



Lincolnshire County Council

NORTH HYKEHAM RELIEF ROAD LITS OPTIONS GENERATION





TYOF DOCUMENT (VERSION) CONFIDENTIAL

PROJECT NO. 70038233

OUR REF. NO. 70038233

DATE: MAY 2018



QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Draft			
Date	12-09-18			
Prepared by	LL/FR/JB/SM/JP			
Signature				
Checked by	GB			
Signature				
Authorised by	PR			
Signature				
Project number	70038233			
Report number	738233-WSP-T00-XX-RP-TP-0007			
File reference	Appendix G			

Appendix G



LITS OPTIONS GENERATION

1.1 INTRODUCTION

As described in the main report, the NHRR has been developed over a significant period of time and it is important that NHRR is seen in the context of transport in the Lincoln urban area, Central Lincolnshire and the county as a whole, rather than as a free-standing scheme. In this context, the option generation and development for the scheme is part of, and is based on, the LITS process, and so any discussion of the NHRR Options must begin with its grounding in LITS.

There have been a several key stages leading to the identification and development of the preferred option for NHRR. This includes the initial work done on the establishment and revision of LITS since 2004, involving extensive option generation and sifting, resulting in a set of measures to be implemented to meet the objectives described in the previous section of this report. Much of this work dates back to the last decade, but the revisions and progress reviews of LITS have ensured that the options generated remain robust and relevant.

This appendix provides a more in-depth look into the LITS historic approach resulting in the development of NHRR. Specifically, it includes:

- Options Generation Approach – this describes the overall approach which has been taken in the generation of a long list of options;
- Identification of Initial Options – this section presents the LITS initial concepts/options and describes the development of these into confirmed options for appraisal;
- Consultation & Refinement – this describes the process which was followed to refine the LITS options into short and longer-term schemes; and
- Development of the Route Corridor Options – this section presents the process to progress to a preferred corridor.

1.2 OPTIONS GENERATION APPROACH

The approach to the options generation and development is summarised in Figure 1 below from the identification of initial options that make up LITS as a whole strategy, to the development of the NHRR as a component of LITS. As shown in Figure 1, a robust process has been employed and each stage has been informed by stakeholder engagement and consultation and detailed assessments.

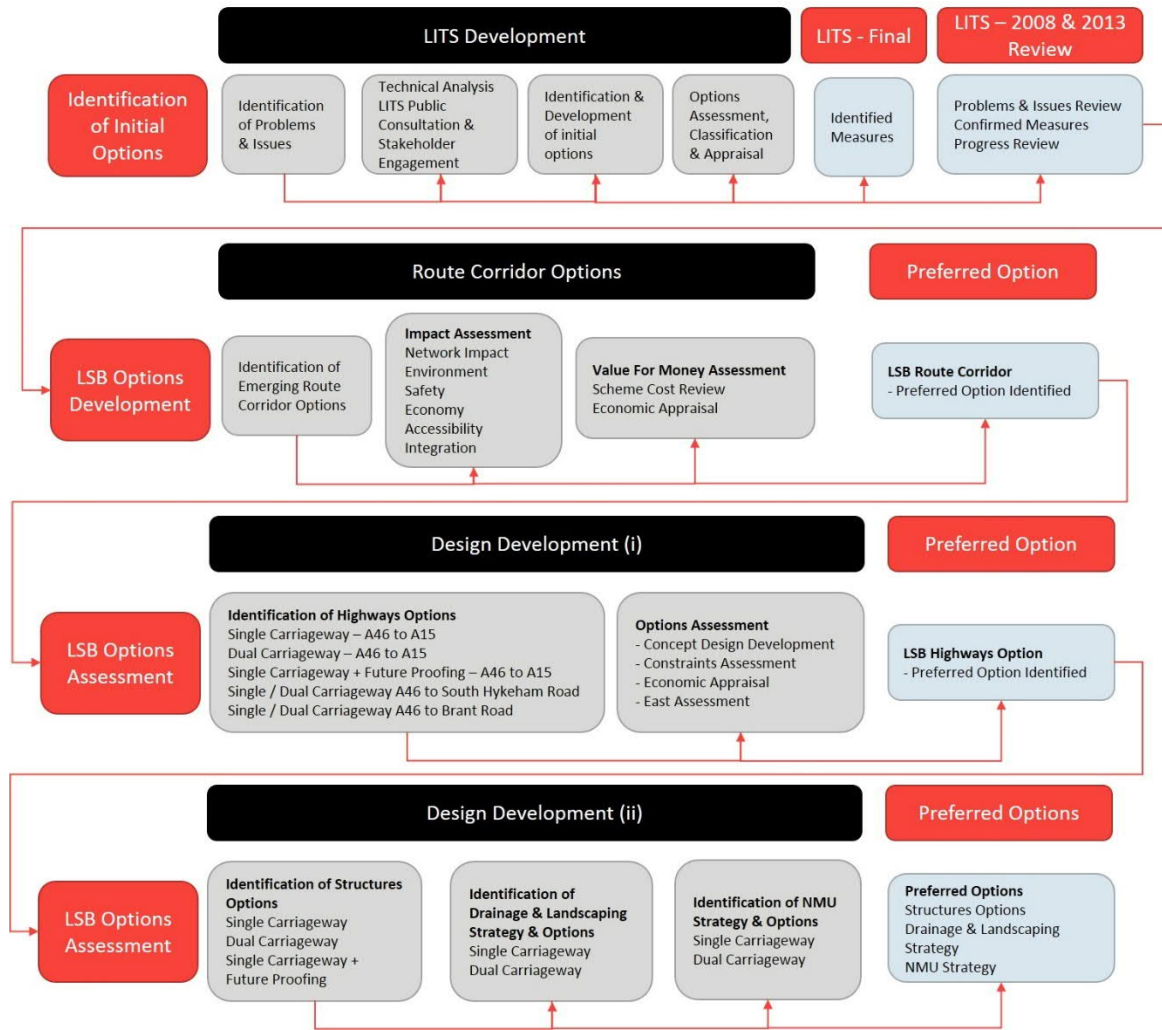


Figure 1 - Options Generation Approach

1.3 IDENTIFICATION OF INITIAL OPTIONS

The original LITS, when it was first developed in 2006, reviewed the key transport issues affecting the Lincoln urban area and identified nine broad objectives as part of the first phase of the strategy’s development. These were expanded in 2008 and revised in the 2013 progress review to take account of changes in policy and focus in transport both locally and nationally.

There are currently 12 objectives identified as of the LITS 2013 Progress Report which were developed in response to the key transport issues affecting Lincoln. The LITS review process has ensured that they remain robust and current. The 12 objectives are as follows:

Table 1 - LITS Objectives

Ref	Objectives
SO1	To assist the sustainable economic growth of Lincolnshire through transport infrastructure improvements.
SO2	To remove strategic road-based freight from Lincoln and other adversely affected communities through encouraging the use of alternative modes and improving links to the Primary Road Network.
SO3	To ensure that the transport infrastructure meets the needs of existing and proposed developments especially: In the regeneration of priorities in the Lincoln Policy Area Including minimising congestion through the promotion of walking, cycling and public transport and minor highways improvements Parking provision and management
SO4	To reduce the number and severity of road traffic accidents by reducing the potential for conflict between different modes and improving the facilities for convenient and safe alternatives
SO5	To maximise accessibility and reduce peripherality by improving the range of travel options especially for those without access to a private car.
SO6	To increase public transport usage by improving reliability, frequency, journey time and integration of bus and rail services.
SO7	To improve overall air quality and noise levels within the study area, especially in the Air Quality Management Area in Lincoln, by the removal of unnecessary traffic by: Removing through traffic Reducing local journeys by car Other traffic management measures
SO8	Protect and enhance the built environment by reducing the adverse impacts from traffic, through improvements to the transport infrastructure.
SO9	Improve the attractiveness and liveability of central Lincoln for residents, workers and visitors by creating a safe, attractive and accessible environment and encouraging healthy travel and lifestyles
SO10	To support the effective implementation and delivery of the Core Strategy and the emerging priorities of the Local Transport Body and Greater Lincolnshire Local Enterprise Partnership.
SO11	To reduce Lincoln's carbon emissions through planning, improving and managing transport
SO12	To reduce the overall impact of travel decisions by making best use of the range of transport interventions available including smarter choices, technology and information.

Source: LITS Progress Report 2013

Following the initial identification of the key problems and objectives an option development process was undertaken between 2004 and 2006. The options were generated through a process of technical analysis and observations, discussions with relevant specialists from LCC, CoLC, NKDC and WLDC and consultation with stakeholders and the public. This resulted in the identification of 18 initial concepts / options (see Table 2) The initial identified options included highways schemes such as an eastern bypass, upgrading the A46 Western Relief Road to dual carriageway and a North

Hykeham Relief Road; public transport options such as Park & Ride, relocation or redevelopment of the bus station and improving the cycle network.

The options / concepts were appraised against the strategic objectives, the feasibility of the option, cost, public acceptability, timescales and financial sustainability and whether the option would be effective as a stand-alone option, or whether there were compatible or complementary options.

Only two options were discounted at the first options identification and review stage: Option 13 (improved bus service frequency) and Option 17 (Commuter Rail Network), both of which were discounted on the grounds of financial sustainability due to the amount of revenue support that would be needed. However, both were subsequently re-included to the process on the grounds that they might become viable in conjunction with other measures and/or the co-operation of other parties. Additionally, two further options were identified:

- An East/West link: a highway scheme facilitating east-west highway movements in Central Lincoln, and
- A Western Gateway Link: a highway scheme aimed at opening up development to the west of Lincoln.

The outcome of this stage of the process was the agreement that all identified options should be worked up in more detail and appraised against a more comprehensive methodology.

Table 2 – Initial Concepts & Options

Option Ref	Initial Option
1	Lincoln Eastern Bypass
2	North Hykeham Relief Road
3	Dual A15 to A158
4	Dual A46 existing Western Bypass
5	Local Highway Improvements (cumulative)
6	Uphill Traffic Management Measures
7	Fully Integrated Park and Ride
8	City (urban area) Parking Strategy
9	Redevelop Bus Station
10	Relocate Bus Station
11	Public Transport Interchange
12	Quality Bus Corridors within LPA
13	Improved bus services (frequency)
14	Improved bus services (priorities)
15	Pedestrianisation

16	Improved Cycle Network
17	Commuter Rail Network
18	Level Crossing Improvements

1.3.1 DEVELOPMENT OF CONFIRMED OPTIONS & APPRAISAL

Following the initial workshop, the identified options were developed in more detail. Additionally, three further options were included in the process: school travel plans, business travel plans and rail/highway grade separation in the city centre. As a consequence, there were 23 options under consideration and appraised against their impact on the objectives, cost, environment, safety, economy, accessibility and integration. In addition they were categorised as either:

- Stand Alone Options: those options which can be deemed feasible, deliverable and effective as a Stand Alone piece of transport infrastructure;
- Dependent Options: those options which require additional pieces of transport infrastructure to make them effective;
- Stand Alone / Dependent Options: those options which could be delivered as stand-alone options, but would result in greater benefits if combined with other pieces of transport infrastructure; and
- Discounted Options: those options which were not deemed feasible, deliverable or effective under any circumstances in planning and engineering terms.

At this stage, once again Option 13 (improved bus service frequency) and Option 17 (Commuter Rail Network) were discounted with the addition of Option 19 (Rail/Highway Grade Separation).

The result of the assessment process was the initial prioritisation of the options, identification of the risks, the compatibility with other options and review of the costs. This provided a further means of strengthening the argument regarding which options should be prioritised within the development of LITS. The appraisal also reinforced the need for a well balance multi-modal solution within the Lincoln area if the problems and issues were to be successfully addressed and the strategy objectives achieved. This is a reflection of the complex and multi-layered transport issues within the study area.

The prioritised options are summarised in Table 3.

Table 3 - Prioritised Options for LITS

Category	Priority (within Category)	Option Name	Appraisal Position (out of 19)	Compatibility	Risk	Cost
Highways Options	1	Lincoln Eastern Bypass	1st	High	Low	High
	2	North Hykeham Relief Road	2nd	Medium	Medium	High
	3	East-West Link	18th =	High	High	High
	4	Uphill Traffic Management	12th	High	Medium	Low
Public Transport Options	1	Quality Bus Corridors	8th =	High	Medium	Medium
	2	High Street Level Crossing Closure	5th =	High	High	Medium
	3	Public Transport Interchange	3rd =	Medium	Medium	High
Parking Options	1	Park and Ride	5th =	High	Medium	Medium
	2	City centre Parking Strategy	14th =	High	High	Medium
Softer Modes	1	Improved Pedestrian Facilities	8th =	High	Low	Medium
	2	Improved Cycle Network	10th =	Medium	Medium	Medium
	3	School Travel Plans	3rd =	High	Medium	Low
	4	Business Travel Plans	7th	High	Medium	Low

1.4 CONSULTATION AND REFINEMENT

The next phase of the development of LITS (January 2005) involved undertaking a public consultation exercise. A questionnaire was issued to 10,000 households across the Greater Lincoln area (the same households who had been the recipients of the original consultation questionnaires during Phase 1) which set out the emerging principles, objectives and options contained within LITS and a series of Public Exhibitions were also held. This exercise was supplemented by a further round of stakeholder consultation. The consultation revealed that people generally supported the proposed transport improvements included in the strategy. The transport improvements considered to be the priorities for the future of Lincoln were as follows:

- A Lincoln Eastern Bypass
- Improved pedestrian and cycle network
- Improved city centre parking
- High quality bus services
- The provision of Park and Ride

- A new bus station
- North Hykeham Relief Road

1.4.1 LITS – IDENTIFIED MEASURES

In 2008 LITS was reviewed and revised and the options refined and classified into short and longer-term schemes. Consequently, the refinement of schemes has resulted in a number of changes from the transport improvement options highlighted previously (Table 3) and these include:

- **Traffic Management Measures:** this includes a variety of traffic management measures including within Lincoln’s historic core which is locally known as the ‘Uphill area’. This is in reference to the Uphill Traffic Management option which has been highlighted previously and now forms a component of this intervention.
- **East West Link (EWL):** the project team examined ways by which the EWL could be reduced in cost, improve deliverability and reduce the impact of the scheme on the cultural heritage of the city. It was decided that the scheme could be split into three sections, each capable of being delivered independently of each other. By breaking down the scheme in this way, deliverability was improved as it reduced the number of independent factors. Furthermore, included as part of the EWL is the pedestrianisation of High Street and supporting this Network Rail’s delivery of a footbridge over the level crossing at High Street. The latter component has been previously referred to as the transport intervention ‘High Street level crossing closure’.

Table 4 provides a summary of the status of the options and the key schemes detailed within LITS – this includes the NHRR as a longer term scheme.

It was stressed in LITS that ‘the improvements within the Strategy are not a series of piecemeal interventions and the timescales associated with their introduction have been designed to maximise their benefits. When introduced, the various improvements result in incremental benefits to the transport network within the Lincoln area which eventually culminates in the benefits associated with the entire Strategy’. If achieved, they will make a significant contribution to making Lincolnshire a healthier, cleaner, safer and more accessible place to live, visit, and do business.

Table 4 – Transport Improvement Options

Transport Improvements	Short-term (2008-2016)	Longer-term (2016-2026+)
Small-Scale Walking/Cycling/Public Transport Schemes	X	X
Quality Bus Corridors	X	X
Real Time Passenger Information	X	
Public Transport Interchange	X	
Park and Ride	X	X
Parking Strategy	X	X
Rail Service Improvements	X	X

Lincoln Eastern Bypass	X	
Traffic Management Measures	X	X
City Centre Pedestrian Improvements	X	X
East-West Link	X	X
Swanpool Link	X	
North Hykeham Relief Road		X
Relief Road Improvements		X

Delivery of the strategy will result in five key benefits to Lincoln and the surrounding area:

- 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
- Economic and regeneration benefits through supporting existing land uses and proposed developments.

1.4.2 LITS – ADDITIONAL MEASURES

The LITS 2013 Progress Report categorises the majority of options previously highlighted within the LITS 2008 review as established transport improvements, with the exception of the Parking Strategy. This has been identified as an emerging improvement, along with a number of other additional improvements which have been identified since the last review of the LITS. The emerging transport improvements include:

- Lincoln Eastern Bypass Dualling;
- Coach Parking Facility;
- Congestion Easing Schemes;
- Access LN6/Access Lincoln;
- Bus Network Review;
- Lincolnshire Cycle Strategy;
- Parking Standards; and
- City Centre Signing Strategy.

1.5 DEVELOPMENT OF THE ROUTE CORRIDOR OPTIONS

Although the NHRR has emerged from the development of LITS, the principle of such a scheme has also been developed as part of a number of strategies and policy plans covering the Lincoln area for many years that in some instances pre-date LITS. An initial route for completing the ring road around Lincoln was identified in March 1990. This assumed that a NHRR would link the western relief road, at the junction with A46 and the proposed LEB at its junction with the A15. The NHRR

has been a long-term aspiration of the county and district councils and is seen as being fundamental to the delivery of a number of aims and objectives.

In September 2003 an Options Assessment Report was produced in order to examine both historic and new alignment options for the NHRR. This report set out the historical context of the scheme from its principal inception in 1990 and the potential impacts on several factors such as residential areas, built heritage, archaeology, landscape and so on. Its main purpose was to carry out an initial investigation into the feasibility of a NHRR from an engineering perspective and an assessment of the environmental impacts.

The City Engineer and Surveyor, in 1990, identified three options for the southern section of the bypass within a route corridor and this was reassessed, by JMP Consultants, in 1991 with additional route options. The 1991 report indicated that the original preferred option was the most feasible route but was not considered economically justifiable at the time. Land was safeguarded for the route of the NHRR in the North Kesteven Local Plan adopted in 1996.

The 2003 OAR highlighted seven historic options that had been considered and added additional variants for consideration and assessed them under the following categories:

- Noise;
- Air Quality;
- Disruption due to construction;
- Demolition of Private property and associated land take;
- Land lost by the community;
- Effects on Development Land;
- Effects on Agricultural Land; and
- Impacts of the scheme on land use policies and pertinent planning policy.

The 2003 OAR report concluded that no option stood out as a preferred solution, due to significant environmental effects. Consequently, detailed traffic analysis was required to be undertaken to gauge level of benefits that NHRR could potentially deliver.

The OAR report resulted in a workshop in April 2004 where route corridors were identified. Three corridor options emerged all connecting the A15 at the terminus of the proposed Lincoln Eastern Bypass and the A46 at the terminus of the existing Western Relief Road (see Figure 2 below).

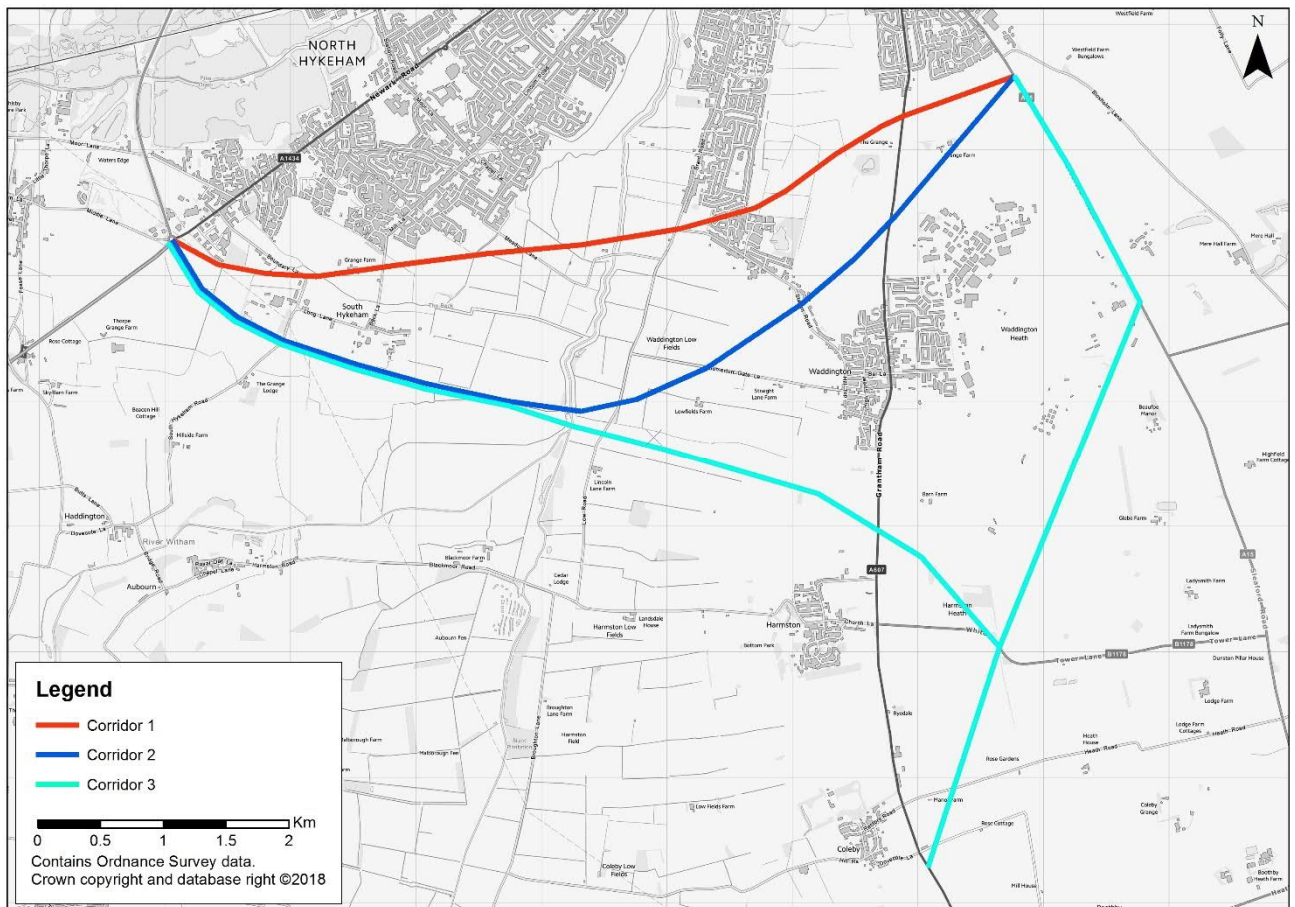


Figure 2 - Location of three emerging route corridors

Following the workshop a Route Assessment Report (2005) was produced in order to examine in detail the possible routes of the relief road and develop further options along the identified corridors. This work included an economic and environmental assessment to review and sift emerging options. This report was prepared taking account of the guidance within the Design Manual for Roads and Bridges (DMRB). As part of this work Corridor 3 was ruled out for the following reasons:

- Traffic studies indicate that Corridors 1 and 2 would provide much greater benefits in traffic terms. Corridor 3 would carry approximately half the traffic of Corridor 1, significantly reducing the benefit of the scheme;
- The cost-benefit analysis produced a significantly worse cost-benefit ratio than Corridors 1 and 2 (see table below). Construction costs would be significantly higher due to the increased length of the highway, and the benefits would be less due to the lower volume of traffic that it would attract;
- Journey time reductions achieved by this corridor would be approximately half of those experienced on Corridor 2 and one-third on Corridor 1;
- An examination of available archaeological data suggested Corridor 3 would have substantially greater archaeological impact than the other corridors; and

- A preliminary assessment of landscape and visual impacts suggested that this corridor would have substantially greater adverse impacts, due to greater land-take and the different character of the landscape at the point where the route would have crossed the Lincoln Edge escarpment.

Table 5 - TUBA Cost Benefit Analysis for the emerging options

Corridor 1	Low Growth	High Growth
NPV	£138,000	£446,000
Benefit to Cost Ratio	3.191	7.755
Corridor 2a	Low Growth	High Growth
NPV	£82,000	£359,000
Benefit to Cost Ratio	2.733	8.269
Corridor 2b	Low Growth	High Growth
NPV	£84,000	£361,000
Benefit to Cost Ratio	2.852	9.240
Corridor 3	Low Growth	High Growth
NPV	£69,000	£223,000
Benefit to Cost Ratio	1.955	3.996

Source: North Hykeham Relief Road Economic Assessment Report Draft November 2004, Lincolnshire County Council

Corridors 1 and 2 were progressed further, with seven options identified within these corridors being assessed. This was further refined to four options (1, 2A, 2B and 2C) on the basis of a combination of engineering, economic and environmental factors.

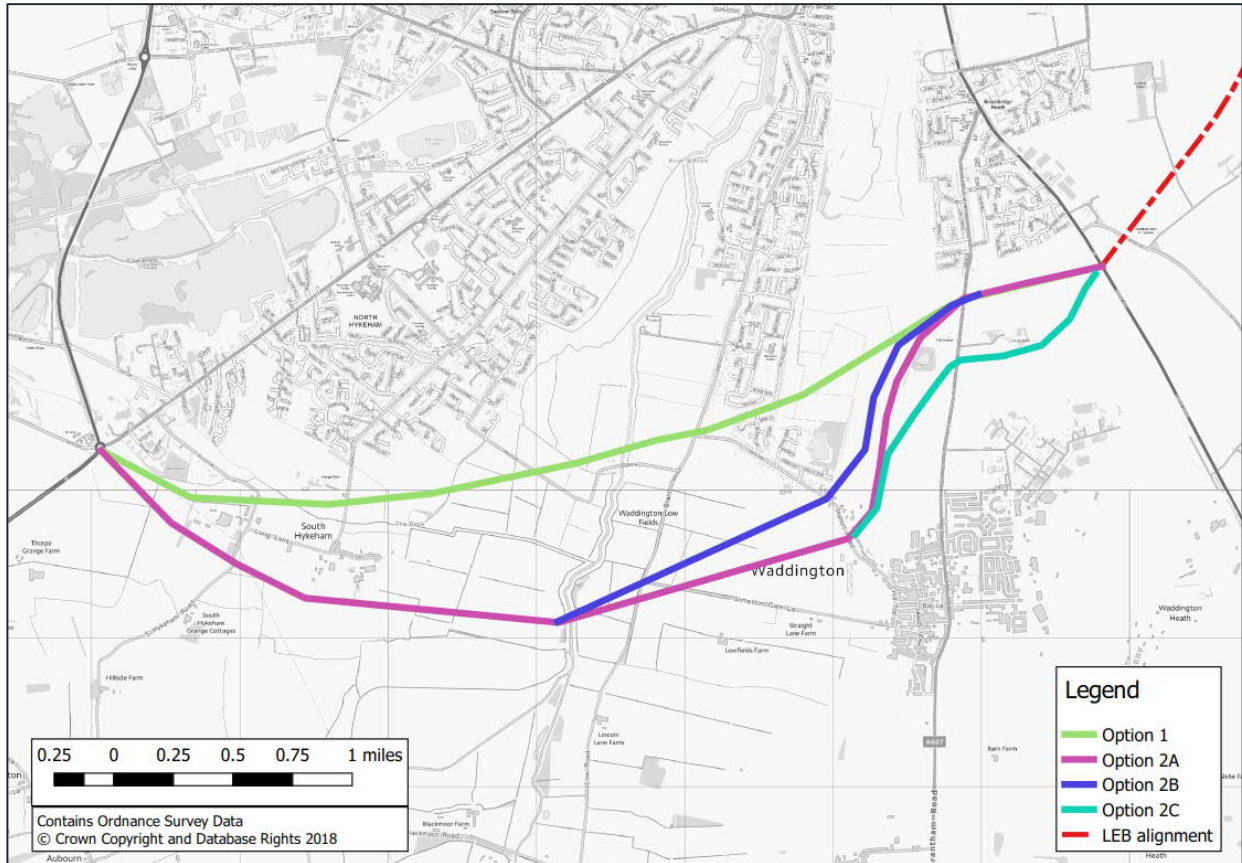


Figure 3 – NHRR four options

The Environmental Assessment looked at a range of factors including:

- Air Quality
- Cultural Heritage
- Disruption due to construction
- Ecology and Nature Conservation
- Landscape and visual Effects
- Land Use
- Traffic Noise and Vibration
- Pedestrians, Cyclists, Equestrians and Community Effects
- Vehicle travellers
- Water Quality and Drainage
- Geology and Soils
- Policies and Plans

This concluded that Option 1 scored considerably worse than the other options based on overall environmental impacts. The differences between options 2a, 2b and 2c however, were relatively small so it was recommended that all three routes in corridor 2 were taken forward for further investigation and public consultation prior to selection of a preferred route.

The recommendation of the report was that all three corridors be presented for public consultation but with a recommendation that Corridors 1 and 3 should not be progressed for further assessment: Three individual routes along Corridor 2, routes 2A, 2B and 2C, should be presented in full.

In October 2005 the NHRR was subject to a public consultation exercise; Public Consultation One. This was undertaken to inform members of the public and other interested parties of the work undertaken to date and invite comments/feedback on the proposals. The public were presented with three alternative route options for the NHRR; Routes 2A, 2B and 2C. The consultation exercise showed that there is general support for a NHRR both within the study area and Lincoln as a whole. General support for the recommended corridor was evident apart from residents in Waddington and the fringes of Bracebridge Heath (that are directly affected by the route). Support for corridor 3 was also shown. Issues identified as being of greatest importance to the public were:

- Community severance
- Noise and air quality within the study area villages and
- Through traffic in local villages

Following the public consultation and a public meeting of the Waddington Parish Council on 27th June 2006, the Leader of Lincolnshire County Council, Cllr. Martin Hill, undertook to carry out a comparative appraisal of the two route corridors known as Corridors 2 and 3 of the NHRR. It was agreed that this appraisal would be carried out prior to confirmation by the Leader that the second public consultation on the preliminary design, including the junction strategy, of the emerging Preferred Route (based on route 2c) would continue. The results of the appraisal would also be used as a basis for prioritising which of the two route corridors should be promoted on a technical basis when considered against Department for Transport (DfT) best practice.

A route corridor appraisal was undertaken in 2006 to assess the strategic impacts of Route Corridors 2 and 3. This is illustrated in the figure below.

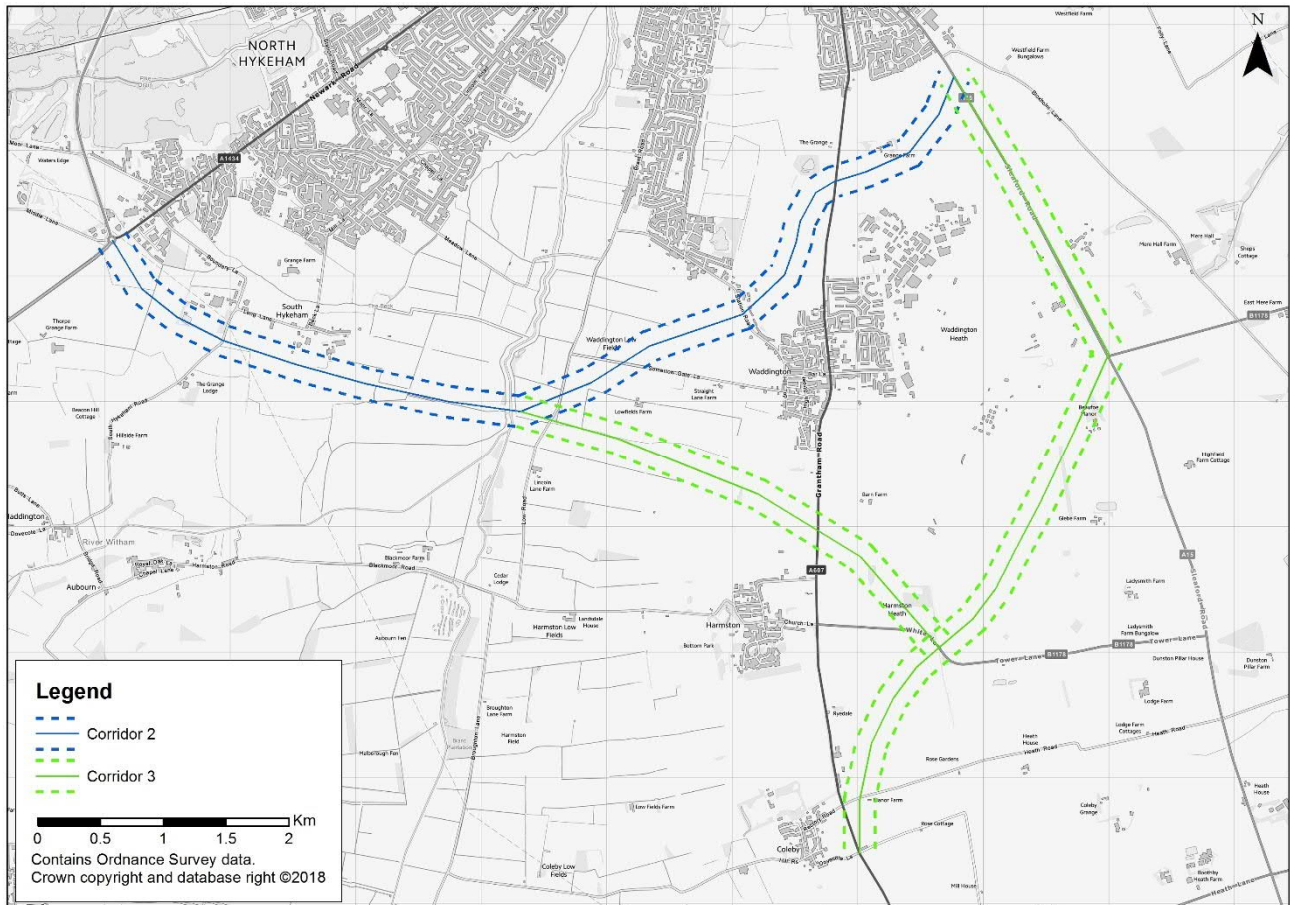


Figure 4 - Route Corridors 2 and 3

Source: North Hykeham Relief Road – Route Corridor Appraisal

The two corridors were assessed against the LITS and NHRR problems and objectives. This identified that Corridor 2 was the preferred option, primarily because it offered a ‘point to point’ strategic route to the south of Lincoln and therefore being a more attractive alternative to which through traffic would transfer. It was considered Corridor 3 would not reduce the traffic flows on the radial routes and at key junctions within the Lincoln area to the same degree as Route Corridor 2 resulting in less significant benefits to journey time reliability.

A Strategic Value for Money appraisal was also undertaken looking at the following factors to determine relative levels of benefits:

- Impact on the Network
- Environment
- Safety
- Economy
- Accessibility
- Integration

The VfM assessment concluded that Route Corridor 2 was recommended for further investigation.

In April 2006 Lincolnshire County Council’s Executive Councillor for Highways requested that a preferred route option be developed based upon the results of Public Consultation One and the

findings of the Route Assessment Study which preceded it. Route 2C was the identified route to be developed further.

As part of the development of Route 2C a junction strategy, engineering constraints and a more detailed assessment of the environmental impacts of the scheme were considered. The junction strategy is a key factor influencing the bypass alignment and took into account:

- Operational requirements;
- Non-motorised users (NMU) (i.e. pedestrians, cyclists and equestrians), community severance and accessibility issues;
- Visual impacts; and
- Other environmental impacts, e.g. noise.

Junctions were considered at a number of locations along the preferred alignment. This included considering at-grade e.g. roundabout or T-junctions, or grade separated junctions e.g. bridges, as well as the capacity requirements for the junctions. The number, type and location of junctions will impact the flows along the entire alignment and as a result a number of scenarios were tested in an iterative process to ensure the best combination of junctions would be provided.

In order to assess the different scenarios a range of factors were considered including the following:

- Topography – the surface profile was considered in developing the preferred option in order to minimise earthworks required for the implementation, whilst maintaining safe visibility distances. Bulk earthwork quantities were calculated in order to assess costs relating to import and export of material to the site as this is a major contributor to overall scheme costs.
- Environmental Impacts – Consideration of the location and amount of cutting and embankment is required as this impacts on the landscape and character of the area including views from residential properties and rights of way, as well as noise and community impacts.
- Non-car modes – consideration of different modes was also required including the need for footbridges to prevent issues of severance between communities.
- Traffic modelling – performance of traffic flows was considered, as the location and type of junctions would impact flows elsewhere on the network.

Considering the above, a preferred junction strategy option was determined to take forward for more detailed environmental assessment and cost estimate preparation and further consideration for an emerging preferred route. This emerging preferred route and junction strategy was taken forward for the next round of public consultation.

The second public consultation was undertaken in October 2006 in order to gauge support for, and invite feedback on, the NHRR and the emerging preferred route. This would then inform a 'preferred route' for the NHRR. This consultation was widely publicised and copies of the information leaflet and questionnaire were sent to 20,000 households in the Lincoln area. It was concluded from the consultation exercise that there is overwhelming support for a North Hykeham Relief Road throughout the Lincoln area. The majority of respondents to the questionnaire supported the line of the Emerging Preferred Route. However, there continued to be some opposition to the route, particularly from respondents living in the Waddington and Waddington Low Fields areas. It was recommended that comments and suggestions received as part of the consultation event be used to inform the decision by Lincolnshire County Council Executive to adopt a Preferred Route for the North Hykeham Relief Road.

On the 5th December 2006 the County Council Executive Committee made the decision to endorse the Preferred Route option for the NHRR.

1.5.1 PREFERRED CORRIDOR

The preferred corridor option was further developed and as illustrated in the figure below the concept design incorporated the following:

- A highway link between the Lincoln Eastern Bypass (LEB) and the A46 Western Relief Road;
- A new bridge over the River Witham; and
- Junctions with the A607 Grantham Road, Brant Road and South Hykeham Road.

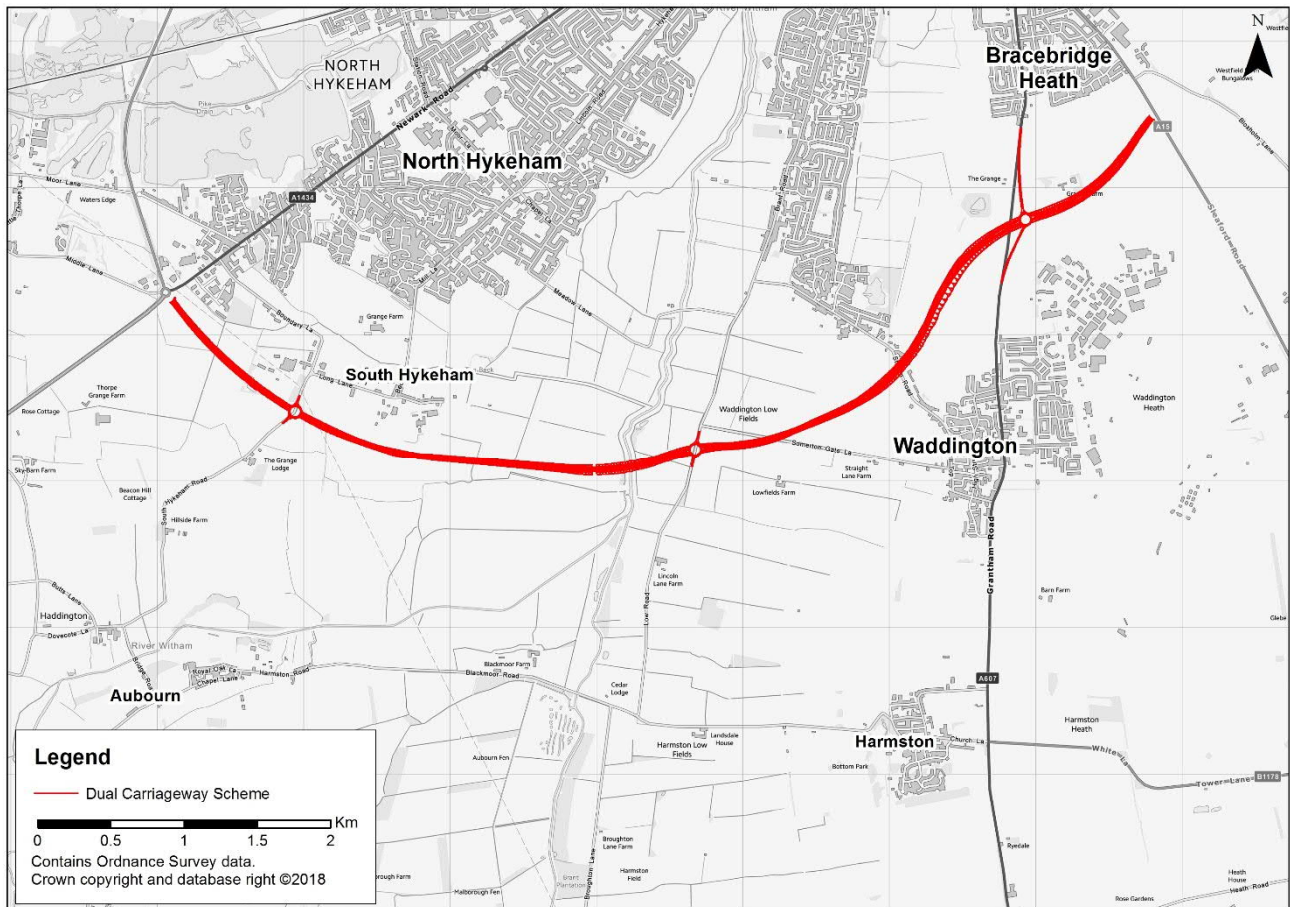


Figure 5 - Alignment of Proposed North Hykeham Relief Road



St John's House
Queen Street
Manchester
M25JB

wsp.com