
- Transform services to meet the changing needs of the district.

The NHRR will improve connectivity to the district and in doing so support economic growth aspirations.

NHRR will support **the *City of Lincoln Strategic Plan Vision (2020)*** and ***The North Kesteven Plan 2018-21*** objectives by:

- Providing a complete ring road which improves connectivity between Lincoln, Central Lincolnshire and the Humber area.
- Improving east-west connectivity in the south of Lincoln for strategic and local traffic resulting in improved access to North Kesteven and therefore improving access to services and economic growth opportunities.
- Support housing delivery by providing direct highway access to the SWQ.

At the local level **the Hykeham Neighbourhood Plan** states that the area is car-centric and is not conducive to more sustainable forms of travel. It also states that North Hykeham suffers from considerable traffic congestion, particularly at peak times, and that South Hykeham village is subject to ‘rat running’. The plan highlights that a bypass would address many of these concerns and has been identified as a priority. It also highlights that the NHRR and its associated benefits would contribute to the Neighbourhood Plan objectives, which are:

- **Growth:** Managed and sustainable development with proportional growth will safeguard Hykeham’s characteristics as a desirable place to live and work. Growth presents an opportunity for future developments of the highest standard of design, both in terms of quality and environmental sustainability.

- **Transport and Infrastructure:** New and improved infrastructure will be provided in Hykeham, further improving the quality of life for residents by providing realistic and attractive opportunities for use of sustainable transport to get everyone to 'where they want to be'.
- **Community and Facilities:** Hykeham will grow as a place with a distinct, strong and enviable social and physical identity; along with the facilities necessary to support its growing population, providing an improved range of services and amenities aimed at serving the whole Hykeham community.

The NHRR will support the Hykeham Neighbourhood Plan objectives by reducing rat running traffic through South Lincoln and North Hykeham as a result of east-west traffic transferring onto the NHRR. The delivery of the NHRR is identified as contributing to the Neighbourhood Plan objectives.

2.7 MIDLANDS ENGINE

The Midlands Engine is a coalition of Councils, Combined Authorities, Local Enterprise Partnerships, universities and businesses across the Midlands, which includes Lincolnshire. The key challenges and objectives for Midlands are set out within the **Midlands Engine Strategy (2017).** The key transport related investment areas and challenges are set out within **Midlands Connect Strategy: Powering the Midlands Engine (2017).**

Midlands Engine Strategy (2017) looks at the challenges the area faces, ensuring investments and interventions are targeted effectively. The strategy focuses on five key objectives:

- Improving connectivity in order to raise productivity;
- Strengthening skills in order to make the Midlands a more attractive location for businesses;
- Supporting enterprise and innovation in order to foster a more dynamic regional economy;
- Promoting the Midlands nationally and internationally in order to maximise trade and investment in the region; and
- Enhancing quality of life in order to attract and retain skilled workers, as well as to foster the local tourist economy.

Midlands Connect Strategy: Powering the Midlands Engine Strategy (2017) highlights 'Humber Ports – Lincoln – Nottingham – Derby – Birmingham and Nottingham – Derby – North Staffordshire' as one of six intensive growth corridors. It states that strategic transport investment will be focussed on these growth corridors with an aim to tackle congestion, support housing growth and improve the transport user experience. The strategy recognises that the road network is not performing at the level needed to support the economy, with 60% of businesses reporting that conditions cause them problems. As a result, two transport-related aspirations are:

- Improving journey times - average speeds of journeys on the SRN to be 60mph at all times of day and all days per week in line with the Government's vision set out in the Road Investment Strategy; and
- Increasing Network Resilience - all journeys within each time period can be completed within 20% of the median journey time for that period.

The principle to drive growth by supporting multi-modal investment in transport is underpinned by the following objectives:

- To support the vision of the Midlands Engine through a transport strategy to transform strategic transport networks; and

- To maximise economic growth through increasing productivity of existing businesses and unlocking the creation of new jobs across the region.

In addition, the strategy lists a number of intended outcomes to improve the quality of life of those living and working in the Midlands:

- Commuters spending less time sitting in traffic congestion;
- People having better access to employment in the region;
- Reduction in negative impacts of travel including noise and pollution; and
- Opening up new job opportunities and sharing prosperity across the region.

The Strategy also identifies number of major infrastructure projects needed to improve the connectivity of key locations to help drive economic growth and power the Midlands Engine. Congestion on the A46 is one of the early priorities listed by Midlands Connect, and specifically lists a number of improvements schemes to improve resilience along the route including upgrading the A46 Newark Northern Bypass to dual carriageway.

NHRR will support the ***Midlands Engine Strategy (2017)*** and ***Midlands Connect Strategy: Powering the Midlands Engine Strategy (2017)*** objectives by:

- Reducing congestion, improving travel times and connectivity for users which results in:
  - Improving conditions for business growth which will help to unlock employment land; attract foreign investment; and provide greater certainty to businesses through improving access to skills.
  - Accommodate a greater number of users, which, combined with reduced congestion contributes to greater productivity.
  - Commuters spending less time in traffic congestion.
- Unlocking housing land which will expand the labour market; grow the skilled workforce; retain young people; increase local expenditure; and attract investment.
- Completion of the ring road will improve Lincoln's overall connectivity and in doing so will:
  - Support priority sectors within Lincoln and the wider Lincolnshire economy including agri-food; advanced manufacturing and engineering; the low carbon industry, with a particular focus on renewable energy; and the visitor economy.
  - Improve connection to the Humber Ports which improves opportunities for national and international trade.
  - Reduce congestion on the A46 (part of the SRN) as traffic reassigns to NHRR.
  - Improving access to employment opportunities.
  - Improved network resilience.

2.8 HIGHWAYS ENGLAND

The **Highways England North and East Midlands Route Strategy (2015)** informs the Road Investment Strategy for Road Period 1 up to 2020 which sets out the investment plan and performance requirements for the network for the next five years. Key strategic outcomes of this investment are:

- Supporting economic growth through a reliable network that reduces delays, creates jobs and opens up new areas for development;
- A safe and serviceable network where no one should be harmed when travelling or working on the network;
- A more free-flowing and resilient network where routine delays are more infrequent and journeys are more reliable;
- An improved environment where impacts are further reduced ensuring a sustainable benefit to the environment; and
- A more accessible and integrated network that provides people with the freedom to choose their mode of transport.

Capacity issues have been identified at a number of locations, including the A46/A1 junction in Newark, which in turn also presents a safety challenge at this particular junction. The strategy also picks up on the single carriageway sections of the A46 between Newark and Lincoln which cause unreliable journey times and delays.

A number of committed/funded major road schemes are included within the strategy, one of which is the A46 Newark Northern Bypass which involves widening the A46 north of Newark to dual carriageway, raising the last section of the A46 between the A1 and M1 to Expressway standard and improvements to the A46/A1 junction to allow for better traffic movement to Newark and Lincoln.

NHRR will support the **Highways England North and East Midlands Route Strategy (2015)** objectives by improving route choice resulting in less congestion and faster journey times on the A46 (SRN) as a result of traffic transferring on to the NHRR. This will result in improved conditions on the A46 in terms of network resilience, journey times and journey time reliability, which will all support economic growth.

The **Highways England Delivery Plan** discusses how it will work with stakeholders to develop a package of integration measures to deliver a more accessible and integrated network. The plan identifies five key strategic outcomes:

- Supporting economic growth – through a modern and reliable network that reduces delay, thereby creating jobs, helping businesses and opening up new areas for development;
- A safe serviceable network – where no one should be harmed when travelling or working;
- A more free-flowing network – where routine delays are less frequent and journeys are safer and more reliable;
- An improved environment – where activities ensure long term and sustainable benefit to the environment; and
- A more accessible integrated network – HE will work with local authorities and other transport hubs to facilitate other modes of transport and enable safe movement across and alongside HE's network.

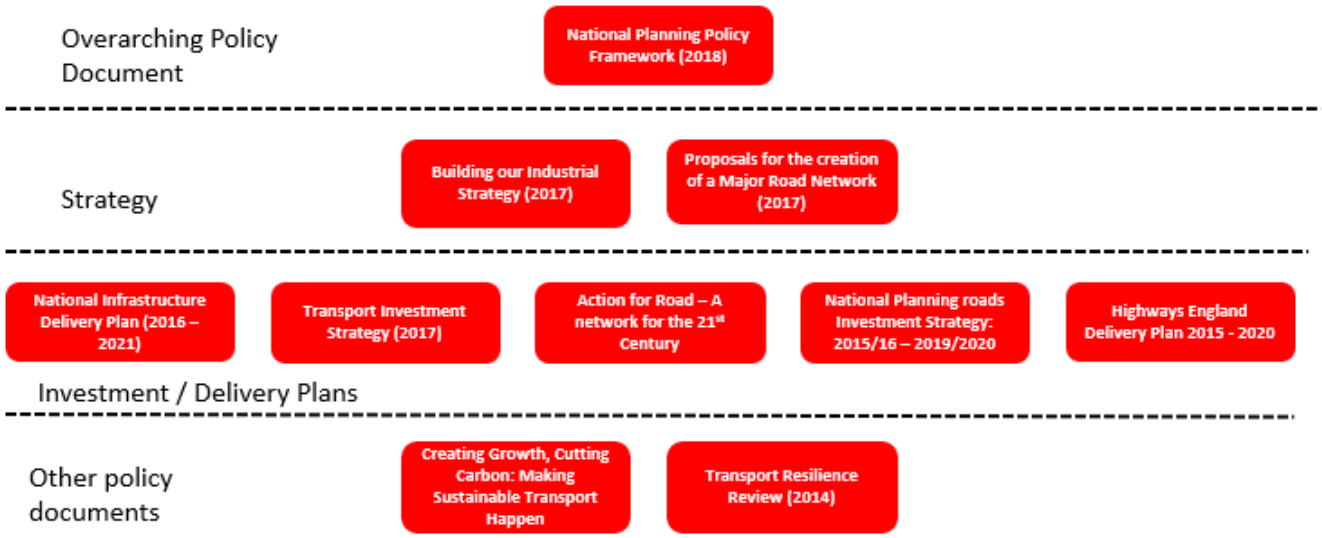
The plan specifically identifies the A46/A616/A617 and A46/A1 junctions for improvements in the next road period to create smooth running of the Newark bypass and to support planned growth in the region. Options will include use of technology to provide better information and promote greater network resilience. These improvements can be capitalised on, and in turn can support the vision of a package of integration measures with the provision of a southern bypass connecting the A46 to the A15.

NHRR will support the **Highway England Delivery Plan** objectives by improving route choice resulting in less congestion and faster journey times on the A46 (which is part of the SRN) as a result of traffic transferring on to the NHRR which ultimately supports economic growth aspirations.

2.9 NATIONAL POLICY & STRATEGY CONTEXT

The NHRR is aligned with national policies (see Figure 2-1) as well as the local and regional policies outlined above. The scheme will support the key national transport priorities including improving infrastructure and connectivity for both vehicular traffic and sustainable transport modes.

Figure 2-1 - National Policy Documents



The **National Planning Policy Framework (NPPF)**[1] sets out the government's planning policies for England and how these are expected to be applied. The framework highlights that the purpose of the planning system is to contribute to the achievement of sustainable development. In achieving this the planning system has three overarching objectives:

- An economic objective - to help build a strong, responsive and competitive economy;
- A social objective - to support strong, vibrant and healthy communities, by ensuring a sufficient number and range of homes can be provided;
- An environmental objective - to contributing to protecting and enhancing our natural, built and historic environment.

[1] An update to the NPPF was published July 2018. This OBC reviews the latest version however the NHRR OAR (2018) (Appendix A) reviews the previous iteration.

The NHRR will contribute to these objectives by:

- Reducing congestion and improving journey times which will support economic growth; and
- Providing supporting infrastructure to deliver a sufficient supply of homes (particularly through the provision of a direct access to the SWQ) and also providing sufficient access to services and employment opportunities from the development. This has been highlighted as a need within the NPPF.

Developed from this overarching policy framework are various strategies. **The Building our Industrial Strategy (2018)** sets out the government's long-term plan to boost the productivity and earning power of people throughout the UK. It provides a national policy framework against which major public and private investments can be made with confidence. The importance of transport in supporting local growth in both urban and rural communities is recognised within the strategy. More broadly, it states that transport investment must seek to create a more reliable, less congested and better-connected network; to build a stronger more balanced economy and to support the creation of new housing.

The NHRR will contribute to these objectives by:

- Unlocking housing land which will expand the labour market; grow the skilled workforce; retain young people; increase local expenditure; and attract investment.
- Reducing congestion and travel times and in so doing:
    - Improve conditions for business growth, which will help to unlock employment land; attract foreign investment; and provide greater certainty to businesses through improving access to skills.
- Completion of the ring road improving Lincoln's overall connectivity and in so doing:
    - Supporting priority sectors within Lincoln and the wider Lincolnshire economy including agri-food; advanced manufacturing and engineering; the low carbon industry, with a particular focus on renewable energy; and the visitor economy.

The **Transport Investment Strategy (2017)** builds on the Industrial Strategy and focuses solely on transport. It sets out the Government's continued investment in transport infrastructure and how it will address specific national challenges related to transport. These challenges include:

- Network connectivity and reliability - By 2040, it is estimated that congestion on the SRN could lead to 28 million lost working days, a £3.7 billion cost to the freight industry, and each household spending an average of 16 hours stuck in traffic a year;
- Productivity and rebalance - UK productivity has been falling behind other G7 countries;
- Global competitiveness - Around a quarter of businesses cite the quality of domestic connections to international gateways as a barrier to exporting; and
- Housing - Current build out rate of new homes is well below the estimated 225,000 to 275,000 homes per year needed to keep up with population growth and tackle years of under-supply.

To meet the challenges described above, the strategy lists a number of objectives, all of which future investment decisions should be focused on:

- Creating a more reliable, less congested and better-connected transport network that works for the users who rely on it;
- Building a stronger, more balanced economy by enhancing productivity and responding to local growth priorities;
- Enhancing global competitiveness by making Britain a more attractive place to trade and invest; and
- Supporting the creation of new housing.

Furthermore, the strategy recognises that a well-connected transport system is fundamental to economic growth and that investment is required to add new capacity to the network in order to create new links between communities and workplaces, connect housing developments to the network and to provide new routes on city and commuter networks.

The contribution of the NHRR to the objectives of the Transport Investment Strategy is assessed within **Appendix B 'Strategic Case - Transport Investment Strategy'**. A brief summary includes:

- **Support the aim to enhance global competitiveness**
  - **Improving trade flows through:**
    - Completing the orbital route around the city of Lincoln, improving east west connectivity in the south of Lincoln for strategic and local traffic;
    - Reducing traffic levels and congestion on the strategic and major route network in Lincoln improving journey times and access to the international gateways (Humber Ports and Airport) and key markets;
    - Improving the resilience of the strategic road network; and
    - Supporting the agri-food sector through reducing congestion, improving access to the wider UK road network and UK ports which will improve productivity by getting goods to market quicker.
  - **Support the visitor economy and tourism within Lincoln through:**
    - Improving the strategic road network and access for visitors and the workforce required to support growth in this sector;
    - Reducing congestion and improving travel times along the major routes to and through Lincoln;
    - Improving route choice to other areas of the city such as the International Bomber Command memorial and reducing the need for visitors to drive through the main urban area and city centre.

- **Improving Productivity & Rebalancing Growth**
  - **The construction and delivery of NHRR will support priority sectors:**
    - **Agri-food:** Through improving the region's strategic road network resulting in improved productivity through getting goods to market quicker;
    - **Advanced manufacturing and engineering:** Advanced manufacturing and engineering sector is highly dependent on access to a young and skilled workforce. NHRR will improve overall access to employment and education opportunities for local residents;
    - **Low carbon economy, with a particular focus on renewable energy**: To support the industry successfully and efficiently; the transporting of goods, skills and services across the region to wind farm locations is crucial. NHRR will strengthen the strategic road network in the region, improving travel times and reducing congestion; and
    - **The visitor economy:** Limited transport infrastructure has been identified as a significant barrier to growth for the visitor economy. Building NHRR and thus improving Lincolnshire's strategic road network will not only improve access the region for visitors but also the workforce required to support the future growth of this sector.
  - **Improving conditions for business growth:**
    - **Reducing congestion and improving travel time**: This will mean goods, services and labour can move more freely, reducing costs for businesses.
    - **Providing greater certainty to businesses through improving access to skills, labour and markets**
    - **Unlocking employment land**
    - **Attracting foreign investment**: By delivering the NHRR and improving Lincoln's wider transport infrastructure, this will contribute towards increasing the area's competitive advantage as an investor location.

- **Support the Creation of New Housing**
  - **Helping meet Lincolnshire's Housing Need:** Approximately 2,200 new dwellings are dependent on the NHRR. This equates to over 5% of Lincolnshire's housing need target to 2036;
  - **Enhancing the local labour market:** The delivery of 2,200 homes could support a resident population of 5,200 people. This population could increase the working age population by 3,000 people, of which almost 2,700 could be economically active;
  - **Supporting new employment opportunities:** The employment floorspace that is proposed dependent developments has the potential to support in the region 1,500 to 1,700 FTEs across a range of B class uses (B1/B2/B8) in the local area;
  - **Supporting the Lincolnshire economy:** Once developed and occupied, the proposed residential development could help generate up to £60m in household expenditure per annum, of which, a significant proportion will be spent on local goods and services, supporting local businesses and employment. In addition, the potential employment resulting from the proposed development could generate up to £100m in GVA and £50m in wages per annum. A proportion of this will be spent on local good and services, supporting jobs and businesses in Lincolnshire; and
  - **Generating local fiscal impacts:** The proposed developments could generate in the region of £4.7m annually.

In terms of the road network the government has committed to creating a MRN across England, as highlighted within '**Proposals for the Creation of a Major Road Network (2017)'**. The MRN aims to:

- Reduce congestion – alleviating local and regional congestion, reducing traffic jams and bottlenecks;
- Support economic growth and rebalancing – supporting the delivery of the Industrial Strategy, contributing to a positive economic impact that is felt across the regions;
- Support housing delivery – unlocking land for new housing developments;
- Support all road users – recognising the needs for all users, including cyclists, pedestrians and disabled people; and
- Support the SRN – complementing and supporting the existing SRN by creating a more resilient road network in England.

The MRN will include the most important 'A' roads and within Lincoln there are aspirations for the inclusion of the A15, A57 and A46. The document also highlights potential funding for significant interventions which offer transformative solutions to the most economically important 'A' roads. These solutions will include, but not be limited to, bypasses and major junction improvements. This provides Lincoln with the opportunity to obtain funding for a major piece of infrastructure to support the inclusion of the above roads as part of the MRN.

The existing congestion issues on the A15 and A46 and forecast levels of traffic growth within Lincoln will likely inhibit any proposal to develop a programme of work along these routes and the effectiveness of the MRN through Lincoln. In line with potential funding opportunities, the NHRR will provide a bypass which will result in the reassignment of traffic from the A15 and A46, resulting in reduced congestion and quicker journey times on these routes. This supports the rationale for the inclusion of these routes.

Action for Road – A Network for the 21st Century (2013) also highlights significant challenges on UK roads including:

- Failures of the road network increase costs and stifle employment opportunities;
- The UK is ranked twenty-fourth in the world for roads, behind many other developed countries; and
- Continued growth of the economy and population means that traffic levels in many areas will rise in the coming decades.

Although not specific to Lincoln, the above strategies echo many of the challenges faced within Lincoln. Key principles derived from the above which inform the development of the NHRR include:

- Support the delivery of a more reliable and less congested SRN;
- The need for a better-connected network to boost global competitiveness; and
- The need to deliver housing.

The NHRR will support Action for Road – A Network for the 21st Century (2013) by:

- Improving route choice resulting in less congestion on the A46 which is part of the SRN and in doing so reduce journey time reliability issues on the route;
- Completing the ring road, improving Lincoln's overall connectivity and in doing so improve journey times which will boost global competitiveness; and
- Support the delivery of the SWQ.

In order to address the challenges highlighted above, the Road Investment Strategy 2015/16 – 2019/20, National Infrastructure Delivery Plan 2016 – 2021 and Highways England Delivery Plan 2015 – 2020 highlight areas of investment over their plan period and specific infrastructure to be delivered.

The **Road Investment Strategy (RIS)** states that transport investment will be made with a view to transforming the SRN by 2040. This will be achieved through delivering a safer, more stress-free journey, as well as enhancing reliability and predictability that is important to businesses. This must be achieved while continuing to work with the wider transport network and supporting new transport developments.

The RIS states the following goals for the national transport network:

- Provide capacity and connectivity to support national and local economic activity;
- Support and improve journey quality, reliability and safety;
- Joining our communities and linking effectively to each other; and

- Support delivery of environmental goals and the move to a low carbon economy.

In relation to Lincoln the RIS echoes the HE Delivery Plan 2015- 2020 and highlights the A46 Newark northern bypass as a scheme to be developed for the next investment period. The scheme will widen the A46 north of Newark to dual carriageway, raising the last section for the A46 between the A1 and M1 to Expressway standard. In addition, there will be improvement to the A46/A1 junction to allow for better traffic movement to Newark and Lincoln.

The NHRR will support the RIS by improving route choice resulting in less congestion and faster journey times on the A46 (which is part of the SRN) as a result of traffic transferring on to the NHRR. This will result in:

- 'Freeing' up capacity on the A46; and
- Improved journey time reliability on the A46.

The National Infrastructure Delivery Plan sets out how £15 billion will be invested to support Highways England in transforming the SRN, with over 100 major schemes completed or in construction by 2020-2021. Although Lincoln is not specifically mentioned within the document, it highlights the need to increase capacity on the SRN along with addressing bottlenecks and transforming regional connectivity, all of which will be supported through provision of the NHRR. The plan also cites that the government is committed to addressing missing links and reducing congestion on the road network to ensure the country has a road network that drives growth instead of constraining it. The plan also highlights the need to deliver new infrastructure such as road and rail links to deliver housing growth.

The NHRR will support the 'The National Infrastructure Deliver Plan' objectives by:

- Reducing bottlenecks on the A46 (SRN) through traffic transferring on to the NHRR; and
- Supporting the delivery of new housing by providing direct access to the SWQ.

In summary, a number of common objectives, issues and investment areas were found across the strategies and policies reviewed, which are summarised in Table 2.1. These key themes inform the development of the NHRR.

Table 2-1 - National Strategy & Policy Aims & Objectives

Policy / Strategy	National Strategy & Policy Objectives				
	Improving connectivity & reliability	Improving route capacity	Enable economic growth	Delivering homes	MRN
NPPF (2018)			✓	✓	
Building our Industrial Strategy (2017)	✓		✓	✓	
Transport Investment Strategy (2017)	✓	✓	✓	✓	
Proposals for the creation of a Major Road Network (2017)	✓	✓	✓	✓	✓
Action for Road - A network for the 21st Century (2013)	✓	✓	✓		
Creating Growth, Cutting Carbon: Making Sustainable Local Transport Happen			✓		
Highways England Delivery Plan 2015 - 2020	✓	✓	✓		
Road Investment Strategy: for the 2015/16 - 2019/20 Road Period	✓	✓	✓	✓	
Transport Resilience Review (2014)	✓				
National Infrastructure Delivery Plan 2016 - 2021	✓	✓	✓	✓	

2.9.1 BUSINESS STRATEGY SUMMARY

The key strategic aims and priorities that the NHRR will support are as follows:

Economic Growth:

- Supporting sustainable economic growth in Lincolnshire and the wider Midlands, through improvements to the transport network;
- Improving access to employment and key services;
- Driving the growth of the area's defining and strongest sectors which offer the most competitive advantage (agri-food; advanced manufacturing and engineering; the low carbon economy; and visitor economy); and
- Growing specific opportunities identified as future defining features of the area (health and care sector; and ports and logistics);

Transport:

- Improving strategic connectivity and accessibility across Lincolnshire;
- Developing transport infrastructure schemes that enable sustainable economic development;
- Improving traffic management and the efficiency of the transport network; and
- Reducing the negative impacts of traffic within Lincoln, including air and noise pollution and severance.

Housing:

- Support the delivery of the CLLP;
- Unlock and support the delivery of housing land including the SUEs; and
- Provide the necessary infrastructure to support the delivery of the SUEs.

3 EXISTING LEVEL OF SERVICE & KEY ISSUES

3.1 OVERVIEW

This chapter identifies the existing level of service and key issues that the NHRR will address. It describes the existing road network and current level of service, examines existing transport demand and identifies a series of key issues that limit connectivity and the ability of Lincoln to grow and develop.

3.2 EXISTING ROAD NETWORK AND LEVEL OF SERVICE

3.2.1 NETWORK FUNCTION

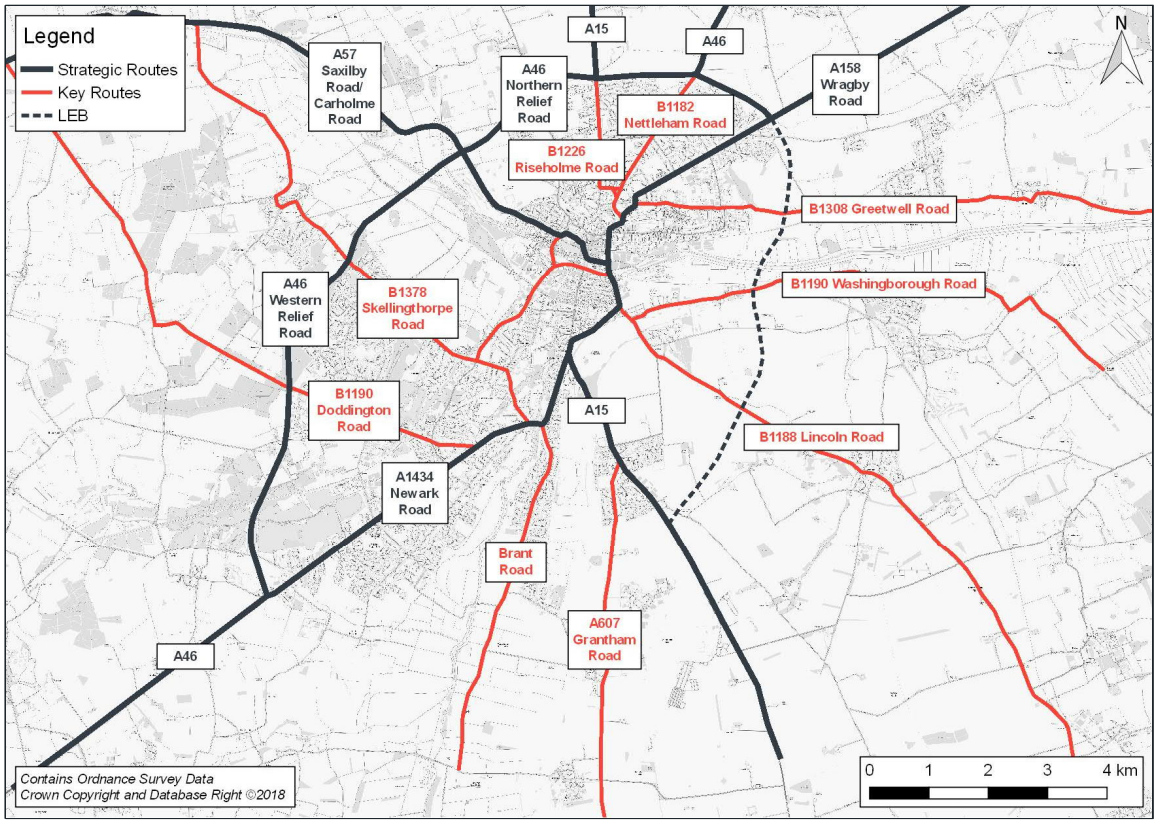
In order to gain an understanding of the existing problems it is necessary to understand how the network currently functions. The existing road network in Lincoln consists of a number of regionally important routes that travel through and around the city, as well as major routes into the city centre and local roads.

The main orbital and strategic routes include the A46 Western Relief Road/Northern Relief Road which forms part of the SRN, the A57 Saxilby Road/Carholme Road on the western side of Lincoln which provides a key east–west route into the city, the A15 which provides a major north-south route through Lincoln and which also provides a link to the Humber Ports and the A1434 which again provides a route into the city from the south west and passes through several residential areas, including North Hykeham.

There are also a number of other major routes which provide links to the city centre and the surrounding towns and villages. These include the A607 Grantham Road, which also provides access to RAF Waddington, the B1190 Doddington Road and B1378 Skellingthorpe Road which provide radial routes into Lincoln on the western side of the city and the B1308 Greetwell Road, B1190 Washingborough Road and B1188 Lincoln Road which provide radial routes into Lincoln on the eastern side of the city.

The network to the south of Lincoln consists of several rural and local routes which connect the villages to the major routes and roads in the area. These include Blackmoor Road/Station Road, a rural east-west route through the villages of Auborn and Harmston and Brant Road, which provides a north-south route into Lincoln. Figure 3-1 provides an overview of the major routes and the network within the area and the OAR (2018) (see Appendix A) presents a detailed summary of the key strategic, regional and local functions for each route.

Figure 3-1 - Strategic and Key Routes



3.2.2 HIGHWAY STANDARD AND CONSTRAINTS

The capacity of existing strategic and local routes is limited, which impacts on the performance of the local and wider network. Figure 3-2 and Table 3-1 highlight the limited nature of the current provision, where, the network is predominantly formed of single carriageway roads with very few dual carriageway sections, which are confined to two small sections within the centre of Lincoln and northern sections of the existing A46 WRR.

There are also a number of physical constraints and features which have an impact on the transport network within Lincoln. The most significant relate to the location of the rivers, watercourses and rail infrastructure.

Lincoln is bisected by the River Witham and Fossdyke Navigation, which cut through the city in both an east-west and north-south direction (see Figure 3-3). These act as a significant constraint to the transport network as there are limited crossing opportunities. In the centre of the city crossings are limited to the B1272 Brayford Way, the A57 Wigford Way and the A15 Broadgate/Melville Street, as well as the LEB once complete. There are however even fewer opportunities to cross the river in the south of Lincoln and these include a number of relatively minor routes that are particularly unsuited to strategic traffic. They include the B1003 Rope Walk to the south of the city centre, Boultham Avenue and the B1360 Dixon Street, which are both minor residential roads, the A1434 Newark Road and Meadow Lane, a minor rural road in North Hykeham.

The railway lines also bisect the city (see Figure 3-3). These run east-west through the centre of Lincoln and in a north-south direction through Hykeham. The road network crosses the railways via a series of overbridges (A46, B1273 Brayford Way, A15 Canwick Road, Greetwell Road) and level crossings (Brayford Wharf East and High Street in the centre of Lincoln and B1738 Skellingthorpe Road, B1190 Doddington Road, Station Road and Thorpe Road to the south of the city centre).

There are again limited opportunities to cross the rail infrastructure and the location and number of level crossings also has a further constraining effect on the network for both strategic and local movements across Lincoln.

Figure 3-2 - Dual carriageway sections of existing network

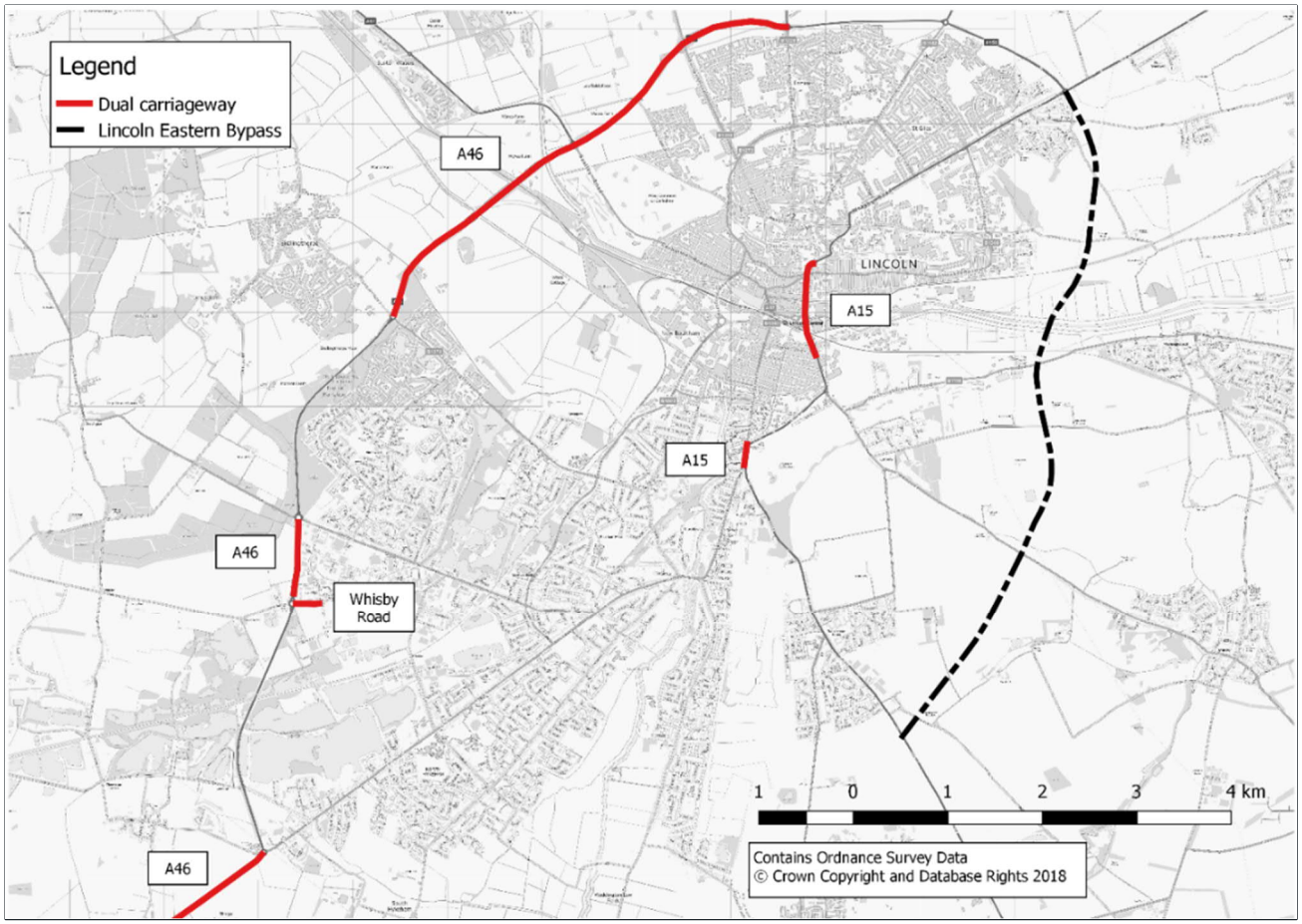
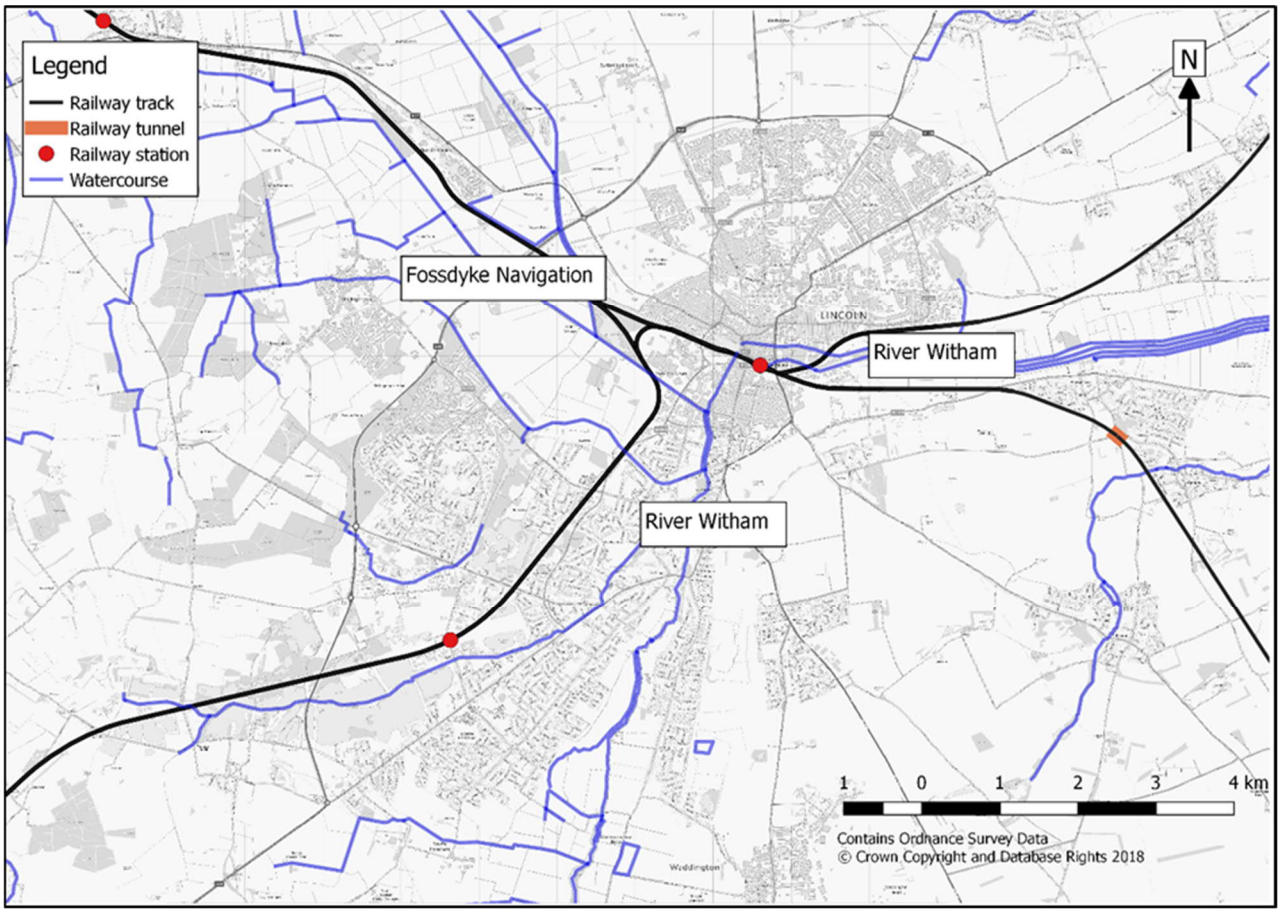


Table 3-1 - Network Standards

Function	Route	Road Type	Overview & Summary
Strategic Route Network	A46	Dual / Single Carriageway	Dual carriageway on approach to Pennell's Roundabout Mixture of single and dual carriageway sections on the western and northern relief road. Southern sections bounded by Nature Park and drainage features
Major Road Network	A57 Saxilby Road / Carholme Road	Single Carriageway	Mixture of rural and urban single carriageway
	A15	Dual / Single Carriageway	Rural / urban single carriageway on approach to Lincoln from both the north and south. Urban dual carriageway through central Lincoln
	A1434 Newark Road	Single Carriageway	Urban single carriageway route Properties front onto the carriageway
	A158	Single Carriageway	Rural single carriageway
	A607 Grantham Road	Single Carriageway	Rural single carriageway on approach to Waddington Properties front onto the carriageway through Waddington and Lincoln
Local Road Network – Key Routes	B1190 Doddington Road	Single Carriageway	Rural single carriageway east of junction with A46 Urban single west of junction with A46
	Whisby Road	Dual / Single carriageway	Short dual carriageway section on approach to Teal Park Single carriageway to the east and west of Teal Park
	B1378 Skellingthorpe Road	Single Carriageway	Mixture of rural and urban single carriageway sections
	B1398 Burton Road	Single Carriageway	Mixture of rural and urban single carriageway sections
	B1226 Riseholme Road	Single Carriageway	Mixture of rural and urban single carriageway sections
	B1182 Nettleham Road	Single Carriageway	Urban single carriageway
	B1188 Lincoln Road	Single Carriageway	Rural single carriageway sections
	B1190 Washingborough Road	Single Carriageway	Mixture of rural and urban single carriageway sections
	B1308 Greetwell Road	Single Carriageway	Mixture of rural and urban single carriageway sections
	Brant Road	Single Carriageway	Mixture of rural and urban single carriageway sections
	Meadow Lane	Single Carriageway	Mixture of rural and urban single carriageway sections
	Blackmoor Road / Station Road	Single Carriageway	Rural single carriageway

Figure 3-3 - Constraints and features impacting on the transport network



3.2.3 ROUTE CHOICE

The existing principal road network also has a number of fundamental challenges and limitations in terms of route choice. North-south traffic has limited route choice, especially in the south of the Lincoln urban area, with traffic forced to use either the A46 or A1434 and A15 to pass by or through the city.

The introduction of the LEB will significantly improve north-south connectivity and help to remove north-south traffic from the centre of Lincoln. However, there will continue to be a lack of east-west connectivity in the south of Lincoln. Traffic travelling from the south west of Lincoln will still be required to use either the A46 or A4134 to travel through or around the city.

The A46/A15 is also a key alternative route from the A1 north through to the nationally important Humber Ports of Grimsby, Immingham and Hull. The A1/A1M/M180 is a longer route to the ports and, although more direct, the A46/A15 is constrained by existing congestion at key junctions and links around Lincoln.

As identified in Section 3.2.2, the limited opportunities for traffic to cross the River Witham, Fossdyke Navigation and the rail lines also provide a constraint. This results in significant volumes of traffic using unsuitable city centre routes and east-west traffic using minor rural routes to the south of Lincoln.

This impacts on the City's historic core and the existing communities and residential areas located to the south of Lincoln. The routes are generally unsuitable for heavy volumes of strategic traffic or the relatively high proportion Heavy Goods Vehicles (HGVs).

Again, although the introduction of the LEB will provide an additional crossing of the River Witham, there will still be a limited number of river crossings. In addition, the limited connectivity from the south west to the eastern side of the city will mean that some north-south traffic will still need to use the centre of Lincoln to cross the River Witham.

The combination of strategic through traffic coupled with locally generated trips results in congestion and severance, particularly south of the city centre. The lack of a strategic orbital connection from the A46 WRR to the A15 results in traffic being forced to use overly complicated and protracted routes along unsuitable local roads, leading to relatively slow speeds and longer journey times, with associated negative impacts on rural and residential communities.

3.2.4 RESILIENCE

The limited capacity of the network, existing constraints and limited number of strategic routes also has an impact on network resilience. When incidents occur, particularly on the major routes, this results in rerouting, longer journey times and congestion throughout the area, impacting on both local and strategic traffic.

The lack of alternatives to the existing orbital ring road and major routes through the city mean that traffic is diverted through urban and residential areas which are unsuited to the additional volumes of traffic. This exacerbates the existing congestion problems already affecting the major routes through the city.

Figure 3-4 shows the official diversion routes during closures of sections of the A46 Lincoln Western Relief Road. The following should be noted:

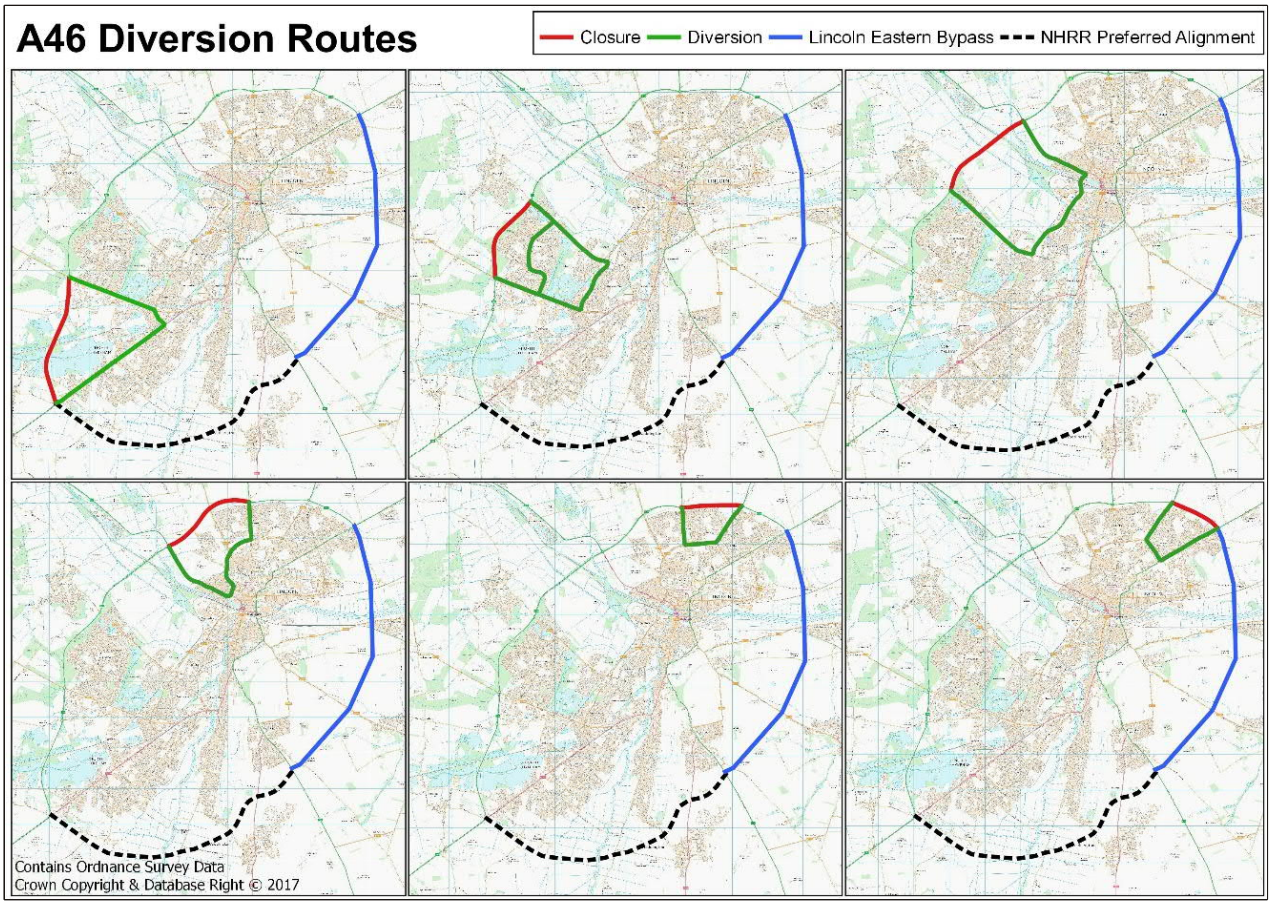
- Closures between the Hykeham and Doddington Roundabouts mean that traffic is diverted on to the A1434 Newark Road, which has many local accesses that create numerous pinch points along the route. Traffic is then directed back towards the A46 along the B1003 Tritton Road and then on to the B1190 Doddington Road, both of which are narrow single carriageways and are not equipped to deal with large amounts of strategic traffic from the A46.
- If a closure occurs further north along the A46 between the Doddington and Skellingthorpe roundabouts, traffic is diverted either along the same section of the B1190 Doddington Road and on to the B1003 Tritton Road before routing back towards the A46 via the B1378 Skellingthorpe Road, or traffic is diverted along Birchwood Avenue which is a local access road. The former is a 7 kilometre diversion route which has a significant negative impact on journey times.
- Network resilience is heavily dependent on where the closure occurs, what time of day it occurs and the volume of traffic on the route at the time. Local traffic is usually accommodated on local routes whereas strategic traffic is directed along the respective official diversion route provided.

There are high levels of seasonal east-west traffic which utilise Lincoln's road network to access the Lincolnshire Coast (predominantly the A46/A15/A158). In the event of an incident or closure on these routes there is little choice of suitable alternatives, which creates severe disruption. In addition, on the eastern side, in the event of a closure along the A15 between Bracebridge Heath and Coleby Heath, traffic is diverted on to sections of smaller local roads, including Heath Road, that are not suited to accommodate strategic traffic. A road closure here is also likely to have an adverse

impact on the residents of Coleby, where the diversion route merges on to the A607 passing through the village of Harmston and Waddington.

Closures elsewhere on the network also have the potential to impact on Lincoln. Incidents on the A1 also result in strategic traffic being diverted past Lincoln. This adds to existing volumes of traffic and congestion problems, which are further exacerbated by the limited number of major routes in the area.

Figure 3-4 - Diversion routes along A46 Lincoln Western Relief Road during closures



The evidence shows that:

The capacity of the road network is currently limited, with very few sections of dual carriageway and limited route choice for north-south and east-west strategic traffic.

Once complete the LEB will significantly improve north-south connectivity. However, there will continue to be limited route choice for east-west movements, particularly in the south of the city.

A further constraint is provided by the limited number of crossings over the River Witham, Fossdyke Navigation and rail lines, which results in strategic traffic being forced to use unsuitable routes and high levels of traffic travelling through existing residential areas.

The resilience of the A46 and A15 principal routes is poor, in that in the event of road closure there is no option but to divert strategic traffic via lower standard, unsuitable local routes adjacent to residential areas.

3.3 EXISTING TRANSPORT DEMAND

3.3.1 RECENT TRENDS IN TRAFFIC GROWTH (2012-2016)

Travel demand has continued to increase over the last few years, both within rural and urban areas in Lincolnshire. The Lincolnshire Transport Monitoring Report (2017) shows that between 2012 (and the economic downturn) and 2016, there has been a 7% increase in vehicle kilometres travelled in Lincolnshire, similar to the national figure of 6.9%. This has continued to put the existing network under pressure, particularly within Lincoln.

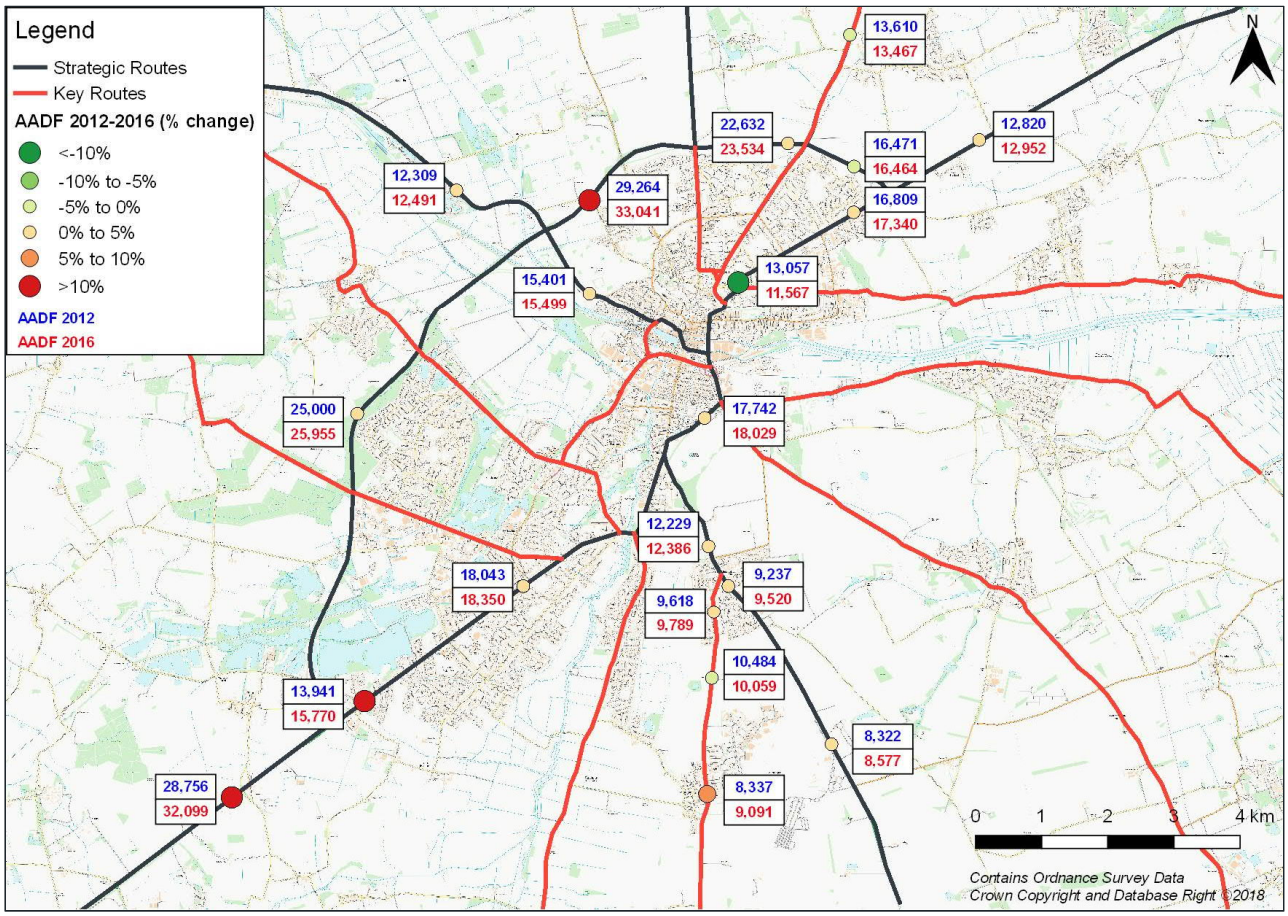
Figure 3-5 shows the change in two-way AADF at DfT count sites around Lincoln's key road network between 2012 and 2016. It shows that traffic volumes on these routes have again started to increase, with a total of 16 out of the 20 count sites seeing an increase. The scale of traffic growth is as high as 13% at some locations over the four-year period. The most significant increases are observed along the A46 WRR and the A1434 Newark Road, which as described earlier forms a primary radial route into the centre of the city from the south west of Lincoln through North Hykeham.

The level of traffic growth over this period is not limited to the strategic routes. The A607 Grantham Road, which serves a number of villages and provides access to RAF Waddington, experienced 9% traffic growth over the period up to 2016[2]. Any continued increase in traffic flows on the major routes

[2] It is noted that one count along the A607 route reported a slight reduction in traffic flow over the period studied. Whilst the definitive reason for this is unknown, the movements of RAF Waddington i.e. the dispersing of the aircraft operating squadrons to other airfields from July 2014 could be a reason for a reduction in trips to/from the site impacting on this section of the A607.

through and around Lincoln will put greater pressure on the network and compromise the ability to meet housing and economic growth aspirations.

Figure 3-5 - Lincoln AADF, 2012-2016 (Data Source: DfT)



Other key points to note include:

Lincoln City Centre: As part of the LTP monitoring process for the Greater Lincoln Area, annual cordon counts were established in Lincoln and around Lincoln city centre. The cordon area and count points are shown in Figure 3.6 since 2013, as with the strategic and major road network there has also been an increase in inbound traffic flows to Lincoln city centre at an accelerated rate. It is expected that this trend will continue, particularly with the planned growth within and around the Lincoln area - further details of which are provided in Chapter 4 – Future Problems.

Figure 3-6

Figure 3-6 - Lincoln Annual Cordon Survey

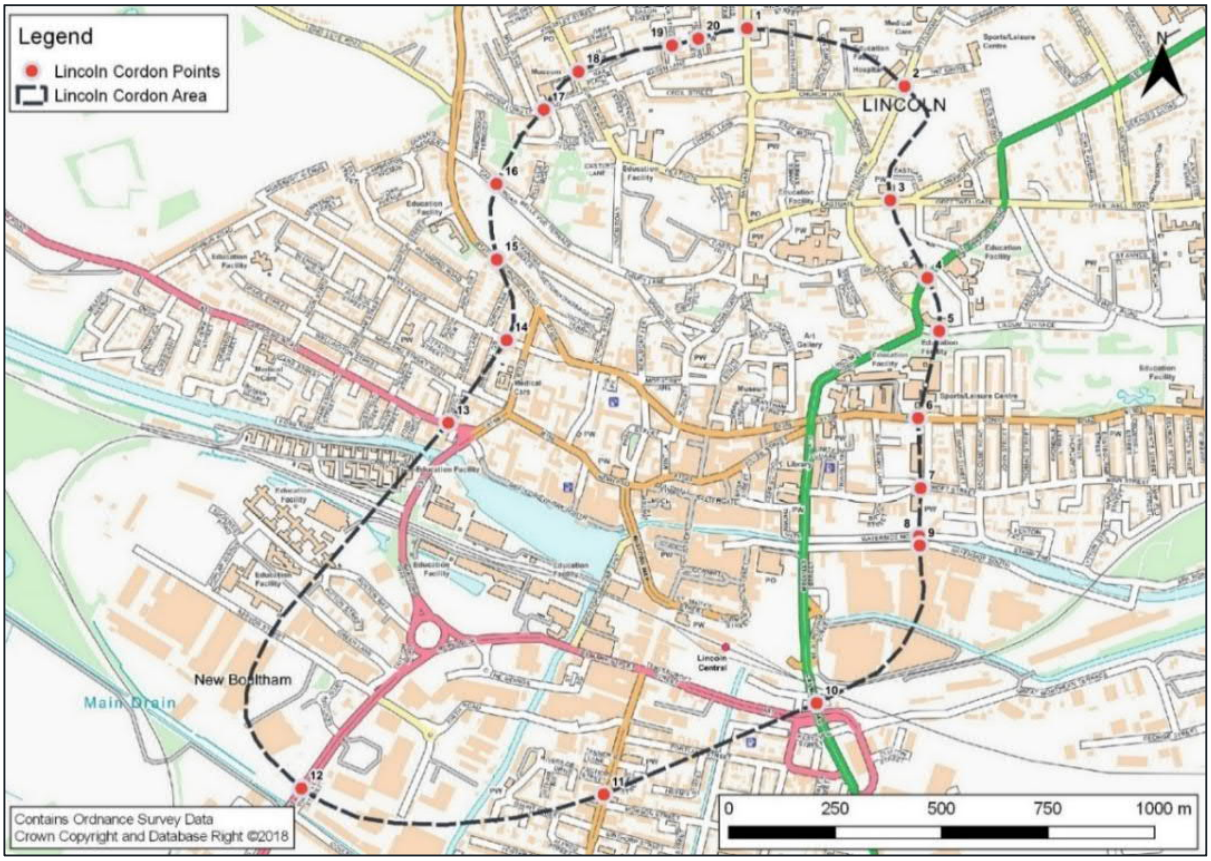
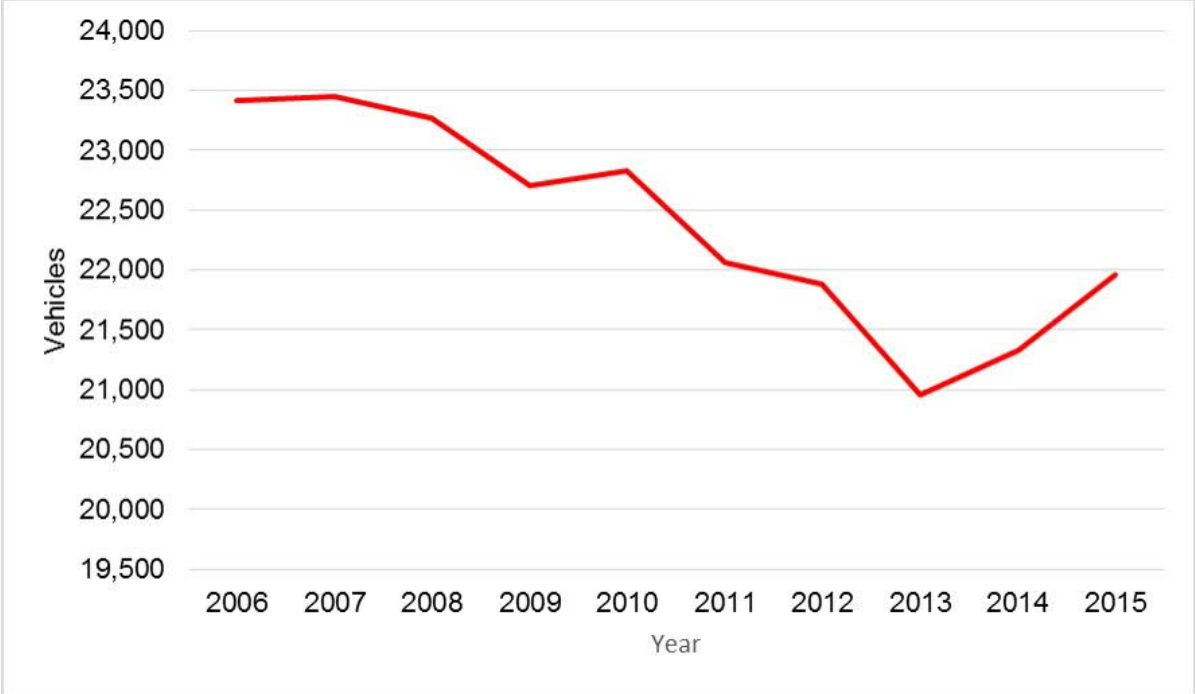


Figure 3-7 - Lincoln Cordon Traffic Counts, Inbound AM Peak, 2006-2015

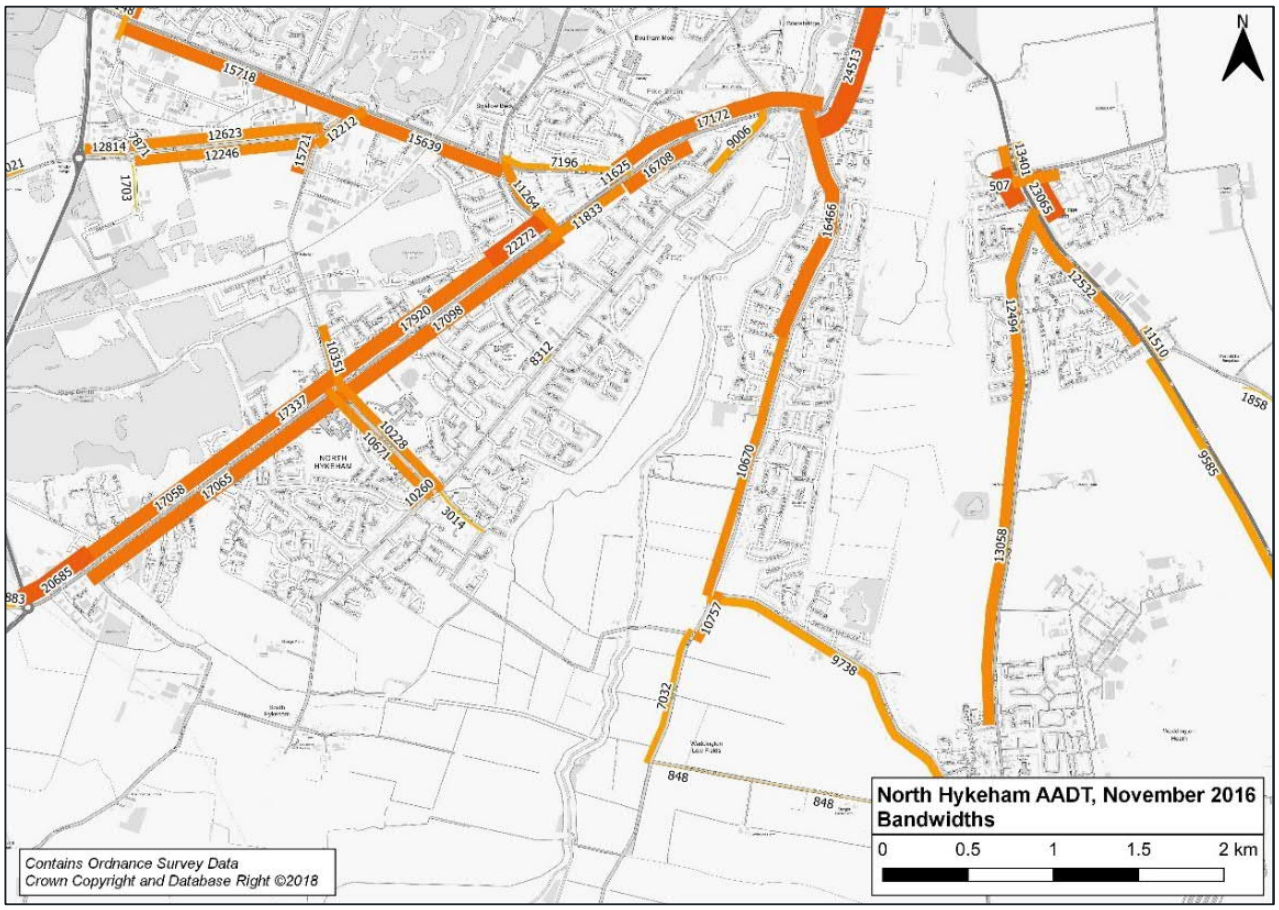


- **Traffic Flows in the Hykeham Area:** The traffic data shows that a number of routes in the south of Lincoln are currently carrying at least 10,000 vehicles on a daily basis. These routes

pass through built up residential areas, often with housing immediately adjacent to the highway. Settlements affected by significant levels of traffic include Bracebridge Heath, Bracebridge/Low Fields Swallow Beck, Boultham and North/South Hykeham. They are unsuitable for high volumes of traffic and are the result of limited route choice for both traffic travelling east west across the southern part of Lincoln and north south towards the city centre. Key points include:

- As previously stated, the A1434 Newark Road currently experiences traffic flows in excess of 17,000 vehicles/day. This is an urban single carriageway road which runs through a predominantly residential area with properties that front on to the carriageway;
- There are significant flows on the other key radial routes in the south of Lincoln that link into the city centre such as Brant Road, the A607 Grantham Road and Lincoln Road where current traffic flows range from 10,000 to 13,000 vehicles per day; and
- More localised east-west routes can also be seen to experience relatively high traffic flows for their characteristics, e.g. Moor Lane, Mill Lane and Station Rd (c10,000 vehicles/day).

Figure 3-8 - North Hykeham AADT, November 2016



3.3.2 EXISTING TRAFFIC FLOWS

The scale of existing traffic flows on the network across Lincoln has been assessed using baseline traffic flows (2016) from the Greater Lincolnshire Transport Model. This has been presented as bandwidth maps for the AM Peak, Inter-Peak and PM Peak periods, as shown in Figure 3-9, Figure 3-10 and Figure 3-11.

Figure 3-9 – Bandwidth AM Peak (2016)

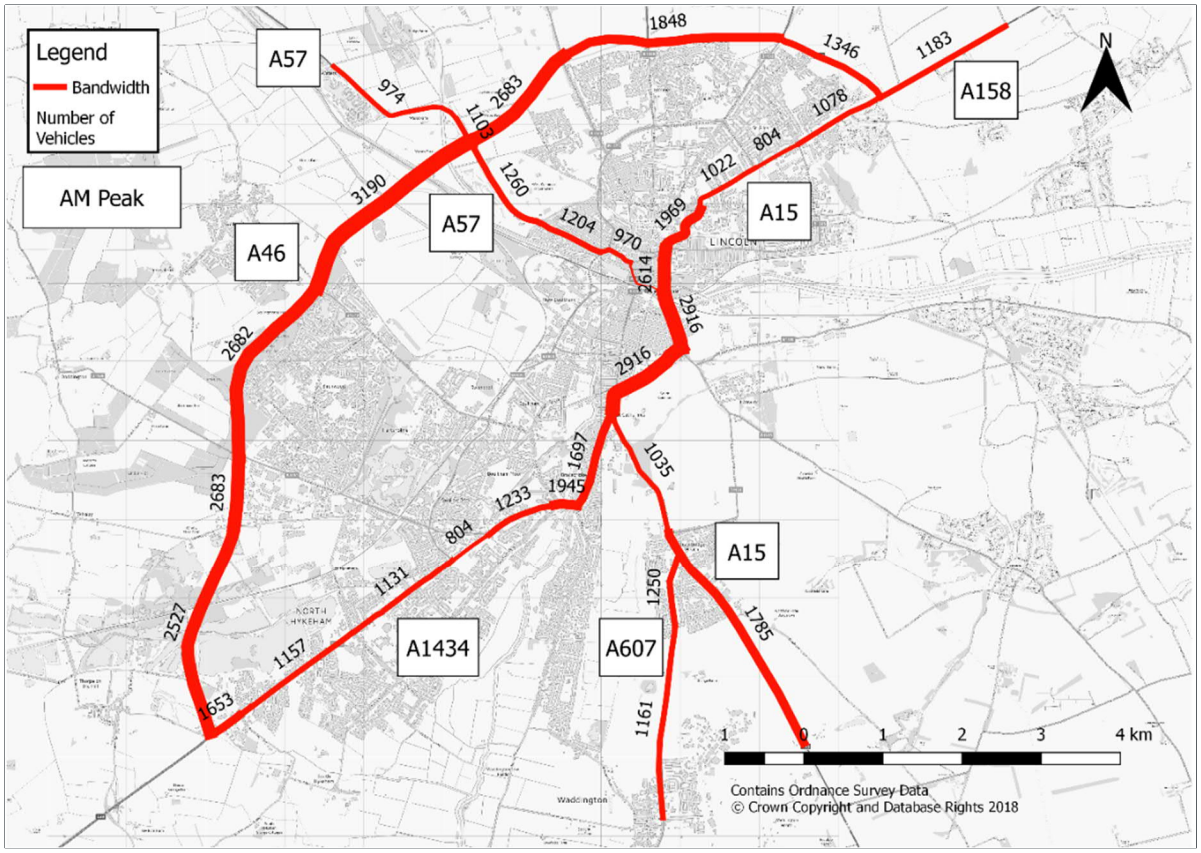


Figure 3-10 - Bandwidth Inter-Peak (2016)

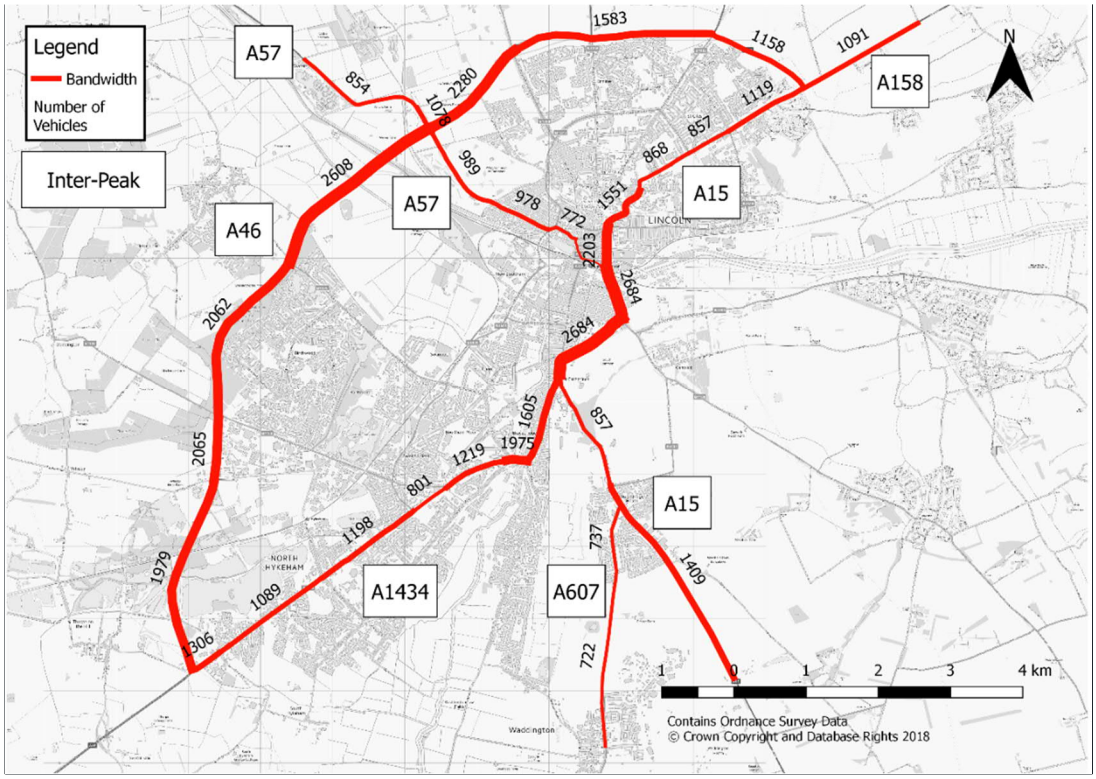
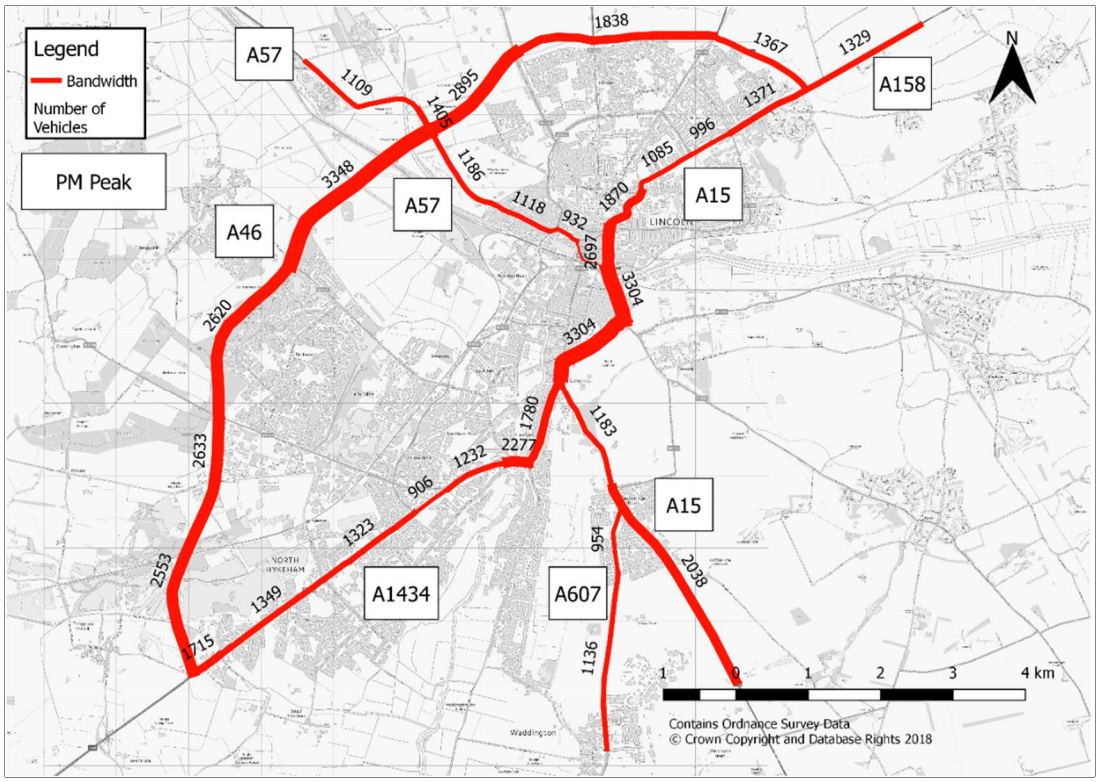


Figure 3-11 - Bandwidth PM Peak (2016)



Key observations are:

- **A46 Western Relief Road:** Traffic flows range from 1,800 to 3,200 in the AM Peak; 1,600 to 2,600 in the Inter Peak; and 1,800 to 3,300 in the PM Peak. The section with the highest traffic flow is the dual carriageway between the A57 Saxilby Road and the B1378, with an Annual Average Daily Flow (AADF) of 42,900 and the lowest flow is the single carriageway section between Riseholme Road and the B1182 (25,100 AADF). The A46 WRR currently provides the only orbital route around the city.
- **A57 Saxilby Road/Carholme Road:** Traffic flows range from 1,000 to 1,300 in the AM Peak; 900 to 1,100 in the Inter Peak; and 1,100 to 1,400 in the PM Peak. The route provides a key east-west link to the centre of Lincoln and the AADF ranges from 13,900 to 17,000 vehicles. The section with the highest traffic flow is on the approach to the A46 junction.
- **A15:** Traffic flows range from 800 to 2,900 in the AM Peak; 900 to 2,700 in the Inter Peak; and 1,000 to 3,300 in the PM Peak. The section with the highest traffic flow is between the B1188 and the A15 Melville Street which is the dual carriageway section that crosses the River Witham and has an AADF of approximately 42,400. The lowest AADF of 13,000 is found on a single carriageway section between Ruskin Avenue and the B1308 Outer Circular Road to the north of the city centre.
- **A1434 Newark Road:** Traffic flows range from 800 to 1,900 in the AM Peak; 800 to 2,000 in the Inter Peak; and 900 to 2,000 in the PM Peak. The section with the highest traffic flow is between Hykeham Road and Brant Road, where there is a crossing of the River Witham, with an AADF of 29,900. As previously stated Newark Road passes through a predominantly residential area.
- **A158:** Traffic flows range from 1,200 to 1,300 in the AM Peak; 1,100 to 1,200 in the Inter Peak; and 1,300 to 1,400 in the PM Peak either side of the Wragby Road East roundabout. The AADF along the single carriageway A158 ranges from 17,200 to 18,400 vehicles. The busiest section is between the A46 and Wragby Road East roundabout which forms part of the northern section of the relief road.
- **A607 Grantham Road:** Traffic flows range from 1,200 to 1,300 in the AM Peak; flows of approximately 700 in the Inter Peak; and 900 to 1,100 in the PM Peak. The section with the highest traffic flow is between Waddington and Grantham Road with an AADF of 13,600 and to the north of this falls slightly to 13,400.

The analysis demonstrates that high demand on the existing network extends beyond the AM and PM peaks to the Inter Peak.

Analysis of traffic routing using Select Link Analysis shows how these routes are currently being used. Full details are provided in the OAR (2018) (Appendix A), which can be summarised as follows:

- 15% to 20% of traffic using the A46 travels the full length of the orbital route, which indicates that these are strategic journeys which do not originate in and are not destined for Lincoln. The remainder of traffic using the route dissipates into the urban area or originates from this area.
- The A1434 Newark Road forms a key radial route between the urban area of Lincoln and the A46. Select Link Analysis shows that the majority of traffic dissipates on/off Newark Road from/to the local road network. This indicates that the majority of journeys utilising Newark Road are destined for or originate from the urban area of Lincoln with around 30% travelling to/from the A46 south of Pennells roundabout.

- The vast majority of journeys on the A15 Sleaford Road, which forms a key radial route to the south east of Lincoln, originate from or are destined for the urban area of Lincoln.

There is significant existing demand on the key strategic and major routes, and traffic is forced to use a limited number of routes to pass through and around Lincoln. Although the LEB will significantly improve north-south connectivity, there will continue to be limited route choice for east-west movements, particularly in the south of the city. It is also reasonable to assume that without further investment it will be difficult for the limited number of major routes within Lincoln to accommodate any significant growth without a deterioration in conditions.

On the SRN and proposed MRN there are several links that current carry significant volumes of traffic:

A46: The A46 is currently the only orbital route of Lincoln and therefore provides a key route for strategic traffic. In 2016 the AADF ranged from approximately 26,000 to over 42,000 and within the peak hours 1,800 to 2,900. The highest traffic flows were found between the junction with Saxilby Road and the A15. From 2010 to 2016 the volume of traffic grew significantly (up to 12.9%) on sections of the A46.

A15: The route provides a key radial link into the city centre from the south east of Lincoln. In 2016 AADF on the single carriageway sections to the south of Lincoln ranged from approximately 8,500 to over 12,400 and within the peak hours 800 to 3,300. DfT counts show a steady growth of traffic of around 3% from 2010 to 2016. Crucially the A15 will provide a link on to the southern and northern sections of the LEB.

A1434: The A1434 is a key radial route between the city centre and the A46 where a high proportion of traffic uses the route for access to/from residential areas in the urban area of Lincoln. In 2016 the AADF ranged from approximately 16,000 to over 18,000 and within the peak hours 800 to 2,200. DfT counts show in parts a significant growth in traffic from 2010 to 2016 of over 13%.

On the local network several routes in the Hykeham area experience relatively high traffic volumes given the nature of the routes and their location. Key points include:

Moor Lane, Mill Lane and Station Road carry circa 10,000 vehicles/day. Critically these routes pass through residential areas, often with housing immediately adjacent to the highway.

Meadow Lane currently forms an important east west link between radial routes to the south of Lincoln and is the only crossing point of the River Witham to the south of Lincoln. Without another viable alternative Meadow Lane will continue to carry significant voulmes of traffic compared to its design standard.

3.4 EXISTING TRANSPORT KEY ISSUES

3.4.1 OVERVIEW AND CONTEXT

The existing network limitations, lack of route choice and limited existing capacity result in a number of transport related key issues, as described in detail in this section. Traffic conditions have significantly deteriorated on the Western and Northern Relief Roads since their construction in the 1980s, with significant peak period congestion experienced on a number of links and at several junctions. This is likely to worsen over the next 20 years due to the planned growth in Central Lincolnshire as set out in the CLLP, and in neighbouring authorities as set out in other emerging Local Plans.

3.4.2 LINK CAPACITY

An assessment of existing link capacity on the Lincoln area road network for the AM and PM peak highlights the locations where the network is already operating at capacity.

Volume to Capacity Ratio (VoC) is a measure of the capacity of a road in terms of the number of vehicles using the road divided by the number of vehicles which could theoretically use the route. Where the VoC is less than 1.0 or 100%, there is reserve capacity on the road. Figure 3-12 and Figure 3-13 present the link VoC for the existing network (2016), for the AM and PM peaks respectively. The colour shading highlights the VoC in the form of a traffic light system, where green represents links with traffic volumes generally within practical operating capacity and the red links show sections of the network which are operating at or in excess of practical operating capacity. The figures indicated the actual flows on each link.

Figure 3-12**Figure 3-12** illustrates that the single carriageway sections of the A46 WRR are clearly operating close to or at capacity, particularly the stretch between Junction 3 (Doddington Roundabout) and Junction 4 (Skellingthorpe Roundabout), where the VoC is between 85% and 100%. In addition, the northbound lane between Pennell's roundabout and the Whisby Road junction is operating at 92% capacity which indicates clear issues for northbound traffic during the AM peak.

Several local roads within the city centre and to the south of the city have high traffic flows with Meadow Lane westbound operating at 81% capacity - this route provides a key route across the River Witham in the south of Lincoln.

Figure 3-13 indicates that the same capacity related issues are generally present on the network for road users during the PM peak. Sections of the A46 WRR are operating close to or above the 85% - 100% threshold. It is also evident that more links in the city centre appear to be operating close to capacity during the PM peak, including the A15/B1188 Canwick Road and the B1003 Silver Street.

Notably, the eastbound lane on the A46 Northern Relief Road between the A15 and A46 Welton Road junctions is operating at 80% capacity, which also suggests issues during the PM peak for traffic heading out of the city centre.

Figure 3-12 - 2016 Base Year Volume to Capacity Ratio, AM

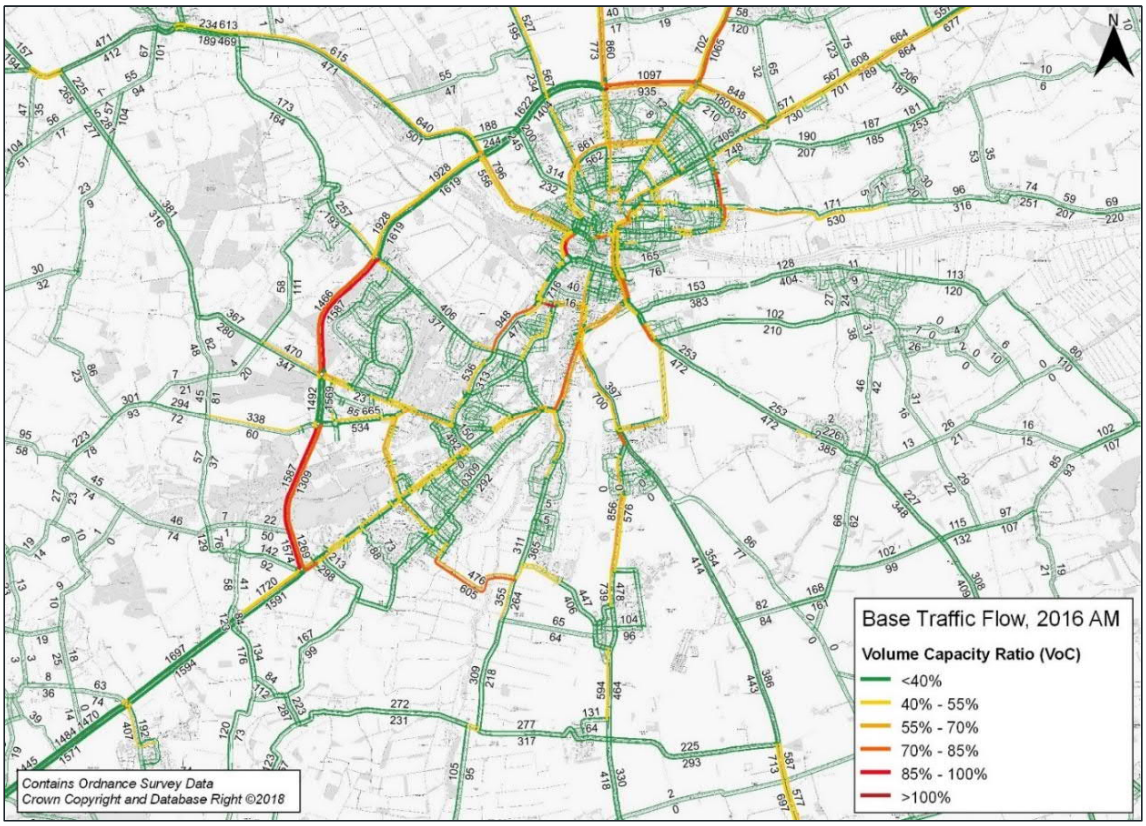
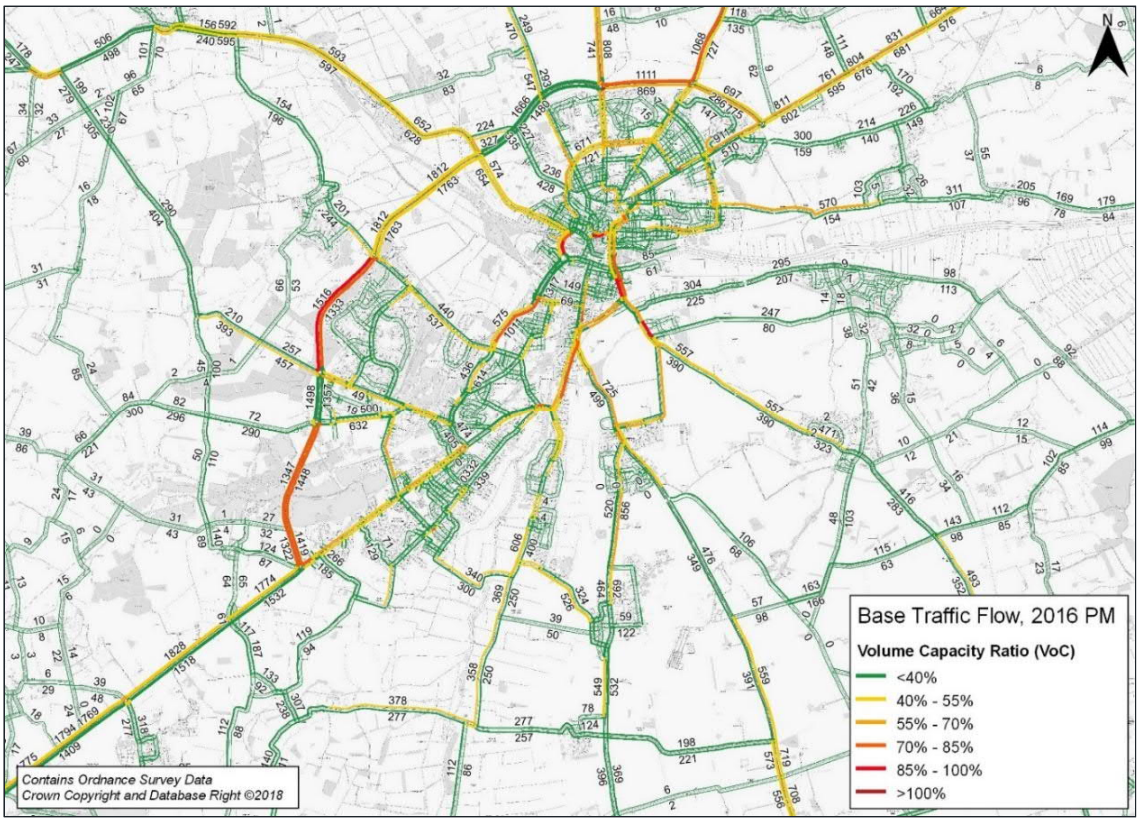


Figure 3-13 - 2016 Base Year Volume to Capacity Ratio, PM



3.4.3 JUNCTION VOLUME CAPACITY RATIO

The assessment of VoC also indicates the junctions which are already experiencing capacity issues across the network. The assessment looks at the VoC during each peak period on the approach arms at several key junctions in the study area. The analysis shows that the following junctions are already operating above practical capacity (>85%):

- A46/Whisby Road;
- A46/Doddington Road; and
- A46/Lincoln Road.

The following junctions are assessed to be approaching practical capacity (>70-85%):

- A46/Newark Road;
- A46/A158;
- Newark Road/A15;
- A15/Greetwell Road;
- Greetwell Road;
- Skellingthorpe Road/Tritton Road; and
- Lincoln Road/Moor Lane/Chapel Lane.

As shown in Figure 3-14, in the AM peak the junctions with capacity issues are located at the key entry points to the city centre, including the A46 WRR junctions, A15/A1434, A15/Greetwell Road and Doddington Road/Tritton Road junctions. A similar situation is observed during the PM peak (Figure 3-15) and it is reasonable to presume that future growth across Lincoln will contribute to increasing congestion at these junctions and a deterioration in operation.

An alternative route to the WRR would deliver greater route choice and capacity and reduce the pressures of increasing levels of traffic at junctions at peak times, particularly those identified below – improving conditions and the overall operation of the highway network.

Figure 3-14 - Max Junction VoC, 2016 AM

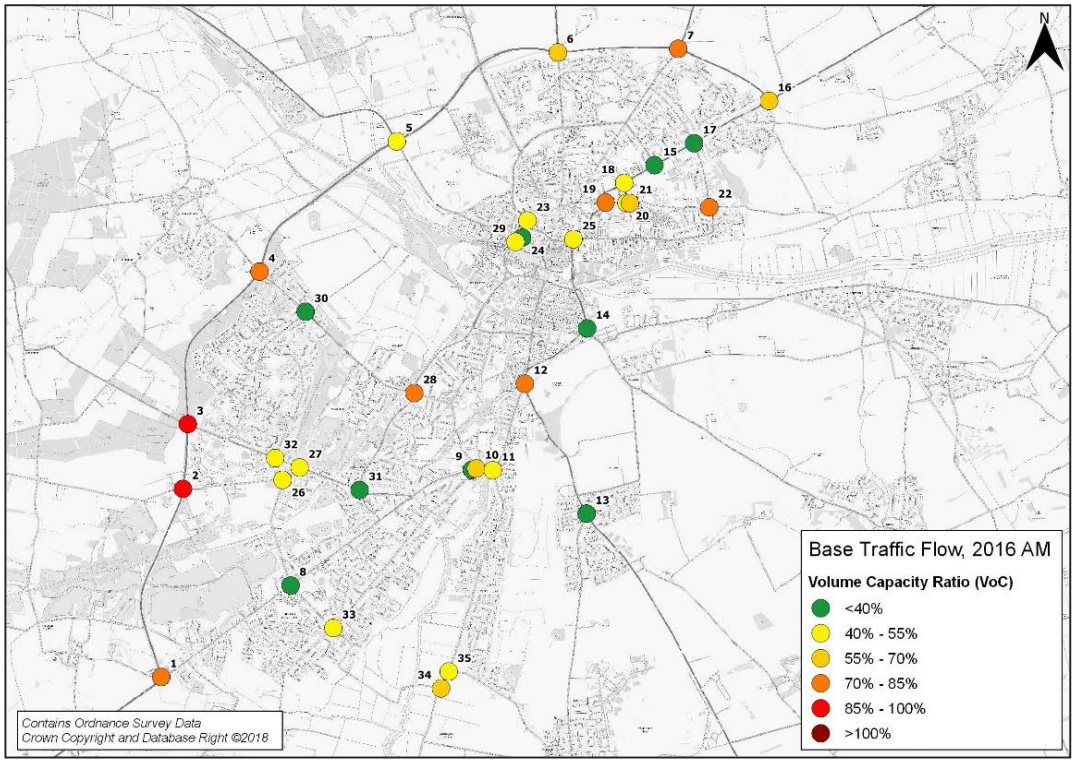
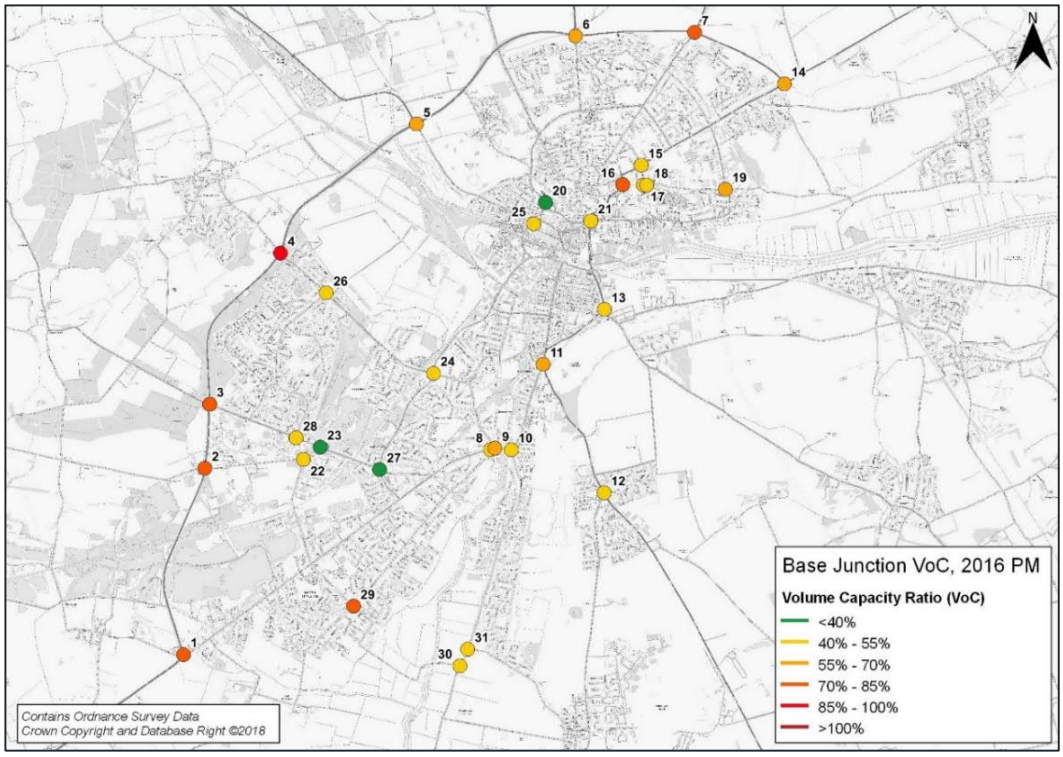


Figure 3-15 - Max Junction VoC, 2016 PM



Key sections of the orbital network are operating either at capacity or would be expected to reach capacity in the short to medium term, which will limit Lincoln's ability to grow and develop.

There are a number of existing congestion hotspots. These are located on the A46, particularly between the Newark Road and Lincoln Road roundabouts and the junction with the A15. They also exist on more localised routes including Meadow Lane in Hykeham.

The A46 link between the B1190 and B1378 junctions and Hykeham roundabout to Whisby Road junction are operating close to capacity (at least 85% VoC). City centre and links in the Hykeham area e.g. Meadow Lane are operating at 81% capacity.

The congestion pinchpoints reflect a lack of route choice and network capacity for north-south and east-west journeys.

3.4.4 AVERAGE SPEEDS

3.4.4.1 Key Routes within the Study Area

Average speeds give an indication of how well traffic moves on the network. Analysis of Trafficmaster data from 2016 for the major routes through and around Lincoln shows that a number of routes including the A46 have average AM and PM peak vehicle speeds that are significantly lower than that of free flow conditions. These are:

- A46 Lincoln WRR
- A46 Welton Road
- A46 (Between Newark and Lincoln WRR)
- A607 Grantham Road/Lincoln Road
- A158 Northern Relief Road
- A15 (Riseholme)

Table 3-2 shows the average speeds recorded during the AM and PM peak periods and the difference to those recorded during free flow (off-peak) conditions for the key strategic routes that fall within the study area. The analysis shows that:

- The average speeds on the A46 WRR are between 10 and 12mph slower than in free flow conditions. The A46 has a national speed limit and the data shows that average speeds in the peak periods are approximately 30mph;
- The average speeds on the A1434 for northbound traffic (towards Lincoln) are 8mph slower than free flow conditions during the AM peak hour and 7mph slower for southbound traffic during the PM peak;
- There is also evidence of significant congestion on routes where traffic is inbound to the city centre during the AM peak, such as the northern section of the A15 where southbound average speeds are nearly 12mph slower than the off-peak average, and the southern section of the A15 where the northbound speeds are on average nearly 11mph slower than in free flow conditions – on this section which has a 60mph speed limit average peak period speeds are approximately 22mph;

- Average speed along the A158 which begins at the eastern end of the A46 western relief road before routing east out of the city centre also vary considerably. During the AM peak on the southbound carriageway, traffic speeds are on average 9mph slower than free flow traffic speeds.

Figure 3-16 and Figure 3-17 provide a more detailed visual and spatial representation of how average speed varies between the peak hours and the off-peak period along each link of the major orbital and radial routes in the city. It shows that there are significant sections of the A1434, A46 WRR and A15 where the average speeds are significantly lower than free flow periods, indicating the scale of the congestion issues.

It is clear from Table 3-2, Figure 3-16 and Figure 3-17 that there are congestion hotspots and sections of the SRN and proposed MRN and routes through the centre of Lincoln that experience capacity related issues during the peak periods.

Again, the impacts of the limited number of routes for traffic travelling around and through Lincoln is expected to become more apparent in the future, where conditions are expected to deteriorate with the major development proposals and the growth-related aspirations set out in the city's Local Plan. Although the LEB will deliver a significant improvement in conditions on the eastern side of Lincoln and through the city centre, the congestion currently experienced on the western orbital and radial routes is expected to remain and deteriorate further with any increase in traffic.

Table 3-2 - Average Speed 2016

Route	Details	Direction	Free Flow (mph)	Speed Limit (mph)*	Average Speed (mph)			Difference to Free Flow Speed (mph)		
					AM Peak	Off Peak	PM Peak	AM Peak	Off Peak	PM Peak
A15	North	NB	42.7	50	40.8	40.7	40.8	-1.9	-2.1	-1.9
		SB	39.4		27.8	34.7	29.9	-11.6	-4.7	-9.5
	South	NB	32.8	60	22.1	29.4	29.9	-10.7	-3.4	-2.9
		SB	35.6		32.5	33.2	33.2	-3.2	-2.5	-2.4
	City Centre	NB	24.6	30	16.3	19.2	17.6	-8.3	-5.4	-7.0
		SB	24.8		19.8	20.3	16.4	-5.0	-4.5	-8.4
A46	North	NB	50.2	60	45.9	50.6	42.7	-4.2	0.4	-7.5
		SB	49.7		39.8	50.2	40.5	-9.9	0.5	-9.2
	South	NB	62.8	70	57.8	60.8	61.9	-5.0	-2.0	-0.9
		SB	62.4		59.4	59.0	60.5	-3.0	-3.3	-1.9
	Western Relief Road	NB	41.0	60/70	30.5	34.2	30.3	-10.4	-6.7	-10.6
		SB	41.5		30.9	35.9	29.2	-10.6	-5.6	-12.3
A57	North	NB/WB	46.2	60	40.1	40.7	41.8	-6.1	-5.5	-4.5
		SB/EB	42.5		30.7	37.8	37.4	-11.8	-4.7	-5.1
	City Centre	NB/WB	26.9	30/40/ 60	12.1	25.2	17.9	-14.8	-1.7	-9.1
		SB/EB	24.6		19.8	16.4	15.1	-4.8	-8.2	-9.6
A607	South	NB	33.2	30/40	29.5	30.3	29.3	-3.7	-2.8	-3.8
		SB	33.6		31.0	31.0	30.0	-2.6	-2.7	-3.6
A158	East	NB	46.5	40	42.0	41.4	41.6	-4.5	-5.1	-4.9
		SB	44.2		35.2	39.3	39.0	-9.0	-4.9	-5.2
	Ring Road	EB	47.7	60	44.2	44.1	45.8	-3.5	-3.6	-1.9
		WB	44.6		34.4	38.0	38.9	-10.2	-6.6	-5.7
A1434	City Centre	NB	28.6	40	20.3	24.8	24.0	-8.3	-3.9	-4.7
		SB	29.4		25.0	23.9	22.6	-4.4	-5.5	-6.9

*Some sections have more than one speed limit and therefore a figure for each individual limit is provided.

Figure 3-16 - Average Speeds – AM compared to Free Flow, 2016

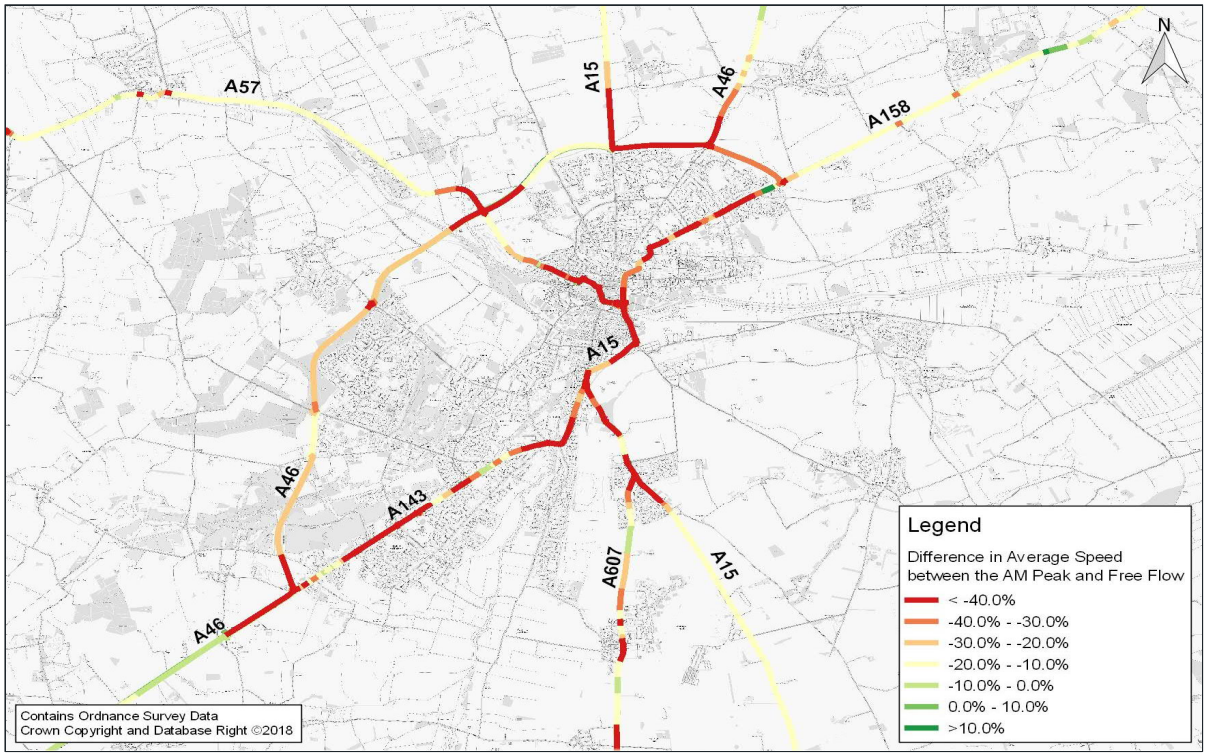
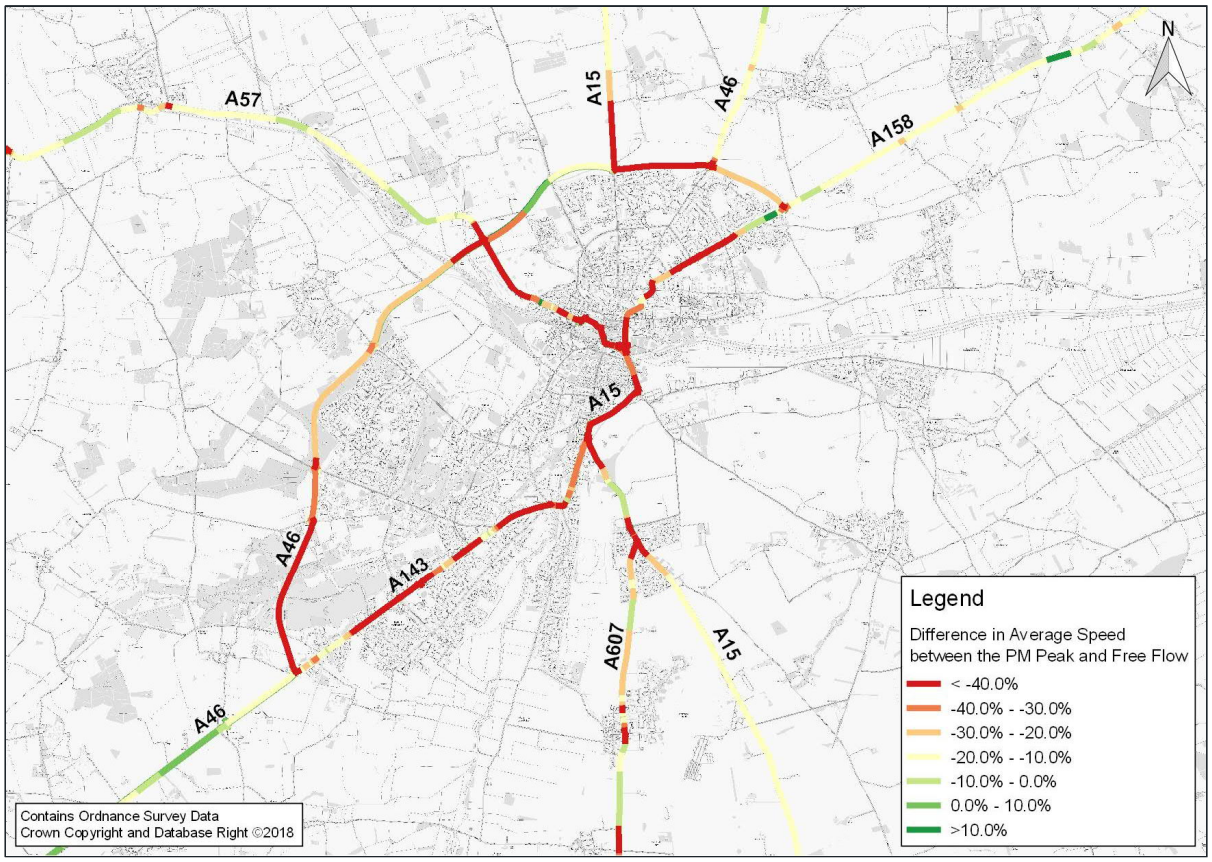


Figure 3-17 - Average Speeds – PM compared to Free Flow, 2016



Journey times for the key routes in and around Lincoln are poor in the morning and evening peaks compared to 'free flow' conditions, particularly for journeys via the A46.

Traffic speeds on the A15 and A57 are most variable between peak and off-peak periods, with over 40% variance in average speeds.

Delay in peak periods are particularly severe on the A46, B1003 and Meadow Lane. The most significant junction delays occur on Lincoln Road and at the Hykeham Roundabout.

3.4.5 JOURNEY TIME RELIABILITY

In addition to the issues with link and junction capacity and average speeds there are also notable journey time reliability issues affecting several routes within and around Lincoln. In particular there is significant journey time variance on the A46, A15, A57, A158, A1434, local routes around South Hykeham and the village of Harmston.

The following section assesses the journey time variability of each of the routes based on the Coefficient of Variation (CV) of the average speed. The CV is a measure of relative variability and it is the ratio of the standard deviation to the mean (average).

Table 3-3 and Table 3-4 show the CV for each route during the AM and PM peak for a neutral month (September 2016). The results highlight route sections that experience the most significant variance in journey times, in particular where the standard deviation is higher than 20% of the mean speed, i.e. where the CV is higher and speeds vary the most, the links are highlighted in red. Where the standard deviation is between 10–20% of the mean, the links are highlighted in yellow.

3.4.5.1 AM Peak Period

The analysis for the AM peak period demonstrates the scale of the journey time variance (see Table 3-3):

- The A46 WRR between the B1378 Skellingthorpe Road/Lincoln Road and the A57/Saxilby Road (eastbound), the A57/Saxilby Road and the A15/Riseholme Road (westbound) and the A15/Riseholme Road and the A158/A46/B1182 experience average speeds that vary by 20% or more of the standard deviation;
- The worst performing link on the A46 is between the B1378 Skellingthorpe Road/Lincoln Road and the A57/Saxilby Road (eastbound), where there is up to 40% variance in journey times compared to the standard deviation;
- Most sections of the A15 and A57 currently experience at least a 20% variance in journey times, with the B1188/A15 Canwick Road to the A57 Oxford Street being the worst performing; and
- The A1434 Newark Road also suffers from journey time reliability issues, particularly for northeast bound trips.

Table 3-3 - Journey Time Reliability along Strategic, Major & Key Local Routes: AM Peak (08:00-09:00)

Route	Start	End	Northeast bound		Southwest bound	
			SD	% mean	SD	% mean
A46	Newark Rd/Middle Ln (J1)	Whisby Rd (J2)	5	8%	5	8%
	Whisby Rd (J2)	B1190/Doddington Rd (J3)	5	7%	5	7%
	B1190/Doddington Rd (J3)	B1378/Lincoln Rd (J4)	5	9%	5	10%
	B1378 Skellingthorpe Rd /Lincoln Rd (J4)	A57/Saxilby Rd (J5)	15	40%	9	11%
	A57/Saxilby Rd (J5)	A15/Riseholme Rd (J6)	5	7%	11	35%
	A15/Riseholme Rd (J6)	A158/A46/B1182 (J7)	4	6%	7	27%
	A158/A46/B1182 (J7)	A158/Bunkers Hill/Wragby Rd (J8)	9	21%	3	4%
A15	Dunston Heath Lane (1)	A1434 St Catherines (2)	5	14%	4	6%
	A1434 St Catherines (2)	B1262/A15/South Park (3)	5	24%	5	18%
	B1262/A15/South Park (3)	B1188/A15 Canwick Rd (4)	7	26%	3	7%
	B1188/A15 Canwick Rd (4)	A57 Oxford Street (5)	7	70%	6	36%
	A57 Oxford Street (5)	B1308 Greetwell Rd (6)	4	28%	5	22%
	B1308 Greetwell Rd (6)	A158/Bunkers Hill/Wragby Rd (7)	4	20%	6	26%
	A1500 Till Bridge Lane (8)	A46/A15/Riseholme Rd (9)	3	4%	10	27%
A57	Mill Lane (1)	Fen Lane (2)	3	4%	66	4%
	Fen Lane (2)	A46 (3)	12	47%	3	4%
	A46 (3)	B1273 Brayford Way (4)	5	10%	11	62%
	B1273 Brayford Way (4)	B1273/B1003/Rope Walk (5)	7	33%	6	30%
	B1273/B1003/Rope Walk (5)	High Street (6)	6	66%	4	17%
A158	Junction with A15	Scothern Lane	3	5%	4	6%
A1434	A46/Newark Rd/Middle Ln (1)	Newark Rd/Hathersage Av (2)	6	32%	5	18%
	Newark Rd/Hathersage Av (2)	A15 St Catherines	6	26%	5	13%
A46 (Auborn to Harmston) to A15	A46 (1)	A607 Grantham Rd (2)	4	7%	3	6%
	A607 Grantham Rd (2)	A15 Sleaford Rd (3)	4	9%	6	9%
South Hykeham to Waddington	A1434 Newark Rd (1)	A607 Grantham Rd (2)	4	10%	4	11%

3.4.5.2 PM Peak Period

The analysis of the PM peak period data shows (see Table 3-4):

- That several sections of the A46 WRR experience significant variance in journey times in the PM peak, including the sections between Whisby Road and the B1190/Doddington Road Roundabout, the B1378 Skellingthorpe Road/Lincoln Road and the A57/Saxilby Road (eastbound);
- As in the AM peak period, the worst performing link on the A46 is between the B1378 Skellingthorpe Road/Lincoln Road and the A57/Saxilby Road (northbound), where there is up to 30% variance in journey times compared to the standard deviation;

- Southbound sections of the A15 also experience significant journey time variability. This includes the sections between the B1262/A15 /South Park and the B1188/A15 Canwick Road and the B1188/A15 Canwick Road and the A57 Oxford Street in central Lincoln; and
- The A1434 Newark Road again suffers from journey time reliability issues in the PM particularly on the section between the A46/Newark Road/Middle Lane and Newark Road/Hathersage Avenue.

Table 3-4 - Journey Time Reliability along Strategic, Major & Key Local Routes: PM Peak (17:00-18:00)

Route	Start	End	Northbound		Southbound	
			SD	% mean	SD	% mean
A46	Newark Rd/Middle Ln (J1)	Whisby Rd (J2)	6	15%	6	13%
	Whisby Rd (J2)	B1190/Doddington Rd (J3)	11	22%	9	14%
	B1190/Doddington Rd (J3)	B1378/Lincoln Rd (J4)	5	9%	6	11%
	B1378/Lincoln Rd (J4)	A57/Saxilby Rd (J5)	14	27%	6	7%
	A57/Saxilby Rd (J5)	A15/Riseholme Rd (J6)	11	18%	6	9%
	A15/Riseholme Rd (J6)	A158/A46/B1182 (J7)	11	30%	6	28%
	A158/A46/B1182 (J7)	A158/Bunkers Hill/Wragby Rd (J8)	4	5%	9	21%
A15	Dunston Heath Lane (1)	A1434 St Catherines (2)	7	16%	4	6%
	A1434 St Catherines (2)	B1262/A15/South Park (3)	5	28%	7	22%
	B1262/A15/South Park (3)	B1188/A15 Canwick Rd (4)	6	17%	9	54%
	B1188/A15 Canwick Rd (4)	A57 Oxford Street (5)	4	17%	7	40%
	A57 Oxford Street (5)	B1308 Greetwell Rd (6)	6	26%	6	30%
	B1308 Greetwell Rd (6)	A158/Bunkers Hill/Wragby Rd (7)	6	28%	5	17%
	A1500 Till Bridge Lane (8)	A46/A15/Riseholme Rd (9)	4	5%	8	19%
			Eastbound		Westbound	
A57	Mill Lane (1)	Fen Lane (2)	4	5%	3	4%
	Fen Lane (2)	A46 (3)	6	15%	3	5%
	A46 (3)	B1273 Brayford Way (4)	5	13%	10	50%
	B1273 Brayford Way (4)	B1273/B1003/Rope Walk (5)	6	37%	7	35%
	B1273/B1003/Rope Walk (5)	High Street (6)	7	113%	6	26%
A158	Junction with A15	Scothern Lane	4	5%	4	6%
A1434	A46/Newark Rd/Middle Ln (1)	Newark Rd/Hathersage Av (2)	5	20%	5	21%
	Newark Rd/Hathersage Av (2)	A15 St Catherines	5	19%	5	16%
			Eastbound		Westbound	
A46 (Auborn to Harmston) to A15	A46 (1)	A607 Grantham Rd (2)	4	8%	4	7%
	A607 Grantham Rd (2)	A15 Sleaford Rd (3)	6	11%	5	9%
South Hykeham to Waddington	A1434 Newark Rd (1)	A607 Grantham Rd (2)	4	10%	4	10%

The analysis for both AM and PM peak periods shows that there is a considerable variance in journey times on several major routes into Lincoln and sections of the existing strategic orbital route

around Lincoln. This again indicates the level of congestion currently experienced and demonstrates the pressure that the network is under.

Journey time reliability is a key concern along the A46 Western Relief Road during both the AM and PM peaks, with some sections varying up to 40% of the standard deviation. Journey times are particularly unreliable between the Skellingthorpe Road and Nettleham roundabouts.

Elsewhere on the network, journey times are particularly unreliable on the A15, where variance of up to 70% of the average speed is experienced, and on the A57, where one section of the corridor experiences variance of up to 113% of the average speed.

The A1434 also has some significant journey time reliability issues.

3.4.6 PROPORTION OF HEAVY GOODS VEHICLES

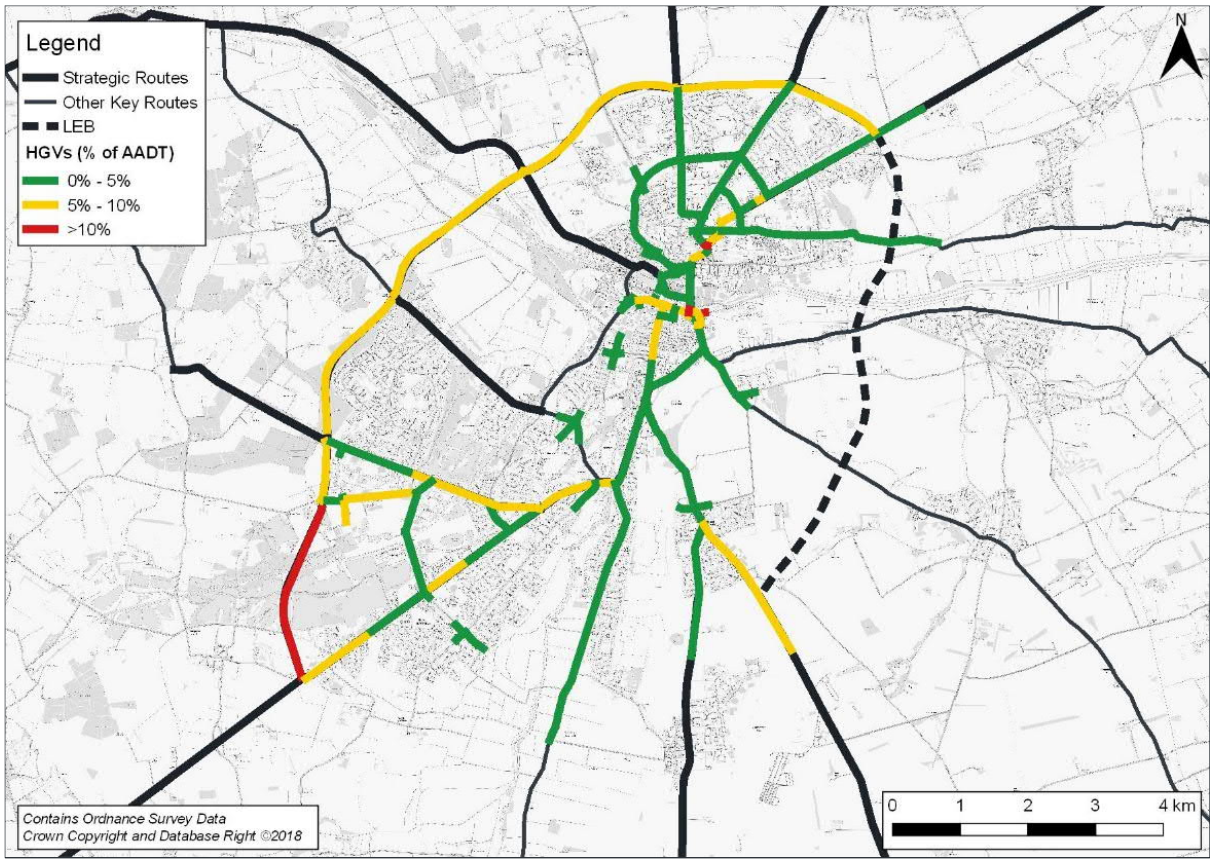
The limited north-south and east west connectivity in and around Lincoln also results in significant proportions of HGVs using a small number of routes. The proportion of HGVs using the key routes around Lincoln has been assessed and derived from permanent LCC counters, DfT counts and WebTRIS data and is illustrated in Figure 3-18.

The analysis shows that the proportion of HGVs is between 5% and 10% on the WRR and exceeds 10% on the A46 between Pennell's Roundabout and the Whisby Road roundabout. Of note is the number of links within Lincoln city centre on which HGVs comprise 5-10% of the total traffic. The narrow routes within the historic core of Lincoln e.g. Tentercroft Street, the B1262 and Wragby Road are not suitable for use by HGVs.

In the area within the vicinity of the NHRR, Newark Road and Sleaford Road, the proportion of HGVs is between 5% and 10%. Both of these routes traverse through highly residential areas such as North Hykeham, Swallow Beck, Bracebridge and Bracebridge Heath; therefore the level of HGVs carried will negatively impact on these small-medium sized, largely rural settlements. In the south west quadrant of the study area, Kingsley Road leading to Teal Park and Whisby Road also carry relatively large proportions of HGVs (5%-10%). The proportions of HGVs which would be expected for these types of routes is:

- On average on the local Major Road Network (includes A Roads managed by Local Authorities) 4% of all traffic can be expected to be classified as HGVs. The data shows that a number of routes in and around Lincoln exceed this, including the A46 where between 5% and 10% of traffic is classified as HGVs;
- On average on urban A Roads 3% of all traffic can be expected to be classified as HGV. Again, the proportion of HGVs on sections of the A1434 exceed this where between 5% and 10% of the traffic is HGVs (Road Traffic Estimates: Great Britain 2017, DfT). This reflects the lack of alternative routes designed to an appropriate standard suitable for HGVs.

Figure 3-18 – Proportion of Heavy Goods Vehicles on Key Routes



The proportion of HGVs on some sections of Lincoln's key road network is between 5 to 10%. This is in excess of what would be expected for the type of route and reflects the lack of alternative routes designed to an appropriate standard suitable for HGVs.

3.4.7 RAT-RUNNING

Existing high levels of traffic on key routes (including the A46 WRR, the A57 Saxilby Road/Carholme Road, the A15, the A1434 Newark Road, the A158 and the A607 Grantham Road) and the resulting congestion leads to traffic rat running on minor routes through suburban areas and surrounding villages. This is exacerbated by the lack of a high standard east-west route in the south of the area.

Specifically, rat running currently affects the following corridors:

- A1434 Newark Road/A15 Sleaford Road;
- South Hykeham/Waddington; and
- Aubourn/Harmston.

The first of these three corridors is an urban major route into and through the Lincoln urban area and as a result caters for a range of functions and journeys. This includes local journeys within the urban area, longer movements across Lincoln and strategic movements into Lincoln from outside the area. The other two corridors, however, are primarily edge of urban area or rural in nature and are appropriate only for local traffic. The current traffic flows at the central points of the South Hykeham/Waddington and Aubourn/Harmston corridors are shown in Table 3-5. For what should be

relatively quiet local rural roads, there are significant traffic flows, which supports the case that they presently serve more than a purely local function.

Table 3-5 - Peak Hour Traffic Flows on 'Rat-run' Corridors

Route	Road	AM Peak		PM Peak	
		Eastbound	Westbound	Eastbound	Westbound
South Hykeham/Waddington	Meadow Lane	421	530	332	252
Aubuorn/Harmston	Station Road	301	432	396	360

Figure 3-19 and Figure 3-20 below present Select Link Analysis from the Greater Lincoln Transport Model (GLTM) for central points in each of the above corridors showing the routing of traffic within them. The figures present data for the 2016 AM peak. The figures show the routing of traffic at the central point of the A1434 Newark Road/A15 Sleaford Road corridor; the first is eastbound and the second westbound. There is a clear east-west movement through the corridor in addition to the larger movements between the A46, Newark Road and the city centre.

Figure 3-19 - SLA A1434 Newark Road/A15 Sleaford Road Corridor AM Peak 2016 Eastbound

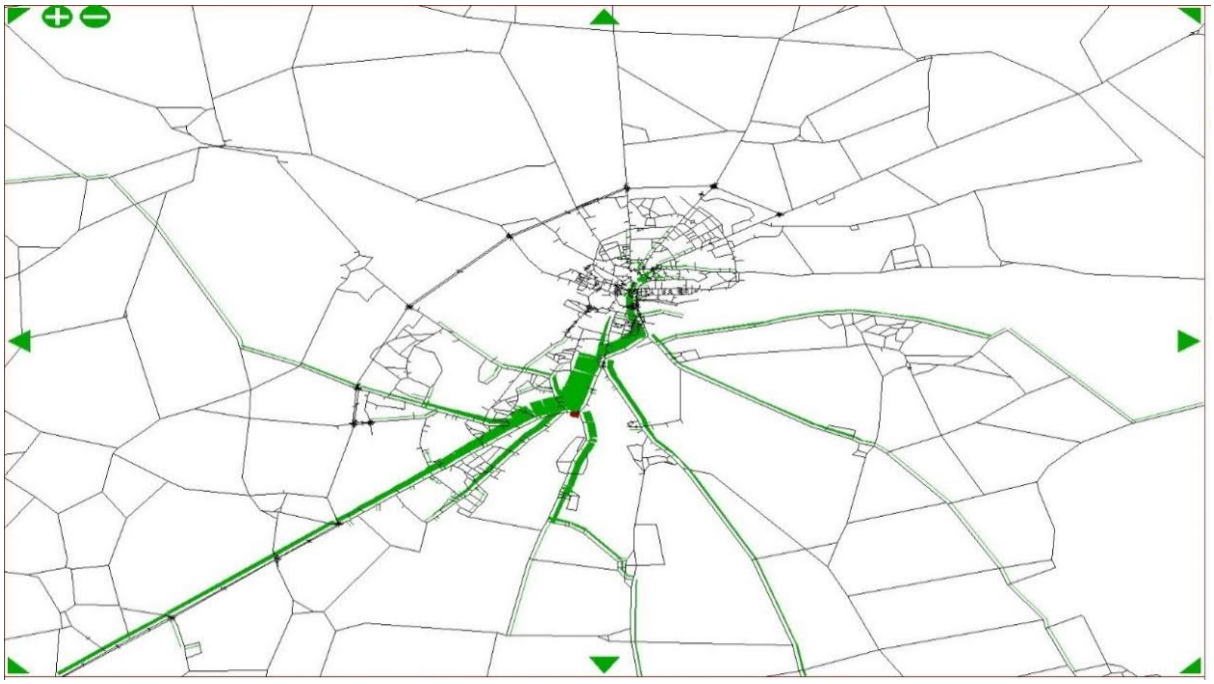


Figure 3-20 - SLA A1434 Newark Road/A15 Sleaford Road Corridor AM Peak 2016 Westbound

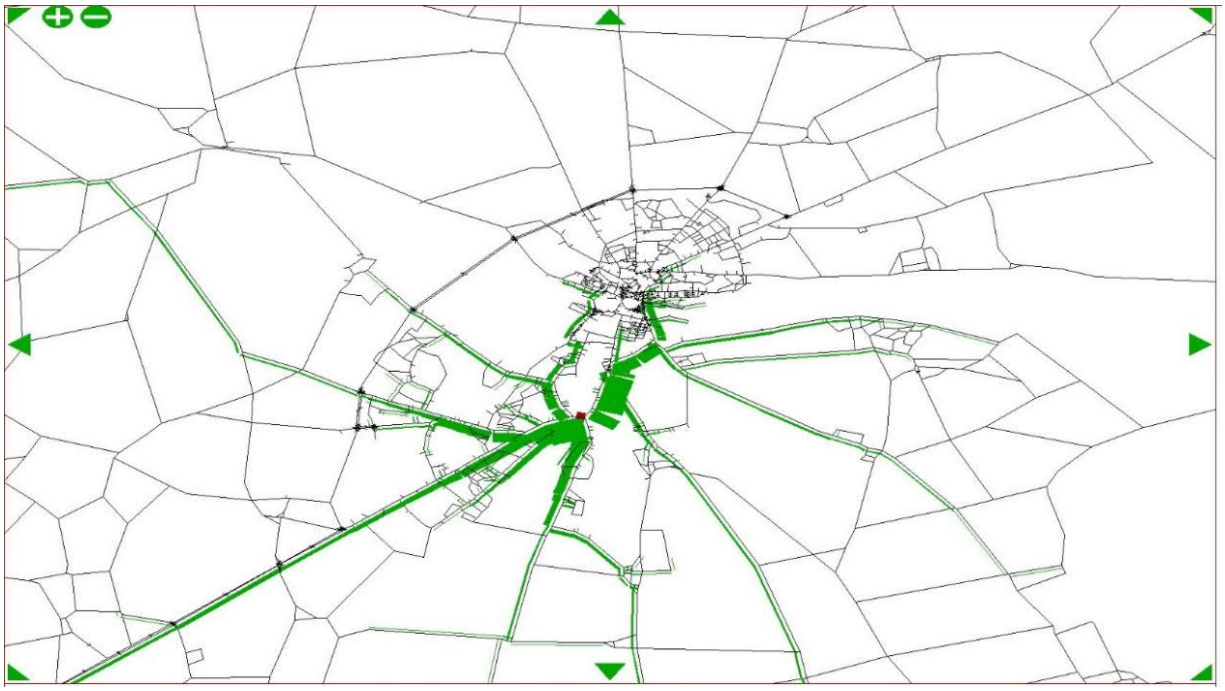


Figure 3-21 and Figure 3-22 show the routing of traffic at the central point of the South Hykeham/Waddington corridor; the first is eastbound and the second westbound. These figures show a clearer east-west movement highlighting traffic between the employment areas immediately to the east of the A46 and the A15 and villages to the south of the Lincoln urban area. They highlight rat-running routes through inappropriate edge of urban area and rural roads.

Figure 3-21 - SLA South Hykeham/Waddington Corridor AM Peak 2016 Eastbound

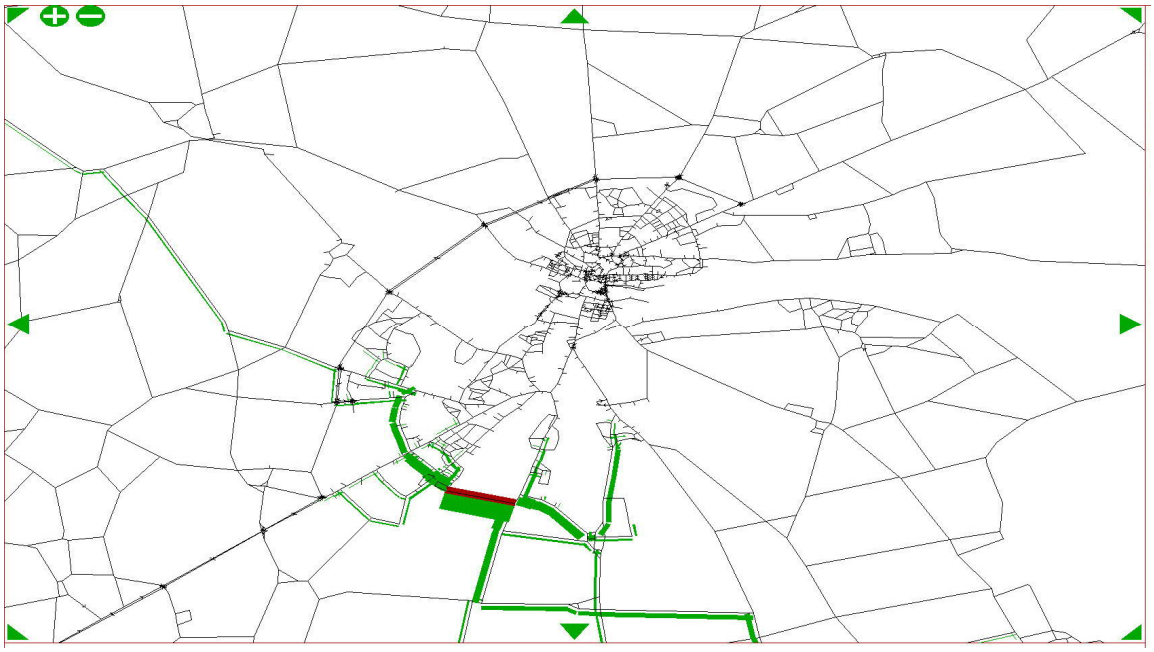


Figure 3-22 - SLA South Hykeham/Waddington Corridor AM Peak 2016 Westbound

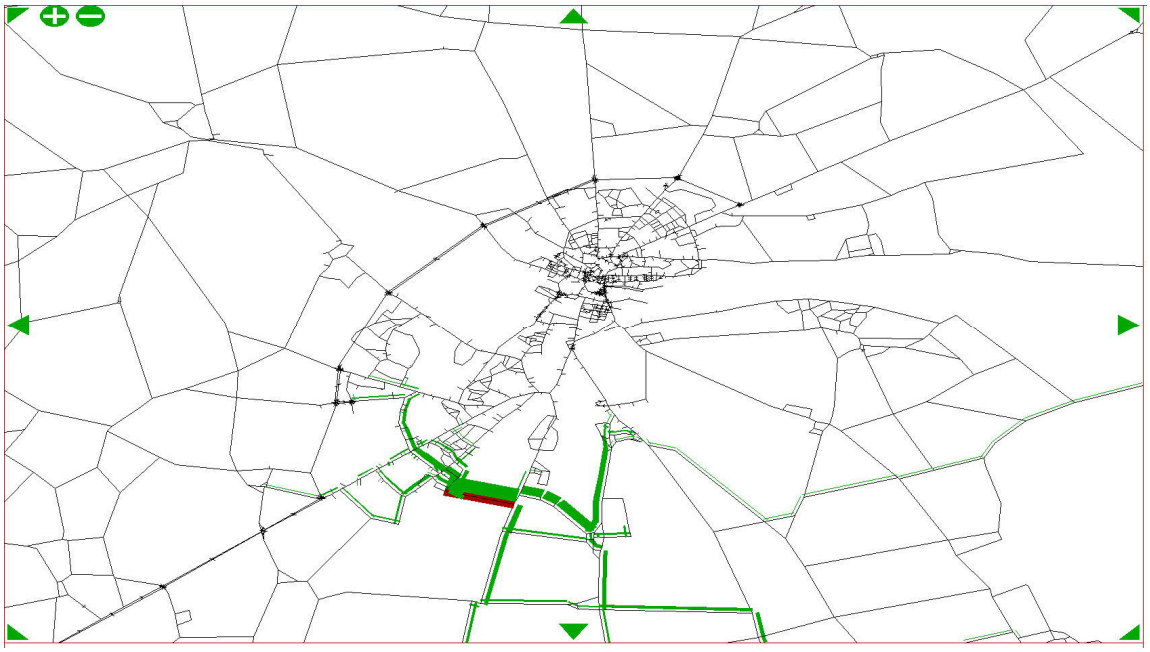


Figure 3-23 and Figure 3-24 show the routing of traffic at the central point of the Aubourn/Harmston corridor; the first is eastbound and the second westbound. These figures highlight routing through rural roads between the A46 and A15 but also movements through the rural area to and from RAF Waddington and into the main Lincoln urban area.

Figure 3-23 - SLA Auborn/Harmston Corridor AM Peak 2016 Eastbound

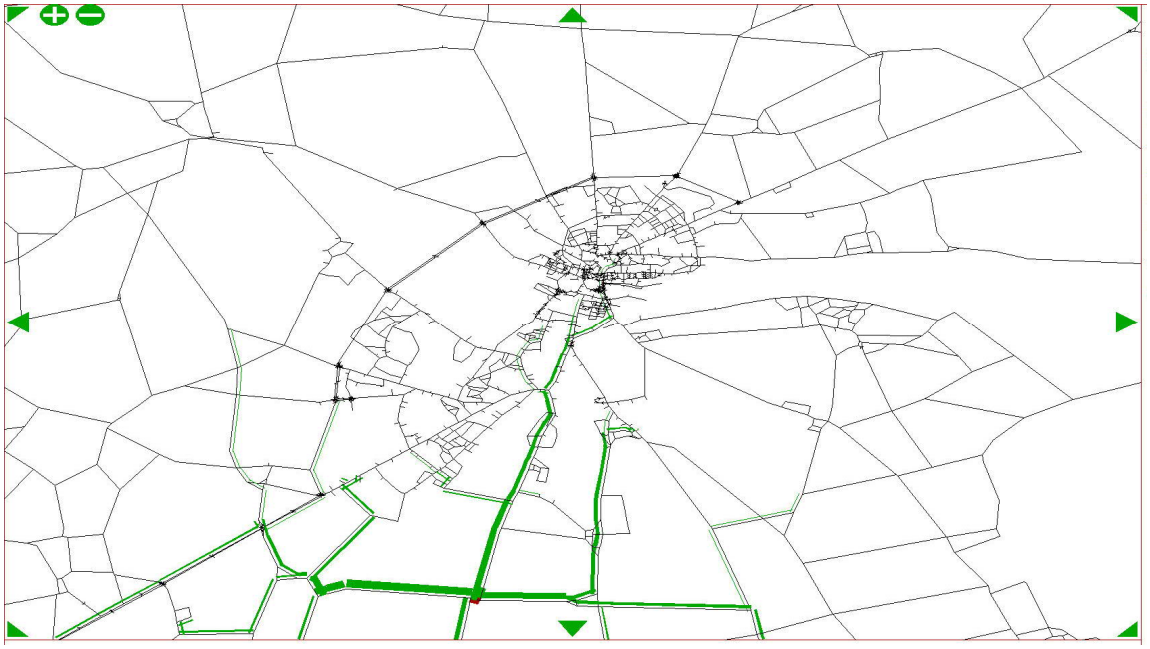
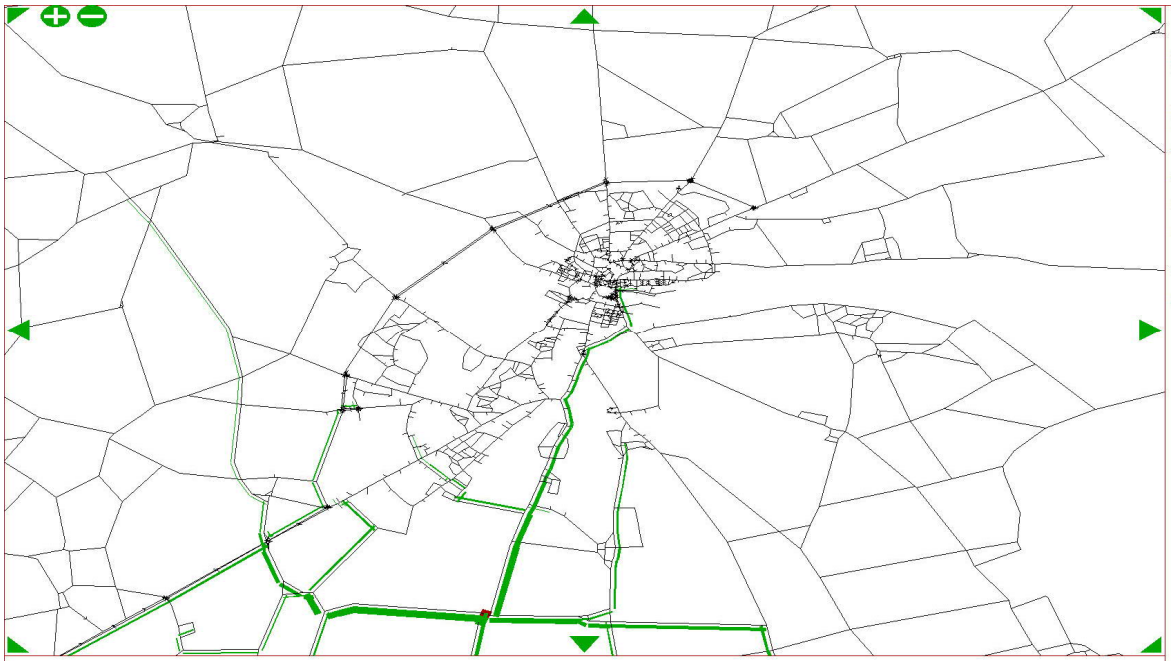


Figure 3-24 - SLA Auborn/Harmston Corridor AM Peak 2016 Westbound



In addition, the lack of resilience in the network which results from the limited choice in strategic routes leads to traffic being re-routed through unsuitable areas when incidents occur.

As described in Section 3.2.4, closures between the Hykeham and Doddington Roundabouts cause traffic to be diverted onto the A1434 Newark Road, which has many local accesses that create numerous pinch points along the route. During closures further north along the A46 WRR between the Doddington and Skellingthorpe roundabouts, traffic is diverted either along the same section of the B1190 Doddington Road and onto the B1003 Tritton Road. These routes are relatively minor in nature and travel through existing urban areas which are unsuitable for large volumes of traffic.

Existing high levels of traffic on key routes (including the A46 Western Relief Road, the A57 Saxilby Road / Carholme Road, the A15, the A1434 Newark Road, the A158 and the A607 Grantham Road) and the resulting congestion leads to traffic rat running on minor routes through suburban areas and surrounding villages.

These routes consequently demonstrate higher traffic flows than would be expected for the type of route, which lead to issues of noise and air pollution and accessibility issues for local residents.

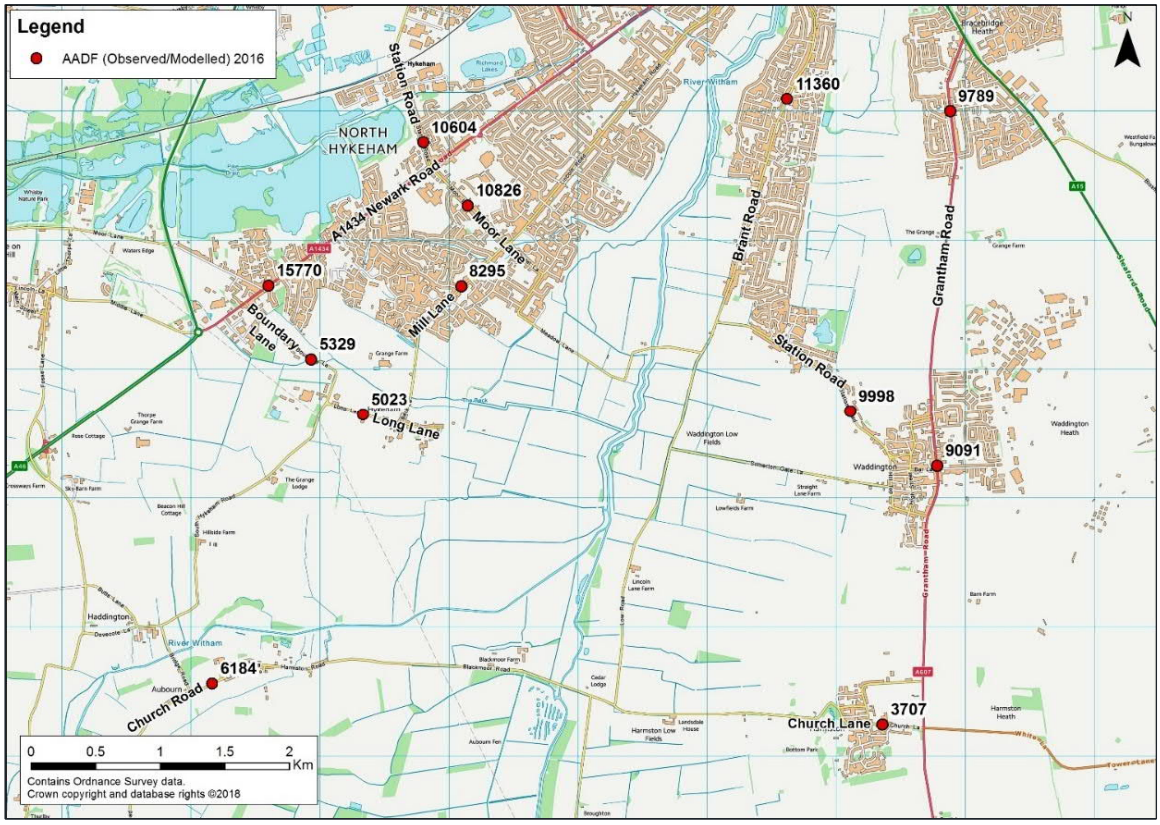
3.4.8 SEVERANCE

The high levels of traffic on the major and local routes through Lincoln and surrounding villages also causes severance which in turn affects access to key and local services for NMUs, particularly vulnerable groups. The general traffic on local routes is exacerbated by the rat-running identified above, causing traffic flows to be higher, which impacts on noise and air quality and reduces opportunities for people to cross local roads. Severance is particularly affected by traffic levels in the suburbs and villages. Table 3-6 and Figure 3-5 summarise the existing traffic flows within these areas.

Table 3-6 - Routes Affected by Severance

Location	Affected Routes	Traffic Flows	Route Description & Characteristics
North Hykeham	A1434 Newark Road	15,770	Urban single carriageway Residential area with properties fronting onto the carriageway
	Station Road	10,604	Minor urban single carriageway Residential area with properties fronting onto the carriageway
	Moor Lane	10,826	Minor urban single carriageway Residential area with properties fronting onto the carriageway
	Mill Lane	8,295	Minor urban single carriageway Residential area with properties fronting onto the carriageway
South Hykeham	Long Lane	5,023	Rural single carriageway Minor route from South Hykeham to A1434 Newark Road
	Boundary Lane	5,329	Minor rural single carriageway Minor route from South Hykeham to A1434 Newark Road
Bracebridge Low Fields	Brant Road	11,360	Urban single carriageway Residential area with properties fronting onto the carriageway
Bracebridge Heath	Lincoln Road/Grantham Road	9,789	Urban single carriageway Residential area with properties fronting onto the carriageway
Waddington	A607 Grantham Road Station Road	9,091 9,998	Urban single carriageway Residential area with properties fronting onto the carriageway
Harmston	Church Lane/Station Road	3,707	Rural single carriageway through Harmston Village Narrow road through the village Properties front onto the carriageway
Aubourn	Church Road/Royal Oak Lane/Chapel Lane/Harmston Road	6,184	Rural single carriageway through Harmston Village Narrow road through the village Properties front onto the carriageway

Figure 3-25 - Locations affected by Severance



3.5 SUMMARY

The key issues on the highways network can be summarised as follows:

- The existing principal road network currently has a number of limitations. North-south traffic has limited route choice, especially in the south of the Lincoln urban area, with traffic forced to use either the A46 or A1434 and A15 to pass by or through the city.
- There are limited crossing opportunities of the River Witham and the Fossdyke Navigation in Lincoln and very few opportunities to cross the river in the south of Lincoln. These include a number of relatively minor routes that are particularly unsuited to strategic traffic.
- The existing network limitations result in significant volumes of traffic having to use a limited number of strategic and major routes or unsuitable routes through residential areas. East west traffic in the south of Lincoln is forced to using minor rural routes to the south of Lincoln.
- Traffic volumes have increased on a number of strategic and major routes including the A46 Western Relief Road and the A4134 Newark Road which provides a major radial route into central Lincoln. The expectation is that they will continue to increase putting the network under further pressure.
- There is a lack of network resilience due to the limited availability of appropriate alternative routes around and through Lincoln.
- Several parts of the existing network are at or close to capacity including the A46, with congestion resulting in poor average speeds, variable journey times and delay in both peak periods and to some extent also in off peak conditions.
- There are routes and sections of the network which are carrying levels of HGV traffic in excess of that expected for these types of routes.
- Predominantly rural residential settlements in the south of Lincoln experience unfavourable conditions due to the volume of traffic utilising routes as a result of a lack of suitable alternatives.

4 FUTURE DEMAND AND KEY ISSUES

This chapter summarises the forecast future transport demand and key issues in relation to the planned and forecast development within Lincoln. In particular it sets out the following:

- **Future Provision –** Summarises the future land-use changes and policies, the levels of planned growth and the future changes to the transport system within Lincoln;
- **Future Demand and Level of Service –** Sets out the forecast traffic demands and levels of service; and
- **Forecast Impact of Future Demand –** Summarises the forecast issues and associated impacts on the transport network.

4.1 FUTURE PROVISION

There is a significant level of planned growth within Lincoln over the next 20 years. The Greater Lincolnshire SEP and Central Lincolnshire Local Plan provide further details of the planned development which includes the build out of four SUEs that will contribute to a 50% increase in dwellings in Lincoln by 2036. Further details are provided in the following sections.

4.1.1 LAND USES AND POLICIES

4.1.1.1 Greater Lincolnshire Enterprise Partnership Strategic Economic Plan 2014-2030

As set out in Section 2.4, the GLLEP produced a SEP in 2014 which sets out a strategy for driving growth. A refresh of the SEP was subsequently published in 2016, which sets out ambitious targets to achieve 13,000 new jobs, support 22,000 businesses, increase the value of the Greater Lincolnshire economy by £3.2 billion and deliver up to 100,000 new homes by 2030; nearly 20% of which are to be provided in the Lincoln urban area. Infrastructure improvements are required to facilitate this growth.

The SEP highlights that Lincoln is at the heart of the strategy and the aim is to:

- Prioritise improved skills, growing new markets, and modern telecommunications at the forefront of growing businesses and sectors further; and
- Make the most of Lincolnshire's attractiveness to investors through protecting businesses, improving connectivity, and increasing housing.
- These plans for growth will increase demand for movements of people and goods throughout the LEP area and have impacts on the capacity of the transport network. The SEP also notes that 'The Greater Lincolnshire LEP will lead on:

    - Sector-specific schemes that give businesses the confidence to invest; and
    - Area-based schemes that unblock housing developments, improve transport, and increase the vitality of our area.

One of the key priorities for the LEP is to promote Greater Lincolnshire as a place for sustainable growth through improved transport infrastructure. This will provide greater connection to national and international markets, enabling wider enjoyment of its world-class heritage sites, culture and strong communities.

The SEP states that the LEP seeks the assistance of Central Government in contributing to the achievement of these goals by *'Investing in transport infrastructure to reduce bottlenecks and improve connectivity thereby creating more confidence for investors'*.

The document recognises that road and rail links will require review as part of the planning process to achieve sustainable growth, with infrastructure schemes identified to ensure that growth can be delivered whilst minimising the impact on the wider transport network.

According to the SEP, the demand for movement of people and goods will continue to grow across Greater Lincolnshire and will therefore increase stress on the existing transport networks. Large numbers of HGVs adding to the pinch points in traffic congestion and the resulting poor access will weaken the future sustainability of the economy, with a particular effect on the agri-food supply chain as the industry is extremely time sensitive. The SEP states that it will prioritise investment towards pinch point and sustainable transport schemes, and also recognises that economic growth will be delivered faster and more effectively through:

- An amendment to the Highways England programme to produce faster east-west links as set out in the Midlands Engine commitments;
- A commitment from the DfT to allocate funding within its second Roads Investment Strategy 2020;
- Recognition of the major road corridors within Greater Lincolnshire that fulfil a national role in moving people and goods;
- Rationalisation of the appraisal process for transport projects;
- Powers to adopt bus service franchise powers and apply a discounted fuel duty scheme to support transport in rural areas; and
- Phased implementation of the outcomes of the Greater Lincolnshire LEP's rail strategy, which supports the Midlands Engine commitment to improving rail services.

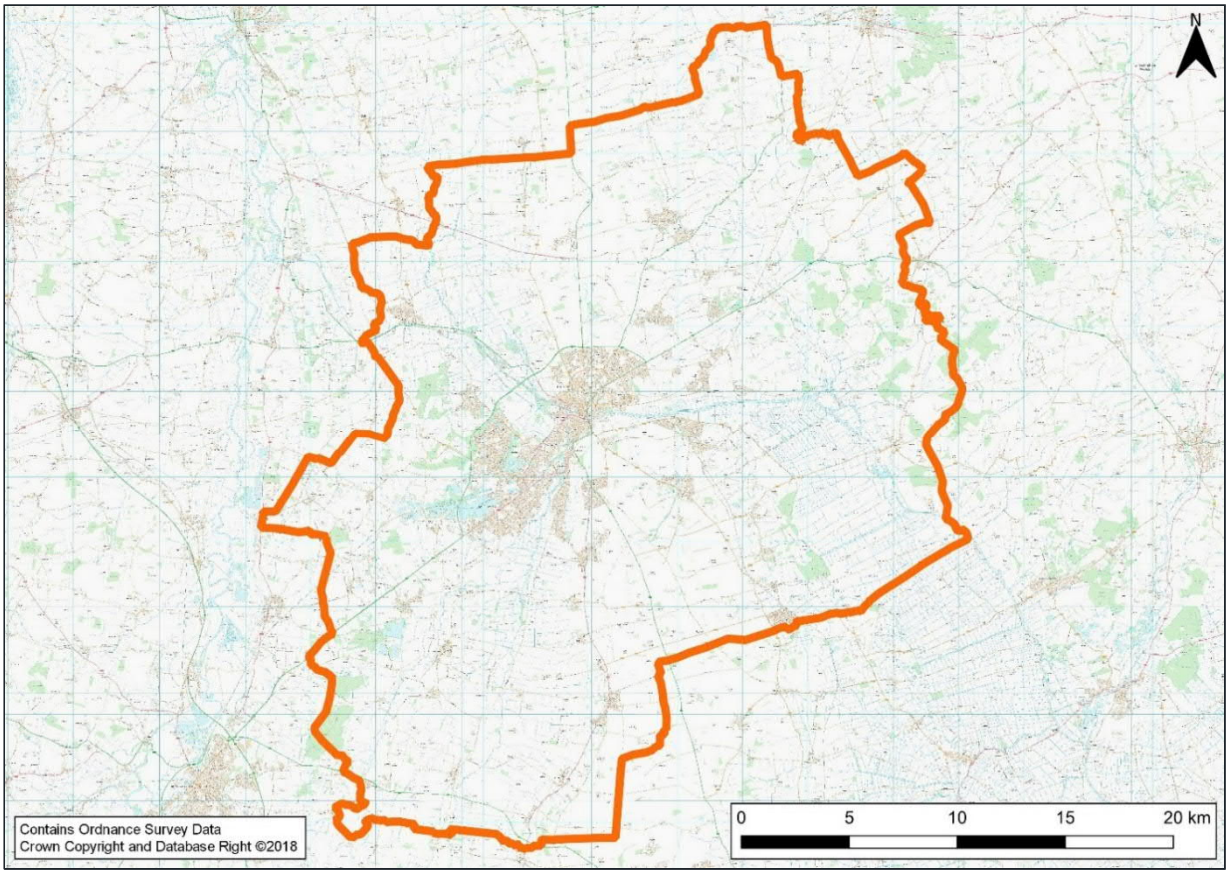
4.1.1.2 Central Lincolnshire Local Plan (2017)

The Central Lincolnshire Local Plan 2012-2036 was adopted by the CLJSPC in April 2017. The document provides a vision for Central Lincolnshire up to 2036 and sets out significant plans for growth in the local plan area.

The Plan identifies a need for an additional 36,960 dwellings and 11,894 jobs across the period 2012-2036, with growth to be concentrated in the Greater Lincoln area, as illustrated in Table 4-1.

An important part of this will be the Lincoln Strategy Area (Figure 4-1) which will accommodate around 64% (24,000) of this growth target in new homes and employment land. Approximately 40% (9,700) of the allocation for the Lincoln Strategy Area will be provided within the Local Plan period (2036). As a result, an additional 14,000 dwellings will be delivered within the Lincoln Strategy Area beyond 2036 to make up the total growth (24,000 dwellings) allocated to the area.

Figure 4-1 - Lincoln Strategy Area



The Plan also sets out the location of several SUEs which will form an important part of delivering the CLLP strategy and achieving the growth identified within the Lincoln Strategy Area. As stated in Section 2.3 these include the WGC, SEQ, NEQ and SWQ.

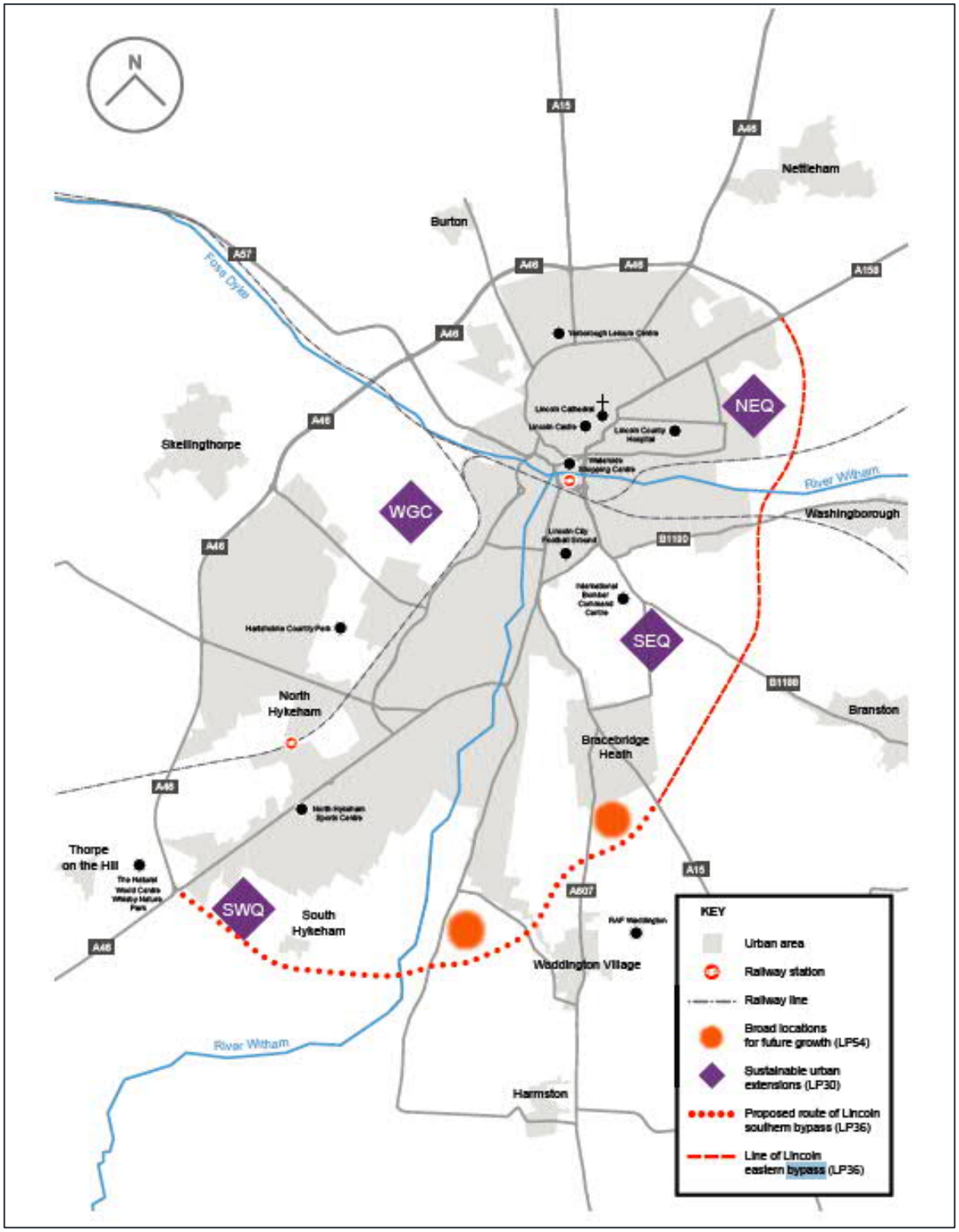
The location of the SUEs and other locations identified for development are illustrated in Figure 4-2, along with the LEB and the indicative route of the NHRR (specific details relating to the SUEs are provided in Section 4.1.1.3).

The NHRR is also identified on the CLLP Policies Map and is safeguarded from any development proposal on or near the route which would prejudice the efficient and effective delivery of the scheme. The Local Plan states that the NHRR will link the Eastern Bypass, at the A15 Sleaford Road, with the existing A46 Western Bypass, at the Newark Road junction, to create a complete ring road around Lincoln. The Local Plan highlights that fact that authorities in Lincoln see NHRR as a part solution to the city's growth and transportation challenges.

Table 4-1 - Local Plan Housing and Employment Allocations in the Greater Lincoln Area

Local Authority	Housing Target	Employment Target	Significant Developments
Central Lincolnshire (West Lindsey, City of Lincoln and North Kesteven).	36,960 dwellings in the period to 2036, of which: 64% will be in the Lincoln urban area; 12% in Gainsborough; 12% in Sleaford.	11,894 net new jobs.	Lincoln WGC – 3,200 dwellings in period to 2036; 20ha employment land. Lincoln SEQ – 3,500 dwellings in period to 2036; 7ha employment land. Lincoln NEQ – 1,400 dwellings in period to 2031; 5ha employment land. Sleaford West Quadrant – 1,400 dwellings; 3ha employment land. Sleaford South East Quadrant – 1,450 dwellings. Gainsborough Southern – 1,400 dwellings; 4ha employment land. Gainsborough Northern - 750 dwellings; 7ha employment land.

Figure 4-2 - Central Lincolnshire Local Plan Lincoln Urban Area Developments



4.1.1.3 Sustainable Urban Extensions

As stated above the SUEs will form an important part of delivering the CLLP strategy and achieving the growth identified within the Lincoln Strategy Area. They are located in areas that can be aligned with the capacity of existing infrastructure (Table 4-2 highlights the quantum of development which is

proposed), or which can be planned at a scale that is viable to include new or improved infrastructure. Overall, the scale of this development within these SUEs alone represents a near 50% increase in the number of dwellings in Lincoln by the mid-2030s. Table 4-2 sets out details of each SUE and their current status.

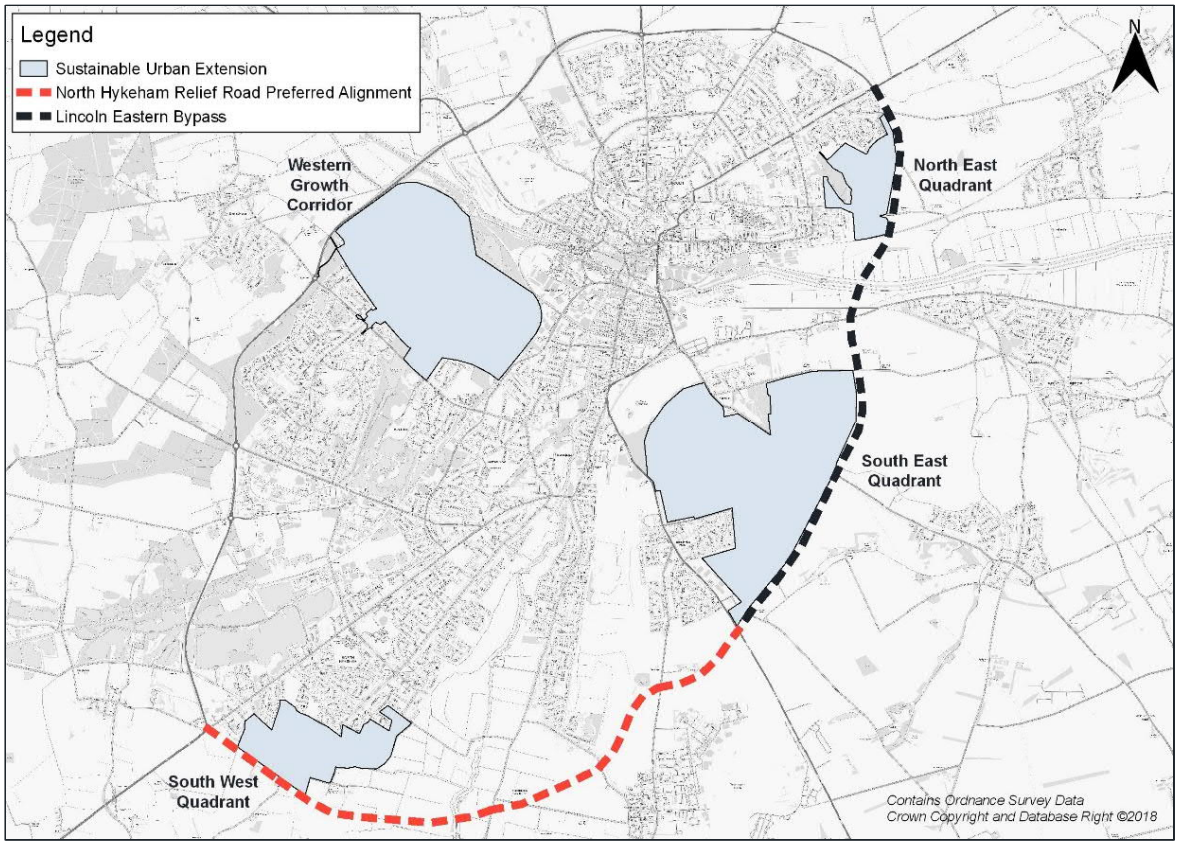
Of particular relevance to the NHRR is the SWQ which has the potential to accommodate around 2,000 dwellings, up to 5 hectares of employment land and other supporting uses. It is located to the south west of Lincoln, predominantly in North Hykeham (See Figure 4-3) immediately adjacent to the proposed NHRR. Without the provision of additional transport infrastructure, it will be difficult to deliver and accommodate the SUEs within the existing network. The provision of additional network capacity in the south of Lincoln will be a fundamental part of this.

Table 4-2 - Sustainable Urban Extensions

SUE	Description	Current Status	Proposed access/transport improvements
Lincoln Western Growth Corridor (WGC): Land at Swanpool, Fen Farm and Decoy Farm.	Up to approximately 3,200 dwellings and 20ha of employment and leisure land uses, together with related uses, a new neighbourhood centre, community facilities, and infrastructure. Consultation on the proposals closed on 15th November 2017.	The SUE is currently in the pre-application stages with technical work ongoing. The application is expected to be submitted in late 2018.	Spine road incorporating bus prioritisation measures for fast access to the city centre. New link from Skellingthorpe Road to Tritton Road, and roads within the site designed to discourage high speeds. Several public rights of way pass through the site and new connections to these existing walking and cycling routes are included within the proposals.
Lincoln South East Quadrant (SEQ): Land at Canwick Heath and Bracebridge Heath	Approximately 6,000 dwellings (3,600 in the plan period to 2036) and 7ha of employment land, together with related uses, a district centre, a small local centre, community facilities, and infrastructure. The implementation and progress of the development is reliant on the delivery of the LEB being completed.	Planning permission for 120 dwellings granted in outline (Linden Homes) and an application for 450 dwellings (Barratt Homes) is currently under consideration. Further traffic modelling is anticipated in Spring 2018 as part of the consideration of the Barratt application and to identify necessary transport mitigations for the delivery of the SUE.	Links to the LEB via other routes with junction and other infrastructure improvements proposed. It is expected that the developer will make provision for the extension of public transport services to the site and that cycling and walking infrastructure will be provided to link the site to surrounding areas.
Lincoln North East Quadrant (NEQ): Land at Greetwell including the former Greetwell Quarry	Approximately 1,400 dwellings and 5ha of employment land, together with related uses, a local centre, community facilities, and infrastructure. Delivery linked to and coordinated with LEB.	NEQ has planning Outline Planning Permission for 500 dwellings. Pre-application discussions are in progress for the development of the first phase of c.180 dwellings, the maximum that could be delivered in advance of the LEB being concluded. We expect a planning application to be submitted this summer, and at present the developers are engaging with LCC on both highways and	Infrastructure to encourage walking, cycling and public transport use in order to maximise take up of sustainable travel in line with LITS. High quality, safe, and effective pedestrian and cycling links that both within and adjoining the development, including links to the National Cycle Network (NCN).

SUE	Description	Current Status	Proposed access/transport improvements
		drainage matters ahead of that submission.	
Lincoln South West Quadrant (SWQ): Land at Grange Farm, Hykeham.	Approximately 2,000 dwellings, 5ha of employment land, a local centre, and community facilities. The implementation of the development requires, and will fund in part, the first phase of the NHRR – a connection to Brant Road being necessary to provide local traffic mitigation. SWQ lies to the south west of the City of Lincoln to the south of the existing built up area of North Hykeham and to the east and north of South Hykeham Fosseway and South Hykeham Village, well located for access to Lincoln and the A46.	NKDC minded to grant planning permission subject to s106 for the construction of 167 dwellings (Tennyson Homes). Discussions ongoing with landowners toward the production of a masterplanning and access strategy for the delivery of the SUE.	Linked to delivery of the first phase of the North Hykeham Relief Road. The first phase of the North Hykeham Relief Road initially connecting the A46 at its Newark Road Junction to the site's primary access road. The primary access road will connect to Meadow Lane to the north east of the site with construction of the next phase of the Relief Road from South Hykeham Road to Brant Road.

Figure 4-3 - Location and Footprint of Sustainable Urban Extensions



4.1.1.4 Proposals for the creation of a Major Road Network

Following a case made by the Rees Jeffreys Road Fund report, 'A Major Road Network for England' for the SRN to incorporate another 3,800 miles of local authority controlled 'A' roads to constitute an 8,000 mile MRN, the government has outlined its plans for an MRN of local roads including proposals on funding and how the routes and schemes will be chosen.

The DfT has stated that the MRN will consist of the most strategic local routes in England and will dedicate over £1 billion a year in funding from the planned National Roads Fund created by ring-fencing Vehicle Excise Duty (VED).

Under the proposals, local highway authorities would retain their existing responsibilities and submit proposals for transport schemes (between £20 million and £50 million) to sub-national transport bodies or equivalent regional groups. These bodies would then consult Regional Evidence Bases which take into account network performance issues and then proceed to select appropriate schemes to be developed. These selected schemes would then be passed on to the transport secretary to allocate funds under a MRN Investment Programme. In line with the existing Road Investment Strategy cycle, the Investment Programme and the Regional Evidence Bases would be updated every two years, with the MRN itself reviewed every five years.

Schemes eligible for funding include:

- Bypasses;
- Missing links;
- Widening of existing MRN roads;
- Major structural renewals;
- Major junction improvements;
- Traffic management / smart technology; and
- Packages of improvements.

Consultation began in late December 2017 and outlines the Government's proposals for the MRN, seeking views on its core principles, the definition of the network, investment planning, and eligibility and investment assessment.

Within the consultation document, the Government lists five central policy objectives:

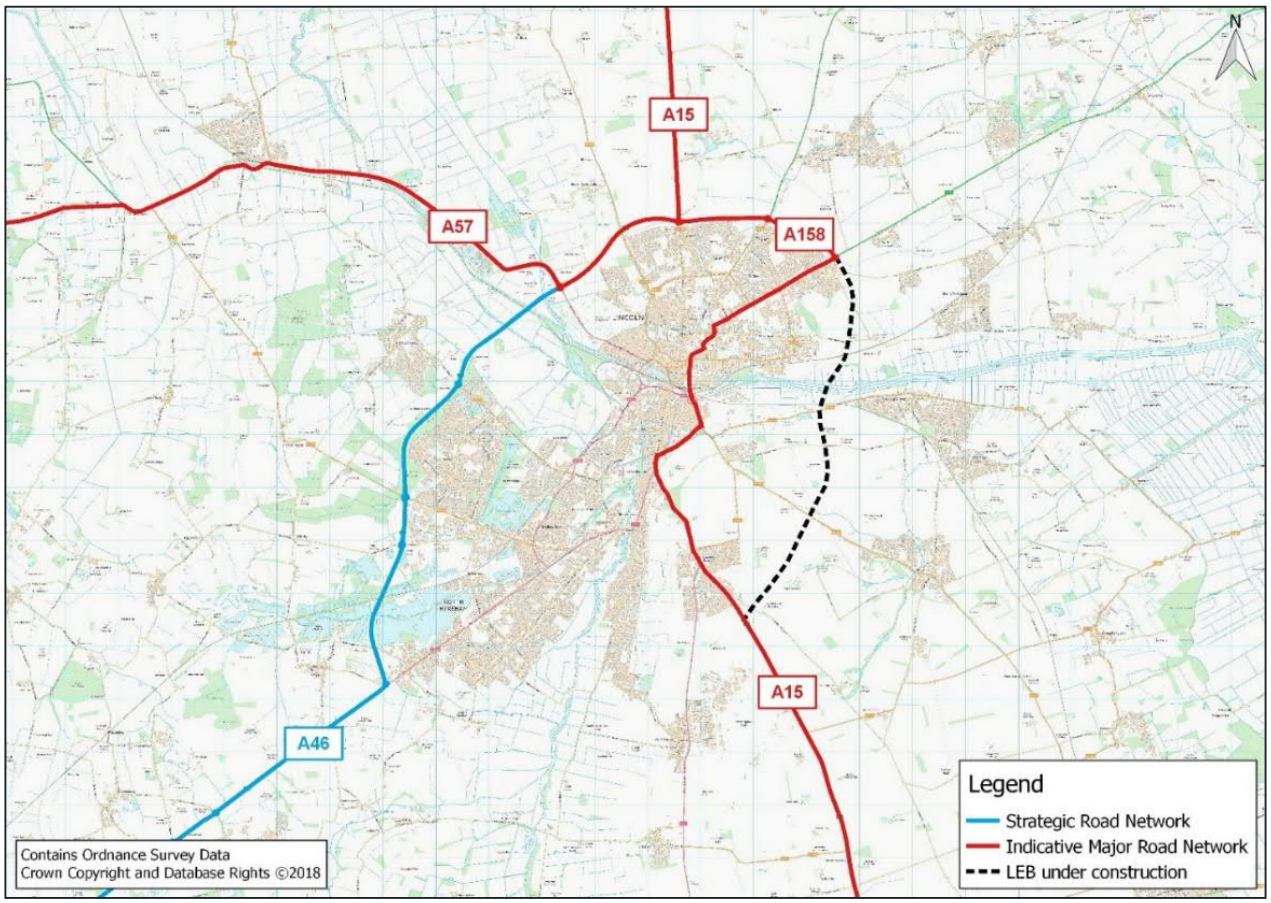
- Reduce congestion;
- Support economic growth and rebalancing;
- Support housing delivery;
- Support all road users; and
- Support the SRN.

The DfT is proposing to shape the MRN using both an objective analytical basis, and local knowledge and requirements. It states that the consultation seeks views on the criteria being used to define the network which include:

- To use current traffic data as the starting point by which to identify those roads that should be considered for inclusion in the MRN.
- To use qualitative criteria in order to create a coherent and consistent network.
- To take into account evidence from local and regional partners concerning regional variations.
- To include, where appropriate, previously de-trunked roads.

As part of the consultation and to help respondents in providing their views, a map of an indicative MRN in the Lincoln area has been published, as shown in Figure 4-4.

Figure 4-4 - MRN Proposals within Lincoln Area



It can be seen that included within the indicative MRN are the A15, A57 and A46; three links that make up the key radial and orbital routes within the Lincoln urban area. Once completed, the LEB will be formally classified as the A15, between the A158 to the north and the existing alignment of the A15 south of Bracebridge Heath.

With reference to the North, TfN has published its 'Initial Major Roads Report' which builds on the Rees Jeffreys Road Fund study along with the Northern Powerhouse Independent Economic Review and Northern Powerhouse Strategy. The report provides early proposals and indicates that the MRN will be a live network that evolves to meet the emerging needs of the Northern economy and its connectivity priorities both now and in the future.

This will be critical to the North to transform:

- Agglomeration;
- The North's productivity gap;
- The ability to better connect current and future Important Economic Centres (IECs) to the SRN, MRN and rail networks;
- Reducing the cost of exporting goods to national and international markets; and
- Time, reliability and resilience benefits.

Within the report, TfN lists 13 broad transport corridors, referred to as connectivity priorities, identified for further appraisal. Amongst these priorities is the South Humber Trans-Pennine corridor which includes the A15 and A46 and their connection to the South Humber Bank from Lincolnshire.

Whilst the A15 and A46 have been identified as part of the indicative MRN and are recognised as being a connectivity priority to the South Humber Bank by TfN, the current congestion problems and forecast levels of traffic growth within Lincoln will likely inhibit any proposal to develop a programme of work along these routes and the effectiveness of the MRN through Lincoln.

It would be expected that the completion of the orbital ring road around Lincoln will further support the reassignment of strategic traffic from existing orbital and the major route network through the city centre, alleviating pressures on the existing network and allowing the benefits that result from meeting the objectives listed above to be realised.

Lincoln is also covered by The Midlands Connect Partnership area, with the Midlands Connect Strategy aiming to improve journey times and network resilience so that all journeys can be completed within 20% of the median journey time for that period. The principles of the strategy are underpinned by the following objectives:

- To support the vision of the Midlands Engine through a transport strategy to transform strategic transport networks; and
- To maximise economic growth through increasing productivity of existing businesses and unlocking the creation of new jobs across the region.

4.1.2 Summary

The Greater Lincolnshire SEP sets out ambitious targets to achieve 13,000 new jobs, support 22,000 businesses, increase the economy by £3.2 billion and deliver up to 100,000 new homes by 2030.

The CLLP identifies a need for an additional 36,960 dwellings and 11,894 jobs across the period 2012-2036, with growth to be concentrated in the Greater Lincoln area.

The Lincoln South West Quadrant SUE, comprising of around 2,000 dwellings and 5ha of employment land, will be developed immediately adjacent to the proposed NHRR.

The NHRR is a critical transport link identified in the Central Lincolnshire Local Plan that will provide access to the SWQ.

4.2 FUTURE DEMAND AND LEVEL OF SERVICE

4.2.1 OVERVIEW

Significant levels of growth are planned and forecast for Lincoln, which will result in increases in the future transport demand and traffic across the network. The GLTM has been used to forecast the changes to levels of demand within the Lincoln Urban Area. The Do-Minimum modelling scenario, undertaken for the study, assesses the impact of growth on the highway network based on the implementation of only the completed and committed schemes included within the proposed CLLP, which are the LEB, the East-West link and the infrastructure proposed as part of the SUE developments, namely the NEQ, SEQ and WGC. It should be noted that the SWQ has not been included in the Do-Minimum scenario as this development is dependent on the scheme. The following section presents the forecast total trips, peak hour traffic flows and AADF.

4.2.2 TOTAL TRIPS

Table 4-3 provides a summary of the total forecast modelled trips during the AM and PM peak hours within the Lincoln urban area up to 2041. In the model base year (2016) there are approximately 31,200 vehicle trips in the AM peak hour and 32,500 in the PM peak hour:

- By 2026, vehicle trips are set to increase by 11% to approximately 34,600 during the AM peak and 10% to 35,800 during the PM peak.
- By 2041, vehicle trips are forecast to increase by 22% to approximately 37,950 during the AM peak and by 21% to 39,300 during the PM peak.

The growth from the base year to 2041 exceeds a total of 6,500 vehicle trips per hour, indicating a substantial rise in traffic volume in Lincoln. Even with the investment and addition of the LEB, conditions on the existing network can be expected to continue to deteriorate. In particular the major routes through and around Lincoln including the A46 and A1434 are expected to come under increasing pressure, as will the local road network in Hykeham, where conditions are expected to continue to deteriorate.

Table 4-3 - Total Vehicle Trip Growth 2016 – 2041

Peak Hour		Base Year (2016)	2026	2041
AM	Vehicle Trips	31,200	34,600	37,958
	% Change	0%	11%	22%
PM	Vehicle Trips	32,489	35,800	39,312
	% Change	0%	10%	21%

4.2.3 TRAFFIC FORECASTS – 2026 DO-MINIMUM

Figure 4-5 shows the AADT for 2026 on the key orbital and radial routes in the Lincoln urban area along with some of the more local routes within North Hykeham around the proposed location of the scheme. Figure 4-6 illustrates the forecast changes in two-way AADT at DfT count sites around Lincoln's strategic road network and other key radial routes from 2016 to 2026.

The data shows that there are forecast to be some significant increases in traffic on several routes into and around Lincoln, including those routes which already experience congestion or are already operating close to or at capacity. This includes sections of the A46 WRR where average daily traffic

is expected to increase by between 2,400 and 9,000 vehicles and the A4134 where traffic is forecast to increase by between 1,700 and 3,500 vehicles a day.

LEB Impact

The completion of the LEB during this period will result in changes to traffic flows on the existing network. Significant reductions in traffic will occur on the following:

- **A15** – There will be a reduction in flow on the dual carriageway section of the A15 in the centre of the city and along Wragby Road and Bunkers Hill. The AADT is forecast to decrease by approximately between 4,000 and 5,500 vehicles a day on this route due to the opening of the LEB as traffic re-routes on to the new orbital route and avoids travelling in to the city centre along the A15.
- **A607 Grantham Road** – Traffic flows on the A607 Grantham Road to the north and south of Waddington are also forecast by up to 1,000 vehicles a day.

However, the introduction of the LEB will result in increases on some sections of the network as a result of traffic reassigning to use the new route. This includes the A15 south (A15 Sleaford Road) where traffic will increase substantially on the approach to the LEB and at the LEB's northern end on the A158 Bunkers Hill junction – traffic here is expected to increase by up to 5,000 vehicles a day. Despite the introduction of LEB, traffic is still forecast to continue to grow across the network including on the A46 WRR and the A1434 as well as local routes including Brant Road, Meadow Land and Boundary Lane.

Figure 4-5 - Forecast 2-way AADT flows - Do-Minimum 2026

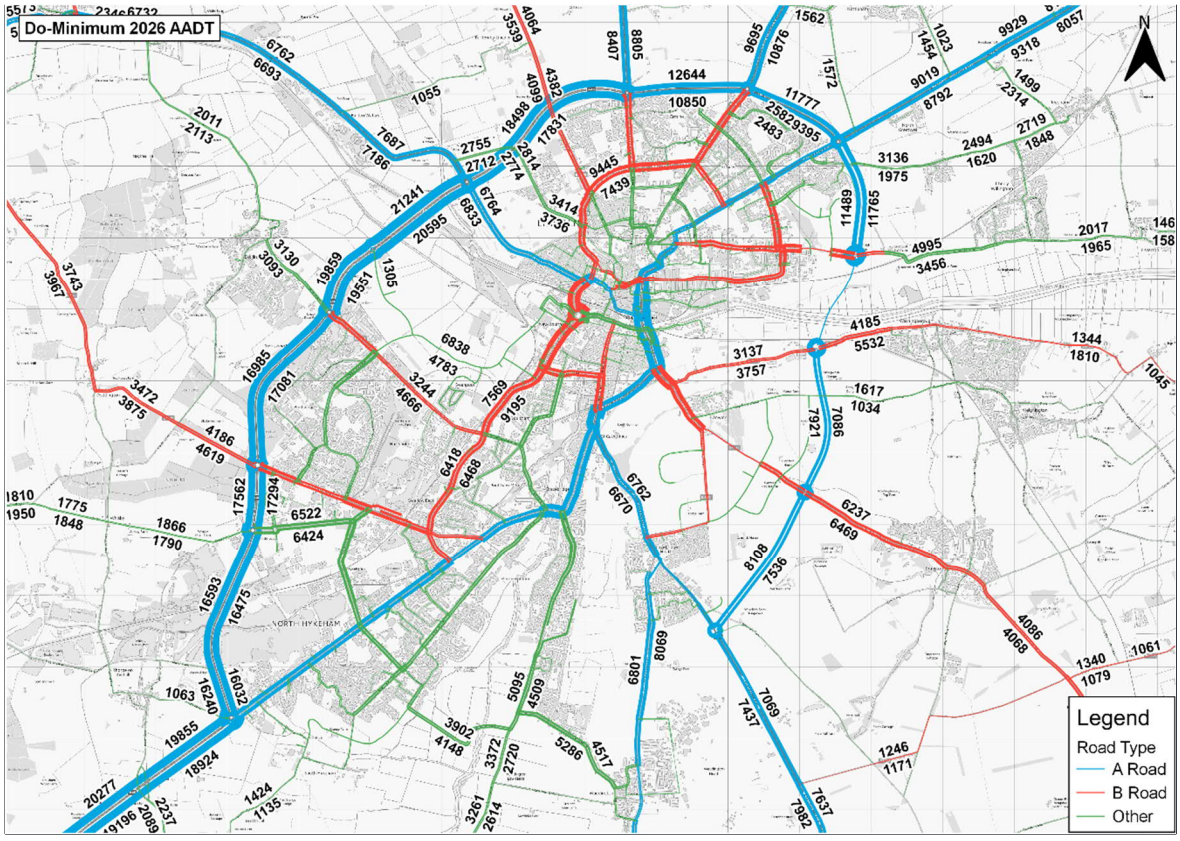
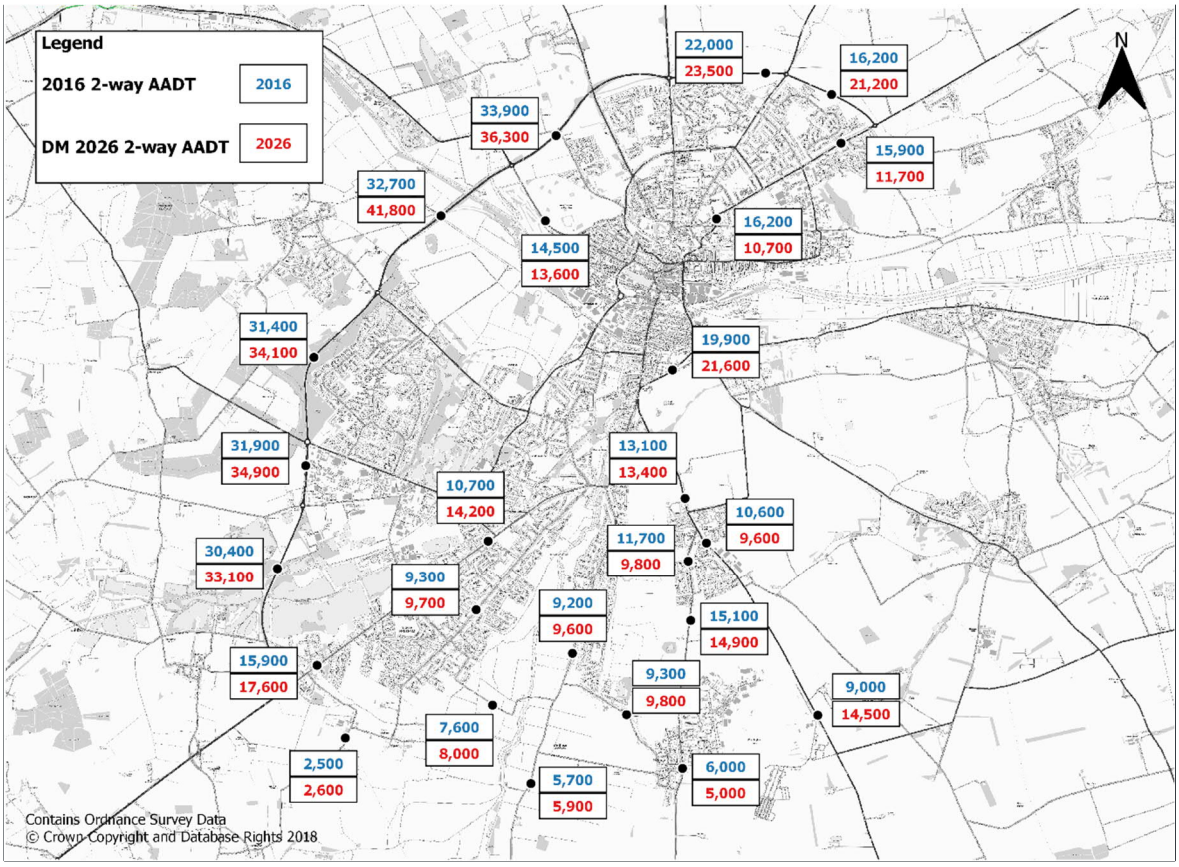


Figure 4-6 - Forecast AADT Change 2016-2026



4.2.4 TRAFFIC FORECASTS – 2041 DO-MINIMUM

Figure 4-7 shows the forecast AADT for 2041 on the key orbital and radial routes in the Lincoln urban area along with some of the more local routes within North Hykeham. Local roads such as Meadow Lane and Station Road are forecast to carry high amounts of traffic in both directions in 2041.

Figure 4-8 shows the forecast change in traffic flows up to 2041 and demonstrates that traffic is again expected to continue to increase on several major routes in and around Lincoln. As in the analysis for the period up to 2026 traffic is expected to continue to increase on the A46, A1434 and A15 where conditions will be expected to deteriorate further. By 2041 traffic is expected to have increased by between 4,500 and 13,000 on sections of the A46 WRR and by up to 11,000 vehicles on the A1434.

In addition, traffic on the local and rural routes in the south of Lincoln is expected to continue to increase. Meadow Lane in particular is forecast to increase by up to 1,700 vehicles by 2041 (an increase of 22%). South Hykeham Road, Station Road and A607 Grantham Road (through Waddington) are also forecast to see increases of up to 2,000 vehicles (increases of between 5% and 30%). This will put further pressure on these limited rural routes impacting on the existing villages and communities, increasing severance as well as affecting air quality and noise.

Figure 4-7 - Forecast One-way AADT flows - Do-Minimum 2041

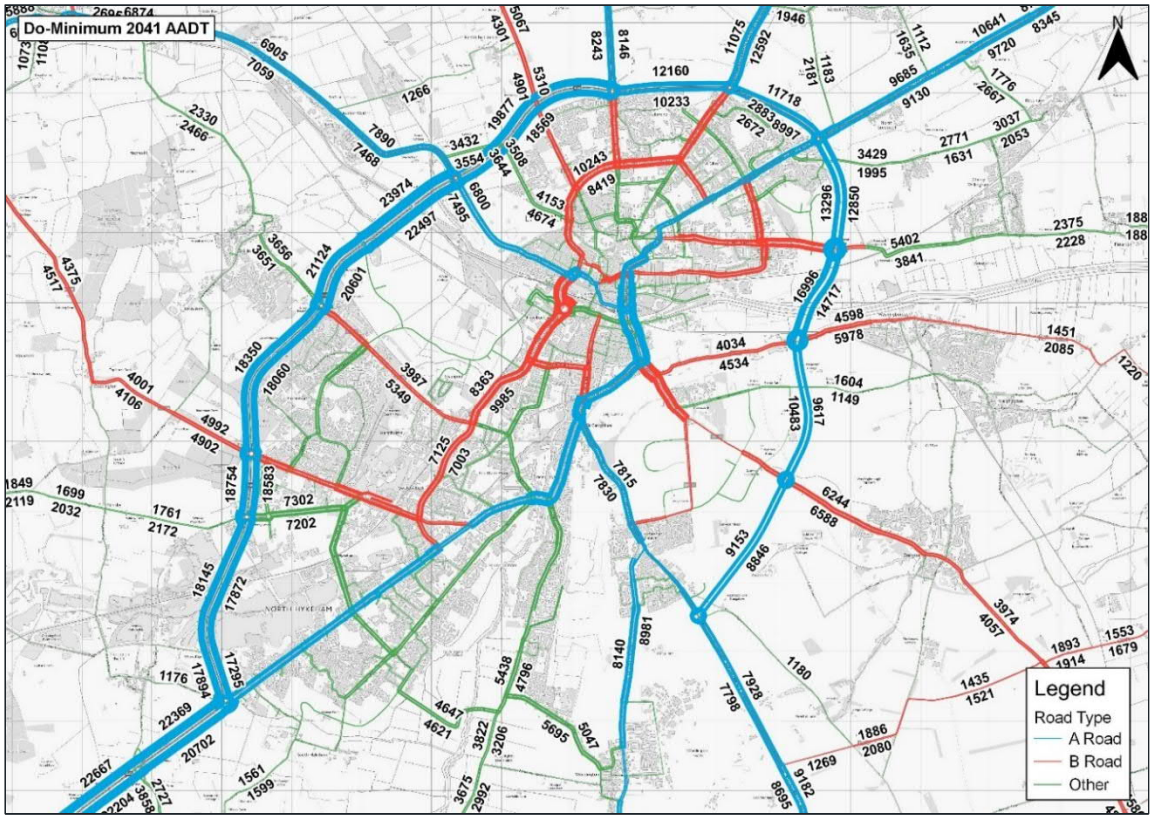
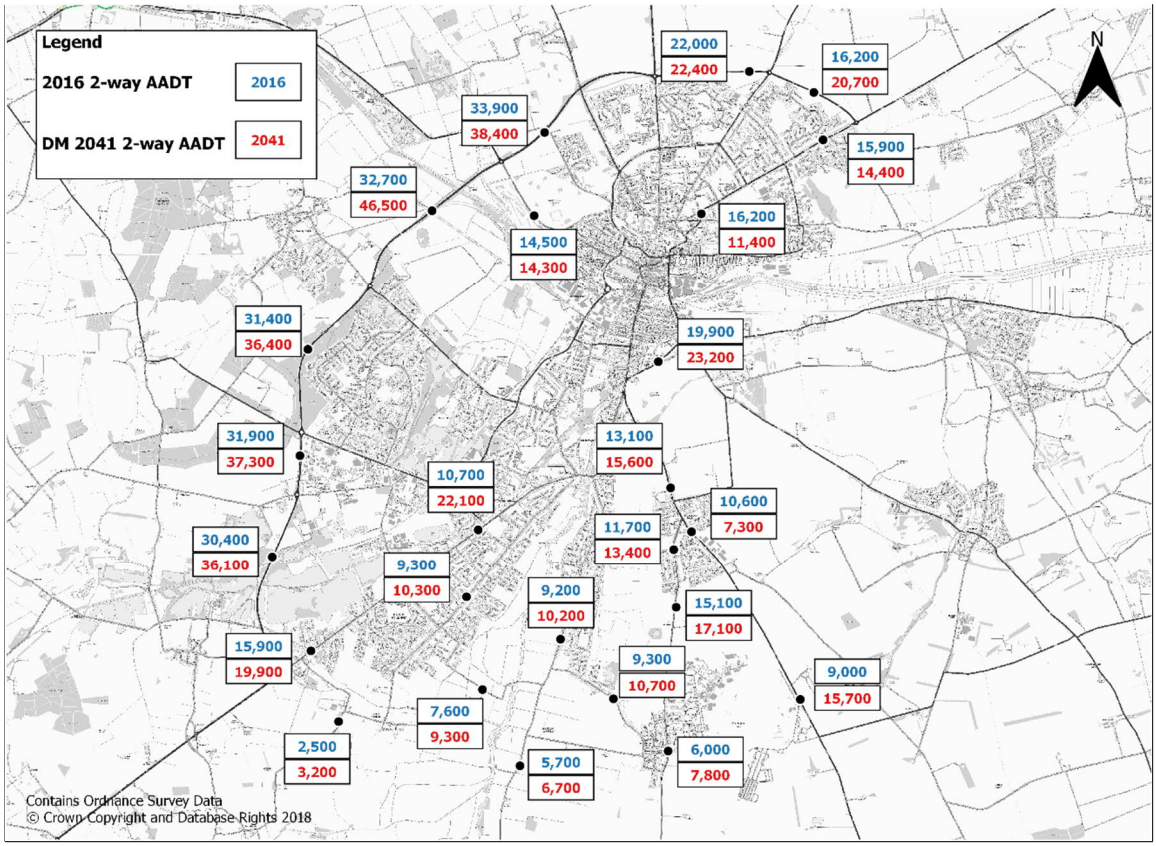


Figure 4-8 - AADT Change 2016-2041



The forecasts show that traffic growth is set to continue at a marked rate across the Greater Lincoln Area road network. In summary, analysis shows that without any further changes to the transport network, current levels of growth will result in traffic levels increasing significantly on many of the strategic orbital and radial routes in and around Lincoln. Further to this, the AADT on the local road network in North Hykeham, to the south of the city, is expected to continue to increase significantly, to a level which is not appropriate for the nature of the roads and the type of traffic that use them.

4.2.5 SUMMARY

Analysis of future travel demands within the study area shows that total trips are expected to increase substantially over the next 20 years.

Traffic levels are forecast to increase in the region of 11% up to 2026 and over 20% by 2041 from a 2016 base year.

The opening of the LEB will improve conditions in the centre of Lincoln. However, traffic is expected to continue to grow on a number of major routes including the A46 WRR, A1434 Newark Road, A607 Grantham Road and local routes in the south Lincoln area. These routes already experience congestion and conditions are expected to deteriorate.

Analysis undertaken as part of the Local Plan identifies significant additional traffic resulting from development and the identification of the NHRR as a prioritised scheme.

Traffic flows on the existing rural east west routes to the south of Lincoln are also expected to increase substantially. This will have a detrimental impact on the existing villages and communities within this area affecting air quality and noise and increasing severance.

4.3 FORECAST IMPACT OF FUTURE DEMAND

4.3.1 OVERVIEW

The forecast increase in demand and traffic on the network is expected to cause a number of problems. The following section presents the impact of the forecast levels of travel demand on the network illustrated through link capacity, junction volume capacity and average speed.

4.3.2 LINK CAPACITY

An assessment of the forecast traffic and link capacity for the AM and PM peak highlights the locations where the network is expected to be under stress in 2026 and 2041. Figure 4-9 to Figure 4-12 provide a visual representation of the link VoC ratio across the network. The colour shading highlights the relationship of traffic flow to capacity with green representing sections of the network that are forecast to operate at less than 40% of capacity and the red links approaching absolute capacity. The figures also show the modelled ‘actual’ flows on each link.

4.3.2.1 2026 Forecast Impact

Figure 4-9 shows the outputs for the scheme opening year (2026) Do-Minimum AM peak hour (as described previously the ‘Do-Minimum’ scenario is based on the assumption that only committed schemes will have come forward by the forecast year).

The forecasts show that the single carriageway sections of the A46 WRR between the A1434 Newark Road and the B1378 Skellingthorpe Road junctions are expected to be operating over capacity by 2026. Capacity related issues for the east-west movements can also be identified along Meadow Lane to the south of the city, which again is expected to be operating at capacity by 2026 – this provides the only crossing of the River Witham in the south of Lincoln. It also shows that sections of the A1434 Newark Road are expected to be operating at capacity by 2026.

Figure 4-9 - Link Volume to Capacity Ratio - Do-Minimum - 2026 - AM Peak

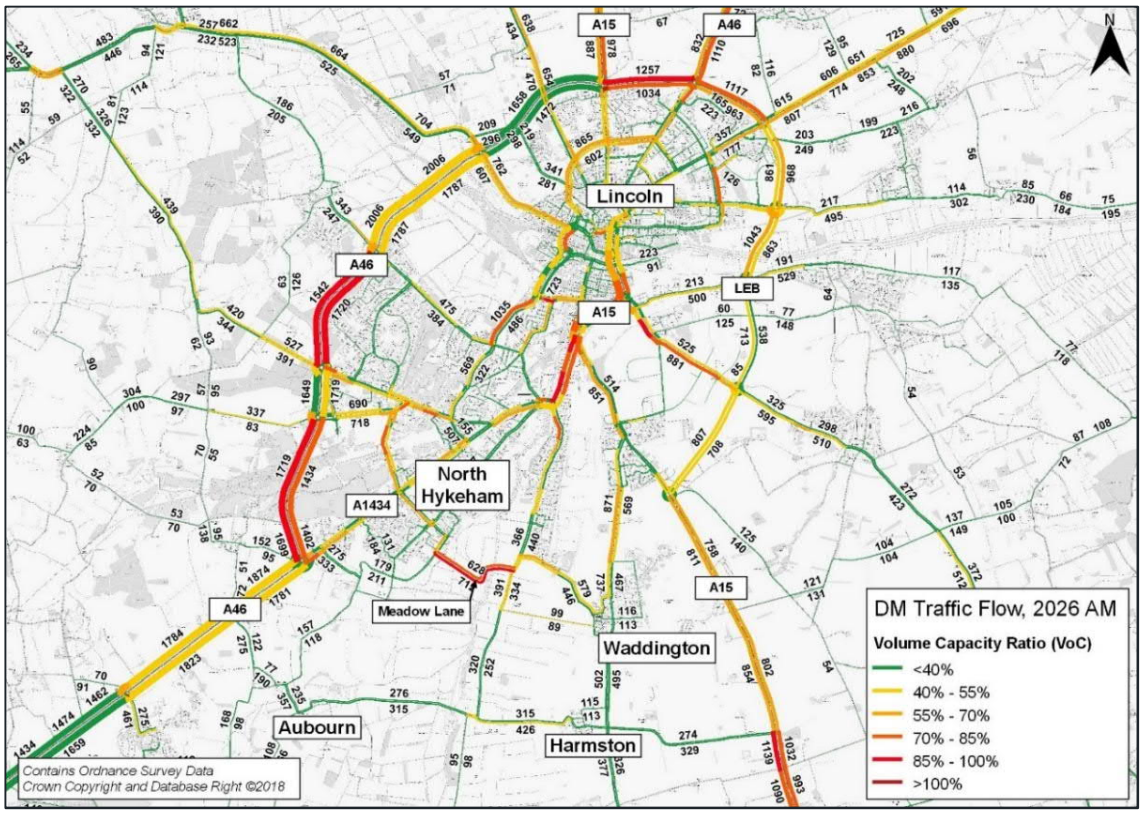
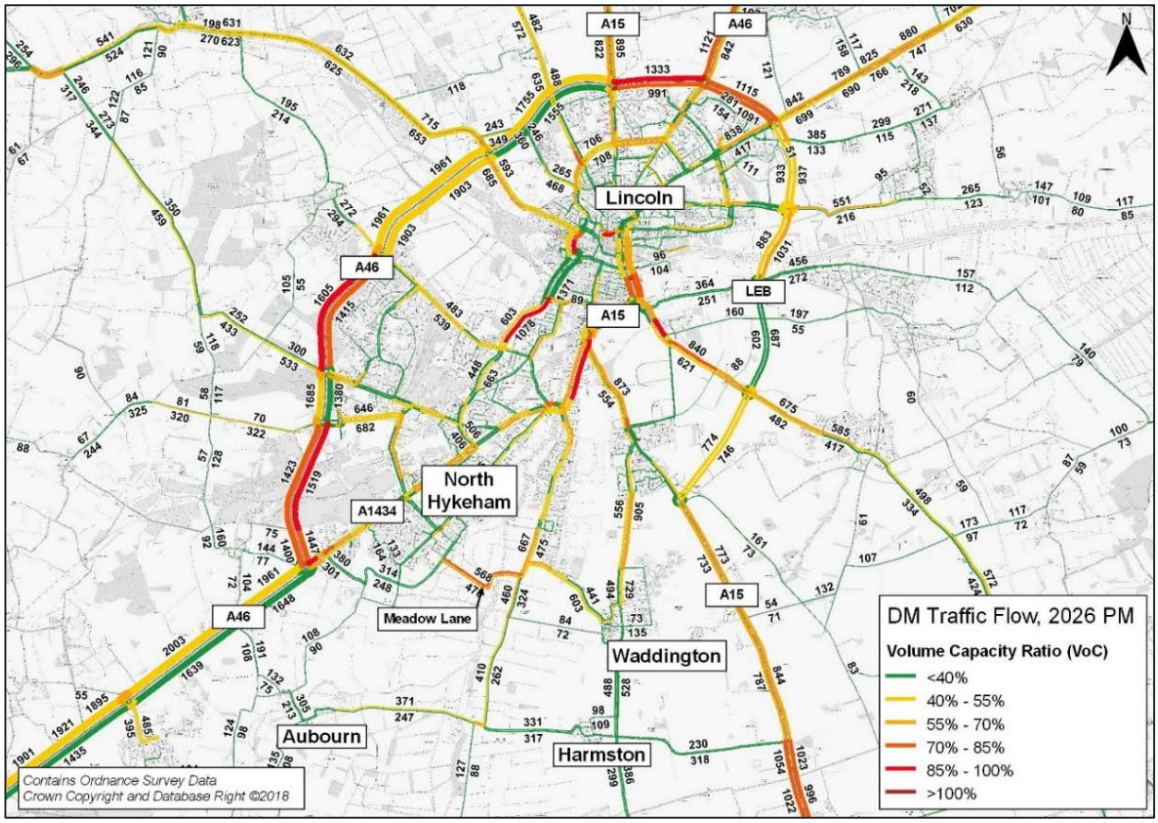


Figure 4-10 illustrates the Do-Minimum 2026 PM peak. It shows that conditions will be similar to the AM peak with the same stretches of the A46 WRR operating close to or above 85% of capacity along with the eastbound section between the A15 and the A46 Welton Road junctions, north of the city. In addition, it can be seen that the ring road section of the A158 to the north-east of the city is also close to operating over 85% of capacity in both directions along with the adjoining A46 Lincoln Road (northbound lane).

Figure 4-10 - Link Volume to Capacity Ratio - Do-Minimum - 2026 - PM Peak



4.3.2.2 2041 Forecast Impact

Figures 4-11 and 4-12 present the link capacity outputs for the 2041 Do-Minimum peak hours. The analysis shows that conditions are expected to deteriorate significantly from the existing situation and in 2026 as a result of the forecast growth traffic across the network. It shows that the pressure is forecast to increase on orbital network and several links are expected to be operating close to or above operating capacity.

The analysis shows that:

- Several sections of the A46 WRR are forecast to be operating over capacity in the AM and PM peaks by 2041;
- The majority of the A46 WRR will be operating above 85% capacity during the peak periods by 2041;
- Meadow Lane, an important existing east west link is also forecast to be operating at over 85% capacity in the westbound direction by 2041; and
- A1434 Newark Road between St Catherines (to the south of the city centre) and Brant Road is also forecast to be operating over 85% capacity by 2041.

Figure 4-11 - Link Volume to Capacity Ratio - Do-Minimum - 2041 - AM Peak

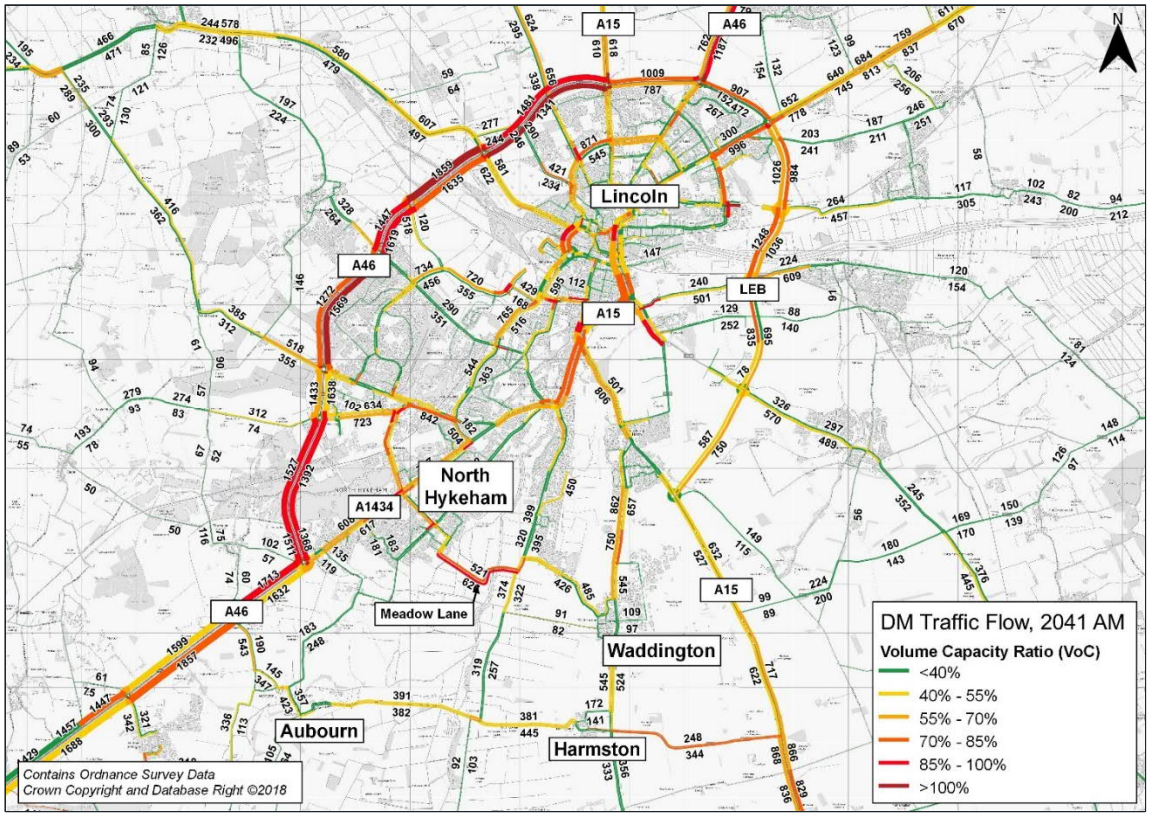
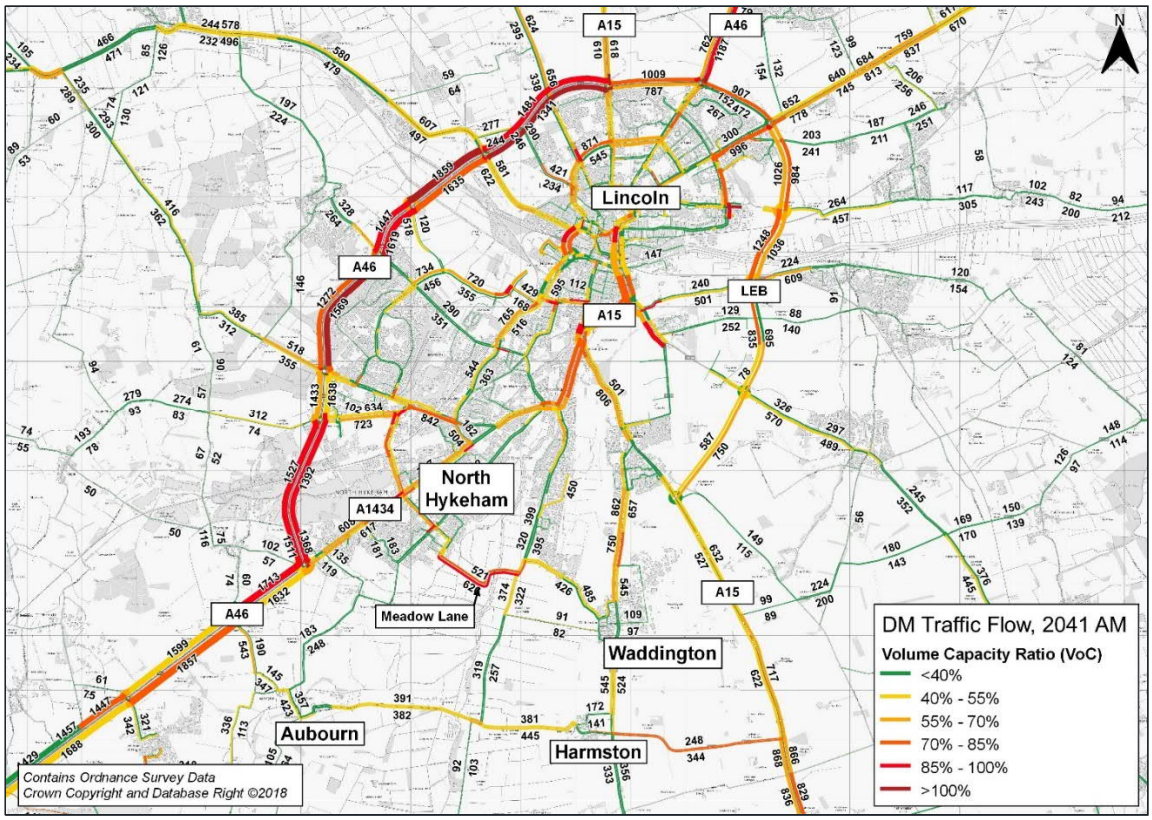


Figure 4-12 - Link Volume to Capacity Ratio - Do-Minimum - 2041 - PM Peak



4.3.3 JUNCTION VOLUME CAPACITY RATIO

Forecast volume to capacity ratios on the approaches to key junctions in the Lincoln city area have been analysed to show the expected level of congestion at junctions in the AM and PM peaks in 2026 and 2041. Table 4-4 shows the maximum VoC forecast at each peak of the assessed junctions for the future years 2026 and 2041.

Table 4-4 - Lincoln Junctions Max. VoC: 2026, 2041

Ref	Junction	2026 AM VoC	2026 PM VoC	2041 AM VoC	2041 PM VoC
1	A46/Newark Rd	102%	106%	105%	110%
2	A46/Whisby Rd	96%	89%	99%	92%
3	A46/Doddington Rd	98%	100%	101%	103%
4	A46/Lincoln Rd	98%	93%	102%	100%
5	A46/Saxilby Rd	103%	104%	108%	107%
6	A46/A15	103%	103%	105%	103%
7	A46/A158	102%	102%	104%	106%
8	A1434 Newark Road / Moor Lane / Station Road	96%	91%	99%	93%
9	A1434 Newark Road / Doddington Road	74%	65%	80%	68%
10	A1434 Newark Rd/Hykeham Rd	68%	86%	73%	86%
11	A1434 Newark Rd/Rookery Lane	71%	98%	76%	99%
12	A1434 Newark Rd/Brant Rd	81%	84%	88%	98%
13	A1434 Newark Rd/A15	77%	91%	82%	94%
14	A15/A607	72%	71%	77%	73%
15	A15/Canwick Rd	72%	97%	84%	101%
16	Wragby Rd/A158	70%	80%	88%	102%
17	A15/Lee Rd/Queensway	74%	68%	82%	76%
18	A15/Greetwell Rd	95%	78%	97%	94%
19	Greetwell Rd/Queensway	77%	51%	88%	56%
20	Greetwell Rd/ St Annes Rd	55%	42%	63%	47%
21	Greetwell Rd/Ocd	66%	61%	75%	80%
22	B1273/B1308	36%	46%	47%	55%
23	Lindum Rd/Monks Rd	92%	97%	97%	101%
24	Station Rd/Whisby Rd	80%	65%	96%	83%
25	B1190/Whisby Rd	81%	83%	85%	87%
26	Skellingthorpe Rd/Tritton Rd	81%	72%	93%	85%
27	Brayford Way/Carholme Rd	94%	96%	98%	98%
28	Skellingthorpe Rd/Birchwood Ave	40%	30%	46%	37%

Ref	Junction	2026 AM VoC	2026 PM VoC	2041 AM VoC	2041 PM VoC
29	Tritton Rd/Doddington Rd	94%	96%	98%	98%
30	Doddington Rd/Birchwood Ave	72%	42%	85%	57%
31	Lincoln Rd/Moor Ln/Chapel Ln	96%	90%	98%	91%
32	Meadow Lane/Brant Road	69%	44%	76%	50%
33	Brant Road/Station Road	55%	82%	60%	88%

Figures 4-13 to 4-16 present the junction VoC results spatially. As can be seen in the figures and Table 4-4, the most congested routes and junctions in 2026 and 2041 are located on the A46 orbital route, the A1434, Doddington Road, the A15 through the city centre and the east west routes in the south of Lincoln. The A46 in particular has severe congestion along its route at all junctions from A46/Newark to the A46/A158 junction in both peaks in 2026. The severity of congestion at these junctions is forecast to increase by 2041. Importantly this includes the A46 junction with Doddington Road which forms an important radial route into the city centre which itself suffers from congestion on a number of junctions along its route.

It is also noted the A1434 junction with Newark Road/Moor Lane/Station Road suffers from high levels of congestion. This is a major junction on the A1434 and the North Hykeham area and is constrained by its location and proximity to the existing properties. Further north on the A1434 there are high / severe levels of congestion on the junctions with Hykeham Road, Rockery Road, Brant Road and the A15. Congestion at all four of these junctions is forecast to increase by 2041.

In addition, the junctions on local roads to the south of Lincoln are also forecast to be considerably more congested, including severe congestion at the junction of Lincoln Road/Moor Lane/Chapel Road in both peak periods and to a lesser extent Meadow Lane/Brant Road in the AM Peak. These are all part of the existing east-west route in the South of Lincoln that connect the existing urban areas and villages in the south of the city.

Figure 4-13 - Max Junction VoC, 2026 AM

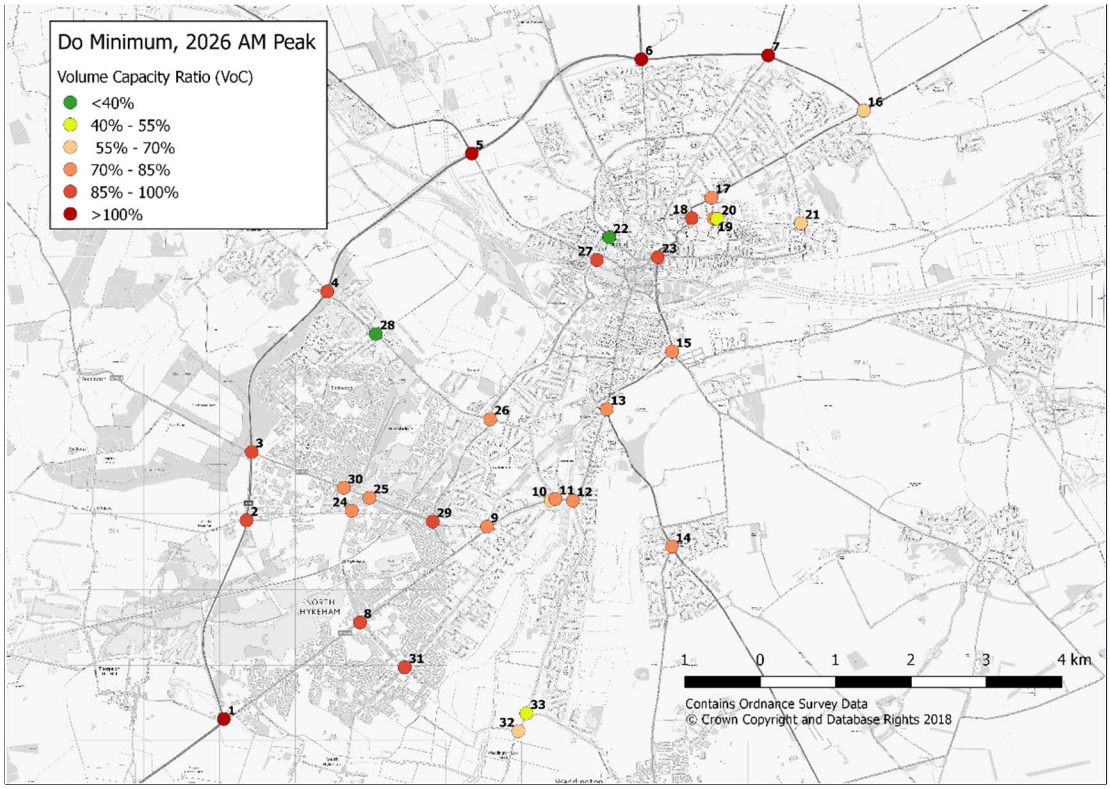


Figure 4-14 - Max Junction VoC, 2026 PM

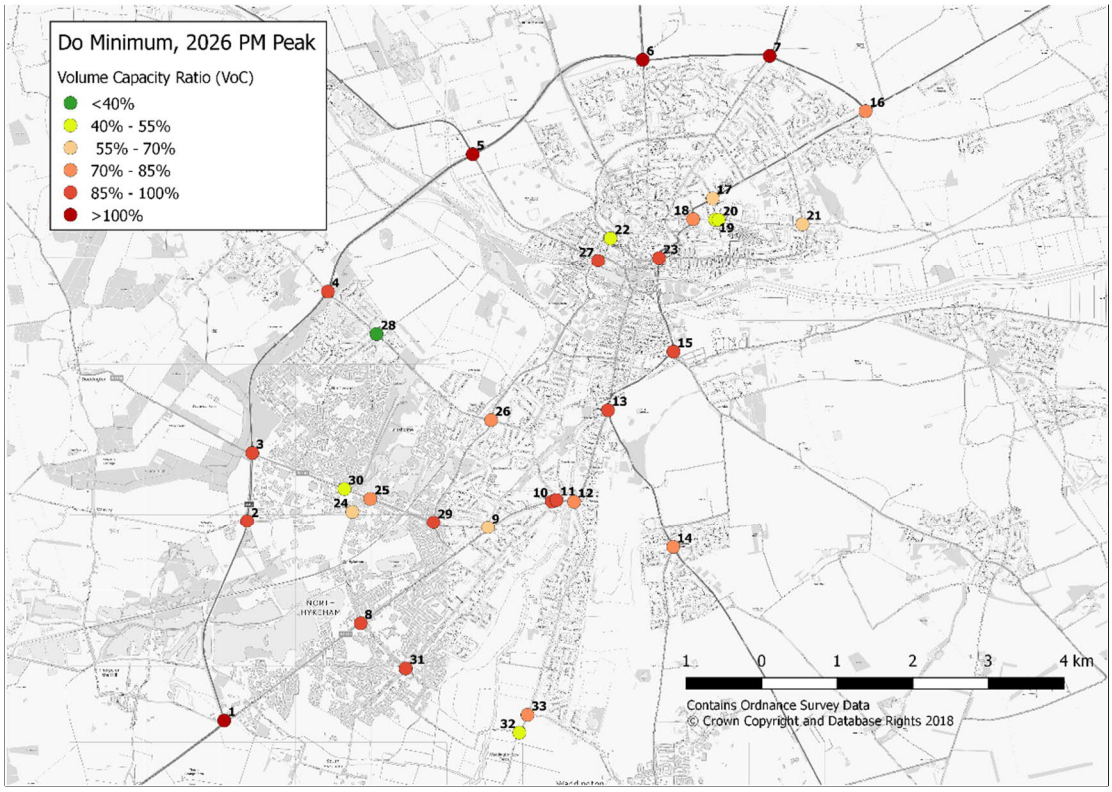


Figure 4-15 - Max Junction VoC, 2041 AM

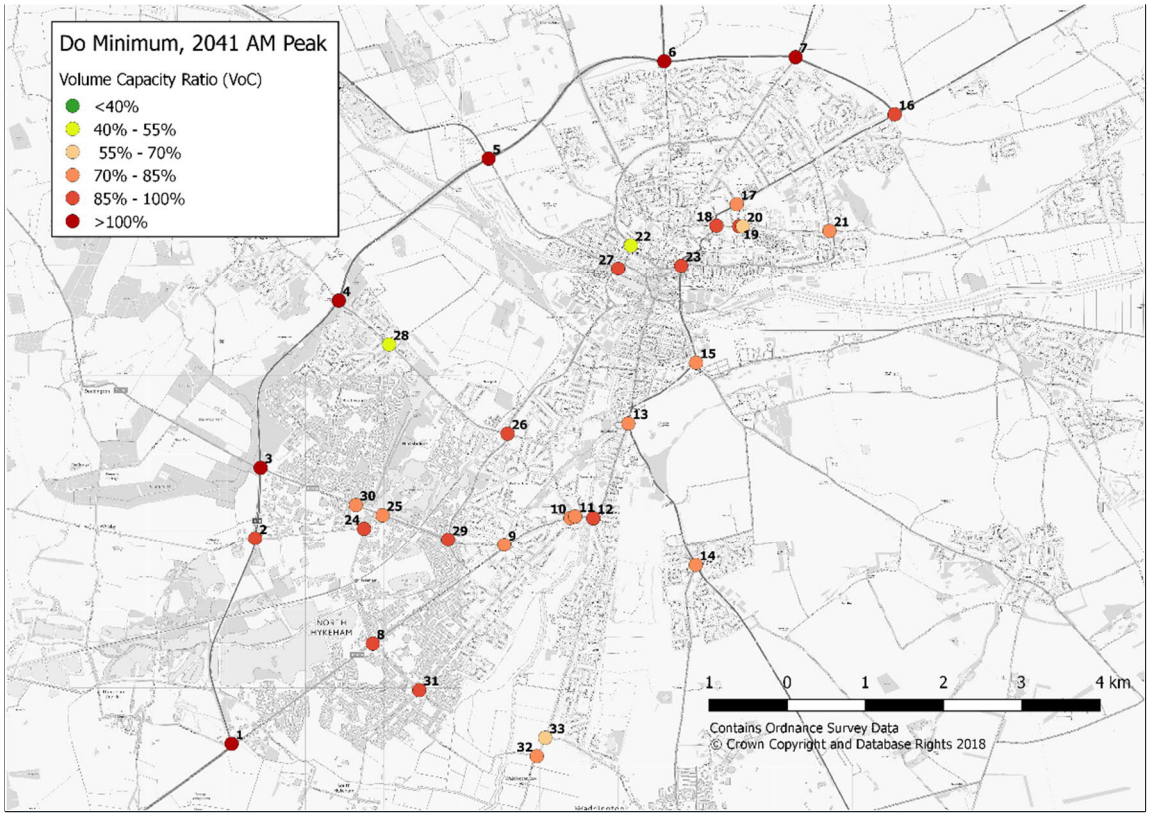
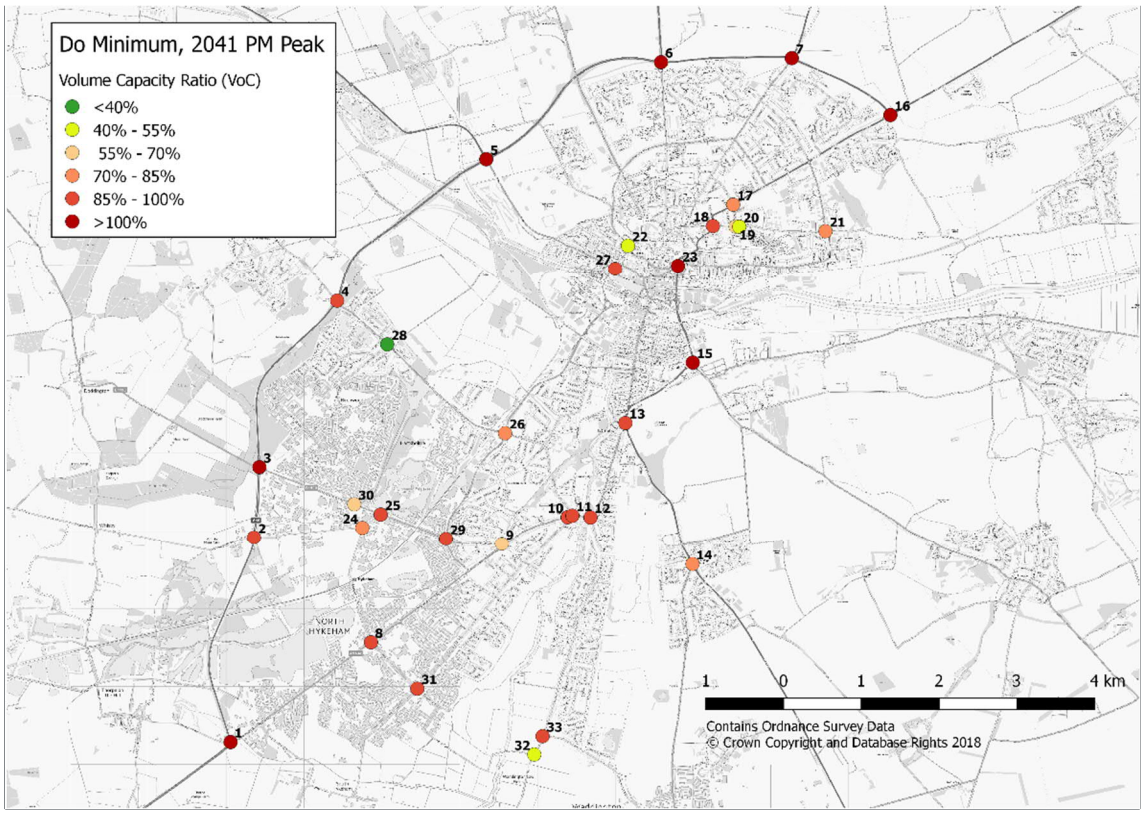


Figure 4-16 - Max Junction VoC, 2041 PM



4.3.4 AVERAGE SPEED – DO-MINIMUM 2026 & 2041

Analysis of the forecast speeds has also identified a number of locations where the average AM and PM peak vehicle speeds are expected to continue to decrease and result in significantly lower speeds than the current free flow conditions observed from 2016 Trafficmaster data. The data shows that conditions are expected to deteriorate along a number of major routes through and around Lincoln. These include the following routes:

- A46 Lincoln Western Relief Road (WRR);
- A46 Welton Road;
- A46 (Between Newark and Lincoln WRR);
- A607 Grantham Road/Lincoln Road;
- A158 Ring Road; and
- A15 (Riseholme).

Figure 4-17 - Average Speed, 2026 AM (Compared to observed 2016 Free Flow Speed)

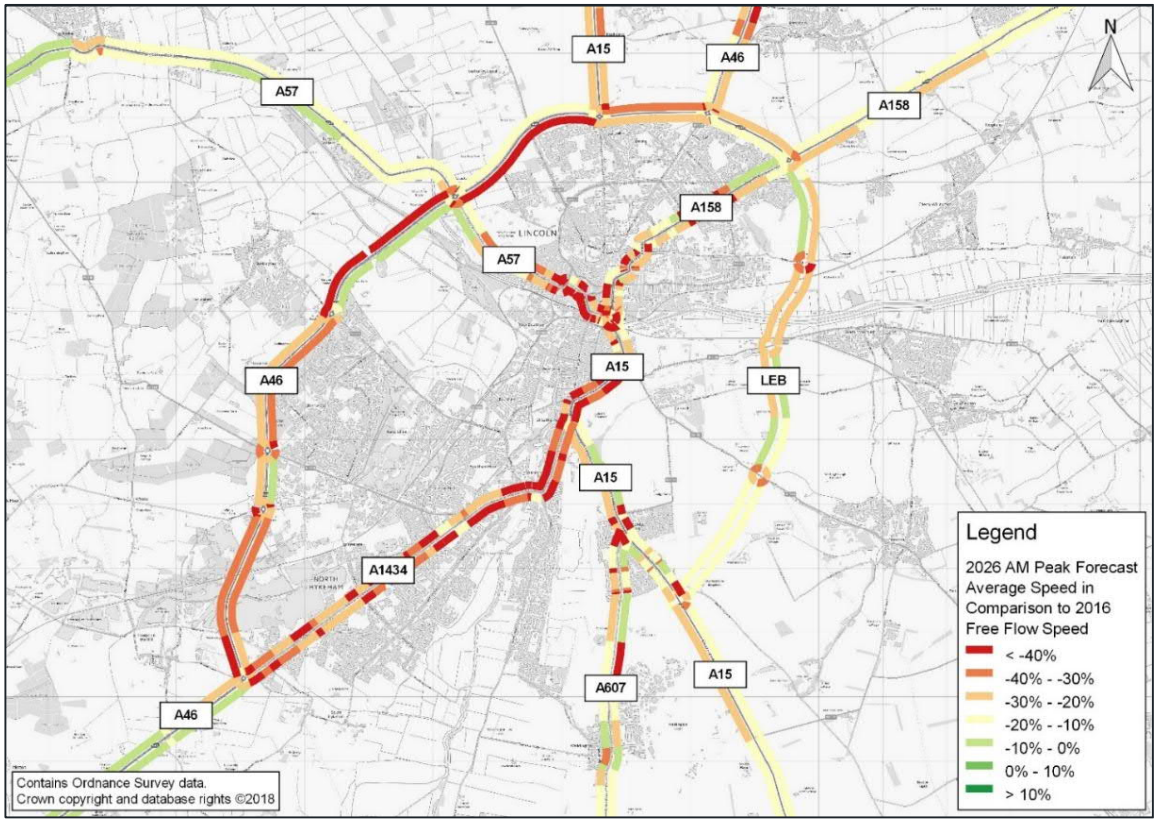


Figure 4-18 - Average Speed, 2026 PM (Compared to observed 2016 Free Flow Speed)

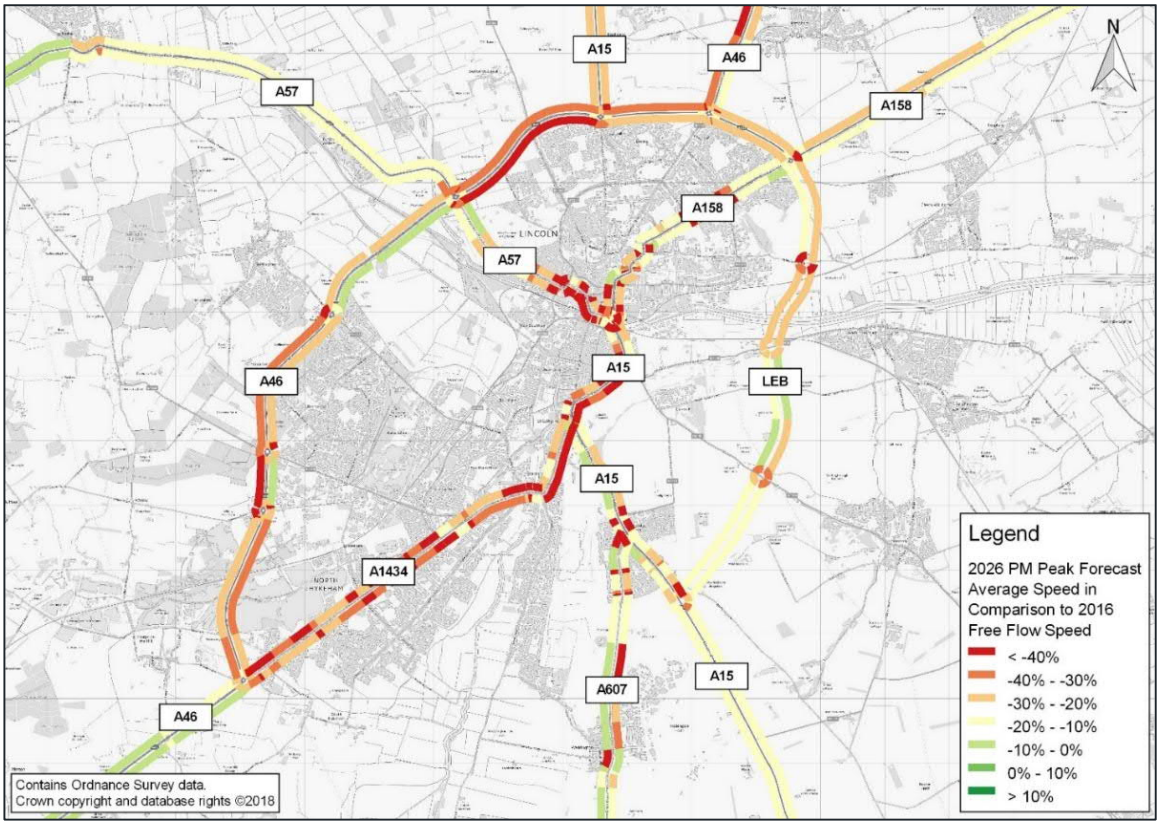


Figure 4-19 - Average Speed, 2041 AM (Compared to observed 2016 Free Flow Speed)

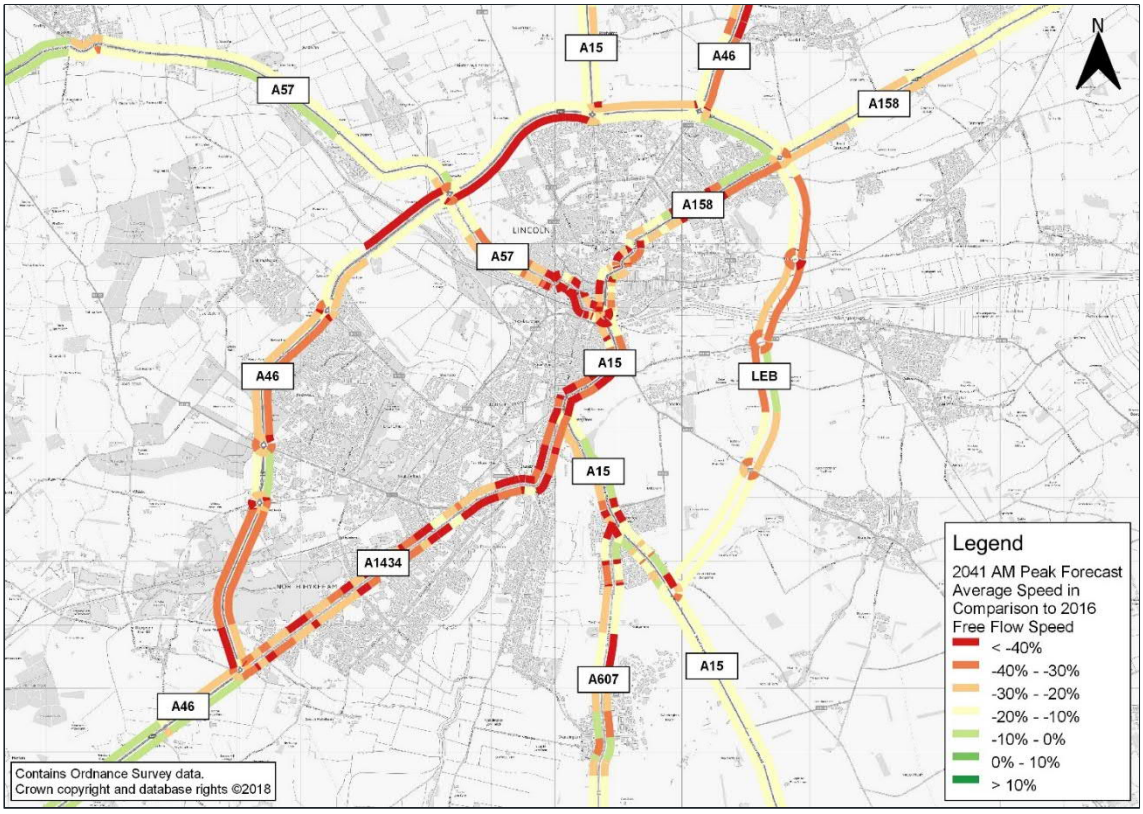
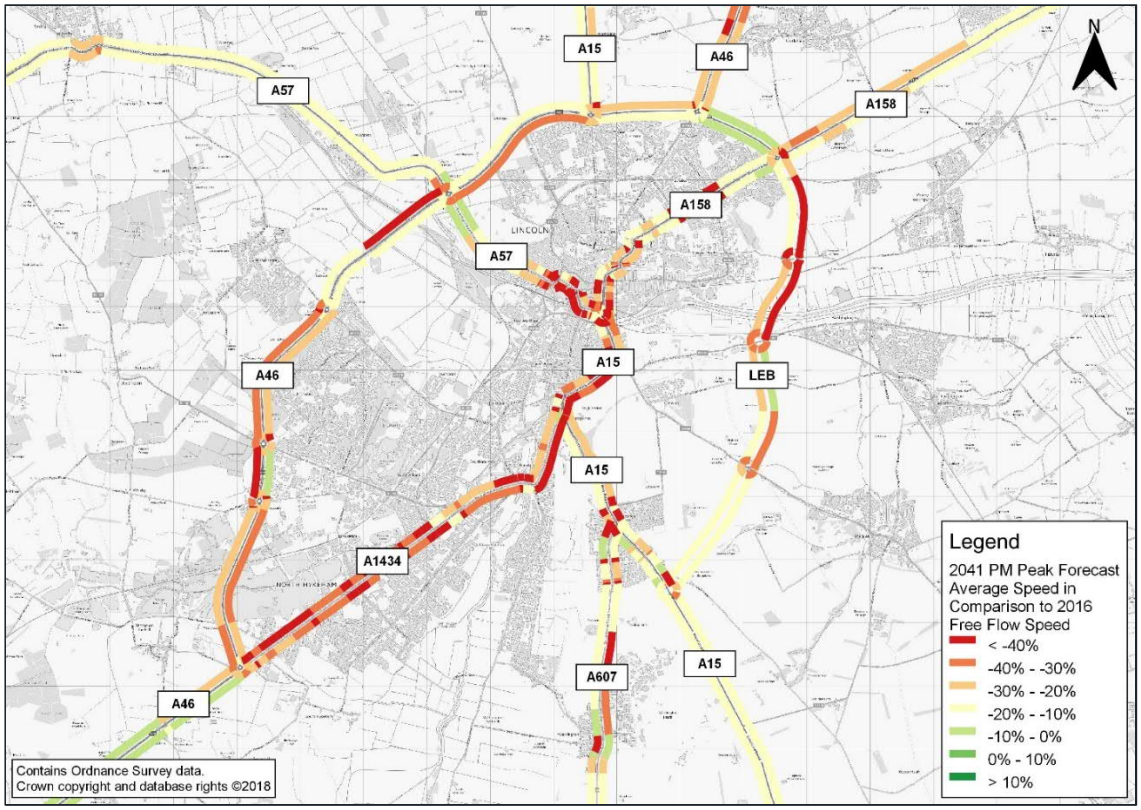


Figure 4-20 - Average Speed, 2041 PM (Compared to observed 2016 Free Flow Speed



4.4 SUMMARY

The findings in this chapter can be summarised as follows:

- Future land-uses and policies identify significant levels of planned growth up to 2036. Forecast development includes four SUEs which contribute to a 50% increase in dwellings in Lincoln by 2036.
- The LEB will provide much needed mitigation for some of the traffic and transport problems affecting Lincoln; however, several residual issues will remain. In particular the lack of strategic east-west connectivity will remain a significant problem which will continue to exacerbate the existing congestion problems on radial routes and routes into Lincoln.
- Travel demand is forecast to increase substantially over the next 20 years within the Lincoln urban area. Increases in traffic of over 20% by 2041 are forecast.
- The forecast traffic growth will result in a deterioration in conditions on key areas of the network, particularly on the western side of Lincoln including the A46 WRR, A1434 Newark Road and sections of the A15.
- The forecast impact of the future level of travel demand on infrastructure is illustrated by link capacity, junction capacity and average speeds, which indicate issues of congestion and low speeds on the key route network including the A46 WRR and the A1434 Newark Road and on local routes in the south of Lincoln and North Hykeham area. This includes Meadow Lane and Brant Road – the main east-west crossing of the River Witham in the south of Lincoln.

5 INTERNAL DRIVERS FOR CHANGE & IMPACT OF NOT CHANGING

5.1 OVERVIEW

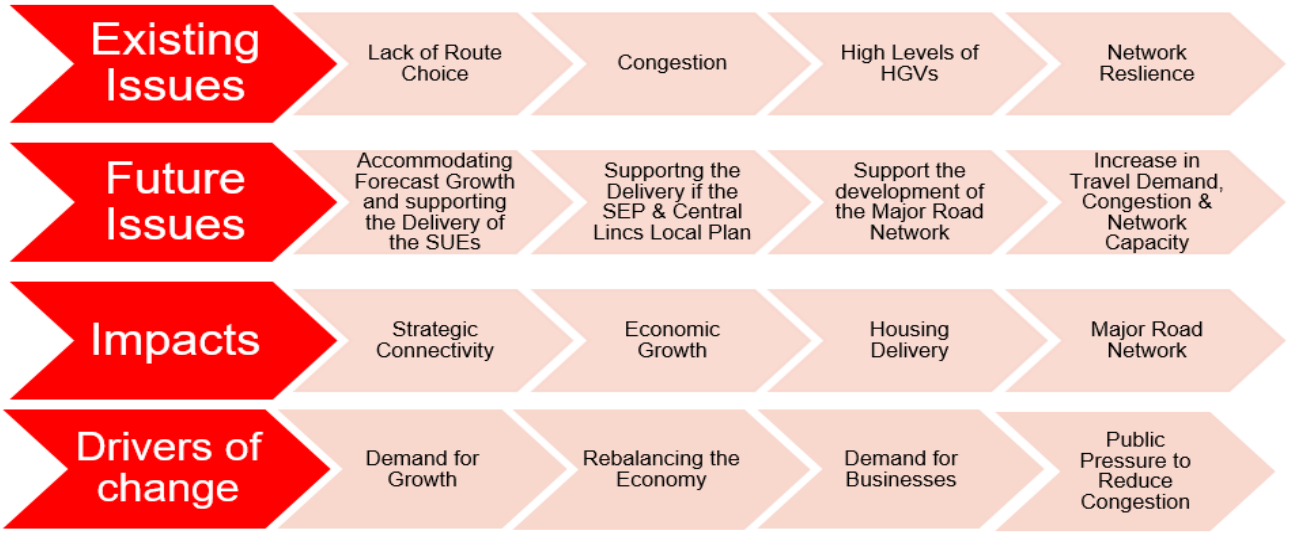
The previous chapters demonstrate that there are a number of significant problems on the current road network which result from the high levels of demand impacting on existing network limitations and constraints.

These issues result in significant volumes of traffic using a limited number of strategic and major routes or unsuitable routes through residential and rural areas. Several parts of the existing network are already at or close to capacity including the A46, with congestion resulting in poor average speeds, variable journey times and delay in both peak periods and to some extent also in inter-peak conditions.

Furthermore, Lincoln is the focus of major planned development over the next two decades which will further exacerbate the existing problems and issues. The increase in development and population will result in additional demand on the network and without further investment this will result in a further deterioration of existing conditions. There are internal and external drivers for change which the NHRR would seek to address, and there are a range of pressures locally, at a regional level and nationally, which make it necessary to act.

Without any further changes or investment, LCC's ability to deliver the planned development and economic growth aspirations for the urban area now and in the future, will be severely impeded.

The diagram below highlights key issues as identified in the previous sections as well as the resulting impact if these issues are not addressed. Addressing the existing and future issues highlighted will form a fundamental part of achieving Lincoln's growth aspirations and development objectives.



5.2 IMPACT OF NOT CHANGING ON EXISTING ISSUES

As described in Chapter 3 and above there are four key issues which affect the transport network in Lincoln. These issues have a significant impact on the operation of the traffic network within Lincoln

and, without investment, conditions can be expected to deteriorate further, affecting Lincoln's ability to grow and develop.

5.2.1 ROUTE CHOICE

Failure to address a lack of route choice will result in traffic continuing to take existing routes, contributing to an increase in the volume of traffic on the A46 orbital route, key radial routes and unsuitable local routes which already suffer from congestion. The additional demand and subsequent delay will negatively impact on the ability of the area to meet its economic growth aspirations. Furthermore, strategic traffic taking inappropriate routes through residential areas, the historic centre of Lincoln and routes through rural villages affects the liveability and quality of life for residents, workers and visitors. The resulting impact of a lack of route choice will be exacerbated in the future as demand on the network is forecast to increase. Indeed, a lack of route choice has been recognised as a key issue within the strategy and policy documents as well as the need to resolve this issue.

A lack of route choice has led to congestion on a number of key orbital and radial routes as well as strategic traffic taking inappropriate routes. This will remain an issue and will be exacerbated in the future as demand grows unless a suitable intervention is implemented.

5.2.2 CONGESTION AND NETWORK RELIABILITY

As highlighted previously, a number of sections on the network are currently operating close to or exceeding capacity and suffer from variability in average speeds. This is affecting several important routes around and though Lincoln including the A46, A1434 and A15.

Failure to intervene will result in continued congestion on the network, particularly on the A46 WRR, A1434 and A15, which are currently operating close to or exceeding capacity in peak times. This issue will be exacerbated in the future by the level of planned development and forecast traffic growth. It will continue to affect strategic connectivity around Lincoln and the key north-south routes to the international gateways of Humber Port and Humberside Airport, and severely limit the ability to accommodate future growth.

Furthermore, a failure to address congestion issues will result in a negative impact on the liveability and attractiveness of Lincoln for residents, workers and visitors. Congestion on key parts of the network may also impact on the area's ability to deliver future development such as the SWQ, which will generate additional traffic on an already congested network.

It is also important to note that congestion impacts on all users of the road network, including bus users, who will be subject to the same delays as other vehicles. This therefore reduces the attractiveness of the bus as a viable transport option. Congestion may also create a barrier to movement and severance issues for pedestrians and cyclists.

Whilst reducing congestion on key routes remains a priority for the Local Plan and Economic Plans of the area, there is also an aspiration to reduce congestion on more local roads within North Hykeham and neighbouring rural areas. Evidence shows that the area suffers from congestion and the Hykeham Neighbourhood Plan (2013) highlights issues of rat running. Rat running was also a clear issue identified as part of the public engagement undertaken in summer 2018.

Congestion and in parts severe congestion is present on key orbital, radial and local roads.

Without intervention, congestion will remain an issue and will worsen in future due to forecast levels of traffic growth and an increase in demand for travel as a result of significant new housing development.

Congestion impacts on all transport users and has an impact on the ability of Lincoln to meet its development and economic growth aspirations.

5.2.3 HGVS

The high numbers of HGVs passing through Lincoln and the residential areas will continue to impact on the quality of life for residents and visitors. High numbers of HGVs contribute to existing severance issues, particularly for communities in the North Hykeham area, as well as having a negative impact on noise and air quality.

This document has previously highlighted a number of policy objectives for the Lincoln area which aim to reduce the adverse impact of HGVs. However, the lack of route choice on the existing network makes this objective difficult to achieve.

The current levels of congestion on the network, particularly on the A46 WRR, also has an impact on the movement of HGVs. Journey time reliability issues along the major routes impact on movements between the Midlands and the international gateways on the Humber. Analysis shows that conditions along the strategic routes around Lincoln will continue to deteriorate and impact on the accessibility of the international gateways for HGVs.

A lack of route choice has resulted in a disproportionately high percentage of HGVs on the A46, routes through the city centre and local roads within residential areas. This has an adverse impact on the communities along the routes.

The current levels of congestion on the network, including on the A46 WRR, will continue to impact on the movement of HGVs.

In particular, congestion will continue to affect access to the Humber Ports, which will have a significant impact on trade and the ability of Lincoln to attract additional investment.

5.2.4 NETWORK RESILIENCE

The network resilience of the A46 WRR and A15 principal routes is poor and, in the event of a road closure, there is no option but to divert traffic via narrow, unsuitable local routes including through the urban area of Lincoln. Specifically:

- The limited number of strategic and major routes through and around Lincoln means that there is no alternative but to use diversionary routes through the urban area or rural villages when incidents occur.
- On average there are 3 to 4 incidents per year on the A46 and the same number on the A15, resulting in closures which require traffic to be diverted. As traffic volumes increase the impact of these diversions on existing urban areas will become more significant.

- The A46 is also a diversionary route for the A1. As demonstrated the A46 already experiences significant congestion problems which will be further exacerbated by diversions from other strategic routes. Conditions along the A46 will continue to deteriorate with the continued traffic growth within Lincoln which will affect the viability of the A46 as a suitable diversion route.

Without any intervention the incidents on principal routes through and around Lincoln will continue have a significant impact on local communities and there will continue to be no option but to divert traffic via unsuitable routes. This will become increasingly problematic with the continued growth of traffic and Lincoln.

Existing diversion routes for the A46 and A15 mean that a high volume of traffic is forced to use inappropriate routes through residential areas when a serious incident occurs. This impacts on journey times for all road users and communities living along the diversion routes, in terms of noise, air quality and severance.

5.3 IMPACT OF NOT CHANGING ON FUTURE ISSUES

Traffic conditions are expected to deteriorate in future in the context of forecast traffic growth. Not only will it be difficult to accommodate this growth on the existing network, it will also threaten the delivery of:

- The SUEs and broader CLLP proposals;
- The SEP objectives around growth and development; and
- The proposed MRN.

5.3.1 ACCOMMODATING FORECAST GROWTH & INCREASE IN TRAVEL DEMAND

The previous sections have shown that current levels of growth will result in traffic levels increasing significantly on many of the strategic orbital and radial routes as well as on the local road network in North Hykeham. Significant development growth is a large contributor to the increased traffic demand in the future. The evidence has demonstrated that while the key committed transport improvements such as the LEB will make significant improvements to the network, they are not sufficient to mitigate all of the impacts of the forecast level of growth, particularly in the south and south west of Lincoln.

The forecast traffic growth will exacerbate the existing congestion problems on the network, particularly on the A46, A1434 and local roads within the North Hykeham area. This will result in deteriorating journey reliability problems within Lincoln and around the city for residents, businesses and visitors.

Committed transport improvements such as the LEB will not be sufficient to mitigate the impacts of forecast growth, particularly in the south and south west of Lincoln.

5.3.2 SUPPORTING THE DELIVERY OF THE SUSTAINABLE URBAN EXTENSIONS

Four SUES have been identified to accommodate a significant proportion of Central Lincolnshire's planned growth in new homes and employment land in Lincoln. The SUEs will contribute to a significant increase in demand on the network which will result in additional congestion on key

routes. Of particular note to the study area is the SWQ, where the local road network around the proposed location already suffers from congestion particularly at peak times.

The development of the SWQ without any further investment or changes to the highway network will compound existing congestion issues and in doing so adversely impact on the economy as well as on communities living along these roads. Consequently, a suitable transport intervention will be necessary to serve the SWQ, improve its accessibility for all modes and ensure that it does not have an unsustainable impact on the strategic and local transport network.

The SUEs will compound existing congestion issues on the network. The deliverability of the SWQ in particular will need to be supported by a suitable transport intervention to ensure it does not have an unsustainable impact on the strategic and local road network.

5.3.3 SUPPORTING THE DELIVERY OF THE SEP AND CLLP

The SEP and Central Lincoln Local Plan set ambitious growth targets for Lincolnshire for new homes and jobs. As such, it is expected that the transport network will be under considerable strain unless significant transport improvements are made.

The growth of Lincoln is a vital contributor to the economy of the whole of the Greater Lincolnshire area and it is therefore crucial that this is achieved in a sustainable way to prevent it being undermined by traffic and transport problems. Continued growth in housing and employment needs to be supported by improved connectivity for all modes to ensure the additional movement generated by development does not deteriorate existing traffic conditions further. If improved connectivity and capacity is not delivered it will reduce the area's attractiveness to investors and may also impact on the area's ability to deliver the planned quantum of development. Therefore, suitable transport intervention is necessary in order to provide an efficient transport network and support economic growth ambitions of the area.

Failure to implement a suitable transport intervention will impede the growth ambitions of the

5.3.4 SUPPORTING THE DEVELOPMENT OF THE MAJOR ROAD NETWORK

The DfT has stated that the MRN will consist of the most strategic local routes in England, with the A15 and A46 identified as part of the indicative MRN. These routes are recognised by TfN as a connectivity priority to the South Humber Bank and Ports, as well as improving access to the Lincolnshire Coast.

The provision of effective strategic routes is also an important part of meeting wider economic priorities relating to agglomeration and reducing the North's productivity gap. The ability to better connect current and future Important Economic Centres (IECs) to the SRN, MRN and rail networks will improve confidence amongst inward investors and help to reduce the cost of exporting goods to national and international markets, through improved journey times and network reliability and resilience.

However, the forecast traffic growth on these strategic routes will result in a further deterioration of traffic conditions around Lincoln. These will inhibit any proposal to develop a programme of work along these routes and the effectiveness of the MRN through Lincoln. Therefore, suitable

intervention is necessary to ensure these routes operate with greater efficiency to ensure they function effectively as part of the MRN.

Suitable intervention is necessary to ensure that the A46 and A15 operate more efficiently and effectively as part of an indicative proposal to be part of the MRN.

5.3.5 CONGESTION & NETWORK CAPACITY

Congestion on the western and southern side of Lincoln is forecast to continue to increase and conditions on the orbital and radial route network will continue to deteriorate.

A number of key sections of the network are forecast to be operating above 85% or over capacity by 2041 including:

- A46 WRR between:
  - A1434 Newark Road and Whisby Road;
  - B1190 Doddington Road and B1378 Skellingthorpe Road; and
  - A15 and A46 Lincoln Road.
- A15 Cross O'Cliff Hill between A1434 Newark Road and B1131 Canwick Avenue.
- B1188 Lincoln Road between B1131 Lincoln Road and Lincoln Eastern Bypass.
- Meadow Lane between Brant Road and Russell Avenue – this provides a crossing of the River Witham in the south of Lincoln.

In addition, several key junctions are expected to be operating at or over capacity by 2041. These include:

- All junctions on the A46 orbital network from the A46/Newark to the A46/A158 junction.
- A number of junctions on the A1434, including:
  - Newark Road / Moor Lane/Station Road;
  - A1434/Hykeham Road;
  - A1434/Rockery Road;
  - A1434/Rant Road; and
  - A1434/A15.
- Junctions on local roads to the south of Lincoln including Lincoln Road/Moor Lane/Chapel Road.

Without any additional transport intervention, forecast increases in congestion on the aforementioned areas will affect the growth and development aspirations of the area including the delivery of the SUEs.

Congestion is forecast to grow in the future and the LEB alone will not sufficiently improve conditions in south and south west Lincoln. This will have a negative impact on the ability of Lincoln to meet its growth ambitions, including the delivery of the SUEs. It will also compromise the liveability and attractiveness for residents, workers and visitors, and impact on the attractiveness of sustainable transport modes, including bus, walking and cycling.

5.4 IMPACTS

The issues and problems described above will have several wider impacts, specifically the problems are expected to impact on:

- Strategic connectivity;
- Economic growth;
- Delivery of housing targets; and
- The delivery of the MRN.

5.4.1 STRATEGIC CONNECTIVITY

A number of challenges within the SEP recognise a need to focus on the delivery of goods to market which may be destined beyond the wider Lincoln area. This is reflected in a key objective within the Plan which highlights a need to improve connectivity between Lincoln, Central Lincolnshire and the Humber area, which are experiencing significant growth.

In order for the above to be realised, it is important to recognise that the A46/A15 is a key alternative route to the A1 through to the international gateways at the Humber Ports of Grimsby, Immingham and Hull. As stated previously, this key route has significant congestion delay and these conditions are expected to deteriorate in the future. Therefore, failure to implement an intervention which facilitates efficient strategic movement between Lincoln and wider economic areas, such as the international gateways, will impact on Lincoln's ability to deliver sustainable economic growth.

Strategic connectivity is being compromised by congestion delay particularly on the A46/A15. Without further transport intervention which provides efficient strategic movement between Lincoln and wider economic areas, such as the Humber ports, traffic conditions will continue to deteriorate, resulting in limited capacity to deliver sustainable economic growth.

5.4.2 ECONOMIC GROWTH

It is widely recognised that improved transport technology and transport networks, through effects on transport costs, access and connectivity, are major factors which underpin economic growth. At a national level, the Action for Road – A Network for the 21st Century (2013) cites an inclusive, integrated and innovative transport system and well-connected road infrastructure with sufficient capacity as a vital component of economic success. However, continued growth of the economy and population means that traffic levels in many areas will rise in the coming decades.

This is echoed within Lincoln and has been demonstrated within the previous sections of this document which showed that the existing traffic conditions result in congestion delays on the network, particularly at peak times, and this will be exacerbated in the future given the scale of planned growth in the Lincoln area. It has also demonstrated that although the LEB will make a substantial improvement to the transport network within Lincoln it will not improve east-west connectivity or the congestion problems on the A46 and in the North Hykeham area. This will inhibit and impact on the economic growth aspirations and investment within Lincoln.

There is an intrinsic link between an efficient transport network and economic growth. Within Lincoln the transport network is forecast to face increasing congestion which will impact on its ability to deliver sustainable economic growth.

5.4.3 HOUSING AND EMPLOYMENT TARGETS

Significant housing and employment development is planned within the Lincoln area, which will largely be accommodated by the four proposed SUEs. The CLLP identifies the need for an additional 36,960 dwellings and 11,894 jobs across the period 2012-2036, with much of that growth to be concentrated in the Lincoln urban area. This includes the SWQ in the south of Lincoln, comprising of around 2,000 dwellings and 5 hectares of employment land.

The additional traffic generated by planned housing and employment development will have a detrimental impact on a network which is already suffering from congestion. The LEB alone will not sufficiently mitigate congestion issues, particularly to the south and south west of Lincoln, and therefore without additional transport intervention, the ability to deliver housing targets will be compromised.

Without suitable transport intervention the ability to deliver the area's housing and employment targets will be compromised.

5.4.4 SUMMARY

The internal drivers for change and the impacts of not changing can be summarised as follows:

Existing Issues

- The existing road network suffers from a number of issues and unless a suitable transport intervention is implemented they will remain an issue. These include:
  - **Lack of route choice**: resulting in congestion and rat-running on local roads, particularly to the south of Lincoln and on key orbital and radial routes, with the latter resulting in a high proportion of strategic traffic travelling through the historic centre of Lincoln.
  - **Congestion**: congestion on the road network impacts on the ability to meet development and economic growth aspirations through slow journey times and issues of journey time reliability. It also impacts on bus users, who are subject to the same delays as other road users. It also makes walking and cycling less attractive.
  - **HGVs**: limited north-south and east-west connectivity in and around Lincoln results in significant proportion of HGVs using the A46 and inappropriate routes within the city centre and residential roads in North Hykeham.
  - **Network resilience**: when a serious incident occurs on the A46 or A15, diversion routes force a high volume of traffic through residential areas, which negatively impacts on local journey times and noise, air quality and severance.

Future Issues

Without suitable transport intervention, traffic conditions in the future will deteriorate and the road network will struggle to:

- Accommodate the forecast growth in travel demand;
- Support the delivery of the four SUEs;
- Support the delivery of the Central Lincolnshire Local Plan; and
- Support the development of the MRN.

Impacts

If a suitable transport intervention is not implemented, existing and future conditions will lead to:

- A lack of strategic connectivity: the A46/A15 currently provide strategic connectivity to wider economic areas such as the Humber ports. Congestion which is forecast to worsen will inhibit efficient movement on this route and compromise wider strategic connectivity.
- Constrained economic growth: the transport network is forecast to face increasing congestion which may impact on the area's ability to deliver sustainable economic growth.
- An impact on housing targets: the ability to deliver housing targets will be compromised.
- An impact on the indicative MRN: existing and future congestion on the A15 and A46 may hinder the potential of these routes to operate as part of the MRN.

6 EXTERNAL DRIVERS FOR CHANGE

6.1 REBALANCING THE ECONOMY

6.1.1 NATIONAL PRODUCTIVITY GAP

Transport is a national priority and a key driver for change within the Industrial Strategy. Despite the UK's clear economic and social opportunities, there remain persistent variations in Gross Value Added (GVA) per capita and productivity performance across the country. An economic gap persists, and changing this will require a radical change in the economy. Whilst there are a range of factors that lead to lower productivity and economic activity rates, many of these are affected either directly or indirectly by transport connectivity.

One of the key challenges to securing economic growth is poor transport connectivity, particularly outside of London. There is a productivity gap which improved transport can help to address. Transport plays a crucial role in the functioning of the economy; an effective and efficient transport system is a fundamental part of everyday life connecting homes, businesses and jobs. Improved connectivity will provide the backbone of a strong future economy delivering opportunities and economic outcomes.

The government has stated the intention to create a MRN to support economic growth and rebalance the economy. The A15, A57 and A46 are proposed as part of the indicative MRN and the NHRR would support this.

6.1.2 EAST MIDLANDS, LINCOLNSHIRE AND LINCOLN'S PERFORMANCE

In terms of productivity, Greater Lincolnshire remains in the bottom 10 LEP areas against the GVA per filled job and GVA per hour measures[3]. Lincolnshire's productivity is worse than the LEP area and significantly behind the UK productivity level.

Lincoln's GVA per FTE employee in 2016 stood at c. £48,900, which is 30% lower than the level seen across England (c. £69,800). Lincolnshire is also significantly less productive than England, though to a lesser extent, with a GVA per FTE in 2016 of c. £56,300 and a gap of 19% with England. This is broadly comparable to the East Midlands region, which had a GVA per FTE in 2016 of £57,900.

The productivity gap between Lincoln and England is now equivalent to 1.5 days each week of lost productivity for full-time equivalent employees. According to the Annual Population Survey, Lincoln's economic activity rate is c. 75%, slightly behind that of the East Midlands (78%) and England (79%).

From the Great Recession (2008 onwards), Lincoln and Lincolnshire have seen weak growth. From 2008 to 2016, Lincoln's average annual growth rate was 1%, behind that of Lincolnshire (2%), which itself was behind that of the East Midlands and England (both 3%). This is a strong reversal of the

[3] ONS (2018) Subregional Productivity: Labour Productivity indices by Local Enterprise Partnership

1998-2008 trend where Lincoln grew at a faster rate (7% average annual growth) than Lincolnshire (5%), the East Midlands (5%) or England (6%).

The statistics above demonstrate that Lincoln does have the capacity to grow and rebalancing the economy particularly within the East Midlands region is a national priority and key driver for change. The message around productivity is echoed at both the national and regional level and demonstrates how important new transport infrastructure such as the NHRR could be the catalyst in driving productivity.

The key drivers for change are:

- Improving connectivity in order to raise productivity;
- Strengthening skills in order to make the Midlands a more attractive location for businesses;
- Supporting enterprise and innovation in order to foster a more dynamic regional economy;
- Promoting the Midlands nationally and internationally in order to maximise trade and investment in the region; and
- Enhancing quality of life in order to attract and retain skilled workers, as well as to foster the local tourist economy.

6.1.3 DEMAND FROM BUSINESSES

There is an aspiration to close the gap between the UK's most productive companies, industries, places and people in order to make the UK one of the most competitive places in the world to start or grow a business. Investment in infrastructure promotes a dynamic economy that encourages innovation and helps resources flow to their most productive use.

Modernising and maintaining the transport network by upgrading the busiest junctions, alleviating bottlenecks, and minimising disruption to users creates a more efficient transport network for business to grow. Connectivity improvements can lead to improvements in business productivity through:

- Better-matching people and their skills/experience to jobs;
- Attracting highly-skilled workers who value the ability to access a range of work and leisure opportunities;
- Facilitating opportunities for collaboration on research and development projects;
- Attracting footloose Foreign Direct Investment (FDI) capital; and
- Knowledge spill-over effects as a consequence of proximity to competitors and collaborators.

Lincoln is a major centre for Lincolnshire's strongest economic sectors including manufacturing and the visitor economy. It is home to global manufacturing businesses as well as important visitor attractions such as Lincoln Castle and Cathedral.

According to the SEP, the demand for movement of people and goods will continue to grow across Greater Lincolnshire and will therefore increase stress on the existing transport networks. Large numbers of HGVs adding to the pinch points in traffic congestion and the resulting poor access will weaken the future sustainability of the economy, with a particular effect on the agri-food supply chain as the industry is extremely time sensitive. The SEP states that it will prioritise investment towards pinch point and sustainable transport schemes, and also recognises that economic growth will be delivered faster and more effectively through improved transport connectivity.

As such, supporting and strengthening these business sectors through investment in improved transport connectivity is a key driver for change.

6.2 PUBLIC PRESSURE TO REDUCE CONGESTION

There is mounting public pressure to reduce congestion, particularly in the Lincoln area. Whilst the LEB will assist in alleviating some pressure, traffic volumes are forecast to continue to rise and without a complete orbital link, strategic traffic will continue to suffer from a lack of route choice resulting in rat running and increasing the levels of congestion already experienced.

The traffic growth from 2018 to 2036 exceeds a total of 6,000 vehicle trips per hour (a 20% increase in the AM peak up to 37,500 vehicles), indicating a substantial rise in traffic volume in Lincoln. Even with the investment and addition of the single carriageway LEB, conditions on the existing network can be expected to continue to deteriorate.

The major routes through and around Lincoln including the A46 WRR and A1434 are already under increasing pressure as well as the local road network in Hykeham, where conditions are forecast to deteriorate. The level of traffic on the local and rural routes in the south of Lincoln impacts on the existing villages and communities creating severance as well as affecting air quality and noise.

A public engagement exercise carried out in summer 2018 revealed strong dissatisfaction with the existing operation of the transport network in and around Lincoln. At the stakeholder workshops the key strategic transport issues affecting Lincoln were identified as included significant congestion on the existing bypasses and key routes through the city. The primary local transport issues in the south of Lincoln and rural area beyond included rat running through North and South Hykeham on local urban and rural roads. Consultation with hard to reach groups revealed that the current level of congestion on the existing road network prevented some members from accessing support groups and/or appointments.

Public dissatisfaction with the current levels of congestion and the overall performance of the transport network in and around Lincoln is therefore a key driver for change.

The external drivers for change can be summarised as follows:

- Address the productivity gap by improving transport connectivity;
- Rebalance the economy by supporting business growth;
- Facilitate economic growth and the additional demand which will result;
- Tackle rising congestion and increasing public dissatisfaction; and
- Improve access to employment, training and key services.

7 OBJECTIVES

7.1 OVERVIEW & APPROACH

Defining objectives plays a key role in steering the development of transport schemes and defines what a scheme or intervention is designed to achieve. The development of objectives for the delivery of the NHRR has been informed by the DfT Transport Appraisal Process guidance.

As per the guidance, a hierarchy of objectives has been considered and developed that is consistent with the wider national, regional and local strategies and aims, addresses the identified existing and future challenges as well as focussing on the specific requirements and need. The objectives are based on a realistic understanding of the issues and context of an intervention, reflecting the identified opportunities and constraints. Specifically, the NHRR objectives have been developed in respect of the following three-level hierarchy:

- **High level or strategic outcomes** – These express the desired end state, and reflect the aims and ambitions for the area or population. These are generally objectives to which transport contributes, but not always in a direct manner;
- **Specific or intermediate objectives** – These represent the intermediate effects of the transport intervention, including the direct and short-term objectives which need to be achieved for the high level or strategic outcomes to be realised; and
- **Operational objectives** – These represent the desirable outputs which are necessary for the intermediate objectives to be achieved.

7.2 NHRR OBJECTIVES AND OUTCOMES

The strategic outcomes, specific objectives and operational objectives for the intervention are summarised below and a more in-depth description of the process used to develop the objectives is presented within the OAR (2018) (Appendix A).

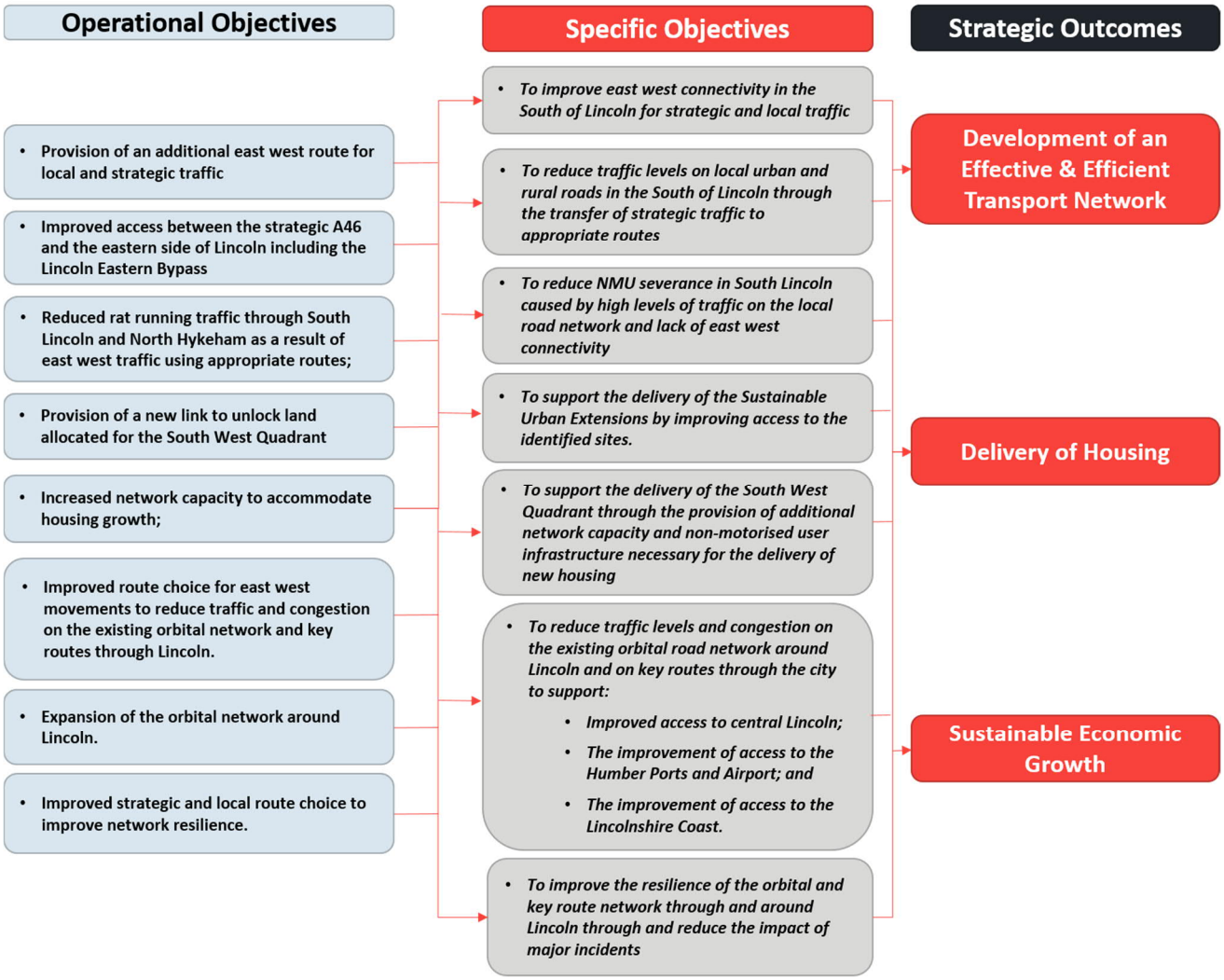
The strategic outcomes have been derived following a review of high level objectives of the DfT's Transport Investment Strategy, Greater Lincolnshire SEP, the CLLP, the Lincolnshire LTP, and the LITS. As a result, the strategic outcomes broadly align with the key themes which emerged from the policy review as presented within Section 2.

The specific / intermediate objectives represent the emerging impacts including the direct and short-term objectives which need to be achieved for the high level or strategic outcomes to be realised. In developing the specific / intermediate objectives it was recognised that a significant level of development is proposed for the Lincoln area up to 2036 and it is critical that this is supported by the delivery of new transport infrastructure. The intervention would also need to support the delivery of the LITS and its aims and objectives. This includes ensuring that the transport infrastructure meets the needs of existing and proposed developments, and that continued investment and development in infrastructure reduces congestion on key strategic and local routes within and around the Lincoln urban area.

Finally, the operational objectives were developed and provide further detail regarding the outputs that will enable the specific objectives to be achieved.

Figure 7-1 presents the operational objectives, specific objectives and strategic outcomes together with an illustration of the relationship between them.

Figure 7-1 - Relationship between Outcomes and Objectives



8 MEASURES FOR SUCCESS

8.1 INTRODUCTION

The success of the NHRR will be measured in terms of:

- The successful delivery of the NHRR itself;
- Delivering the scheme's operational and specific objectives; and
- Supporting the realisation of strategic outcomes.

8.2 SCHEME DELIVERY

The success of the scheme itself will primarily be concerned with ensuring that the planning, design, and construction phases are delivered effectively and efficiently. The following elements will constitute successful delivery:

- **NHRR Build** – The scheme is developed and constructed as described in the programme and as per the approved design, an effective stakeholder engagement process is employed, and the risk management process is successfully implemented.
- **NHRR Costs** – The final outturn costs are in line with those identified at the FBC stage and detailed the final business case.
- **Delivery Process** – The scheme is approved at the Outline and Full Business Case stages, the planning application is approved and all other necessary statutory processes are approved, and monitoring and evaluation is undertaken.
- **Delivered Scheme** – The scheme is delivered to the specified quality standards and costs and in line with the programme.

The results of which would be:

- The delivery of a dual carriageway orbital route linking the A46 Western Relief Road with the currently-under-construction Lincoln Eastern Bypass; and
- The scheme is delivered in line with the specified budget and programme and to the specified design and standards.

8.3 SCHEME OBJECTIVES AND OUTCOMES

The second measure of success for the scheme will be whether it has achieved its objectives and intended outcomes. The operational objectives and outcomes of the NHRR are as follows:

- NHRR Operational Objectives
  - To provide an additional east-west route for local and strategic traffic;
  - To improve access between the strategic A46 and the eastern side of Lincoln including the LEB;
  - Reduced rat running traffic through southern Lincoln and North Hykeham as a result of east-west traffic using appropriate routes;
  - To provide a new link to unlock land allocated for the SWQ;
  - Increased network capacity to accommodate housing growth;
  - To improve route choice for east-west movements to reduce traffic and congestion on the existing orbital network and key routes through Lincoln;
  - The expansion of the orbital network around Lincoln; and

- To improve strategic and local route choice to improve network resilience.

Outcomes

- Development of an Effective & Efficient Transport Network:
  - Through improved east-west connectivity in the south of Lincoln for strategic and local traffic.
  - Through reduced traffic levels on local urban and rural roads in the South of Lincoln through the transfer of strategic traffic to appropriate routes;
  - Through reduced NMU severance in South Lincoln caused by high levels of traffic on the local road network and lack of east west connectivity.
- Delivery of Housing:
  - To support the delivery of the SUEs by improving access to the identified sites.
  - To support the delivery of the SWQ through the provision of additional network capacity and NMU infrastructure necessary for the delivery of new housing.
- Sustainable Economic Growth:
  - To reduce traffic levels and congestion on the existing orbital road network around Lincoln and on key routes through the city to support:
    - Improved access to central Lincoln;
    - The improvement of access to the Humber Ports and Airport; and
    - The improvement of access to the Lincolnshire Coast.
  - To improve the resilience of the orbital and key route network through and around Lincoln and reduce the impact of major incidents.

8.4 MONITORING SUCCESS

The delivery of the scheme and the achievement of the objectives and outcomes will be monitored as part of the scheme monitoring and evaluation process (for further details see Section 9 of the Management Case).

As part of this plan, a programme of monitoring will be established that covers the pre-construction, construction, one year post construction and five years post construction periods. This will provide a robust framework for assessing the impact of the scheme against its objectives. It is envisaged that the monitoring and evaluation will examine the following:

Figure 8-1 - Monitoring and Evaluation

Process Evaluation	Impact Evaluation	Economic Evaluation
•Scheme Build •Scheme Costs •Delivery Process •Delivered Scheme	•Travel Demand •Travel Times & Reliability •Carbon •Noise •Air Quality •Accidents	•Delivery of Local Development •Congestion Relief •Job Creation & Employment

8.5 SUMMARY

The primary measures for success can be summarised as:

- The successful design, planning and construction of the NHRR scheme; and
- The successful delivery of the scheme objectives and outcomes.

Importantly a robust monitoring and evaluation plan will enable the impact of the scheme to be measured and reported to all key stakeholders. This will be completed in advance of the FBC.

9 SCOPE & SCHEME IMPACTS

9.1 INTRODUCTION

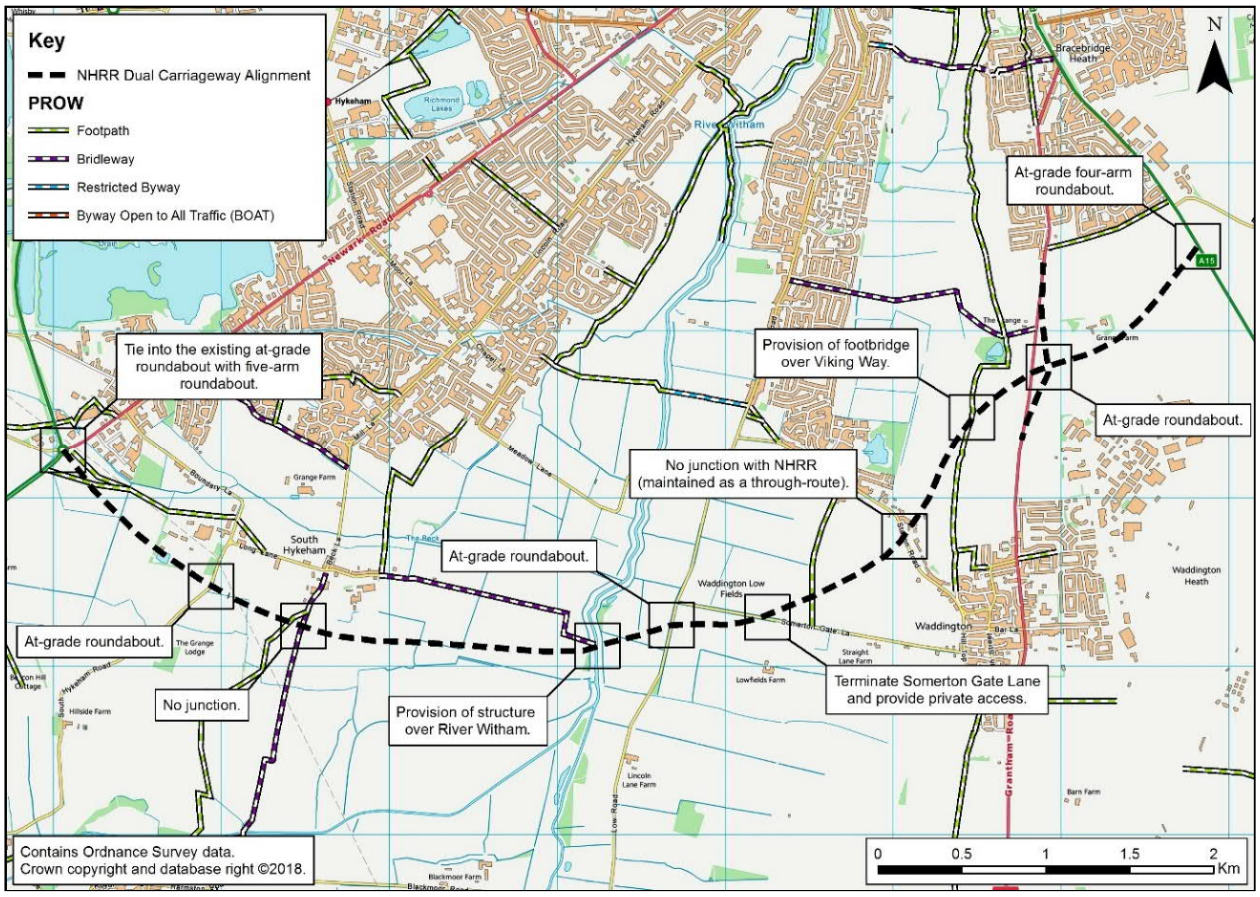
This section defines what is included within the scope of the NHRR scheme. It summarises the improvements which will be delivered as part of the NHRR and sets out the forecast impacts of the scheme in terms of traffic and associated development.

9.2 NHRR OVERVIEW

The NHRR will provide a 70mph dual carriageway link between the A46 on the western side of Lincoln and the A15/LEB Junction. The scheme will tie into the existing at-grade five arm roundabout at the A46 WRR/A1434 Newark Road/A46 (T)/Middle Lane and join the A15/LEB junction on the eastern side of Lincoln through an additional fourth arm.

As detailed in Section 11 and the Options Assessment Report (Appendix A), a significant amount of feasibility assessment and design development has been completed resulting in the identification of an optimum route alignment and highway standard. In addition, a significant amount of design development has been completed on the junction, structures, NMU and landscaping strategies and proposals. Figure 9-1 below shows the proposed highway alignment. Further details relating to the junction, structures, NMU proposals and landscaping strategy are provided in Sections 8.2.3 to 8.2.4.

Figure 9-1 - NHRR Scope and Inclusions



9.2.1 JUNCTIONS

In addition to the junctions with the A46 and A15 the scheme will also include the provision of three new junctions with the main radial routes where they intersect with the NHRR. These include:

- **South Hykeham Road:** A new four arm at-grade roundabout junction will be provided which will maintain access onto the local road network and provide access to the SWQ;
- **Brant Road:** A new four arm at-grade roundabout junction will be provided to maintain access onto the local road network; and
- **A607 Grantham Road:** A four arm at-grade roundabout will be provided to maintain access to the A607 Grantham Road and RAF Waddington.

The scheme also intersects the existing highway at three other points; however junctions will not be provided for the following reasons:

- **Wath Lane:** Wath Lane is a minor route used by NMUs and for access to adjacent agricultural land. It is therefore not appropriate to provide a junction with the NHRR;
- **Somerton Gate Lane:** Somerton Gate Lane is a minor route which carries a low level of traffic and is not deemed an appropriate standard to use for traffic from the NHRR; and
- **Station Road:** Station Road will be maintained as a through route and no junction will be provided with the NHRR. This will minimise the number of junctions along the NHRR and support the requirement to provide a strategic route (access onto the NHRR will be provided via the adjacent junctions with Brant Road and A607 Grantham Road).

9.2.2 STRUCTURES

The NHRR will include the provision of the following bridge structures:

- **River Witham Overbridge:** This will form a 119 metre 3 span bridge and carry the NHRR over the River Witham; and
- **Station Road Overbridge:** This will form a 47-metre single span bridge which will carry Station Road over the NHRR.

In addition, grade-separated NMU bridges will be provided at the following locations:

- **A46/NHRR Roundabout:** This will provide a crossing over the NHRR to maintain National Cycle Network route 9;
- **Wath Lane:** A NMU structure will be provided over the NHRR to maintain the existing public right of way along Wath Lane. Further options are being developed to consider allowing use by agricultural vehicles; and
- **Viking Way/A607 Grantham Road:** A NMU structure will be provided over the NHRR to maintain the existing public right of way along Viking Way and the cycle route along the A607 Grantham Road.

9.2.3 NMU STRATEGY

As part of the development of the feasibility proposals and designs a NMU strategy was developed which considered the aspirations and key objectives relating to provision for pedestrians, cyclists and equestrians. Key to the proposals is the following:

- Provision of high quality NMU infrastructure that maintains and improves connectivity across the PROW network in and to the south of the Lincoln urban area; and

- Improvement of orbital connectivity for NMUs and provision of safe green routes in the south of Lincoln.

In addition to the NMU structures described in Section 9.2.2 the following will be provided and further developed as part of the next stage of the design:

- A shared pedestrian and cycle route on the north side of NHRR. This will:
  - Link the A46 on the western side of the scheme to the LEB on eastern side; and
  - Link into the LEB route and be consistent with the LEB design principles.
- A bridleway on the south side of NHRR, this will:
  - Enhance NMU connectivity across this part of Lincoln and provide a facility that can be used by equestrians; and
  - Link into the existing PROW network on the southern side of the NHRR and improve access to the open countryside to the south.

9.2.4 LANDSCAPE STRATEGY & DRAINAGE PROPOSALS

The design of the NHRR route will be integrated into the existing environment. The landscaping proposals are being developed to take into account the development of the SWQ, the rural open sections adjacent to the River Witham, and the approach to the Lincoln Edge and Waddington. The key elements of the landscaping and drainage proposals are summarised below:

- **Drainage Design:** The design objective is for the drainage design to mimic the natural drainage of the greenfield site on which the bypass alignment is proposed. To this end, it will incorporate the principles of Sustainable Drainage Systems (SuDS).
- **Visual Impact:** The landscaping and planting will be targeted to reduce the visual impact of the scheme at key points along the route. These will be determined through the environmental assessments and development of the landscape strategy;
- **Landscape Integration:** Integration of the design of the NHRR route into the existing environment reflecting the different existing and future landscape character along the route. This will take into account the development of the SWQ, the rural open sections adjacent to the River Witham, the approach to the Lincoln Edge and Waddington;
- **Design Consistency:** Provide a consistent design and approach with the LEB; and
- **Maintenance:** Consider / adopt a low maintenance design.

9.3 SCHEME IMPACTS

NHRR is expected to have a fundamental impact on traffic in and around the Lincoln Urban Area and for longer distance strategic traffic. Specifically, the scheme will:

- Complete the orbital route around the city of Lincoln, improving east-west connectivity in the south of Lincoln for strategic and local traffic. It will reduce traffic levels on local urban and rural roads in the south of Lincoln through the transfer of strategic traffic to appropriate routes. This in turn will reduce severance and rat running which will improve the quality of life for communities and residents in the south of Lincoln.
- The scheme will support the delivery of housing, in particular the four proposed SUEs, by improving access to the identified sites and providing the additional network capacity and NMU infrastructure necessary for the delivery of the new housing. Specifically, the NHRR is an integral part of the delivery of the SWQ.

- It will reduce traffic levels of the strategic and major route network in Lincoln. This will improve access to central Lincoln, the Lincolnshire coast, the closest international gateways (Humber Ports and Airport). It will also improve the resilience of the orbital and key route network through and around Lincoln and reduce the impact of major incidents.

The forecast impacts of the NHRR have been examined in terms of traffic, development and wider economic impacts. Details are provided in the sections below.

9.4 TRAFFIC IMPACTS

The traffic model outputs and analysis in Section 4.2 show that without the scheme the pressure on the existing traffic network and the current problems will remain and over time conditions will worsen. Without any intervention congestion and capacity issues on the A46 western and northern relief roads and also on the A15 via the Lincoln urban area will increase.

The assessment of the 'with scheme' scenario shows the impact of the NHRR on the traffic network. The analysis shows that the NHRR is forecast to carry a significant level of traffic from opening. The traffic flow forecasts range from 25,000 to 26,600 in the opening year up to 28,900 to 32,700 in 2041, as illustrated in Table 9-1.

Table 9-1 - NHRR Forecast Traffic Flows

NHRR - Section	AADT - 2026	AADT - 2041
Section 1 - Pennell's Roundabout to South Hykeham Road	26600	29800
Section 2 - South Hykeham Road to Brant Road	25000	30500
Section 3 - Brant Road to A607 Grantham Road	26200	32700
Section 4 - A607 Grantham Road to A15/LEB	25000	28900

9.4.1 STRATEGIC ROAD NETWORK

The impact of the NHRR on the strategic and major road network has been assessed, this shows:

- The provision of the NHRR will help relieve pressure on the existing network and support the management and reassignment of traffic away from the existing A46 WRR in 2041;
- The traffic relief is more pronounced on the northern sections of the existing relief road, particularly on the sections between Skellingthorpe Road and Riseholme Road;
- It will result in a reduction in traffic during the peak periods, with the most significant changes in the inter-peak period (10am-4pm); and
- The scheme is also forecast to result in more traffic reassigning to the LEB with the southern section to the B1188 Lincoln Road expected to see the most significant increases.

Table 9-2 - Percentage Difference AADT & Peak Hour Flow 2041

Description	2041			
	AADT	AM Peak	Inter-Peak	PM Peak
Clockwise				
A46: Moor Ln to Whisby Rd	-5%	1%	-7%	-7%
A46: Whisby Road to Lincoln Road B1190	-1%	-3%	-8%	16%
A46: Lincoln B1190 to Skellingthorpe Road	-11%	-11%	-14%	-4%
A46: Skellingthorpe Road to WGC Link Road	-9%	-6%	-12%	-5%
A46: WGC Link Road to Saxilby Road	-7%	-3%	-10%	-4%
A46: Saxilby Road to Riseholme Rd	-5%	-1%	-9%	-2%
A46: Riseholme to A158	6%	-3%	16%	-3%
A158: A46 to LEB	-9%	-4%	-15%	-1%
LEB: A158/A15 to Hawthorn Rd	3%	5%	3%	3%
LEB: Hawthorn Rd to Greetwell Rd	1%	3%	1%	0%
LEB: Greetwell Rd to Middle Node 1	10%	14%	11%	4%
LEB: Middle Node 1 to Washingborough Rd	10%	14%	11%	4%
LEB: Washingborough Rd to Middle Node 2	27%	34%	29%	18%
LEB: Middle Node 2 to B1188 Lincoln Rd	27%	34%	29%	18%
LEB: B1188 Lincoln Rd to NHRR	61%	53%	66%	59%
Anti-clockwise				
LEB: NHRR to B1188 Lincoln Road	46%	62%	47%	34%
LEB: B1188 Lincoln Rd to Middle Node 2	25%	25%	27%	23%
LEB: Middle Node 2 to Washingborough Rd	25%	25%	27%	23%
LEB: Washingborough Road to Middle Node 1	12%	12%	11%	12%
LEB: Middle Node 1 to Greetwell Rd	12%	12%	11%	12%
LEB: Greetwell Road to Hawthorn Rd	5%	7%	7%	0%
LEB: Hawthorn Rd to A158/A15	5%	7%	7%	0%
A158: LEB to A46	-6%	1%	-11%	5%
A46: A158 to Riseholme Rd	4%	-8%	10%	2%
A46: Riseholme Rd to Saxilby Rd	-3%	-2%	-5%	-1%
A46: Saxilby Rd to WGC Link Rd	-4%	-3%	-6%	-1%
A46: WGC Link Rd to Skellingthrope Rd	-6%	-5%	-9%	-3%

Description	2041			
	AADT	AM Peak	Inter-Peak	PM Peak
A46: Skellingthorpe Rd to Lincoln Rd B1190	-6%	-2%	-9%	-3%
A46: Lincoln Rd B1190 to Whisby Rd	0%	-1%	-2%	6%
A46: Whisby Rd to Moor Ln	1%	0%	-1%	3%

9.4.2 LOCAL ROAD NETWORK

The NHRR will also have a significant impact on the local road network. The tables below show the impact across an east-west screenline (Table 9-3) which captures the impact through the centre of Lincoln and a south-west screenline (Table 9-4) which captures the changes across routes in the south west of the city.

- The NHRR will provide significant traffic relief across a number of routes both within central Lincoln and in the south of the city and result in an improvement in conditions;
- It shows that there will be a significant reduction on traffic on several key routes including the A1434 Newark (up to 13% - including at the key crossing over the River Witham), the A607 Grantham Road (7% by 2041) and the A15 (27% by 2041);
- It shows that the existing east-west rural routes in the south of Lincoln will experience a significant level of traffic relief; these include Meadow Lane (which provides a crossing of the River Witham) and Blackmoor Road (which forms part of the existing east west route from the A46 to the A15;
- It will also provide traffic relief to several routes within the residential areas in North Hykeham; and
- The benefits can be seen across a wider area and the scheme will help to address a number of challenges – including east-west connectivity, increasing network capacity to support growth and improving network resilience, as well as reducing localised congestion and rat running.

Table 9-3 - Traffic Flow Changes East West Screenline 2026 Opening Year & 2041

Location	Direction	2026			2041		
		DM AADF	Traffic Flow Change DS AADF	Change	DM AADF	Traffic Flow Change DS AADF	Change
A46	2-Way	23,493	23,147	-346	22,392	23,499	1,107
				-1%			5%
Longdales Road	2-Way	19,219	18,244	-975	20,858	20,038	-821
				-5%			-4%
B1308 West Parade	One-Way	5,301	5,072	-229	5,580	5,426	-153
				-4%			-3%
Mint Street	One-way	9,573	9,354	-219	10,281	10,044	-237
				-2%			-2%
St.Marks Street	2-Way	11,918	10,811	-1,107	14,311	13,194	-1116
				-9%			-8%
Boultham Avenue	2-Way	1,977	1,373	-604	2,647	1,532	-1,115
				-31%			-42%
Dixon Street	2-Way	12,341	12,262	-80	12,517	12,861	345
				-1%			3.00%
Newark Road	2-Way	28,651	24,804	-3,847	30,347	26,379	-3,968
				-13%			-13%
Meadow Lane	2-Way	8,050	6,887	-1,163	9,269	8,178	-1,091
				-14%			-12%
NHRR	2-Way	N/A	24,934	N/A	N/A	30,402	N/A
Blackmoor Road	2-Way	6,956	1,328	-5,628	8858	1,388	-7,470
				-81%			-84%
Navenby Lane	2-Way	1,357	907	-450	940	615	-325
				-33%			-35%
Broughton Lane	2-Way	965	818	-147	2,011	1,280	-731
				-15%			-36%

Table 9-4 - Traffic flow changes Southwest Screenline 2026 Opening Year & 2041

Location	Direction	2026			2041		
		DM (AADF)	DS (AADF)	Traffic Flow Change	DM (AADF)	DS (AADF)	Traffic Flow Change
Thorpe Road	2-Way	1,016	505	-512	1,286	971	-315
				-50%			-24%
A46 (between Pennell's Rdbt and Whisby Road)	2-Way	33,068	32,314	-754	36,017	35,258	-759
				-2%			-2%
Station Road, North Hykeham	2-Way	13,518	12,289	-1,229	14,676	13,655	-1,021
				-9%			-7%
A1434 Newark Road	2-Way	15,873	13,669	-2,204	16,612	14,355	-2,257
				-14%			-14%
Lincoln Road	2-Way	9,704	8,477	-1,227	10,326	9,160	-1,166
				-13%			-11%
Meadow Lane	2-Way	8,050	6,887	-1,163	9,268	8,178	-1,090
				-14%			-12%
Brant Road (approach to NHRR)	2-Way	6,092	9,750	3,658	7,028	11,548	4,520
				60%			64%
Station Road, Waddington	2-Way	9,803	7,211	-2,592	10,742	7,764	-2,978
				-26%			-28%
A607 Grantham Road	2-Way	14,870	12,921	-1,950	17,121	15,837	-1,284
				-13%			-7%
Sleaford Road (formerly A15)	2-Way	9,556	7,821	-1,735	13,103	9,545	-3,558
				-18%			-27%
A15 LEB	2-Way	15,644	25,572	9,928	17,999	27,611	9,612
				63%			53%

9.5 DEVELOPMENT IMPACTS

As previously discussed the SUEs will form an important part of delivering the CLLP strategy and achieving the growth identified within the Lincoln Strategy Area. Of particular relevance to the NHRR is the SWQ which has the potential to accommodate around 2,000 dwellings, up to 5 hectares of employment land and other supporting uses. It is located to the south west of Lincoln, predominantly in North Hykeham immediately adjacent to the proposed NHRR. Without the provision of additional transport infrastructure, it will be difficult to deliver and accommodate the SUEs within the existing network.

The CLLP states that the NHRR is required to enable the SWQ to come forward and facilitate the delivery of the housing and employment land.

9.6 WIDER ECONOMIC IMPACTS

NHRR will also have a number of wider economic benefits. Appendix C - Strategic & Wider Economic Benefits Report provides details of the expected impacts and these are summarised below.

9.6.1 DEVELOPMENT

As set out earlier in the Strategic Case, the proposed NHRR scheme has the potential to unlock a significant amount of employment and housing land in the Hykeham area –particularly in relation to the SUEs. The SUEs will form an important part of delivering the CLLP strategy and achieving the growth identified within the Lincoln Strategy Area. Of particular relevance to the NHRR is the SWQ which has the potential to accommodate around 2,000 dwellings, up to 5ha of employment land and other supporting uses. It is located to the south west of Lincoln, predominantly in North Hykeham immediately adjacent to the proposed NHRR. Without the provision of additional transport infrastructure it will be difficult to deliver and accommodate the SUEs within the existing network. The CLLP states that the NHRR is required to enable the SWQ to come forward and facilitate the delivery of the housing and employment land.

The NHRR will also directly support the delivery of two other development sites in the Hykeham area:

- **Hambleton Avenue Site:** Located adjacent to the village of South Hykeham this will deliver 167 dwellings; and
- **Leafbridge Site:** Located within North Hykham this will deliver 28,000m^2 of employment floorspace, split over B1 & B2 (14,000m2) and B8 (14,000m2) uses.

The delivery of the dependent development will have a significant impact and the socio-economic benefit resulting from all development is expected to be as follows:

- **Helping meet Lincolnshire's Housing Need:** The proposed residential development, within the pipeline, could add in the region of 2,200 new dwellings to the local housing stock. This equates to over 5% of Lincolnshire's housing need target to 2036;
- **Enhancing the local labour market:** Combining all the socio-economic benefits together based on the sites detailed above, it is estimated that approximately 2,200 homes could be built, supporting a resident population of 5,200 people. This population could increase the working age population by 3,000 people, of which almost 2,700 could be economically active. Over 1,000 of these residents could be in higher skilled and higher value occupations, which could help address the productivity puzzle in Lincoln;
- **Supporting new employment opportunities:** The employment floorspace that is proposed as part of the SWQ SUE and at the Leafbridge site has the potential to support in the region 1,500 to 1,700 FTEs across a range of B class uses (B1/B2/B8) in the local area. This will provide a range of occupations, including higher skilled jobs alongside less skilled employment, ensuring there are opportunities for all residents;
- **Supporting the Lincolnshire economy:** Once developed and occupied, the proposed residential development could help generate up to £60m in household expenditure per annum, of which, a significant proportion will be spent on local goods and services,

supporting local businesses and employment. In addition, the potential employment resulting from the proposed development could generate up to £100m in GVA and £50m in wages per annum. A proportion of this will be spent on local good and services, supporting jobs and businesses in Lincolnshire. The estimated number of indirect and induced jobs across the wider Lincolnshire area, supported through supply chains and other expenditure as a result of the proposed employment development, could be in the region of 200 FTEs;

- **Generating local fiscal impacts:** The new developments also have the potential to deliver fiscal benefits (revenues) for local authorities in the form of council tax and business rates. Based on average business rates for the local area, it is estimated that the proposed development could generate up to £1m in business rates per annum. Additionally, the 2,000 new dwellings that could be built have the potential to generate an estimated £3.7m in council tax revenues per annum. Therefore, the proposed developments could generate in the region of £4.7m annually in fiscal benefits (revenue), of which North Kesteven and Lincolnshire County Council will benefit; and
- **Wider Benefits:** Increasing the housing stock in the local area and creating new employment opportunities is vital to retaining young people, both existing residents and students who move to Lincoln for their degree courses, as well as working age families in the Lincoln and Lincolnshire economy. The completion of these new developments will also play an important role in raising awareness and changing perceptions of Lincoln, while also playing a role in catalysing other developments in the immediate and wider area. Taken together, these effects will contribute towards making Lincolnshire an increasingly attractive location for inward investors and for local businesses who are wanting to grow.

9.6.2 SUPPORT ECONOMIC GROWTH

The NHRR will help to deliver the strategic priorities (as described in Section XX), generate direct economic benefits and support the wider regeneration ambitions of Lincoln and wider Lincolnshire. The delivery of the scheme will help address Lincoln's productivity challenge by:

- **Supporting Priority Sectors:** Future growth aspirations for Lincoln and the wider Lincolnshire economy revolve around a number of priority sectors. The GLLEP has earmarked these sectors as the region's strongest, which offer the most competitive advantage, and which have the ability to drive economic growth. Improvements to the existing road network, will help support these growth sectors in a number of ways:
  - **agri-food –** Lincolnshire produces over 12% of the UK's food supply, this sector is heavily dependent on efficient and reliable transport network to distribute produce across the country. Improvements to the current road network, reducing congestion, improving access to the wider UK road network, UK ports will improve productivity by getting goods to market quicker, helping further strengthen Lincolnshire's position as a leading agri-food location;
  - **advanced manufacturing and engineering –** the advanced manufacturing and engineering sector is highly dependent on access to a young and skilled workforce, which is currently a constraint in Lincolnshire. The proposed NHRR scheme will improve overall access to employment and education opportunities for local residents, whilst also improving transport links and travel time to Lincoln. The new housing sites, unlocked as a result of the NHRR will also help encourage young people to remain in the area, as well as attracting new residents – with the necessary skills to support this sector;

- **the low carbon economy, with a particular focus on renewable energy –** over £2bn of offshore wind projects have been completed within the proximity of the Humber, with plans to develop more windfarms along this coastline. The area can support all aspects of the offshore wind development lifecycle, with specific capability in manufacture; assembly; construction/ installation and operations and maintenance. To support the industry successfully and efficiently; the transporting of goods, skills and services across the region to wind farm locations is crucial. The NHRR will play an important role in strengthening the strategic road network in the region, improving travel times and reducing congestion;
- **the visitor economy –** the visitor economy is worth almost £2bn to the Lincolnshire economy and is expected to grow further, with investment identified across a number of locations across the region. However, limited transport infrastructure has been identified as a significant barrier to growth for the visitor economy. Building NHRR, reducing congestion and thus improving Lincolnshire's strategic road network will not only improve access the region for visitors but also the workforce required to support the future growth of this sector. The Lincolnshire Coastal Highway (LCH) is another strategic transport priority for LCC, with the proposed NHRR scheme being a key component in the LCH being realised, opening new opportunities and to support the growth and development of the Greater Lincolnshire visitor market.

- **Improving Conditions for Business Growth:** To help encourage further business growth, Lincoln needs to become a more competitive place to do business. Business demography data shows that Lincoln underperforms in terms of business births and business survival. Investment in transport infrastructure will improve the conditions for business growth in a number of ways, including;

  - **reducing congestion and improving travel time –** reducing congestion means goods, services and labour can move more freely – overall, reducing costs for businesses;
  - **providing greater certainty to businesses through improving access to skills, labour and markets –** accessing labour and skills is recognised a barrier to strategic growth by GLLEP. The proposed NHRR scheme and upgrading the strategic road network in Lincoln, will help improve access to skills and labour across Lincolnshire (i.e. increase businesses' effective catchment areas) – making Lincolnshire a more attractive place to do business;
  - **unlocking employment land –** there are several future employment sites that could be unlocked, as a result of the NHRR. Increasing the stock of employment land has the potential to attract new business to the area, as well as encouraging existing businesses to expand;
  - **attracting foreign investment –** as highlighted earlier, transport infrastructure is of major importance to foreign investors, with 60% stating it was one of the most important investment criteria. By delivering the NHRR and improving Lincoln's wider transport infrastructure, this will contribute towards increasing the area's competitive advantage as an investor location. The delivery of essential economic infrastructure in the UK's regional cities will be particularly important consideration for a post-Brexit UK, enabling cities, like Lincoln, to be able to compete nationally and internationally for investment opportunities as they emerge.

9.7 SCOPE & SCHEME IMPACTS SUMMARY

- The NHRR will provide a 70mph dual carriageway link between the A46 on the western side of Lincoln and the A15/LEB Junction.
- The scheme will tie into the existing at-grade five arm roundabout at the A46 Western Relief Road/A1434 Newark Road/A46 (T)/Middle Lane and join the A15/LEB junction on the eastern side of Lincoln through an additional fourth arm.
- The NHRR is forecast to carry a significant level of traffic from opening.
- The traffic flow forecasts range from 25,000 to 26,600 in the opening year (2026) up to 28,900 to 32,700 in 2041;
- The provision of the NHRR will help relieve pressure on the existing network and support the management and reassignment of traffic away from the existing A46 WRR in both 2026 and 2041;
- The NHRR will provide significant traffic relief across a number of routes both within central Lincoln and in the south of the city and result in an improvement in conditions;
- It shows that there will be a significant reduction on traffic on several key routes including the A1434 Newark (a key crossing over the River Witham), the A607 Grantham Road and the A15;
- It shows that the existing east-west rural routes in the south of Lincoln will experience a significant level of traffic relief; these include Meadow Lane (which provides a crossing of the River Witham) and Blackmoor Road (which forms part of the existing rural east-west route from the A46 to the A15;
- It will also provide traffic relief to several routes within the residential areas in North Hykeham;
- The benefits can be seen across a wider area and it helps to deal with a number of challenges – including east-west connectivity, increasing network capacity to support growth, improving network resilience as well as dealing with localised congestion, rat running and severance; and
- NHRR will support priority sectors; conditions for business growth; and the potential of housing growth.

10 CONSTRAINTS AND INTERDEPENDENCIES

10.1 CONSTRAINTS

The major constraints associated with the delivery of the scheme are discussed below. These relate to stakeholder engagement and support, land acquisition, funding, physical constraints relating to the alignment and environmental constraints.

10.1.1 STAKEHOLDER CONSTRAINTS

The Management Case and NHRR Engagement Strategy (Appendix C of the Management Case) describes the consultation completed to date, the consultation plan going forward and the range of stakeholders involved in the development of the scheme.

Maintaining and gaining ongoing stakeholder support will be crucial to the success of the scheme, particularly the support at a local political level and those of key interest groups. The support from stakeholders is important to ensure the success of the Outline Business Case, planning application and the successful completion of other statutory processes.

It will be important to build on the most recent stakeholder engagement, as ultimately if there is a lack of support from stakeholders at critical stages of the project, it could impact negatively on the programme, scope and cost. The NHRR Engagement Strategy will continue to be crucial in mitigating this risk.

10.1.2 THIRD PARTY LAND CONSTRAINTS

The delivery of the NHRR will require third party land to be acquired. The land registry review shows that there are 124 land registry titles in the study area, 13 parcels of unregistered land, and 35 residential properties. This is represented by a total of 61 individual landowners with a variety of interests/land uses including farm land, hospitality, statutory undertakers, highways authorities, and developers.

Furthermore, the delivery of the SWQ which includes 2,000 dwellings and 5 hectares of employment land has been linked to the delivery of the NHRR. As such there are ongoing discussions with developers of the SWQ and an agreed need for developer contributions which will need to be secured through relevant planning consents and associated planning obligations.

As a result, the NHRR scheme needs to support the delivery of these developments and the business objectives of the key stakeholders as well as other key scheme objectives. As such any issues regarding the design and scope of the NHRR scheme could affect developer support which could impact on the programme, cost and ultimately the level of funding available to deliver the scheme. Discussions with landowners and developers is ongoing and their comments have, where possible, been taken account into account through the preliminary design process.

10.1.3 FUNDING CONSTRAINTS

The Financial Case summarises the scheme costs and the funding considerations for the scheme. LCC has approved a contribution of up to £34 million for the development of the scheme, of which a minimum of £10 million will be provided by third parties. The funding required from regional or national funding sources for the delivery of the NHRR is approximately £104 million.

LCC has identified three potential funding routes for securing the vital contributions needed to progress the scheme; these include the National Road Fund for the MRN and Large Local Majors fund promoted through DfT and the MHCLG's Housing Infrastructure Fund. The NHRR supports the key aims of all three funds and LCC will continue to review and monitor the eligibility of the scheme as and when further details are provided.

LCC will also forward fund third-party developers' costs as it is recognised that these funds may take several years to recover due to being dependent on the construction of dwellings as stipulated by Section 106 agreements.

10.1.4 PHYSICAL CONSTRAINTS

The key physical constraints are summarised below:

- **The River Witham:** The main physical constraint on the proposed route alignment in the River Witham and flood plain where a structure will be required to span the approximately 14.4 metre width of the watercourse.
- **Existing Topography:** The scheme will need to pass in cut through the Lincoln Edge, a significant escarpment running north-south across the route alignment at the eastern end of the NHRR.
- **SWQ Development Land:** The alignment will need to ensure that the delivery of the SWQ remains commercially viable and deliverable.
- **Existing Properties:** Other physical constraints include the existing residential properties on Station Road in Waddington. A number of these have been purchased and will require demolition to make way for NHRR. The scheme will also pass to the south of South Hykeham village and it will be important to reduce the potential impacts of the NHRR.
- **Environment Agency Flood Prevention Scheme:** The River Witham Washland is classed as a reservoir; therefore the NHRR is likely to need to be constructed so as to allow any overspill from the reservoir to flow freely down the floodplain and ensure the road is not at risk of flooding. This can be achieved by the introduction of a number of culverts running north-south under the highway embankment to carry the flows and a small amount of ground re-profiling at the limit of the existing floodplain to provide a compensatory volume for that lost due to the footprint of the embankment.
- **Utilities:** The NHRR will cross a number of existing utilities. Any required diversions will need to be accommodated within the design.

10.1.5 ENVIRONMENTAL CONSTRAINTS

The main potential environmental constraints are as follows:

- An area identified by the Environment Agency as Flood zone 3 runs from north to south directly through the proposed scheme. This designation identifies land which has an annual probability of 1 in 100 or greater of river flooding. It will be important to continue to engage with the Environment Agency through the design development.
- Within 1 kilometre of the study area there is an AQMA; 16 listed buildings; and various sensitive receptors including three primary schools and various farms.
- Within 2.5 kilometres of the study area there is one scheduled monument; Whisby Nature Park Local Nature Reserve (LNR); 15 Local Wildlife Sites (LWS), one Local Geological Site (LGS); two Sites of Nature Conservation interest (SNCIs); one Lincolnshire Wildlife Trust (LWT); Sustrans

regional and local cycle routes as well as walking footpaths and bridleways which cross the proposed scheme corridor.

- Within 5.5 kilometres of the study area there are three Grade II registered parks and gardens; Swanholme Lakes Site of Special Scientific Interest (SSSI) and a LNR.

10.1.6 HIGHWAY DESIGN CONSTRAINTS

There are two key highways constraints as follows:

- The proposed alignment will be required to link into the SRN at the A46 Pennells Roundabout at its western end and with the currently-under-construction LEB and the A15 at its eastern end; and
- The route corridor is also fixed and is protected within the CLLP.

10.2 INTERDEPENDENCIES

The delivery of the scheme has a number of dependencies. These are as follows:

- **Funding Approval:** A suitable funding mechanism has yet to be formally identified by Lincolnshire County Council. It is assumed that funding for the scheme will come from a combination of central government grants, local government funds and developer contributions.
- **Planning Approval:** The NHRR route will require planning consent and therefore the scheme is dependent on approval of the planning application. The successful delivery of the scheme is therefore dependent on approval being granted.
- **Successful Approval of Statutory Orders:** The scheme may require approval of Compulsory Purchase Orders (CPO) and Side Road Orders (SRO).
- **Timely Public Inquiry Completion:** In the event of the orders for NHRR being subject to a Public Inquiry, this will severely impact on delivering the scheme within the programme timetable. However, the likelihood of the scheme going to Public Inquiry will be minimised through negotiation and effective partnership working with stakeholders.
- **Stakeholder Support:** The scheme will be dependent on support from a number of landowners and stakeholders.
- **Third Party Land Requirements**: The proposal is dependent on the acquisition of third party land required for the construction of NHRR.

10.2.1 STAKEHOLDER DEPENDENCIES

NHRR is expected to have significant impact on the study area and the transport network given the existing constraints of the network. As a result, it will affect a significant number of people, groups and organisations all of whom will need to have the opportunity to review and comment on the scheme throughout its development.

Delivery of the scheme will be dependent on support from stakeholders and their continued involvement and engagement throughout the project will be critical to its success. To date the project has engaged with a large number of stakeholders, these are shown in Figure 11-1 Chapter 11.

10.2.2 CONSTRAINTS & INTERDEPENDENCIES SUMMARY

- The major constraints associated with the delivery of the scheme relate to stakeholder engagement and support, land acquisition, funding, physical constraints relating to the alignment and environmental constraints.
- The delivery of the scheme has a number of interdependencies as follows:
    - Funding Approval;
    - Planning Approval;
    - Successful Approval of Statutory Orders;
    - Timely Public Inquiry Completion (if required);
    - Stakeholder Support; and
    - Third Party Land Requirements.

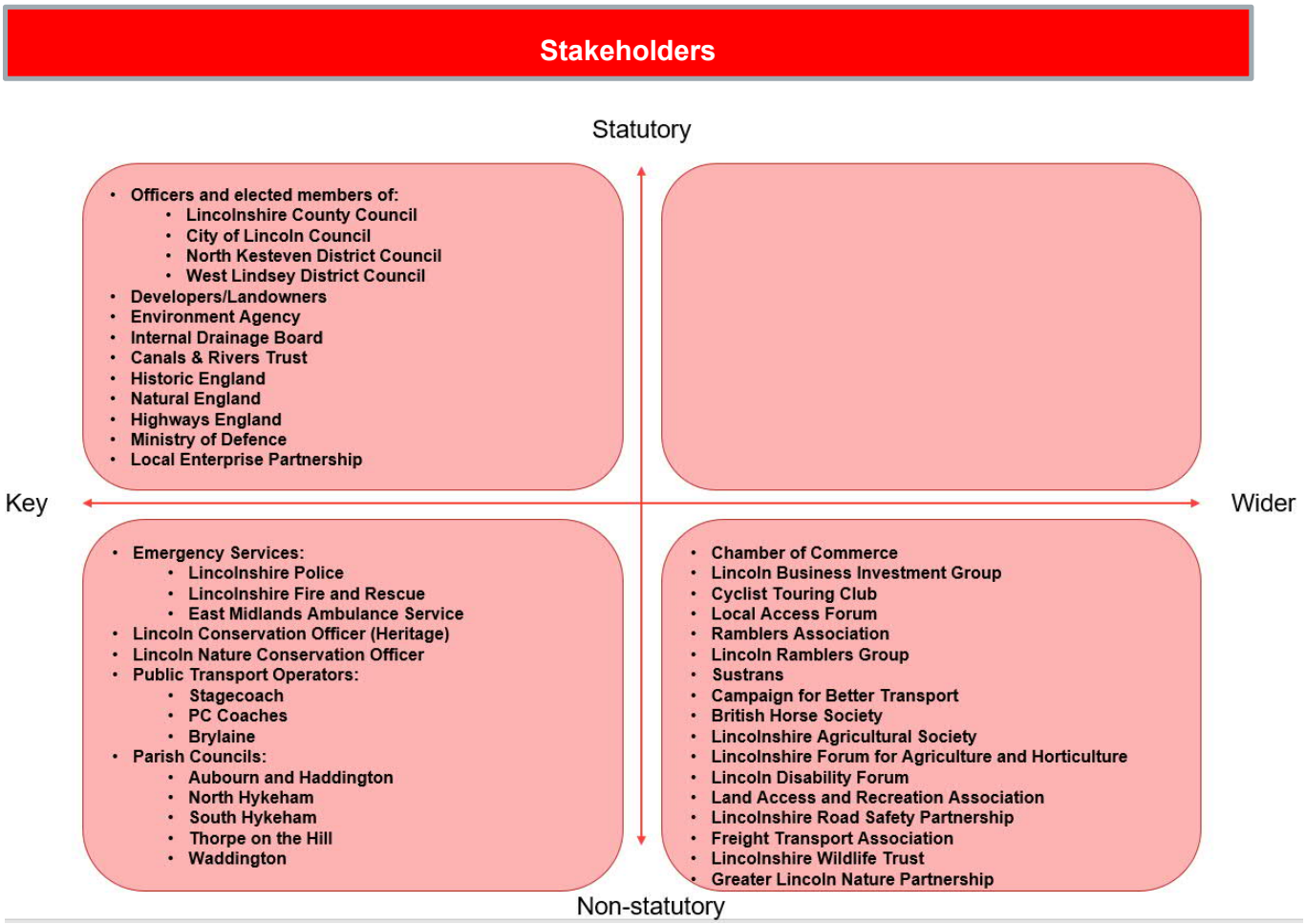
11 STAKEHOLDER ENGAGEMENT

11.1 STAKEHOLDER OVERVIEW

The NHRR will affect a large number of people, groups and organisations. As such ongoing stakeholder engagement is vital to the success and delivery of the scheme. A Stakeholder Engagement Strategy (Appendix C of the Management Case) has been developed with the aim to manage stakeholder expectations and to ensure that, where appropriate and possible, their views are incorporated into the scheme design.

Figure 11-1 provides an overview of the key stakeholders and consultees identified to date and the remainder of this sections describes their interest, input and contribution to the project.

Figure 11-1 - Stakeholders, Statutory Consultees & Non-Statutory Consultees



11.2 KEY STAKEHOLDERS

There are a number of stakeholders that will be key to the project and form an important part of its ongoing development, as shown in Table 11-1.

Table 11-1 - Key stakeholders

Stakeholder	Interest	Consultation stage
Lincolnshire County Council City of Lincoln North Kesteven District Council West Lindsey District Council	The scheme will have a fundamental impact on the traffic network and development of the city of Lincoln and the bordering districts. Elected members of the county, district, and city councils will require continued engagement throughout the design, planning and construction of the NHRR.	Pre-planning application Planning Application Engagement Pre-Statutory Orders
Developers/Landowners	The scheme will open up land to allow delivery of the SWQ and will also require LCC to acquire land from private landowners. Developers and landowners will need to be consulted to ensure they are aware of how the scheme progresses and how it will affect them.	Pre-planning application Planning Application Engagement Pre-Statutory Orders
Environment Agency Internal Drainage Board Canal & River Trust	The alignment of the route passes through a Flood Risk Zone 3 and a bridge will be required to span the River Witham south of Lincoln.	Pre-planning application Planning Application Engagement Pre-Statutory Orders
Historic England Natural England	These stakeholders will need to be consulted regarding the potential impacts of the scheme on heritage and natural conservation.	Pre-planning application Planning Application Engagement Pre-Statutory Orders
Highways England	The NHRR appends onto the SRN at the A46. Consultation will therefore be required with HE to ensure they understand the impacts of the NHRR on the SRN.	Pre-planning application Planning Application Engagement Pre-Statutory Orders
Ministry of Defence	The alignment of the route will pass close to RAF Waddington. Consultation will be required during the planning and construction of the scheme to ensure support for the scheme.	Pre-planning application Planning Application Engagement Pre-Statutory Orders
Local Enterprise Partnership	The LEP represents the interests of businesses within Lincoln that may be affected by the scheme. It will be important to ensure that the LEP 'buys in' to the scheme.	Pre-planning application Planning Application Engagement Pre-Statutory Orders
Lincolnshire Police Lincolnshire Fire & Rescue East Midlands Ambulance Service	The Emergency Services will be consulted so they can understand the potential impacts on their operations.	Pre-planning application Planning Application Engagement Pre-Statutory Orders
Lincoln Heritage Conservation Officer Lincoln Nature Conservation Officer	These stakeholders will need to be consulted regarding the potential impacts of the scheme on heritage and natural conservation.	Pre-planning application Planning Application Engagement Pre-Statutory Orders
Stagecoach East Midlands PC Coaches Brylaine	NHRR will provide access to a new Sustainable Urban Extension in Hykeham which will require public transport provision. It is therefore important to engage with public transport providers in the design phase in particular, to ensure that adequate public transport provision can be delivered once NHRR is constructed.	Pre-planning application Planning Application Engagement Pre-Statutory Orders

11.3 WIDER STAKEHOLDERS (STATUTORY & NON-STATUTORY)

In addition to the key stakeholders there are a range of wider stakeholders both statutory and non-statutory. Table 11-2 lists the wider stakeholders that either have been or will be consulted, presenting their interest in the North Hykeham Relief Road.

Table 11-2 - Wider Stakeholders

Stakeholder	Interest and rationale	Consultation stage
Aubourn and Haddington Parish Council North Hykeham Town Council South Hykeham Parish Council Thorpe on the Hill Parish Council	The scheme has the potential to affect many people and groups, therefore it will be important to discuss the scheme with each parish/town council at each stage of the project.	Pre-planning application Planning Application Engagement Pre-Statutory Orders
Chamber of Commerce Lincoln Business Investment Group	The Chamber of Commerce and Business Investment Group represent the interests of businesses within Lincoln that may be affected by the scheme. Therefore, it will be important to ensure that these groups are both fully aware of and support the scheme and its objectives.	Pre-planning application
Cyclist Touring Club	Engagement with cycling groups will ensure that they have opportunity to provide input to the design of the scheme with respect to cyclists.	Pre-planning application
Local Access Forum Ramblers Association Lincoln Ramblers Group Land Access and Recreation Association Sustrans British Horse Society	The scheme is likely to impact upon pedestrians', cyclists', and equestrians' access to and use of existing routes and improve the NMU environment to the south of Lincoln. Engagement with these groups, particularly in the design phase, will be important.	Pre-planning application
Campaign for Better Transport	NHRR will provide access to a new Sustainable Urban Extension in Hykeham which will require public transport provision. It is therefore important to engage with CBT in the design phase in particular, to ensure that adequate public transport provision can be delivered once NHRR is constructed.	Pre-planning application
Lincolnshire Agricultural Society Lincolnshire Forum for Agriculture and Horticulture	Lincolnshire Agricultural Society and Lincolnshire Forum for Agriculture and Horticulture represent the interests of the agricultural industry in Lincolnshire. It will be important to engage with these groups to ensure their continued awareness and support for the scheme.	Pre-planning application
Lincoln Disability Forum	Engagement with local disability groups will be essential to ensure that they can provide input to the developing design.	Pre-planning application Pre-construction
Lincolnshire Road Safety Partnership	NHRR is likely to have a positive impact on the number and severity of collisions across the intervention area. Consultation will be required with LRSP to ensure continued awareness and support for the scheme.	Pre-planning application Pre-construction
Freight Transport Association	The FTA represents the interests of freight operators in the UK. NHRR will have on impacts on freight operators travelling in and	Pre-planning application

Stakeholder	Interest and rationale	Consultation stage
	around Lincoln, so consultation will be required with the FTA to ensure their continued awareness and support for the scheme.	
Lincolnshire Wildlife Trust	These stakeholders will need to be consulted regarding the potential impacts of the scheme on natural conservation.	Pre-planning application Planning Application Engagement Pre-Statutory Orders
Greater Lincoln Nature Partnership		

11.4 HISTORIC ENGAGEMENT

A large amount of work has already been undertaken in developing the proposals and engaging with stakeholders and the general public. The stakeholder and public engagement to date is summarised below. The earlier stages focussed on the need for the scheme, the route corridor alignment and the general principles. The most recent engagement phase (June 2018) focussed on the more detailed design proposals including the highway standard as well as the scheme objectives and requirements – further details are provided in Section 11.5.

- Option Assessment Report / Initial Stakeholder Engagement (2003);
- Stakeholder Workshop (June 2004);
- Public Engagement One (October 2005);
- Public Engagement Two (October 2006); and
- OAR engagement (Summer 2018).

11.5 JUNE 2018 ENGAGEMENT

The purpose of the engagement exercise was to provide an opportunity for interested parties external to the County Council to provide inputs into the early stages of the process to deliver the NHRR and in particular to the development of the OAR and OBC. Further details are provided in the Management Case (Section 7.3.2); however the scope of the engagement exercise was:

- The existing situation without the scheme;
- The current land use planning proposals (e.g. the SUEs);
- Implications for the future situation without a scheme;
- Objectives of the scheme;
- Review of previous scheme development work and conclusions;
- Current progress in developing the scheme;
- Options under consideration;
- Implications of proposals (costs and benefits); and
- What happens next following the completion of the engagement.

The scope of the engagement also focussed on particular groups of interested parties, which included the following:

- Land Owners: including the owners, and their representatives, of land that may be directly affected by the alignment of the scheme i.e. land through which the route is likely to pass;
- Key Stakeholders: including those stakeholders who have a statutory interest in the scheme or will be key to its delivery;
- Wider Stakeholders: these are stakeholders who will have a non-statutory interest but will have important information and views relevant to the scheme;

- General Public: the wider general public including, but not limited to, those living, working and travelling within the vicinity of the scheme and the wider Lincoln area; and
- Hard to reach groups: members of the public who are from hidden or hard to reach communities, often those with disabilities or protected characteristics.

The methodology for the exercise utilised five separate approaches for engaging with different groups of interested parties:

- Face-to-face meetings with key stakeholders and land owners;
- Stakeholder workshops – all key and wider stakeholders were invited to one of two workshops held on consecutive nights at the beginning of June 2018;
- Public exhibition – four events were held at various locations to provide stakeholders and the wider public with an opportunity to gain further information on the scheme;
- Engagement with hard to reach groups – LCC commissioned The People's Partnership to undertake specific engagement activity; and
- Questionnaires – used for both the general public and key stakeholders both as hard copies for completion at the exhibitions and workshops, and electronically for completion via LCC's website.

A total of 1,023 respondents provided feedback on the scheme through the questionnaire, and a total of 42 stakeholders from 21 organisations attended the workshops. 393 members of the public attended exhibition events. The hard-to-reach engagement undertaken by The People's Partnership received feedback from 256 people.

Key findings from the engagement exercise include:

- Key stakeholder and public knowledge and awareness of the scheme was high, with numerous respondents having a longstanding interest in the progression of the scheme;
- The problems and existing issues identified by stakeholders and members of the public correlated strongly with the scheme objectives. The predominant issues cited were congestion, delays, poor east-west connectivity, a lack of network resilience (particularly when incidents occur), and local rat running and in North and South Hykeham;
- There is overwhelming support for the scheme (need and objectives); 89% of respondents support it and 73% strongly support it;
- Strong preference for the A46 to A15/LEB scheme option to dual carriageway standard (75% of respondents);
- There was some concern raised surrounding the scheme impact on existing Public Rights of Way. The inclusion of bridges and underpasses assisted in mitigating some concerns. There was support for walking & cycling provision along the length of the scheme, including lighting. Design should avoid severance of local routes e.g. routes used for cycling and tie in with strong provision of cycle facilities along radial routes; and
- A lack of support for the scheme was evident from those who would be directly impacted by noise or visually by the scheme; for example residents on Station Road due to the visual impact.

11.6 SUMMARY

Key points include:

- Key stakeholders and wider stakeholders which consist of statutory and non-statutory consultees have been identified, as well as the stage of the project they will be engaged/consulted with (identified within the Stakeholder Engagement Strategy Appendix C, Management Case)

- A significant amount of public and stakeholder engagement has already taken place and the most recent phase completed in June 2018
- The June 2018 engagement included a face to face meeting, workshop with stakeholders, public exhibitions and questionnaires.

Key observations include:

- Key stakeholder and public knowledge and awareness of the scheme was high, with numerous respondents having a longstanding interest in the progression of the scheme;
- The predominant problems and issues cited were congestion, delays, poor east-west connectivity, a lack of network resilience (particularly when incidents occur), and local rat running and in North and South Hykeham;
- There is overwhelming support for the scheme (need and objectives), with 89% of respondents in support and 73% strongly supporting it; and
- Strong preference for the A46 to A15/LEB scheme option to dual carriageway standard (75% of respondents).

12 SCHEME OPTIONS

12.1 OVERVIEW

To date there has been a substantial amount of work undertaken over a significant period of time to inform the development of options resulting in the 'Do Something' scenario brought forward for this OBC. The most recent of which was the OAR (2018) (see Appendix A) which included the assessment and development of more detailed proposals including the highway standard. This resulted in the identification of the preferred option. Full details of the options that have been developed, assessed and considered are provided in the OAR, with the following summarised in this chapter:

- Do-Minimum scenario: Provides details of the Do Minimum Scenario and the expected impacts;
- Options Development – Do-Something Scenario: Provides details of the preferred option promoted as part of this business case, the key options considered and the benefits, challenges and issues associated with each; and
- Upgrade of the A46 WRR: Considers the viability and feasibility issues associated with upgrade of the A46 WRR.

12.2 DO-MINIMUM

A 'Do-minimum' scenario represents a without scheme position. In this instance it includes the existing network and committed highway schemes, including the LEB.

This Strategic Case describes the existing and future key issues and challenges facing Lincoln and the surrounding area. The impact of a Do-Nothing / Do-Minimum scenario can be summarised as follows:

- Future land-uses and policies identify significant levels of planned growth up to 2036.
- Forecast development includes four SUEs which contribute to a 50% increase in dwellings in Lincoln by 2036.
- An analysis of future travel demands within the study area has revealed that total trips are expected to increase substantially over the next 20 years. Traffic levels are forecast to increase in the region of 11% up to 2026 and over 20% by 2041.
- The opening of the LEB will improve conditions in the centre of Lincoln. However, traffic is expected to continue to grow on a number of major routes including the A46 Western and Northern Relief Roads, A1434 Newark Road, A607 Grantham Road and local routes in the south Lincoln area. These routes already experience congestion and conditions are expected to deteriorate.
- Traffic flows on the existing rural east-west routes to the south of Lincoln and North Hykeham area are also expected to increase substantially. This will have a detrimental impact on the existing villages and communities within this area affecting air quality and noise and increasing severance.
- The forecast traffic growth will result in a deterioration in conditions on key areas of the network particularly on the western side of Lincoln including the A46 Western and Northern Relief Roads, A1434 Newark Road, sections of the A15 and on local routes in the south of Lincoln and North Hykeham area. This includes Meadow Lane and Brant Road – the main east-west crossing of the River Witham in the south of Lincoln.

- Lack of suitable routes leads to rat-running through existing residential areas affecting quality of life and increasing severance.

Failure to intervene or progress the NHRR would have serious implications for the viability of the SUEs in their present form and the ability of Lincoln to achieve the economic growth and housing targets set out in the SEP and CLLP. Failure to deliver the key housing developments identified in these plans would likely contribute to a shortfall of housing in Lincoln as the population rises.

A 'Do-Minimum' Scenario would also affect the strategic highway and major road network. Demand will continue to exceed the available capacity impacting on strategic and local traffic. The key strategic and major routes will have difficulty accommodating the forecast traffic levels and this will affect the economic growth aspirations, access to Lincoln and the movement of strategic traffic. Additional capacity and route choice is critical in helping to support the forecast and planned growth, improve reliability and resilience.

12.3 OPTIONS DEVELOPMENT – DO-SOMETHING SCENARIO

The NHRR has been developed over a long period of time and subject to a robust options assessment and selection process. The preferred route was initially developed in 2006 and the requirements for the scheme were further developed as part of the LITS process. The scheme development process and timeline is summarised in Figure 12-1 below and full details of the LITS process and route options are provided in the OAR (2018).

The options assessment work summarised below used the Preferred Route (Figure 12-2) as the starting point and the focussed on the carriageway standard.

As part of this process three primary options for a NHRR between the A46 (A46/A1434 Pennell's Roundabout) to the A15 (A15 Lincoln Eastern Bypass/Sleaford Road Roundabout) were considered as part of this OAR stage; these being:

- A single carriageway;
- A dual carriageway; and
- A single carriageway with future-proofed junctions and structure which would allow for dualling of the scheme at a future date.

In addition, further options for shorter schemes were also been considered:

- A46 to South Hykeham Road – single carriageway;
- A46 to South Hykeham Road – dual carriageway;
- A46 to Brant Road – single carriageway; and
- A46 to Brant Road – dual carriageway.

Figure 12-3 provides a further overview of each of the options.

Figure 12-1 - NHRR development stages

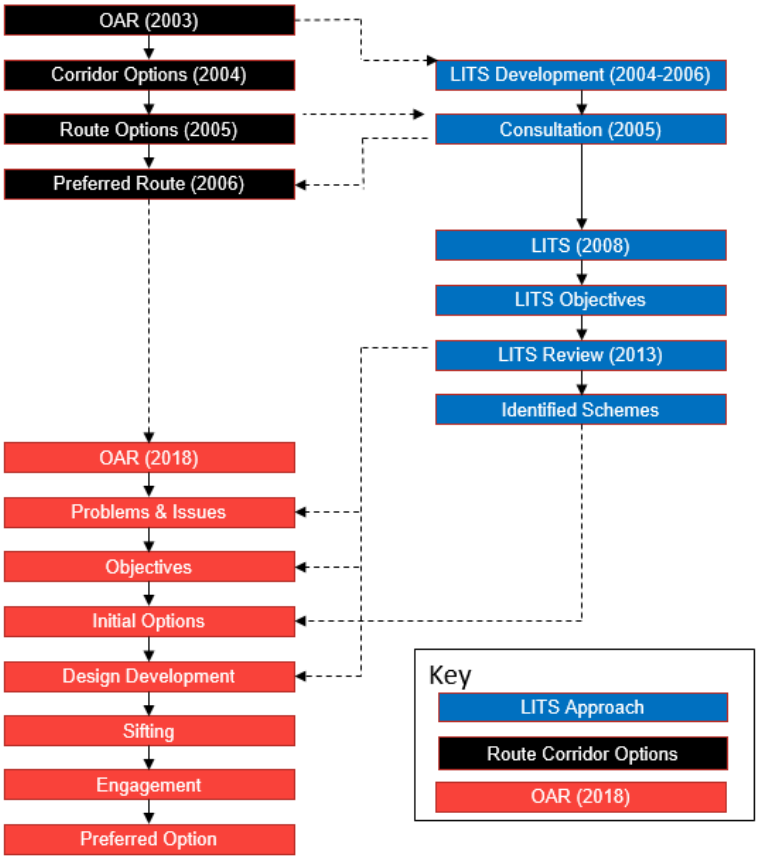


Figure 12-2 - Alignment of Proposed North Hykeham Relief Road

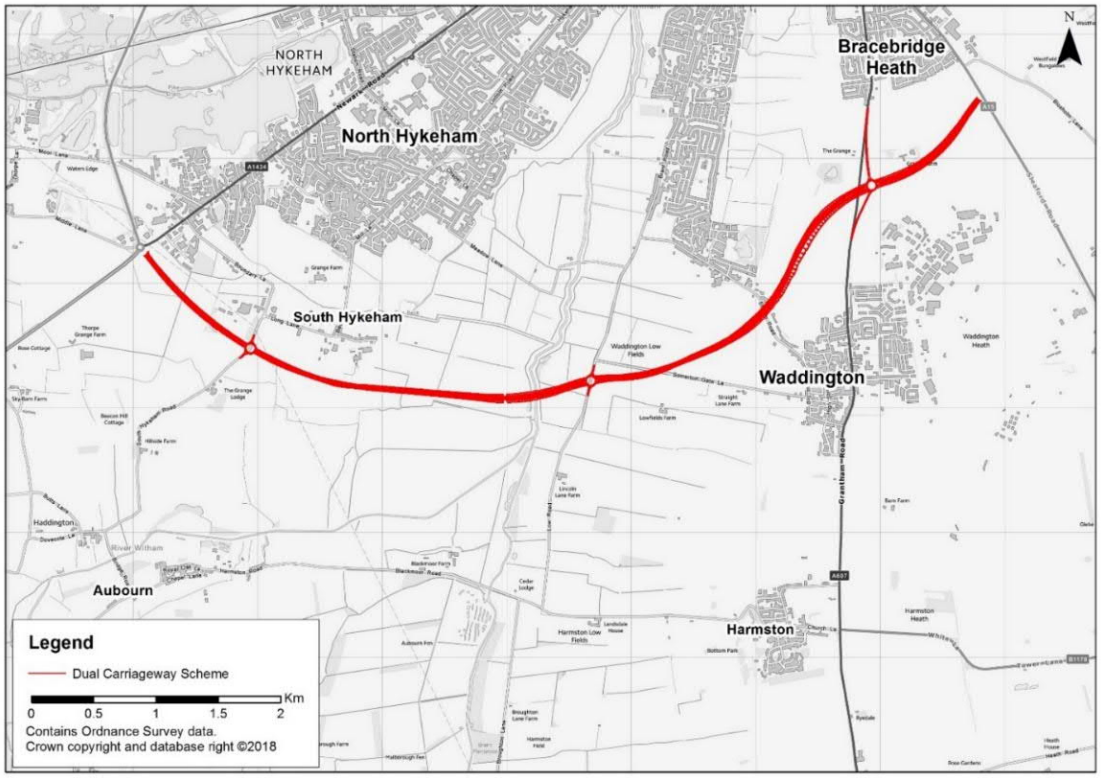
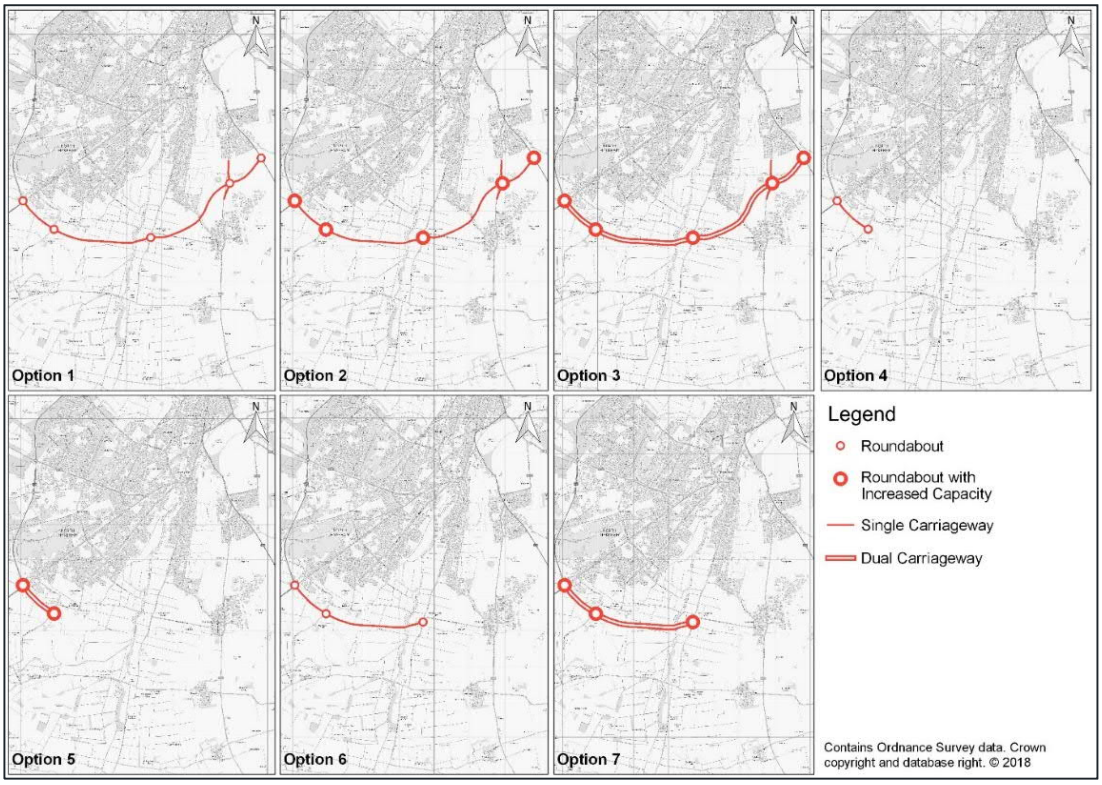


Figure 12-3 - Assessed Options



12.3.1 OPTIONS ASSESSMENT

In order to determine the better performing scheme options, a structured sifting process was followed as summarised below:

Figure 12-4 - Option sifting process

12.3.1.1 Initial Sift

The initial sifting considered and scored the options against the categories and criteria detailed below.

- **Objectives:** The ability of each option to achieve the following objectives:
  - To improve east-west connectivity in the South of Lincoln for strategic and local traffic;
  - To reduce traffic levels on local urban and rural roads in the South of Lincoln through the transfer of strategic traffic to appropriate routes;
  - To reduce NMU severance in South Lincoln caused by high levels of traffic on the local road network and lack of east-west connectivity;
  - To support the delivery of the SUEs by improving access to the identified sites;
  - To support the delivery of the SWQ through the provision of additional network capacity and NMU infrastructure necessary for the delivery of new housing;
  - To reduce traffic levels and congestion around Lincoln and on key routes through the city to support:
    - Improved access to central Lincoln;
    - The improvement of access to the Humber Ports and Airport; and
    - The improvement of access to the Lincolnshire Coast.
  - To improve the resilience of the orbital and key route network through and around Lincoln and reduce the impact of major incidents.
- **Deliverability:** The deliverability of the option was assessed against its overall acceptability (relating to the level of stakeholder/political / public support and environmental impacts), whether the option was acceptable in planning terms, whether it would require any significant mitigation and whether there are any legal issues and risks.
- **Implementation timescales/funding likelihood**
- **Third Party Issues**
- **Feasibility**: This related to physical constraints, design standards, whether the option is possible from an engineering perspective and whether the option is technically appropriate when considering future demand.

The shorter options (A46 to South Hykeham Road and the A46 to Brant Road) were discounted at this stage due to:

- Scoring poorly against scheme objectives;
- Not deemed deliverable on the grounds that they do not align with long term policy aspirations of a relief road to the south of Lincoln as stated within the LITS, LTP and the CLLP; and
- Not deemed feasible as the options are not technically appropriate when considering future demand.

The remaining options (single carriageway, single carriageway with future proofing and dual carriageway options) were considered using the EAST Tool.

12.3.1.2 Upgrade of the A46 WRR

Outside of the schemes developed within the LITS, LCC has also considered the viability and feasibility of upgrading the A46 Western and Northern Relief Roads. This has included dualling the remaining sections and upgrading the junctions along the route.

As identified within the OAR (2018) and this Strategic Case, the A46 Western and Northern Relief Roads is already under significant pressure and this is forecast to continue with conditions expected to deteriorate. Concept designs have been developed as shown in Appendix D, with the improvements summarised in Table 12-1.

Table 12-1 – Potential A46 Improvements

Location / Section	Existing design	Concept design
Pennells roundabout	A46 Newark exit arm: Two lane exit onto Pennells roundabout A46 WRR exit arm: Two lane exit on to Pennells roundabout A1434 Newark Road exit arm: Two lane exit on to Pennells roundabout	A46 Newark exit arm: The addition of a short flare for left turn only resulting in a three-lane exit onto Pennells roundabout A46 WRR exit arm: The addition of a short flare resulting in a three lane exit onto Pennells roundabout A1434 Newark Road exit arm: The addition of a short flare for right turn only resulting in a three lane exit onto Pennells roundabout
A46 from Pennells roundabout to Whisby roundabout	Single carriageway section	Dual carriageway section to include an upgrade to the existing bridge over the railway line.
A46 from Doddington Road to Skellingthorpe Road	Single carriageway section	Dual carriageway section with a reduced curve to the highway alignment
Riseholme roundabout	A46 exit arm (west of roundabout): Two lane exit onto Riseholme roundabout A15 exit arm: Two lane exit onto Riseholme roundabout Riseholme Road exit arm: Two lane exit onto Riseholme roundabout	A46 exit arm (west of roundabout): The addition of a short flare resulting in a three lane exit onto Riseholme roundabout A15 exit arm: The addition of a flare for left turn only resulting in a three lane exit onto Riseholme roundabout Riseholme Road exit arm: The addition of a short flare for left turn only resulting in a three lane exit onto Riseholme roundabout
A46 from Riseholme roundabout to Nettleham roundabout	Single carriageway section	Dual carriageway section
Nettleham roundabout	A46 entrance arm: Single lane entrance A46 exit arm: Single carriageway splitting into a two lane exit onto Nettleham roundabout Lincoln Road exit arm: Single lane flaring out to a two-lane exit. The flare has a very short approach. Lincoln Road entrance arm: Two lane entrance merging into a single lane	A46 entrance arm: Two lane entrance merging into a single carriageway A46 exit arm: Includes an additional short flare to result in a three lane exit onto Nettleham roundabout Lincoln Road exit arm: Two lane exit with an extended flare. Lincoln Road entrance arm: Two lane entrance with an extended flare merging into a single lane
A158 from Nettleham roundabout to Wragby Road East	Single carriageway section	Dual carriageway section

The indicative outturn cost of upgrading the A46 WRR are detailed below (see Table 12-2) and are considered to be a very conservative estimate of the potential costs of upgrading this section of the network. There are significant constraints along the line of the route including the existing structures over the railway line which will need to be upgraded, the existing drainage structures and the existing environmental bund along the southern section of the A46. The indicative costs include the design and preparation, land acquisition and construction of the upgrade, however further consideration of the constraints and completion of more detailed designs may increase the costs significantly.

Table 12-2 – A46 Improvements – Indicative Scheme Cost Estimate

Cost Element	Indicative Costs
Base Cost	£54,157,414
Risk Allowance	£25,814,479
Inflation	£23,039,299
Total Outturn Cost	£103,011,192

The assessment identified several significant challenges and risks associated with the delivery of the scheme and it would be expected to have limited impact on reducing traffic on the local road network, improving east-west movements and supporting the SUEs – specifically the SWQ. Further details of the assessment are provided within Table 12-3 and Table 12-4 below.

Table 12-3 – A46 upgrade assessed against NHRR objectives

A46 Upgrade		
Operational Objectives	**Impact**	**Will it contribute to the objective?**
Provision of an additional east-west route for local and strategic traffic	This option upgrades the existing A46 WRR and as a result does not provide an additional east west route. There will still be limited route choice for east west traffic. The pressures on the local road network will remain particularly in the South of Lincoln.	No
Improved access between the strategic A46 and the eastern side of Lincoln including the Lincoln Eastern Bypass	It does not provide a strategic link from the A46 to the LEB. Traffic travelling east from south of the city will still need to use the WRR and existing major routes. The congestion and capacity issues will still affect a number of the key routes within Lincoln.	No
Reduced rat running traffic through southern Lincoln and North Hykeham as a result of east-west traffic using appropriate routes	There will still be limited route choice for east west traffic. As a result, the pressures on a number of local routes will remain particularly in the South of Lincoln.	No
Provision of a new link to unlock land allocated for the SWQ	This option upgrades the existing A46 and therefore will not provide a link to unlock the SWQ.	No
Increased network capacity to accommodate housing growth	It will provide additional capacity on the A46 WRR which will help mitigate the impacts of the increases in traffic on the A46 resulting.	Yes
Improved route choice for east-west movements to reduce traffic and	It will not provide additional route choice for traffic travelling through and around Lincoln.	No

A46 Upgrade		
congestion on the existing orbital network and key routes through Lincoln		
Expansion of the orbital network around Lincoln	This option will not complete the orbital route around Lincoln as there will still be a missing link between the A46 and LEB.	No
Improved strategic and local route choice to improve network resilience	Improves resilience through the provision of additional capacity on the A46. However, it does not provide an additional route in the south of Lincoln and traffic will still be diverted through unsuitable routes.	Partially

Table 12-4 – A46 upgrade deliverability issues

Deliverability Issues	Impact
Constraints	*Environmental constraints* There are several environmental constraints located in proximity to the A46 between Pennells roundabout and Whisby roundabout and Doddington Road to Skellingthorpe which could potentially be impacted by proposed dualling of these sections. These include the following: • Whisby Nature Park LNR, which is located on the western boundary of the A46 between Pennells roundabout and Whisby roundabout; • Swanholme Lakes LNR and SSSI, which is located 1.6km to the east of the A46 between Pennells roundabout and Whisby roundabout; • A number of lakes, including Grebe Lake; Apex Lane; and Water Ski Lake, and watercourses, such as Pike Drain (which may require the upgrade of existing culverts); • Seven Grade II listed buildings within 1km of the proposed dualling; • Woodland located on either side of the sections for which dualling is proposed; and • An environmental bund located on the western boundary of the A46 between Pennells roundabout and Whisby roundabout. In addition to the above constraints the proposed dualling will impact upon the habitats in its surroundings, and any species which may be supported by these habitats. Also the proposed dualling will impact on the landscape and visual amenity of the area and noise, air quality and visual impacts surrounding receptors in North Hykeham, Thorpe on Hill, Birchwood and Skellingthorpe.
	Disruption to traffic flow Improvements on the A46 will result in a severe level of disruption to existing traffic flows. The A46 is part of the SRN with an AADF of over 40,000 on various sections and a high volume of HGVs consisting of over 10% of the AADT between Pennells roundabout and Whisby roundabout. The impact of improvements will mean traffic will have to take a diversion route. The existing A46 diversion routes route through residential areas and are inappropriate to carry such volumes of traffic or the type of traffic in the case of HGVs. This will impact on local residents and also the economy as a result of slow journey times during the construction phase.
	Time constraint An upgrade to the existing bridge structure over the railway line between Pennells roundabout and Whisby roundabout is required. In order to minimise disruption to railway passengers works will be restricted to holiday periods and some weekends. This will mean there is a limited time period for works to be undertaken. This puts pressure on delivering works within specified periods and if it is not completed on time the next opportunity for works would be the next specified period. This could result in a prolonged construction period.
	Engineering constraints There are a number of engineering constraints which include:

Deliverability Issues	Impact
	▪ 4 impacted culverts, 3 of which are on the link between Pennells roundabout and Whisby roundabout and 1 on the link between Riseholme roundabout and Lincoln Road roundabout; ▪ Upgrade to the existing bridge structure over the railway line between Pennells roundabout and Whisby roundabout. This will require permission from Network Rail due to the impact on the railway line. As mentioned previously works will mostly likely be limited to holiday periods and particular weekends resulting in tight timeframes to deliver works and potentially a prolonged construction phase; and ▪ Impact on environmental bund between Pennells roundabout and Whisby roundabout.
Implementation Timescales	Implementation will require scheme progression from concept design to the detailed design phase. In doing so a number of obstacles will need to be overcome including 3rd party issues (expanded on below); engineering constraints and environmental constraints, to name a few. As a result, the delivery of any potential business case and construction of the scheme itself would take a number of years with suitable consultation required to gauge stakeholder and public perception of any potential upgrade.
3rd Party Issues	Network Rail – As discussed previously, an upgrade of the existing bridge structure over the railway line between Pennells roundabout and Whisby roundabout will require Network Rail permission due to potential disruption to services. The station to the east of the railway line is Hykeham railway line which had over 71,000 users in 2015-16. Land ownership – Upgrade to various junctions and dualling the remaining sections of the A46 will require additional land including: ▪ Land north of Moor Lane junction: Land is required to the west of the A46 which is owned by a local business; and ▪ Land north of the railway line and south of Whisby Road: Land is potentially required to the west of the A46.
Funding	The upgrade does not directly support any specific developments and the level of third party contributions is likely to be minimal.

It was therefore concluded that while upgrade to the A46 orbital route would provide benefit to the transport network, it would not achieve all of the operational objectives and not taken forward for further consideration at this stage.

12.3.1.3 Early Assessment Sifting Tool (EAST)

The EAST assessment considered the impact of the scheme against the strategic, economic, managerial, financial; and commercial impacts. The outcome is summarised below:

Strategic Case:

- All three options are expected to meet the defined objectives, however when compared to the single carriageway and future-proofed options, the dual carriageway option is forecast to have a greater degree of traffic relief of the existing network.
- All options would also support the key strategies and existing proposals. However, the dual carriageway option is forecast to provide a greater level of relief to the orbital road network on the western side of Lincoln and the local road network in the south of the city when compared to the single carriageway and future proofed options. As a result, it is likely that the dual carriageway will better support the key strategies and local objectives.

Economic Case:

- **Economic Impact:** Each option will improve east-west connectivity across Lincoln with the largest journey time savings being for east-west and northeast-southwest journeys. Each option will also increase the average speed on the network with the dual carriageway providing the biggest change. This is reflected in the Transport User Benefits Assessment (TUBA) where the dual carriageway will provide the largest benefits (£308 million).
- **Reliability:** Each option will improve the variability of journey times on the existing orbital, radial and local road network and lead to a reduction in traffic on the A46, A1434 and on a number of local roads in North Hykeham (including Moor Lane, Mill Lane and Meadow Lane). The provision of the dual carriageway option is forecast to result in the largest decreases in traffic on these routes.
- **Resilience:** All three options will improve the resilience of the transport network through the expansion of the orbital network, provision of alternative and diversionary routes, and increase in capacity. A dual carriageway option would further improve the resilience benefits of the scheme as it will have the capacity to better deal with incidents and the impact of maintenance works.
- **Delivery of housing:** All three options will facilitate the delivery of new housing and will support the development of the SWQ.
- **Carbon emissions:** The improvements in journey times and reduction in congestion will result in a reduction in greenhouse gas emissions. This is forecast to be marginally greater for the dual carriageway option.
- **Expected VfM category**: TUBA benefits are forecast to range from £272 million for the single carriageway option to £308 million for the dual carriageway option. The Present Value of Costs (PVC) is expected to range from £76 million for the single carriageway option up to £112 million for the dual carriageway option. This places each option in the high Value for Money (VfM) category. However, given the relatively modest difference in benefits between the three options and the lower scheme costs the single carriageway would be expected to result in a higher Benefit Cost Ratio (BCR).

Management Case

- **Implementation Timetable:** Implementation of all three options has been assessed to be between five and ten years.
- **Public acceptability:** As set out above the NHRR has been a longstanding aspiration by the County Council and the concept of a new east-west link forms part of a number of strategies including the adopted CLLP and the LITS. The development of the scheme has been informed by stakeholder and public engagement; this included the route selection process (which was consulted on in 2006) and the highways concept designs which formed the basis of the most recent engagement (June 2018). The 2018 engagement resulted in the dual carriageway being identified as the preferred approach for the majority of consultees when compared to the single carriageway and future proofed options.
- **Practical feasibility:** All three options have been subject to a robust concept design process and all are considered feasible. All options will require planning permission, land acquisition and detailed design and a risk management strategy has been established and the key risks identified.
- **Key risks:** The NHRR risk register has been established and the key risks assessed and quantified. The key risks for each option relate to unforeseen archaeological finds, developer contributions not being agreed and 3rd party property interests cannot be secured by negotiation.

Financial Case

- **Affordability:** The funding for the scheme is yet to be fully scoped out and defined. However, it is anticipated to be a mixture of central and local government as well as private sector. As the most expensive option the dual carriageway would likely require a greater level of public funding.
- **Capital Cost:** Regardless of which option is chosen, all three options fall within the same EAST cost category (£100 to £250 million).
- **Cost profile:** Each option will be expected to result in a similar cost profile.
- **Overall cost risk:** Each option has been subject to a robust cost assessment exercise based on the concept designs and inflation and risk has been assessed, quantified and incorporated into the outturn cost estimates – as appropriate for this stage of the design. The dual carriageway is judged to represent a slightly higher cost risk rating due to its scale and the increased base costs.
- **Other costs:** There is a risk of unforeseen archaeological finds which has the potential to significantly increase cost. It is anticipated that preliminary investigations and assessments will reduce this risk.

Commercial Case

- **Flexibility of Option:** All three options received the same score as the route alignment of all options has been determined and each option was at the same design stage.

The EAST Assessment identified the dual carriageway as marginally being the best performing option in relation to the objectives and overall impact. In the main this is due to the higher level of traffic relief expected to result from its implementation. However, each option is likely to deliver high VfM (in line with DfT's criteria) with the single carriageway expected to deliver the highest BCR given the lower scheme costs and the modest difference in benefits between the three options.

12.3.1.4 Options Assessment Framework & Traffic Impact Considerations

The three remaining scheme options were also assessed against the Options Assessment Framework (OAF) which considered the options against a greater detail of evidence compared to the previous sifting stages. In particular this looked at the relative costs, benefits and impacts of the options under consideration.

The following summarises the key considerations and issues for the three shortlisted options (further details can be found in Appendix A Options Assessment Report):

- Across all three options, the opening year traffic flows for the NHRR are consistent with those acceptable for a dual two lane all-purpose carriageway as set out in guidance contained within the Design Manual for Roads and Bridges (DMRB);
- Average journey times for the dual carriageway option are over a minute quicker than the single carriageway option and future proofed options in the peak periods both in 2026 and 2036. The average speeds are also forecast to be significantly quicker (approximately 10mph) for the dual carriageway option;
- Analysis indicates that the single carriageway links, particularly at the western end of the NHRR, may operate close to capacity by the end of the Local Plan period (2036) or at the design year (2041) whilst the dual carriageway option should remain well within capacity in these timescales;
- The LEB is being constructed as a single carriageway with future proofed junctions and features. There remains an aspiration to upgrade this to a dual carriageway at some point in the future. Progressing the NHRR as a standard single carriageway could be seen as being inconsistent with the overall design approach to the LEB;

- At the OAR stage, as the SWQ was considered dependent development it was not taken into account in the core Do-Something scenario. Once added it will place further development pressures on the network;
- All three options will improve the resilience of the transport network through the expansion of the orbital network and the provision of capacity increases. However, a dual carriageway option would further improve resilience as it will have the capacity to better deal with incidents and the impact of maintenance works;
- The dual carriageway option is forecast to provide the greatest level of traffic relief on the A46 when compared to the Do-Minimum situation in both 2026 and 2036. This is more pronounced on the northern sections of the existing relief road on the sections between Skellingthorpe Road and Riseholme Road;
- All three options will provide significant traffic relief across a number of routes both within central Lincoln and in the south of the city. However, the additional traffic relief afforded by the dual carriageway means that it has been assessed as being the better performing option in traffic impact terms;
- All three options will produce a high level of benefits with the dual carriageway option providing the highest level of benefits;
- The standard single carriageway is the lowest cost option and the outturn costs are expected to be in the region of £48 million lower than the dual carriageway;
- The dual carriageway is significantly more expensive than the other two options and has an outturn cost of approximately £148 million;
- In terms of public acceptability the dual carriageway is the best performing option (see Section 12.3.1.4 below).

12.3.1.5 Engagement Outcome & Considerations

As set out in Section 10.5 the June 2018 stakeholder and public engagement exercise considered the seven options described in Section 11.3. As detailed earlier some 73% of respondents strongly supported the scheme and 89% either supported or strongly supported the scheme. Only 8% of respondents opposed or strongly opposed the scheme with 2% either not knowing or having no opinion. In addition, 87% of respondents preferred the full scheme between the A46 and the A15 with 75% of respondents preferring the dual carriageway option. Only 1% of respondents preferred any version of the A46 to South Hykeham Road option with 8% preferring the A46 to Brant Road option.

12.4 SUMMARY

- The NHRR scheme has been developed over a long period of time, and has been subject to a robust and detailed options assessment and selection process at each stage of its development.
- The most recent options assessment phase considered seven options; including three primary options of a single carriageway, a single carriageway with future-proofed junctions and structure and a dual carriageway.
- The assessment work undertaken indicates that a failure to intervene or progress the NHRR will threaten LCC's economic growth and delivery of the housing targets set out in the SEP and CLLP and the SUEs in their present form.
- A Do-Nothing scenario would also mean that traffic demand continues to exceed available capacity on strategic and local routes, which will worsen with forecast traffic growth.
- On balance, the dual carriageway option is identified as the best performing option, as it will provide an additional east-west route for local and strategic traffic and improve access between the A46 and the eastern side of Lincoln including the LEB.
- The opening year daily traffic flows compared to DMRB guidance for carriageway standards indicate that a dual carriageway standard is appropriate and economically and operationally acceptable.
- A dual carriageway will provide the greatest level of traffic relief through Southern Lincoln and North Hykeham and will reduce the level of rat running traffic;
- It will also provide the highest level of support for the SWQ and increase network capacity to accommodate the planned and forecast growth.
- It will also improve route choice for east-west movements to reduce traffic and congestion on the existing orbital network and key routes through Lincoln.
- The recent stakeholder and public engagement exercise has shown that the majority of respondents (75%) support the dual carriageway option for the full A46 to A15 NHRR.
- The dual carriageway option is forecast to provide the highest level of traffic relief on the A46 when compared to the Do-Minimum situation in both 2026 and 2036.
- The dual carriageway option will provide the highest level of benefits.

13 SUMMARY

13.1 OVERVIEW

This report provides the Strategic Case of the OBC for the NHRR, in line with the guidance set out in the DfT's 'The Transport Business Case'. A robust evidence base is provided, that outlines a clear rationale for making the investment, including an assessment of its strategic fit, analysis of the existing and future transport and wider economic issues that it aims to address, information on how the scheme has developed and the preferred option chosen and details of the anticipated impacts and benefits.

There is a clear need and requirement to progress the development of the NHRR. Failure to intervene will have serious implications for the viability of LCC's economic growth and housing targets set out in the SEP and CLLP. It will also negatively affect the strategic highway and major road network, where demand will continue to exceed the available capacity, impacting on journey times, journey time reliability and journey quality for strategic and local traffic. Specifically, the development of the NHRR is critical to support the forecast and planned level of growth through improved network capacity, reliability and resilience.

13.2 BUSINESS STRATEGY AND POLICY FIT

There are a number of common objectives and issues across national, regional and local policies and strategies. These include but are not limited to:

- Improving connectivity & network reliability;
- Enabling economic growth;
- Delivering significant levels of new housing;
- Reducing congestion and associated problems of air and noise pollution and severance; and
- The proposed development of the MRN.

The delivery of the NHRR will support each of these, by providing a new east-west strategic link in the south of Lincoln that will attract traffic away from the city centre and unsuitable local residential routes. This will not only reduce existing issues of congestion, journey time unreliability and severance, it will also play an important role in facilitating the delivery of significant new housing development, and wider economic growth.

13.3 EXISTING KEY ISSUES

The existing road network in Lincoln consists of a number of regionally important routes through and around the city, as well as major routes into the city centre and local roads. The main orbital and strategic routes include the A46 Western and Northern Relief Roads which form part of the SRN, the A57 Saxilby Road/Carholme Road on the western side of Lincoln which provides a key east-west route into the city, the A15 which provides a major north-south route through Lincoln and which also provides a link to the nearest international gateways (the Humber Ports and Airport) and the A1434 which again provides a route into the city from the south west and passes through several residential areas including North Hykeham. There are also a number of other major routes which provide links to the city centre and the surrounding towns and villages.

However, Lincoln 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. This is caused by a number of key issues, which are summarised in Table 13-1.

Table 13-1 – Existing Transport Key Issues

Key Issue	Description	Impacts
Network Constraints	Few major, strategic routes through and around Lincoln, with the majority of routes single carriageway. The network is further constrained by the River Witham and Fossdyke Navigation, which cut through the city in both north-south and east-west directions. In the south of the city, river crossings are limited to relatively minor routes unsuited to strategic traffic and HGVs. There are also limited opportunities to cross the rail lines that bisect the city, and the location and number of level crossings has a further constraining effect.	Traffic is forced to use either the A46 or A1434 and A15 to pass by or through the city, which operate at or close to capacity at peak times. East-west traffic in the south uses minor rural routes, causing issues for local residents in terms of accessibility, noise and air pollution and severance. Several routes in the Hykeham area carry circa 10,000 vehicles per day, including Moor Lane, Mill Lane and Station Road. In some parts, housing is immediately adjacent to the footway.
Network Resilience	Events and closures on strategic routes such as the A46 result in long diversion routes through urban and residential areas, which are unsuited to large volumes of traffic and large proportions of HGV movements.	Negative impacts on local communities located along diversion routes, including noise and air pollution, severance, and longer journey times to access employment and services.
Network Capacity	The A46, A15 and A1434 currently operate at or close to capacity during the AM and PM peaks and, to some extent, the Inter Peak.	Congestion results in low average speeds, unreliable journey times and delays for all road users, including bus users.

13.4 FUTURE PROBLEMS & CHALLENGES

There are significant levels of planned growth in Lincoln, including the development of four SUEs which will contribute to a 50% increase in dwellings by 2036.

The LEB, which is currently under construction, will provide welcome and much needed mitigation for the traffic and transport problems affecting Lincoln but once open several residual issues will remain.

In particular the lack of east-west connectivity will remain a significant problem which will continue to exacerbate the existing congestion problems on radial routes and routes into Lincoln.

Travel demand is also forecast to increase substantially over the next 20 years. Increases in vehicle trips of up to 20% by 2036 are forecast and will result in a deterioration in conditions on key areas of the network, particularly on the western side of Lincoln including the A46 Western and Northern Relief Roads, A1434 Newark Road and sections of the A15.

The forecast impact of the future level of travel demand on infrastructure illustrated by link capacity, junction capacity and average speed indicates issues of congestion and poor speeds on the key

route network including the A46 Western & Northern Relief Roads and the A1434 Newark Road and on local routes in the south of Lincoln and North Hykeham area. This includes Meadow Lane and Brant Road – the current main east-west crossing of the River Witham in the south of Lincoln

If a suitable transport intervention is not implemented, existing and future conditions will result in:

- A lack of strategic connectivity: the A46/A15 currently provide strategic connectivity to wider economic areas such as the Humber ports. Congestion which will be exacerbated in the future will inhibit efficient movement on this route and therefore constrain wider strategic connectivity;
- Constrained economic growth: the transport network is forecast to face increasing congestion which will impact on the area's ability to deliver sustainable economic growth;
- An impact on housing targets: the ability to deliver housing targets will be compromised; and
- An impact on the indicative MRN: existing and future congestion on the A15 and A46 may hinder the potential of these routes to operate as part of the MRN.

13.5 OBJECTIVES

A robust set of objectives has been developed in response to the key challenges and issues identified as part of the review of the existing and future situation. A significant level of development is proposed for the Lincoln area up to 2036 and it is critical that this is supported by the delivery of new transport infrastructure.

The scheme will also need to support the delivery of the LITS, its aims and objectives. This includes ensuring that the transport infrastructure meets the needs of existing and proposed developments and the continued investment and development in infrastructure that reduces congestion on key strategic and local routes within and around the Lincoln urban area.

The NHRR objectives are as follows:

- To improve east-west connectivity in the south of Lincoln for strategic and local traffic;
- To reduce traffic levels on local urban and rural roads in the south of Lincoln through the transfer of strategic traffic to appropriate routes;
- To reduce NMU severance in south Lincoln caused by high levels of traffic on the local road network and lack of east-west connectivity;
- To support the delivery of the SUEs by improving access to the identified sites;
- To support the delivery of the SWQ through the provision of additional network capacity and NMU infrastructure necessary for the delivery of new housing;
- To reduce traffic levels and congestion around Lincoln and on key routes through the city to support:
    - Improved access to central Lincoln;
    - The improvement of access to the Humber Ports and Airport; and
    - The improvement of access to the Lincolnshire Coast.
- To improve the resilience of the orbital and key route network through and around Lincoln and reduce the impact of major incidents.

13.6 MEASURES FOR SUCCESS

This report has also described what constitutes success for the scheme. This will be measured in terms of:

- The successful delivery of the Relief Road itself including delivery of:
    - **NHRR Build –** The scheme was developed and constructed as described in the programme, an effective stakeholder engagement process was employed, and the risk management process was successfully implemented.
    - **NHRR Costs –** The final outturn costs were in line with those included in the Full Business Case.
    - **Delivery Process –** Successful approval at each of the Business Case stages and successful approval of the planning application and all statutory processes.
    - **Delivered Package –** The package delivered to the quality standards expected.
    - **Objectives & Strategic Outcomes**
        - Delivering the scheme's operational and specific objectives; and
        - Supporting the realisation of strategic outcomes.

The delivery of the scheme and the achievement of the objectives and outcomes will be monitored as part of the scheme monitoring and evaluation process. This process is described in further detail within the Management Case of this OBC.

13.7 CONSTRAINTS AND INTERDEPENDENCIES

The Strategic Case has identified a number of high level constraints and interdependencies that could impact on the delivery of the scheme. These include:

- Third party constraints: the proposed alignment incorporates land owned by various landowners and the delivery of the SWQ has been linked to the first phase of NHRR;
- Physical constraints: this includes the need for a structure over the River Witham; Lincoln Cliff; residential properties on Station Road in Waddington that will require demolition; and statutory undertakers' equipment along the route;
- Highway design constraints: NHRR will need to tie into the A46 Pennells Roundabout and the A15/LEB junction;
- Environmental constraints: a number of environmental constraints have been identified;
- Inter dependencies: including funding approval; planning approval; successful approval of statutory orders; timely public inquiry completion; stakeholder support; and third-party land requirements; and
- Stakeholders: NHRR will affect a significant number of people, groups and organisations, all of whom will need to have the opportunity to review and comment on the scheme throughout its development.

13.8 STAKEHOLDERS

The development of the scheme has been subject to a significant level of public and stakeholder engagement. A robust stakeholder engagement strategy has been developed with the aim to manage stakeholder expectation and to ensure that, where appropriate and possible, their views feed into the design of the scheme. As part of the strategy key stakeholders and wider stakeholders which consist of statutory and non-statutory consultees have been identified as well as the stage of the project they will be consulted at.

The most recent phase of engagement took place in June 2018. This included face to face meetings, workshops, public exhibitions and questionnaires with stakeholders. Separately LCC also engaged hard to reach groups. The result of the extensive engagement exercise identified the importance of NHRR to stakeholders and continues to inform the design of NHRR.

13.9 STATEMENT OF NEED

The NHRR has been developed over a long period of time and subject to a robust and detailed options assessment and selection process at each stage of its development. A structured and robust assessment process has been used to appraise all of the identified options including a Do-Nothing / Do-Minimum scenario.

This business case identifies that there is a clear need and requirement to progress the development of the NHRR and that failure to intervene would have serious implications for the viability of LCC's economic growth and housing targets set out in the SEP and CLLP. It would also affect the strategic highway and major road network where demand will continue to exceed the available capacity impacting on strategic and local traffic. The key strategic and major routes will have difficulty accommodating the forecast traffic levels and this will affect the economic growth aspirations, access to Lincoln and the movement of strategic traffic. Additional capacity and route choice is critical in helping to support the forecast and planned growth, improve reliability and resilience.

The process has considered the impacts, challenges and benefits of each of the scheme options and identified that, on balance the dual carriageway is the best performing option and is LCC's preferred approach.

Appendix A

OPTION ASSESSMENT REPORT (2018)

Appendix B

STRATEGIC CASE – TRANSPORT INVESTMENT STRATEGY

Appendix C

STRATEGIC AND WIDER BENEFITS REPORT

Appendix D

A46 CONCEPT DESIGNS

Appendix E

NHRR OUTLINE DESIGNS

Lincolnshire County Council
Crown House
Grantham Street
Lincoln
LN2 1BD

wsp.com