Proof of Evidence
Highway Engineering

David Chetwynd IEng MICE
On behalf of Lincolnshire County Council

Public Inquiry in respect of the Lincoln Eastern Bypass and the following Orders and Application

3. The Lincolnshire County Council (A15 Lincoln Eastern Bypass) (Classified Road) (Side Roads) Order 2014.

2. The Lincolnshire County Council (A15 Lincoln Eastern Bypass) Compulsory Purchase Order 2014.

3. Application In Relation To Proposed Compulsory Purchase Of Land Held By The Canal & River Trust.

Department for Transport Reference: NATTRAN/EM/LAO/0084

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1 Introduction

1.1 I am David James Chetwynd, a Principal Engineer at Lincolnshire County Council ('the County Council') since June 2013. I hold a Higher National Certificate in Civil Engineering from North Lincolnshire College attained in 1988 and I am an Incorporated Civil Engineer with the Institution of Civil Engineers having attained my professional qualification in 2009.

1.2 Prior to my current position I have held the post of Senior Engineer with the County Council for five years and have a total of 29 years' experience working in local government Highway infrastructure.

1.3 My current duties include those of Lead Design Engineer (Roads) for the Lincoln Eastern Bypass.

1.4 As part of these duties, I have had direct experience with the Lincoln Eastern Bypass scheme since September 2013 in that I have been managing the detailed design of the Highway aspects of the scheme. The scheme has been worked on by staff within the current Technical Services Partnership (TSP) of Lincolnshire County Council since 2010.

1.5 I am aware of the history of the Scheme prior to my direct involvement.

1.6 I am familiar with the Statement of Reasons, Statement of Case and proofs of evidence submitted by the County Council in connection with the promotion of the Lincolnshire County Council (A15 Lincoln Eastern Bypass) Compulsory Purchase Order 2014 (and associated Side Roads Order) ('the Orders') and I produce this evidence to explain and describe the Scheme for which planning permission has been granted.

1.7 I can confirm that the contents of my statement of evidence are my professional opinion and are true and gained from my own direct knowledge except where indicated. My evidence shall only cover highway engineering matters.

2. Scheme Development

2.1 The need for an Eastern Bypass of Lincoln has long been recognised and considered by Lincolnshire County Council since the mid 1990's.

2.2 Initial feasibility work to provide a new road passing to the east of Lincoln connecting the A15 south of Lincoln and the A158 north of Lincoln commenced in 2004 with the route being granted planning permission in April 2005.

2.3 The scheme authorised by that permission was revisited following the City of Lincoln Council being granted growth status which meant that it would be expected to accommodate further growth. A second assessment investigated additional route alignments and ultimately a route further to the east of the City from that given planning permission in 2005 was selected as the best option necessary to accommodate the anticipated growth. That route was selected following public consultation and was developed as a dual carriageway option for which planning permission was granted in 2010.

2.4 In that same year (2010) the option was reassessed following the Governments Comprehensive Spending Review (CSR) and it was indicated that the dual carriageway option would not receive funding in its then current form. The need for the LEB remained and following the indication being given that funding would be available for a reduced option it was developed into a single carriageway scheme. It was redesigned to include aspects that would otherwise hinder any realistic upgrade to a dual carriageway at a later date should funds be forthcoming in the future. The decision not to dual the LEB is not a reflection on the potential of the proposal as an attractive route for users or its economic viability but reflects the fiscal requirements at the time.

2.5 *TA 46 (issued in 1997) of the DMRB: Traffic Flow Ranges for Use in the Assessment of New Rural Roads (Published by the DfT);* provides guidance on the economic viability of the various standards of road and provides recommended flow ranges for new rural routes. The predicted opening year flows on some sections of the LEB are circa 21,000 vehicles per day and exceed the guidance provided given for opening year economic flow ranges; with a capacity of up to 13,000 vehicles per day for a 2 Lane Single carriageway (S2). A Dual 2 lane All Purpose carriageway (D2AP) is advised to provide a capacity of between 11,000 and 39,000 vehicles per

day. The flow ranges provide a starting point that help a scheme promoter inform the decision making process when bidding for scheme funding and deciding which carriageway standards are most likely to be economically and operationally acceptable. The adoption of the S2 Standard still provides an economically beneficial scheme through the junction design strategy as described in the following sections. Mr Smith in his evidence provides details of the economic benefits of the scheme.

2.6 The options open to the schemes promoters in 2010 were therefore to dispense with any scheme at all, which would have been inconsistent with the growth status of Lincoln or to re-examine the proposals. The need for the LEB had not diminished and therefore the latter option was chosen.

2.7 A revised single carriageway scheme was therefore developed that used the approximate footprint of the northbound element of the dual carriageway scheme that had been granted planning permission in 2010. In terms of the capacity of the revised proposal a great deal of effort was put into engineering the scheme to optimise its capacity whilst ensuring that the design did not prevent future expansion. This meant in particular that the capacity of the roundabouts was increased to ensure that delays caused by them would be minimised. On any road delays occur more at junctions as they interrupt the traffic flow rather than on the links between the junctions. Accordingly by allowing sufficient capacity at the roundabouts the traffic would be able to flow along the road more freely. The LEB should not therefore be considered to be over capacity as it has been designed to make the route as efficient as possible. In addition the roundabouts will not need to be enlarged at a later date for a future dual carriageway, thus minimising disruption to road users during construction.

2.8 The most significant gains in terms of capacity have been through the design of the roundabouts. This has helped to build in significant additional capacity to the route that should help to mitigate queuing on the links of the route. *Appendix 1* provides details of the assessed junction capacities.

2.9 At Hawthorn Road it was therefore decided that a Left in Left Out junction be provided on the Eastern side of the bypass and the western side stopped up as part of the value engineering process to remove the need for an underbridge and

associated earthworks. The reduction in traffic flows on the western side of the LEB along Hawthorn Road would also reduce the consequential effects on the existing junctions along Bunkers Hill, Wragby Road and Outer Circle Road.

2.10 On 10 June 2013 full planning permission was granted for the Single Carriageway Scheme by Lincolnshire County Council under reference number L/0110/13 ('The Planning Permission').

2.11 The Planning Permission enables the construction and operation of the Scheme. The CPO and the SRO orders are required to provide the means by which the Scheme can come forward.

2.12 During the promotion of the 2013 Orders it became evident to the County Council that a NMU bridge at Hawthorn Road over the bypass would aid NMU provision by facilitating access to Cherry Willingham and Reepham. A planning application was made to the County Council to facilitate this and was granted consent on the 15th January 2014 under reference W42/130726/13. The County Council sought to modify the 2013 Side Roads Order as a result of this; however there was no change to the Compulsory Purchase Order as the construction of the provision required no additional land.

2.13 Following the grant of Planning Permission LCC published Side Road and Compulsory Purchase Orders in 2013 along with a scheme to cross the River Witham which were considered at a Public Inquiry in February 2014. I gave evidence at that Inquiry. The Inspectors rejection of the SRO and CPO was based on a safety consideration which I would have been able to address at the Inquiry had the matter been raised with me. That matter was not however raised in a way in which I was asked to provide an alternative solution and the Inspectors recommendation and the Secretary of States decision followed.

2.14 Following the 2014 Public Inquiry the River Witham Bridge Scheme was confirmed by the Secretary of State, the CPO and SRO were not however confirmed. The design of the proposed NMU crossing of the Bypass at Hawthorn Road was reviewed in response to the Inspectors Report. This resulted in a revised proposal being submitted as a new application and Planning Permission was granted on the 6th of October 2014 under reference W42/131/879/14.

2.15 In respect of the original 2013 single carriageway planning permission it was concluded that while still sufficient to enable the LEB to be built, it was identified that the following alterations could be made in order to improve the proposals through a Section 73 application:

(i) amend the layout and design of the Hawthorn Road intersection so as to reflect the revised position of the NMU bridge (granted permission under reference W42/131879/14) as well as alterations to the position of a bridge pier where the bypass crosses the River Witham;
(ii) amend the timing for when details relating to the temporary bridge structures have to be submitted for formal approval and;
(iii) amend the noise mitigation measures proposed along the route of the bypass to remove the need for low noise road surfacing and provide acoustic fencing where a need could be established thus resulting in an increase in the extents of the noise mitigation provision to the proposed North East Quadrant Phase I development.

2.16 Planning permission for the amendments sought by the Section 73 application were subsequently granted on 7 October 2014 under planning permission reference L/0643/14.

2.17 The LEB will provide a new 7.5km single carriageway relief road that will link the existing junction of the A15 and A158 at Wragby Road East to the existing A15 at Sleaford Road, Bracebridge Heath to the South of Lincoln and will be designated as the A15. The new route will have a design speed of 100kph (with the understanding that there will be a 60mph speed limit) and a separate 3m wide combined cycle and pedestrian right of way (located on the western side of the carriageway) will be provided along the full length of the scheme, to link up with existing public rights of way. The pedestrian, equestrian and cycle route is referred to as the NMU route. NMU provision is discussed further in section 6 of my evidence.

2.18 The LEB will comprise the following elements (running north to south): starting from the Wragby Road Roundabout.

2.18.1 Wragby Road East Roundabout to Greetwell Road:

i) From the existing Roundabout on the A158 Wragby Road East, the single carriageway layout ties in as a fourth arm at right angles to the existing route. The existing layout of the roundabout remains unchanged.

ii) The route crosses Hawthorn Road in shallow cut (below existing ground level) where a new junction is formed. The western side (residential side) of Hawthorn Road will be stopped up. A left in left out only junction with auxiliary diverge lane on the eastern side of the LEB will be added and a segregation island included to block right turns into and out of the junction.

iii) Hawthorn Road bridge: A NMU bridge will span the bypass to the South of the existing Hawthorn Road to provide direct access to the NMU and maintain the current NMU route along Hawthorn Road.

iv) The existing public footpath located to the north of Hawthorn Road will be stopped up where it crosses the LEB and diverted via the NMU on the Eastern side of the LEB, which connects Wragby Road to Greetwell Road; and along the Hawthorn Road NMU route.

v) The route then passes around the edge of the abandoned Greetwell Quarry and heads towards Greetwell Road.

vi) Greetwell Road NMU Bridge: A bridge on the north side of the Greetwell Road Roundabout over the LEB will provide access to the NMU route and maintain the current NMU provision along Greetwell Road.

2.18.2 Greetwell Road Roundabout to Washingborough Road Roundabout:

vii) The route crosses Greetwell Road at right angles with a new four arm roundabout which will provide a link from the LEB to Greetwell Road.

viii) The route heads south and crosses the Lincoln to Market Rasen Railway Line via a new bridge; the angle of the approach is designed to be as close to a right angle as the site constraints will allow in order to keep the length of the span of the bridge to a minimum. The structure will carry the LEB over the railway line and the Viking Way which is a nationally recognised long distance trail. A link will be provided to the Viking Way from the NMU route.

ix) A northbound overtaking lane is provided between the River Witham Bridge and the Greetwell Road Roundabout to provide overtaking opportunities for northbound traffic.

x) The route crosses the North Delph, the River Witham and the South Delph via a Bridge which is the largest structure on the scheme with the aim of meeting the Washingborough Road Roundabout at the most efficient location in relation to the Lincoln to Spalding Railway Line and the existing railway viaduct over Washingborough Road. Again the angle of the approach is designed to be as close to a right angle as the site constraints will allow in order to keep the length of the span of the bridge to a minimum.

xi) The route passes underneath the Lincoln to Spalding Railway line to the south of the River Witham via an underpass.

xii) South Delph Footbridge: The footbridge will cross the South Delph watercourse away from the northbound carriageway and provide access from the NMU route to the existing Sustrans cycleway/footway that runs the length of the South bank of the River Witham.

2.18.3 Washingborough Road Roundabout to Lincoln Road Roundabout:

xiii) The route joins the B1190 Washingborough Road at a new four arm roundabout that will be constructed in cut to provide sufficient headroom through the Lincoln to Spalding Railway Underpass.

xiv) The route changes direction on leaving Washingborough Road and heads south towards Heighington Road. A climbing lane has been provided on the southbound exit from the roundabout where the gradient is 5%.

xv) Heighington Road Overbridge: The route passes under Heighington Road in a deep cutting and will be completely separate from Heighington Road through the provision of a new bridge that will maintain Heighington Road at its existing level. There will only be NMU access to Heighington Road from the LEB. The provision of vehicular access to Heighington Road has not been included as it is not desirable in terms of vehicles being able to join the LEB safely and the costs of constructing such a provision. The provision of priority junctions within climbing lanes should be avoided as stated in TD9 of the Dft's Design Manual. The alternative of providing a roundabout would be expensive due to the depth of cut which would require significant earthworks including very long tie ins back to existing ground level on Heighington Road and would also require an amendment to the climbing lane gradients.

xvi) The route then heads towards Lincoln Road where it crosses the existing B1188 at right angles.

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

xviii) Lincoln Road Subway: An underpass has been included for non-motorised users to cross the LEB north of Lincoln Road. It was not possible to provide a bridge at this point due to the proximity of the existing High Voltage Overhead Electricity Transmission Lines and Pylons. The underpass solution also suited the existing topography of the site which makes use of a dip in the landscape that requires deep filling in order to satisfy the requirements of the highway alignment design criteria.

2.18.4 Lincoln Road Roundabout to Sleaford Road Roundabout:

xix) The route leaves Lincoln Road Roundabout and heads towards Sleaford Road where it meets the A15 at a shallow angle to avoid the existing settlement off Bloxholm Lane.

xx) Bloxholm Lane NMU Bridge: A new NMU bridge will be provided over the LEB at Bloxholm Lane, adjacent to the original line of Bloxholm Lane.

xxi) Bloxholm Lane will be diverted to tie in to the new roundabout. The original line of Bloxholm Lane is reclassified as a bridleway.

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

3 Highway Engineering

The following is a brief description of the highway design. The information provided centres around horizontal and vertical alignment parameters as defined in TD9 *Highway Link Design (issued 1993), of the Design Manual for Roads and Bridges (DMRB) as published by the Department for Transport (DfT).* The cross section for the scheme is a standard 7.3m wide single carriageway with a verge width of 3.5m that includes 1 metre wide hard strips. There are only two exceptions to this:

a. where climbing lanes are provided and the cross section changes to two uphill lanes, the nearside being 3.2m wide and the offside one being 3.4m wide with a 3.4m wide downhill lane with a verge width of 3.5m wide including 1m wide hard strips.

b. at the Hawthorn Road junction the LEB main carriageway is widened to 9.4 metres to accommodate a central reserve with nearside verges of 3.5 metres width that includes 1 metre hard strips.

3.1 Wragby Road to Greetwell Road

3.1.1 This section of the route is designed to a 100kph (60mph) design speed with a single horizontal curve between two straights. The curvature used is required for the intended design speed and would remain acceptable for any future dual carriageway provision.

3.1.2 The *v*ertical Alignment is also designed to the 100kph standard around the left in/left out junction with Hawthorn Road whilst the remainder of the alignment to Greetwell Road retains the 120kph (70mph) design speed parameters from the original dual carriageway scheme.

3.1.3 The side road approach to the Left In Left Out junction at Hawthorn Road has been designed to an 85kph (50mph) standard following a design speed assessment being carried out in accordance with TD9 of the DMRB. The approach will be signed with a 50mph speed limit from the junction with the LEB and will continue up to Cherry Willingham for a distance of 1.2km where it will meet the current 40mph speed limit.

3.2 Greetwell Road to Washingborough Road

3.2.1 This section is designed to a 100kph (60mph) design speed and comprises two curves of opposite hand connected together to form a reverse curve; leading into a straight on the approach into the Washingborough Road Roundabout. As above; the

curvature used is required for the intended design speed and would remain acceptable for any future dual carriageway provision.

3.2.2 The vertical Alignment is also to a 100kph design speed with the selected elements being acceptable for use at the higher design speed. This will accommodate a compliant future dual carriageway scheme that would utilise the structures provided in the current proposals.

3.3 Washingborough Road to Lincoln Road

3.3.1 This section consists of a straight starting at Washingborough Road; followed by two curves of opposite hand connected together to form a reverse curve and ends in a straight leading up to Lincoln Road. The alignment matches the 120kph (70mph) design speed of the original dual carriageway proposal. Under single carriageway conditions with a design speed of 100kph (60mph) the curve radii that have been used in combination with the climbing lane provide sufficient overtaking opportunities for this section. The horizontal geometry is therefore satisfactory for a single carriageway arrangement.

3.3.2 The vertical alignment has been designed to a 100kph (60mph) standard and has been designed keep the requirement for cut to a minimum and will not prevent construction of the future dual carriageway proposal. The 5% grade is suited to the requirements of both the current scheme and that of any future dualling scheme.

3.4 Lincoln Road to Sleaford Road

3.4.1 This section of the route consists of a large radius curve between two straights which will provide a design to a standard of 120kph (70mph) and has been chosen as it provides opportunities for overtaking in the southbound direction. In the event of future dualling this alignment will be entirely suitable.

3.4.2 The vertical alignment reflects the flat terrain over this section with a shallow grade covering most of its length and a vertical curve forming a crest that exceeds that required for a 120kph design speed.

3.5 Forward Visibility and Overtaking

A visibility assessment has been carried out for the scheme. The minimum requirement for the scheme is a Desirable Minimum Stopping Site Distance (SSD) for the Design Speed of 100kph in accordance with TD9. The assessment also established lengths of overtaking using a Full Overtaking Site Distance (FOSD) for the chosen Design Speed. These are detailed in *Appendix 2*. The overtaking

provision exceeds the minimum 15% requirement for a Category 1 Type Road, is contributory to the economic analysis of the scheme for which planning permission has been achieved and will not prevent future change.

3.6 Scheme Design and Strategy

3.6.1 The development of the LEB scheme and the provision of a single carriageway road are dealt with in section 2.

3.6.2 The Junction Strategy for the LEB has general consistency in terms of form of junction throughout the length of the bypass. In most cases the most appropriate form of junction for this semi-rural bypass that provides access to adjoining routes and development sites is a roundabout constructed at-grade (constructed at the same level as the route it intersects). The roundabouts have been designed to provide capacity to accommodate the predicted traffic flows produced from traffic modelling which has produced a scheme that would require minor modifications at the junctions to accommodate future dualling. Appendix 1 provides details of capacity assessments carried out on the junctions. The land take that is required to construct the scheme is therefore justified as the junctions as designed are acceptable to both the current proposal and that of a future dual carriageway scheme. Mr Smith provides further evidence regarding the proposed junction strategy in his evidence.

3.6.3 For Hawthorn Road a different strategy was adopted to provide access to the LEB and Lincoln from the East for motor vehicles without increasing traffic flows to the West particularly on the existing network around the St Augustine Road, Carlton Boulevard and Outer Circle Road area. The construction of a large roundabout would have disadvantaged the scheme overall due to the increased risk of accidents associated with siting a major junction in close proximity to another (the A15/A158 Roundabout at Wragby Road) as well as increasing delays on the LEB due to queueing between junctions. Such a junction would require significant additional cut and therefore the compulsory purchase of land outside of the current CPO Boundary including property on Hawthorn Chase as well as the acquisition of Public Open Space. The junction would therefore need a new planning permission.

3.6.4 At the previous Inquiry alternative junction strategies were suggested that sought to maintain the existing vehicular route of Hawthorn Road by mitigating the

increased costs of making such a provision. The cost differential as stated by the County Council was at the time £700k between a full road over bridge and an NMU bridge including Left In Left Out junction with the LEB. It was however, not possible due to the time constraints of the previous Inquiry to model the forecast changes in traffic flows and therefore assess the full extent of any consequential works created by the inclusion of a road bridge at Hawthorn Road although it was anticipated some would have been required on Wragby Road at the junctions of Hawthorn Road and Outer Circle Road.

3.6.5 Following the Secretary of State's decision not to confirm the Orders after the previous Inquiry, the County Council took the opportunity to refine its current modelling. This was done in order to better understand travel patterns in the locality, refine model responses to take account of detail and provide a platform upon which the revised future growth and local development assumptions could be tested with the latest configuration of LEB. The results of this modelling work are presented in Mr Smith's evidence and indicate that the Junction of Hawthorn Road with Bunkers Hill is significantly over capacity due to traffic growth with the non-stopping up Hawthorn Road. The only option available to address the imbalanced flows at this junction would be to provide traffic signals at a considerable additional cost to the County Council.

3.6.6 The junction of Wragby Road with Outer Circle Road is currently running near to capacity and would be relieved with the construction of the LEB. However, the inclusion of an overbridge at Hawthorn Road would increase traffic levels sufficiently to require improvements that would provide additional capacity as necessary on the Wragby Road East / Bunkers Hill approach.

3.7 Road Safety Audits

3.7.1 The use of Road Safety Audits was adopted by Lincolnshire County Council in the 1990's. The policy adopted was based on the 'Guidelines for the Safety Audit of Highways' published by the Institution of Highways and Transportation (IHT) in 1996 and was also influenced by the Highways Agency guidance HD19/03 published in 2003. The IHT published an update in 2008 which gives Local Authorities guidance on a more flexible approach to meet the resources available and scale of highway schemes that most Local Authorities have to consider.

3.7.2 Road Safety Audits are a formal, systemic, independent assessment of the potential safety problems associated with any new road or improvement scheme and are carried out by the Lincolnshire Road Safety Partnership (LRSP) for the County Council. LRSP is a multi agency unit consisting of the following partners that is independent of the scheme:

- Lincolnshire County Council
- Lincolnshire Police
- Lincolnshire Fire and Rescue
- NHS Partnership
- Highways England
- Probation Service and
- East Midlands Ambulance Service.

3.7.3 The Audit process will consider the safety of all types of road users under all types of conditions and identify who could be hurt in a collision, how it might happen and what could be done to reduce the potential for that collision or to limit the consequences. Road Safety Audits are not exclusively a technical check on highway design standards or whether the scheme has been constructed in accordance with the design. However, in order to clearly explain a safety problem or recommendation to resolve a problem the Audit Team may, on occasion make reference to a design standard without touching on technical audit. The process is not an opportunity to query why other measures are not being proposed or to comment on proposals where there are no adverse safety implications.

3.7.4 The Audit process is comprised of three stages defined as follows:

i. Stage I - Preliminary Design, considers the safety implications of the alignment and junction choice including horizontal alignments, vertical alignments and road widths

ii. Stage II - Detailed Design, carried out on completion of the detailed design that reviews any aspects considered in the Stage I Audit moving on to consider the interaction of highway features such as signing, road markings, surface characteristics, lighting and landscaping; consideration is also given to all road users including those with disabilities

iii. Stage III - Scheme Completion, carried out either prior to or upon opening of new road schemes; it is a final opportunity to identify and rectify potential hazards before the scheme is used by traffic.

3.7.5 The LEB is engaged in the Road Safety Audit process in accordance with LCC Policy as follows:

- Stage I Audit for the whole scheme completed in 27 November 2012
- Stage II Audit for the whole scheme completed in 31 January 2014
- Stage II for the revised Hawthorn Road junction completed in 3 July 2014
- Stage I for revised NMU uncontrolled crossing points of Hawthorn Road completed in 11 July 2014 (Northern Route)
- Stage I for the revised NMU uncontrolled crossing point of Hawthorn Road completed in 23 July 2014 (Northern Route)
- Stage I for the revised location of the NMU Bridge over the LEB and the revised junction completed in 18 September 2014
- Stage II for the revised location of the NMU Bridge over the LEB and the revised junction layout completed in 9 July 2015.

All of the above described Audits and the appropriate designer response are supplied as core deposit document CD86 to the Inquiry.

4 Specific Engineering Judgements of Note

4.1 Although the Scheme has been designed as required to accommodate traffic safely there are various aspects where provision has been built in to ensure that the current design will not make any future additions either unlikely or impossible to provide. I have set out above the position in respect of the new roundabouts and the links between them but in addition there are a number of structures where the same approach has been adopted.

4.2 The following structures have been designed to varying extents to accommodate the future dual carriageway scheme in addition to delivering the LEB:

- Spalding Railway Line underpass
- Heighington Road bridge
- Greetwell Road NMU bridge
- Lincoln Road NMU underpass
- Bloxholm Lane NMU bridge
- Hawthorn Road NMU Bridge
- Lincoln to Market Rasen Railway Bridge.

4.3 Forward visibility splays along the north bound carriageway have been designed to a 120kph (70mph) standard to ensure that Landscaping is placed in its final location to protect the route from future development up to the route. This affects the west side of the route for which there is development potential. The future costs of purchasing land, compensation and accommodation works associated with not pursuing this strategy would be potentially prohibitive in terms of providing a future dual carriageway scheme.

4.4 The cut section from Washingborough Road to Lincoln Road has been designed to accommodate a future dual carriageway scheme; the cutting slope to the east is shallower than required and would therefore only need to be re-cut to match the west side in order to provide the required additional width. This operation would not affect any landscape planting provided by the original scheme. The costs associated with making this provision as part of the current scheme are likely to be considerably less than what they would be as part of a future dual scheme.

4.5 Environmental bunds to the east side of the scheme between Lincoln Road and Sleaford Road have been designed in a similar way to minimise the impact of future widening in terms of both cost and impact on established ecology as there will be no affected landscape planting. It is therefore important that this feature is included within the scheme as the likely impact of not doing so would be considerable especially in terms of ecological issues, extended programme due to consultation and cost.

4.6 The scheme has been designed predominantly with straight crossfalls, with the use of crowns largely eliminated. This allows for the much simpler construction of a future dual carriageway scheme and in turn reduces the requirements for the drainage network of the single carriageway scheme which also does away with built in redundancy. This solution provides better value for money in terms of both the scheme and any future dualling scheme and should therefore be considered as being beneficial to the scheme.

4.7 The attenuated storage for the drainage system has also been designed to accommodate the requirements of a future dual carriageway scheme. In addition to the ponds providing additional ecological gain to the scheme this would also mitigate any future disturbance of the ponds to enlarge them that could impact protected species that may be present in the future. The provision of such an expanded feature again not only delivers the scheme but also contributes to the efficient delivery of a future dual scheme.

4.8 At Hawthorn Road; the siting of the surface water pumping station, associated drainage attenuation pond and the diverted foul rising main from Hawthorn Chase have been located such that they would not have to be moved as part of a future dualling scheme. The NMU route that runs along the East side of the LEB from Wragby Road up to the existing Greetwell Fields is also set further East on the boundary of the proposed dual carriageway scheme. All of this infrastructure is considerable in scope and therefore cost; as it is the desire of the Authority to dual the bypass at some time in the future it makes no economic sense at all not to locate them in their current location. Their present location does not in any way compromise the scheme or the potential of a future dualling scheme.

5 Justification Of Land Acquisition

5.1 *Alignment of Route –Engineering Purposes for construction*

The land required to build the scheme falls into two categories:

5.1.1 Land that is required to construct the permanent works including that which is required to mitigate adverse effects and to accommodate access to adjacent lands. The route has been developed to make the most efficient use of existing features i.e. tie-ins to existing routes so that junctions can be designed to operate efficiently and be constructed in a cost efficient manner.

5.1.2 Land that is required to accommodate temporary areas of work: including storage and compounds; rights off access over major watercourses and areas to be used for the permanent storage of surplus topsoil (known as regrading) arising from the construction of the works. This is an engineering requirement as well as a significant cost saving. There are significant cost savings to be made from the regrading instead of disposal off site. It is intended to enter into a licence to temporarily enter the land in lieu of acquisition; should this not be possible all areas of land without a licence are to be compulsorily purchased. All areas of land required for temporary works and regrading are to be offered back to the owner from whom land was acquired on completion of the works. Land required for temporary areas of work would only be required for the duration of the works to which they relate e.g. fabrication areas adjacent to bridges would only be required for the duration of the construction of the structure.

5.2 In November 2011 the Best and Final Bid funding application for the single carriageway scheme was successful and achieved Programme Entry status from central government, following which a review of the design was undertaken to ensure that it remained robust. Given that dualling of LEB remains a long term aspiration of LCC, the design was revised to incorporate potential future proofing measures to minimise where possible the costs and impacts of future dualling, to a large extent, whilst remaining within the land acquisition requirements that are justified by the single carriageway scheme. The main exceptions to this are:

a. the need to acquire land to permit future widening in the cut running up to Heighington Road which would otherwise be very difficult and costly to achieve in the future. The design of the cutting from Washingborough Road South towards Heighington Road has been designed to ensure that the future dualling of the road is

not prevented or rendered impossible or uneconomic at the time the scheme is provided.

b. the need to construct the NMU route on the Eastern side of the LEB between Wragby Road and Greetwell Road around the future proofed location of the surface water pumping station including the NMU Bridges at Hawthorn Road and Greetwell Road.

5.3 The western arm of Greetwell Road Roundabout will have provision for the future dualling of Greetwell Road to accommodate potential development in the area. Some of the area would be needed to provide visibility to the right on the immediate approach to the roundabout; the remainder will be landscaped to provide additional screening for the cycleway\footway.

5.4 It is proposed to build the Greetwell Road NMU bridge with a longer span than required for the designed carriageway width to allow any future widening of the LEB to be accommodated without having to rebuild the bridge. Reducing the span would not significantly reduce land take.

5.5 The Lincoln to Market Rasen Railway bridge design contains a wider northbound verge that will allow for the longer sightline for future dualling of the LEB. The additional width required is relatively small (less than 5m). Building the additional width as part of this scheme would minimise disruption on the Lincoln to Market Rasen Railway in future.

5.6 The Heighington Road bridge has been designed to accommodate a widened LEB carriageway. Not building the larger structure as part of this scheme would also cause additional disruption to road users in the future as Heighington Road would need to be closed for the duration of the works.

5.7 The Lincoln to Spalding Railway bridge design contains a wide single span structure to allow for and simplify any future widening of the carriageway. The only land affected by this structure belongs to Network Rail. Building the wide single span structure would also preclude any future blockades on the Lincoln to Spalding Railway.

5.8 It is proposed to build the Bloxholm Lane NMU bridge with a longer span than required for the designed carriageway width to allow for any future widening of the LEB. Reducing the span would not significantly reduce landtake.

The longer spans have been justified on the basis of economics as the cost of providing the longer spans at the outset would more than offset the costs associated with demolition and replacement as part of a future dualling scheme. Given the overall design of the scheme and taking account of the level differences which dictate the design of the approaches, the land take for both scenarios is essentially the same.

There is also an opportunity to deliver the early establishment of permanent landscaping around the bridge that would not require removal or alteration as part of a future Dualling scheme.

5.9 It is proposed to build the Lincoln Road Subway wider than required for the designed carriageway to accommodate any future widening of the carriageway. Building the lengthened subway as one structure as opposed to two will provide more structural stability in the longer term, given the depth of the subway.

5.10 The drainage (including catchment ponds) has already been discussed in 4.7 above but does include a modest impact on land take for which justification is detailed.

5.11 The large cutting south of the Washingborough Road Roundabout has also been discussed previously in 4.4 above. Again the modest impact on land take would be offset by the mitigation of significant disruption to road users while the existing cutting is widened. In addition the cutting slopes are likely to attract ecological gain which would be destroyed if the slope was to be changed.

5.12 The PMA\bridleway between Wragby Road and Greetwell Fields at the northern end has been located at the eastern edge of the future dual carriageway to avoid having to remove and rebuild at a later stage. South of Hawthorn road the PMA/bridleway has been located to follow the profile of the existing ground, to allow it to tie in to the existing provision. In addition the area also includes a pumping station and a balancing pond which would be expensive to move.

5.13 Details of the land required are contained in *Appendix 3.*

5.14 Plot 2/3A; which is land that was identified for the purposes of the permanent storage of topsoil, is no longer required. Discussions with the Earthworks and Landscape Designers resulted in the following change to the proposed scheme; an increase in topsoil thickness from 150mm to 400mm in landscaping areas over an area of 153,000 sq metres has resulted in a decrease in surplus of topsoil of circa 38,000 cu metres. This reduction in volume means that the acquisition of Plot 2/3A can no longer be justified and the increase in topsoil in landscaping areas is also beneficial to the scheme.

6 NMU Provision on the LEB

6.1 At the previous Inquiry a number of queries raised by individuals regarding the use of various NMU routes. The following clarification was therefore provided to that Inquiry:

'Non-Motorised Users and Bridleways: TA 91\05 'Provision For Non-Motorised Users' states at paragraph 1.2 'NMUs are considered to be pedestrians, cyclists and equestrians'. Annex 1 paragraph A1.3 to TA 91/05 states 'Bridleways – provide a right of way on horseback, foot and bicycle. The Countryside Act 1968 gave cyclists the right to use bridleways but they must give way to other users.' In light of the above two definitions, the scheme as provided with planning permission provides for equestrian use on the NMU route and the diversion of Greetwell Fields track can be used by cyclists. The bridleway was clearly shown in the planning application documents as connecting from Hawthorn Road to the remaining length of Greetwell Fields on the eastern side of the bypass which has now been reclassified as bridleway in the Side Roads Orders. A connection to Greetwell Fields on the Western side which will remain as public highway will be provided'.

6.2 The LEB scheme includes the provision of a new footway/cycleway along the length of the Proposed Scheme on the western side with at grade crossing facilities provided at each junction with existing routes except at the A15 Sleaford Road Junction. It also provides a new provision on the eastern side of the scheme from Wragby Road to Greetwell Road. These provisions create new links to the existing Public Rights of Way network, particularly the Sustrans route and the Viking Way, which would increase the accessibility of these routes.

6.3 New crossing facilities have been included in the Scheme for which Planning Permission has been achieved, to maintain the continuity of existing Non-Motorised User (NMU) routes. The tables below summarise all routes affected and the mitigation measures adopted. A plan showing the locations of the described routes in respect to the LEB is included in Appendix 7.

Principal Rights of Way, and NMU Routes affected by the LEB	Operational Impacts on NMU's	Mitigation / Provision
Cycle path along the south side of the A158 Wragby Road	Construction of the fourth arm of the roundabout will sever the existing route.	At grade crossing facilities are provided across the fourth arm of the roundabout. Alternatively NMU's can divert along the NMU provision on the east side of the LEB and back to Bunkers Hill via the Hawthorn Road NMU Bridge and the NMU route.
Footpath - Gtwl/140/1	Permanent severance of existing route.	Diversion of route along LEB east and west NMU routes and Hawthorn Road NMU Bridge.
Footway/Cycleway on Hawthorn Road	Hawthorn Road severed by the LEB and stopped up to the west.	Provision of grade separated NMU bridge to the South of Hawthorn Road.
Restricted Byway – CHER/133/1	No overall impact	Connectivity provided to the LEB NMU provision and Greetwell Road East.
Footpath - Viking Way	No overall impact as it passes under the Network Rail underbridge.	Provision enhanced by connectivity being provided to the LEB NMU provision.
Footpath – Gtwl/102/1	No overall impact as it passes under the River Witham Bridge.	-
Sustrans Route / National Cycle Route No.1	No overall impact as it passes under the River Witham Bridge.	Provision enhanced by connectivity being provided to the LEB NMU provision and ramped access to a new crossing of the South Delph.
Cycle path Lincoln Road Branston	Construction of roundabout will sever the existing route.	Construction of grade separated facility (underpass) including equestrian facilities as well as connectivity to the LEB NMU provision.

Other Routes affected by the LEB	Operational Impacts on NMU's	Mitigation / Provision
Greetwell Fields	Permanent severance of existing route.	1. North West - connection is provided to the Western NMU. 2. South East - Route reclassified as a bridleway and diverted from the South along the Eastern side of the LEB on the new NMU Route.
B1308 Greetwell Road	Construction of the roundabout will divert the existing Highway route.	Provision of grade separated NMU bridge to the North of Greetwell Road with connectivity provided to the main NMU route on the LEB.
B1190 Washingborough Road.	Construction of the roundabout will divert the existing Highway route.	Provision of at grade facilities to the North of Washingborough Road with connectivity provided to the main NMU route on the LEB and the Sustrans Route No 1. (see note below)
C113 Heighington Road Canwick	No overall impact.	Provision of grade separated road bridge over the LEB with connectivity provided to the NMU route on the LEB.
C2 Bloxholm Lane.	Permanent diversion of the existing Highway route to the new roundabout on the A15.	Provision of grade separated bridge over the LEB maintaining the existing route for NMU's only with connectivity provided to the NMU route on the LEB.
A15 Sleaford Road Waddington.	Construction of the roundabout will divert the existing Highway route.	At grade access from the highway provided to the NMU route on the LEB with traffic islands designed to accommodate future NMU routing.

* ***Pedestrians and Cyclists travelling from Washingborough to Lincoln currently have the option to use the Sustrans Route No 1 which can be picked it up from Station Lane in Washingborough.***

6.4 Hawthorn Road NMU Bridge maintains the existing provision connecting the Bunkers Hill area with Cherry Willingham and the village Schools which was completed in 2010 as part of the County Councils Safer Routes to School, Rural Priorities Initiative.

6.5 The design of the Proposed Scheme incorporates continuity of the existing routes where possible and provides suitable diversions of other routes as described above. The design will also lend itself readily to any future expansion of the NMU network. This would encourage people to at least maintain the existing level of walking and cycling in the region with the longer term aim of promoting these activities.

6.6 The Scheme for which Planning Permission has been achieved has been designed to be fully compliant with both National and Local standards. The Planning Statement also concluded that the scheme would have a positive impact for Non-Motorised Users within the route corridor.

7 Engineering Assessment Of Reasonably Convenient Alternative Routes

7.1 This section has been produced in response to the requirements of the Side Roads Order as published.

7.2 A geometric assessment of the existing routes, alternative routes and comparative routes has been carried out to provide an empirical set of data that seek to compare their measurable characteristics. There is no known set methodology available that provides such a comparison and so the most appropriate is to use the design speed assessment process as defined in Chapter 1 of TD9 of the DMRB. While it is not intended to assess convenience on the basis of design speed, the attributes that are measured to arrive at the design speed can be.

The attributes are defined as follows:

- Harmonic Mean Visibility (VISI), an assessment of forward visibility in terms of stopping sight distance and overtaking sight distance
- Bendiness (B) in degrees per Km
- Alignment Constraint (Ac), the degree of constraint imparted by the road alignment (a function of Bendiness and Harmonic Mean Visibility)
- Layout Constraints (Lc), the degree of constraint imparted by the number of junctions and accesses.

7.3 The routes have been chosen on the basis of common origins; from village centres, to access points at either end of Outer Circle Road. This assumes that drivers will wish to take the most direct route to their destination which could be one or more of many establishments along the length of Outer Circle Road. With the comparative routes from the South of the City; a common destination of the Lincoln City Bus Station has been adopted.

7.4 The results of the geometric assessments of the routes are contained in Appendix 8 of this evidence. The table below shows the variance or range between each of the values for the alternative routes in comparison to the variance between comparative routes to the South East of the City.

	VISI	B	Ac	Lc
Range for Alternative Routes	105 to 261	55 to 176	10 to 17	23 to 29
Range for Comparative Routes	150 to 241	59 to 128	11 to 15	23 to 26

7.4 The summary conclusion from this exercise is that the routes are all of a comparable quality with little variance in VISI, B, Ac and Lc between the stopped up route and the alternatives as well as the comparative routes to the South. The routes are therefore assessed as being representative of typical roads in Lincolnshire.

8 Summary

8.1 In conclusion, it is clear that the Scheme which benefits from planning consent to enable its construction and operation is deliverable in engineering terms and that in so doing it meets key planning and corporate policy objectives as defined in my colleagues' statements.

8.2 The Bypass has evolved through development from being a dual to a single carriageway road that fully meets the expectations of the Authority within current funding constraints. Considerable effort has been put into engineering the scheme to optimise its capacity whilst ensuring that the design does not prevent future expansion. On any new road delays occur more at junctions as they interrupt traffic flow rather than on the links between junctions. Accordingly by allowing sufficient capacity at the roundabout junctions traffic will be allowed to flow along the road more freely. The LEB should not therefore be considered to be over capacity as it has been designed to make the route as efficient as possible.

8.3 Planning permission for the scheme was granted in June of 2013 which enables the construction and operation of the scheme. This was reaffirmed by the Section 73 application and NMU Revision granted consent in October 2014.

8.4 The LEB will provide a new 7.5 kilometre single carriageway relief road that will link the existing A15 / A158 at Wragby Road East to the north of Lincoln; to the existing A15 at Sleaford Road, Bracebridge Heath to the South of Lincoln and will be designated the A15. The route is designed to the current standards as described in the Design Manual for Roads and Bridges (DMRB) as published by the Department for Transport (DfT). The new route will have a design speed of 100kph with a speed limit of 60mph and will have a separate 3m wide Non Motorised User route (NMU) provided along the full length of the western side of the scheme. The route will generally have a standard cross section that is compatible with the category of road. The route also satisfies statutory requirements for forward visibility in terms of Stopping Sight Distance (SSD) as well as providing overtaking opportunities. The overtaking provision is contributory to the economic analysis of the scheme for which planning permission has been achieved and will not prevent future change.

8.5 The junction Strategy for the LEB has general consistency in terms of form of junction throughout the length of the route. In most cases roundabouts are seen as

the most appropriate form of junction for this semi-rural bypass that provides access to existing routes and development sites. The roundabouts have been designed to provide capacity to accommodate the predicted traffic flows produced from traffic modelling which has produced a scheme that would require minor modifications at the junctions to accommodate future dualling. However for Hawthorn Road a different approach has been adopted to maintain access for the villages east of the Bypass via acceptable alternative routes while improving the amenity for all road users including Non Motorised Users and pedestrians in the Carlton Boulevard Area leading to an improvement in the residential character of the Area.

8.6 NMU provision within the scheme has been designed to be as inclusive as possible with emphasis being made on the improvement of existing provision wherever possible. A fully compliant route has been provided along the whole length of the route that crosses existing routes and rights of way at grade and provides grade separation for existing routes crossing the LEB. The strategy helps to achieve the aims and objectives of the Lincoln Integrated Transport Strategy.

8.7 The route has been developed to make the most efficient use of existing features i.e. tie-ins to the existing routes so that junctions can be designed to operate efficiently and be constructed in a cost efficient manner. Land that is required to construct the permanent works is therefore defined by the route as described and also includes land which is required to mitigate adverse effects and to accommodate access to adjacent lands. Land is also required for temporary working areas including storage and compounds and would only be required for the duration of the works to which they relate e.g. fabrication areas adjacent to bridges would only be required for the duration of the construction of the structure. Land is also required to accommodate rights of access over major watercourses for construction purposes and for areas to be used for the permanent storage of surplus topsoil (known as regrading) arising from the construction of the works. This is an engineering requirement as well as a significant cost saving that brings value to the scheme. There are significant cost savings to be made from the regrading instead of disposal of excess materials off site. It is intended to enter into a licence to temporarily enter the land in lieu of acquisition; should this not be possible all areas of land are to be compulsorily purchased. All areas of land required for temporary works and regrading are to be offered back to the owner from whom land was acquired on completion of the works.

8.8 With regard to future proofing of the bypass, the Best and Final Bid scheme that was successful in November 2011 achieved DfT Programme Entry status. Given that dualling of the LEB remains a long term aspiration of LCC, the design was revised to incorporate potential future proofing measures to minimise where possible the costs and impacts of future dualling, to a large extent, whilst generally remaining within the land acquisition requirements that are justified by the single carriageway scheme. The main exceptions to this is the need to acquire land to permit future widening in the cut running up to Heighington Road which would otherwise be very difficult and costly to achieve in the future; and the land to the east of the route between Hawthorn Road and Greetwell Road around the surface water drainage features.

APPENDIX 1- JUNCTION CAPACITIES

ARCADY Testing Results for Junctions on LEB – 2033 (Flat & Peaked Profile)

Terminology: RFC = Ratio of Flow to Capacity, Max Q = Queue lengths (in Vehicles).

Junction 1 – Existing Wragby Road Roundabout

Profile Type:	**Peaked Profile**			
Scenario:	**2033 - LEB as single carriageway**			
Time Period:	**AM**		**PM**	
Arm:	**RFC**	**Max Q**	**RFC**	**Max Q**
A - LEB N	0.734	3	0.791	4
B - Wragby Rd E	0.760	3	0.547	1
C - LEB S	0.430	1	0.767	3
D - Wraby Rd W	0.428	1	0.651	2

Junction 2 - Greetwell Road Roundabout

Profile Type:	**Peaked Profile**			
Scenario:	**2033 - LEB as single carriageway**			
Time Period:	**AM**		**PM**	
Arm:	**RFC**	**Max Q**	**RFC**	**Max Q**
A - LEB N	0.920	10	0.697	2
B - Greetwell Rd E	0.917	7	0.445	1
C - LEB S	0.792	4	0.875	7
D - Greetwell Rd W	0.281	0	0.321	1

Junction 3 - Washingborough Road Roundabout

Profile Type:	**Peaked Profile**			
Scenario:	**2033 - LEB as single carriageway**			
Time Period:	**AM**		**PM**	
Arm:	**RFC**	**Max Q**	**RFC**	**Max Q**
A - LEB N	0.793	4	0.807	4
B - Washingb Rd E	0.718	2	0.487	1
C - LEB S	0.587	1	0.768	3
D – Washb Rd W	0.323	1	0.578	1

Junction 4 - Lincoln Road Roundabout

Profile Type:	**Peaked Profile**			
Scenario:	**2033 - LEB as single carriageway**			
Time Period:	**AM**		**PM**	
Arm:	**RFC**	**Max Q**	**RFC**	**Max Q**
A - LEB N	0.727	3	0.820	4
B - Lincoln Rd E	0.582	1	0.409	1
C - LEB S	0.598	1	0.843	5
D - Lincoln Rd W	0.476	1	0.752	3

Profile Type:	**Peaked Profile**			
Scenario:	**2033 - LEB as single carriageway**			
Time Period:	**AM**		**PM**	
Arm:	**RFC**	**Max Q**	**RFC**	**Max Q**
A - Sleaford Road N	0.376	1	0.504	1
B - LEB	0.653	2	0.701	2
C - Bloxholm Lane	0.261	0	0.067	0
D - Sleaford Road S	0.498	1	0.76	3
E - LSB				

Notes:

RFC's are the ratio of predicted flows over the designed capacity of an approach to a junction. An RFC of 0.5 would indicate that an approach is being utilised at 50% of its capacity.

DfT Guidance provides a suggested upper limit of 0.85 (85%) for design year flows.

The design year (2033) is used as a test to understand the robustness of a scheme and is usually assessed at 15 years post the scheme opening in accordance with DfT Guidance.

APPENDIX 2 - **PROVISION OF OVERTAKING**

Southbound Carriageway		
Highway Section		**Total Length of FOSD (m)**
1	Wragby Road Roundabout to Greetwell Road Roundabout	160
2	Greetwell Road Roundabout to Washingborough Road Roundabout	0
3	Washingborough Road Roundabout to Lincoln Road Roundabout	1400
4	Lincoln Road Roundabout to Sleaford Road Roundabout	1900
	Total Overtaking Length	3460
	Length of Scheme	7485
	Overtaking Value %	46%
	Minimum Overtaking Value % (Table 7, para 7.20, TD9)	**15%**

Northbound Carriageway		
Highway Section		**Total Length of FOSD (m)**
4	Sleaford Road Roundabout to Lincoln Road Roundabout	900
3	Lincoln Road Roundabout to Washingborough Road Roundabout	0
2	Washingborough Road Roundabout to Greetwell Road Roundabout	400
1	Greetwell Road Roundabout to Wragby Road Roundabout	400
	Total Overtaking Length	1700
	Length of Scheme	7485
	Overtaking Value %	23%
	Minimum Overtaking Value % (Table 7, para 7.20, TD9)	**15%**

APPENDIX 3 - LAND AQUISITION

A3.1 Land required to construct the scheme:

The following plots are required to construct the scheme:-

Plot Number	Landowner	Purpose for which freehold title is required
1/1	The Church Commissioners for England	Title required for the construction of the new highway
1/1B	The Church Commissioners for England	Title required for the construction of the proposed highway
1/2	Taylor Lindsay Limited	Title required for the construction of the new highway
1/2A	Taylor Lindsay Limited	Title required for the construction of the new highway
1/3	Greetwell Developments Limited	Title required for the construction of the new highway
1/3A	Greetwell Developments Limited	Title required for the construction of the new highway
1/4	The Church Commissioners for England	Title required for the construction of the new highway
1/4A	The Church Commissioners for England	Title required for the construction of the new highway
1/5	The Church Commissioners for England	Title required for the construction of the new highway
1/8	The Church Commissioners for England	Title required for the construction of the new highway
1/9	The Church Commissioners for England	Title required for the construction of the new highway
1/10	The Church Commissioners for England	Title required for the construction of the new highway
2/1 (part thereof)	The Church Commissioners for England	Title required for the construction of the new highway
2/2	The Church Commissioners for England	Title required for the construction of the new highway
2/2B	The Church Commissioners for England	Title required for the construction of the new highway
2/3	The Church Commissioners for England	Title required for the construction of the new highway
2/3C	The Church Commissioners for England	Title required for the construction of the new highway
2/6	The Church Commissioners for England	Title required for the construction of the new highway
2/6E	The Church Commissioners for England	Title required for the construction of the new highway
2/7	The Church Commissioners for England	Title required for the construction of the new highway
2/7A (part thereof)	The Church Commissioners for England	Title required for the construction of the new highway

Plot Number	Landowner	Purpose for which freehold title is required
2/7C (part thereof)	The Church Commissioners for England	Title required for the construction of the new highway
2/9	Environment Agency	Title required for bridge support
2/11	Secretary of State for Transport	Title required for bridge support
2/12	Secretary of State for Transport	Title required for bridge support
2/13	The Church Commissioners for England	Title required for the construction of the new highway
2/15	Secretary of State for Transport	Title required for the construction of the new highway
2/16	H.M. Seelig & L.A. Moore	Title required for the construction of the new highway
3/1	The Church Commissioners for England	Title required for the construction of the new highway
3/1B	The Church Commissioners for England	Title required for the construction of the new highway
3/2	Anglian Water Services Limited	Title required for the construction of the new highway
3/2A	Anglian Water Services Limited	Title required for the construction of the new highway
3/3	Anglian Water Services Limited	Title required for the construction of the new highway
3/3A	Anglian Water Services Limited	Title required for the construction of the new highway
3/4	The Church Commissioners for England	Title required for the construction of the new highway
3/4C	The Church Commissioners for England	Title required for the construction of the new highway
3/5A	City of Lincoln Council	Title required for the construction of the new highway
3/5B	City of Lincoln Council	Title required for the construction of the new highway
3/6	City of Lincoln Council	Title required for the construction of the new highway
3/6B	The Church Commissioners for England	Title required for the construction of the new highway
3/7	Robert Nelstrop Farms Limited	Title required for the construction of the new highway
3/7B	Robert Nelstrop Farms Limited	Title required for the construction of the new highway
3/8	Robert Nelstrop	Title required for the construction of the new highway
4/2	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Title required for the construction of the new highway

Plot Number	Landowner	Purpose for which freehold title is required
4/2H	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Title required for the construction of the new highway
4/3	Naverlode Limited	Title required for the construction of the new highway
4/4	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Title required for the construction of the new highway
4/4D	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Title required for the construction of the new highway
4/5	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Title required for the construction of the new highway
4/5F	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Title required for the construction of the new highway
5/1	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Title required for the construction of the new highway
5/2	The Church Commissioners for England	Title required for the construction of the new highway
5/3	The Church Commissioners for England	Title required for the construction of the new highway
5/3B	The Church Commissioners for England	Title required for the construction of the new highway
5/4	The Church Commissioners for England	Title required for the construction of the new highway
5/5	The Church Commissioners for England	Title required for the construction of the new highway
5/5C	The Church Commissioners for England	Title required for the construction of the new highway
5/5D	The Church Commissioners for England	Title required for the construction of the new highway
5/6	The Church Commissioners for England	Title required for the construction of the new highway
5/6A	The Church Commissioners for England	Title required for the construction of the new highway

A3.2 Land required for mitigation of the scheme:

Plot 1\9A is a severed corner of a field which is being used for a habitat pond to mitigate the environmental impact of the scheme.

A3.3 Land for which rights are required:

The following plots are required for rights to be granted:-

Plot Number	Landowner	Purpose for which freehold title is required
1/5A	The Church Commissioners for England	Right required to construct and maintain a new watercourse (diversion of Greetwell Fields Drain)
1/5B	The Church Commissioners for England	Right required to construct and maintain a new watercourse (diversion of Greetwell Fields Drain)
1/5E	The Church Commissioners for England	Right required to construct and maintain a new watercourse (diversion of Greetwell Fields Drain)
1/6	Greenbelt Energy Limited	Right required to construct and maintain a new watercourse (diversion of Greetwell Fields Drain)
1/11	Unknown	Right required to construct and maintain a new watercourse (diversion of Greetwell Fields Drain
2/3A	The Church Commissioners for England	Rights to permanently re-grade land (No longer required See Note 1 below)
2/5	Network Rail Infrastructure Limited	Rights required to construct and maintain the new structure spanning the Lincoln to Market Rasen Railway
2/7D	The Church Commissioners for England	Right required to construct and maintain the new surface water drain discharging into the adjacent North Delph watercourse
2/7E	The Church Commissioners for England	Rights to construct and maintain a road bridge
2/8	Unknown	Rights to construct and maintain a road bridge
2/9A	Environment Agency	Rights to construct and maintain a road bridge
2/9B	Environment Agency	Rights to construct and maintain a road bridge
2/10	Canal and River Trust	Rights to construct and maintain a road bridge
2/11A	Secretary of State for Transport	Rights to construct and maintain a road bridge
2/11B	Secretary of State for Transport	Rights to construct and maintain a road bridge
2/12A	Environment Agency	Rights to construct and maintain a road bridge
2/12B	Environment Agency	Rights to construct and maintain a road bridge
2/13A	The Church Commissioners for England	Right required for the construction and maintenance of the flood compensation area (No longer required permanently See Note 2 below)
2/13D	The Church Commissioners for England	Rights to construct and maintain a drainage outfall
2/14	Network Rail Infrastructure Limited	Right required to construct and maintain the new structure spanning the Lincoln to Spalding Railway

Plot Number	Landowner	Purpose for which freehold title is required
4/2E	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	A right to construct and maintain a culvert
4/2F	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	A right to construct and maintain a culvert
4/5A	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Rights to permanently re-grade land

Note 1 - Plot 2/3A is no longer required following the further development of the design proposals. LCC have modified the design of the landscaping areas and as a result the amount of surplus topsoil has been reduced.

Note 2- Plot 2/13A is no longer required for flood mitigation measures following agreement with the Environment Agency. It will however be required as a temporary works area using the same rights as plot 2/13B.

These rights are connected to:

- The diversion of Greetwell Fields drain and creation of a culvert north of Lincoln Road Branston
- Creation of an outfall for balancing ponds
- The construction of bridges over watercourses, and over and under railways
- The permanent regrading of land adjacent to the scheme. This is required to provide a location of disposal of surplus topsoil from the scheme that would otherwise have to be removed from site. A specification for the reinstatement of these fields will be agreed with landowners and their tenants.

A3.4 Land to be dedicated:

These areas are to be dedicated as Public Rights Of Way.

Plot Number	Landowner	Purpose for which freehold title is required
1/5D	The Church Commissioners for England	Dedication required for diversion of public footpath
2/12E	Environment Agency	Dedication for new footpath link to Sustrans Route
2/12G	Environment Agency	Dedication for new footpath link to Sustrans Route
2/13F	The Church Commissioners for England	Dedication for new footpath link to Sustrans Route

A3.5 Land for which a licence is required for temporary purposes:

As part of the acquisition there are parcels of land that the Council needs to acquire to enable the Scheme to proceed but which will not be needed permanently once the Scheme has been built and is operating. Those uses consist of

Topsoil Storage

These areas are required for the temporary storage of topsoil from the scheme. The topsoil will be either placed in a similar location to where it was removed from upon completion of the works or moved to another part of the site for re-use. Some of these areas may also be used for the temporary storage of other materials prior to incorporation into the scheme.

Plot Number	Landowner	Purpose for which freehold title is required
1/1A	The Church Commissioners for England	Essential licence for the storage of topsoil
1/5C	The Church Commissioners for England	Essential licence for the storage of topsoil
1/8A	The Church Commissioners for England	Essential licence for the storage of topsoil
2/1 (part thereof)	The Church Commissioners for England	Essential licence for the storage of topsoil
2/1A	The Church Commissioners for England	Essential licence for the storage of topsoil
2/2A	The Church Commissioners for England	Essential licence for the storage of topsoil
2/6B	The Church Commissioners for England	Essential licence for the storage of topsoil
2/7B	The Church Commissioners for England	Essential licence for the storage of topsoil
3/1A	The Church Commissioners for England	Essential licence for the storage of topsoil
3/4B	The Church Commissioners for England	Essential licence for the storage of topsoil
3/5	City of Lincoln Council	Essential licence for the storage of topsoil
3/6A	The Church Commissioners for England	Essential licence for the storage of topsoil
3/7A	Robert Nelstrop Farms Limited	Essential licence for the storage of topsoil
4/5B	The Principal Fellows Scholars of	Essential licence for the storage of topsoil

Plot Number	Landowner	Purpose for which freehold title is required
	Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	
5/3A	The Church Commissioners for England	Essential licence for the storage of topsoil
5/5A	The Church Commissioners for England	Essential licence for the storage of topsoil
5/5B	The Church Commissioners for England	Essential licence for the storage of topsoil

Site Compound\Construction Area

These areas are required for either working space adjacent to the works to allow the scheme to be constructed or for temporary use as site storage compounds and offices by the contractor

Plot Number	Landowner	Purpose for which freehold title is required
2/3B	The Church Commissioners for England	Essential licence for site compound/ construction area
2/6A	The Church Commissioners for England	Essential licence for site compound/ construction area
2/7A (part thereof)	The Church Commissioners for England	Essential licence for site compound/ construction area
2/7C (part thereof)	The Church Commissioners for England	Essential licence for site compound/ construction area
2/8A	Unknown	Essential licence for site compound/ construction area
2/8B	Unknown	Essential licence for site compound/ construction area
2/9C	Environment Agency	Essential licence for site compound/ construction area
2/9D	Environment Agency	Essential licence for site compound/ construction area
2/10A	Canal and River Trust	Essential licence for site compound/ construction area
2/10B	Canal and River Trust	Essential licence for site compound/ construction area
2/11C	Secretary of State for Transport	Essential licence for site compound/construction area
2/11D	Secretary of State for Transport	Essential licence for site compound/ construction area
2/11F	Secretary of State for Transport	Essential licence for site compound/ construction area
2/11G	Secretary of State for Transport	Essential licence for site compound/ construction area
2/11H	Secretary of State for Transport	Essential licence for site compound/ construction area
2/12C	Environment Agency	Essential licence for site compound/ construction area
2/12D	Environment Agency	Essential licence for site compound/ construction area
2/12F	Environment Agency	Essential licence for site compound/ construction area
2/12H	Environment Agency	Essential licence for site compound/ construction area
2/12J	Environment Agency	Essential licence for site compound/ construction area

Plot Number	Landowner	Purpose for which freehold title is required
2/13B	The Church Commissioners for England	Essential licence for site compound/ construction area
2/13C	The Church Commissioners for England	Essential licence for site compound/ construction area
2/13E	The Church Commissioners for England	Essential licence for site compound/ construction area
2/13G	The Church Commissioners for England	Essential licence for site compound/ construction area
2/16A	H.M. Seelig & L.A. Moore	Essential licence for site compound/ construction area
3/4A	The Church Commissioners for England	Essential licence for site compound/ construction area

Land Connected to Private Means of Access (Temporary and Permanent)

These areas are required to provide access for landowners and their tenants to fields severed by the scheme, and for temporary working space to construct the accesses.

Plot Number	Landowner	Purpose for which freehold title is required
2/6C	The Church Commissioners for England	Licence required to construct a private means of access to be used by the owner (and any lessee or tenant of the owner) and a right required for the construction and maintenance of the bypass
2/6D	The Church Commissioners for England	Licence required to construct a private means of access to be used by the owner (and any lessee or tenant of the owner) and a right required for the construction and maintenance of the bypass
3/8A	Robert Nelstrop	Licence to construct a private means of access for use by the owner (and any lessee or tenant of the owner)
3/8B	Robert Nelstrop	Essential licence for working space in connection with the construction of the private means of access
4/2A	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Licence to construct a private means of access for use by the owner (and any lessee or tenant of the owner)
4/2B	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Essential licence for working space in connection with the construction of the private means of access
4/2C	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Essential licence for working space in connection with the construction of the private means of access
4/2D	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Essential licence for working space in connection with the construction of the private means of access

Plot Number	Landowner	Purpose for which freehold title is required
4/3A	Naverlode Limited	Licence to construct a private means of access for use by the owner (and any lessee or tenant of the owner)
4/3B	Naverlode Limited	Essential licence for working space in connection with the construction of the private means of access
4/3C	Naverlode Limited	Essential licence for working space in connection with the construction of the private means of access
4/4A	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Licence to construct a private means of access for use by the owner (and any lessee or tenant of the owner)
4/4B	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Essential licence for working space in connection with the construction of the private means of access
4/4C	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Essential licence for working space in connection with the construction of the private means of access
4/5C	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Licence to construct a private means of access for use by the owner (and any lessee or tenant of the owner)
4/5D	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Essential licence for working space in connection with the construction of the private means of access
4/5E	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Essential licence for working space in connection with the construction of the private means of access
5/1A	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Licence to construct a private means of access for use by the owner (and any lessee or tenant of the owner)
5/1B	The Principal Fellows Scholars of Jesus College within the City and University of Oxford of Queen Elizabeth's Foundation of Jesus College	Essential licence for working space in connection with the construction of the private means of access

APPENDIX 4 - EXTRACT FROM TD 9/93 HIGHWAY LINK DESIGN

DESIGN SPEED kph	120	100	85	70	60	50	V^2/R
STOPPING SIGHT DISTANCE m							
Desirable Minimum	295	215	160	120	90	70	
One Step below Desirable Minimum	215	160	120	90	70	50	
HORIZONTAL CURVATURE m.							
Minimum R* without elimination of Adverse Camber and Transitions	2880	2040	1440	1020	720	520	5
Minimum R* with Superelevation of 2.5%	2040	1440	1020	720	510	360	7.07
Minimum R* with Superelevation of 3.5%	1440	1020	720	510	360	255	10
Desirable Minimum R with Superelevation of 5%	1020	720	510	360	255	180	14.14
One Step below Desirable Minimum R with Superelevation of 7%	720	510	360	255	180	127	20
Two Steps below Desirable Minimum Radius with Superelevation of 7%	510	360	255	180	127	90	28.28
VERTICAL CURVATURE							
Desirable Minimum* Crest K Value	182	100	55	30	17	10	
One Step below Desirable Min Crest K Value	100	55	30	17	10	6.5	
Absolute Minimum Sag K Value	37	26	20	20	13	9	
OVERTAKING SIGHT DISTANCES							
Full Overtaking Sight Distance FOSD m.	*	580	490	410	345	290	
FOSD Overtaking Crest K Value	*	400	285	200	142	100	

Table 3

* Not recommended for use in the design of single carriageways (see Paragraphs 7.25 to 7.31 inclusive)

The V^2/R values shown in Table 3 above simply represent a convenient means of identifying the relative levels of design parameters, irrespective of Design Speed.

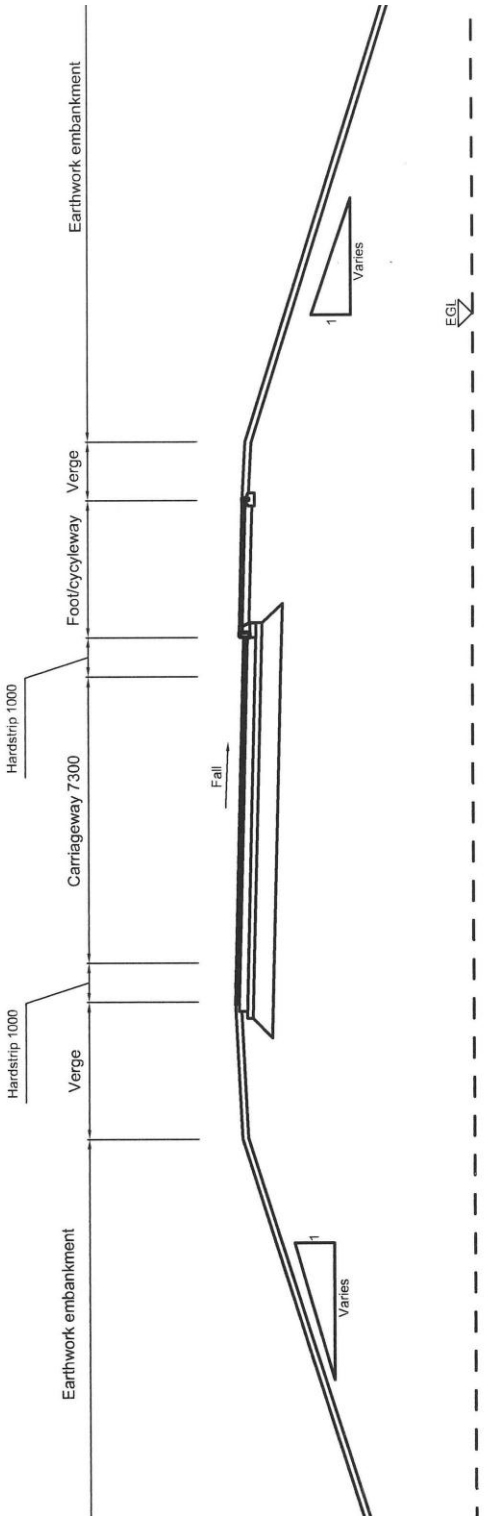
Geometric design speed related parameters.

APPENDIX 5 - **EXTRACT FROM TA 46/97 TRAFFIC FLOW RANGES**

Carriageway Standard	Opening Year AADT	
	Minimum	Maximum
S2	Up to 13,000	
WS2	6,000	21,000
D2AP	11,000	39,000
D3AP	23,000	54,000
D2M	Up to 41,000	
D3M	25,000	67,000
D4M	52,000	90,000

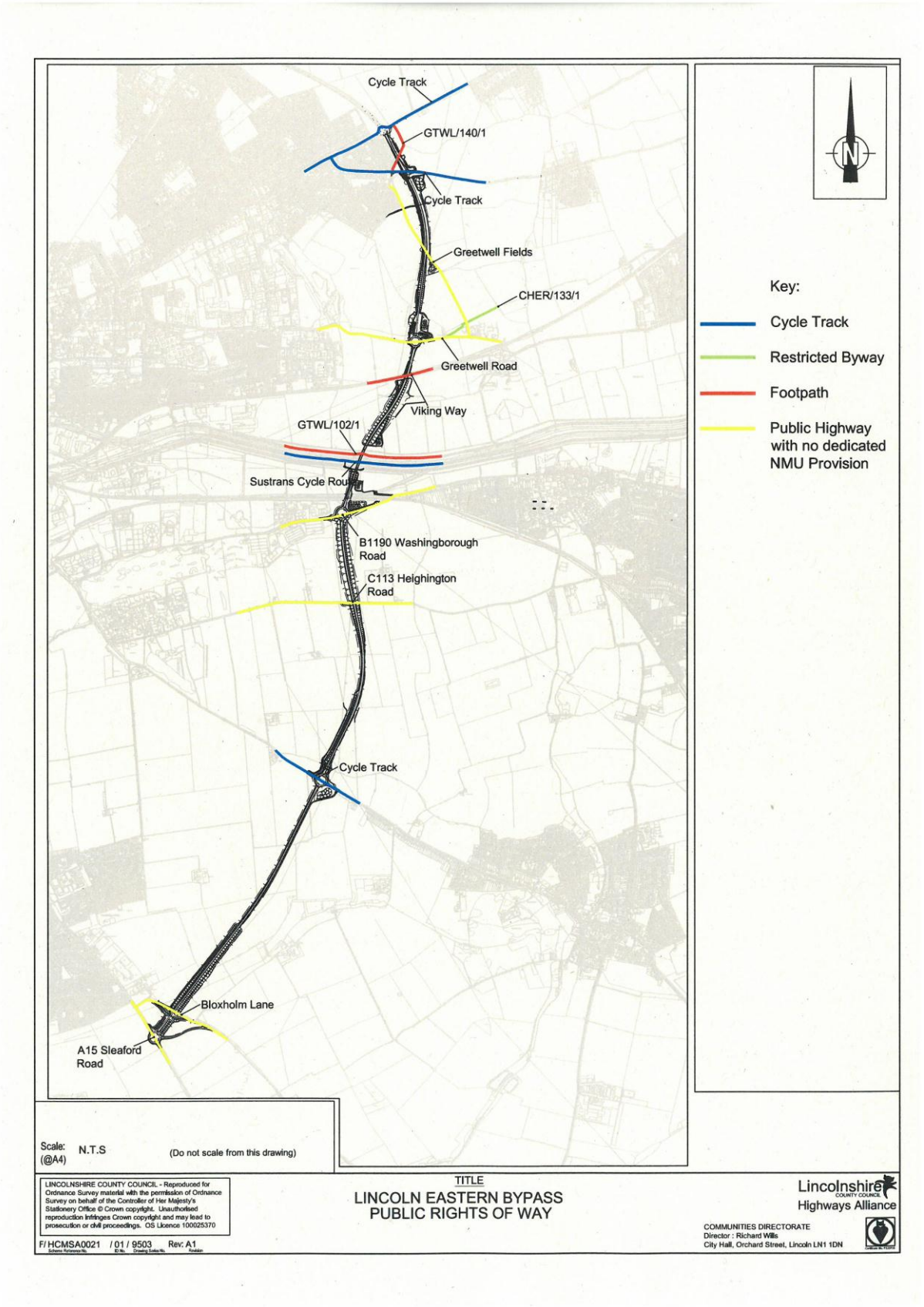
Table 2.1 Opening Year Economic Flow Ranges

APPENDIX 6 - **LEB TYPICAL SECTION**



LINCOLN EASTERN BYPASS HCMSA0021
TYPICAL SECTION OF DEEP FILL TAKEN AT CH 2800.00m
SCALE H = 1:200, V = 1:200 @ A4 SIZE
13-01-14

APPENDIX 7 - **Location Plan Showing Rights Of Way and NMU Routes**



APPENDIX 8 - **Summary of Geometric assessments of existing, alternative and comparative routes.**

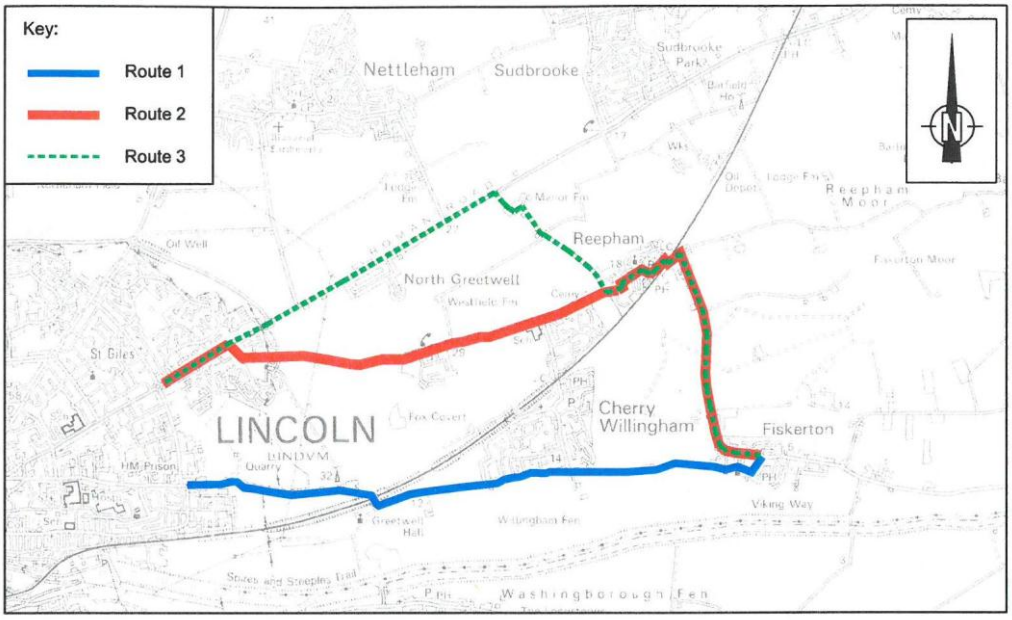


Figure 1: Routes from Fiskerton

	Route	Description	VISI	Length (Km)	Total Degrees	B Deg/Km	Alignment Constraint (Ac)	Layout Constraint (Lc)	Route Design Speed (Kph)
Route Closed Under Scheme	Route 2	Fiskerton to Outer Circle Road - Via Hawthorn Road	183	**4.75**	834	**176**	**17**	**28**	85
	Route 1	Fiskerton to Outer Circle Road - Via Greetwell Road	139	**5.44**	765	**141**	**16**	**26**	85
	Route 3	Fiskerton to Outer Circle Road - Via Kennel Lane and Wragby Road	207	**8.22**	1084	**132**	**14**	**26**	85

Table 1 - Routes from Fiskerton

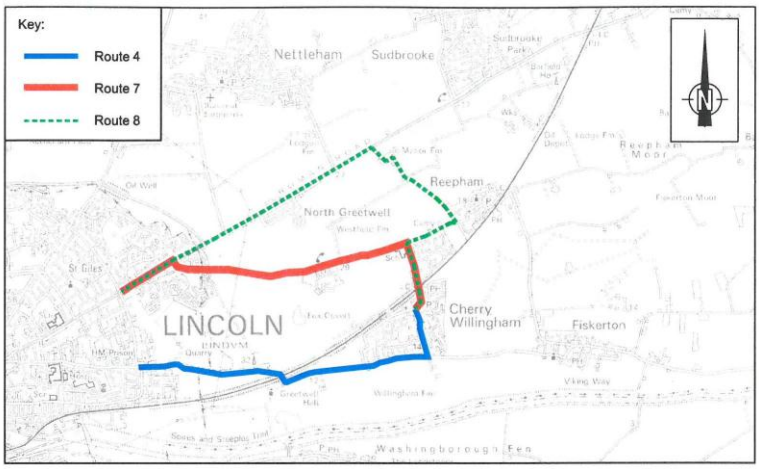


Figure 2: Routes from Cherry Willingham

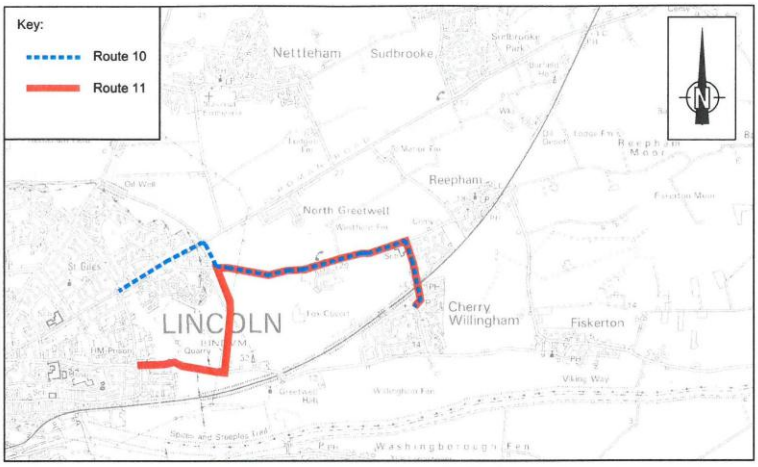


Figure 3: Routes from Cherry Willingham that use the Lincoln Eastern Bypass

	Route	Description	VISI	Length (Km)	Total Degrees	B Deg/Km	Alignment Constraint (Ac)	Layout Constraint (Lc)	Route Design Speed (Kph)
Route Closed Under Scheme	Route 7	Cherry Willingham to Outer Circle Road - Via Hawthorn Road	260	**4.35**	238	**55**	**10**	**29**	85
	Route 4	Cherry Willingham to Outer Circle Road - Via Greetwell Road	105	**4.80**	735	**153**	**17**	**26**	85
	Route 8	Cherry Willingham to Outer Circle Road - Via Kennel Lane and Wragby Road	256	**6.27**	431	**69**	**11**	**26**	100
	Alternative Routes from Cherry Willingham with use of the LEB								
	Route 10	Outer Circle Road to Cherry Willingham - Via LEB and Hawthorn Road	261	**4.55**	344	**76**	**11**	**23**	100
	Route 11	Cherry Willingham to Outer Circle - Via LEB, Hawthorn Road & Greetwell Road	200	**5.36**	445	**83**	**12**	**23**	100

Table 2 - Routes from Cherry Willingham

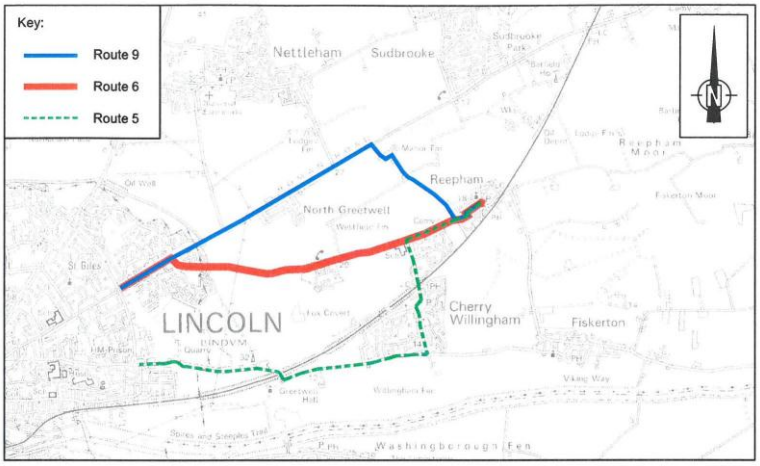


Figure 4: Routes from Reepham

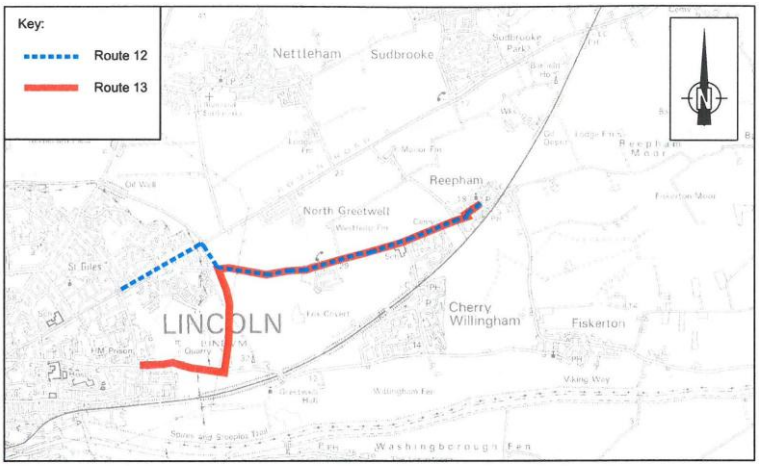


Figure 5: Routes from Reepham that use the Lincoln Eastern Bypass

	Route	Description	VISI	Length (Km)	Total Degrees	B Deg/Km	Alignment Constraint (Ac)	Layout Constraint (Lc)	Route Design Speed (Kph)
Route Closed Under Scheme	Route 6	Reepham to Outer Circle Road - Via Hawthorn Road	170	**4.79**	530	**111**	**14**	**26**	85
	Route 5	Reepham to Outer Circle Road - Via Greetwell Road	146	**6.51**	1141	**175**	**17**	**26**	85
	Route 9	Reepham to Outer Circle Road - Via Kennel Lane and Wragby Road	214	**5.43**	575	**106**	**13**	**26**	85
	Alternative Routes from Reepham with use of the LEB								
	Route 12	Outer Circle Road to Reepham - Via LEB, Hawthorn Road	218	**5.00**	552	**110**	**13**	**23**	100
	Route 13	Reepham to Outer Circle Road - Via LEB, Hawthorn Road & Greetwell Road	147	**5.81**	653	**112**	**15**	**23**	100

Table 3 - Routes from Reepham

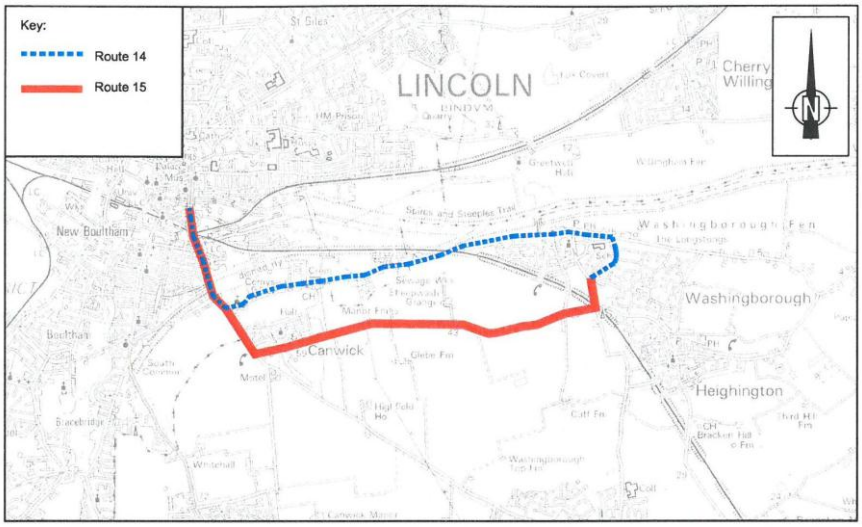


Figure 6: Routes from Washingborough

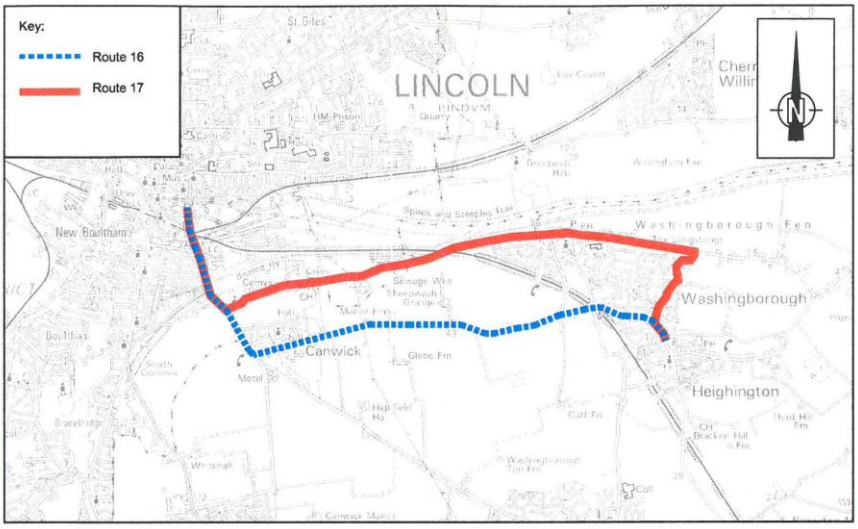


Figure 7: Routes from Heighington

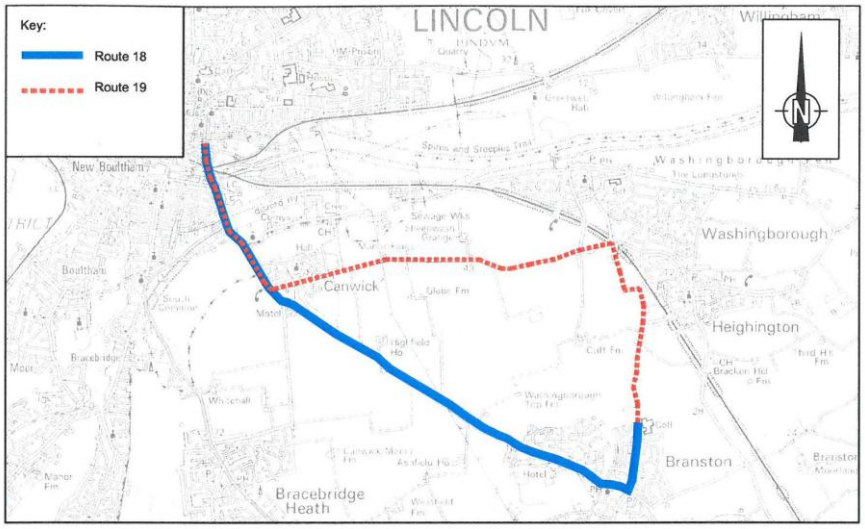


Figure 8: Routes from Branston

	Route	Description	VISI	Length (Km)	Total Degrees	B Deg/Km	Alignment Constraint (Ac)	Layout Constraint (Lc)	Route Design Speed (Kph)
	Route 14	Washingborough Precinct to City Bus Station via Washingborough Road	195	**5.89**	566	**96**	**13**	**26**	85
	Route 15	Washingborough Precinct to City Bus Station via Heighington Road	204	**6.05**	482	**80**	**12**	**26**	100
	Route 16	Heighington Post Office to City Bus Station via Heighington Road	169	**7.44**	543	**73**	**12**	**26**	100
	Route 17	Heighington Post Office to City Bus Station via Canterbury Drive, Washingborough Road	152	**8.34**	1063	**128**	**15**	**26**	85
	Route 18	Station Road Branston to City Bus Station via Lincoln Road	241	**6.86**	404	**59**	**11**	**23**	100
	Route 19	Station Road Branston to City Bus Station via Heighington Road	150	**7.71**	754	**98**	**14**	**23**	100

Table 4 - Comparative Routes Into Lincoln From Washingborough, Heighington And Branston