Lincolnshire County Council

NORTH HYKEHAM RELIEF ROAD

Social and Distributional Impacts Report

JULY 2019

CONFIDENTIAL

Lincolnshire County Council

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Social and Distributional Impacts Report

WSP

8 First Street
Manchester
M15 4RP

Phone: +44 161 200 5000

WSP.com

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1 INTRODUCTION

1.1 PURPOSE OF THE REPORT

This report has been prepared as supporting information for North Hykeham Relief Road (NHRR) business case and economic appraisal which is to be submitted to the Department for Transport (DfT).

The purpose of the Social Impact (SI) and Distributional Impact (DI) appraisals are to identify groups that may benefit or experience disbenefits as a result of a transport intervention, with particular reference to the impact upon equality through identifying impacts on groups that are disadvantaged both financially and socially.

This report sets out the methodology and outputs of the SI and DI appraisals of the NHRR in accordance with WebTAG Units A4.1[1] and A4.2[2]. The SI and DI indicators can be seen set out in Table 1-1.

Table 1-1 – Social and Distributional Impact Indicators

Appraisal	Social Impacts	Distributional Impacts
Indicator / Topics	Option and Non-Use Values	User Benefits
	Severance	Noise
	Accidents	Air Quality
	Security	Accidents
	Accessibility	Severance
	Physical Activity	Personal Affordability
	Journey Quality	Security
	Personal Affordability	Accessibility

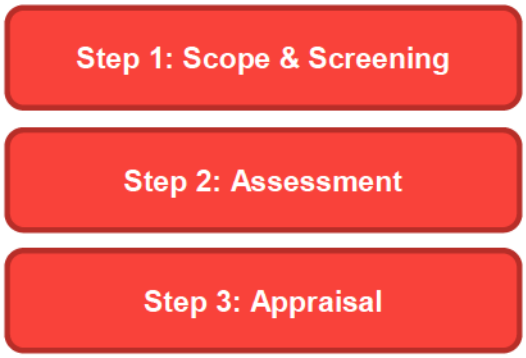
1.2 SCOPE AND SCREENING

The first step in the social and distributional impacts assessment is to review the indicators and understand their scope. The outcome of this process (Step 1) is that some indictors may be scoped out through a screening process. Indicators not scoped out are carried forward to an assessment stage (Step 2) and finally appraised, (Step 3). The SDI process is presented in Figure 1-1.

[1] WebTAG: TAG unit A4-1 social impact appraisal, December 2017

[2] WebTAG: TAG unit A4-2 distributional impact appraisal, December 2015

Figure 1-1 – Social and Distributional Impact Process



1.2.1 SOCIAL IMPACT

SI appraisal covers the human experience of the transport system and its impacts on social factors, not considered as part of economic or environmental impacts. Each social impact is required to be assessed as part of the appraisal and an assessment entered into the Appraisal Summary Table.

Option values and non-use values

The option values and non-use values is undertaken using TAG Unit A4.1 Social Impact Appraisal. The guidance defines option value as 'the willingness-to-pay to preserve the option of using a transport service for trips not yet anticipated or currently undertaken by other modes, over and above the expected value of any such future use'. Non-use values is defined as 'the values that are placed on the continued existence of a service (i.e. transport facility), regardless of any possibility of future use by the individual in question'.

TAG Unit A4.1 states option and non-use values should be assessed 'if the scheme being appraised includes measures that will substantially change the availability of transport services within the study area (e.g. the opening or closure of a rail service, or the introduction or withdrawal of buses serving a particular rural area)'.

New transport services could be introduced as part of the new dependent development (SWQ) associated with the scheme. However, these impacts are outside of the scope of this project and as a result cannot be assessed. Furthermore, the scope of the scheme does not include the opening or closure of a rail service and as a result this indicator will not be assessed.

Outcome: Scoped out.

Accessibility

The accessibility indicator was also undertaken using TAG Unit A4.1 Social Impact Appraisal. It highlights that the appraisal should focus on **public transport accessibility** aspect of accessing employment, services and social networks. However, new public transport services and changes to existing services is beyond the scope of this project. Despite this, a high-level assessment was undertaken in the recognition that NHRR will have an impact on traffic levels on existing bus routes which may result in faster journey times and/or rescheduling of services. Existing bus routes were mapped along with roads which will have a significant change in traffic level (-/+ >10% on links over 8,000 AADT). The maps can be found in Appendix A and key observations include:

- There is a total of 19 bus services through Lincoln within the study area;
- Many of these services operate along the major radial routes including the A15, A1435 Newark Road, Lincoln Road, A158, A607 Grantham Road and B1378 Skellingthorpe Road as well as key local routes including Brant Road and Meadow Lane; and
- A significant decrease in traffic flow on existing bus routes is forecast on A1435 Newark Road, Lincoln Road, Meadow Lane and Station Road which will have a positive impact on a number of existing bus routes.

Whilst the above gives a snap shot of potential benefits further analysis has not been undertaken as the operation and scheduling of public transport is beyond the scope of this project. Therefore, accessibility has been scoped out of this assessment.

Outcome: Scoped out

1.2.2 DISTRIBUTIONAL IMPACT

The DI appraisal compares the distribution of benefits arising from a transport intervention against the distributions of different social groups to assess the extent to which benefits are experienced by those groups and compared nationally.

An initial screening assessment has been undertaken to consider the likely impacts of the eight indicators. The findings from the initial screening are presented in the proforma (Appendix B) which identifies which indicators should be appraised in more detail and provides recommendations where appropriate for further analysis. The screening proforma is summarised in Table 1-2 below.

Table 1-2 – Scope and Screening Outcome, Distributional Impact

TAG Unit	Summary of Importance
User Benefits ***(TAG Unit A4.2.2)***	It is important to gain an understanding of the distribution of user benefits by social group and by area. This analysis assists in understanding how user benefits accrue to different groups in society and across a geographic area. Analysing a wider area outside of the immediate vicinity of the intervention is vital as user benefits are often generated significantly beyond the immediate area of the scheme. Note that DI analysis is only applicable for individuals and not in-work trips experienced by businesses. **Scheme Impact:** Significant positive benefits as a result of the improved journey times for east west traffic and reduction in congestion on the major routes through and around Lincoln. **Result: Scoped in.**
Noise ***(TAG Unit A4.2.3)***	It is important to understand the distributional effects of changes to noise generated by the transport intervention – both in terms of improvements and deterioration. Changes in noise levels resulting from the intervention will be experienced to varying extents in different areas and by different groups of people. It is therefore important to understand the noise-related social and distributional impacts of a scheme. **Scheme Impact:** It is anticipated there will be a beneficial impact due to traffic re-routing from the A46 and more significantly the local road network to the south of Lincoln which has a number of receptors in close proximity (mainly housing) to the highway boundary and on to the NHRR where there are fewer receptors due to its rural location. **Result: Scoped in.**

Air Quality ***(TAG Unit A4.2.4)***	Changes in emission levels resulting from the transport intervention will vary by location and social group. It is therefore important to understand the distribution of air quality changes – both in terms of improvements and deteriorations. **Scheme Impact:** The A46 is congested particularly during peak periods and rat running occurs on the local road network within North Hykeham. With the inclusion of the NHRR a proportion of this traffic re-routes onto the NHRR where traffic is more free flowing resulting in less pollutants emitted. **Result: Scoped in.**
Accidents ***(TAG Unit A4.2.5)***	Transport schemes can have significant impacts on safety and accidents and as these issues can have varying impacts on different areas and social groups, it is important to understand the specific impacts of an individual scheme. **Scheme Impact:** The scheme will reduce traffic in existing residential areas with the south of Lincoln and provide a new strategic route. **Result: Scoped in.**
Severance ***(TAG Unit A4.2.6)***	Transport interventions can result in changes to levels of severance within the transport network through influencing traffic flows and providing new infrastructure. As severance issues impact on different social groups and areas to differing extents, it is important to analyse how individual scheme will alter levels of severance. **Scheme Impact:** It is anticipated that traffic will re-route from the local road network south of Lincoln onto NHRR resulting in less traffic on the local road network. **Result: Scoped in.**
Security ***(TAG Unit A4.2.7)***	Transport schemes can have impacts on personal security (both real and perceived) and these benefits can differ according to area and social group. It is therefore, important to gain an understanding of the social and distributional impacts of the transport intervention from the personal security perspective. **Scheme Impact:** No direct impact on public transport waiting/interchange facilities which would affect user perception of security. **Result: Scoped out.**
Accessibility ***(TAG Unit A4.2.8)***	Access to services often presents significant difficulties to certain social groups and those living remotely. Transport interventions can have an impact of the ability of people to access services they require. **Scheme Impact:** No direct impact on routings, frequencies, timings or rolling stock of current public transport services form part of the scheme. **Result: Scoped out.**
Personal Affordability ***(TAG Unit A4.2.9)***	Changes in costs (both increases and reductions) need to be assessed in terms of understanding the social and distributional effects. Any changes in transport costs due to changes to the transport network could impact on the lower income groups. **Scheme Impact:** Positive car fuel and non-fuel cost benefits are expected as a result of rerouting, increase in journey speeds and congestion relief. **Result: Scoped in.**

Distributional impacts consider the benefits and disbenefits that transport interventions have across different social groups. For example, people with access to a car may experience less benefits to those without a car for an intervention that improves local public transport services. It is also important to consider vulnerable groups and asses if they are disadvantaged further by receiving a disproportionately low share of the benefits provided by the intervention, or a disproportionately high

share of the disbenefits. Table 1-3 sets out the scope of socio-demographic analyses for the indicators to be carried forward (not scoped out as part of the screening above).

Table 1-3 – Scope of Socio-Demographic Analyses for DI

Dataset / Social Group	User Benefits	Noise	Air Quality	Accidents	Severance	Personal Affordability
Income Distribution	✓	✓	✓			✓
Children (proportion of population aged under 16)		✓	✓	✓	✓	
Young Adults (proportion of population aged 16-25				✓		
Older People (proportion of population aged over 70)		✓		✓	✓	
Proportion of population with a disability					✓	
Proportion of population of Black and Minority Ethnic (BME) origin						
Proportion of households without access to a car					✓	
Carers (proportion of households with dependent children)						

Table 1-4 sets out the general scoring method of distributional impacts for identified social groups.

Table 1-4 - General System for Grading of Distributional Impacts for each of the Identified Social Groups

Impact	Assessment
Beneficial and the population impacted is significantly greater than the proportion of the group in the total population	Large Beneficial ✓✓✓
Beneficial and the population impacted is broadly in line with the proportion of the group in the total population	Moderate Beneficial ✓✓
Beneficial and the population impacted is smaller than the proportion of the group in the total population	Slight Beneficial ✓
There are no significant benefits or disbenefits experienced by the group for the specified impact	Neutral
Adverse and the population impacted is smaller than the proportion of the group in the total population	Slight Adverse ×
Adverse and the population impacted is broadly in line with the proportion of the group in the total population	Moderate Adverse ××
Adverse and the population impacted is significantly greater than the proportion of the group in the total population	Large Adverse ×××

1.3 STRUCTURE OF THE REPORT

Following on from this introductory chapter, the remainder of this report will cover the assessment of the SI and DI indicators. The social impact assessment for accidents, severance and personal affordability are described and assessed in the distributional impacts assessment. This is due to these indicators being 'scoped in' within the DI appraisal (see appendix B) and it is considered that this process provides a more detailed appraisal approach.

The indicators carried forward for the appraisal process are those that have not been scoped out as part of the screening process and are as follows:

- **Chapter 2 - SI appraisal:**
  - Security;
  - Physical activity;
  - Journey quality.
- **Chapter 3 - DI appraisal:**
  - User benefits;
  - Noise;
  - Air quality;
  - Accidents;
  - Severance; and
  - Personal affordability
- **Chapter 4 - Conclusions**

2 SOCIAL IMPACT APPRAISAL

2.1 SECURITY

Transport interventions may affect the level of security for transport users. TAG Unit A4.1 states the following should be considered when assessing security:

- Any change in public transport waiting facilities / interchange facilities;
- Changes to pedestrian access;
- Changes to provision of lighting and visibility;
- Changes to landscaping; and
- Changes to formal or informal surveillance.

Guidance states that when assessing the above parameters there are several groups who should be considered who have particular concerns about their personal security. This includes women, younger people (teenagers), older people, people with disabilities and Black and Minority Ethnic (BME) communities as they tend to perceive risk more acutely when using public transport. Furthermore, public transport users tend to be from lower income groups. These users may suffer from greater anxiety when using public transport leading to the potential suppression of travel, which could reduce the effective accessibility of the transport system.

Social Impact Appraisal

The types of transport users which should be considered when assessing the above are public transport passengers, pedestrians and freight. In terms of public transport passengers, NHRR is a new link and so no bus service currently operates along this route. The new dependent developments (SWQ) associated with the scheme may generate enough demand to justify a new bus route or alteration to existing services. These impacts are outside the scope of the project and as a result will not be assessed as part of the social impact appraisal.

For pedestrians NHRR will provide a shared pedestrian and cycle route to the north side and a bridleway to the south side. It will also include the provision for three NMU structures. Therefore, an assessment has been undertaken on the level of security provided to pedestrians. The result of this assessment is provided below in Table 2-1.

Table 2-1 – Security indicator for pedestrians

Security indicator	Importance	Scheme impact	Impact*
Site perimeter, entrances and exits	Medium	NHRR will have clearly marked site perimeters / exits and follow the latest design standards in accordance with DMRB guidance.	Neutral
Formal surveillance	Low	The route will have no CCTV system in place. However, this is considered to be of low priority and will have minimal impact in terms of pedestrian security.	Neutral
Informal surveillance	Medium	NHRR will have an annual average daily flow of between 27,000 and 29,000 in the opening year. The high volume of traffic will provide informal surveillance for pedestrians utilising	Positive

Security indicator	Importance	Scheme impact	Impact*
		the route. However, it is noted that on the NMU structures pedestrians may be temporarily out of the site line of traffic operating on NHRR.	
Landscaping	Medium	It is anticipated that landscaping will be designed to the latest standards.	Positive
Lighting and visibility	Medium	The pedestrian facilities will be suitably lit and follow the appropriate DMRB design guidance.	Positive
Emergency call	Low	The design standard of the road will follow the latest DMRB design guidance which may or may not require the provision of emergency phones.	Neutral

Tag Unit A4.1 categorises impact as either poor, moderate of high. For the purposes of this assessment it was considered more robust to use positive, neutral and negative

WebTAG A4.1 also states that the security of freight traffic should be considered. The guidance states:

- *Road users are more vulnerable to crime in circumstances where they are required to stop their vehicles or travel at slow speeds, such as at the approaches to signals or in congested conditions;*
- *Road users are more vulnerable to crime at locations where they are required to leave their vehicles, such as at service stations, car parks and so on; and*
- *the importance of each indicator is likely to vary according to the location and nature of the road; for example: emergency call facilities are likely to be more important than surveillance when considering a rural road.*

Given NHRR will be of dual carriageway standard with a 70mph speed limit and no service stations or car parks within the immediate vicinity this will result in limited opportunities for HGV drivers to stop and leave their vehicle. It is also noted that in addition to the junctions at the A46 and A15, NHRR will include the provision of three new junctions at South Hykeham Road; Brant Road and Grantham Road. On approach to these junctions vehicles will slow down and come to a stop which in accordance to WebTAG A4.1 has an impact on security. However, the expected AADF is between 27,000 and 29,000 resulting in a high volume of traffic providing informal surveillance and so the overall impact on security is negligible.

Key points from the security social impact appraisal include:

- Public transport passenger security has been scoped out of the assessment due to the provision of public transport being outside the scope of the project;
- Pedestrian facilities will follow the latest DMRB design guidance and therefore minimising the potential for security issues; and
- NHRR will have a minimal impact on freight security due to the road standards following the latest DRMB guidance; high AADT acting as informal surveillance and limited opportunities for HGV drivers to stop and leave their vehicles.

Given the above, security is assessed as Slight Beneficial.

2.2 PHYSICAL ACTIVITY

The Physical Activity Impacts is undertaken using TAG Unit A4.1 Social Impact Appraisal. The guidance states that transport can affect physical activity. Physical inactivity is a primary contributor to a broad range of chronic diseases such as coronary heart disease, stroke, diabetes and some cancers. Physical activity also has an important role to play in preventing weight gain and obesity, and improving mental health. The physical activity impacts indicator appraises the health benefits of active transport (i.e. cycling and walking).

Social Impact Appraisal

As stated within the NHRR Appraisal Specification Report (ASR) physical activity will be assessed qualitatively. This is due to insufficient detailed baseline data available to develop a robust quantitative forecast.

When assessing the benefits to physical activity it is recognised that this will not only be through the NMU provision provided as part of the scheme itself, but also the increase in physical activity as a result of changes to traffic levels and improvements in conditions for NMUs. Depending on the change in traffic level this can create or remove barriers to physical activity.

NHRR will provide a shared pedestrian and cycle route to the north side and a bridleway to the south side. It will also include the provision of the following grade separated NMU structures:

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

The provision of the new infrastructure will aim to maintain Public Rights of Way (PROW) and the existing cycling network and where possible enhance existing links. Furthermore, while there will be an inevitable increase in traffic on NHRR, the grade separated NMU crossing opportunities and shared pedestrian and cycle route to the north side, and a bridleway to the south side will minimise pedestrian / cycling conflict with vehicular traffic. All of which has the potential to encourage physical activity.

All existing PROW and the cycling network within the wider area have been shown in Figure 2-1 and Figure 2-2.

Figure 2-1 – Public Rights of Way

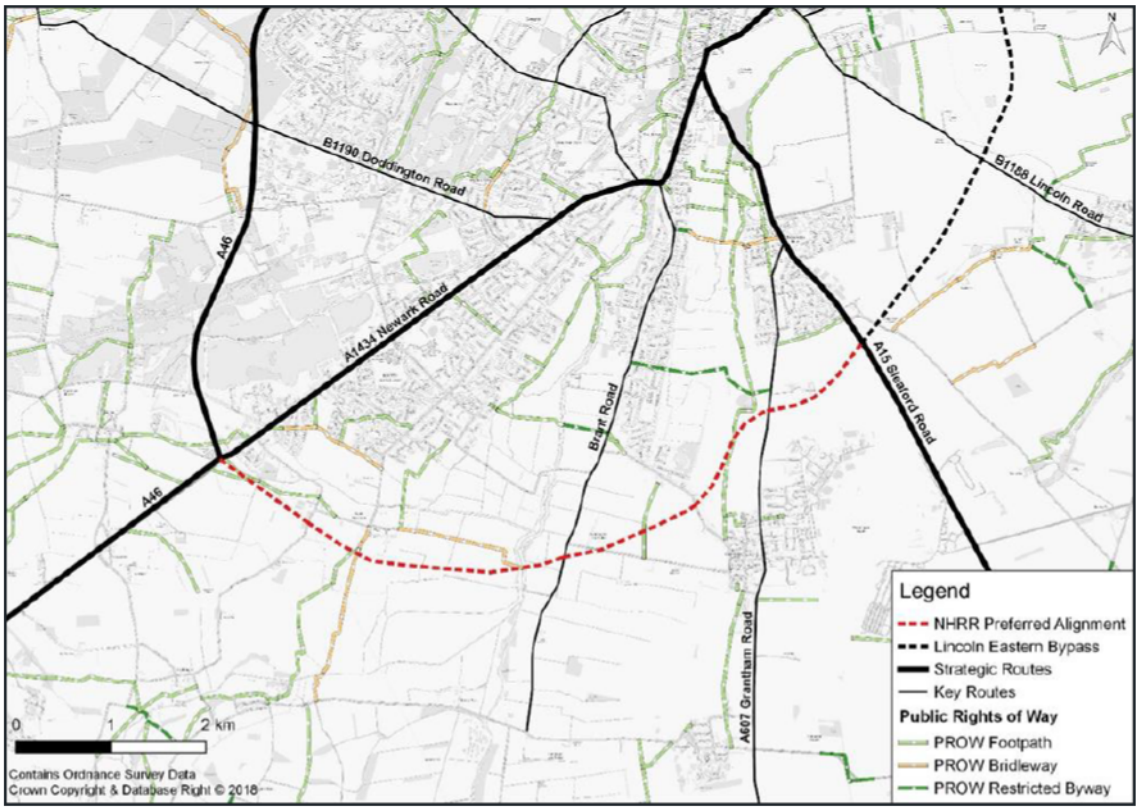
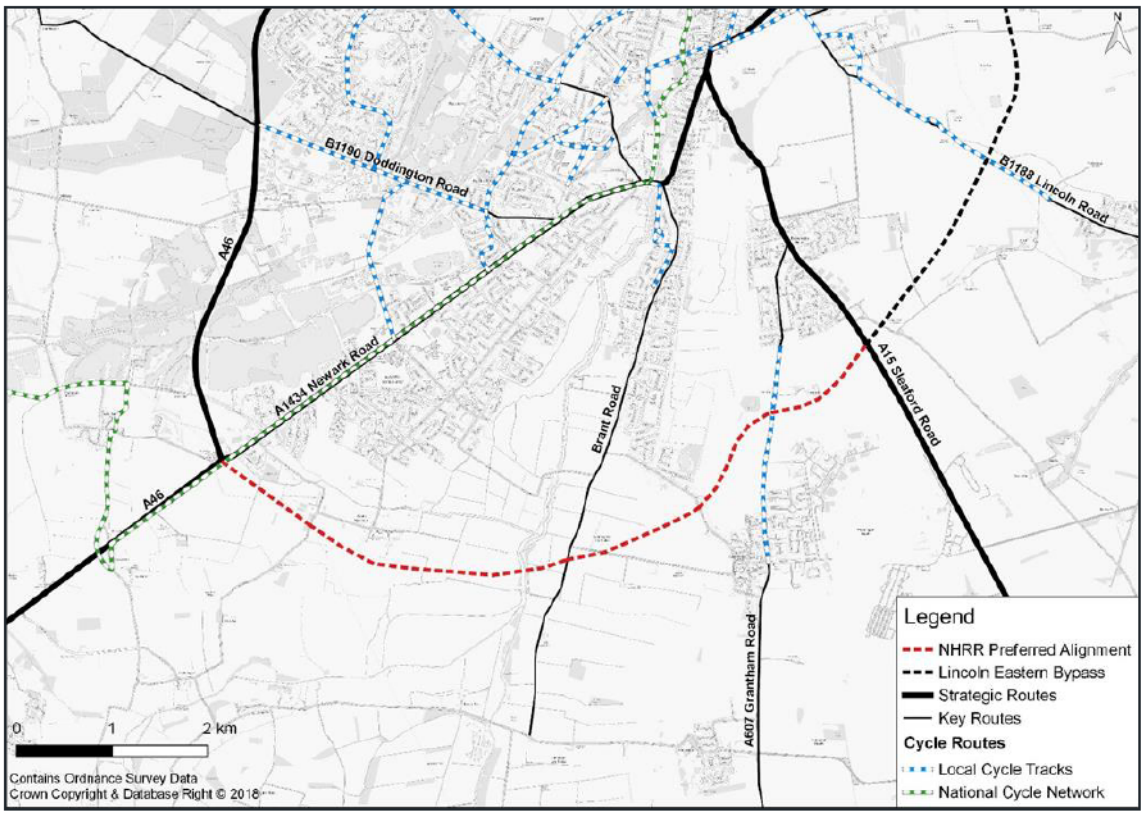
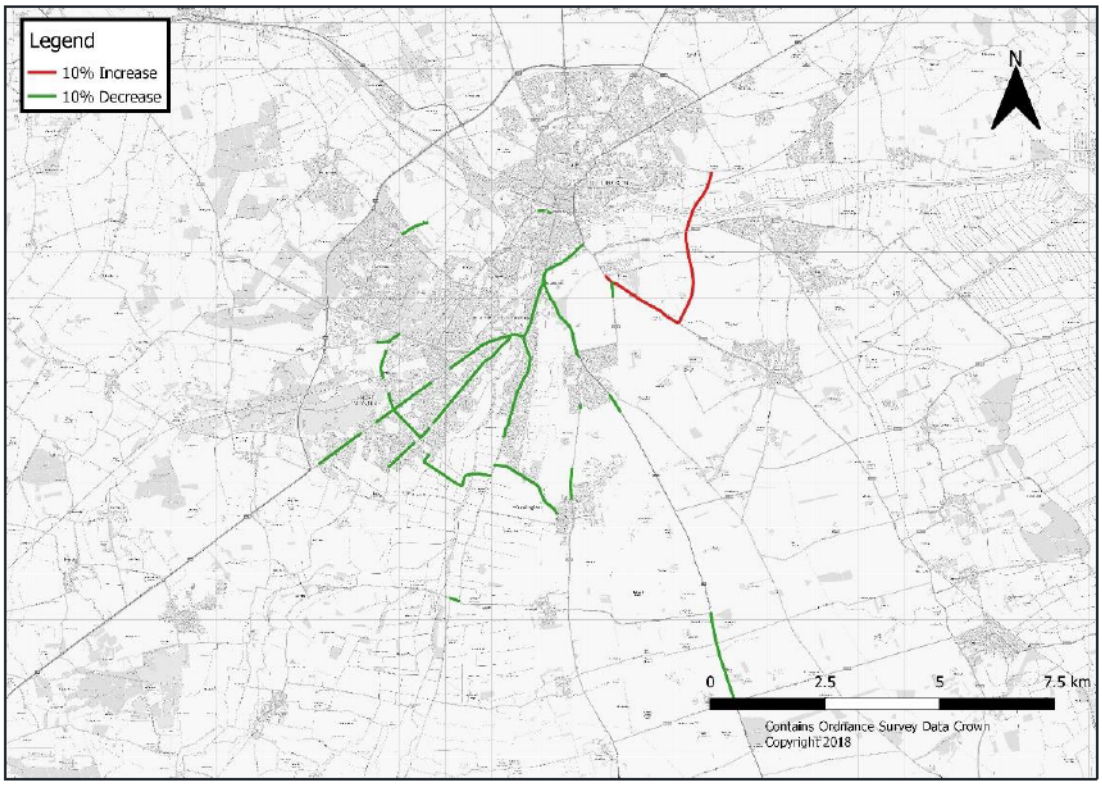


Figure 2-2 – Existing Cycling Network



The existing designated cycle network within the study area (as shown in Figure 2-2) consists of Regional Route 93 which is an on-road section along Newark Road up to Bracebridge where the route continues into Lincoln city centre via a traffic-free route. Route 93 additionally diverts on-road up Fosse Lane to Whisby Nature Park. The Lincoln Eastern Bypass, which is currently under construction will be accompanied along its entirety by shared-use foot/cycleways and will have grade separated crossing opportunities.

Figure 2-3 - Forecast change in traffic levels*



Links with under 8,000 vehicles in the DM scenario have been removed

Importantly Figure 2-3 shows the location of roads where there will be a significant change in traffic levels (excluding NHRR) which has the potential to impact on the level of physical activity along these routes. For example, where there is significant decrease in traffic it is expected that this would improve conditions for NMUs. Similarly, where there is a substantial increase in traffic this could introduce or create barriers to physical activity. When cross referencing forecast change in traffic levels to the existing cycling network and PROW key points to be made include:

- There will be a reduction in traffic levels on the A4134 Newark Road which is a residential area. This results in:
  - Reducing the barrier for cycling between the A46 and Bracebridge which has an on-road cycle lane as part of Regional Route 93;
  - Reducing the barrier for walking along sections where there is a reduction in traffic; and
  - A minimal impact on cycling on Newark Road within the city centre as there is already a traffic free cycling route within the city centre.

- Reduction in traffic on Lincoln Road / Hykeham Road and Brant Road may improve conditions for cycling and walking on these routes.
- A reduction in traffic on Meadow Lane and Station Road may improve conditions for cycling and walking and the links between North Hykeham and Waddington.
- There will be an increase in traffic on the B1188 Lincoln Road which may discourage cycling and walking. Existing infrastructure on this route includes a pavement on one side of the road and no cycling infrastructure. However, actual numbers of NMUs is expected to be small given the rural location of this road;
- An increase in traffic on the LEB. This will have a minimal impact on cycling and walking as the LEB will have a shared-use footway / cycleway separated from traffic and grade separated crossing opportunities which means there will be no conflict between pedestrians / cyclists and vehicular traffic.

As part of the Lincolnshire Local Transport Plan monitoring process, a total of 31 automatic cycle counters have gradually been installed across the county. Of these, 10 automatic counts, shown in Figure 2-4, are within the study area and these have informed an average daily cycle count for each year at respective sites from 2008 to 2017.

Year on year growth has been estimated by comparing a selection of those sites where there is at least 8 months comparable data with the previous year. This has then been converted into an index where the base year of 2008 = 100.

Figure 2-5 illustrates that there has been a 5% increase in cycling rates over 10 years.

Figure 2-4 - Lincoln Cycle Count Locations

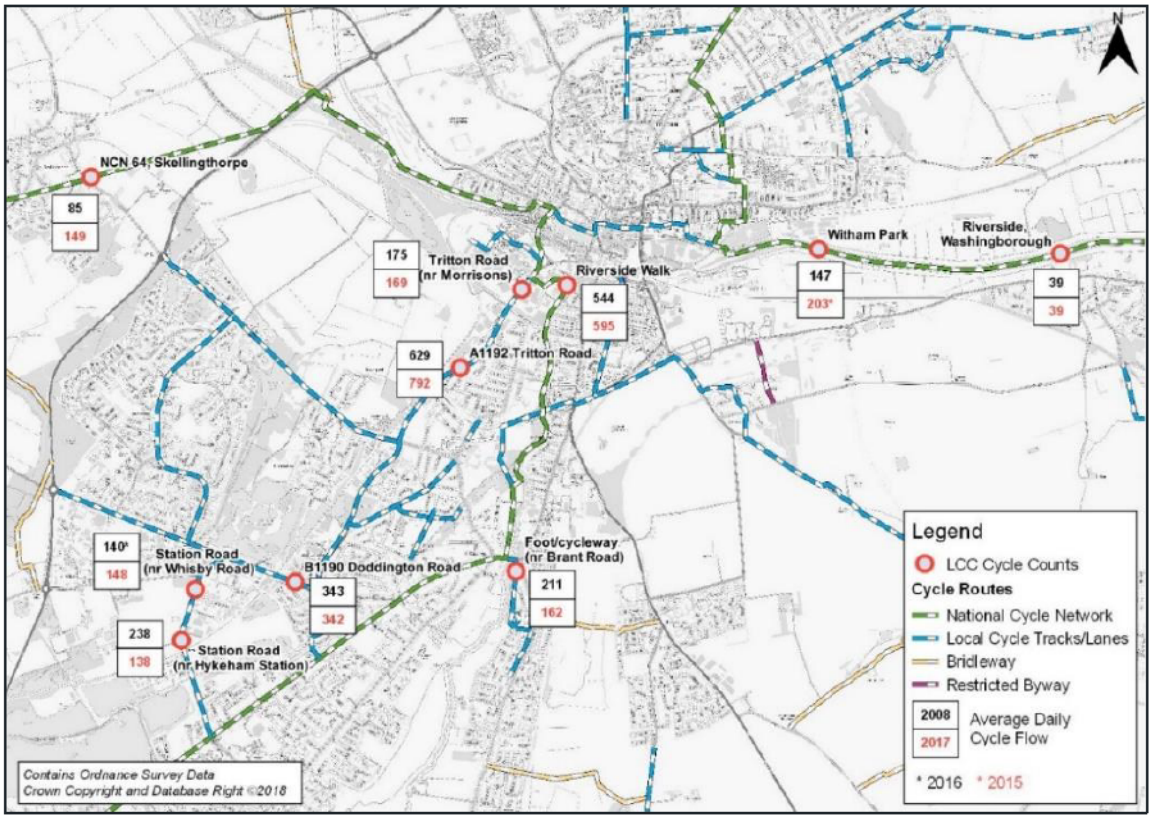
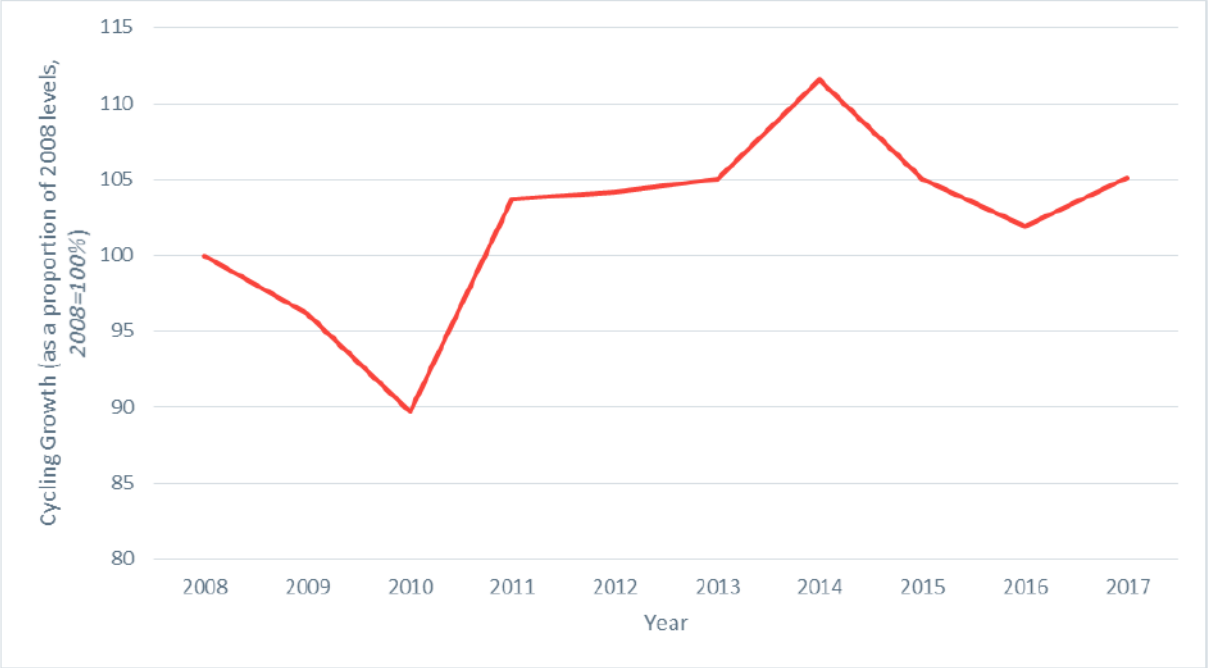


Figure 2-5 - Cycling level change



It is also noted that the SWQ will provide approximately 2,000 dwellings and 5 ha of employment land. This Sustainable Urban Extension will have direct access to NHRR. This has the potential to increase physical activity in the area.

In summary this assessment has shown:

- NHRR will maintain links on to existing cycling infrastructure and PROW;
- NHRR will provide additional infrastructure which will encourage physical activity and will also minimise conflict with vehicular traffic;
- A reduction in traffic levels on a number of routes will reduce barriers to physical activity; and
- The SUEs and in particular the SWQ will encourage additional physical activity in the area and will contribute to the increasing levels of cycling within the study area (over the last 10 years).

Whilst there is no formal requirement to score physical activity within the AST, given the evidence presented above, it is assessed that the impact of NHRR on Physical Activity will be **Slight Beneficial**. A qualitative statement is provided within the AST.

2.3 JOURNEY QUALITY

Tag Unit A4.1 states that '*travel is a derived demand that arises from people's desire to engage in activities. Therefore, a high-quality journey, when experienced, can be easily recognised'.* It highlights that journey quality is a measure of the real and perceived physical and social environment experienced while travelling. This indicator, where possible, will measure these elements of journey quality.

Social Impact Appraisal

Tag Unit A4.1 states that journey quality can be sub-divided into three groups, according to their nature:

- Traveller care: aspects such as cleanliness, level of facilities, information and the general transport environment;
- Travellers' views: the view and pleasantness of the external surroundings in the duration of the journeys; and
- Traveller stress: frustration, fear of accidents and route uncertainty.

When assessing the above, the without-scheme and with-scheme scenarios must be compared. A qualitative assessment has been undertaken in line with Tag Unit A4.1 and has been summarised in the table below.

Table 2-2 – Journey quality impacts

Factor	Sub-factor	Description	Impact
Traveller care	Cleanliness	This sub-factor refers to the cleanliness of public transport. As described previously public transport is beyond the remit of this scheme and so this sub-factor shall not be assessed.	N/A
	Facilities	NHRR is located within a rural location and no service stations and facilities will be delivered as part of the delivery of the NHRR and therefore there will be no change from the 'Do Minimum' scenario.	Neutral
	Information	This sub-factor primarily refers to information provided for public transport services and so has been scoped out of this assessment.	N/A
	Environment	This sub-factor primarily refers to the environment on board public transport services and so has been scoped out of this assessment.	N/A
Travellers views	-	The landscaping strategy and design for the NHRR will be sensitive to the views of the surrounding countryside and townscape including views of historic Lincoln.	Positive
Travellers stress	Frustration	It is anticipated that NHRR will have a positive impact in reducing driver frustration. This is through: ▪ Providing an additional east west route where a lack of route choice exists in the no scheme scenario; ▪ Reducing congestion on key radial routes resulting in improved journey times; ▪ Reducing congestion on the A46 orbital route resulting in journeys making better progress along this route; and ▪ Improved network resilience which means when an incident does occur NHRR can provide a viable alternative route which reduces driver frustration.	Positive
	Fear of potential accidents	The fear of potential accidents can cause a barrier to travel. For vulnerable groups such as pedestrians and cyclists this fear is a result of the conflict with vehicular traffic. This is dependent on the flow of traffic as well as the pedestrian / cycling facilities provided. Where there is a clear separation between cycling / walking facilities and vehicular traffic the	Positive

Factor	Sub-factor	Description	Impact
		fear of accidents is reduced. Furthermore, where suitable crossing provision is provided this further reduces the conflict. With the exception of NHRR, Figure 2-3 highlights where there will be a significant change in traffic flow (with an AADT of over 8,000 in the DM scenario). Key points include: ▪ There will be a reduction in traffic levels on Newark Road which reduces the fear of accidents for: • Cyclists travelling between the A46 and Bracebridge which has an on-road cycle lane as part of Regional Route 93; • Pedestrians along sections where there is a reduction in traffic; and • The presence of a traffic free cycling route within the city centre means there will be a minimal benefit for cyclists on this section as a clear separation from vehicular traffic already exists. ▪ Reduction in traffic on Lincoln Road / Hykeham Road and Brant Road which will reduce the fear of accidents for: • Cyclists given that there are no existing cycling facilities providing a separation from vehicular traffic; and • Pedestrians using the route. ▪ A reduction in traffic on Meadow Lane and Station Road which will reduce the fear of accidents for: • Cyclists given that there are no existing cycling facilities providing a separation from vehicular traffic; and • Pedestrians which is exacerbated by the lack of pavement on Meadow Lane. ▪ An increase in traffic on the B1188 Lincoln Road which may increase the fear of accidents for: • Cyclists given that there are no existing cycling facilities providing a separation from vehicular traffic; and • Pedestrians where a pavement only exists on one side of the road. ▪ An increase in traffic on the LEB which will have: • A minimal impact on the fear of accidents for pedestrians and cyclists due to the provision provided on the LEB. This includes a shared-use foot / cycleway separated from traffic and grade separated crossing opportunities; and ▪ A traffic flow on NHRR which will have: • A minimal impact on the fear of accidents for pedestrians and cyclists due to the provision provided on the NHRR. This includes a separation of cyclists / pedestrians from vehicular traffic through shared pedestrian and cycle route to the north side and a bridleway to the south side and 3 grade separated NMU structures offering safe crossing opportunities.	
	Route uncertainty	This sub factor refers to timetables, network maps and in route signs. Public transport and associated information of services is beyond the remit of this scheme and so will not be	Positive

Factor	Sub-factor	Description	Impact
		assessed. However, NHRR will be adequately signed and in line with the latest DMRB design standards.	

Whilst there is no formal requirement to score Journey Quality within the AST, given the evidence presented above, it is assessed that the impact of NHRR on Journey Quality will be **Slight Beneficial**. A qualitative statement is provided within the AST.

3 DISTRIBUTIONAL IMPACT

3.1 USER BENEFITS

User benefits of transport schemes are experienced by different groups of people in different areas. In order to measure this impact for NHRR a user benefit DI analysis has been undertaken, in line with TAG Unit 4.2.

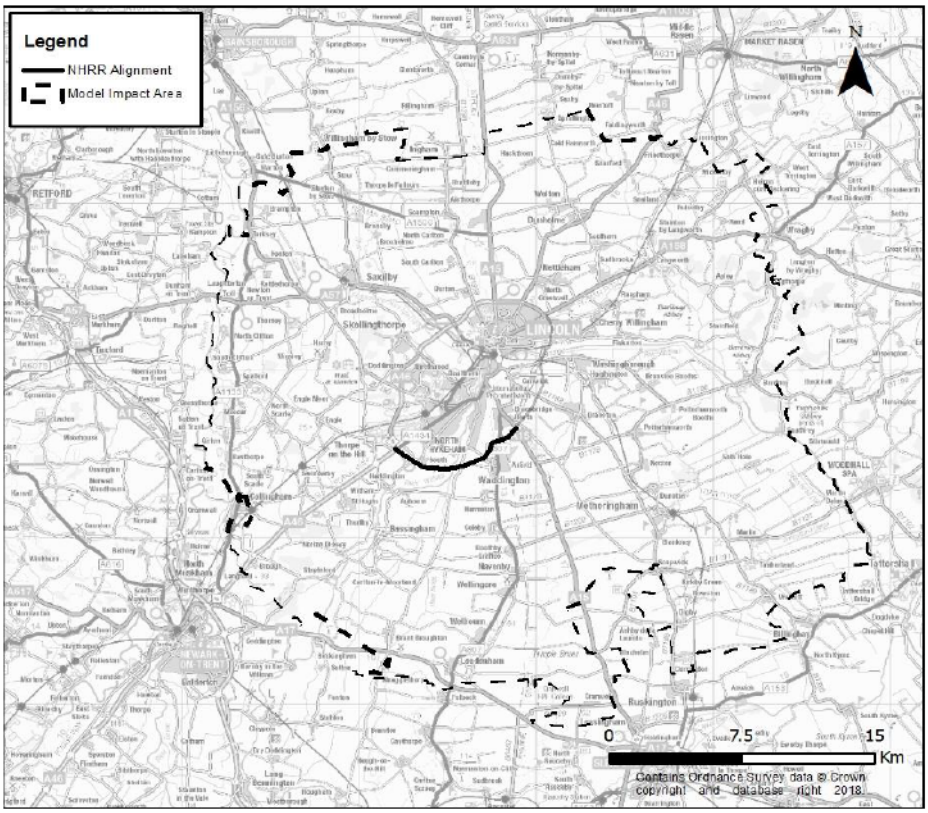
Screening (Step 1)

An initial screening proforma was undertaken which assessed the user benefits using the DfT's Transport User Benefit Appraisal (TUBA) software, where they have been quantified in conjunction with a spatially disaggregate transport model. TUBA calculates user benefits from the differences in travel times, vehicles operating costs (VOCs) and user charges between the Do-Minimum and Do-Something scenarios. The outputs can then be used to spatially identify a benefit per head of the population as a result of the scheme and assess the areas that will have the most significant impacts in relation to income distribution for people living within the impact area.

Areas of Impact (Step 2a)

The impact area for the user benefits is defined as the Fully Modelled Area (FMA) within the Greater Lincolnshire Transport Model (GLTM) and is shown in Figure 3-1. Within the FMA the transport modelled zones were used to define the DI assessment study area as this would provide a defined area where impacts could be quantified. The external modelled zones (which lie outside the 'model impact area' within Figure 3-1.

Figure 3-1 – Fully modelled area



Identification of Social Groups in Impact Area (Step 2b)

It is important to understand the distribution of user income within the impact area. To achieve this, the income domain from the Index for Multiple Deprivation (IMD) 2015 has been mapped at Lower Super Output Area (LSOA) level throughout the scheme area. The user benefit analysis was conducted on the FMA and the vast majority of zones within this matched the LSOAs respective boundaries. The high degree of commonality (i.e. overlapping) meant very little adjustment was necessary to assign the user benefits within the FMA zones to respective LSOAs. This methodology was found to be robust and met the requirements set out in TAG Unit 4.2. The end result provided user benefits assigned to each individual LSOA allowing the appraisal to focus on the impact across income deprivation quintiles.

Appraisal of Impacts (Step 3)

Table 3-1 shows the distribution of user benefits across the population within the scheme area by national income deprivation quintile.

Table 3-1 - Distribution of User Benefit Costs by Income Deprivation Quintile

	IMD Income Domain					
	0%<20%	20%<40%	40%<60%	60%<80%	80%<100%	Rest of England and Wales
Total user benefits of LSOA's within impact area (£M)	£10,315,174	£15,051,710	£21,119,728	£51,025,578	£30,468,538	£22,723,317
Share of user benefits within impact area	8%	12%	17%	40%	24%	_
Share of user benefits within Modelled Area (Inc. rest of England and Wales)	7%	10%	14%	34%	20%	15%
Population	28,709	33,971	40,438	50,310	46,962	56,075,912
Share of population in the impact area	14%	17%	20%	25%	23%	-
Assessment	✓	✓✓	✓✓	✓✓✓	✓✓	

Figure 3-2 presents a visual representation of the income domain quintiles and how user benefits are distributed throughout the impact area at LSOA level.

Figure 3-2 - IMD income domain

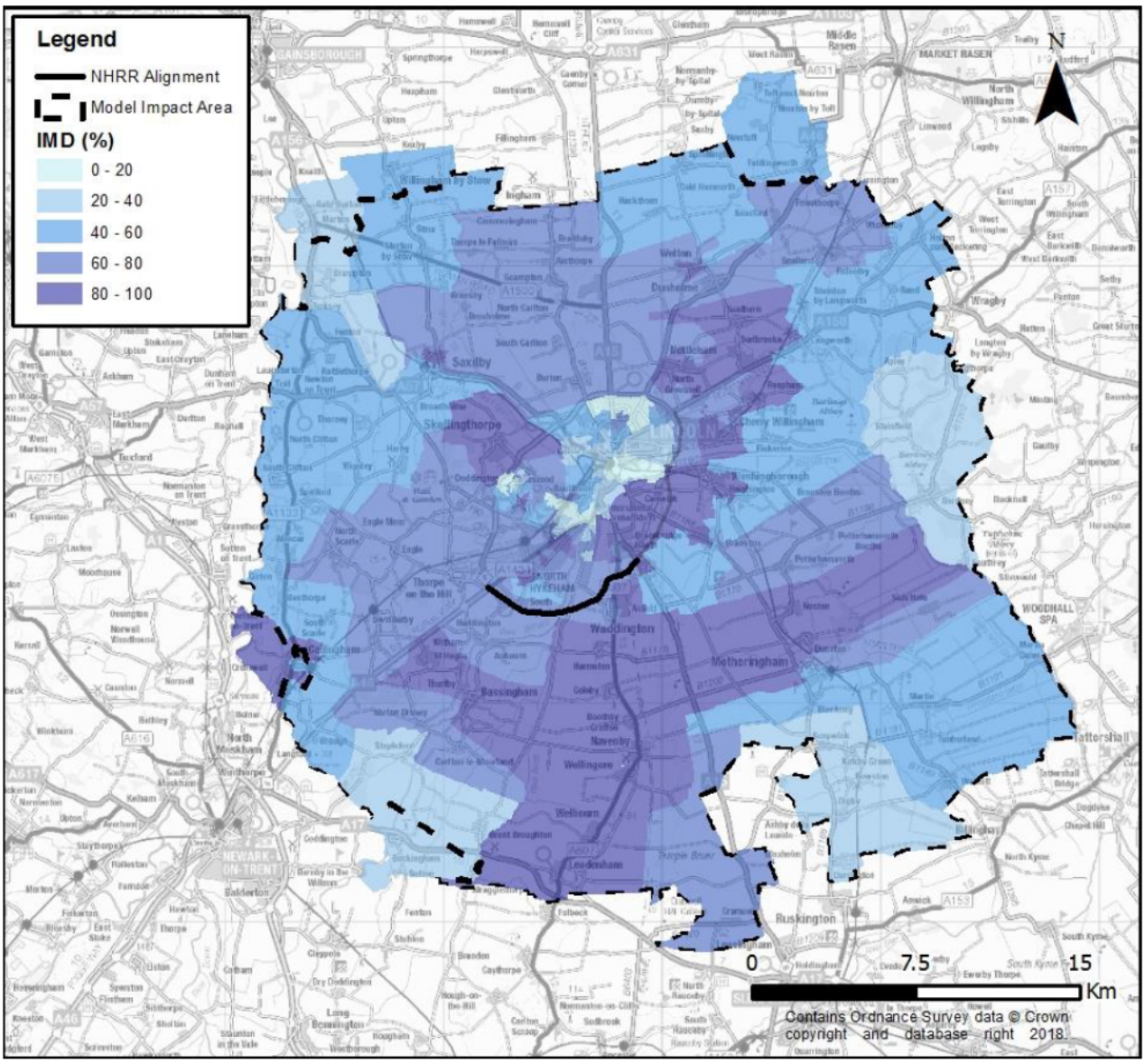
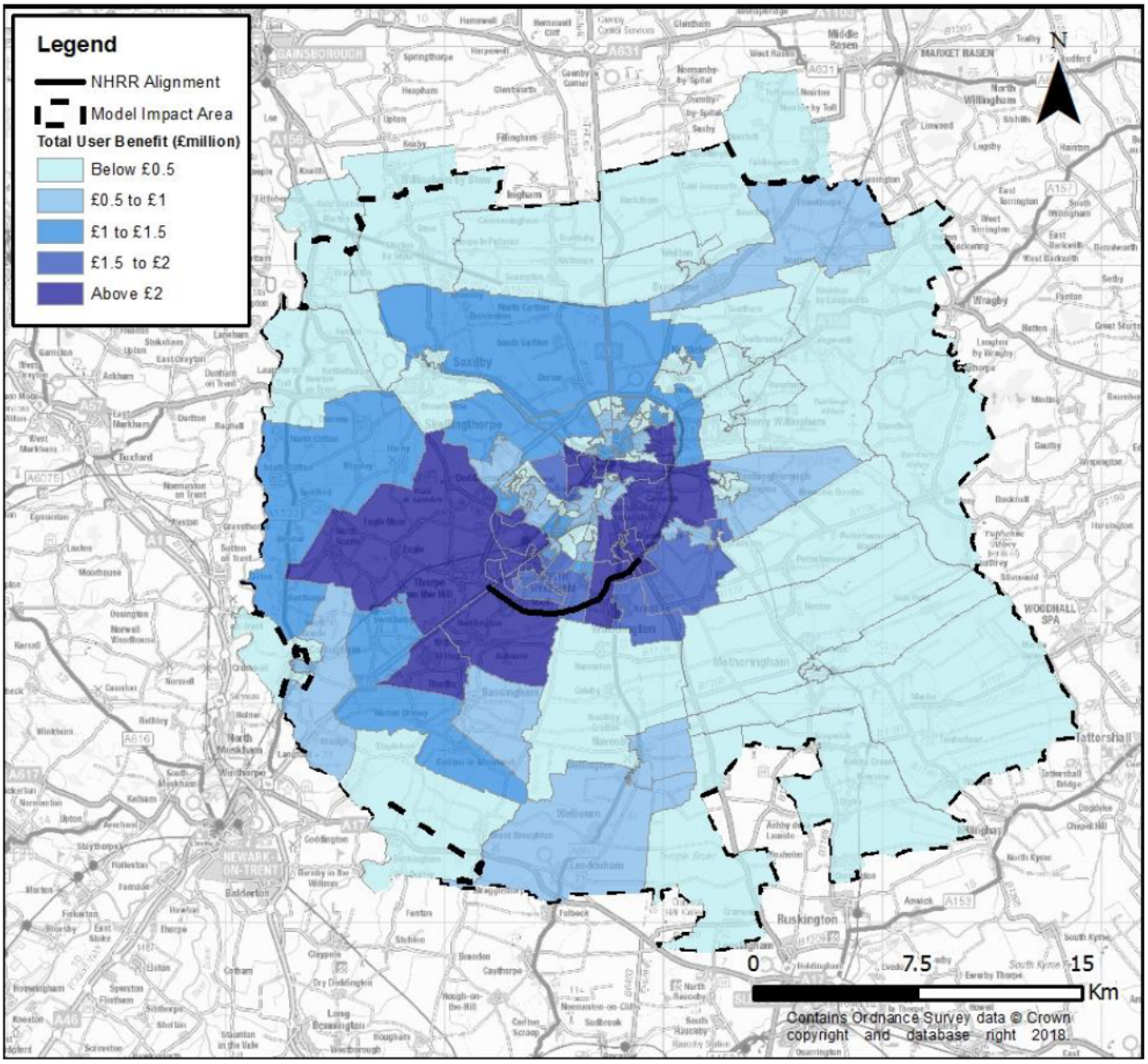


Figure 3-3 shows where the monetary benefits are being accrued within the impact area by LSOA level.

Figure 3-3 - User benefits disaggregated at LSOA level



The analysis shows:

- Around 85% of the benefits of the scheme are experienced by the population within the impact area;
- £127,980,728 benefits are experienced by users within the FMA;
- 20% of these benefits are experienced by those in the 40% most income deprived communities (0% < 40%);
- 57% of the benefits is experienced by those in the 40% to 80% income deprived group; and
- 24% in the least income deprived group (80% < 100%).

Based on the evidence provided, the DI assessment of User Benefits for NHRR is considered to be Moderate Beneficial.

3.2 NOISE

In total there are 20,179 residential properties within the Noise Calculation Area, with an estimated population of 46,412 (based a factor of 2.3 per household).

TAG unit A4-2 requires the impacts of noise on the following social groups to be assessed:

- Income Distribution; and
- Children: proportion of population aged <16
- Older people: proportion of population aged 70+

The Study Area for Distributional Impact (DI) appraisal is the same as identified in the TAG Unit A3 environmental noise impact appraisal.

The Lower Super Output Areas (LSOA) within the Study Area and their population and income profile are detailed in Table 3-2 below:

Table 3-2 – LSOAs within Noise Study Area

LSOA Code	Ward	Population	Quintile[1]
E01026169	Lincoln 011G	1534	20-40%
E01026170	Lincoln 010B	1466	0-20%
E01026171	Lincoln 011H	1635	40-60%
E01026173	Lincoln 010D	1579	0-20%
E01026174	Lincoln 008D	1486	0-20%
E01026175	Lincoln 010E	1889	0-20%
E01026177	Lincoln 006C	1992	0-20%
E01026178	Lincoln 006D	1818	0-20%
E01026182	North Kesteven 003B	1568	80-100%
E01026184	North Kesteven 004A	2027	80-100%
E01026185	North Kesteven 004B	1981	40-60%
E01026186	North Kesteven 001A	1746	80-100%
E01026187	North Kesteven 001B	1985	80-100%
E01026132	Lincoln 005A	3166	20-40%
E01026133	Lincoln 008A	4309	20-40%
E01026134	Lincoln 006A	1561	0-20%
E01026135	Lincoln 008B	1673	20-40%

LSOA Code	Ward	Population	Quintile[1]
E01026137	Lincoln 011A	1150	40-60%
E01026139	Lincoln 011C	1413	80-100%
E01026141	Lincoln 011E	1465	60-80%
E01026142	Lincoln 011F	1192	0-20%
E01026188	North Kesteven 004C	2289	40-60%
E01026190	North Kesteven 004D	1516	20-40%
E01026195	North Kesteven 006C	2015	60-80%
E01026199	North Kesteven 003D	2389	20-40%
E01026203	North Kesteven 001D	1878	80-100%
E01026211	North Kesteven 005C	2093	60-80%
E01026214	North Kesteven 014A	1111	60-80%
E01026215	North Kesteven 014B	1074	80-100%
E01026218	North Kesteven 014C	1203	40-60%
E01026219	North Kesteven 014D	1181	60-80%
E01026220	North Kesteven 013A	2235	40-60%
E01026237	North Kesteven 004E	1068	40-60%
E01026238	North Kesteven 004F	1409	60-80%
E01032988	North Kesteven 013B	1906	20-40%
E01032989	North Kesteven 013C	1910	20-40%
E01032990	North Kesteven 003G	3551	80-100%
E01032991	North Kesteven 014E	1700	60-80%
E01032992	North Kesteven 014F	1519	40-60%
E01032993	North Kesteven 013D	2084	60-80%
E01032994	North Kesteven 003H	1451	40-60%

1. Quintiles have been normalised to the scheme and defined locally. Each LSOA has been allocated to one of the five income quintiles. The top ranked 20% of LSOAs have been assigned to the lowest income quintile, the next highest 20% to the next income quintile and so on.

Using a Geographic Information System (GIS), the number of residential properties experiencing an increase, decrease or no change in noise level, in each of the LSOAs, as a result of the scheme in the 15th year after opening are identified.

Table 3-3 reports the noise impact of the proposed scheme for each quintile in the income domain of Index of Multiple Deprivation (IMD).

Table 3-3 – Noise DI Analysis

	IMD Income domain					Total
	0-20%	20-40%	40-60%	60-80%	80-100%	
Population with increased noise	0	512	2039	269	260	3080
Population with decreased noise	11817	6964	7802	8928	5867	41378
Population with no change in noise level	1166	10927	4690	3861	9115	29759
Net number of winners / losers	11817	6452	5763	8659	5607	-
Total number of winners / losers across all groups	-	-	-	-	-	38298
Net winners / losers as %	30.9%	16.8%	15.0%	22.6%	14.6%	-
Share of total population in study area	17.5%	24.8%	19.6%	17.6%	20.5%	100.0%
Assessment	Large Beneficial ✓✓✓	Slight Beneficial ✓	Moderate Beneficial ✓✓	Large Beneficial ✓✓✓	Slight Beneficial ✓	

From Table 3.3 it is evident that the most deprived quintile has 17.5% share of the total population and 30.9% of the net winners. The proportion of the net winners is greater than the proportion of the population as a whole, and it is therefore appropriate to give a score of large beneficial.

The second most deprived quintile has a 24.8% share of the total population and 16.8% of the net winners. The proportion of net winners is smaller than the proportion of the population as a whole, and it is therefore appropriate to give a score of slight beneficial.

The next most deprived quintile has a 19.6% share of the total population and 15% of the net winners. The proportion of net winners is in line with the proportion of the population as a whole, and it is therefore appropriate to give a score of moderate beneficial.

The second least deprived quintile has a 17.6% share of the total population and 22.6% of the net winners. The proportion of net winners is greater than the proportion of the population as a whole, and it is therefore appropriate to give a score of large beneficial.

The least deprived quintile has a 20.5% share of the total population and 14.6% of the net winners. The proportion of net winners is smaller than the proportion of the population as a whole, and it is therefore appropriate to give a score of slight beneficial.

Unit A4.2 also requires the noise impact of the scheme on children and over 70s to be assessed. This has been done by appraising the change in noise level between DM and DS scenarios at all identified schools and nursing/care homes in the area in the 15th year after opening. This appraisal is reported in Table 3-4 and Table 3-5. The assessment for each receptor included within these tables has been undertaken adopting the guidance on the classification of noise impacts associated with short term changes in noise levels as set out in DMRB HD 213/11 (Table 3.1).

Table 3-4 – Noise impact at schools in the study area

School location	Noise Level, dB(A), $L_{A10,18h}$ (Free-field)			Assessment
	2041 DM	2041 DS	Change	
Tiber Road	40.2	38.4	-1.8	Minor Beneficial
Canwick Avenue	42.4	41.5	-0.9	Negligible Beneficial
High Dyke	40.7	40.3	-0.4	Negligible Beneficial
School Lane	50.4	49.6	-0.8	Negligible Beneficial
St Andrews Close	47	46	-1.0	Minor Beneficial
553 Newark Road	54.4	53.7	-0.7	Negligible Beneficial
Grange Crescent	41	39.8	-1.2	Minor Beneficial
Ash Grove	49.5	48.4	-1.1	Minor Beneficial
Bargate	42.7	41.7	-1.0	Minor Beneficial
Bristol Drive	45.4	44.5	-0.9	Negligible Beneficial
Grantham Road	61.5	61.1	-0.4	Negligible Beneficial
Grantham Road	61.5	61.1	-0.4	Negligible Beneficial
Hykeham Road	50.9	49.7	-1.2	Minor Beneficial
Hykeham Road	44.5	43.2	-1.3	Minor Beneficial
Mere	44	43.6	-0.4	Negligible Beneficial
Ravensmoor Close	47.4	46.1	-1.3	Minor Beneficial
Hykeham Road	44.6	43.2	-1.4	Minor Beneficial

School location	Noise Level, dB(A), $L_{A10,18h}$ (Free-field)			Assessment
	2041 DM	2041 DS	Change	
Kingsway	47.5	46.6	-0.9	Negligible Beneficial
Wath Lane	36.1	55.5	19.4	Major Adverse
Moor Lane	55.6	54.6	-1.0	Minor Beneficial

Table 3-5 – Noise impact at nursing/care homes in the study area

Care home location	Noise Level, dB(A), $L_{A10,18h}$ (Free-field)			Assessment
	2041 DM	2041 DS	Change	
Altham Terrace	41.1	40.5	-0.6	Negligible Beneficial
Boundary Street	41	40.4	-0.6	Negligible Beneficial
Bowden Drive	45.1	44.5	-0.6	Negligible Beneficial
High Street	42.9	42.5	-0.4	Negligible Beneficial
Mayall Court	42.3	41.8	-0.5	Negligible Beneficial
Middle Street	42.5	41.8	-0.7	Negligible Beneficial
Newark Road	44.9	43.9	-1.0	Minor Beneficial
Botolphs Crescent	67.1	66.3	-0.8	Negligible Beneficial
South Park	53.2	52.3	-0.9	Negligible Beneficial
Bernadette House South Park	44.3	43.4	-0.9	Negligible Beneficial
RI01 Brantley Manor Brant Road	41.3	40.6	-0.7	Negligible Beneficial
Fosse House Hykeham Road	53.6	52.7	-0.9	Negligible Beneficial
Grinter House Grinter Close	42.4	41.4	-1.0	Minor Beneficial
Neale Court Neale Road	40.2	39.5	-0.7	Negligible Beneficial
Scorer Street	45.5	44.7	-0.8	Negligible Beneficial
Langley Road	41.5	40.9	-0.6	Negligible Beneficial
Newark Road	57.8	57	-0.8	Negligible Beneficial

From Tables 3-4 and 3-5, it is evident that for all except one receptor, predicted noise level changes are small and are assessed as being negligible to minor beneficial. There is one school for which major adverse noise level increases are predicted. This receptor is located on Wath Lane within close proximity to the Proposed Scheme. Existing routes local to this receptor generally have low levels of road traffic, furthermore some routes local to this receptor, such as Meadow Lane and Wath Lane itself, have not been included within the traffic model. Calculated DM levels are therefore likely to be unrealistically low, thus resulting in a greater predicted noise level increase than is likely to be experienced in practice.

Based on the summary of impacts in Tables 3-4 and 3-5, the overall assessment of DI impacts for noise is considered to be **Minor Beneficial.**

3.3 AIR QUALITY

Detailed modelling using traffic data was undertaken to inform the OBC. The data output from that assessment was used to inform the DI analysis following the guidance in Chapter 4 of TAG Unit 4.2.

A summary of the outputs is shown in Table 3-6

Table 3-6 – Summary of the air quality DI analysis

Scenario	Distributional impact of income deprivation					Are the impacts distributed evenly?
	0-20%	20-40%	40-60%	60-80%	80-100%	
2026 NO_2	✓✓✓	✓✓✓	✓✓	✓	✓	No
2026 PM_{10}	✓✓✓	✓✓✓	×××	✓✓	✓✓	No
2041 NO_2	✓✓✓	✓✓✓	O	✓	✓✓	No
2041 PM_{10}	✓✓✓	✓	×××	✓✓	✓✓✓	No

Table 3-6 shows that most of the distributional benefits are concentrated in the lower two deprivation quintiles, however negative impacts in the 3rd quintile may have a negative impact on the positive impacts in the lower two quintiles. Positive impacts in the upper two quintiles, though they are smaller overall, may offset this.

The proportion population under the age of 16 within the air quality study area is 19%, and this is distributed evenly across the study area. Given the locations of the 20 schools, 21 play spaces and 73 parks and green spaces that intersect the study area it is considered that this cohort of the population will experience large positive benefits.

The total net present value of the changes in air quality is valued as a disbenefit of £9,152,430.

The locations of all residential receptors and the impacts upon them are shown in Appendix C.

Based on the summary of impacts in Table 3-6, the overall assessment of DI impacts for air quality is considered to be **Moderate Beneficial**.

3.4 ACCIDENTS

Any intervention that results in increases to traffic levels and speeds or reduces physical separation between people and traffic can give rise to increases in accidents. The approach to the SDI appraisal of accidents uses data from the accident assessment (COBALT assessment), changes in traffic flow as a result of NHRR and STATS 19 from the DfT's Road Casualties online database for 2013 to 2017 (the most recent complete 5-year period).

It is also noted that most accidents related to transport occur on the road network where there is a strong link between vulnerable groups and deprivation[3]. Tag Unit A4.2 states that vulnerable groups at risk in terms of accident include children and older people (both particularly as pedestrians) as well as young males. Further to this, it is noted that a child from a more deprived area is more likely to be involved in a fatal road accident than a child from a higher social class. As a result, the following groups will be considered when assessing this indicator:

- Children (under 16);
- Young adults (16 to 25);
- Older people (65+);
- Index of multiple deprivation; and
- Pedestrians.

Screening (Step 1)

NHRR is expected to impact on existing routing options, vehicle flow, vehicle speed and HGV's. In particular TAG Unit A4.2 states that a DI is necessary if there is -/+10% change in vehicle flow (annual average daily traffic). Model forecasts highlight that this is the case and so it is necessary to undertake a DI appraisal.

Areas of Impact (Step 2a)

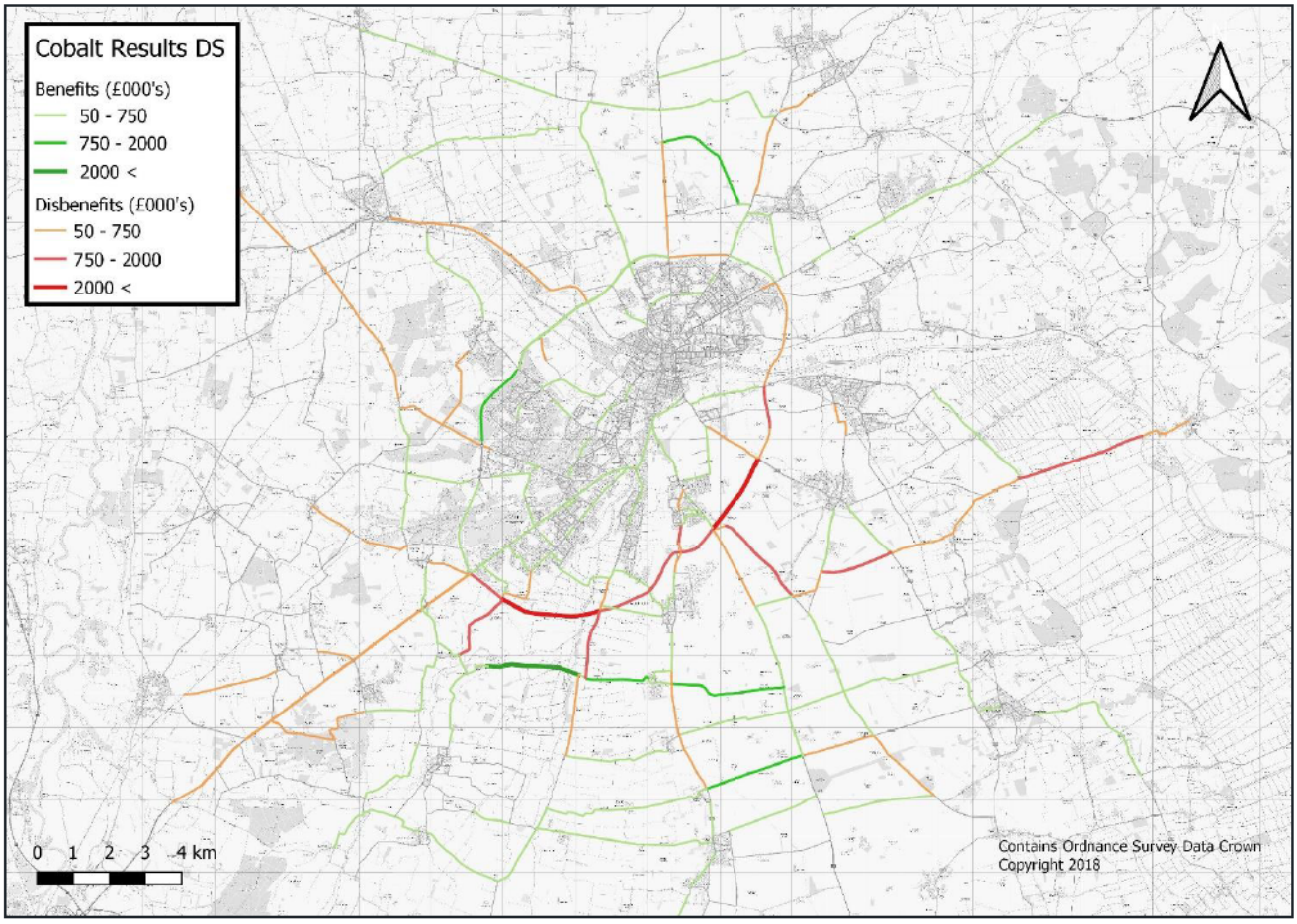
The wider accident area has been defined by the accidents analysis area covered by COBALT which monetises the accident benefits over a 60-year appraisal period. Figure 3-4 shows a breakdown of the monetised accident benefits / dis-benefits assigned to individual links. Key points include:

- There is a large dis-benefit on NHRR which is to be expected as the road did not previously exist. However, the inclusion of 3 grade separated NMU structures; a shared pedestrian and cycle route to the north side; and a bridleway to the south side will mean pedestrian / cycle conflict with vehicles is minimised which reduces the potential of accidents;

[3] This link has been highlighted within TAG Unit A4.2 (December 2015), P25.

- LEB will see an overall dis-benefit as a result of the increase in traffic on the route following the opening of the NHRR. However, accidents between vehicular traffic and pedestrians / cyclists will be minimised through the provision of a shared-use foot / cycleways separated from traffic and grade separated crossing opportunities which means there will be minimal conflict between pedestrians / cyclists and vehicular traffic;
- The majority of radial routes will see an accident benefit as strategic traffic transfers on to the NHRR instead of travelling via the city centre and through residential areas; and
- A number of links on the A46 will see accidents benefits as traffic transfers on the NHRR.

Figure 3-4 - COBALT Results



For the purposes of the DI assessment and in accordance with Tag Unit A4.2 the area of impact has been focused and defined by identifying areas where 'the intervention causes any significant changes (-/+10%) in vehicle flow'. These links have been identified and displayed within the GIS analysis along with observed accident locations categorised by severity (2013 to 2017) along these routes. This reduces the study area and in doing so focuses on the distribution of benefits.

Identification of Vulnerable Groups in Impact Area (Step 2b)

As mentioned previously and highlighted within Tag Unit A4.2 a number of vulnerable groups have been identified. This indicator will look to assess the identified vulnerable groups in relation to:

- Percentage of the population impacted belonging to:

- Children (under 16);
- Older people (65+); and
- Deprived communities (using the Index of Multiple Deprivation).

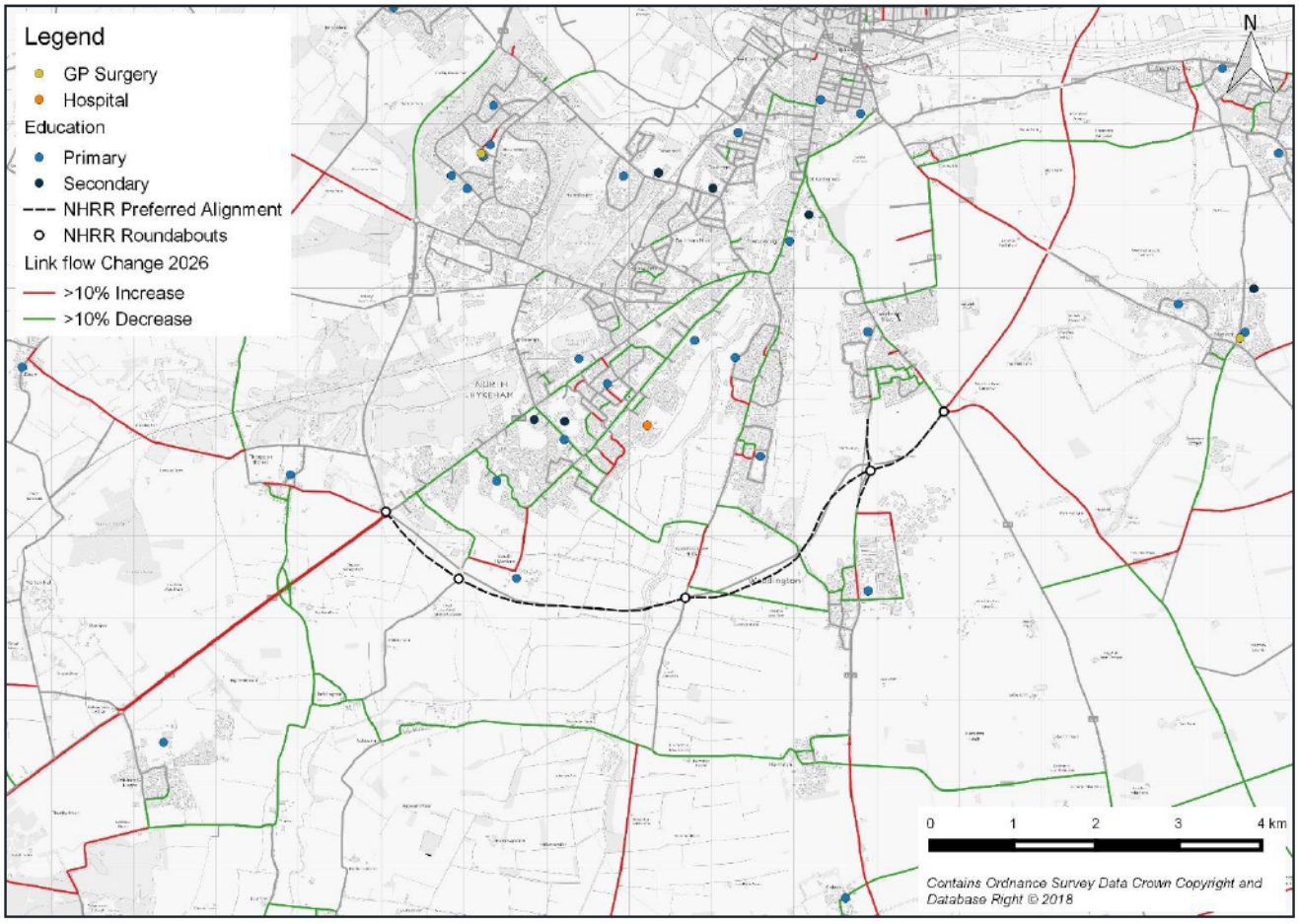
- Accidents (2013 - 2017) highlighting incidents involving:
  - Pedestrians;
  - Children (under 16);
  - Young adults (16 -25); and
  - Older people (65+).

Maps showing the distribution of the above in relation to traffic changes (-/+10%) is presented within Appendix D. A summary of the key points is presented within Table 3-8 with other key considerations. A more detailed assessment for vulnerable groups involved in collisions (2013 - 2017) is provided within the appraisal of impact section.

Amenities in the Impact Area (step 2c)

The concentration of vulnerable groups is not only dependant on the resident population but also on local amenities that may attract visitors from vulnerable groups. As a result, a 1km buffer (to represent pedestrian walking distance) has been placed around impacted roads which saw a -/+10% change in vehicle flow (as stipulated by Tag Unit A4.2) and amenities which fall within these buffers identified. The results are shown in the map below.

Figure 3-5 - Impacted amenities



A summary of Figure 3-5 is presented within Table 3-7. Instances where there is 10% decrease in traffic flow within 1km of an amenity has been assessed as a positive impact representing a potential decrease in collisions in the future and where there is a 10% increase the opposite holds true.

Table 3-7 – Impact of NHRR on amenities

Facilities	Positive Impact (number of amenities)	Negative Impact (number of amenities)	Difference (number of amenities)
Primary School	49	42	+7
Secondary School	9	6	+3
Hospital	5	7	-2
GP Surgery	5	5	0

As shown in Table 3-7 NHRR will have a slight positive in terms of access to amenities with respect to future accidents within the vicinity.

Table 3-8 – Summary of accident impact on vulnerable groups

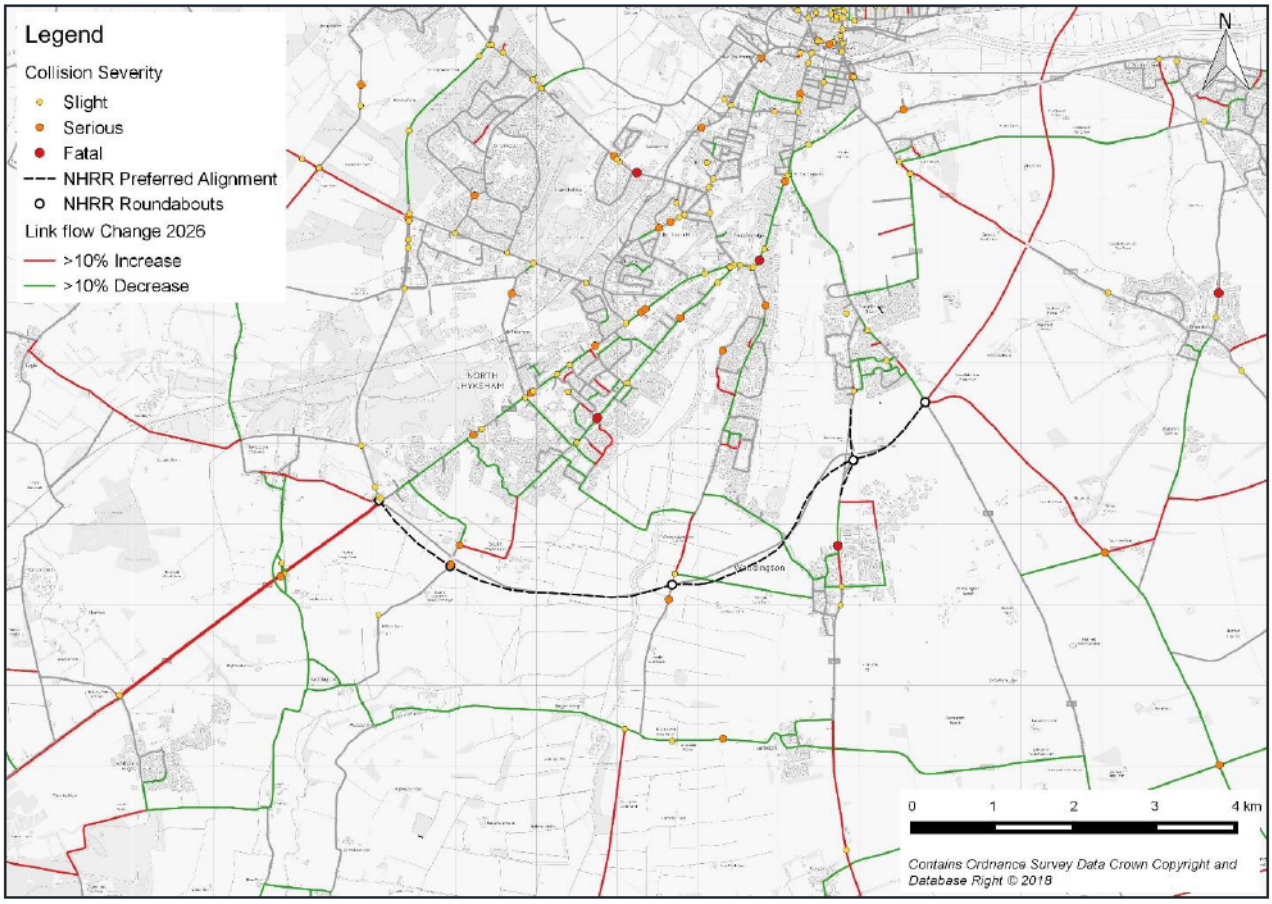
Location	Accident benefit (COBALT)	Percentage of the population belonging to identified vulnerable groups (aged under 16; aged 65+; and belonging to deprived communities)	Vulnerable groups involved in a collision (2013 -2017)	Other considerations
NHRR	Large dis-benefit.	NHRR is located in a rural location and so the number of people living in close proximity to the link road will be low. As a result, the impact on the actual number of people belonging to the identified vulnerable groups will also be low. With this in mind, key observations include: ▪ Relatively high proportion of individuals aged under 16; ▪ Pockets of low and relatively high percentage of individuals aged 65+ along the route; and ▪ NHRR crosses LSOAs with relatively low levels of deprivation.	The road is not in operation and so no data can be obtained.	▪ NHRR will include grade separated NMU structures and separated cycling and walking provision from the highway. This minimises conflict between vehicular traffic and pedestrians / cyclists resulting in a relatively safe environment for pedestrians and cyclists; ▪ It is noted that the minimum age for being issued a driving license is 17 and so individuals aged 16 or under are more likely to walk or cycle and therefore use NMU facilities on this route; and ▪ When individuals are aged 70 they will have to renew their license every 3 years and this is assessed on their ability to drive. As a result, there will be fewer drivers 70+ and they may be more likely to use the pedestrian facilities provided as part of NHRR.
LEB	Moderate to large dis-benefit	LEB is largely located in a rural location and so the number of people living in close proximity to the link road will be low. As a result, the impact on the actual number of people belonging to the identified vulnerable groups will also be low. Key observations from the maps include: ▪ Low percentage of individuals aged under 16; ▪ A high percentage of individuals aged 65+; and ▪ Crosses LSOAs with relatively low levels of deprivation.	The road is not in operation and so no data can be obtained.	▪ LEB will have a shared-use foot / cycleway separated from traffic and grade separated crossing opportunities which means there will be minimal conflict between pedestrians / cyclists and vehicular traffic; ▪ It is noted that the minimum age for being issued a driving license is 17 and so individuals aged 16 or under are more likely to walk or cycle and therefore use NMU facilities on this route; and ▪ When individuals are aged 70 they will have to renew their license every 3 years and this is assessed on their ability to drive. As a result, there will be fewer drivers 70+ and they may be more likely to use the pedestrian facilities provided as part of the LEB.

Location	Accident benefit (COBALT)	Percentage of the population belonging to identified vulnerable groups (aged under 16; aged 65+; and belonging to deprived communities)	Vulnerable groups involved in a collision (2013 -2017)	Other considerations
Radial routes south of the city centre	Benefit	The radial routes are within an urban area and so the actual number of people living in this area is proportionately larger than rural locations. Key observations from the maps include: ▪ Moderate to low percentage of individuals aged under 16; ▪ High percentage of individuals aged 65+; and ▪ Crosses LSOAs with relatively low levels of deprivation.	Newark Road has a proportionately higher collision rate involving vulnerable groups compared to other radial routes to the south of the city centre.	N/A
City centre	Benefit	▪ Pockets containing a high percentage of children aged under 16; ▪ High percentage of individuals aged 65+; and ▪ Crosses LSOAs with high levels of deprivation.	Higher concentration of collisions involving pedestrians and younger people compared to other locations.	N/A
Local roads providing east west connectivity in North Hykeham	Large to moderate benefit	These routes consist of semi-rural roads and so the actual number of people living in this area is lower than the more urbanised areas. Key observations from the maps include: ▪ Pockets containing a high, medium and a low percentage of children aged under 16; ▪ High percentage of individuals aged 65+; and ▪ Crosses LSOAs with relatively low levels of deprivation.	Relatively low levels of collisions involving vulnerable groups along these routes.	N/A

Appraisal of Impact (Step 3)

The map below shows collisions according to severity in relation to where there is forecast to be a -/+10% change in vehicle flow.

Figure 3-6 - Accidents by severity (2013-2017)



The collisions data has been broken down further to show the number of vulnerable groups involved in the incidents which includes:

- Pedestrians;
- Children (under 16);
- Young adults (16 -25); and
- Older people (65+).

Where traffic flows are forecast to decrease by 10% it is anticipated that this will have a positive impact on accident levels and where traffic is forecast to have an increase by 10% this will have a negative impact on collisions. The result of this exercise is summarised within Table 3-9.

Table 3-9 – Impact of NHRR on collisions

Vulnerable groups	Number of People Involved in Collisions											
	Positive impact				Negative impact				Difference			
	Slight	Serious	Fatal	Total	Slight	Serious	Fatal	Total	Slight	Serious	Fatal	Total
Children (<16)	43	3	0	46	14	2	0	16	+29	+1	0	+30
Young adults (16-25)	157	24	0	181	49	19	1	69	+108	+5	-1	+180
Older people (>65)	46	13	3	62	29	4	0	33	+17	+9	+3	+29
Pedestrians	38	6	2	46	5	1	1	7	+33	+5	+1	+39

Table 3-9 shows that NHRR will have a significant positive impact on vulnerable groups in terms of accidents.

Based on the evidence provided, the DI assessment for NHRR in relation to accidents is considered to be Moderate Beneficial.

3.5 SEVERANCE

The severance impacts of a transport scheme are a measure of the scheme's impact on residents' access to local community facilities and services. An assessment is required for non-motorised users, particularly pedestrians, as stated in TAG Unit A4.2.

Screening (Step 1)

Severance impacts were assessed by considering the forecast changes in vehicle flow. As the scheme provides a new road link road to the south of Lincoln it is anticipated that traffic will re-route from the local road network south of Lincoln onto NHRR resulting in less traffic on the local road network. Traffic acts as a barrier to walking and cycling including at peak times where there is evidence of rat running on the local road network. Furthermore, a shared pedestrian and cycle route on the north side of NHRR and a bridleway on the south side of NHRR will be provided. This is expected to help reduce barriers to cycling and walking and it is expected that the scheme in general will reduce the 'severance' of communities in the South of Lincoln. Therefore, it is appropriate to examine these areas further to understand the severance impacts on vulnerable groups.

Areas of Impact (Step 2a)

The impact area has been defined through the severance analysis, described in TAG Unit A4.1 and A4.2. A 1km buffer was placed around roads which were considered to have a severance impact. This distance was chosen as it was considered suitably robust to cover walking distances to community facilities. Severance in this instance are roads which are forecast to have a significant change in vehicle flow (-/+>10%) and in accordance with DMRB guidance (Volume 11, Section 3.8)