



**Norfolk County Council**

---

# **NORWICH WESTERN LINK**

Strategic Outline Business Case





Norfolk County Council

---

# NORWICH WESTERN LINK

Strategic Outline Business Case

**TECHNICAL REPORT (VERSION 1.1) PUBLIC**

**PROJECT NO. 70041922**

**OUR REF. NO. 70041922-WSP-SOBC**

**DATE: JUNE 2019**

WSP

62-64 Hills Road

Cambridge

CB2 1LA

Phone: +44 1223 558 050

Fax: +44 1223 558 051

WSP.com



# QUALITY CONTROL

---

Issue / revision		Revision 1	Revision 2	Revision 3
Remarks	Draft 1.2	Draft 1.3	Draft 1.41	Final
Date	07/06/2019	14/06/2019	28/06/2019	28/06/2019
Prepared by	UKSDP600 UKACP002 UKBRL002 UKDXK014	UKSDP600 UKACP002 UKBRL002 UKDXK014	UKSDP600 UKACP002 UKBRL002 UKDXK014	UKSDP600 UKACP002 UKBRL002 UKDXK014
Signature				
Checked by	UKLMA001 UKDCG002 UKCAD001	UKLMA001	UKLMA001	UKLMA001
Signature				
Authorised by	UKJNL001			UKJNL001
Signature				
Project number	70041922	70041922	70041922	70041922
Report number	SOBC_DRAFT1	SOBC_Draft v1.2	SOBC_Draft v1.3	SOBC Final
File reference	\\uk.wspgroup.com\central data\Projects\700419xx\70041922 - Norwich Western Link\02 WIP\TP Transport planning\03 Document			

# CONTENTS

---

<b>EXECUTIVE SUMMARY</b>	<b>1</b>
<b>1 INTRODUCTION</b>	<b>9</b>
1.2 DOCUMENT STRUCTURE	9
<b>2 STRATEGIC CASE</b>	<b>10</b>
2.1 BACKGROUND	10
2.2 LOCAL CONTEXT	12
2.3 EVIDENCE OF STRATEGIC FIT	14
2.4 PROBLEM IDENTIFIED	37
2.5 IMPACT OF NOT CHANGING	49
2.6 OBJECTIVES	50
2.7 MEASURES FOR SUCCESS	51
2.8 SCOPE OF THE PROPOSED SCHEME	54
2.9 CONSTRAINTS AND INTERDEPENDENCIES	54
2.10 OPPORTUNITIES FOR GROWTH AND INWARD INVESTMENT	55
2.11 STAKEHOLDERS	57
2.12 OPTIONS	62
2.13 SUMMARY	64
<b>3 ECONOMIC CASE</b>	<b>66</b>
3.1 INTRODUCTION	66
3.2 ECONOMIC APPRAISAL METHODOLOGY	66
3.3 OPTIONS APPRAISED	67
3.4 TRANSPORT ECONOMIC EFFICIENCY	70
3.5 WIDER ECONOMIC BENEFITS	73
3.6 ENVIRONMENTAL IMPACT APPRAISAL	74

---



3.7	SOCIAL	78
3.8	PUBLIC ACCOUNTS	81
3.9	BENEFIT COST RATIO	82
3.10	SUMMARY OF IMPACTS	84
<b>4</b>	<b>FINANCIAL CASE</b>	<b>86</b>
4.1	INTRODUCTION	86
4.2	BASE COST ESTIMATES	86
4.3	SPEND PROFILE	87
4.4	SCHEME COST	89
4.5	BUDGETS AND FUNDING COVER	90
4.6	FUNDING COVER FOR WHOLE LIFE COSTS	91
4.7	AFFORDABILITY	91
4.8	SUMMARY OF THE FINANCIAL CASE	91
<b>5</b>	<b>COMMERCIAL CASE</b>	<b>92</b>
5.1	INTRODUCTION	92
5.2	OUTPUT BASED SPECIFICATION	92
5.3	SOURCING TEAM	93
5.4	PROCUREMENT STRATEGY	93
5.5	SOURCING OPTIONS	97
<b>6</b>	<b>MANAGEMENT CASE</b>	<b>99</b>
6.1	INTRODUCTION	99
6.2	EVIDENCE OF SIMILAR PROJECTS	99
6.3	PROJECT GOVERNANCE, ORGANISATIONAL STRUCTURE & ROLES	102
6.4	PROGRAMME AND PROJECT PLAN	110
6.5	ASSURANCE & APPROVALS PLAN	111
6.6	COMMUNICATIONS & STAKEHOLDER MANAGEMENT	112
6.7	PROJECT REPORTING	113
6.8	RISK MANAGEMENT STRATEGY	114

<b>6.9</b>	<b>BENEFITS REALISATION PLAN (OUTLINE)</b>	<b>117</b>
<b>6.10</b>	<b>MONITORING AND EVALUATION PLAN</b>	<b>120</b>
<b>6.11</b>	<b>CONCLUSIONS</b>	<b>123</b>

---

## **TABLES**

Table 2.1 – NPPF Sustainable Development Objectives	16
Table 2.2 – TIS Objectives	17
Table 2.3 – Highways England Strategic Business Plan 2015-2020 Summary	19
Table 2.4 - Connecting Norfolk Policies Summary	26
Table 2.5 - Norfolk Strategic Framework Objectives	29
Table 2.6 - NATS transport priorities	32
Table 2.7 – Severity and casualties of accidents in study area 2013-2017	44
Table 2.8 – Indicative scheme targets	51
Table 2.9 - Stakeholder Groups	57
Table 3.1 – Optimism Bias (£)	68
Table 3.2 - Transport User Benefits (TUBA Results)	70
Table 3.3 – Stress Assessment Results	72
Table 3.4 – Reliability Assessment	73
Table 3.5 - Output Change in Imperfectly Competitive Markets	74
Table 3.6 – Environmental Appraisal Summary Table	76
Table 3.7 – NWL Study Area Accident Analysis	79
Table 3.8 – Public Accounts Table	82
Table 3.9: - Analysis of Monetised Costs and Benefits - Initial	83
Table 3.10: - Analysis of Monetised Costs and Benefits - Adjusted	84
Table 3.11: Value for Money Statement.	85
Table 4.1 - Estimated Scheme Costs	87
Table 4.2 – Options Spend Profile (£)	88
Table 4.3 – Inflation (£)	88
Table 4.4 – Risk Allowance	89
Table 4.5 - Scheme costs (£)	89

Table 4.6 - Funding request (£)	90
Table 6.1 – Experience of Similar Recent Projects	100
Table 6.2 – Project Board	104
Table 6.3 – Delivery Team members and roles	106
Table 6.4 – Key Delivery Milestones	110
Table 6.5 – Strategic Objectives (High Level), outputs and outcomes	118
Table 6.6 - Scheme Objectives, outputs and outcomes	119
Table 6.7 - Enhanced monitoring	121
Table 6.8 - Data requirements (outline)	121

---

## **FIGURES**

Figure 2.1 – Study area	13
Figure 2.2 – Economic Strategy and Transport Strategy Themes	22
Figure 2.3 - Strategic Infrastructure projects in Local Authority control	30
Figure 2.4 – GNLP Draft Vision and Objectives	35
Figure 2.5 – Greater Norwich Local Plan baseline committed growth	37
Figure 2.6 – PICs in the study area 2013-2017	44
Figure 2.7 – PICs along the A1067; Attlebridge	45
Figure 2.8 - PICs along the A1067; Drayton	46
Figure 2.9 – PIAs along the A47 / A1074	47
Figure 2.10 - Scheme objectives	53
Figure 2.11 – A47 North Tuddenham to Easton scheme	56
Figure 2.12 - Level of support for the proposed options	60
Figure 2.13 - Effectiveness of NWL options	61
Figure 2.14 - The 4-Shortlisted Highway Link Options	63
Figure 3.1 - Calculation of BCR and VfM score - methodology	66
Figure 3.2 - Scheme Assessment Routes – Journey Time Reliability	72
Figure 5.1 - Prime contracting (design largely or entirely by client or consultant)	94
Figure 5.2 - Design and build by tier one contractor	94
Figure 6.1: - Project Governance Diagram	103

## **APPENDICES**

Appendix A - Technical Note 1 - Traffic Data and Forecast Conditions Overview

Appendix B - Letters Of Support

Appendix C - Technical Note 2 - Model Overview

Appendix D - Technical Note 3 Economic Narrative

Appendix E - Technical Note 4 Environmental Impact Appraisal Overview

Appendix F - Appraisal Summary Table

Appendix G - Option Base Costs

Appendix H - Project Programme

Appendix I - Risk Register

## **GLOSSARY**

<b>Acronym</b>	<b>Meaning</b>
AADT	Annual Average Daily Traffic
AMCB	Analysis of Monetised Costs and Benefits
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
ARN	Affected Road Network
ATC	Automatic Traffic Count
BCR	Benefit to Cost Ratio
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
CDM	Construction Design and Management
CO <sub>2</sub>	Carbon Dioxide



Acronym	Meaning
CPO	Compulsory Purchase Order
CWS	County Wildlife Site
DBA	Desk Based Assessment
DfT	Department for Transport
DIADEM	Dynamic Integrated Assignment and Demand Model
DMRB	Design Manual for Roads and Bridges
EAST	Early Assessment and Sifting Tool
EA	Environment Agency
ECC	Engineering Construction Contract
ECI	Early Contractor Involvement
EHV	Extra High Voltage
EIA	Environmental Impact Assessment
ES	Environmental Statement
FBC	Full Business Case
FEZ	Food Enterprise Zone
GDP	Gross Domestic Product
GEH	Geoffrey E. Havers
GNDP	Greater Norwich Development Partnership
GVA	Gross Value Added
HER	Heritage Environment Record
HGV	Heavy Goods Vehicle
HRA	Habitats Regulations Assessment
HSE	Health and Safety Executive
ICT	Information and Communications Technology
IMD	Indices of Multiple Deprivation
ITS	Integrated Transport Strategy
JCS	Joint Core Strategy

Acronym	Meaning
JTV	Journey Time Variability
KSI	Killed or Seriously Injured
LDO	Local Development Order
LEP	Local Enterprise Partnership
LEZ	Low Emission Zone
LGV	Light Goods Vehicle
LIDAR	Light Detection and Ranging
LLG	Local Liaison Group
LLM	Large Local Majors
LMVR	Local Model Validation Report
LNR	Local Nature Reserve
LPA	Local Planning Authority
LSOA	Lower Super Output Area
LTB	Local Transport Board
LTP	Local Transport Plan
MCC	Manual Classified Count
MRN	Major Road Network
MWG	Member Working Group
NATS	Norwich Area Transport Strategy
NCA	National Character Area
NCC	Norfolk County Council
NCN1	National Cycle Network Route 1
NDR	Northern Distributor Road ( <i>now named A1270 Broadland Northway</i> )
NIA	Noise Important Area
NIS	National Institute of Statistics
NMU	Non-Motorised User
NNUH	Norfolk and Norwich University Hospital

Acronym	Meaning
NO <sub>2</sub>	Nitrogen Dioxide
NPPF	National Planning Policy Framework
NPV	Net Present Value
NRP	Norwich Research Park
NRTF	National Road Traffic Forecasts
NSES	Norfolk and Suffolk Economic Strategy
NSIP	Nationally Significant Infrastructure Project
NTEM	National Trip End Model
NVQ	National Vocational Qualification
NWL	Norwich Western Link
NWQ	Norwich Western Quadrant
OAN	Objectively Assessed Need
OAR	Option Assessment Report
OBC	Outline Business Case
OGV	Ordinary Goods Vehicle
OJEU	Office Journal of the European Union
ONS	Office for National Statistics
PCU	Passenger Car Unit
PIA	Personal Injury Accident
PICS	Personal Injury Collisions
PRA	Preferred Route Announcement
PRoW	Public Rights of Way
PVB	Present Value of Benefit
PVC	Present Value of Costs
QRA	Quantified Risk Assessment
RIS	Road Investment Strategy
RNR	Roadside Nature Reserve

Acronym	Meaning
SAC	Special Area of Conservation
SATURN	Simulation and Assignment of Traffic to Urban Road Networks
SERTM	South East Regional Transport Model
SHMA	Strategic Housing Market Assessment
SOBC	Strategic Outline Business Case
SRN	Strategic Road Network
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
TBM	Tunnel Boring Machine
TCPA	Town and Country Planning Act
TEE	Transport Economic Efficiency
TEMPro	Trip End Model Presentation Program
TEN-T	Trans-European Transport Network
TfN	Transport for Norwich
TIS	Transport Investment Strategy
TUBA	Transport User Benefit Appraisal
TTV	Travel Time Variability
UEA	University of East Anglia
VfM	Value for Money
VOC	Vehicle Operating Costs
VoT	Values of Time
WebTAG	Transport Analysis Guidance
WebTRIS	Highways England Traffic Information System
WFD	Water Framework Directive

## EXECUTIVE SUMMARY

This report sets out the Strategic Outline Business Case for the proposed Norwich Western Link (NWL) between the A1067 Fakenham Road to the A47 Norwich Southern Bypass west of Norwich, that will connect the A1270 Broadland Northway (Northern Distributor Road).

### PURPOSE OF THE STRATEGIC OUTLINE BUSINESS CASE

The Strategic Outline Business Case (SOBC) has been prepared in accordance with the Department for Transport (DfT) three-phased decision-making process for investment in transport infrastructure.

The purpose of the SOBC is to establish the case for investment in the NWL based on the HM Treasury’s Five Business Case Model. This SOBC seeks to demonstrate that the NWL solves problems locally, regionally and nationally and helps deliver wider government objectives (**the strategic case**), represents value for money (**the economic case**), is commercial viable (**the commercial case**), is financially affordable (**the financial case**) and is deliverable (**the management case**).

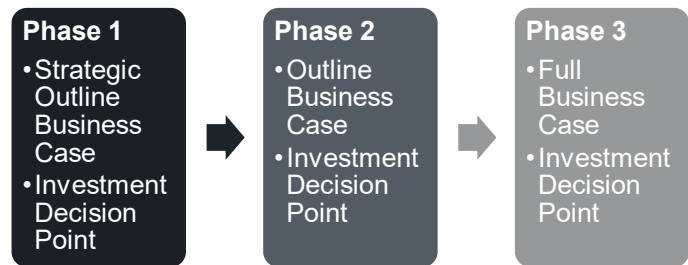
### NWL - NEED FOR INTERVENTION AND ASSOCIATED CHALLENGES

The opening of the A1270 Broadland Northway from the A1067 Fakenham Road to the A47 at Postwick has substantially improved regional and local access to the north and east of Norwich. However, the realisation of the full potential local and regional connectivity, and economic benefits of this scheme, are constrained by the ‘missing link’ in the

strategic road network to the west of Norwich. This missing link in the regional infrastructure, between the western end of the A1270 Broadland Northway to the A47 Norwich Southern Bypass to the northwest of Norwich, has resulted in a number of local and regional challenges.

These local and regional challenges stem from the lack of strategic north-south connectivity between the key radial A47 Norwich Southern Bypass and A1067 Fakenham Road corridors, and the orbital A1270 Broadland Northway to the west of Norwich. North-south connectivity between the A47 Norwich Southern Bypass and A1270 Broadland Northway is restricted to the A140 Sweet Briar Road (outer ring road) and a relatively few low-standard rural local access roads routing through several communities including Weston Longville, Hockering, Ringland, and Taverham. This generates severance in these areas, along with local air quality and safety problems due to inappropriate traffic and rat-running on these local roads.

Poor connectivity to the airport and other locations is a problem / challenge as it increases journey times (user dis-benefits), it reduces productivity for businesses,



and extra delay deters tourists (impact on visitor economy / tourism).



Delays and reduced network efficiency caused by congestion due to the poor quality and standard of the existing rural lanes occur on the existing north-south routes to the west of Norwich, directly impacting the quality of life of local residents from an environmental and safety perspective, and wider regional resident, business and visitor movements.

The lack of strategic road connectivity around northwest Norwich will constrain both local and regional housing and economic growth, and the future performance of Norwich as the primary economic centre for the sub-region. In the absence of investment in the proposed scheme, congestion along existing routes is expected to worsen, leading to increased journey times for residents, visitors and businesses. Delays as a result of increased congestion will be a cost borne by businesses, restricting business efficiency, productivity, investment and access to local, regional and global markets. The continued routing of local and regional movements on inappropriate north-south routes and through rural communities and Norwich’s outer ring road; will continue to impact on safety, environment and quality of life.

The need for improved connectivity around the western side of Norwich has been identified by a range of local partners including New Anglia LEP, Norwich City Council, Broadland, South Norfolk, Breckland and North Norfolk district councils, the Norfolk and Norwich University Hospital, the Norwich Research Park and Norwich International Airport. There is also overwhelming public

support, identified in the 2018/2019 scheme public consultations for a new road linking the A1270 Broadland Northway with the A47 Norwich Southern Bypass to reduce rat-running, improve journey times, reduce local air quality impacts, reduce congestion and improve the quality of life for local communities.

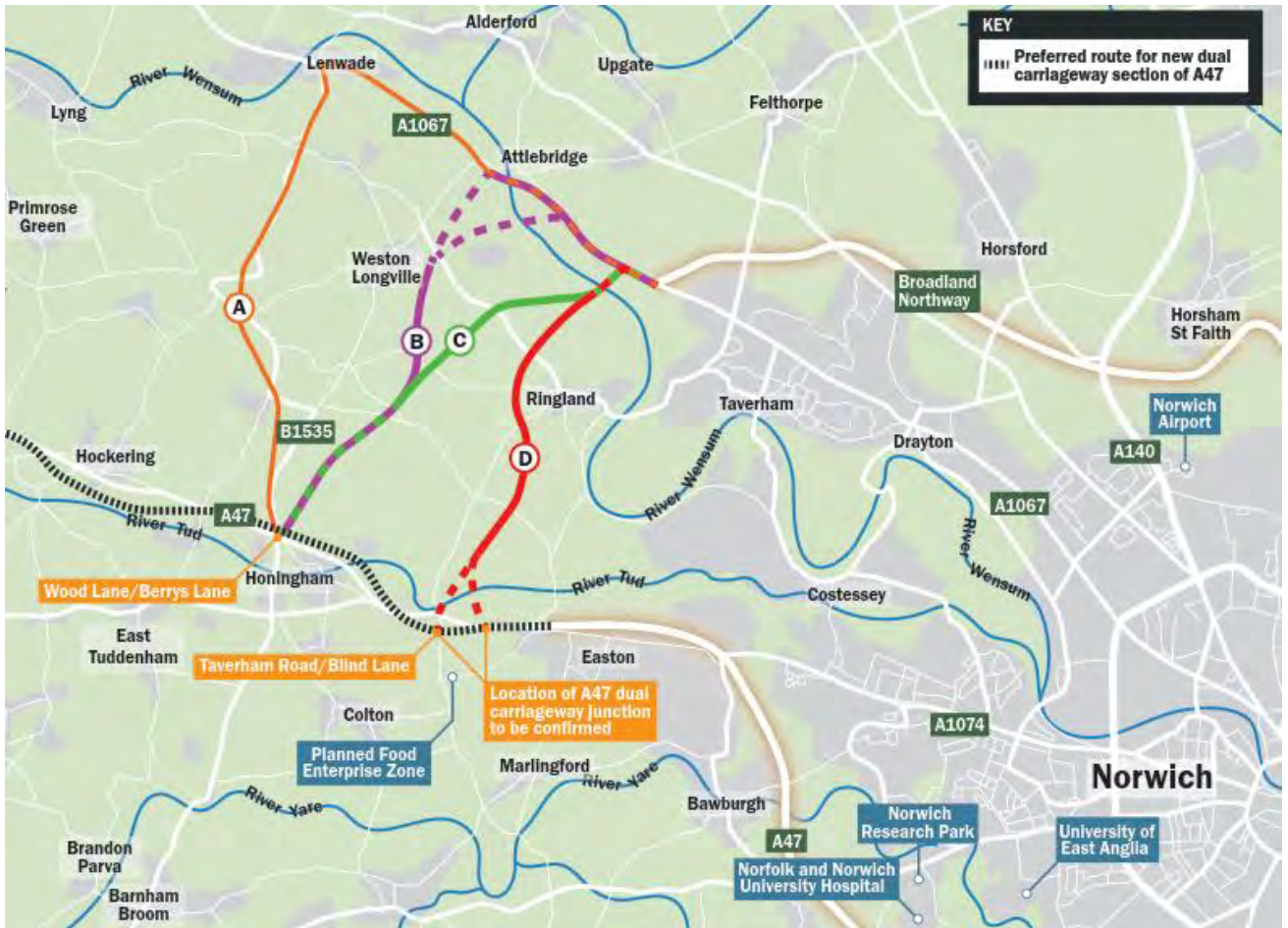
## NWL HIGH LEVEL OBJECTIVES

The analysis of the existing and future challenges in the study area have resulted in the identification of the high-level objectives focused on encouraging sustainable economic growth, improving quality of life and the environment and improving strategic connectivity. The NWL high-level objectives are:

<p>H1 Support Sustainable Growth</p>	<ul style="list-style-type: none"> <li>• Support the growth ambitions of the local authorities, New Anglia LEP and Transport East by improving access to jobs and providing opportunities for new public transport routes</li> </ul>
<p>H2 Improve the quality of life for local communities</p>	<ul style="list-style-type: none"> <li>• Reduce congestion and delay on local roads to improve the environment for local communities and contribute to better safety and health whilst encouraging sustainable transport modes</li> </ul>
<p>H3: Support Economic Growth</p>	<ul style="list-style-type: none"> <li>• Help deliver the economic potential of Norwich and its sub-region by enhancing connectivity to key growth sites including Norwich International Airport, Norwich Research Park and the Food Enterprise Park</li> </ul>
<p>H4: Promote an improved environment</p>	<ul style="list-style-type: none"> <li>• Improve quality of life, reduce congestion to support public transport and active travel</li> </ul>
<p>H5: Improve strategic connectivity with the national road network</p>	<ul style="list-style-type: none"> <li>• Provide the missing strategic link that delivers enhanced regional connectivity through a faster, safer and more reliable connection around the northwest of Norwich, linking existing growth corridors and the completed A1270 Broadland Northway</li> </ul>

## OPTION DEVELOPMENT

Following the establishment of a case for intervention, the option developing process identified an initial 82 options from the established evidence, and on the basis of feedback from stakeholders. The long list of options was then appraised using a Strategic Assessment Tool and sifted using the DfT's Early Assessment and Sifting Tool (EAST) comparing the Strategic, Economic, Managerial, Financial and Commercial case for each option. The sifting process identified four shortlisted options for the missing link between the A47 Norwich Southern Bypass and the A1270 Broadland Northway. Further investigations identified two sub-variants of two route options, resulting in six short-listed schemes. These are depicted in the following figure. There are four main options with two of the options having a further two sub-option.



## ECONOMIC CASE

The scheme was economically appraised to establish its value for money. This included establishing scheme costs and benefits, then undertaking cost benefit analysis, using the Norwich Area Transport Strategy SATURN Model, and available evidence. The analysis concluded that all six route options are expected to provide a benefit in terms of journey times to commuters and business users, both within the study area, and for those beyond and passing through the study area. The proposed scheme will also provide benefits to transport providers such as bus and taxi operators, as the scheme improves access to Norwich city centre by car and bus.

The estimates of costs and benefits allowed an initial and adjusted benefit to cost ratio (BCR) to be calculated for each option in accordance with DfT Value for Money guidance. These BCRs are summarised below. The adjusted BCR includes additional Air Quality and wider economic impacts that have been considered.



	Option A	Option B West	Option B East	Option C	Option D West	Option D East
Initial Benefit Cost Ratio	1.4	2.6	2.2	2.5	1.8	2.0
Adjusted Benefit Cost Ratio	1.4	2.6	2.2	2.5	1.9	2.0
Adjusted VfM Category	Low	High	High	High	Medium	High

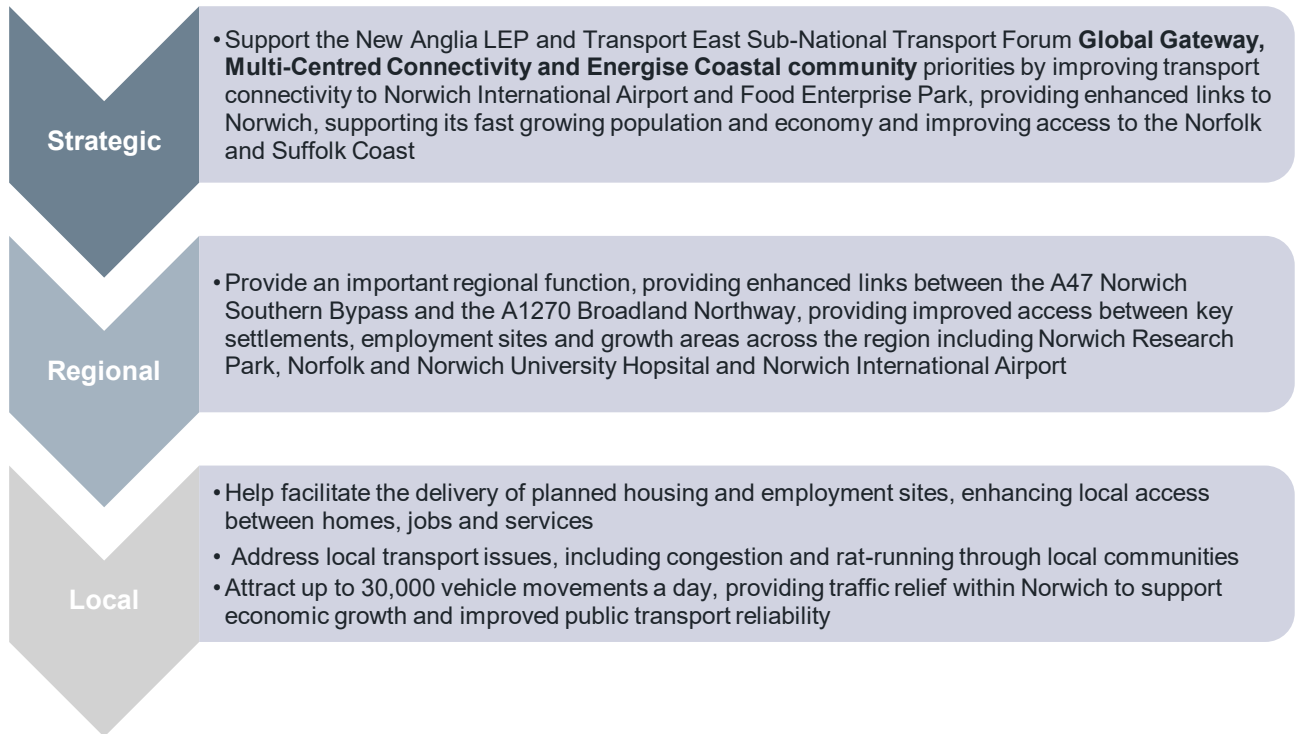
The options have an adjusted BCR in the range of 1.4 to 2.6, giving it an adjusted Value for Money (VfM) category in the range of low to high, depending on the Option. Option A returns the lowest BCR placing it in the low VfM range, Option D West returns a VfM within the medium range, and all other options are in the high VfM range.

## NWL BENEFITS

Norwich is one of the UK’s most successful cities that performs strongly in a range of economic indicators including high employment rates. The New Anglia LEP identifies Norwich and the Greater Norwich area as a priority place where there are significant opportunities and commitment for continued growth.

The strong economic performance of Norwich is due in part to its connectivity with its wider sub-region via well-established road and rail links including the A11 and A47 a vital east-west growth corridor. The poor north-south connectivity between the A47 Norwich Southern Bypass and the A1270 Broadland Northway is restricting the realisation of the full economic potential of Norwich and its sub-region.

Extending the A1270 Broadland Northway around the west of Norwich to the A47 growth corridor will therefore provide a range of strategic, regional and local benefits. The forecast user benefits associated with this scheme for the new dual carriageway options are over £300 million pounds.



The NWL would provide the following benefits:

- **Economic:** The NWL will improve access to Norwich, the primary economic centre for the wider sub-region and to the wider western area which will facilitate the delivery of new and expanded business sites. Quicker more reliable journeys will reduce business costs, increase labour market catchments, improve access to key strategic growth sites and support the visitor economy. This will also help support the delivery of new and existing housing sites.
- **International Gateways:** The NWL will provide enhanced connectivity to Norwich International Airport, vital to existing businesses and residents as well as supporting the Norwich Aeropark proposals for aviation-related enterprises adjoining the airport, and around 30 hectares of other employment uses in the new Airport Business Park. Norwich International Airport, a key international gateway and employment hub for the region and the UK, is also seeking to increase its passenger numbers from 500,000 in 2017 to 1,400,000 by 2045, which will increase demand from the south and the west for high quality infrastructure to enable this growth. The Airport is fully supportive of the NWL and their growth plans will increase their value to the local economy from £70m to £170m by 2045.
- **Norwich:** The NWL will support existing businesses and unlock opportunities for economic growth in Norwich by reducing traffic movements from in and around the city. The NWL would reduce through movements from the outer ring road freeing up capacity to accommodate housing and employment growth, improve public transport journey time reliability and the conditions for active travel. The NWL will also facilitate improvements to emergency response times to the west of Norwich.
- **Broadland and North Norfolk:** The NWL will provide better access and improved journey time reliability to the A47 and A11 strategic road corridors from market towns such as Fakenham, Aylsham and North Walsham, and large parts of Broadland and North Norfolk, avoiding the need for slow and congested journeys.

- **Local Communities:** The NWL will provide traffic relief to rural and suburban communities to the west of Norwich, improving local residents' quality of life, environment and wellbeing.
- **Public Transport:** The NWL will provide opportunities for improvements in public transport routes and bus journey time reliability due to reduced traffic along existing routes.
- **Resilience:** The NWL will provide resilience to the road network, as it will provide a high standard alternative route at times of maintenance and incidents on the network.

## CONCLUSION

The evidence shows that there is a lack of strategic north-south connectivity around the western side of Norwich linking the strategic A47 Norwich Southern Bypass, A1067 Fakenham Road and A1270 Broadland Northway corridors. The existing north-south routes are low standard local rural access roads, and together with the Norwich outer ring road, are therefore unsuitable to accommodate existing and forecast growth in local and regional movements resulting in congestion and delays, particularly during peak travel periods.

The local and regional movements on the low standard rural roads negatively affect the capacity, reliability, resilience and safety along the existing routes and have a substantial impact on local community's quality of life. The current transport conditions on existing north-south routes also constrain the potential economic benefits of the completed A1270 Broadland Northway, and the committed A47 dualling at Tuddenham and are a constraint to delivering future housing and economic growth.

The A1270 Broadland Northway forms part of the Major Road Network (MRN), the middle tier of the country's busiest and most economically important local authority 'A' roads while the A47 dualling scheme will significantly upgrade the SRN west of Norwich. Currently there is a missing link between the A1270 Broadland Northway and the A47, the provision of the NWL will help to deliver the benefits of these two schemes through the provision of a vital link between the strategic and local road network west of Norwich.

Transport problems on the existing north-south routes will be exacerbated by future increases in travel demand generated by key employment sites to the west and north of Norwich. The increased travel demand generated by these businesses, as the labour market accesses new jobs, and trips are generated as part of logistics activity need to be accommodated. The current transport infrastructure constrains optimal productivity, due to the congestion experienced by road users, preventing efficient access to these markets.

Haulage operators have also raised concerns about inadequacy of existing highway infrastructure in the locality in terms of the size and weight limitations for HGVs, which impedes efficient access and movement of goods, further increasing travel times and reducing productivity. The existing infrastructure deficit will make Norwich and its sub-region less attractive to businesses as employers will struggle to attract and retain skilled workers.

Transport infrastructure is an 'enabler' to supporting the additional housing and jobs growth required to deliver the growth ambitions of the New Anglia LEP and its partners. The New Anglia LEP and Transport East set out a vision for the region to deliver improved access to international gateways including Norwich Airport, enhanced connectivity between economic centres including Norwich and



supporting improved connections to coastal communities to support the offshore energy sector and visitor economies which are significant sectors in the East of England.

The NWL will provide connectivity benefits that support the strategic objectives of the New Anglia LEP and Transport East, including more reliable journeys, facilitate development opportunities and provide economic benefits including connecting skilled people with jobs, link employment clusters, and create an efficient regional transport network that enables housing and job growth to be delivered in a way that supports the efficient movement of people and goods.

An economic assessment of the NWL demonstrates that the shortlisted corridor options will generate direct travel time savings. Considering current high-level scheme cost estimates and expected monetised benefits based on the work undertaken to date.

# 1 INTRODUCTION

---

1.1.1. This document is the Strategic Outline Business Case (SOBC) for the Norwich Western Link (NWL) scheme. It has been prepared on behalf of Norfolk County Council (NCC) for consideration by the Department for Transport (DfT) and Transport East. The structure of the business case, and the appraisal described in it, has been developed in line with published DfT guidance including Web-based Transport Analysis Guidance (WebTAG).

## 1.2 DOCUMENT STRUCTURE

1.2.1. The remainder of the document is sets out the five-case model and is structured as follows:

- Chapter 2: Strategic Case
- Chapter 3: Economic Case
- Chapter 4: Financial Case
- Chapter 5: Commercial Case
- Chapter 6: Management Case

## 2 STRATEGIC CASE

---

### 2.1 BACKGROUND

- 2.1.1. There are ambitious transport plans for Norwich, developed and already being delivered as part of 'Transport for Norwich' (TfN). This has provided focus on delivering increased levels of public transport usage and supporting people to walk and cycle where journey distances are appropriate. The TfN plans also acknowledge that Norfolk is a rural county, where car use is still often essential, and therefore seeks to incorporate this by encouraging better use of the existing park and ride facilities between the city outskirts and centre.
- 2.1.2. Part of the plan to improve the way people travel within the city is the need to provide adequate transport infrastructure so that those trips that don't need to be routed through the city have viable alternatives, such as the outer ring road, associated radial routes and Broadland Northway. The NWL forms part of this improved infrastructure.
- 2.1.3. Public consultation on the revised Norwich Area Transportation Strategy (NATS) in 2003 showed strong support for transport improvements to the north and west area of Norwich. In particular, there was support for a Northern Distributor Road (NDR) extending from the A47 in the west skirting around the northern fringe of Norwich to re-join the A47 at Postwick, in the east.
- 2.1.4. A revised NATS was agreed in 2004, which included the provision of a NDR, with the aim to reduce the impacts of high volumes of traffic and congestion in Norwich. Throughout 2004 and 2005, further consultation was undertaken on a variety of route options for the NDR, including several different options for the western section, between the A47 and the A1067, through the River Wensum Valley.
- 2.1.5. On 19 September 2005 NCC's cabinet agreed an adopted route for the NDR, excluding a link between the A47 and the A1067. Early plans to link the A47 (west) to the A47 (east), which included a link between the A1067 and A47 (west), were not progressed due to environmental concerns regarding the River Wensum and its status as a Special Area of Conservation (SAC), and protection due to its international importance in biodiversity conservation. The NDR (A1270 Broadland Northway) was progressed linking the A1067 and A47 east which opened in 2018.
- 2.1.6. Since the adoption of the NDR preferred route, there has been continued local pressure for provision of a NWL to connect the A47 west to the A1067, to ease traffic problems in the local area and enhance strategic connectivity. Following an announcement from the Department for Transport (DfT) and subsequently Highways England<sup>1</sup> (in 2014) of their intention to upgrade the A47 between Easton and North Tuddenham to dual carriageway, and following full approval of the NDR (in 2015), NCC committed to revisit the feasibility and need for a NWL, whilst also considering wider public transport and non-motorised user (NMU) impacts, and the role of complementary measures to reduce traffic on existing routes.

---

<sup>1</sup> Road Investment Strategy (Department for Transport, December 2014)

- 2.1.7. A pre-feasibility study<sup>2</sup> was completed in June 2016 which reviewed previous work, including a scoping study<sup>3</sup> from 2014 which investigated potential NWL route options. The output of the 2016 study included, amongst other aspects, a series of actions to support the next stage of development for an NWL, and these were presented at NCC's Environment, Development and Transport Committee in July 2016.
- 2.1.8. The 2016 study concluded that further work needed to be undertaken to develop a business case and to set out a compelling case for the scheme. This included demonstrating that there is a real problem to be solved, the scheme forms part of a coherent wider strategy, a full range of options has been considered, with the best scheme selected, the scheme should represent a good return on investment with a high or very high value for money and that the scheme is feasible and affordable. To facilitate this, the report recommended that a local transport strategy be developed to identify local problems, define objectives for the wider area and identify possible measures within the Norwich Western Quadrant.
- 2.1.9. A further study<sup>4</sup>, undertaken in October 2017, looked at the potential mitigation of environmental impacts of crossing the River Wensum through a number of crossing options – a bridge (dual carriageway / single carriageway) and a tunnel (dual carriageway / single carriageway). The study resulted in a viaduct option being taken forward as the chosen crossing option on all new link road schemes which cross the River Wensum.
- 2.1.10. NCC undertook a non-statutory public consultation, which ran between Tuesday 08 May 2018 and Tuesday 03 July 2018. The purpose of this consultation was to understand people's experience of living in, and travelling through, the area to the west of Norwich. A total of 4,426 website visitors were recorded with 2,327 comments across the platforms used.
- 2.1.11. The results demonstrated that respondents perceive the roads in the area to be unsuitable for the current levels and type of traffic (1,395 respondents), with rat-running (1,103 respondents) and slow journey times (1,001 respondents) also frequently mentioned issues. There was a clear preference for developing a new road between the A1270 and A47 in order to tackle the transport issues highlighted in the area (1,492 respondents). This option of a new road between the A1270 and the A47 was selected by more than three times as many people as the next most popular option of improving the existing roads (which was supported by 473 respondents).
- 2.1.12. From July 2018 to November 2018 an optioneering and appraisal process was carried out to assess options which would potentially address the issues identified by NCC, the various stakeholders during consultation and project consultants WSP through a traffic forecasting study.

---

<sup>2</sup> Norwich Western Link Project Technical Report (Mouchel, June 2016)

<sup>3</sup> A47-A1067 Western Link Road Scoping Study (WSP, September 2014)

<sup>4</sup> NWL Technical Report (WSP, October 2017)

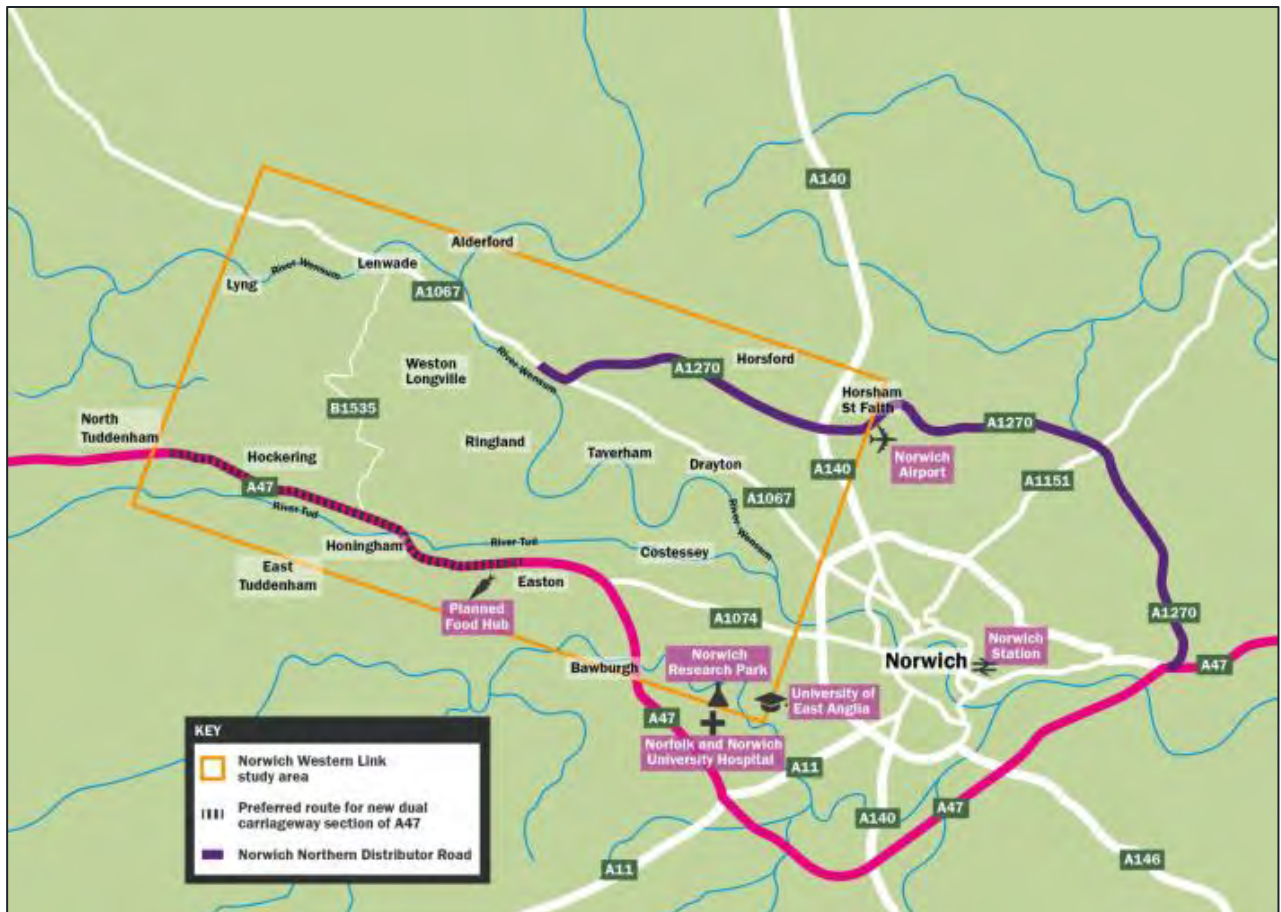
- 2.1.13. This study, using the DfT's Early Assessment Sifting Tool (EAST), identified a long list of 82 potential options which were developed across a broad range of modes and policies and thereafter assessed against the EAST five case assessment criteria. The EAST assessment criteria consist of Strategic, Economic, Managerial, Financial and Commercial. The EAST process is designed to help quickly summarise and present evidence on options in a clear and consistent format.
- 2.1.14. The process resulted in a shortlist of four highway link options and 10 non-highway options. The non-highway link options will be taken forward to be potentially considered as part of a package of measures which could include sustainable transport measures. The four highway link options which performed best within the East appraisal consist of three new highway link options and an existing highway link upgrade option.
- 2.1.15. A second round of public consultation commenced on 26 November 2018, with a series of public events held in late 2018 prior to the Christmas break and after the holidays in January 2019. This maximised the opportunity for local residents and affected stakeholders to participate, whilst avoiding conflict with the seasonal holidays. This public consultation was undertaken in order to:
- Understand the degree of public support for each of the shortlisted highway options
  - Understand how each of the shortlisted options rank against one another
  - Gauge support for each shortlisted option from statutory and non-statutory organisations
  - Gain knowledge of potential scheme risks and local effects of each of the shortlisted options which may influence design or cost
  - Informing the development of the SOBC, in particular seeking to identify additional potential social and economic scheme benefits and opportunities which may arise as a result of each shortlisted option and any aspects requiring mitigation which may influence the scheme cost
  - Update members of the public on feedback from the previous consultation and how this has been considered in developing scheme options
  - Engage with potentially affected landowners
  - Explain the longlist of options considered and shortlisting results, in particular how constraints and environmental considerations have influenced the outcome
  - Communicate the high-level principles and broad locational characteristics of the shortlisted options now proposed
  - Explain the next steps and timescales for the project moving forward
  - Indicate the likely process for planning that might be followed and opportunities for people to engage with the project going forward (e.g. future consultation events)
- 2.1.16. This document has been developed in line with the relevant guidance: WebTAG (Transport Analysis Guidance) and DfT transport business case using the five-case model and has been developed to consider the range of options shortlisted within the Options Appraisal Report.

## **2.2 LOCAL CONTEXT**

- 2.2.1. Norwich is the county city of Norfolk, and is a key regional centre in the East of England. It is approximately 185km north-east of London, and occupies a strategically significant position within East Anglia.



- 2.2.2. The city performs a regional role in delivering growth and as a major employment, shopping and service centre, and a focus for transportation. The Norwich Research Park which is accessed from the B1108 south of the Longwater junction currently provides various roles to 12,000 people with an annual research budget of £130 million. The Food Enterprise Park is located to the west of Easton and includes 100 acres of potential development within the Food Enterprise Zone. Norwich is also acknowledged as a leading centre in the UK finance and insurance services and has the largest general insurance centre in the UK, with support functions and supply chain companies located throughout the Greater Norwich area.
- 2.2.3. A longstanding partnership between the three district councils and the County Council has delivered a joint Core Strategy, a City Deal, and large-scale jobs and housing growth. Planned growth includes what is believed to be the largest urban extension in the country (13,500 homes), underway to the north east of Norwich. A new joint Local plan is currently at Regulation 18 stage.
- 2.2.4. The focus of this study is the north-west area of Norwich, known as the Norwich Western Quadrant (NWQ), as illustrated in Figure 2.1. The broad study area includes the key radial routes of the A47 trunk road, the A1074 (Dereham Road), and the A1067 (Drayton High Road / Fakenham Road).



Source: About the Norwich Western Link, Location Map (Norfolk County Council)

**Figure 2.1 – Study area**

- 2.2.5. The study area is bounded to the south by the A47 which forms part of the Strategic Road Network (SRN), which is to be dualled between Tuddenham and Easton, and provides a link from Lowestoft and Great Yarmouth in the east, via Norwich towards King's Lynn, Peterborough and the A1. Just outside of the study area to the south-east, the A47 connects with the A11 which also forms part of the SRN and provides connections from Norwich to Cambridge and London (via the M11). The A1270/Broadland Northway is located to the north.

## **2.3 EVIDENCE OF STRATEGIC FIT**

- 2.3.1. This section summarises relevant policies and strategic objectives and sets them out in relation to the NWL proposal.

### **LEGISLATIVE & POLICY CONTEXT**

- 2.3.2. This section considers the relevant legislation and policy at a national and local level, to identify the key themes and priorities that need to be considered in the development of a scheme, and identification of potential measures for a NWL.
- 2.3.3. It outlines the legislation that is applicable to the NWL project, before focussing on the national policy set out by central government or government-owned bodies, in which the broad principles of transport infrastructure delivery in England are set out, which will steer the development of intervention options. Adopted local policy and emerging policy are then discussed.

### **APPLICABLE LEGISLATION**

#### **Town & Country Planning Act 1990**

- 2.3.4. The Town and Country Planning Act 1990 regulates the development of land in England and Wales. The development of a NWL is a scheme that is likely to come under the remit of this Act, as any new highway would constitute 'development' (as defined in the Act), and would therefore require planning permission from the relevant authority prior to construction commencing.

#### **Town & Country Planning (Environmental Impact Assessment) Regulations 2017 (England)**

- 2.3.5. The development of a NWL is a scheme that is likely to come under the remit of these regulations as a result of the scale of the proposals. The Environmental Impact Assessment (EIA) regulations require any substantial application for planning permission to be accompanied by an Environmental Statement (ES) that assesses the impacts of the project upon the environment. The preparation of the ES and its consideration by the planning authority is a process known as the EIA.
- 2.3.6. These regulations identify, in Schedule I and Schedule II, a variety of projects and developments that require planning permission. Schedule I developments, including new power stations, oil refineries and motorways are projects for which EIA is compulsory, and Schedule II developments are projects for which EIA is not necessarily required, but should be undertaken should the project exceed certain thresholds and have the potential for significant effects upon the environment. Any NWL project is likely to be Schedule II development because it is likely to occupy a footprint of greater than 1ha in area, thus the potential effects upon the receiving environment need to be adequately considered and assessed by competent assessors. A screening opinion and scoping report will need to be submitted to the planning authority prior to application to define the scope of assessment.

## **The Conservation of Habitats and Species Regulations 2017**

- 2.3.7. The Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations) transpose Council Directive 92/43/EEC, on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) into UK law. The Habitats Regulations provide for the designation and protection of 'European sites' and the adaptation of planning and other controls for the protection of European sites. Under the Habitats Regulations, competent authorities are required to consider plans or projects and restrict or revoke planning permission where the integrity of the European site would be adversely affected. The River Wensum is a Special Areas of Conservation which are strictly protected sites designated under the EC Habitats Directive.

## **NATIONAL POLICY**

### **National Planning Policy Framework**

- 2.3.8. The National Planning Policy Framework (NPPF), published by the Ministry of Housing, Communities and Local Government in February 2019, contains the Government's planning policies for England and how these are expected to be applied. The NPPF has a presumption in favour of sustainable development, which is summarised as: "meeting the needs of the present without compromising the ability of future generations to meet their own needs".
- 2.3.9. The NPPF advises that planning policies and decisions should play an active role in guiding development towards sustainable solutions, and recognises three interlinked dimensions in achieving this; economic, social and environmental. The policies within the framework seek to improve health, social and cultural wellbeing for all, deliver adequate community and cultural facilities and provide services to meet the demand of local people and create a good standard of amenity for all existing and future occupants of land and buildings. Development that takes place under the framework is expected to contribute to the conservation and enhancement of the natural and historic environments as well as prevent development that leads to unacceptable levels of pollution.
- 2.3.10. The NPPF places emphasis on good design which is a key aspect of sustainable development and should contribute positively to making places better for people and should avoid significant adverse impacts which can affect health and quality of life.

**Table 2.1 – NPPF Sustainable Development Objectives**

<b>SUSTAINABLE DEVELOPMENT OBJECTIVES</b>		
<b>An Economic Objective</b>	To help build a strong, <b>responsive and competitive economy</b> , by ensuring that sufficient land of the right types is available in the right places and at the right time to <b>support existing, planned and potential growth</b> , innovation and improved productivity; and by <b>identifying and coordinating the provision of infrastructure</b>	The provision of the new link will increase accessibility to existing planned and potential local and regional areas of growth through improved accessibility
<b>A Social Objective</b>	To support <b>strong, vibrant and healthy communities</b> , by ensuring that a <b>sufficient number and range of homes</b> can be provided to meet the needs of present and future generations; and by fostering a <b>well-designed and safe built environment</b> , with <b>accessible services and open spaces</b> that reflect current and future needs and support communities' health, social and cultural well-being	Improved transport links will facilitate and encourage new development and therefore increase access to existing and new homes while opening up land on existing links to potential development  The reassignment of traffic away from inappropriate routes through villages and on narrow lanes will help to reduce local carbon emission levels, provide a safer environment for road users and pedestrians and encourage active travel modes
<b>An Environmental Objective</b>	To contribute to <b>protecting and enhancing our natural, built and historic environment</b> ; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy	The provision of smart design will help to mitigate any potential damage to areas of environmental concern  The reassignment of traffic away from current inappropriate routes will benefit the local natural and built environment in these locations reducing emissions and noise

**National Infrastructure Delivery Plan 2016-2021**

- 2.3.11. The National Infrastructure Delivery Plan 2016-2021 (published in March 2016) sets out the Government's plans for economic infrastructure over a five-year period, alongside plans to support delivery of housing and social infrastructure. It reflects the Government's commitment to invest over £100 billion by 2020-2021 to drive wider economic benefits, including:
- Supporting growth and creating jobs in the short term as projects are built – especially where public investment is used to attract private investment
  - Raising the productive capacity of the economy in the long term as the benefits of new infrastructure are felt; reduced transaction costs; larger and more integrated labour and product markets; and better opportunities to collaborate and innovate
  - Driving efficiency – enabling greater specialisation and economies of scale
  - Boosting international competitiveness – attracting inward investment and enabling trade with foreign partners

2.3.12. In the East of England, the National Infrastructure Delivery Plan 2016-2021 made reference to a NDR as a key project, connecting the A47 (east of Norwich) to the A1067. The NDR (A1270 Broadland Northway) has subsequently been completed.

**Transport Investment Strategy (November 2017)**

2.3.13. The Transport Investment Strategy (TIS) sets out how recent progress through capital investment will be built on – through the investment decisions to be taken – how responses will be realistic and pragmatic towards today’s challenges. This will drive progress towards fulfilling the aims of the Industrial Strategy and put the travelling public at the heart of the choices we make.

2.3.14. The investment decisions should focus on the main objectives set out in the TIS. **Table 2.2** summarises the objectives and policy in the TIS.

**Table 2.2 – TIS Objectives**

POLICY	SUMMARY OF POLICY	NWL
Create a more reliable, less congested, and better-connected transport network that works for the users who rely on it	<i>“Our intensively used networks are ageing and face increasing demands, creating delays and undermining reliability. In places they don’t provide the connections people and businesses need”</i>	The proposed roads options would improve connectivity between north and south and west and east through a new link which will also reduce congestion on existing roads
Build a stronger, more balanced economy by enhancing productivity and responding to local growth priorities	<i>“Our national productivity lags behind other countries and prosperity hasn’t been shared evenly between different places, leaving some communities feeling left behind”</i>	The provision of a new link will improve accessibility to business and employment encouraging investment
Enhance our global competitiveness by making Britain a more attractive place to trade and invest	<i>“Our long-term success in a globalised world will depend on our ability to attract job-creating investment in our industrial strengths and to trade as frictionlessly as possible with partners old and new”</i>	Improved accessibility and connectivity will help to streamline local business and improve accessibility to the SRN and MRN
Support the creation of new housing	<i>“We face an immense challenge to provide the houses that people need in the places they need them. Transport infrastructure is one of the keys to unlocking development”</i>	The provision of the new link will improve accessibility to new and existing housing while helping to encourage new housing locally

### **Large Local Majors (LLM)**

- 2.3.15. The LLM programme was set up in 2016 to cater for the small number of exceptionally large local highway authority transport schemes that could not be funded through the normal routes, such as Local Growth Fund or other devolved allocations. The NWL fits within this category.
- 2.3.16. The core principle of the LLM programme remains that it is for schemes that cannot reasonably be funded through any other route. They should be single schemes that can only be delivered or justified as a whole, as opposed to being split into phases or smaller elements.
- 2.3.17. LLM is now funded through the National Roads Fund, therefore only road schemes will be considered for the programme. The objectives for the LLM schemes are those set out for the TIS

### **National Policy Statement for National Networks (NPSNN)**

- 2.3.18. The National Networks National Policy Statement (NN NPS), sets out the need for, and Government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national road and rail networks in England.
- 2.3.19. The Government's vision and strategic objectives for the national networks are that "The Government will deliver national networks that meet the country's long-term needs; supporting a prosperous and competitive economy and improving overall quality of life, as part of a wider transport system. This means:
- Networks with the capacity and connectivity and resilience to support national and local economic activity and facilitate growth and create jobs
  - Networks that support and improve journey quality, reliability and safety
  - Networks that support the delivery of environmental goals and the move to a low carbon economy
  - Networks that join up our communities and link effectively to each other"

The NWL will improve the capacity and connectivity around Norwich providing improved resilience and supporting economic growth

### **Highways England: Strategic Business Plan 2015-2020**

- 2.3.20. In December 2014, Highway England published their Strategic Business Plan for 2015-2020. The Plan recognises the importance of the Strategic Road Network (SRN) in enabling and supporting economic growth and prosperity, as well as being essential to quality of life across the nation. It states that 98% of UK manufacturers consider the condition of roads on the network to be critical to the potential success of a business, and that 60% of congestion is caused by a general lack of available capacity.
- 2.3.21. The Performance Specification within the Plan sets out the eight key areas which the Government will measure both the network and company performance:

**Table 2.3 – Highways England Strategic Business Plan 2015-2020 Summary**

Key Measures	NWL
Making the network safer	A new link will provide improved safety through the reduced accident rate associated with the higher standard of link while the new link will be more direct and shorter further reducing accidents. Limited number of conflict points on the route due to a reduction in the number of junctions compared to the current situation
Improving user satisfaction	The provision of a more direct route will significantly improve user satisfaction by removing congestion and increasing accessibility and connectivity
Improved connectivity	Provision of better connections between SRN and MRN with the inclusion of alternative shorter quicker route to north of Norwich from A47 and A11
Improved resilience	Improved resilience through the provision of a new higher standard of diversionary route between the A47 and A1067 will help the network to cope with accidents/roadworks which occur on existing routes. This new route will provide an improved alternative routing option locally in relation to existing routes between the A47 and A1067 and for users on the A47 and A1067 corridors themselves. The NWL will also provide greater resilience for users of the A1270 Broadway Northland by providing an alternative routing option when incidents or road works occur on the eastern side of Norwich allowing continued flow of vehicles between the north and south of Norfolk
Supporting the smooth flow of traffic	A new link will reassign flows on the network away from the existing congested routes improving the flow of traffic both through the introduction of a higher standard link and through the reduction of traffic on existing routes
Encouraging economic growth	A new highway link will help to support and encourage economic growth through: <ul style="list-style-type: none"> <li>• new routing option and improved accessibility</li> <li>• reduced journey times</li> <li>• increased connectivity</li> </ul>
Delivering better environmental outcomes	The proposed options have been developed in order to minimise the environmental impact of the scheme and mitigate any residual impacts. It will improve the environment of existing rural and built-up areas experiencing rat running traffic
Achieving real efficiency	The proposed link will promote a more efficient transport system in the area, improving N-S access and the regional centre of Norwich
Keeping the network in good conditions	The provision of a new link will reduce the require maintenance regime on the existing links due to a reduction of traffic. The provision of an alternative route means less congestion during planned roadworks on the existing links
Helping cyclists, walkers & other vulnerable users	A new link will remove traffic from existing routes improving conditions for Cyclists, Walkers and other vulnerable users on the existing north to South routes between the A47 and A1067

- 2.3.22. Highways England considers that to improve the capacity and performance of the network, it will be required to modernise, maintain and operate the network, with the desired outcomes of supporting economic growth, a safe and serviceable network, a more free flowing network, an improved environment and a more accessible and integrated network.
- 2.3.23. Investment in the MRN and local road network within the study area will support the Highways England Strategic Business Plan by improving network capacity and resilience and thus support economic growth and productivity.

#### **Highways England: Delivery Plan 2015-2020**

- 2.3.24. Building upon the Strategic Business Plan 2015-2020, the Delivery Plan 2015-2020 provides detail on how Highways England intends to deliver strategic outcomes, measure success, identify goals and plan for the future. The focus of the Plan is on:
- Supporting economic growth
  - A safe and serviceable network
  - A more free-flowing network
  - Improved environment
  - An accessible and integrated network
- 2.3.25. The Plan recognises the importance of supporting economic growth through the creation of a more free-flowing, integrated and accessible network. Investment in improved connectivity between the A47 and A1067 within the study area would help deliver Highways England's strategic outcomes.

#### **Norfolk and Suffolk Economic Strategy (NSES)**

- 2.3.26. The New Anglia Local Enterprise Partnership (LEP) covers Norfolk and Suffolk. It works with businesses, local authority partners and education institutions to drive growth and enterprise in Norfolk and Suffolk.
- 2.3.27. In 2017 the New Anglia LEP published their NSES which followed on from the 2014 Strategic Economic Plan. The NSES sets out the LEPs ambition to establish New Anglia area as:
- The place where high growth businesses with aspirations choose to be
  - An international facing economy with high value exports
  - A high performing, productive economy
  - A well-connected place
  - An inclusive economy with a highly skilled workforce
  - A centre for the UK's clean energy sector
  - A place with a clear, ambitious offer to the world
- 2.3.28. This will be achieved through actions and investment in priority places and themes. Their priority places are the areas where the evidence shows there are significant opportunities and commitment for continued growth:
- Ipswich
  - Norwich and Greater Norwich
  - The Norfolk and Suffolk Energy Coast, including Bacton, Great Yarmouth, Lowestoft and Sizewell, with assets on and offshore
  - The Cambridge - Norwich corridor



- The East/West corridors along the A47 from Lowestoft to King's Lynn and the A14 Felixstowe through Ipswich, Stowmarket, Bury St Edmunds, Newmarket and Haverhill to Cambridge
- King's Lynn and the A10 and rail corridor to Cambridge

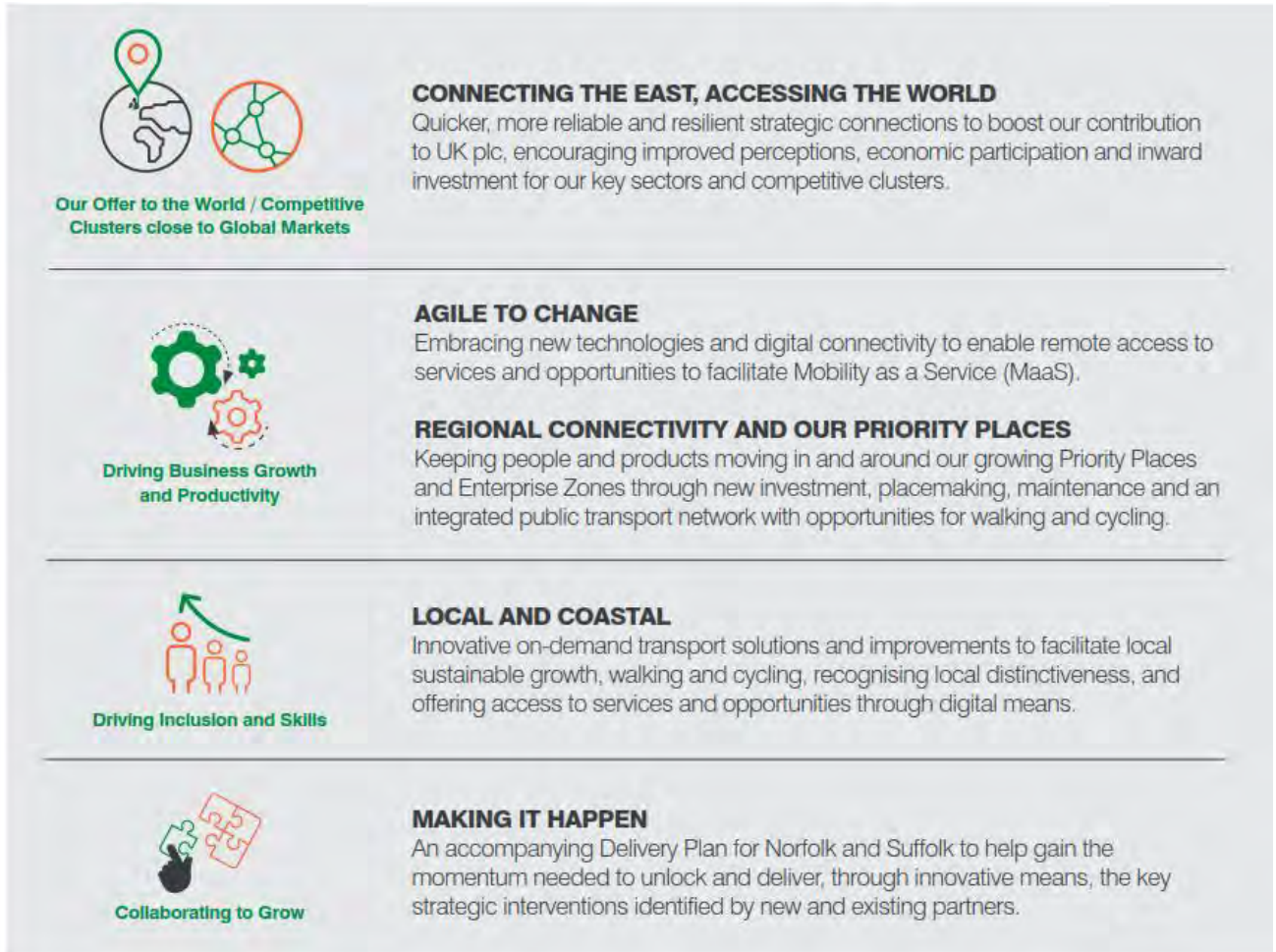
- 2.3.29. The priority themes are those economy wide opportunities where the evidence shows that investment and action will have the greatest impact on the ambitions and how they will deliver growth in all places across Norfolk and Suffolk.
- 2.3.30. The NSES states that Norfolk and Suffolk should be “a well-connected place, locally, national and internationally. Investment in housing, roads, rail and broadband is coordinated to build the communities and connections that people and businesses need. This will drive housing and GVA.”
- 2.3.31. The area is also fortunate in its natural and cultural assets, making it a very attractive place to live and work. To unlock the potential in the key sectors and to create new jobs and businesses requires focussed investment by local partners and Government to improve the area's infrastructure and to ensure that business has a supply of skilled workers and the right support to grow.

The NWL would help to unlock future economic growth in the region creating significant accessibility and journey time efficiencies for the regions key sectors such as agri tech, energy, information and communications technology (ICT) and digital creative, and life sciences

### **Integrated Transport Strategy (ITS)**

- 2.3.32. The New Anglia Local Transport Body was set up to identify the priorities and delivery of major transport improvements across Norfolk and Suffolk as part of New Anglia's plan to make Norfolk and Suffolk a mobile and accessible world class economy. A partnership between New Anglia LEP and Norfolk and Suffolk County Councils, the Local Transport Body has been formed to develop transport infrastructure projects for funding and oversee delivery infrastructure projects.
- 2.3.33. The New Anglia Local Transport Board (LTB) partners have developed an ITS (May 2018). It sets out the ambition, the collective goals for delivery and how the LTB might see them brought to fruition. It also provides a robust foundation for the newly formed sub-national transport forum: Transport East. Most importantly, it sets out how the transport network can help to continue to make Norfolk and Suffolk a great place to trade, live, work, visit and learn.
- 2.3.34. It states that “For the East to continue to thrive, we must work together to develop a network that meets our aspirations both now and in the decades to come. If implemented successfully future businesses will benefit from better connected opportunities for growth, a wider pool of accessible skilled labour and the opportunity to engage in more markets than ever before.”
- 2.3.35. The Strategy looks ahead to the 2040s but focuses on the actions that need to be taken over the next three to five years to help secure the foundations for long-term success.
- 2.3.36. Ipswich and Norwich are the largest economic centres for the area with specialisms in the financial services and insurance sector and ICT, tech and digital creative at Adastral Park and Norwich. Coastal towns such as Great Yarmouth and Lowestoft are also important centres of activity, particularly in the globally competitive energy sector. Together, they form part of the Norfolk and Suffolk Energy Coast along with Sizewell, Bacton and the offshore windfarm clusters as part of the East of England Energy Zone. In addition, Norfolk and Suffolk has a thriving life sciences and bio-tech sector clustered around Norwich Research Park, the National Stud (the home of horseracing) in Newmarket and CEFAS (Centre for Environment, Fisheries and Aquaculture Science) in Lowestoft.

- 2.3.37. Each of the key sector clusters, together with the other sector strengths, need to be well connected in order to continue to be catalysts for innovation and opportunity and to drive the strong and growing economy.
- 2.3.38. The ITS states that the “transport network can help to support our world-leading competitive clusters in clean energy, financial services and insurance, ICT, tech and digital creative and life sciences and biotech to thrive.”
- 2.3.39. In the ITS the economic strategy themes are mapped to the key transport themes as shown in **Figure 2.2**.



**Figure 2.2 – Economic Strategy and Transport Strategy Themes**

Connecting the East, Accessing the World.

- 2.3.40. International access is a key strength and opportunity for the East. Access to the Port of Felixstowe as the nation’s largest container gateway and other ports including Great Yarmouth which is expanding to meet the demand for off shore wind, as well as airports at London Stansted and Norwich are clear priorities for the area. Connectivity between the East and the rest of the UK is essential to enabling businesses to have strong links to customers and supply chains. Fast and reliable links to London, Cambridge, Peterborough and beyond are key to business-to-business connectivity, realising new opportunities and future economic performance and competitiveness of the East and UK plc.

The NWL will improve connectivity between the west/south of Norwich and the airport to the north of Norwich. It will enable quicker, more reliable and resilient strategic connections.

#### Agile to change

- 2.3.41. To respond to the future challenges and opportunities the East must remain agile to change. The East will be promoted as being 'open' to innovative new technologies, particularly where change could facilitate growth in the key sectors.

#### Regional Connectivity and our priority places

- 2.3.42. Improving accessibility between the East's economic centres is essential to the realisation of the future aspirations. It provides better access to jobs, education and healthcare, encourages the clustering benefits of development and services and attracts inward investment. A strong digital and transport network across the East will link businesses and suppliers to markets and provide the backbone for the East to thrive.
- 2.3.43. As part of this the ITS seeks to "Deliver a reliable Major Road Network (MRN) with improved journey times between our Priority Places, through the creation of an integrated MRN Action Plan for delivery". this includes the NWL, connecting the new Broadland Northway from the A1067 to the A47 west of Norwich, which will improve the flow of traffic around the growing local communities and ensure the network is kept in a good state of repair.
- 2.3.44. It also seeks to "Facilitate better connectivity which provides more reliable and resilient journey times within and between our Priority Places. This will be through making the strategic case for and the delivery of infrastructure investment. It will include new river crossings (in Great Yarmouth, Ipswich and Lowestoft), orbital links and relief roads (including the Ipswich Northern Route(s) and the NWL, connecting the new Broadland Northway from the A1067 to the A47 west of Norwich), and junction improvements, prioritising infrastructure that will facilitate the delivery of significant housing and jobs growth."

#### Local and Coastal

- 2.3.45. The Norfolk and Suffolk Energy Coast is a significant contributor to the East's economy and serves Sizewell nuclear power station, Bacton Gas Terminal and the significant offshore energy sector as part of the wider East of England Energy Zone. It is a global centre of oil, gas, nuclear and renewable energy generation and infrastructure.
- 2.3.46. A large amount of tourism is attracted to East Anglia every year. The latest information available (2013 ONS) shows that The East accounted for over £10.2 billion of Total Tourism Consumption with £5.2 billion of that associated with the East Anglia Area. Improving regional connectivity will help support this sector of the economy.

#### Making it happen

- 2.3.47. Local and collaborative delivery is important, having the potential to make a real difference and the skills, experience and resources from a number of new and existing partners are needed to help bring the stated ambitions to fruition.

- 2.3.48. The Norfolk and Suffolk Energy Coast, the enterprise zones, the life sciences and bio-tech sector clustered around Norwich Research Park and Centre for Environment, Fisheries and Aquaculture Science in Lowestoft will all benefit from the proposed scheme.

The ITS outlines that the NWL will help deliver the economic strategy for Norfolk and Suffolk, that it will improve connectivity to centres of excellence and will enhance the quality of life for residents in the area, connecting the new A1270 Broadland Northway from the A1067 to the A47 west of Norwich, to improve the flow of traffic around the growing communities prioritising infrastructure that will facilitate the delivery of significant housing and jobs growth.

## TRANSPORT EAST STRATEGY

- 2.3.49. Transport East is the sub-national transport body for Norfolk, Suffolk, Essex and Southend-on-Sea. In December 2018 it held a summit to kick-start the development of a regional strategy. The initial progress report proposes three strategic themes:

- Ports and Airports – Improved connectivity to our ports and airports to support the UK economy and enable exports.
- Multi-Centred Connectivity - Enhanced links between our fastest growing places and business clusters; enabling the area to function as a coherent economy and improving productivity.
- Coastal communities – reinventing our coast for the 21st Century.

As stated in the ITS the NWL will improve connectivity to centres of excellence and improve the flow of traffic around the growing communities. It will provide improved connectivity to Norwich airport and the Space to Innovate Enterprise Zone sites (Norwich Research Park, Scottow Enterprise Park, Egmore Business Zone) and The Great Yarmouth and Lowestoft Enterprise Zone along with the Norfolk and Suffolk Energy Coast.

### Ports and Airports

- 2.3.50. Norwich is located 59 miles north of Felixstowe Port which is the region's and nation's largest freight gateway. Currently goods movements to Felixstowe from the coastal areas north of Norwich are constrained in terms of potential routing alternatives.
- 2.3.51. Improved access to international markets is critical for future growth which will help business to business connectivity in terms of realising opportunities and developing trade. Currently the missing link within the NWQ will constrain existing goods movements and may impact potential for growth within the NWQ and regionally due to the longer route around Norwich equating to higher transport costs for business. The provision of a more appropriate route for goods movement in terms of conditions and directness and length of route would prove more economically efficient for business and produce more freight and goods friendly environment to the region as whole.
- 2.3.52. Norwich Airport is located approximately 3 miles north of Norwich. Total passenger numbers for 2017 were recorded as 528,153 and the Airport is worth some £70 million to the local economy. The airport is growing and has published a masterplan setting out a vision for the airport's continued growth over the next 30 years. By 2045 passenger numbers could rise to 1.4 million and the airport could be worth some £170 million to the local economy.

Currently movements from the south/south west of Norwich to the Airport are constrained in terms of potential routing alternatives, currently the airport is sign posted via the A1074 and Longwater Interchange junction with A47 which already suffers from delays and unreliability due to peak period congestion. A NWL would help to provide a more appropriate and reliable primary route to the regional airport, supporting future employment growth at the airport and Longwater business parks the Food Enterprise Park and the Norwich Research Park, helping Norwich to retain and attract international airport patronage.

By 2045, it is estimated that, in total, Norwich Airport will support up to 3,350 direct, indirect and induced jobs. Of these, around 3,250 jobs may be in the 'local economy'. Without the NWL the ability of Business associated with Norwich Airport will be significantly impacted as existing routes become clogged and access to employees reduced rather than expanded. Norwich International Airport is also the centre for aviation operations for the southern sector of the North Sea Oil, Gas and Renewables sector.

### **Multi-Centred connectivity**

- 2.3.53. Norwich and the Greater Norwich area is recognised as a priority place with the New Anglia Economic Strategy. The Greater Norwich area has the highest Gross Value Added (GVA) per head of Norfolk and Suffolk districts and the highest percentage of residents with NVQ4+ qualifications. Business creation and survival rates are higher than average, as are employment and economic activity rates.
- 2.3.54. There are existing links between local businesses and the global excellence of the University of East Anglia and Norwich University of the Arts, which the LEP seeks to strengthen, providing the ecosystem that new entrepreneurs need to thrive.
- 2.3.55. The city has a successful financial services and insurance cluster. Including existing long-standing firms such as Aviva, Marsh and Virgin Money, alongside new start-ups and a growing number of fin-tech companies.
- 2.3.56. The Norwich Research Park is a centre of world class expertise in genome analysis and manipulation of animal, microbial and plant systems for a wide range of industrial applications.
- 2.3.57. The sector takes advantage of both global opportunities and the tech, creative and digital skills available in the city. These firms tap into the skilled labour market and growing number of young professionals that see the area as a great place to live and work.

An NWL would assist with supporting this and growing the local economy. An initial economic appraisal carried out in October 2018 to inform the OAR and public consultation indicated that the NWL scheme would have a high BCR between 2.0 and 4.0 based purely on journey time benefits alone, assuming the A47 junctions are grade separated. Taking into account wider benefits that can be captured via accident savings, improved non-motorised user benefits and decongestion effects, the BCR is expected to further increase, demonstrating that a strong economic case exists for the scheme and it is expected to bring significant benefit to the study area and across the Transport East sub-region.

## Coastal communities

- 2.3.58. The Norfolk and Suffolk Energy coast, branded as part of the East of England Energy Zone, is a global centre of oil, gas, nuclear and renewable energy generation and infrastructure. Alongside the Nuclear generation and decommissioning expertise, the Southern North Sea currently plays host to over 150 offshore gas assets, together with 986 offshore wind turbines generating 3.75GW of renewable power directly off the region’s coast, with an additional 1,000+ turbines generating some 14GW of offshore wind power to be installed over the next decade. The sector is driving down costs through innovation and collaboration, developing new technologies across our energy system, maximising offshore production and generation. The sector employs some 8,469 skilled people in more than 834 companies.
- 2.3.59. Tourism is a significant contributor to the regional economy with visitors attracted to the Norfolk broads and the Norfolk coastline as well as other locations. Many visitors will travel via A140 which runs north-south from the northern edge of Norwich adjacent to the Airport towards Cromer. Visitors accessing this route from A11 or A47 will have a desire line through the NWQ.

The NWL will provide better connectivity to the North Norfolk coast from the west. At peak seasonal times of the year, a NWL would help to further alleviate pressure on the Norwich outer ring road and prevent strategic long-distance visitor traffic from routing inappropriately via local minor roads within the NWQ.

## LOCAL ADOPTED POLICY

### Connecting Norfolk – Norfolk’s Local Transport Plan for 2026 (April 2011)

- 2.3.60. The Local Transport Plan sets out the strategy and framework policy for transport in Norfolk up to 2026 and seeks to function as a guide for transport investment in Norfolk, as well as supporting decision making by other organisations. The plan is currently under review however, there is a general agreement to keep the existing themes.
- 2.3.61. The document identifies a transport vision for the region which is “A transport system that allows residents and visitors a range of low carbon options to meet their transport needs and attracts and retains business investment in the county.” This vision is to be underpinned by six strategic aims, each with several sub policies which are identified in **Table 2.4**.

**Table 2.4 - Connecting Norfolk Policies Summary**

POLICY	SUMMARY OF POLICY	NWL
<b>1. Managing and Maintaining the Transport Network</b>		
<i>Policy 1: Maintenance</i>	Improving the condition of Norfolk’s highway network	Provision of a new link will reassign traffic from existing links on to high standard new link thereby reducing maintenance requirement
<i>Policy 2: Traffic Management</i>	Improving journey time reliability, particularly on public transport corridors	New Highway link would remove traffic from existing corridors improving reliability

POLICY	SUMMARY OF POLICY	NWL
<i>Policy 3: Network resilience</i>	The network should be able to withstand a changing climate	The provision of a new route will either, reassign traffic away from areas which may suffer from flooding or may carry trips over areas of potential flooding through appropriately developed crossing infrastructure
<i>Policy 4: Protecting the environment</i>	Transport decisions should take account of the character of the environment around them	<p>The proposed options will encompass innovative design in order to protect the environment. This may include viaduct design and specific drainage. NCC are in close communication with EA in relation to the design</p> <p>The development of the new link will also divert traffic away from existing lower standard routes which helping to protect and enhance the local natural and built environments adjacent to these routes</p>
<b>2. Delivering Sustainable Growth</b>		
<i>Policy 5: Growth</i>	New development should be well located and connected to existing facilities to minimise the need to travel	Improved accessibility and connectivity should encourage investment locally with potential employment, housing and services attracted to the area reducing the need to travel
<i>Policy 6: Transport infrastructure to support growth</i>	To bring about sustained growth priority should be on enabling public transport, walking and cycling from new development sites	The provision of the new link will reduce traffic on existing routes encouraging more sustainable form of transport while the proposed package of measures which will accompany a new link will include sustainable options
	Recognition should also be given to required improvements on the highway network at bottlenecks. These should be matched with sustainable travel packages or measures to encourage regeneration. Contributions should be secured to help mitigate any adverse effects of new development on the transport network	<p>The new link should reduce traffic at the Longwater interchange which is a recognised bottleneck in the area</p> <p>The potential development of a package of measures will allow a focus on sustainable travel options</p>
<b>3. Enhancing Strategic Connections</b>		
<i>Policy 7: Bring about improvements in journey time reliability</i>	To bring about an improvement in journey time reliability in and around Norfolk, local agencies should work together to enhance the strategic network	Will significantly improve connectivity in the local area through the provision of a more direct north to south link while also removing some east to west movements from the A47 and A1067

POLICY	SUMMARY OF POLICY	NWL
<b>4. Reducing Transport Emissions</b>		
<i>Policy 8: Vehicle efficiency</i>	Reducing emissions should be to support a shift to more efficient travel	A shorter more direct route with improved journey times, more efficient fuel use on journeys due to continuous speeds (no deceleration/acceleration caused by junctions and bends)
<i>Policy 9: Travel choice</i>	Having a range of choices to travel, other than the private car	Improved sustainable travel options through extended package of measures
<i>Policy 10: Air quality management areas</i>	Reducing the levels of traffic in town centres and urban areas	The reassignment of traffic away from the Norwich outer ring and from the 1067 and A1074 will help to reduce emissions locally
<b>5. Improving Road Safety</b>		
<i>Policy 11: Reducing casualties</i>	reducing the number of killed and seriously injured	The introduction of a new higher standard link to the network and associated reassignment of trips will reduce the number of accidents on the network
<b>6. Improving Accessibility</b>		
<i>Policy 12: Tackling poor accessibility</i>	Working across agencies to provide better access to key service providers	The inclusion of the new short direct route will improve accessibility between and through the NWQ to the NNUH and other key service providers
<i>Policy 13: Access to town and urban centres</i>	Efficient movement to town and urban centres should be enabled for all modes, with priority on achieving a balance for car drivers	The provision of a new route will increase access between north and south and remove trips on the A47 and A1067 improving accessibility to Norwich
<i>Policy 14: Sustainable tourism and leisure</i>	Opportunities for sustainable tourism or leisure trips should be pursued	The provision of a new route will produce reassignment of existing trips from local roads encouraging sustainable transport on the existing roads through reduced traffic flow
<i>Policy 15: Access for all</i>	Accessibility for all, particularly people with disabilities, should be sought by all projects	Access for vulnerable users will be improved on local roads with the reduction in existing flow as trips reassign
<i>Policy 16: Alternatives to travel</i>	Agencies in Norfolk should work together to encourage alternatives to travel, with priority on interventions that result in fewer trips generated or a reduction in the total distance travelled	Provision of improved accessibility will encourage greater development potential of area reducing distance travelled between place of origin and destination



## Norfolk Strategic Framework – Shared Spatial Objectives for a Growing County (July 2017)

- 2.3.62. This document sets out shared objectives and strategic priorities for Norfolk, to be considered in developing plans to at least 2036. This approach enables them to work collaboratively in developing evidence and securing external funding for natural and built environments and infrastructure within the region.
- 2.3.63. **Table 2.5** highlights the Norfolk Strategic Framework objectives.

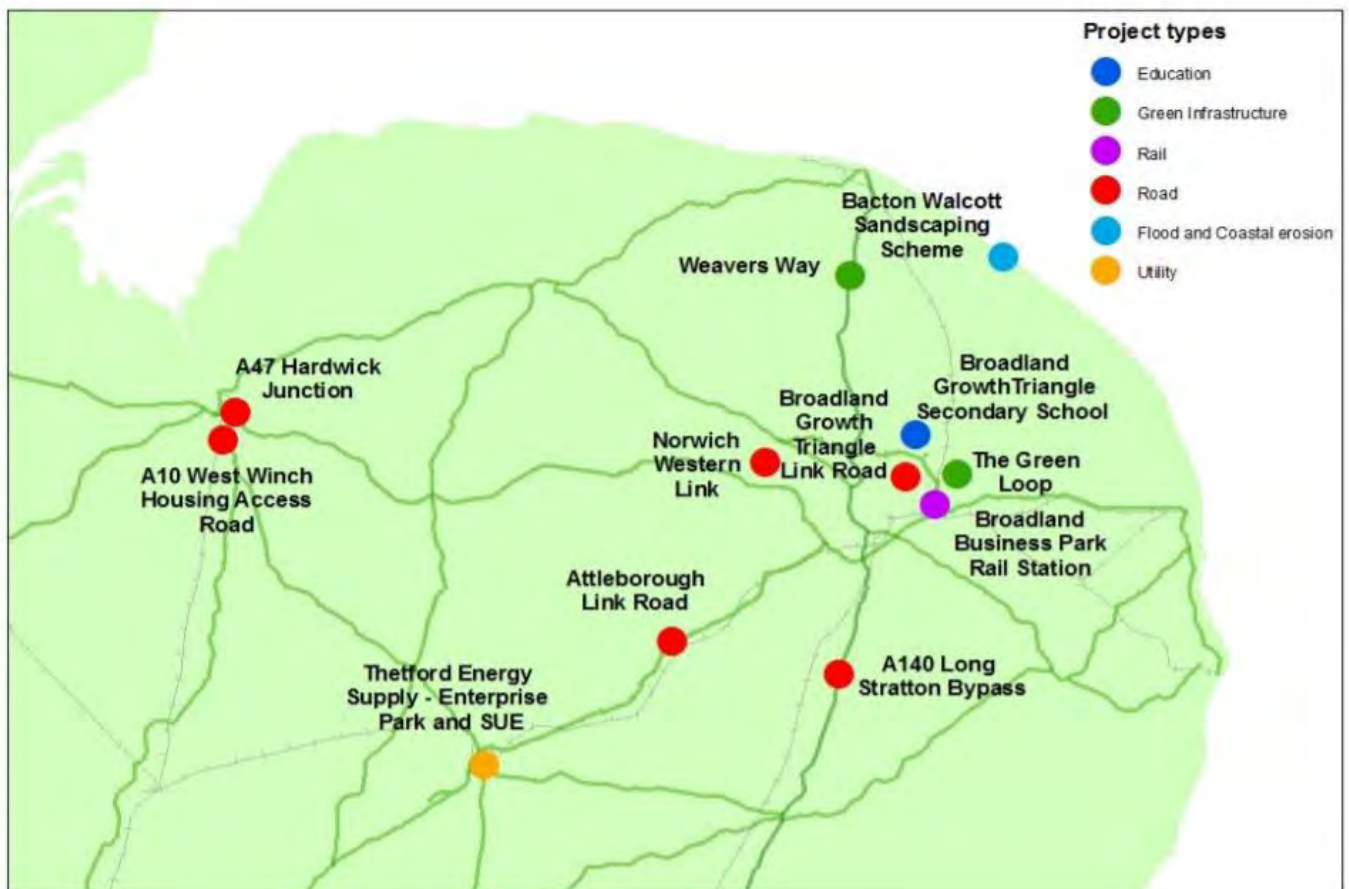
**Table 2.5 - Norfolk Strategic Framework Objectives**

OBJECTIVES SET OUT BY THE DOCUMENT	NWL
To realise the economic potential of Norfolk and its people	The proposed link will significantly improve access and connectivity, encourage investment in the local area including high added-value jobs at the research park and UEA
To reduce Norfolk’s greenhouse gas emissions as well as the impact from, exposure to, and effects of climate change	The proposed scheme will lead to an overall reduction in congestion currently experienced on and between the A47 and A1067, and will limit increases in greenhouse gas emissions
To address housing needs in Norfolk	The potential options will encourage investment locally of both employment and housing through increased accessibility
To improve the quality of life for all the population of Norfolk	<p>The new link will improve journey times while reducing delay and congestion encouraging investment locally and regionally</p> <p>The new link will, through reassignment of traffic, lead to improved air quality within local villages and urban areas adjacent to existing routes helping to improve the health of locals and visitors</p> <p>There will improved accessibility to a wider range of goods and services for those currently constrained by the lack of an appropriate route or those impacted by rat running traffic using the existing routes</p> <p>Improved safety through the reduction of rat running trips and the associated speeding in certain locations will further benefits those in local communities</p>
To improve and conserve Norfolk’s environment	The potential options will be designed to minimise impact on the environment while there are expected to be benefits in terms of air quality and noise locally and in the urban environment. To minimise the impact on biodiversity through the development of appropriate design

- 2.3.64. As part of a general improvement to the priority road network the NWL is an agreed shared priority.
- 2.3.65. The Norfolk Strategic Framework sets out the developments in Norfolk. These might have considerable impact on the study area, through a direct intervention in the form of the NWL and through the indirect impacts such as increasing population and employment requirements.

## Norfolk Strategic Infrastructure Delivery Plan (2018 – 2028)

- 2.3.66. The Infrastructure Delivery Plan (IDP) pulls together information on the key infrastructure needed to deliver economic growth in Norfolk. As a working document it will be reviewed on a regular basis as information becomes available and projects progress through to delivery. The Plan will help NCC and partners to coordinate implementation, prioritise activity and respond to any funding opportunities.
- 2.3.67. The plan lists several Key Infrastructure Projects that NCC, in collaboration with partners, is seeking to progress over the next 10 years.
- 2.3.68. These were judged on three criteria:
- Delivering significant housing and jobs growth
  - Identified in existing plans/programmes
  - Have a committed route to delivery
- 2.3.69. The A47 North Tuddenham to Easton dualling scheme, is currently being progressed by Highways England as part of their Route Investment Strategy (RIS) programme. This is due to be delivered by May 2023. **Figure 2.3** provides a summary of the location of the proposed Norfolk infrastructure projects. The NDR Broadland Northway was at this stage under construction and so is not included within the map.



**Figure 2.3 - Strategic Infrastructure projects in Local Authority control**

- 2.3.70. With respect to the NWL the document states that “to connect the Norwich Northern Distributor Road at Taverham to the A47 west of Norwich – has been identified as one of the county council’s priority road infrastructure schemes. Scheme development work has commenced, looking at the business case for such a link and to consider possible routes.”

### **Greater Norwich Joint Core Strategy**

- 2.3.71. The Joint Core Strategy (JCS), adopted in 2014, sets out the long-term vision and objectives for the area covering Broadland, Norwich and South Norfolk Councils working together with NCC as the Greater Norwich Development Partnership (GNDP). It identifies broad locations for new housing and employment growth and changes to transport infrastructure as well as other supporting community facilities. The JCS states that 37,000 additional homes and 27,000 new jobs are to be provided by 2026.
- 2.3.72. Broadland District Council, NCC and South Norfolk Council are working together with NCC to prepare the Greater Norwich Local Plan and review the JCS. The Plan will build on the long-established joint working arrangements for Greater Norwich, which have delivered the current JCS for the area. The JCS plans for the housing and jobs needs of the area to 2026 and the Greater Norwich Local Plan will ensure that these needs continue to be met to 2036.
- 2.3.73. The Greater Norwich Local Plan will build on the long-established joint working arrangements for Greater Norwich, which have delivered the current JCS and will include strategic planning policies and allocate sites for development. It will aim to ensure that new homes and jobs are delivered and the environment is protected and enhanced, promoting sustainability and the effective functioning of the area. To oversee the preparation of the new Local Plan the authorities involved have re-established their joint working arrangements under the GNDP.

### **Norwich Area Transportation Strategy**

- 2.3.74. The NATS, published in 2006, has been prepared by NCC, in partnership with Norwich City Council, Broadland District Council and South Norfolk Council. The strategy covers the city of Norwich, its suburbs and the first ring of surrounding villages. Currently the NATS is under review with the guiding principles agreed.
- 2.3.75. The document sets out a transportation strategy for the Norwich area until 2021 to help deliver the growth within the Norwich area and address the problems, such as congestion. The strategy also promotes sustainable travel choices, recognising the need to maintain the economic health of the Norwich area. The NATS includes six strategic themes and objectives which underpin the vision, as outlined in **Table 2.6**.
- 2.3.76. The NATS Implementation Plan Update was published in 2013 which outlined progress made since 2010 and set out the proposed approach and phasing of future delivery.

**Table 2.6 - NATS transport priorities**

Theme	Aim	NWL Contribution
Accessibility	Promote sustainable modes of travel and encourage reduced car-use through land use policies; reduce social exclusion by improving accessibility for people from poorer, deprived areas to work, shops and medical facilities	The reassignment of trips away from the existing routes between the A1067 and A47 will help to encourage more active travel trips on these routes, while the new link will improve accessibility to employment and services locally and regionally
Congestion	Minimise congestion and delays for all modes of transport by improving the efficiency of the transport network	Reassignment of trips on to the new link will significantly improve the journey times of both the reassigned trips and those trips remaining on the existing routes
Pollution	Reduce carbon dioxide (CO <sub>2</sub> ) emission from transport by encouraging sustainable modes of travel and vehicles using fuels derived from renewable sources or waste; minimise noise and vibration and visual intrusion from transport; implement transport solutions that protect open spaces and biodiversity	Reassignment of trips onto the new direct higher speed link to help to limit increase in carbon emissions (this does not take account of electrification of vehicles)  Removal of trips on local roads could encourage travel by sustainable modes
Safety	Maximise safety and security for everyone; minimise the number and safety of road traffic accidents	The reassignment of trips from the existing lower standard roads on to the proposed higher standard NWL will produce a lower accident rate
Economic viability	Improve the competitiveness of the Norwich area as a retail, tourist and business centre, whilst enhancing its image and maintaining a high-quality environment	Development of a new link will improve the areas and regions accessibility. Improved journey times will help promote an efficient economic environment while reduced traffic flows on existing routes will to encourage more tourism
Liveability and community	Lower the incidence of crime experienced on the transport system and remove the perception of fear of crime for vulnerable people; protect and enhance residential amenity and minimise community severance	The introduction of the new link should reduce the incidence of rat running and associated speeding. Removing traffic from the local roads should improve severance in the villages and residential areas affected

### Norwich City Council Local Plan

- 2.3.77. The Norwich City Council Site Allocations and Site-Specific Policies Local Plan (adopted December 2014) demonstrates allocations for a total of 73 sites, many of which are for mixed-use development and for housing, with a small number of sites allocated for employment and other uses. Policy 11 of the Greater Norwich Joint Core Strategy covers Norwich city centre, promoting it as the main focus in the sub-region for retail, leisure and office development, with housing and educational development also adding to the vibrancy of the centre. The remainder of the Norwich urban area is covered in Policy 12.

- 2.3.78. The Local Plan allocates 31 sites in the city centre and 42 in the remainder of the city. Most of the sites proposed for development will deliver mixed-use development, which will contribute to the vibrancy of the city centre, strengthen the city’s sub-regional role and help deliver targets for new housing and employment. The allocations are sufficient to accommodate 3,124 new houses and flats (927 of these in the city centre, and 2,215 in the remainder of the city) together with an additional 7ha of employment land.

With the provision of the new highway link it is considered that trips will reroute from roads within Norwich reducing congestion and improving accessibility helping to support housing within Norwich while also supporting investment to the west of the city and helping to provide jobs.

### **South Norfolk District Local Plan**

- 2.3.79. South Norfolk District Council’s Site-Specific Allocations and Policies Document (adopted October 2015) designates areas of land for particular uses, most notably land to deliver housing, but also for other forms of developments such as employment, recreation, open space and community uses. Policy 10 of the Greater Norwich Joint Core Strategy identifies a list of major new or expanded communities in the Norwich Policy Area, including Easton and Costessey within South Norfolk.
- 2.3.80. Policy EAS 1 and EAS 2 of the document states that the settlement of Easton has 52.6ha of land allocated for 900 dwellings and associated infrastructure, as well as 1.4ha of land allocated for a new Gymnastics Centre. Costessey has a number of policies within the document (COS 1, COS 2 and COS 3), which outlines an allocation of 29.6ha of land for 500 dwellings and associated infrastructure (with an additional 5.5ha for green infrastructure), and 13.3ha of land allocated for employment uses.

The inclusion of the NWL in to the road network will help to encourage growth in the Easton and Costessey area as well as the region in general through improved accessibility and connectivity

### **Breckland Council Local Plan**

- 2.3.81. The Core Strategy adopted in 2009, outlines the vision and overall objectives for development in Breckland up to 2026, and sets out where new housing and other development should be focused. The Site-Specific Policies and Proposals Development Plan document (adopted in early 2012) allocates areas of land for different uses to deliver the requirements of the Breckland Core Strategy and thus meet the development needs of the District up to 2026.
- 2.3.82. The requirement for Breckland is to deliver 15,200 homes and 6,000 net new jobs over the period 2001 to 2021. Policy CP 1 indicates that provision is made for the development of at least 19,100 homes and associated infrastructure with the majority to be provided in the larger towns and settlements, including; Thetford, Attleborough, Dereham, Swaffham, Watton, Shipdham, Harling, Swanton Morley and Narborough. A total of 14% (2,716 dwellings) are allocated to ‘All other parishes’ within the district, with some allocated within the NWL study area at Lyng, Sparham and Bawdeswell.
- 2.3.83. Beckland Council are in the process of producing a new Local Plan which will replace the Core Strategy and group of documents that make up the current adopted Local Plan. This emerging Local Plan will run from 2011 – 2036. The plan sets out that 15,298 new homes (Policy HOU 01) are needed over the Plan period along with 64 hectares of employment land (Policy EC 01).

- 2.3.84. The Breckland Local Plan was submitted for independent examination on 30 November 2017. A consultation on the main modifications is currently ongoing (Thursday 30 May 2019 to 5pm on Friday 12 July 2019).

The provision of a new highway link between the A47 and A1067 will improve accessibility and connectivity locally and regionally encouraging investment and new housing.

### **Broadland District Council Local Plan**

- 2.3.85. Broadland District Council's Site Allocations Development Plan Document (adopted May 2016) sets out housing allocations in respective policy areas, some of which are incorporated within the study area. The document refers to the Norwich Policy Area which includes the city of Norwich, part of South Norfolk and part of Broadland District. The plan encompasses the Growth Triangle Area Action Plan (adopted July 2016) which has an Area Action Plan and seeks to deliver around 7,000 new homes by 2026 rising to 10,000 thereafter.
- 2.3.86. As well as housing significant land is allocated for employment purposes including 25ha at Broadland Business Park, a further 25 ha at Rackheath Business Park.

The improved level of accessibility and connectivity associated with the new highway link will encourage investment in the local area and help to encourage housing

## **EMERGING POLICY**

### **Greater Norwich Local Plan**

- 2.3.87. The Greater Norwich Local Plan (GNLP) (Regulation 18) sets out the planning strategy across the three districts of Broadland, Norwich and South Norfolk until 2036. Greater Norwich is a key engine of growth nationally. The area is one of the fastest growing parts of the country and is establishing itself as a leader in science, technology and manufacturing. The partners are committed to helping to turn world class knowledge and ideas into world class jobs, particularly in key growth sectors such as the life sciences and biotechnology, agri-tech, food and drink, creative and digital industries, high-value engineering. There is also the need to support and boost other sectors such as tourism.
- 2.3.88. The currently adopted strategy planning to 2026, the JCS for Broadland, Norwich and South Norfolk, along with adopted Site Allocations Plans, Area Action Plans (AAPs) and Neighbourhood Plans in each of the three districts, set out where a high proportion of the growth required by the GNLP to 2036 will be located.
- 2.3.89. The GNLP will identify the broad strategy for where the additional growth will be located, the sites for that growth and how to plan for issues such as supporting the economy, environmental protection and good design.
- 2.3.90. The GNLP will be part of a wider package of joined up measures the councils are taking to work with the Government, New Anglia LEP, the development industry and service and infrastructure providers to fund and deliver the high-quality growth. The draft vision and objectives of the GNLP are shown in **Figure 2.4**.



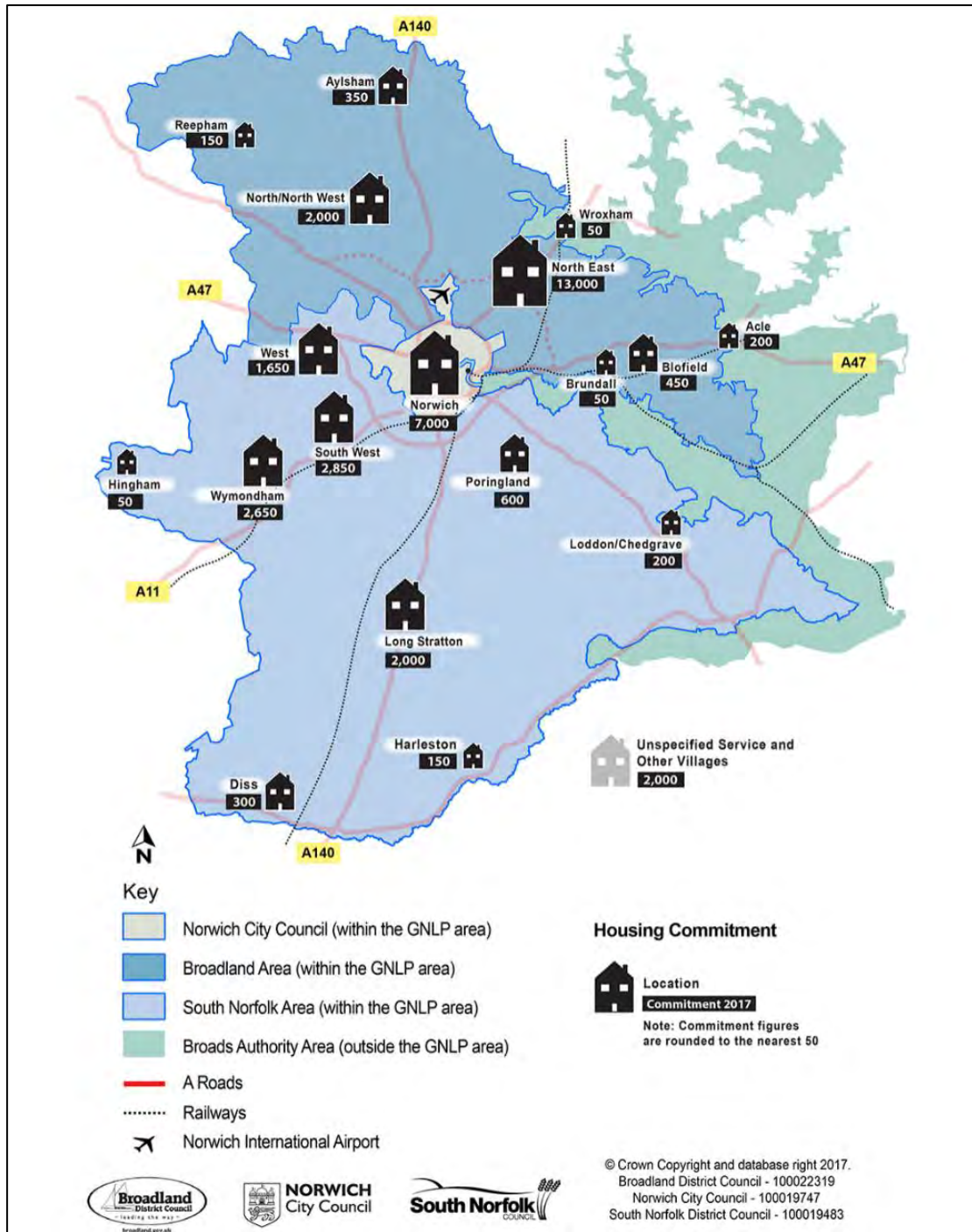
**Figure 2.4 – GNLP Draft Vision and Objectives**

2.3.91. To achieve the Vision and Objectives of the plan, the GNLP will help to drive economic growth, delivering an increase on forecast growth in jobs and productivity. The plan will aim to support the delivery of 45,000 additional jobs by 2036 and enable growth in the economy, including in high productivity sectors. To make this happen the GNLP will include policies that:

- Support the economy through infrastructure investment, environmental enhancement and quality of life improvements
- Enable development of the strategic employment locations in the city centre, the Norwich Airport area, Broadland Business Park/Broadland Gate, Norwich Research Park (NRP), Wymondham/Hethel, Longwater and the Food Enterprise Zone
- Promote the Cambridge Norwich Tech Corridor growth initiative
- Promote inclusive growth and social sustainability
- Provide for local employment close to where people live
- Support a thriving rural economy

- 2.3.92. The strategy will deliver the housing that is needed. To do this, 42,865 new homes will need to be provided. Allowing for sites which are already permitted or allocated, new sites for an additional 7,200 homes are needed.
- 2.3.93. The plan will maximise urban brownfield site capacity and ensure greenfield development takes place in accessible locations, helping to sustain town and village life, providing choice and aiding housing delivery.
- 2.3.94. The majority of the planned growth is focussed in and around Norwich, with the city centre and other strategic employment sites supporting the area's regional, national and international economic functions and the suburbs and fringe parishes providing growing sustainable communities.
- 2.3.95. Growth of the economies of the main towns and rural areas will also be encouraged and supported, with some housing growth in all towns and in the villages with a range of services.
- 2.3.96. Growth will be located to make the best use of the existing transport and green infrastructure networks and community facilities, with new and improved infrastructure provided where it is needed to support growth.
- 2.3.97. The Strategic Housing Market Assessment (SHMA) calculates how many homes would be required in the Greater Norwich Local Plan to support this growth. A simple recalculation of the SHMA assessment to rebase to 2017 suggests that around 40,700 dwellings are required, of which 80% have been identified as part of existing adopted plans (as shown in **Figure 2.5**). Beyond this, the new Local Plan seeks to identify further sites for 7,200 new homes to achieve the OAN set out in paragraph 4.17 of the Local Plan.





Source: Greater Norwich Draft Local Plan (page 23)

Figure 2.5 – Greater Norwich Local Plan baseline committed growth

## 2.4 PROBLEM IDENTIFIED

2.4.1. The main challenges which the proposed schemes have been developed to address, cover a range of topics including demographics, transport, travel patterns, baseline and future modelling and environmental challenges.

## TRANSPORT CONTEXT

- 2.4.2. Within the NWQ, the River Wensum and, to a lesser extent, the River Tud present a significant physical barrier to north-south movement between the A47 and A1067 which are the key radial routes into central Norwich from surrounding market towns of Fakenham, Dereham, Kings Lynn and Swaffham on the west of Norwich. There are a small number of existing bridges crossing the Rivers which are also constrained - some are unsuitable for heavy vehicle traffic and others cannot be appropriately widened or strengthened in their current position due to the Special Area of Conservation and SSSI Ecological designations which apply to the River Wensum.
- 2.4.3. There are no existing Primary A Road Standard routes available to cater for north-south desire lines through the NWQ between the outer ring road (A140 Sweet Briar Road) and A1065 route from Swaffham to Fakenham, some 35km west of A140.
- 2.4.4. The existing signed HGV route via the B1535 is also remote from Norwich, some 10km west of the A140 outer ring road Following B-road re-classification in 2015 the current B1535 has a tortuous alignment geometry with tight bends which deter some users.
- 2.4.5. All other alternative routes within the study area are predominantly rural minor single carriageway roads, with constrained alignment geometry, which offer indirect and inefficient travel routes. Whilst efforts have been made by NCC to avoid attracting additional through traffic to these routes, many network users have local knowledge of the area and use the routes on a daily basis to avoid congestion and satellite navigation devices also enable unfamiliar users to find shortest distance routes through minor roads within the study area.
- 2.4.6. Generally, the existing minor rural roads through the NWQ are less than 6 metres in width and often with tight bends and narrow verges or protected verges, these roads pass through residential areas. Improvements to local roads have been implemented to resolve long standing HGV traffic problems in Hockering, however there is still existing pressures on the local road network.
- 2.4.7. A lack of appropriate route options results in a significant number of rat running trips on existing local routes such as Lyng Road, Heath Road, Honingham Road, Church St, Marl Hill, Taverham Road, Honingham Lane, Ringland Road, Beech Road, Longwater Lane and Costessy Lane. This results in delay and congestion in peak hours and speeding outside the peak hours. A technical note summarising recent survey data collected in October 2018 is attached in **Appendix A**. This additional traffic brings with it issues related noise, safety and emissions for local communities and hinders the opportunity for non-active travel modes.
- 2.4.8. As part of a previous study, the Longwater Interchange has been identified as suffering from congestion and delay in the peak periods especially on Frost Way and the A47 Offslips in the PM peak period.
- 2.4.9. There is congestion and delay at junctions and along road links on the radial routes and the ring roads within Norwich. Outputs from the traffic model showing the areas with issues are attached at **Appendix A**.

- 2.4.10. Economically the lack of an appropriate link is likely to hamper investment and growth in the future both locally and regionally. Several key employers are located in or adjacent to the study area such as the Food Enterprise Zone, the Norfolk and Norwich University Hospital (NNUH), the Norwich Research Park (NRP) and Norwich International Airport. Currently the lack of an appropriate western link restricts accessibility to these businesses both locally and in relation to areas to the west of Norfolk and the West Midlands.
- 2.4.11. Norwich Railway Station is located approximately 8km south-east of the study area. Norwich is well placed on the rail network, however there are no connecting stations present within the NWQ. Two disused railway lines, passing through the study area, now form the National Cycle Network Route 1 (NCN1), a 42km footpath, bridleway and cycle route.
- 2.4.12. The bus network in the study area is largely radial, providing routes to/from Norwich city centre along key corridors connecting residential areas to major employment sites. The eastern part of the study area is well connected with Norwich city centre, due to its proximity. There are a number of services connecting the NWQ to the north and east of Norfolk and Norwich, however, other services are limited and infrequent. The bus service network and the frequency of services is set out on the Option Assessment Report (OAR).
- 2.4.13. The Costessey Park & Ride is located closest to the NWQ study area; however, this only serves NNUH and University of East Anglia (UEA), therefore residents of the NWQ would undertake trips through the study area to access alternative Park & Ride sites. The location of the other Park & Ride Sites and the bus routes that serve them are set out in the OAR.
- 2.4.14. Walking infrastructure in the study area is variable, with built up areas having footways adjacent to the highway. Rurally, there is limited provisions – with PRowS through a number of villages. The A1067, A47 and Longwater interchange are currently major barriers to pedestrian access, as no/limited infrastructure is available for users wishing to access local community facilities, shops and services.
- 2.4.15. Cycling facilities within the study area are generally limited to the urban fringe and Norwich city centre. Seven Pedalways crossing the city in all directions, and converging at St Andrews Plain, are being funded to improve connections and provide a higher quality cycle network. The study area also includes the NCN1, utilising the disused railway line. The cycle network is set out in the OAR.
- 2.4.16. In the central region of the study area, between Hockering, Longwater interchange, Taverham and Attlebridge, there is a limited number of existing structures that could support a potential NWL. The majority of structures between the A47 and A1067 are single lane carriageway or footway/cyclepath structures. The only dual carriageway structure within the study area is currently in New Costessey serving the A1074. Currently a couple of river crossing structures are assessed as weak bridges and therefore have weight restrictions in force, however it is noted that some HGVs ignore the restrictions currently in place.

#### **Transport context challenges:**

- Limited connections exist between the A47 and A1067, reducing the orbital connectivity of the A1270, and creating pressure on the existing single carriageway roads – especially for HGV movements
- There are no railway connections within the study area, and significant infrastructure would be required to create a rail network within the NWQ, therefore increasing pressure on the highway network

- There are limited direct bus connections between the NWQ and other towns / major services within Norfolk. Limitations of the Costessey Park & Ride service is likely to generate trips through the study area
- There are inadequate pedestrian and cycle facilities between villages and to services outside of built-up areas. The existing facilities are perceived as unsafe due to high volumes of traffic
- Cycling facilities are located to the east of the study area, within the urban fringe of Norwich. To the west of the study area there are limited connections, increasing pressure on the highway network
- Within the study area there is a limited number of existing structures that could support a potential NWL and therefore significant infrastructure will be required to provide for the standard needed

## TRAVEL PATTERNS

- 2.4.17. As set out in the OAR the car represents the dominant mode of travel to work within the study area, even though 37% of journey to work trips made by car are under 10km. Approximately three-quarters of residents within the NWQ travel to work by car, with much smaller proportions using public transport. The majority of the study area has access to two or more cars.
- 2.4.18. Traffic volumes on key links within the study area have generally increased by about 13% between 2015 and 2018 following the opening of the A1270. The A1270 carries approximately 20,000 vehicles per day, approximately 3% of which is HGVs, and relieves traffic on the A1067 Drayton High Road by removing around 2,000 vehicles per day.
- 2.4.19. There is a large concentration of commuters journeying to Norwich city centre, NNUH and other wider locations, such as Attleborough / Wymondham and Dereham, from and through the NWQ. These trips could benefit from a NWL by avoiding the need to use the local road network, or the outer ring road of Norwich to continue on more strategic journeys. Origin-destination data demonstrates that trips could be potentially removed from these networks and be attracted onto a NWL.
- 2.4.20. During the five-year period from 2011 to 2015, there were 663 recorded collisions within the study area, involving 898 casualties, of which, 77 were pedestrians, 90 were cyclists, and 72 included motorcyclists. The introduction of a NWL has the potential to improve safety on the local road network between the A1067 and A47, and may reduce the accident rate along the A1067 and A1074 by transferring a proportion of trips onto a NWL, avoiding the need to use the outer ring road as part of a longer strategic journey.

### Travel pattern challenges:

- There is high car dependence and ownership which puts pressure on local transport networks, despite a high number of journeys being short. There is potential to encourage modal shift
- Increasing traffic volumes causes increased pressure on the highway network. A NWL could relieve congestion on the local road network and reduce rat-running, as is evident along the A1067
- There is a high volume of traffic movement through the study area, with origin-destination data showing that a NWL could serve as a commuter link for the city centre, NNUH and other locations along the SRN

- There were 663 accidents within the study area, eight of which were fatal, and nearly one-fifth involved NMUs. A NWL scheme could help address safety issues at accident hotspots by providing higher standard highway infrastructure to current design standards

## LOCAL ENVIRONMENT

- 2.4.21. The study area has a mixture of land uses, including: rural farmland, parkland, residential areas and business and retail areas. The study area also includes the River Wensum and a number of environmental designations. The closest AQMA is the Central Norwich AQMA. There are three NIAs along the A47, five NIAs along the A1074, 11 along the A1067 and several in Norwich city centre. There is a total of 186 listed buildings, of which 12 are Grade I, 19 Grade II\* and 155 Grade II and a total of nine Scheduled Monuments. The study area has high potential for archaeological deposits. The most significant ecological site is the River Wensum SAC / SSSI. The study area also includes 75 CWSs and five RNRs. There are two watercourses which are designated as 'main rivers' within the study area (the River Wensum and the River Tud), which are in a Flood Zone 3 area.

### Local environment challenges:

- There is a mixture of land uses that will require a wide-ranging approach to ensure appropriate engagement is undertaken with local communities, stakeholders and land owners
- The study area is environmentally sensitive, and designated sites will need to be considered when implementing any transport infrastructure within the study area

## FUTURE GROWTH

### Housing and employment

- 2.4.22. The Greater Norwich Local Plan indicates that from 2017 to 2036 there is a OAN for approximately 38,988 dwellings. In Broadland, a number of fringe parishes forming part of the Norwich Policy Area have a combined allocation of between 1,462 and 1,662 new houses. The Easton / Costessey area has also been identified as a major growth location, with plans to accommodate 1,500 new dwellings and enhanced local services. Further development of the Greater Norwich Local Plan is ongoing and will eventually lead to formal allocation of sites for housing for the period up to 2036.
- 2.4.23. The draft Greater Norwich Local Plan also seeks to deliver a total of 30,000 jobs by 2031 (including the 27,000 jobs planned for in the Joint Core Strategy). Broadland District Council has progressed a LDO to help facilitate a Food Enterprise Zone (FEZ) to the west of Easton village and south of the existing A47. When complete the FEZ is expected to provide 3,000-5,000 jobs and host multiple businesses with a range of complimentary uses connected to the agri-food sector.

### Transport improvements

- 2.4.24. As part of the RIS, the A47 was recognised as having a number of congestion hotspots, particularly around Norwich. The A47 North Tuddenham to Easton scheme is for a new dual carriageway, with two new junctions – a roundabout at Berry's Lane / Wood Lane, and a roundabout at Blind Lane / Taverham Road. Elsewhere in the study area, a number of schemes are also being brought forward for the local road network, which seek to be address local issues, however they are not generally of a scale which will influence the way in which a NWL is used.

### Future challenges:

- Significant housing and employment growth is anticipated across the study area, which will increase pressure on the local and strategic road network. The impact of this growth needs to be fully understood and considered within appraisal of a NWL
- Individual local and strategic improvements to the road network will assist with capacity issues, however transport related problems within the NWQ will persist into the future without intervention

### FORECASTED TRAFFIC

- 2.4.25. The future year traffic models have been utilised to provide an indication of the future operation of the local road network. The forecast models include local developments which have planning permission or are going through the planning process. Background traffic growth has been applied using TEMPro and NRTF factors for each of the forecast years (2025, 2040 and 2050). By 2025 HGV movements across the network are forecast to have grown by up to 17%. This is likely to exacerbate issues on the local road network between the A1067 and A47, resulting in increased severance, congestion and safety concerns for local residents.
- 2.4.26. AADT flows for the 2025, 2040 and 2050 forecast year models have been produced, assuming grade separated junctions with the A47 North Tuddenham to Easton.
- 2.4.27. The A47 is forecast to increase by 12,000 vehicles per day (west of Sandy Lane) and 11,000 vehicles per day (east of Wood Lane) by 2040. The A1067, between Attlebridge and the A1270 is forecast to increase by 6,000 vehicles per day by 2040. The existing routes between the A47 and A1067 (including Lyng Road, Ringland Road, Honingham Road and Taverham Road) are also predicted to show increases in traffic of approximately 6,000 vehicles by 2040. This would be nearly double the existing total flow on these routes. The existing B1535 would experience an additional 3,000 vehicles per day by 2040. There is predicted to be a large increase in modelled flow on the former A47 west of Taverham Road which is likely to be influenced by traffic from additional development in the A47 corridor.

### Forecasted Traffic challenges:

- HGV movements are forecast to grow by 17% by 2050. This is likely to exacerbate issues on the local road network, increasing severance, congestion and safety concerns
- Existing routes between the A47 and A1067 are forecast to increase by up to 6,000 vehicles per day by 2040, which is nearly double the observed base flow
- West of Taverham Road, there is expected to be a large increase in modelled flow due to traffic generated from additional development within the A47 corridor

### DEMOGRAPHICS

- 2.4.28. The total estimated population in the NWQ is 77,600 (excluding Morton on the Hill and Alderford). The study area has an ageing population with high proportions over 65 years of age, and a lower than average economically active proportion compared to the region. The population in the Norfolk area is expected to increase by approximately 12.4% over the period from 2016 to 2041, of which 2% is growth in the working population (15-64 years of age) and 44% is growth in the retired population (65+ years of age).

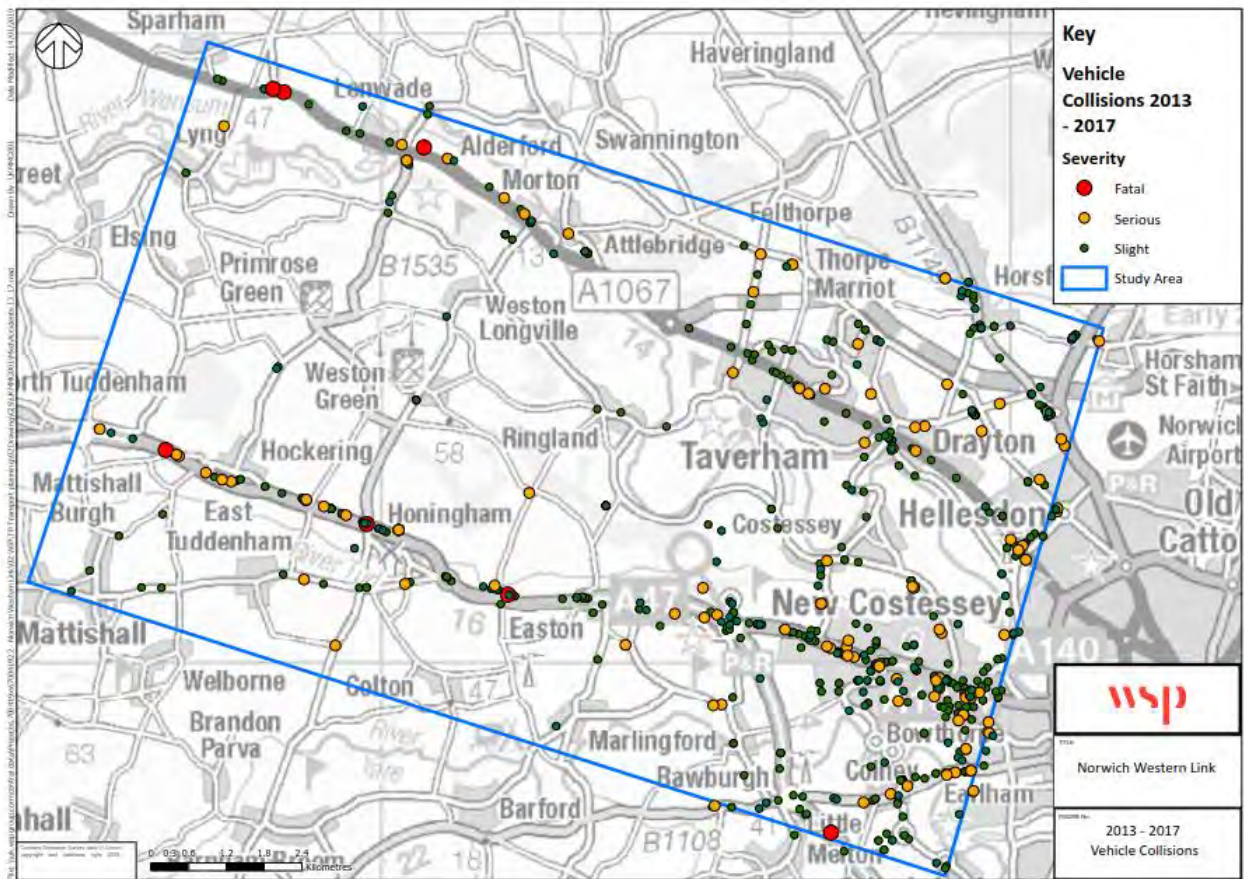
- 2.4.29. The NWQ has two of its LSOAs (Bowthorpe and North Earlham) in the 10% most deprived areas of the country, measured against the IMD. Higher deprivation exists across the study area when education skills and training indices are considered with some areas within the 30% most deprived areas in the country. However, in terms of health deprivation, the study area is less deprived, with some locations within the top 10% least deprived areas nationally.
- 2.4.30. Norwich is the largest labour market in the region, accounting for approximately 60% of all jobs in Norfolk. The employment rate ranges from 16% (University) to 79% (Horsford and Felthorpe). Unemployment rate ranges from 4% (Cringleford, University, Drayton and Great Witchingham) to 13% (Wensum). Apart from the eastern part of the study area (Bowthorpe and North Earlham), the NWQ has higher levels of employment than the surrounding county, region and country as a whole.

#### Demographic challenges:

- A significant increase in population, particularly of elderly residents, is likely to generate additional pressure on the transport and community infrastructure
- The overall study area has varying levels of deprivation, which results in a complex mix of differing local needs and challenges. A mixture of locations to the west and east of the study area have higher deprivation with regard to education, skills and training, suggesting inadequate transport provision for access to key areas / services
- Levels of employment / economic activity varies across the study area, therefore implementing measures to support economic activity and growth, may vary between communities

#### PERSONAL INJURY COLLISIONS

- 2.4.31. Within the study area, between 2013 and 2017, there have been a number of recorded road traffic incidents resulting in personal injury (the data excludes “damage-only” accidents). The Personal Injury Collisions (PICs) are shown in **Figure 2.6**, which demonstrates that the incidents are primarily along the main arterial routes to or from Norwich city centre. Due to the data available, it should be noted that the A1270 has not been included within this analysis.



**Figure 2.6 – PICs in the study area 2013-2017**

2.4.32. **Table 2.7** looks at the frequency and number of casualties related with the different severity levels of the incidents. During the five-year period from 2013 to 2017, there were 621 recorded collisions within the study area, involving 830 casualties. Of these, 8% (64) were pedestrians, 14% (115) were cyclists, and 13% (106) were motorcyclists or motor cycle passengers. The following sections looks at the pattern of accidents on key sections within the study area.

**Table 2.7 – Severity and casualties of accidents in study area 2013-2017**

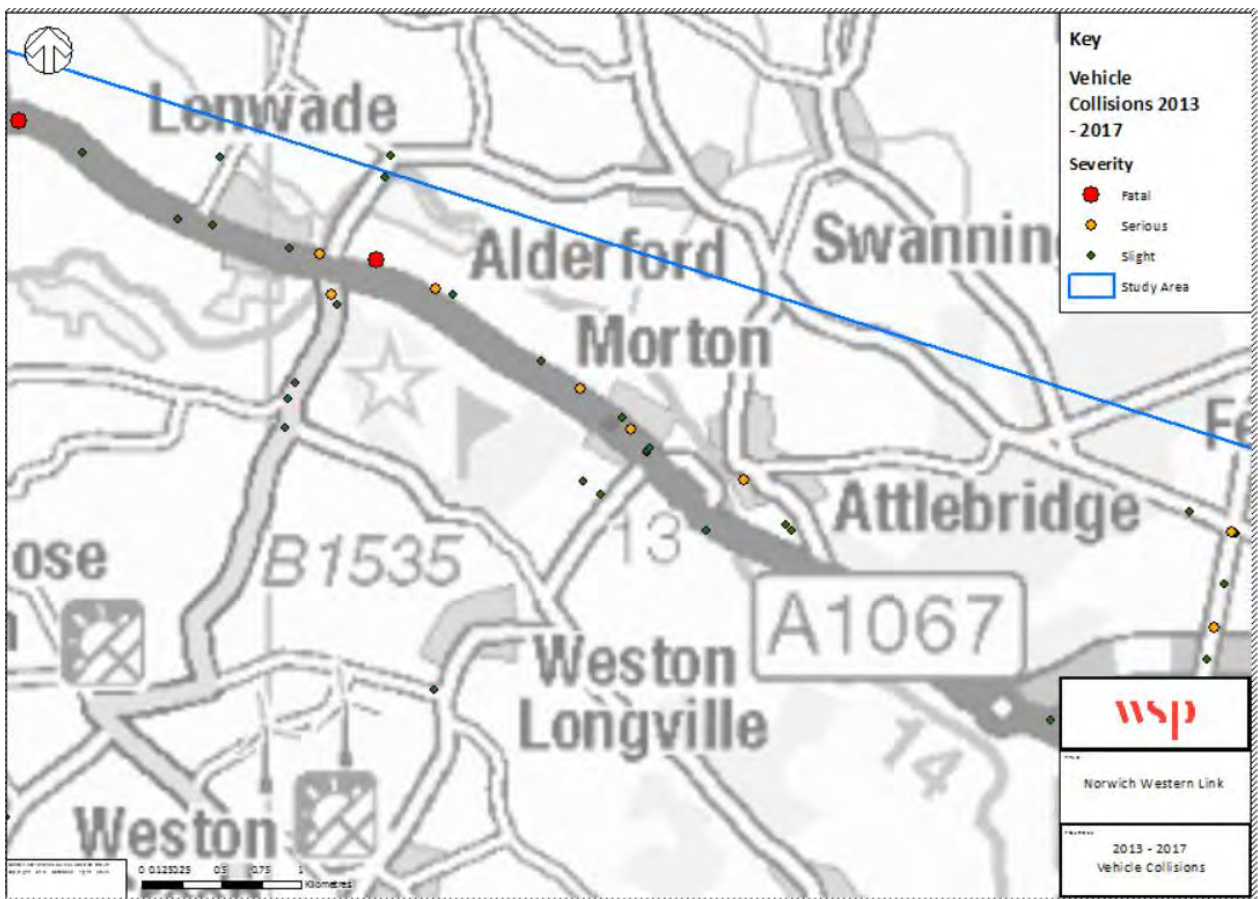
Severity	Collisions	Casualties
Fatal	7	7
Serious	99	121
Slight	515	702
<b>Total</b>	<b>621</b>	<b>830</b>



## A1067

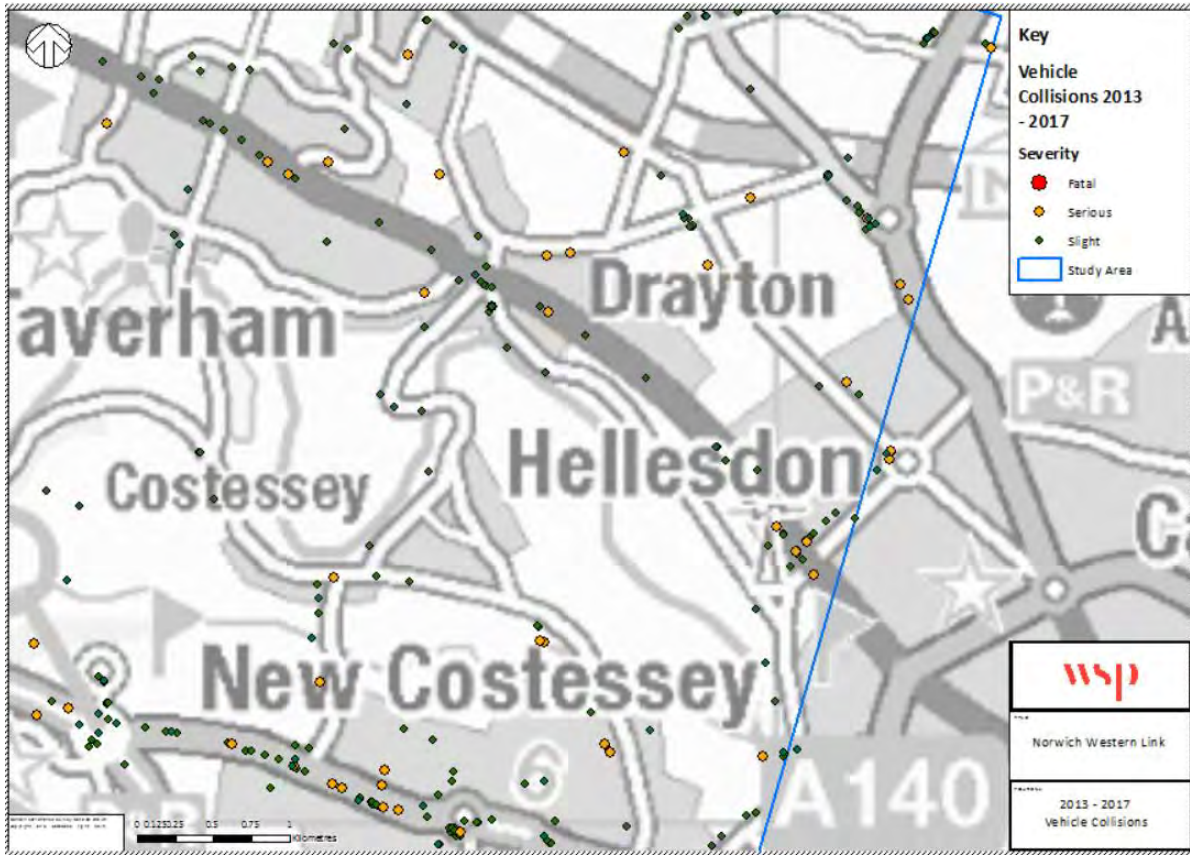
- 2.4.33. **Figure 2.7** and **Figure 2.8** shows the incident record between 2013 and 2017 along the A1067 from Drayton to Morton. The A1067 between the A1270 and Morton demonstrates a relatively low collision occurrence, with a small cluster of slight incidents occurring at the A1067 / Old Fakenham Road junction. The existing route (Marl Hill Road) connecting the A1067 to the A47 via Weston Longville demonstrates only two slight incidents over the time period.
- 2.4.34. Through Taverham there are significantly more incidents, but the majority are slight, with a small proportion of serious incidents. The other alternative route to the A47 through Taverham displays only three slight incidents. The introduction of a NWL has the potential to improve safety on the local road network between the A1067 and A47 and may reduce the incident rate along the A1067 through Taverham by transferring a proportion of trips onto the NWL and avoiding trips having to use the outer ring road as part of a longer strategic journey.

## Attlebridge



**Figure 2.7 – PICs along the A1067; Attlebridge**

## Drayton

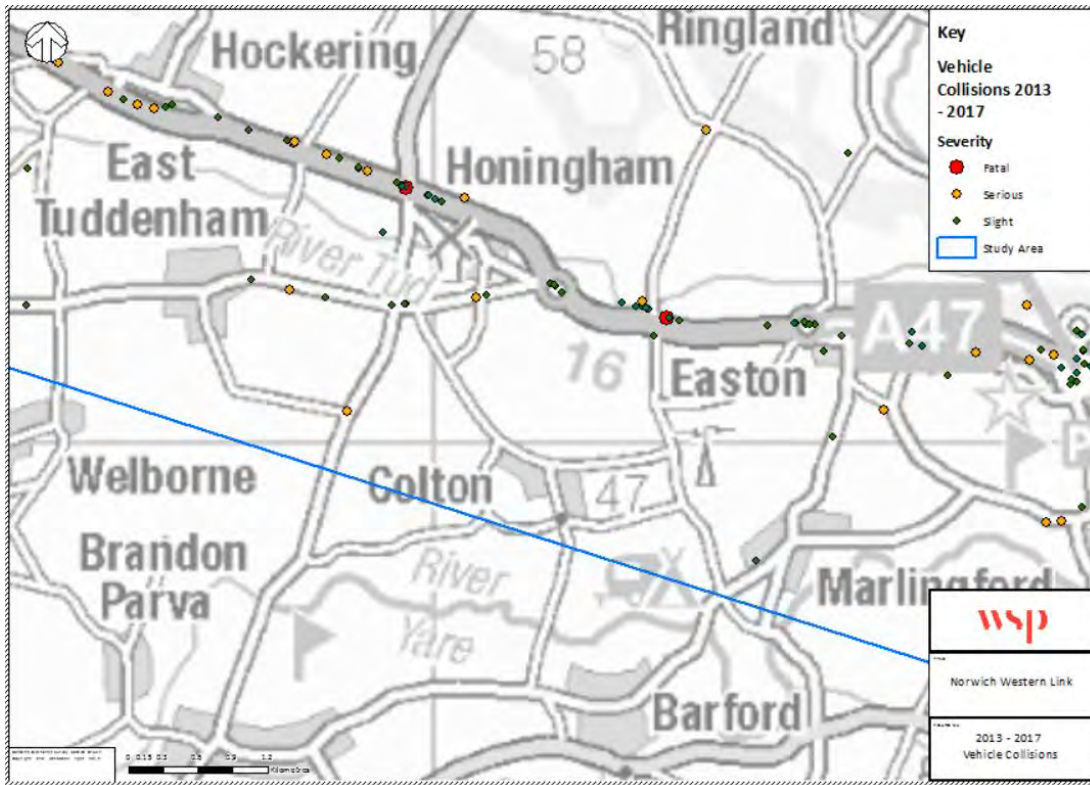


**Figure 2.8 - PICs along the A1067; Drayton**

### A47

- 2.4.35. **Figure 2.9** shows the incident record between 2013 and 2017 along the A47 from Tuddenham to the A1074 through New Costessey. The A47 between the Longwater interchange and the Taverham Road junction demonstrates a cluster of incidents where the A47 reduces to single carriageway. Prior to the Taverham Road junction the A47 exhibits a couple of fatal incidents and a significant number of serious incidents. The Highways England A47 North Tuddenham to Easton scheme, commits to upgrading the A47 to dual carriageway standard, with a key objective of the scheme being to improve road safety for all road users.
- 2.4.36. The introduction of a NWL, in addition to the Highways England RIS scheme, has the potential to improve the current incident rates on the local road network as trips transfer to new higher standard links.
- 2.4.37. The A1074 through New Costessey demonstrates a significant number of slight incidents, with particular clusters occurring at junctions (for example Longwater Lane, Wendene and Norwich Road). There is also a significant cluster of incidents (slight and serious) at the Longwater interchange. The introduction of a NWL has the potential to improve safety on the road network, and may reduce the incident rate along the A1074 through New Costessey by transferring a proportion of trips onto the proposed higher standard NWL, and avoiding trips having to use the outer ring road as part of a longer strategic journey, with particular destinations to the north of Norwich.

Easton



New Costessey

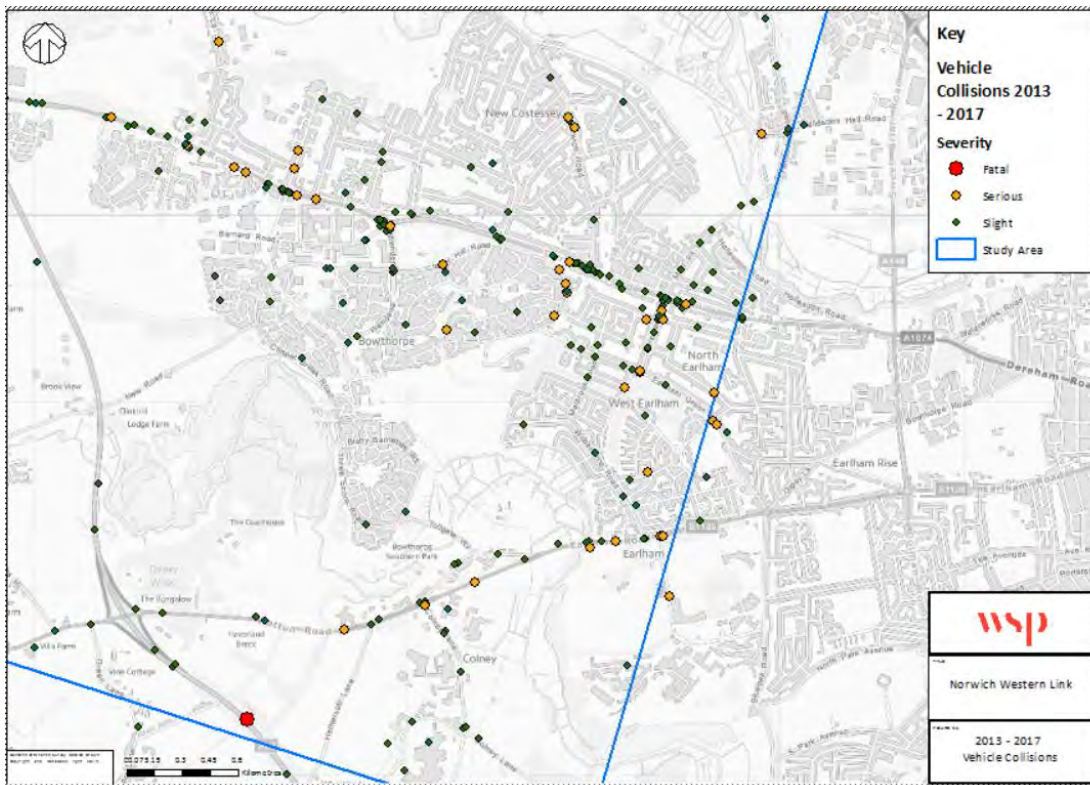


Figure 2.9 – PIAs along the A47 / A1074

## Study Area Collisions on the North-South Corridors

- 2.4.38. **Figure 2.9** provides not only the location of PICs on the major roads in the study area but all PICs including those on minor and local roads. Collisions on several roads which are currently used by drivers to connect between the A47 in the south and the A1067 in the north have been analysed. This includes but is not restricted to:
- Lyng Road
  - B1535
  - Paddy's Lane
  - Beech Avenue
  - Ringland Road
  - The Street, Ringland
  - Taverham Road
  - Southern Ringland Road
  - Taverham Lane
  - Hellesdon Road and Low Road
  - Longwater lane
  - Norwich Road, Costessy
  - Town House Road
- 2.4.39. A total of 61 collisions were recorded during the study period on the main north-south connector roads resulting in 99 personal injuries. There were no collisions resulting in fatalities recorded during the study period, however eight were classified as serious injury and 53 were classified as slight injury. The total number of killed or seriously injured casualties on the north-south connector roads in the survey area during the survey period was 17% of all casualties.
- 2.4.40. Of the 99 casualties recorded in the study area 82 (83%) were slight while 17 (17%) were recorded as serious, this included 14 non-motorised users including 5 pedestrians and 9 cyclists. While the latest DfT reported road casualties on rural roads shows 11% of casualties were pedestrians and pedal cyclists in 2017, analysis of the study area shows 14% of the recorded road casualties in the study area during the five-year study period have been identified as either pedestrian or pedal cyclist, approximately 29% higher than the national average for rural roads.
- 2.4.41. A significant number of collisions occurred on Longwater Lane to the south of Costessey, The Street running through Costessey and Costessey Lane to the north of Costessey have a combined total of 13 collisions with 16 casualties recorded during the five-year study period.
- 2.4.42. The 2018 survey data indicates that there are speeding issues on some of the routes. Based on the data the roads with the lower speed limits (20 and 30 mph) have the highest incidents of vehicles exceeding the stated speed limit. With three sites showing that over 75% of vehicles exceeded the stated speed limits at the time of the surveys (2018 data). These locations are Honningham Road, Weston Longville (95% exceed speed limit), W End, Costessey (89% exceed speed limit) and Ringland Road, east of River Wensum, Taverham (80% exceed speed limit). Three more sites have more than 40% of traffic exceeding the speed limits, these are: Heath Road, Hockering 47%, Taverham Road, east of Penn Road, Taverham 56% and Longwater Lane, Costessey 46%

## 2.5 IMPACT OF NOT CHANGING

- 2.5.1. Norwich is a major growth area for the wider region. Large scale housing and employment development is planned or being delivered to both the north and south west of Norwich. The Airport area is the most strategically significant focus for employment and business development to the north of Norwich while in the south-west the main focus is the NRP, encompassing the NNUH and the University of East Anglia (UEA). In addition, the FEZ has commenced, Longwater is an established employment and retail concentration, and the showground is a significant attraction. Major housing growth is planned or underway at Hethersett, Cringleford, Costessey and Easton.
- 2.5.2. The future identified challenges based on current information are:
- Significant housing and employment growth is anticipated across the study area which will increase pressure on the local and strategic road network
  - Individual local and strategic improvements to the road network will assist with capacity issues, however transport related problems within the NWQ will persist into the future without intervention
  - HGV movements are forecast to have grown by 17% by 2050. This is likely to exacerbate issues on the local road network, increasing severance, congestion and safety concerns
  - Existing routes between the A47 and A1067 are forecast to increase by up to 6,000 vehicles per day by 2040, which is nearly double the observed base flow
  - West of Taverham Road, there is expected to be a large increase in modelled flow due to traffic generated from additional development within the A47 corridor
- 2.5.3. Based on the modelling report, traffic is expected to grow between 2015 the current model base year and 2025 the scheme opening year by an average of 12% with some vehicles experiencing higher growth rates. Heavy Goods Vehicles (HGVs) are only forecast to grow by 3% in this period whilst Light Goods Vehicles (LGVs) are forecast to grow by 15%.
- 2.5.4. Based on the consultation responses, residents are already concerned with the amount of traffic currently using the local road network and there are safety concerns around walkers and cyclists due to this. The review of the most recent five years of PICs has already highlighted higher casualty levels for walkers and cyclists than the DfT national data for rural roads. The increase of traffic volumes along these routes will exacerbate these issues and concerns leading to increased severance issues for residents. Numerous schools are located within the Taverham area, both primary and secondary. These are classed as sensitive receptors and increases in road traffic around these schools should be kept to a minimum, to avoid air quality, safety and severance issues.
- 2.5.5. Analysis of observed traffic data has shown a high proportion of LGV's in the rural roads between the A1067 and the A47 this includes at Marl Hill Road, north of Weston Longville where approximately 12% of average daily traffic was LGV's. Similar high levels were also observed on Weston Hall Road, on the B1535 south of Weston Hall, Honingham Road, south of Weston Longville, Paddys Lane, and Wood Lane. It can be expected that without provision of a new higher standard route that LGV's will continue to use the existing routes and that the number of LGVs making this movement will increase.
- 2.5.6. The scheme will play a significant role in attracting future investment in to both the study area and regionally in the form of housing and employment development and tourism. The policies and strategies set out in Section 2.3 highlight the aspirations for growth in the area. Both the Joint Core Strategy and the Local Plan, set out the need for housing growth and employment in the study area.

- 2.5.7. Without the proposed western link, existing conditions will worsen and discourage investment locally and regionally. It is considered that, to improve existing conditions in order to provide the desired outcomes and achieve the vision and the objectives of the local area and the wider region the NWL is necessary.

## 2.6 OBJECTIVES

### HIGH LEVEL OBJECTIVES

- 2.6.1. The NWL objectives have been categorised at strategic and local scales. A range of objectives for the scheme have been developed to align with high-level objectives presented in national, regional and local policy. It is anticipated that the NWL will improve strategic connectivity to growth areas, Norwich International Airport and associated development, while addressing specific local issues in the NWQ related to traffic rat-running and congestion.
- 2.6.2. The NWL high-level objectives reflect issues and opportunities identified to support the principal aim of a modern and efficient transport system:
- H1 Support sustainable growth
  - H2 Improve the quality of life for local communities
  - H3 Support economic growth
  - H4 Promote an improved environment
  - H5 Improve strategic connectivity with the national road network

### SPECIFIC OBJECTIVES

- 2.6.3. The specific objectives for the NWL have been developed to both support the high-level objectives and respond to the local challenges identified and need for intervention and are outlined below:
- S1 Reduce congestion and delay, and improve journey time reliability, on routes through the study area
  - S2 Improve network resilience and efficiency of the strategic and local transport network
  - S3 Reduce the number of Heavy Goods Vehicles using minor roads
  - S4 Make the transport network safer for all users (including Non-Motorised Users)
  - S5 Encourage modal shift to more sustainable modes of transport
  - S6 Provide traffic relief (and reduce noise & emissions) within residential areas
  - S7 Enable improved accessibility to existing and new housing and employment sites
  - S8 Improve emergency response times
  - S9 Improve access to green space
  - S10 Not affect the ecological integrity of the River Wensum SAC
  - S11 Contribute to the improved health and well-being of local residents
  - S12 Improve connectivity and accessibility to Norwich International Airport, Norwich Research Park and Norfolk & Norwich University Hospital
  - S13 Minimise any detrimental impact on valued landscapes, the built environment and heritage assets, including through high quality design

## 2.7 MEASURES FOR SUCCESS

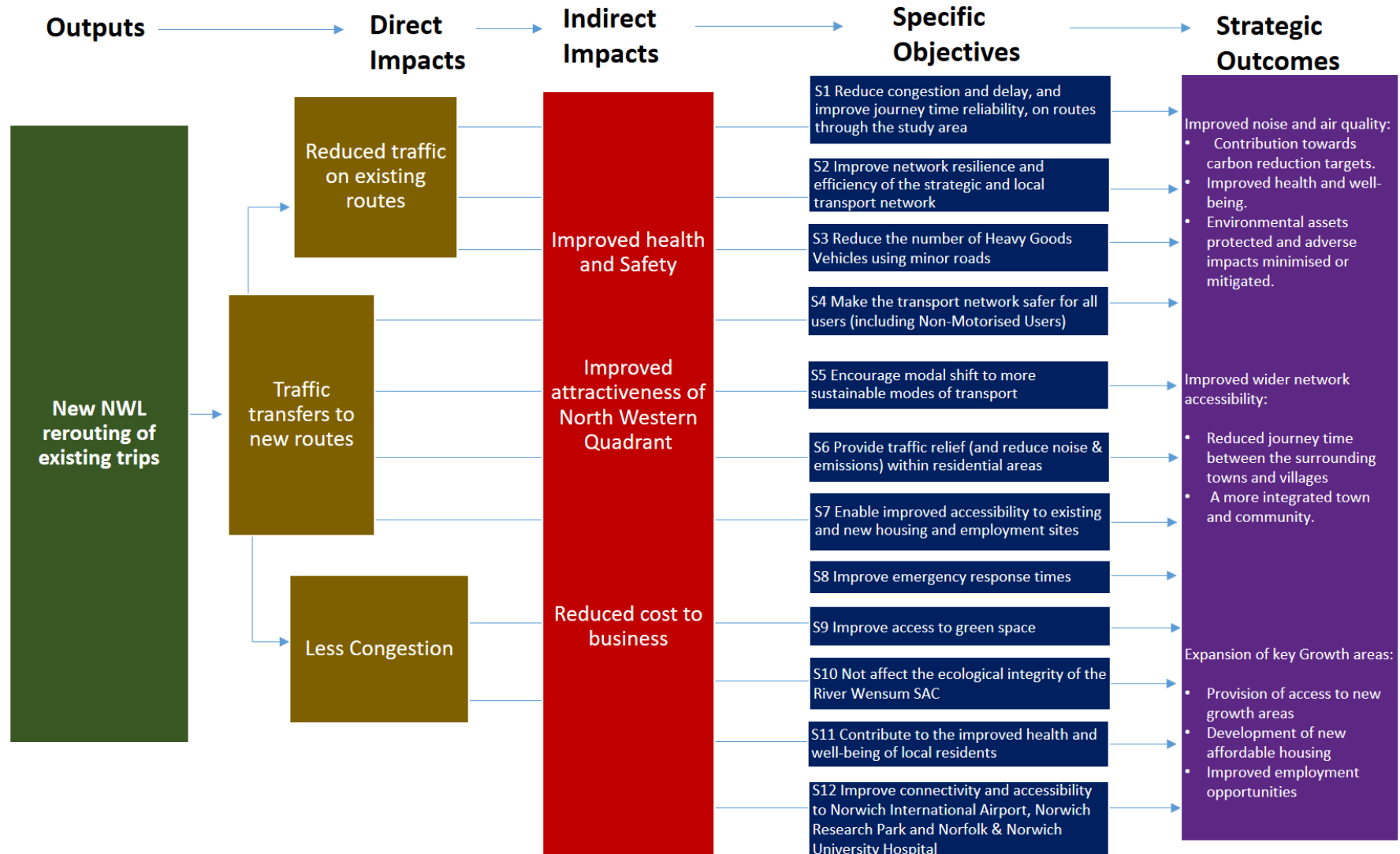
2.7.1. In alignment with the objectives identified within Section 2.6 some measurable outcomes are to be developed using the ‘SMART’ target methodology. This involves the development of Specific, Measurable, Attainable, Realistic and Time bound targets which provide a structured approach to measuring the success of the scheme. At the Strategic Outline Business Case stage these are outlined in **Table 2.8**. The interdependencies of the scheme impacts and objectives are summarised within **Figure 2.10**.

**Table 2.8 – Indicative scheme targets**

Objective	Indicative Target themes
S1 Reduce congestion and delay, and improve journey time reliability, on routes through the study area	Journey time improvements through the study area network and improved journey time reliability Aiming to improve journey time across the wider Norwich area
S2 Improve network resilience and efficiency of the strategic and local transport network	The NWL will provide an alternative route around Norwich to the A47. This will provide options to travellers when there is maintenance or incidents on the transport network and reduce delay at these times Can be measured by a reduction in delay when incidents/maintenance occurs
S3 Reduce the number of Heavy Goods Vehicles using minor roads	The NWL will provide an alternative higher standard route. Can be measured by reduced number of HGV movements using minor roads comparing current to future traffic flows and composition within NWQ
S4 Make the transport network safer for all users (including Non-Motorised Users)	Overall reduction of incident rate within NWQ Current v future five-year study
S5 Encourage modal shift to more sustainable modes of transport	Use of non-highway options in combination with NWL to encourage active travel and increase in PT usage. Can be measured by an increase in numbers of people walking cycling and using public transport
S6 Provide traffic relief (and reduce noise & emissions) within residential areas	Reduced traffic flows and associated noise and emissions in local villages and urban areas such as Costessey, Taverham, Ringland, Weston Longville and Lyng
S7 Enable improved accessibility to existing and new housing and employment sites	Improved journey time between NWQ and through the existing and new sites within the wider Norwich area Increased network capacity

Objective	Indicative Target themes
S8 Improve emergency response times	Improved journey time across NWQ wider area leading to an improvement in emergency response times to the NNHU from the north and north west of Norfolk
S9 Improve access to green space	Reduced journey times to various leisure locations within the wider Norwich area
S10 Not affect the ecological integrity of the River Wensum SAC	The scheme design will be informed by discussions with statutory undertakers such as Natural England and the Environment Agency. The potential environmental impacts will be closely assessed and a detailed mitigation scheme developed for the route to ensure that the integrity of the River Wensum SAC is maintained, during both the construction and operational phases of the scheme
S11 Contribute to the improved health and well-being of local residents	<p>Reduced traffic flows will provide better conditions for active travel within the NWQ.</p> <p>Reduce traffic flows should lead to a reduction in noise and air quality levels for local residents within the NWQ</p>
S12 Improve connectivity and accessibility to Norwich International Airport, Norwich Research Park and Norfolk & Norwich University Hospital	Improved accessibility and connectivity for residents within the NWQ and those travelling through the NWQ to key destination. This will be achieved through the introduction of a new improved route and an overall reduction in journey times
S13 Minimise any detrimental impact on valued landscapes, the built environment and heritage assets, including through high quality design	The Scheme will help to enhance the character of the Wensum Valley through the viaduct creating a beneficial focal feature in the valley, with appropriate planting





**Figure 2.10 - Scheme objectives**

## 2.8 SCOPE OF THE PROPOSED SCHEME

### IN-SCOPE:

- 2.8.1. The proposed scheme will comprise a new single/dual carriageway all-purpose road to the west of Norwich, from the A47 to the A1067/A1270, including a new bridge over the River Wensum and its floodplain for 5 out of the 6 options. Two options also require a new bridge over the River Tud.
- 2.8.2. Along with the A1270 Broadland Northway, the NWL will form a complete route between the A47 trunk road to the east and west of Norwich which will complete the link between the NDR and the Southern bypass.
- 2.8.3. The scheme will include a “grade separated” junction with the A47 and an “at grade” junction with the A1067.
- 2.8.4. The scheme will include:
  - A single/dual carriageway
  - Re-located rights of way and field paths as required
- 2.8.5. The scheme includes landscaping, planting, and environmental mitigation work.

### Out of scope:

- 2.8.6. The scheme does not include physical improvements, enhancements or traffic management in other streets or areas of Norwich.
- 2.8.7. The scheme does not include provision of public transport facilities or services at this time.

### Note:

- 2.8.8. The above description of the scope of the scheme refers to the shortlisted options, as proposed in this Business Case.

## 2.9 CONSTRAINTS AND INTERDEPENDENCIES

### CONSTRAINTS

- 2.9.1. There are physical and environmental constraints that have been considered in the development of the shortlisted options. These include the various environmental designations in the area (SAC, SSSI, County Wildlife Sites (CWS), etc) and the National Grid gas pipeline, Hornsea Project three and the topography of the land.
- 2.9.2. In addition, the key constraints likely to affect the delivery of the scheme are:
  - Statutory procedures to be completed in time for works procurement, construction preparation and the main construction works
  - Funding allocation granted

### INTERDEPENDENCIES

- 2.9.3. While not dependent on the A47 North Tuddenham to Easton dualling scheme, the location and layout of the new junctions on the upgraded A47 will affect the scheme design for the NWL. Therefore, it is advantageous to develop the NWL in line with the dualling scheme in terms of efficiency and continued liaison is required between NCC and Highways England to keep NCC up to date with the current A47 scheme plans.

## 2.10 OPPORTUNITIES FOR GROWTH AND INWARD INVESTMENT

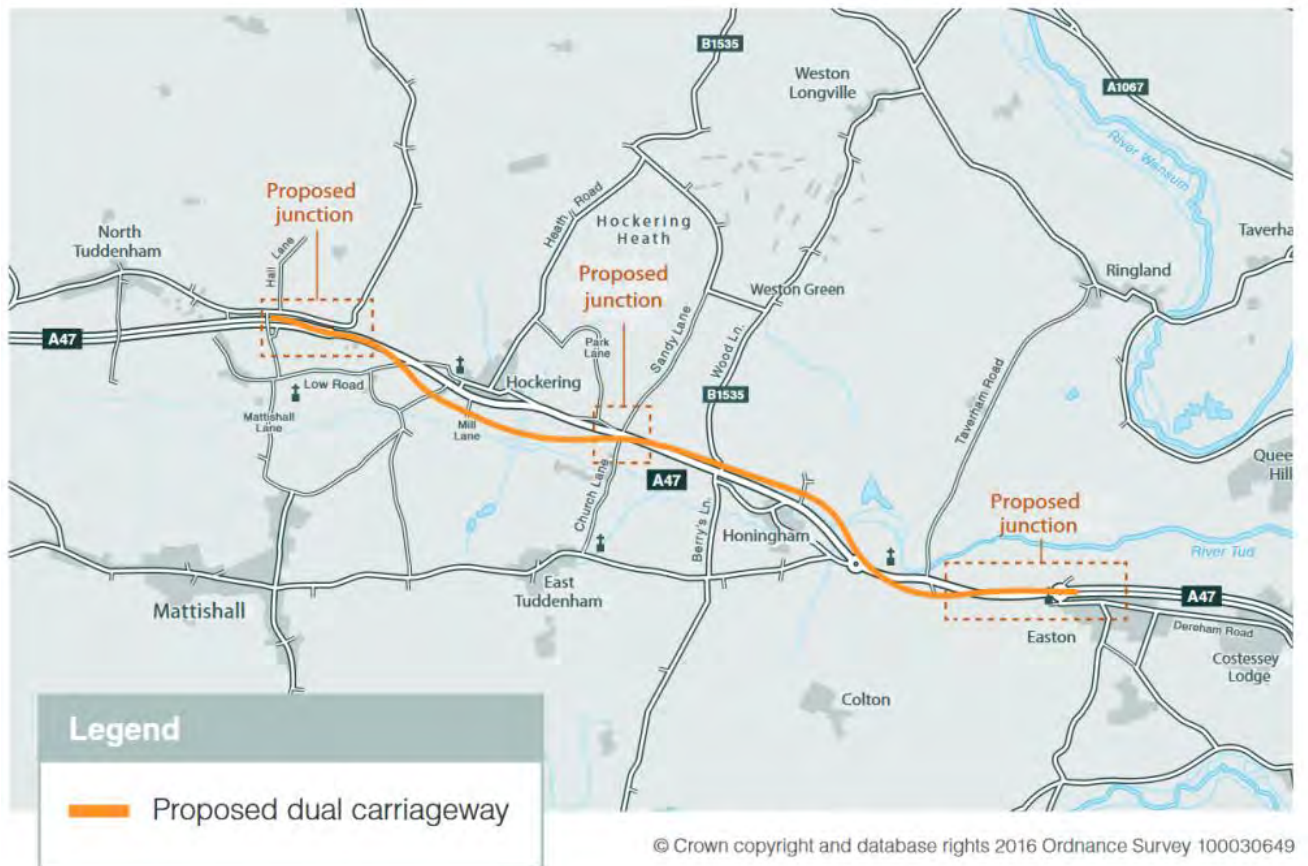
- 2.10.1. Broadland District Council, Norwich City Council and South Norfolk Council are working together with NCC to prepare the Greater Norwich Local Plan (GNLP) and Growth Triangle Local Plan which will include strategic planning policies and will also allocate individual sites for development.
- 2.10.2. In the adopted Broadland Local Plan, a number of fringe parishes are defined: Taverham, Drayton, Hellesdon, Old Catton, Sprowston and Thorpe St Andrew. These form part of the Norwich Policy Area and have a combined allocation of between 1,462 and 1,662 new houses.
- 2.10.3. Within the study area, the Easton / Costessey area has also been identified as a major growth location within the South Norfolk adopted Local Plan, with plans to accommodate 1,500 new dwellings and enhanced local services
- 2.10.4. Further development and consultation on potential site options for the Greater Norwich Local Plan is ongoing and will eventually lead to formal allocation of sites for housing for the period up to 2036.
- 2.10.5. The Breckland Local plan currently provides an allocation of 2,975 additional new homes and a number of potential new employment sites placing further emphasis on the requirement for improved transport links in the region.

### EMPLOYMENT

- 2.10.6. The draft Greater Norwich Local Plan also indicates that The City Deal seeks to deliver an additional 13,000 jobs by 2031 on top of the 27,000 jobs planned for in the Joint Core Strategy, resulting in a total requirement of at least 40,000 jobs to 2036.
- 2.10.7. Broadland District Council has progressed a Local Development Order (LDO) to help facilitate a Food Enterprise Zone (FEZ) for which the phase of development is under construction. The FEZ is located to the west of Easton village and just south of the existing A47. FEZs are a government initiative introduced by the Department for Food, Environment and Rural Affairs, with the aim to:
  - Enhance rural development through the growth of food businesses in a particular location, be it producers, processors, retailers and / or manufacturers
  - Encourage greater collaboration between food and farming businesses, and even encourage links to research and education institutions, in order to develop the domestic food and farming sector
  - Allow local decision making, particularly for planning and development
  - Attract inward investment
- 2.10.8. The LDO is being progressed to provide planning permission and allow greater flexibility for new business-related development to locate within the site. The proposed LDO was considered at Broadland District Council's Cabinet meeting on 23 May 2017, where it was agreed to be adopted subject to the outcome of a Screening Direction from the Secretary of State and a Section 106 obligation. This process has now concluded and the LDO has been made.
- 2.10.9. When complete the FEZ is expected to provide 2,000 jobs by 2050 and host multiple businesses with a range of complementary uses connected to the agri-food sector.

## OTHER PROPOSED HIGHWAY SCHEMES

- 2.10.10. The development, while stand alone, will tie in to the A47 and as such will interact with the A47 North Tuddenham to Easton scheme. The proposed dualling scheme is expected to relieve the currently congested single carriageway section of the A47, reduce journey times, encourage economic growth and improve user experience.
- 2.10.11. **Figure 2.11** illustrates the preferred route. At the time of publishing this report Highways England and their consultants were undertaking a number of local engagement sessions with council representatives and so the full details of the proposal are still to emerge, however, it is understood that Highways England expect to start works on site in 2021/22 subject to securing the appropriate approvals.



**Figure 2.11 – A47 North Tuddenham to Easton scheme**

- 2.10.12. The dualling of the A47 will influence traffic behaviour across the NWQ and beyond, and whilst the impact of the dualling will need to be considered alongside the potential for a NWL the improvement does present a possible opportunity to ensure that a NWL could effectively tie in to the dualled A47 at an existing or upgraded junction.

## 2.11 STAKEHOLDERS

### STAKEHOLDER GROUPS

2.11.1. Key stakeholders have been actively engaged in the project throughout 2017 and 2018 via a series of Local Liaison Group (LLG) workshops, occurring bi-monthly with Parish Council representatives from within the study area. A group of elected Council Members has also provided guidance to the project via bi-monthly Member Working Group (MWG) meetings. Both the LLG workshops and MWG meetings have often included other relevant stakeholders as necessary, for example, Highways England and their consultants have attended and provided updates on their A47 Road Investment Strategy (RIS) schemes and modelling work.

A list of stakeholder groups is provided in **Table 2.9** below.

**Table 2.9 - Stakeholder Groups**

Organisation	Position	Summary
Breckland Council	Support	The Council believe a NWL is of key importance, as traffic congestion is having a negative impact on local industry. Furthermore, the council mention how a NWL will remove HGVs from local roads, providing a positive impact to local residents
Broadland District Council	Support	The Council strongly recognises the benefits a NWL would have for the local community and people visiting the area. The Council also believe a NWL will reduce rat-running through smaller villages, and result in an overall positive outcome
Landowners	Neutral	Landowners identified as affected by the proposed options were invited to take part in the public consultation. Owners tended to provide route preferences which least directly impacted their land or adjacent environmental concerns
Cringleford Parish Council	Support	The Council have stated a NWL will have a positive impact on the parish and wish to see a new road connecting with the A47 west of Easton, easing traffic congestion for local residents. However, the Council is concerned about the River Wensum SAC, as a conservation site, stating that the protection of wildlife habitats is of utmost importance
East Winch Parish Council	Support	The Council supports the principle of a NWL, however, they have outlined some concerns, such as the proximity to the city of Norwich. The Council also noted that additional local road improvements are needed, for example improvements to the crossroads at Necton
Great Yarmouth Borough Council	Support	The Council believe a NWL will have a positive impact on the local economy and wider county, bringing further investment to the City. The Council acknowledges the environmentally sensitive area of the project, but it believes with careful planning and consideration a NWL can be successfully implemented
Green Party	Oppose	The Green Party expressed opposition due to the location of the scheme and the presence of the River Wensum SAC, believing a NWL would cause adverse harm. The Green Party also believe a NWL would increase carbon emissions surrounding the route and, with the financial cost of

Organisation	Position	Summary
		such a project, the public should be focussed on more sustainable modes of transport
New Anglia Local Enterprise Partnership (LEP)	Support	The LEP outlines that the new link will help deliver the economic strategy for Norfolk and Suffolk, will improve connectivity to centres of excellence and will enhance the quality of life for residents in the area
Norfolk and Norwich University Hospital	Support	NNUH state that the improved infrastructure will make the hospital more accessible, in particular to residents living in North Norfolk
Norwich Friends of the Earth	Oppose	Friends of the Earth outlined a number of concerns, including; the location (in regard to the presence of the River Wensum SAC), the reasoning, cost, air quality and the impact on climate change
Road Haulage Association Ltd (RHA)	Support	The RHA encourages the project as it would reduce journey times, improve air quality and assist in the economic growth of Greater Norwich. Ideally, the RHA would like a dual carriageway solution linking the A47 and A1067. The RHA also requested purpose-built overnight parking facilities for lorries along the proposed link road
South Norfolk Council	Support	The Council believe the infrastructure initiative supports the growing local economy
The Friends of North Norfolk	Oppose	The Friends of North Norfolk opposed the principle of a NWL, due to the harm that will be caused to the River Wensum and the overall financial cost of the project
Wensum Valley Alliance	Oppose	The Wensum Valley Alliance outlined a number of concerns, including; the location (in regard to the presence of the River Wensum SAC), the reasoning, cost, air quality and the impact on climate change

## CONSULTATIONS

### 2003

- 2.11.2. Public consultation on the revised Norwich Area Transportation Strategy (NATS) in 2003 showed strong support for transport improvements to the north and west area of Norwich. In particular, there was support for a Northern Distributor Road (NDR) extending from the A47 in the west skirting around the northern fringe of Norwich to re-join the A47 at Postwick, in the east.

### 2004

- 2.11.3. A revised NATS was agreed in 2004, which included the provision of a NDR, with the aim to reduce the impacts of high volumes of traffic and congestion in Norwich. Throughout 2004 and 2005, further consultation was undertaken on a variety of route options for the NDR, including several different options for the western section, between the A47 and the A1067.

## **May to July 2018**

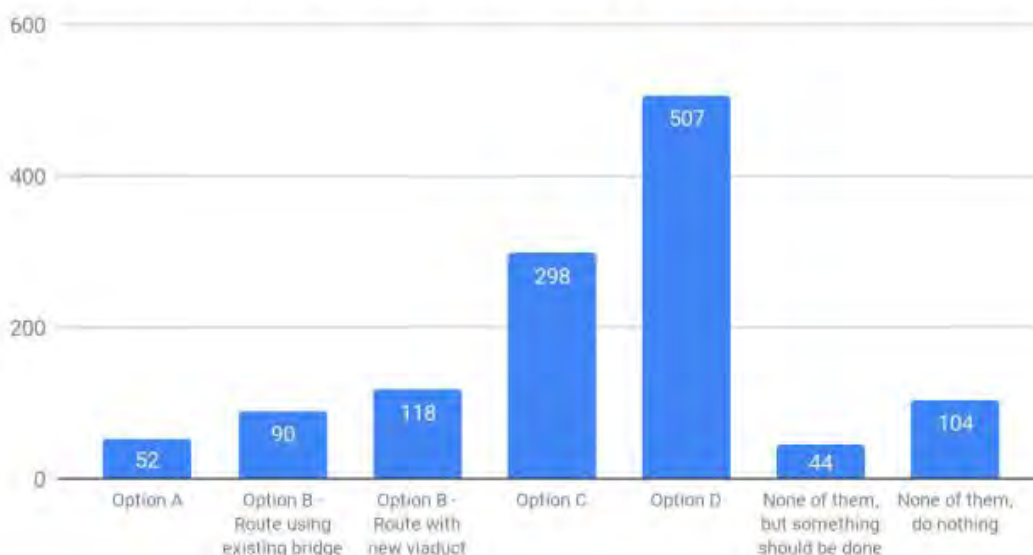
- 2.11.4. NCC undertook a non-statutory public consultation, which ran between Tuesday 08 May 2018 and Tuesday 03 July 2018. The purpose of this consultation was to understand people's experience of living in, and travelling through, the area to the west of Norwich. A total of 4,426 website visitors were recorded with 2,327 comments across the platforms used.
- 2.11.5. The results demonstrated that respondents perceive the roads in the area to be unsuitable for the current levels and type of traffic (1,395 respondents), with rat-running (1,103 respondents) and slow journey times (1,001 respondents) also frequently mentioned issues. There was a clear preference for developing a new road between the A1270 and A47 in order to tackle the transport issues highlighted in the area (1,492 respondents). This option was selected more than three times as much as the next most popular option of improving the existing roads (473 respondents).

## **Options consultation November 2018 – January 2019'**

- 2.11.6. A further round of public consultation commenced on 26 November 2018, with a series of public events held in late 2018 prior to the Christmas break and after the holidays in January 2019. This maximised opportunity for local residents and affected stakeholders to participate, whilst avoiding conflict with the seasonal holidays.
- 2.11.7. Between 26 November 2018 and 18 January 2019, the Council consulted on the four shortlisted road options for a NWL. The purpose of the consultation was to provide information on the options proposals, asking for views on them to help identify a preferred option
- 2.11.8. The objectives for the consultation were as follows:
- Understand the degree of public support for each of the four options.
  - Understand how each option may rank against one another.
  - Gauge support for each option from statutory and non-statutory organisations.
  - Gain knowledge of potential scheme risks and local effects of each of the proposed options which may influence design or cost.
  - Inform the development of the Strategic Outline Business Case, in particular seeking to identify additional potential social and economic scheme benefits and opportunities which may arise as a result of each option and any aspects requiring mitigation which may influence the scheme cost.
- 2.11.9. The consultation sought views from the public and stakeholders, including previous respondents to the initial consultation, local communities and businesses.
- 2.11.10. Key stakeholders that were consulted, included:
- Local authorities, businesses and organisations within the NWL local area
  - Relevant public-sector bodies
  - Environmental groups
  - Walking and cycling groups
  - Organisations who have previously expressed an interest in the project
- 2.11.11. Work to identify any landowners affected by any of the proposed options was undertaken. As such, those identified were sent a letter containing tailored information prior to the start of the consultation period informing them of the latest proposals and the opportunity to provide comment.

- 2.11.12. Consultees were asked to provide their views on the four options, and to advise any options they preferred based on the information provided and the potential benefits and impacts of each option. People could also state a preference for 'none of them - do nothing' or 'none of them but something should be done'.
- 2.11.13. Respondents were asked to highlight any particular issues, interests or concerns in relation to each of the options put forward, as well as comparative views on the different options. Consultees were invited to respond to the consultation by completing an online questionnaire, available via the consultation website, in writing to the council or in person at one of the consultation events.
- 2.11.14. A total of 1,929 respondents provided feedback to the consultation. Responses were received either via the online questionnaire, or through letters and emails. The majority of responses were received via the online questionnaire, with 1,825 people providing a response in this manner. In addition to the online questionnaires, 58 stakeholder organisations and 46 members of the public provided responses by letter or email.
- 2.11.15. Quantitative questions within the questionnaire covered preferences across the different proposed options, as well as querying which local issues respondents felt were most important to consider as part of the proposals. Respondents were also asked to clarify how effective they felt each option could be if taken forward as the NWL.
- 2.11.16. The questionnaire asked respondents any options they would support, as well as which other transport improvement they felt could complement the NWL proposals.
- 2.11.17. The response to the quantitative questions shows that more respondents supported Option D, in comparison to the other options. Option C is the second most supported option. Option A received the least amount of support. **Figure 2.12** provides the number of respondents who expressed support for each of the options, as well as those who noted support for none of them.

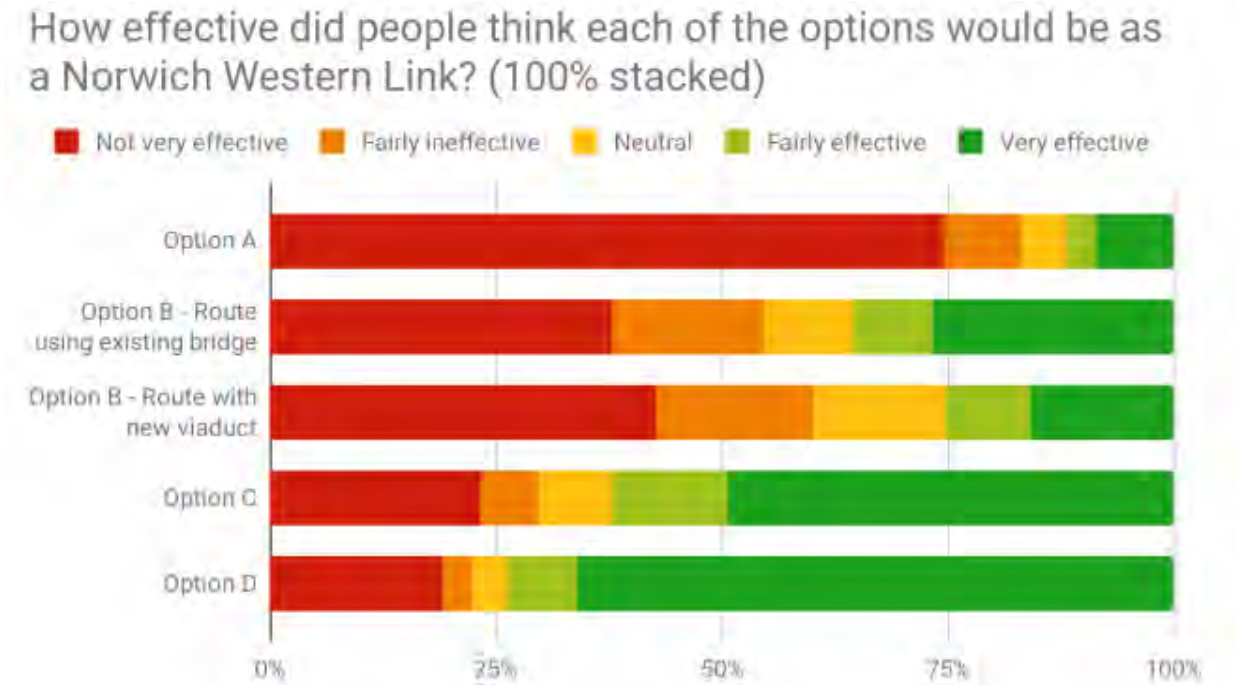
Which options did people support as a Norwich Western Link?



**Figure 2.12 - Level of support for the proposed options**



2.11.18. **Figure 2.13** shows the level of effectiveness which respondents assigned to each of the options. Option D is considered to be the most effective, with nearly 75% of responses highlighting Option D as either 'fairly effective' or 'very effective'. Option A is considered to be the least effective with nearly 75% of respondents highlighting this option as being 'not very effective'.



**Figure 2.13 - Effectiveness of NWL options**

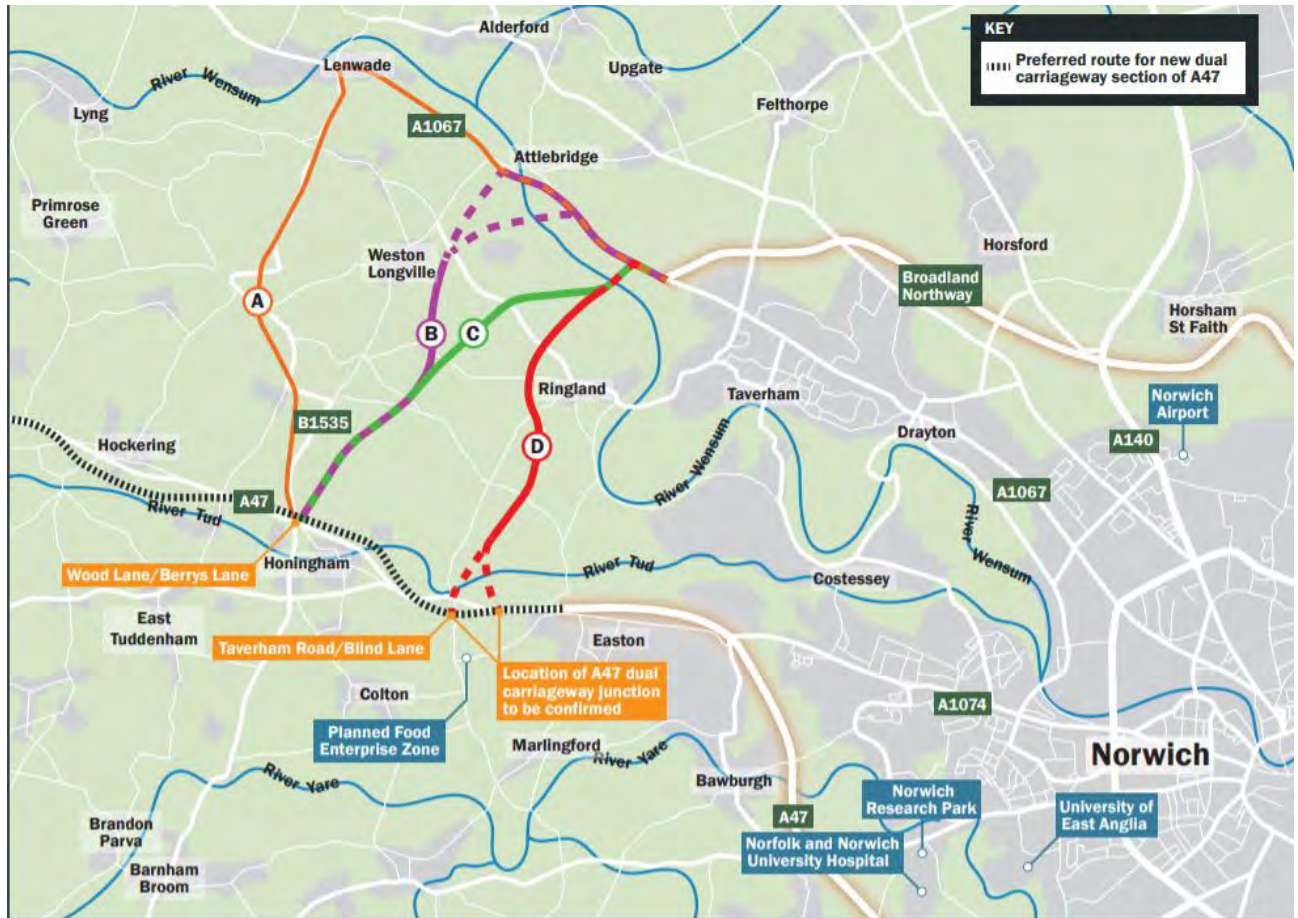
- 2.11.19. Three key themes have emerged which mirror the comments raised for each of the separate options: connectivity, environment, and rat running.
- 2.11.20. Over 100 comments refer to the need for improved bus services. The need for improved facilities for cycling and walking are also highlighted by respondents. Roads and traffic improvements were strongly supported overall however there was also a number of comments requesting that new roundabout schemes be avoided if at all possible.
- 2.11.21. Traffic calming measures are commented upon in both a positive and negative context. Several respondents note the need to implement traffic calming measures, while others also note concern with these measures causing more congestion, noise and air pollution.
- 2.11.22. The consultation feedback indicates a broader preference for Option D, with consultees highlighting this as a viable route due to it being so direct, as well as providing good links to other major roads such as the A47 and the Broadland Northway.
- 2.11.23. Consultation responses suggest that Option A is the least preferred option. Consultees have noted that this option does not solve current traffic / congestion issues as it is too long and too far away from Norwich to be effective. There are also concerns regarding the single carriageway proposals.
- 2.11.24. Concern over environmental impacts have arisen for all options, with particular concern over impact on wildlife, on woodland, and on the Wensum Valley.

- 2.11.25. There is interest in the potential to integrate other transport improvements which could complement the NWL. Consultees noted the need for improved bus services, as well as cycling and walking facilities.
- 2.11.26. Letters of support that have been received in relation to the development of the NWL have been included within **Appendix B**.

## 2.12 OPTIONS

### OPTION DEVELOPMENT

- 2.12.1. A long list of options was developed which would address the identified existing and forecast issues within the study area. The development of the potential options followed the guidance within step 5 of Department for Transport (DfT) Web based Transport Analysis Guidance (WebTAG) The Transport Appraisal Process and a wide a range of options were considered, including all modes, infrastructure, regulation, pricing and other ways of influencing behaviour.
- 2.12.2. A total of 82 options were developed and taken forward for assessment. These options were sifted using Early Assessment and Sifting Tool (EAST). For this project environmental statutory designated constraints are considered to be very significant, given the proximity and importance with the River Wensum SAC, therefore an additional tier of assessment was considered appropriate.
- 2.12.3. Following the sifting process three new highway link options and an existing highway link upgrade were chosen as the shortlisted option to be taken forward for further assessment. The Optioneering and sifting process is set out in the Option Assessment Report
- 2.12.4. **Figure 2.14** provides an overview of the proposed option routes.



**Figure 2.14 - The 4-Shortlisted Highway Link Options**

**Option A**

- 2.12.5. A single carriageway upgrade to the B1535 and A1067, linking to the A47 at the Wood Lane junction north of Honingham. This option would significantly realign the current B road, smoothing it out to make it a higher standard route. The route would join the A1067 via a new junction at Lenwade and make use of the existing bridge across the River Wensum at Attlebridge.

**Option B West (Existing Bridge) & Option B East (New Viaduct)**

- 2.12.6. A new dual carriageway route and dual carriageway upgrade of the A1067, with the new route to the east of Weston Longville and linking to the A47 at Wood Lane. At the northern end of this route, two alternatives are given for how it could join the A1067. One would be via a new junction near Attlebridge which would include widening the existing River Wensum bridge at Attlebridge, Option B West. The other would see a new viaduct crossing of the Wensum created, joining the A1067 further to the east and is named Option B East.

**Option C**

- 2.12.7. A new dual carriageway route and dual carriageway upgrade of the A1067, linking to the A47 at Wood Lane. A short section of the A1067 would be dualled before a new junction would take the route between Weston Longville and Ringland, crossing the River Wensum on a viaduct.

## Option D

- 2.12.8. A new dual carriageway route and dual carriageway upgrade of the A1067. The route is similar to Option C at its northern end, however it then runs to the west of Ringland and links to the A47 further east. A short section of the A1067 would be dualled before a new junction would take the route between Weston Longville and Ringland, crossing the River Wensum on a viaduct, then turning more to the south and crossing the River Tud on a second viaduct, before it meets the A47.
- 2.12.9. Two alternatives for how option D could join the A47 are shown. This is due to Highways England's plans to dual the section of the A47 between North Tuddenham and Easton. There is currently limited detail available on the new junction location near Easton and, until more detail is known, the Council has accounted for the possibility of the junction being located near Blind Lane and Taverham Road or closer to the current Easton roundabout junction.

## Do Nothing

- 2.12.10. Do nothing – This option has no proposed measures however it is carried through in order to provide a base from which to make comparisons. Within the Do Nothing the A47 Dualling scheme is included as this is a Highways England scheme which will progress as a standalone scheme.

## 2.13 SUMMARY

- 2.13.1. The consultation responses have highlighted concerns around high vehicle numbers, high numbers of HGVs and when asked 'If there are any other transport issues', 9% of respondents considered speeding traffic on the local roads an issue in the NWQ and the safety of walkers and cyclists due to this. In addition, there are concerns about orbital connectivity as public transport routes are on the radial links into Norwich. Also raised were concerns with growth in traffic levels related to the large amount of development planned in and around Norwich.
- 2.13.2. The policy review indicates a large amount of development planned in and around Norwich, which will lead to increases in traffic on the road network. There are locations that already suffer from congestion in the peak periods such as Longwater Interchange. The additional development traffic at these congested locations will exacerbate the existing delay and queuing issues and could lead to more traffic diverting onto less appropriate routes, including the north south routes across the NWQ.
- 2.13.3. The most recent collision data shows that during the five-year period from 2013 to 2017, there were 621 recorded collisions, involving 830 casualties, of these, 8% (64) were pedestrians, 14% (115) were cyclists, and 13% (106) were motorcyclists or motor cycle passengers. Based on this review over 21% of recorded casualties were walkers or cyclists. The total number of killed or seriously injured casualties on all the roads in the survey area during the survey period was 15% of all casualties.
- 2.13.4. The proposed link will help to address accessibility issues and increase the potential for investment in both the study area and regionally. Expected increases in traffic and associated congestion will hamper potential investment due to perceived issues with connectivity. The proposed link will provide a connection with business and economic growth areas both regionally and nationally.

- 2.13.5. A total of 61 collisions were recorded during the study period on the main north-south connector roads resulting in 99 personal injuries. There were no collisions resulting in fatalities recorded during the study period, however eight were classified as serious injury and 53 were classified as slight injury. The total number of killed or seriously injured casualties on the north-south connector roads in the survey area during the survey period was 17% of all casualties.
- 2.13.6. Of the 99 casualties recorded 82 (83%) were slight while 17 (17%) were recorded as serious, this included 14 non-motorised users including 5 pedestrians and 9 cyclists. While the latest DfT reported road casualties on rural roads shows 11% of casualties were pedestrians and pedal cyclists in 2017, analysis of the study area shows 14% of the recorded road casualties in the study area on the north south routes during the five-year study period have been identified as either pedestrian or pedal cyclist, approximately 29% higher than the national average for rural roads.
- 2.13.7. The traffic survey data indicates that there is a large proportion of larger vehicles that use the local roads, ranging from 4.8% on the Taverham Road to 13.5% on the Honningham Road (2018 data). Where data is available for both 2015 and 2018, the majority of sites show an increase in proportions across the two years, with the largest on Honningham Road with an increase from 8.2% to 13.5% and Wood Lane with an increase from 5.4% to 9.3 %.
- 2.13.8. A review has also been made of the speed of vehicles using these routes based on the survey data. The roads with the lower speed limits (20 and 30 mph) have the highest incidents of vehicles exceeding the stated speed limit. With three sites showing that over 75% of vehicles exceeded the stated speed limits at the time of the surveys (2018 data).
- 2.13.9. The NWL would provide an important link between housing and employment sites in and around Norwich, a major growth area for the East of England. Significant new housing is being delivered to the north of Norwich while major employment centres exist in the south-west of Norwich, including the key NRP development, which encompasses NNUH and the UEA. The growth potential for Norwich, in both housing and employment, will become constrained without adequate infrastructure. This is recognised by the business community in particular who fully support the delivery of the NWL, as do all of the Local Authorities, who share the ambitions for Norwich and Norfolk to realise the significant targets for employment and housing growth.
- 2.13.10. A NWL will improve the resilience of both the strategic and local road network, providing an alternative route around Norwich to the existing A47 (which orbits Norwich to the south) and the outer ring road. The outer ring road has residential properties located in close proximity and Noise Important Areas are defined on the outer ring road. The provision of an alternative route will encourage a reduction in traffic levels on existing routes improving journey time reliability for all modes. This is important for business as it improves efficiency and in the long run should also contribute towards improved profitability.
- 2.13.11. The alternative route will also provide resilience when incidents or maintenance work occurs on the highway which will restrict capacity on the existing road network causing congestion and delay.

### 3 ECONOMIC CASE

#### 3.1 INTRODUCTION

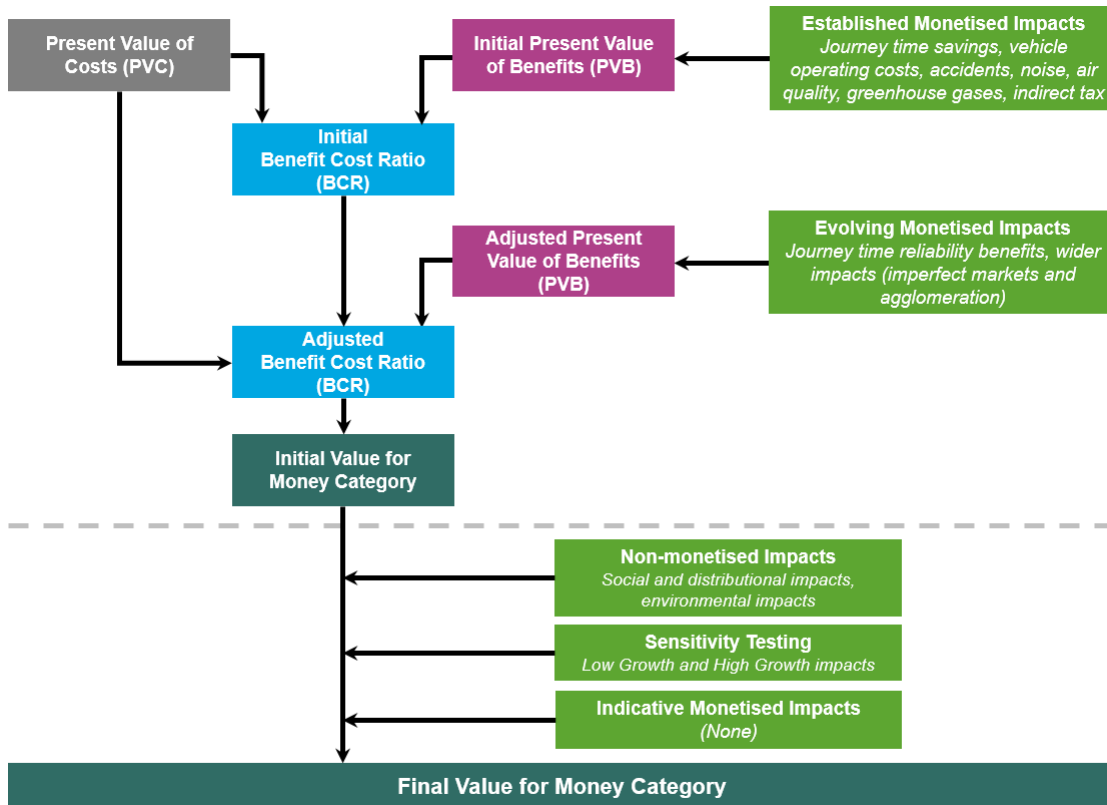
3.1.1. The economic case appraises the proposed scheme to identify its economic impacts, and the resulting Value for Money. The appraisal of impacts will not be limited to the monetised measured economy, and will include welfare, economic and environmental benefits as well as social and distributional impacts.

#### 3.2 ECONOMIC APPRAISAL METHODOLOGY

3.2.1. The economic appraisal of the scheme has been undertaken in accordance with current WebTAG guidance, including:

- TAG Unit A1 cost-benefit analysis
- TAG Unit A2 economic impacts
- TAG Unit A4 social and distributional impacts
- TAG Unit A5-1 Active Mode Appraisal

3.2.2. The methodology is based on the DfT Value for Money Note (July 2017) and is illustrated in **Figure 3.1**



**Figure 3.1 - Calculation of BCR and VfM score - methodology**

3.2.3. The basic steps are summarised below:

- The present value of cost (PVC) is calculated using the discounted whole life costs of the scheme

- TUBA (Transport User Benefit Analysis) is used to calculate the user benefits from time and vehicle operating cost savings, and reductions in greenhouse gas emissions
- An initial benefit-cost ratio (BCR) is calculated
- Other monetised benefits – reliability and wider impacts – are then taken into consideration, producing an adjusted present value of benefit (PVB), which is used to calculate an adjusted BCR
- Other impacts which are not capable of being fully monetised – social, distributional and environmental impacts – are then assessed qualitatively. These are not included in the BCR, but are used, together with the final BCR, to determine a final Value for Money category for the scheme

3.2.4. The economic, environmental, social and distributional impacts of the scheme have all been examined, using qualitative, quantitative and monetised information as appropriate and proportional to the level of the scheme. In assessing Value for Money, all of these are consolidated to determine the extent to which a proposal's benefits compare to its costs.

3.2.5. While all six options are presented in the Economic Case, the assessment of traffic flow, and the other aspects derived from it, for options D West and D East have been carried out using a single Option D scenario due to the geographical similarities of the two options and where any difference would be negligible.

### **3.3 OPTIONS APPRAISED**

3.3.1. Between July and November 2018 an extensive option appraisal process took place identifying 82 initial options and thereafter undertaking an appraisal and sifting exercise in order to produce a short list of options which addresses the project objectives. This is set out in more detail in the Option Assessment Report.

3.3.2. The resulting shortlist consists of 3 new highways options, a highway upgrade option and a range of non-highways measures to be developed within a final package of measures.

3.3.3. The scope of modelling and economic appraisal of the NWL scheme was set out in the initial Appraisal Specification Report (ASR), which was developed in December 2018.

#### **TRANSPORT MODEL**

3.3.4. The assessment of highway user benefits for the NWL utilises the Highways England updated NATS 2015 transport model which was updated for the assessment of the A47 RIS schemes assessments. The model was developed in line with WebTAG guidance and calibrated and validated within acceptable industry recognised standards.

3.3.5. At this stage a 'core' central growth scenario has been developed with district wide demographic growth constrained to TEMPro version 7.2. TEMPro and NRTF factors have been assigned to the origin and destination totals for each base year zone and increased appropriately in accordance with TAG Unit M4: Forecasting and Uncertainty.

3.3.6. Forecast year 2025, 2040 and 2050 networks have been produced with core growth demand matrices. These are the 'Do Minimum' (DM) scenarios for 2025, 2040 and 2050 and contain a network without NWL infrastructure but includes the proposed Highways England A47 upgrade scheme. 'Do Something' (DS) scenarios have been developed for which include the network changes for each option.

3.3.7. Traffic flow information from the transport models has been utilised in the environmental appraisal, which use air quality and noise models. For each modelled year and design option, the following data has been provided:

- Average link flow data:
  - 24-hour annual average daily traffic (AADT) data for air quality modelling
  - 24-hour annual average weekday traffic (AAWT) data for noise modelling
- Percentage mix of HGV traffic (all vehicles greater than 3.5 tonnes)

3.3.8. As NATS 2015 base models were validated prior to the opening of the A1270 Broadland Northway. A sensitivity test has been undertaken to confirm the validity of models after the inclusion of the A1270 Broadland Northway. This showed that the opening of the A1270 does not affect traffic volumes within the NWL study area. The sensitivity test is set out in the modelling technical note attached at **Appendix C**

3.3.9. An elastic assignment procedure was used to give an initial indication of the effects of variable demand on the model. The results indicated that a Variable Demand Model will be required for two of the options (D West and D East). The elasticity tests are set out in the modelling technical note attached at **Appendix C**

## TRANSPORT SCHEME COSTS

3.3.10. In order to understand the Value for Money (VfM) category of a scheme, it is necessary to know its estimated delivery costs. The derivation of costs for the scheme is discussed in detail in **Chapter 4** ('The Financial Case'). For use in a VfM assessment, DfT guidance states that several adjustments must be made to the 'base' costs. These adjustments are discussed below.

3.3.11. The risk and inflation adjusted scheme costs at Q1 2019 prices are presented in **Table 4.5** in the Financial Case. A Quantified Risk Assessment (QRA) has been conducted for each option, including a risk identification workshop and statistical calculations of volume and cost risks for individual project components. This QRA has been undertaken at the 85% level of certainty, meaning that the costs are expected to be within the calculated risk allowance in all but 15% of cases. As noted in the Financial Case, the total quantified risk has been assessed in the range of £10,742,272 to £30,729,522 dependent on the option at 2019 Q1 prices, which adds 21.6% to 23.5% to the base cost of the scheme.

3.3.12. This robust approach to cost estimation and quantified risk assessment gives a high degree of confidence in the risk-adjusted cost estimates than would normally be present at this stage, therefore the allowances for optimism bias have been reduced to a midpoint between Stage 1 and Stage 2. An uplift of 29.5% for the roadworks and 44.5% for the structures has been applied to the risk and inflation adjusted scheme costs. The amounts applied are shown in **Table 3.1**.

**Table 3.1 – Optimism Bias (£)**

	Option A	Option B West	Option B East	Option C	Option D West	Option D East
Optimism Bias	4,103,547	8,985,220	10,141,108	10,668,048	12,223,673	11,512,414



- 3.3.13. The risk, optimism bias and inflation adjusted costs have been converted to Present Value Costs (PVC) in 2010 prices and values, for comparison with the values of transport impacts over the 60-year appraisal period.

### **USER BENEFIT APPRAISAL**

- 3.3.14. The Transport Economic Efficiency (TEE) assessment incorporates the monetary benefits that accrue through reductions in travel time and vehicle operating costs (VOC) over the 60-year appraisal period. The journey time and VOC benefits usually make up the majority of a scheme's monetised benefits.
- 3.3.15. The assessment has been undertaken in-line with current WebTAG and Treasury Green Book guidance to quantify transport user benefits between the existing situation and the proposed improvements. The TEE assessment has been undertaken using TUBA.
- 3.3.16. Using the WebTAG values of time (VoT) and vehicle operating costs (VOC) for various vehicle types and journey purposes, the difference between the two scenarios has been quantified and monetised over a standard 60-year appraisal period. The scheme benefits were then compared to the forecast costs, discounted to common 2010 prices and values, and a benefit to cost ratio (BCR) calculated.
- 3.3.17. Traffic flow information is based on the SATURN forecast year transport models (2025, 2040 and 2050). The modelled time slices used to represent the average weekday period are detailed below:
- AM peak period average hour
  - PM peak period average hour
  - Average Inter-peak period average
- 3.3.18. Annualisation factors have been applied to convert the peak period flows into annual flows. There are 253 peaked weekdays (excludes weekdays falling on bank holidays) in the year, therefore the annualisation factors applied are:
- AM peak (07:00-10:00): 759
  - PM peak (16:00-19:00): 759
  - Inter-peak (10:00-16:00): 1,518
- 3.3.19. No benefits were calculated for weekday off-peak periods (19:00 - 07:00) and weekends or bank holidays.

### **APPROACH TO ASSESSMENT OF OTHER IMPACTS**

- 3.3.20. Other impacts have been assessed outside of TUBA, including Environmental and Wider Economic impacts. The assessment of these non-TUBA impacts has been undertaken following WebTAG guidance. The majority of the non-TUBA impacts have been assessed qualitatively, with the exception of the following:
- Air Quality and Greenhouse Gases – Air Quality and Greenhouse Gas impacts have been assessed in accordance with WebTAG A3.3 Air Quality Impacts, and with regard to current European and UK legislation, regulations, policy, and best practice
  - Output Change in Imperfectly Competitive Markets – this has been assessed in line with WebTAG A2.1 Wider Economic Impacts Appraisal and A2.2 Appraisal of Induced Investment Impacts

3.3.21. The above impacts have been assessed over the standard 60-year appraisal period, and monetised in 2010 prices and values. The full Analysis of Monetised Costs and Benefits (AMCB) in Section 3.9 includes the TUBA impacts and the monetised impacts listed above to calculate the initial and adjusted BCR for the scheme.

## 3.4 TRANSPORT ECONOMIC EFFICIENCY

### USER BENEFITS

3.4.1. The benefits or disbenefits related to construction and maintenance have not been included at this stage.

3.4.2. TEE benefits for the scheme were assessed using the DfT's Transport Users Benefit Appraisal (TUBA) software. TUBA calculates the benefits associated with journey time savings and vehicle operating cost savings using information taken from the traffic model, in accordance with the procedures and economic parameters in WebTAG Unit A1.

3.4.3. The transport user benefits for the DS scenario relative to the DM scenario have been assessed using TUBA v1.9.11 with the standard TUBA 1.9.11 economics file. User benefits as forecast by TUBA are shown in **Table 3.2**

**Table 3.2 - Transport User Benefits (TUBA Results)**

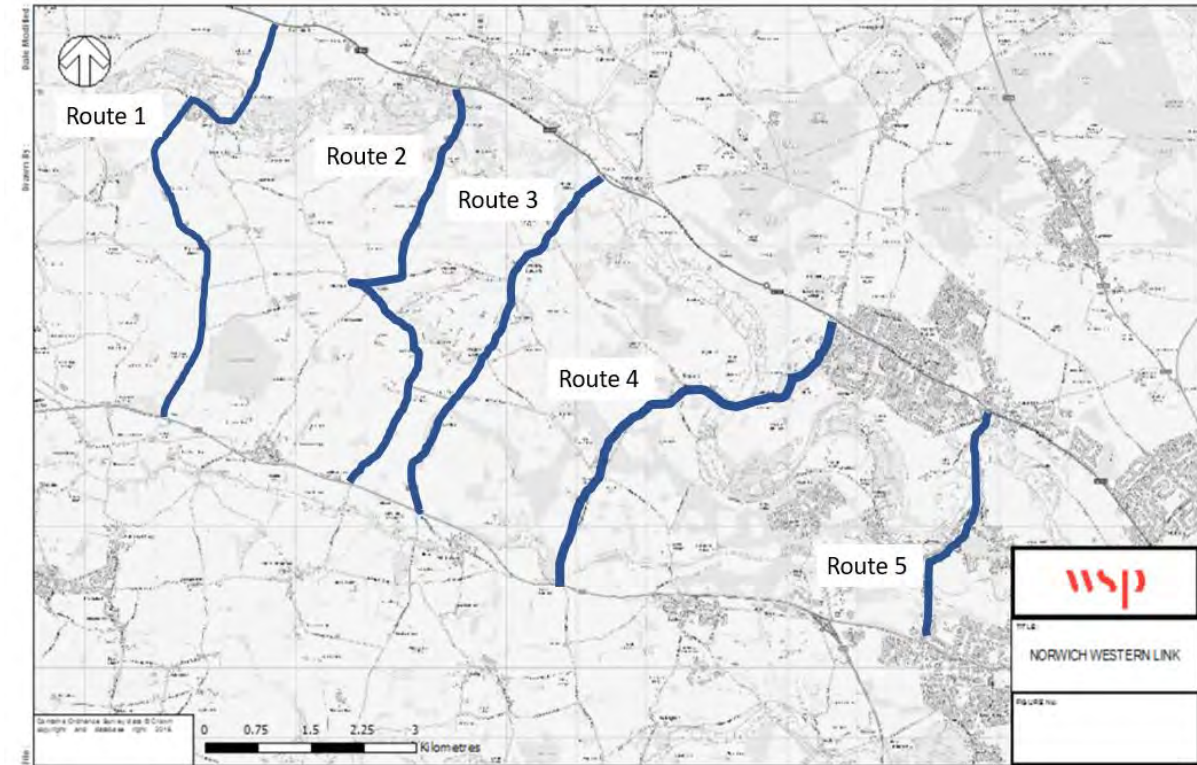
<b>Benefit</b>	<b>Option A</b>	<b>Option B West</b>	<b>Option B East</b>	<b>Option C</b>	<b>Option D West</b>	<b>Option D East</b>
Greenhouse Gases	0,614	-0,383	-0,050	1,533	0,422	0,422
Economic Efficiency: Consumer Users Commuting	20,662	114,850	121,547	133,364	116,397	116,397
Economic Efficiency: Consumer Users Other	24,911	98,547	104,853	116,124	108,973	108,973
Economic Efficiency: Business Users and Providers	18,425	91,549	97,469	107,463	92,480	92,480
<b>Present Value of Transport Economic Efficiency Benefits (TEE)</b>	<b>64,612</b>	<b>304,563</b>	<b>323,819</b>	<b>358,484</b>	<b>318,272</b>	<b>318,272</b>

Results (£000's, 2010 prices discounted to 2010)

3.4.4. The scheme is expected to provide a net benefit in terms of journey times to all users both within the study area and for those beyond and passing through the study area.

## RELIABILITY

- 3.4.5. Travel Time Variability (TTV), or Journey Time Variability (JTV), are defined as variations in journey time that travellers are unable to predict, as such it excludes predictable variation relating to varying levels of demand by time of day, day of week, and seasonal effects and tends to relate to non-recurring events, such as accidents. WebTAG provides guidance for modelling and monetisation of changes in journey time reliability for motorway and urban road users. Changes in journey time reliability for other road users cannot be monetised.
- 3.4.6. It is considered that the provision of a new link or that of an upgraded link will improve the reliability and reduce the dependence on existing routes to/from/within the NWQ. The NWL will provide an alternative route for traffic travelling east west and north south on the western side of the city, with consequent re-assignment of a proportion of journeys to this new road linking the A47 to the A1067. The NWL will also provide improved access to the A1270 Broadland Northway, thereby increasing network resilience and improving journey time reliability.
- 3.4.7. WebTAG A1.3 provides potential methodologies to both calculate improvements in journey time variability and to assess the benefits dependent on the road type. As the current road network is predominantly on single carriageways outside urban areas, 'stress', is being used as a reasonable proxy for reliability. This assessment is qualitative.
- 3.4.8. As set out in A1.3 Appendix C.5, the stress based approach to the assessment of reliability impacts of road proposals is applied to provide a broad indication of the impact of the proposals on reliability. This approach is based on the change in 'stress' (within the range 75% to 125%) as a result of the proposal, combined with the number of vehicles affected. Stress is the ratio of measured annual average daily flow to the congestion reference flow (a definition of theoretical capacity as defined in the DMRB Volume 5, Section 1, Part 3, Annex D), expressed as a percentage.
- 3.4.9. The lower the percentage, the higher the likelihood that journey time reliability is better. To consider the 'bottleneck' effects that occur in the study area, the analysis has been carried out on five key links at locations where there is expected to be the greatest 'stress' in the Do Nothing scenario and where the interventions are likely to have the greatest impact. The routes are set out Nothing below and are shown in **Figure 3.2**:
- Route 1 – Lyng Road, Heath Road, The Common
  - Route 2 – Sandy Lane Weston Green Road, Rectory Road, Weston Hall Road
  - Route 3 - Wood Lane, Paddys Lane, Honingham Road, Church St, Marl Hill
  - Route 4 - Taverham Road, Honingham Lane, The Street, Ringland Road, Beech Road
  - Route 5 – Longwater Lane, West End, The Street, Costessy Lane



**Figure 3.2 - Scheme Assessment Routes – Journey Time Reliability**

3.4.10. This assessment has been undertaken using opening year flows, and the option results have been compared to the opening year do nothing outputs. In the opening year three of the routes are operating below 75% stress, one is operating just above at 77% and the final route (5) is operating at over 125% stress. The results are shown in **Table 3.3**.

**Table 3.3 – Stress Assessment Results**

Route	Do nothing	Option A	Option B West	Option B East	Option C	Option D West	Option D East
Route 1	21	18	15	15	15	14	14
Route 2	65	53	0	0	12	14	14
Route 3	77	77	24	24	24	25	25
Route 4	48	49	6	6	6	6	6
Route 5	129	132	112	110	106	93	93

3.4.11. The stress values are combined with the volume of traffic to reach an appropriate textual score as set out in the guidance.

- 3.4.12. The stress based approach has been used to derive a qualitative assessment of the impact of the proposed schemes in relation to journey time reliability on routes between the A47 in the south and the A1067 in the north. The assessment summary captured in **Table 3.4** shows that Option A is forecast to produce a neutral impact in terms of reliability and the other options are forecast to provide a moderately beneficial impact

**Table 3.4 – Reliability Assessment**

Option	Assessment
Option A	Neutral
Option B West	Moderate beneficial
Option B East	Moderate beneficial
Option C	Moderate beneficial
Option D West	Moderate beneficial
Option D East	Moderate beneficial

- 3.4.13. In terms of reducing stress on the most stressed routes Option D provided the biggest change in stress for route 5 reducing the stress level to 92%, the next most effective option was Option C which reduced the stress level to 106%, both B options reduced the stress levels to approximately 110%. Option A caused the stress to increase on Route 5 above that of the Do Nothing option.

## 3.5 WIDER ECONOMIC BENEFITS

### INTRODUCTION

- 3.5.1. The assessment is based on WebTAG Units A2.1 - 2.4 and M5.3 and on the DCLG appraisal guidance (ministry of housing, communities and local government).
- 3.5.2. Static Clustering, Output Change in Imperfectly Competitive Markets and Labour supply impacts which are classed as Connectivity Impacts can be included in the adjusted PVB.

### STATIC CLUSTERING

- 3.5.3. Static Clustering is a productivity impact and is relevant if the scheme is in a Functional Urban Region (FUR) area or if the transport scheme improves accessibility to a local employment centre.
- 3.5.4. The scheme is expected to improve accessibility to employment at the Easton Food Enterprise Zone and Norwich Airport, therefore it is considered that static clustering will be impacted by the scheme. Due to the stage of the assessment no impact analysis has been undertaken, it is recommended that static clustering is assessed at OBC stage when the preferred route has been identified.

### OUTPUT CHANGE IN IMPERFECTLY COMPETITIVE MARKETS

- 3.5.5. The methodology to estimate Output Change in Imperfectly Competitive Markets does not seek to explicitly quantify the change to net investment or the associated land use. Instead the methodology uses the conventional transport user benefits and applies an uplift factor. The welfare effects which arise due to the presence of imperfect competition (the market structure distorts the efficient operation of the market), is estimated by applying a 10% uplift factor to the business and freight user benefits.

3.5.6. Based on the TUBA outputs the Output Change in Imperfectly Competitive Markets impact is shown in **Table 3.5** across all options.

**Table 3.5 - Output Change in Imperfectly Competitive Markets**

Type	Option A	Option B East	Option B West	Option C	Option D West	Option D East
Impact	1,876	7,683	7,304	8,659	7,224	7,224

## LABOUR SUPPLY IMPACTS

3.5.7. Based on the assessment stage and using a proportionate approach a qualitative analysis has been undertaken.

3.5.8. As set out in the Economic Narrative (**Appendix D**) the eastern part of the study area (Bowthorpe and North Earlham) has lower levels of employment than the surrounding county, region and country as a whole. The Public Transport routes in the area focus in the radial routes into Norwich itself with limited provision for orbital connectivity. This makes it difficult for those people without access to a car to access the employment opportunities at locations outside the town centre such as NNUH, the food enterprise zone at Easton and the Norwich Research Park. Therefore, it is considered that transport accessibility could be a barrier to people entering employment. Due to the stage of the assessment no impact analysis has been undertaken, it is recommended that labour supply impacts is assessed at OBC stage when the preferred route has been identified.

## 3.6 ENVIRONMENTAL IMPACT APPRAISAL

3.6.1. To help inform the business case for NWL, a series of WebTAG appraisals of the five route options (including individual appraisals of the two Route B variants) has been undertaken. These appraisals consider the potential impacts of the various route options on the built and natural environment and on people, and also consider the strategic, policy and physical constraints and opportunities for the scheme.

3.6.2. The appraisals have been undertaken on the following environmental topics that are identified in TAG Unit A3 'Transport Analysis Guidance – Environmental Impact Appraisal' (December 2015):

- Noise (Qualitative)
- Air Quality
- Greenhouse gases
- Landscape
- Historic Environment
- Biodiversity
- Water Environment

3.6.3. The environmental appraisals have been undertaken using the methods set out in TAG Unit A3 and with regard to current European and UK legislation, regulations, policy, and best practice. The noise assessment undertaken here does not use the TAG Unit methods, for the reasons set out in the Environmental technical note.

- 3.6.4. An entry for each of the identified topics has been made for each route option in the Appraisal Summary Table (AST) A technical note setting out more detail regarding the appraisal of each topic and the relevant worksheets are provided in **Appendix F**.

### **ENVIRONMENTAL APPRAISAL SUMMARY**

- 3.6.5. There are a lot of potential important environmental issues that need to be taken into account during all stages of the process of this scheme. All route options have environmental impacts associated with them, however in general at this stage, and as outlined in **Table 3.6** Route Option A is the least environmentally impactful, with the exceptions of biodiversity and historic environment, and Option D, for most disciplines, has some of the largest environmental impacts.
- 3.6.6. **Table 3.6** is a summary of the environmental appraisals from the WebTAG worksheets for each environment discipline. The noise appraisal results are the conclusions taken from the qualitative noise assessment.

**Table 3.6 – Environmental Appraisal Summary Table**

Environmental Impacts	Route Options					
	Option A	Option B West	Option B East	Option C	Option D (west)	Option D (east)
<b>Noise</b>	Route Option A adversely impacts more properties and benefits fewer properties than the other route options in the short-term. However, the changes in noise that result from Route Option A are almost all less than $\pm 1$ dB, which would be classed as negligible changes	Slightly larger changes when compared to Option A, however overall, they would still be classed as negligible in magnitude	Very similar to the outcomes for Route Option B West. All of the changes would be classed as negligible in magnitude	Similar to those of Route Options B western and eastern variants, but overall, they would be classed as minor impacts, both adverse and beneficial, rather than negligible	Similar to those from Route Option B western and eastern variants and Route Option C and would be classed as negligible in magnitude	Similar to those from Route Option B western and eastern variants and Route Option C and would be classed as negligible in magnitude
<b>Air Quality</b>	Total NPV of changes in air quality over 60-year appraisal period following opening is <b>£3,602,929</b>	Total NPV of changes in air quality over 60-year appraisal period following opening is <b>£728,499</b>	Total NPV of changes in air quality over 60-year appraisal period following opening is <b>-£548,522</b>	Total NPV of changes in air quality over 60-year appraisal period following opening is <b>-£453,195</b>	Total NPV of changes in air quality over 60-year appraisal period following opening is <b>-£3,029,388</b>	Total NPV of changes in air quality over 60-year appraisal period following opening is <b>-£3,029,388</b>
<b>Greenhouse Gases</b>	Total NPV of changes in (CO <sub>2</sub> ) <sub>e</sub> over 60-year appraisal period following opening is <b>£8,622,855</b>	Total NPV of changes in (CO <sub>2</sub> ) <sub>e</sub> over 60-year appraisal period following opening is <b>-£1,358,528</b>	Total NPV of changes in (CO <sub>2</sub> ) <sub>e</sub> over 60-year appraisal period following opening is <b>-£4,900,284</b>	Total NPV of changes in (CO <sub>2</sub> ) <sub>e</sub> over 60-year appraisal period following opening is <b>-£4,149,699</b>	Total NPV of changes in (CO <sub>2</sub> ) <sub>e</sub> over 60-year appraisal period following opening is <b>-£10,575,555</b>	Total NPV of changes in (CO <sub>2</sub> ) <sub>e</sub> over 60-year appraisal period following opening is <b>-£10,575,555</b>





Environmental Impacts	Route Options					
	Option A	Option B West	Option B East	Option C	Option D (west)	Option D (east)
<b>Landscape</b>	Slight Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse
<b>Historic Environment</b>	Large Adverse	Large Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse
<b>Biodiversity</b>	Very Large Adverse	Very Large Adverse	Very Large Adverse	Large Adverse	Large Adverse	Very Large Adverse
<b>Water Environment</b>	Minor Adverse	Minor Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse
<b>Geology and Soils</b>	This Option has the least exposure to the construction of embankments/piled structures over Alluvium layer	This Option has a limited exposure to construction of embankments and piled structure over Alluvium layer	This Option has a considerable exposure to construction of embankments and piled structure over Alluvium layer	This Option has a considerable exposure to construction of embankments and piled structure over Alluvium layer	This Option has the greatest exposure to construction of embankments and piled structure over Alluvium layer	This Option has the greatest exposure to construction of embankments and piled structure over Alluvium layer

## 3.7 SOCIAL

### USER BENEFITS

#### Transport users

- 3.7.1. The impact on Commuters and Other Users has been determined as part of the TUBA assessment of Transport User Benefits in the Value for Money (Transport Users). The results are set out in **Table 3.2**.

### PHYSICAL ACTIVITY

- 3.7.2. Physical activity is concerned with whether the intervention is likely to generate significant additional numbers of walking or cycling trips. A qualitative assessment was undertaken, which considered how the scheme would affect walking and cycling using a three-point scale.
- 3.7.3. Currently none of the road scheme options include measures aimed specifically at walking and cycling, however Walking and Cycling will be considered moving forward potentially through design of the route options and or potentially through the proposed additional non- road options carried through from the initial sifting to be considered as part of a package of measures.
- 3.7.4. The reduction in traffic on the local roads due to the scheme is likely to create a better environment for walkers and cyclist, therefore the scheme is likely to generate additional walking and cycling trips. At this current stage the size of the increase is unknown, therefore the impact is assumed as neutral to slight beneficial, however Option A is likely to be less effective at providing walking and cycling benefits as it removes the least traffic from the existing roads.

### JOURNEY QUALITY

- 3.7.5. Journey quality is a measure of physical and social environment (real and perceived) experienced when travelling. This considers traveller care, traveller views and traveller stress. Traveller care considers the impacts associated with cleanliness, facilities, information and environment. Travellers' views consider anything that may block the view and traveller stress considers the impacts associated with frustration, fear of potential accidents, and route uncertainty.
- 3.7.6. The impact on traveller care will be neutral - beneficial. All elements will be designed to current industry standards therefore this may be an improvement to traveller environment over the existing local roads that are currently being used.
- 3.7.7. The impact on travellers' views will be neutral as the majority of works will run through countryside.
- 3.7.8. The impact on traveller stress will be beneficial as the scheme will reduce congestion and delay, which will improve route certainty and therefore reduce traveller stress.
- 3.7.9. Overall the impact on journey quality is assumed as beneficial.

### ACCIDENTS

- 3.7.10. Highway schemes are generally assessed using both travel time savings and accident impacts. Changes in accident impacts are associated with change of junction or link type or a change in flow which impacts existing conditions such as speed and merge or diverge rates, the scheme accidents impacts have not been directly assessed at this stage because the proposed scheme does not include sufficient detail. In order to assess the impact of the scheme in relation to accidents a qualitative exercise has been carried out. It is envisioned that a monetised assessment will be carried out using Cobalt at a later stage.

- 3.7.11. The implementation of transport schemes may impact on the likelihood of accidents occurring, and on the number and severity of casualties. An assessment of the impact that the proposed NWL scheme has on accidents has been undertaken.
- 3.7.12. Within the study area, there have been a number of recorded road traffic accidents, primarily along the main arterial routes to or from Norwich city centre. It should be noted that these records only represent injury accidents recorded by the police and do not take into account 'damage only' accidents. Anecdotal feedback from consultation with communities indicates that there are a significant number of damage only accidents but that these cannot be quantified.
- 3.7.13. In the five years from 2013 to 2017, there were 621 recorded collisions in the study area, involving 830 casualties:

**Table 3.7 – NWL Study Area Accident Analysis**

Injury Severity	Collisions	Casualties
Slight	515	702
Serious	99	121
Fatal	7	7
<b>Total</b>	<b>621</b>	<b>830</b>

- 3.7.14. **Table 3.7** provides a summary of all accidents in the study area for the period 2013-2017. Of the 830 casualties, 64 (8%) were pedestrians and 115 (14%) were cyclists. 106 casualties (13%) arose from accidents involving motorcycles. Clusters (based on five-year accident plot 2013-2017) have been identified at the following locations:

- A47 Longwater junction
- Dereham Road (A1074), junction with Longwater Lane
- Dereham Road (A1074), roundabout junction with Wendene
- Dereham Road (A1074), junction with Norwich Road
- Drayton High Road (A1067) junction with Boundary Road
- A140 in the vicinity of the airport
- Middletons Lane

- 3.7.15. Currently the majority of traffic in the study area can be found on three roads, the A47, and its continuation the A1074 from Longwater Junction heading east into Norwich and the A1067 located to the north of the study area. As strategic routes within the study area these roads provide core linkage between the west and east and access to the main north to south routes. A summary of the number of accidents recorded on these roads is provided below.

- A1067 from Cadge Road to Longwater Junction - 46
- Longwater Junction - 19
- Longwater to Taverham Road -15
- Hospital Lane to A1270 Broadland Northway - 38
- A1270 Broadland Northway to Attlebridge - 18
- Attlebridge to B1535 and Potters Lane - 11

- 3.7.16. The proposed link road will run between the A47 in the south and the A1067 in the north and is expected to have the most significant impacts on roads and routes which currently service this area. Analysis has shown that on these routes between 2013 and 2017 a total of 61 accidents resulting in 82 slight injuries and 17 serious injuries. It was noted that in terms of non-motorised users a total of 14% of all injuries where pedestrians (5) or cyclists (9) which equates to 14% of all injuries, 29% above the national average.
- 3.7.17. A review of the main 5 routes linking the A47 and A1067 in the study area was undertaken to allow an understanding of the potential direct impact on accidents. The routes are shown in **Figure 3.2** and are described below.
- Route 1 – Lyng Road, Heath Road, The Common
  - Route 2 – Sandy Lane, Weston Green Road, Rectory Road, Weston Hall Road
  - Route 3 - Wood Lane, Paddys Lane, Honingham Road, Church St, Marl Hill
  - Route 4 - Taverham Road, Honingham Lane, The Street, Ringland Road, Beech Road
  - Route 5 – Longwater Lane, West End, The Street, Costessy Lane
- 3.7.18. On these 5 routes during the five-year period a total of 32 accidents occurred resulting in 36 slight injuries and 11 serious injuries with 13% of the injured categorised as non-motorised users.
- 3.7.19. The proposed options will encourage a reassignment of traffic away from existing lower standard routes to the new higher standard highway links proposed between the A47 and A1067. It is expected that this will produce an overall reduction in accidents in the study area and deliver a beneficial outcome.

## SECURITY

- 3.7.20. Transport interventions may affect the level of security (freedom from crime) for road users, public transport passengers and freight (all modes). No significant security risk will be introduced by the proposed scheme. The security impact is assumed to be neutral.

## ACCESSIBILITY

- 3.7.21. Accessibility reflects the ranges of opportunities individuals have for connecting with key activities and services. Such activities and services might include access to jobs, healthcare, community facilities, education and transport interchanges. It is also about the availability and affordability of transport; providing journeys that are appropriate in terms of time and cost.
- 3.7.22. There are five key barriers that impact accessibility:
- The availability and physical accessibility of transport, eg public transport routes in rural areas
  - Cost of transport, (personal or public transport very high cost or unaffordable)
  - Services and activities located in inaccessible places
  - Safety and security, (fear of crime or anti-social behaviour)
  - Travel horizons, (unwilling to travel long journey times or distances)
- 3.7.23. At this stage the scheme focuses on highway improvements with no change in the routes served by the public transport system or the transport costs, although this may change in the future. The accessibility impact is currently assumed as neutral.
- 3.7.24. Going forward the plan is to combine the road scheme with other sustainable transport solutions, this will affect the accessibility impact of the scheme.

## AFFORDABILITY

- 3.7.25. The analysis of personal affordability is concerned with changes in the monetary costs of travel. The monetary costs of travel can, in some cases, be a major barrier to mobility for certain groups of people, and increases in travel costs can have particularly acute effects on their ability to access key destinations.
- 3.7.26. The scheme has not been designed to address the affordability of the transport system, there will be no change in fares/travel costs for users apart from those already identified through TUBA via Car Fuel and Non-Fuel operating costs. The affordability impact is assumed as Neutral.

## SEVERANCE

- 3.7.27. WebTAG defines community severance as the separation of residents from facilities and services they use within their community caused by substantial changes in transport infrastructure or by changes in traffic flows. Severance will only be an issue where either vehicle flows are significant enough to significantly impede pedestrian movement or where infrastructure presents a physical barrier to movement.
- 3.7.28. The scheme is likely to sever existing public rights of way along the new road corridor. However, the reduction in traffic along the existing local roads should reduce severance on the towns and villages. Where routes are severed it is considered that crossing facilities will be provided in line with or in close proximity to existing routes, or if required alternative routes will be provided, which should mitigate the impact of the new road. The severance impact is classed as neutral to slight beneficial.

## OPTION VALUES

- 3.7.29. The appraisal of impact on option and non-user values is only likely to be of importance where an intervention will substantially change the availability of transport services within a study area.
- 3.7.30. At this stage the scheme does not directly provide for new public transport services. The option values impact is assumed as neutral.

## 3.8 PUBLIC ACCOUNTS

### IMPACT ON PUBLIC ACCOUNTS

- 3.8.1. **Table 3.8** shows the impact on public accounts for each of the options, this is reported in £000s at 2010 prices and values.

**Table 3.8 – Public Accounts Table**

Public Account Impacts	Route Options					
	Option A	Option B West	Option B East	Option C	Option D West	Option D East
Broad Transport Budget	54,351	119,584	147,782	142,858	166,523	155,251
Wider Public Finances (Indirect Taxation Revenues)	-1,109	1,144	0,520	-2,650	-0,305	-0,305
<b>Present Value of Costs (PVC)</b>	<b>54,351</b>	<b>119,584</b>	<b>147,782</b>	<b>142,858</b>	<b>166,523</b>	<b>155,251</b>

3.8.2. Option A has the lowest costs with Option D west being the highest, Option D East is the second lowest with Option B East and Option C coming out with broadly similar costs.

### 3.9 BENEFIT COST RATIO

#### Initial BCR

3.9.1. The BCR considers the impact to the economy, society, the environment and the public accounts. It offers an estimate of the value of benefit generated for every £1 of public expenditure. Therefore, any BCR above one shows value for money for every £1 of invested cost. The Value for Money (VfM) category is defined by the BCR, these are:

- BCR < 1.0                                      Poor
- BCR between 1.0 and 1.5                      Low
- BCR between 1.5 and 2.0                      Medium
- BCR between 2.0 and 4.0                      High
- BCR > 4.0                                        Very High

3.9.2. The initial BCR includes the monetised impacts associated with Economy for business users and providers, Environment for Greenhouse Gases, Social for non-business users, and Public Accounts for the cost to the broad transport budget and indirect tax. **Table 3.9** shows the Initial Analysis of Monetised Costs and Benefits (AMCB) results and the Initial BCR associated with the scheme.

**Table 3.9: - Analysis of Monetised Costs and Benefits - Initial**

	Route Options					
	Option A	Option B West	Option B East	Option C	Option D West	Option D East
Economic Efficiency: Consumer Users (Commuting)	20,662	114,850	121,547	133,364	116,397	116,397
Economic Efficiency: Consumer Users (Other)	24,911	98,547	104,853	116,124	108,973	108,973
Economic Efficiency: Business Users and Providers	18,425	91,549	97,469	107,463	92,480	92,480
Wider Public Finances	-1,109	1,144	520	-2,650	-305	-305
Greenhouse Gases (Environmental assessment)	8,623	-1,359	-4,900	-4,149	-10,576	-10,576
Air Quality	3,603	729	-548	-453	-3,029	-3,029
<b>Present Value of Benefits (PVB)</b>	<b>75,115</b>	<b>305,460</b>	<b>318,941</b>	<b>349,699</b>	<b>303,940</b>	<b>303,940</b>
<b>Present Value of Costs (PVC)</b>	<b>54,351</b>	<b>119,584</b>	<b>147,782</b>	<b>142,858</b>	<b>166,523</b>	<b>155,251</b>
Net Present Value (NPV)	20,764	185,876	171,159	206,841	137,417	148,689
<b>Benefit Cost Ratio (BCR)</b>	<b>1.38</b>	<b>2.55</b>	<b>2.16</b>	<b>2.45</b>	<b>1.83</b>	<b>1.96</b>

£000s 2010 prices, discounted to 2010

- 3.9.3. Therefore, based on the transport benefits the scheme has an initial VfM category in the range of low to high, depending on the Option. Option A returns the lowest BCR placing it in the low VfM range, Option D West and East are in the medium range while the other options are all in the high VfM range.

#### **Adjusted BCR**

- 3.9.4. For the study the only additional impacts which have been monetised are Output Change in Imperfectly Competitive Markets impacts. **Table 3.10** shows the adjusted AMCB results and the adjusted BCR associated with the scheme.

**Table 3.10: - Analysis of Monetised Costs and Benefits - Adjusted**

	Route Options					
	Option A	Option B West	Option B East	Option C	Option D West	Option D East
Economic Efficiency: Consumer Users (Commuting)	20,662	114,850	121,547	133,364	116,397	116,397
Economic Efficiency: Consumer Users (Other)	24,911	98,547	104,853	116,124	108,973	108,973
Economic Efficiency: Business Users and Providers	18,425	91,549	97,469	107,463	92,480	92,480
Wider Public Finances	-1,109	1,144	520	-2,650	-305	-305
Greenhouse Gases	8,623	-1,359	-4,900	-4,149	-10,576	-10,576
Air Quality	3,603	729	-548	-453	-3,029	-3,029
Wider Impacts	1,876	7,683	7,304	8,659	7,224	7,224
<b>Present Value of Benefits (PVB)</b>	<b>76,991</b>	<b>313,143</b>	<b>326,245</b>	<b>358,358</b>	<b>311,164</b>	<b>311,164</b>
<b>Present Value of Costs (PVC)</b>	<b>54,351</b>	<b>119,584</b>	<b>147,782</b>	<b>142,858</b>	<b>166,523</b>	<b>155,251</b>
Net Present Value (NPV)	22,640	193,559	178,463	215,500	144,641	155,913
<b>Benefit Cost Ratio (BCR)</b>	<b>1.42</b>	<b>2.62</b>	<b>2.21</b>	<b>2.51</b>	<b>1.87</b>	<b>2.00</b>

£000s 2010 prices, discounted to 2010

- 3.9.5. Based on the additional monetised impacts the scheme has an adjusted BCR in the range of 1.4 to 2.6, giving it an adjusted VfM category in the range of low to high, depending on the Option. Option A returns the lowest BCR placing it in the low VfM range, Option D West is in the medium range, while the other options are all in the high VfM range.
- 3.9.6. However, large portions of the assessments undertaken to date are qualitative rather than quantitative, and therefore numerous aspects of the scheme have not been monetised, this includes noise and accidents which could have a significant impact on the BCR of the scheme.
- 3.9.7. There are also likely to be significant impacts associated with the environmental aspects of the schemes which cannot be monetised including Landscape, Historic Environment, Biodiversity and the Water Environment. Without mitigation these impacts are adverse.

## 3.10 SUMMARY OF IMPACTS

- 3.10.1. A summary of the impacts associated with the scheme are provided in the Appraisal Summary Table (AST).



## VALUE FOR MONEY STATEMENT

3.10.2. **Table 3.11** sets out the Value for Money Statement for the core growth scenario for all of the 6 options assessed for the NWL scheme.

<b>Table 3.11: Value for Money Statement.</b>						
<b>Criteria</b>	<b>Scheme</b>					
Value for Money	The scheme offers: a low-high value for money for the adjusted BCRs as set out					
	A	B West	B East	C	D West	D East
	Low	High	High	High	Medium	High
PVC	The scheme has a PVC of: £m					
	A	B West	B East	C	D West	D East
	54.3	119.6	147.8	142.9	166.5	155.3
NPV	The scheme has an adjusted NPV of: £m					
	A	B West	B East	C	D West	D East
	22.6	193.6	178.5	215.5	144.6	155.9
Adjusted BCR (inc reliability and Webs)	The scheme has an adjusted BCR of:					
	A	B West	B East	C	D West	D East
	1.4	2.6	2.2	2.5	1.9	2.0
Significant non-monetised impacts	<p>Economy: Beneficial for Reliability</p> <p>Environmental: adverse for Landscape, Historic Environment, Biodiversity and Water Environment.</p> <p>Social: Beneficial for Reliability</p>					
Key risks, sensitivities and uncertainties underlying the appraisal	<p>Key Risks, statutory undertakers' equipment, ground conditions, land, technical approvals timescale, SAC</p> <p>Key uncertainties. Traffic growth</p>					
<p>The scheme has been assessed by utilising the NATS model, Impacts have been monetised for transport user and wider economic impacts. The environmental and social impacts have been assessed qualitatively apart from Air Quality and Greenhouse Gases</p>						

## 4 FINANCIAL CASE

---

### 4.1 INTRODUCTION

4.1.1. The Financial Case outlines the proposed financing of the scheme in terms of the affordability of the proposal, the source of funding, annual breakdown of provisions and outturn costs. This chapter considers the potential costs and associated financial case for the options and will describe:

- How much the scheme will cost, and how this has been calculated
- The anticipated profile of expenditure (whole life costs)
- How the scheme will be paid for, and by whom

4.1.2. The Financial Case also addresses cost and accounting issues.

### 4.2 BASE COST ESTIMATES

4.2.1. Scheme costs have been developed for the shortlisted scheme options appropriate to the scheme stage (i.e. SOBC). The costs have been developed in line with WebTAG A1.2 (2017).

4.2.2. The estimates have been compiled using rates taken from Spons Civil Engineering and Highways Works Price Book 2019, or historic rates from previous projects, which have been considered appropriate. They include Drainage, Earthworks, Surfacing, Line Markings, Signs, Fencing and Barrier works, as well as an allowance for Accommodation Works, Statutory Undertakings and Landscaping as appropriate to the type and location of carriageway. This list is not exhaustive.

4.2.3. The cost estimate is based upon a price base of 2019 Q1.

#### CONSTRUCTION WORKS ESTIMATES

4.2.4. The following items summarise the assumptions included in developing the construction works cost estimates:

- Items within the estimate have been based upon measured quantities taken from the scheme drawings
- All rates and prices are exclusive of VAT
- An allowance for contingency has been included within the base costs at 5% to allow for any variations or uncosted items
- Contractor's preliminaries have been included at approximately 21% of the estimated construction works cost, this varies by option
- Traffic Management – An allowance has been used in the range of 0.5% to 1.25% dependent on the option, this is included in the preliminaries allowance

4.2.5. The estimated cost of the schemes at 2019 prices, unadjusted for risk and inflation, are shown below within **Table 4.1**. Estimate base costs for each option are detailed in **Appendix G**.

**Table 4.1 - Estimated Scheme Costs**

Scheme element	Option A £	Option B West £	Option B East £	Option C £	Option D West £	Option D East £
Construction Roadworks	21,453,404	33,606,129	31,386,615	29,070,150	33,398,298	32,021,495
Construction Structures	2,417,506	22,876,152	44,466,928	45,383,066	50,107,626	46,231,930
Sub-total: Construction costs	<b>23,870,910</b>	<b>56,482,281</b>	<b>75,853,543</b>	<b>74,453,216</b>	<b>83,505,924</b>	<b>78,253,425</b>
Preliminaries	5,490,309	12,143,690	15,549,976	15,262,909	16,492,420	15,455,051
Utilities: Works by statutory undertakers and others	1,291,442	2,342,162	1,703,065	1,634,409	5,637,653	5,637,653
Land	5,700,000	16,900,000	14,200,000	10,300,000	15,400,000	12,700,000
Other Items	500,000	750,000	750,000	1,000,000	1,000,000	1,000,000
Fees <sup>5</sup> : Design, investigations, surveys, procurement, supervision etc.	8,833,895	10,979,902	12,223,057	12,130,319	12,818,826	12,477,414
Base cost at 2019 Q1 prices	<b>45,686,557</b>	<b>99,598,036</b>	<b>120,279,642</b>	<b>114,780,854</b>	<b>134,854,823</b>	<b>125,523,543</b>

- 4.2.6. The above estimated costs for each scheme option, include alterations to the existing road network to accommodate tie-ins where appropriate. The A47 junctions are to be provided as part of the Highways England A47 Upgrade scheme at locations coincident with the NWL. Minor alterations to the layouts such as provision of roundabouts and realignment of approach link roads are expected to be required to accommodate the NWL.
- 4.2.7. Cost estimates have been prepared by an experienced WSP Quantity Surveyor and reviewed by NCC.

### 4.3 SPEND PROFILE

- 4.3.1. Subject to funding, construction of the scheme will start in 2022 and the new scheme will open to traffic in 2025. An indicative spend profile has been developed for each scheme and is set out in **Table 4.2**.

<sup>5</sup> From 2017/18 onwards

**Table 4.2 – Options Spend Profile (£)**

Year	Option A	Option B West	Option B East	Option C	Option D West	Option D East
2918/2019	1,541,140	1,549,187	1,348,099	1,329,376	1,340,285	1,117,204
2019/2020	3,197,969	6,371,172	7,960,561	6,268,814	8,935,433	7,473,427
2020/2021	5,482,004	13,996,977	11,533,714	9,576,069	14,095,545	12,084,146
2021/2022	9,114,094	18,567,477	24,235,068	23,652,217	27,752,956	26,162,254
2022/2023	11,445,795	25,644,014	40,895,891	40,215,360	45,163,285	42,968,037
2023/2024	11,541,913	25,916,423	29,321,631	28,836,768	32,108,820	30,528,612
2024/2025	3,363,643	7,552,786	4,984,677	4,902,251	5,458,499	5,189,864
Total	<b>45,686,557</b>	<b>99,598,036</b>	<b>120,279,642</b>	<b>114,780,854</b>	<b>134,854,823</b>	<b>125,523,543</b>

**Out-turn price adjustment (inflation)**

- 4.3.2. The base costs have been adjusted for inflation in order to account for changes in ‘real costs’ over time.
- 4.3.3. The 2019 prices have been inflated through the delivery and construction period based on the Bank of England CPI latest forecasts of general inflation. **Table 4.3** shows the inflation that has been calculated and applied for each option.

**Table 4.3 – Inflation (£)**

	Option A	Option B West	Option B East	Option C	Option D West	Option D East
Inflation	4,218,618	9,254,385	10,485,666	11,030,579	12,580,924	11,892,958
Proportion of Base Costs	9.2%	9.3%	8.7%	9.6%	9.3%	9.5%

- 4.3.4. Data to compile the construction indices appears to have become very limited. CPI rates are used by Highways England and therefore the use of Bank of England CPI inflation rates is considered appropriate in the context of setting out robust scheme costs for this Strategic Outline Business Case.

**Estimating uncertainty**

- 4.3.5. The final cost of delivering the schemes will not be known until after completion of detailed design, land purchase, land investigation and following the receipt of contractor tenders. As such the cost estimates are subject to change. For this reason, the scheme cost estimates include allowances to account for this uncertainty, or risk. During the project lifecycle, the risk associated with cost estimates is determined by the level of detailed knowledge at each respective stage, therefore as the level of detail increases, the level of risk, and the risk-adjusted costs usually reduce.

4.3.6. The treatment of risk, and the calculation of quantified risk (QRA) is described in the Management Case (Section 6.8.)

4.3.7. The current Risk Allowance for each option is set out in **Table 4.4**.

**Table 4.4 – Risk Allowance**

	<b>Option A £</b>	<b>Option B West £</b>	<b>Option B East £</b>	<b>Option C £</b>	<b>Option D West £</b>	<b>Option D East £</b>
Risk Allowance	10,742,272	21,504,589	27,352,083	26,872,937	30,729,522	29,020,000
% of Base Cost	23.51%	21.59%	22.74%	23.41%	22.79%	23.12%

## 4.4 SCHEME COST

4.4.1. The scheme cost as defined by DfT, is the out-turn capital cost of the scheme excluding sunk costs. Sunk' costs, represent expenditure incurred prior to the scheme appraisal. Therefore, the forecast scheme costs are set out in **Table 4.5**.

**Table 4.5 - Scheme costs (£)**

<b>Cost £</b>	<b>Option A</b>	<b>Option B West</b>	<b>Option B East</b>	<b>Option C</b>	<b>Option D West</b>	<b>Option D East</b>
Base cost	<b>45,686,557</b>	<b>99,598,036</b>	<b>120,279,642</b>	<b>114,780,854</b>	<b>134,854,823</b>	<b>125,523,543</b>
Risk	10,742,272	21,504,589	27,352,083	26,872,937	30,729,522	29,020,000
Inflation	4,218,618	9,254,385	10,485,666	11,030,579	12,580,924	11,892,958
<b>TOTAL</b>	<b>60,647,447</b>	<b>130,357,009</b>	<b>158,117,391</b>	<b>152,684,370</b>	<b>178,165,269</b>	<b>166,436,501</b>

### Whole life costs

4.4.2. Although the request for funding is for a contribution towards the capital costs only of delivering the scheme, the business case must also consider its whole-life costs. These include the costs of operating and maintaining the highway (including any structures) and associated infrastructure as well as the longer-term costs of infrastructure renewal. This will include any costs associated with maintaining the landscaping/environmental mitigation.

### Highways maintenance and renewals

Highways maintenance and renewals costs include:

- Highways maintenance liabilities including communication equipment, drainage clearance, road and street lighting operation, winter maintenance (i.e. application of salt and snow clearance) and infrastructural and safety inspections
- Longer term highways renewals, including re-surfacing and renewing the road pavement, periodic inspection of the bridge structures and any associated works

4.4.3. A high level indicative cost of £100k per annum has been developed. This would be included as part of NCC annual maintenance programme. This will be further developed as a preferred option is chosen and further detailed design is produced.

## 4.5 BUDGETS AND FUNDING COVER

### FUNDING STRATEGY

4.5.1. It is anticipated that the scheme will be funded entirely from public finances.

4.5.2. It is considered that the most appropriate funding solution for the scheme is via the Large Local Majors (LLM) programme. The LLM programme is for schemes which are requesting a funding contribution in excess of £50 million. LLM is now funded through the National Roads Fund, therefore only road schemes will be considered for the programme. As a general guideline LLM schemes should aim for the local or third-party contribution to be at least 15% of the total scheme costs.

4.5.3. The proposed funding breakdown for each option is detailed in **Table 4.6**. This assumes a maximum LLM funding contribution of 85%.

**Table 4.6 - Funding request (£)**

	Option A	Option B West	Option B East	Option C	Option D West	Option D East
DfT funding requested	£51,550,330	£110,803,458	£134,399,782	£129,781,715	£151,440,478	£141,471,026
LA (NCC) and 3 <sup>rd</sup> party contribution	£9,097,117	£19,553,551	£23,717,609	£22,902,656	£26,724,790	£24,965,475
Total	£60,647,447	£130,357,009	£158,117,391	£152,684,370	£178,165,269	£166,436,501

### LOCAL AUTHORITY CONTRIBUTION

4.5.4. The LLM guidance states that schemes should aim for the local or third-party contribution to be at least 15% of the total scheme costs. Currently no third-party contribution has been identified for the scheme, therefore the full minimum 15% contribution will be underwritten by NCC. The costs for developing the scheme will form part of the local contribution.

4.5.5. The exact composition of the local contribution has not yet been finalised, but it is expected with a high degree of confidence that some funding from the LEP will be secured as a part of the local contribution element towards the project. Funding from a pool of sources will be comprised of the following elements:

- Rates retention
- Pooled business rates
- Future arrangements for business rates retention
- Private sector contributions from the Community Infrastructure Levy (CIL) and Section 106 contributions from developers
- Possible long-term funding through the New Anglia LEP

4.5.6. The details of the local funding mechanism will be clarified as the scheme is developed.

## **4.6 FUNDING COVER FOR WHOLE LIFE COSTS**

- 4.6.1. The whole life costs, will also need to be met by NCC, and provision will be made for this in the Council's budgets for highways and bridge maintenance, which are funded through LTP allocations. It is considered that the NWL will form part of the MRN, and would be maintained as part of that network with funding provision specific to the MRN.
- 4.6.2. The scheme is not expected to generate any direct income.

## **4.7 AFFORDABILITY**

The LLM programme is for schemes which are requesting a funding contribution in excess of £50 million, there is no upper limit stated. Of those schemes that have been submitted and approved through the LLM the average scheme cost is £66 million. The funding request for the options lies in the range £50 to £150 million, therefore all scheme option costs are within the funding envelope. NCC have confirmed that they will underwrite the local funding contribution and the S151 has been signed off. Therefore, the scheme is considered to be affordable.

## **4.8 SUMMARY OF THE FINANCIAL CASE**

- 4.8.1. The base scheme costs lie in the range of £45,686,577 to £134,854,823 depending on the option. The scheme costs include a risk allowance taken from the latest QRA. Based on the indicative profile inflation has been calculated for each option using bank of England CPI rates.
- 4.8.2. The total scheme costs including risk and inflation lie in the range of £60,647,447 to £178,165,269.
- 4.8.3. Funding is sought via the Large Local Majors through the National Roads Fund.

## 5 COMMERCIAL CASE

---

### 5.1 INTRODUCTION

- 5.1.1. This chapter outlines the commercial viability of the scheme, including the preferred procurement strategy which will be used by NCC to engage with the market and outline how the council will secure the delivery of the project.
- 5.1.2. The financial implications of the proposed procurement strategy will be taken into account as will an initial consideration of evidence on risk allocation and transfer.
- 5.1.3. NCC is developing a robust and well managed approach, in line with best practice for managing public money.

### 5.2 OUTPUT BASED SPECIFICATION

- 5.2.1. The contract to be let for the NWL will be a contract for outputs (completion of the scheme in accordance with quality criteria) – rather than for outcomes (the transport objectives of the scheme).
- 5.2.2. In construction terms, the outputs can be specified straightforwardly. In essence:
  - a new road is to be built in accordance with the Specification for Highway Works to connect the A1270 Broadland Northway, at its junction with the A1067 Fakenham Road, via the preferred route to a new junction with the A47, being constructed by Highways England
  - some modification to that junction is likely to be needed to increase its capacity
  - overpasses/underpasses will need to be constructed where the NWL crosses existing roads, or those roads will need to be stopped up
  - a viaduct over the Wensum may need to be constructed at a given height, and there will be a given exclusion zone within which no temporary or permanent works will be permitted
  - a north-south NMU route may be included – which itself may include:
    - NMU lane(s) on the viaduct
    - Either an NMU route alongside the carriageway, or connectivity from existing lanes onto the NMU viaduct
  - There will be requirements for:
    - Landscaping
    - Drainage works
    - Green bridges/underpasses/ecological mitigation
    - Associated works
- 5.2.3. The specification of the constraints will be of more significance. The NWL will need to comply with environmental requirements and deliver against the relevant objectives of the Norfolk Spatial Strategy:
  - Providing a well-designed living environment
  - Ensuring the protection and enhancement of Norfolk's environmental assets, including the built and historic environment, protected landscapes, Broads and coast
  - Protecting the landscape setting of our existing settlements where possible
  - Where previously undeveloped land is developed, maximising the environmental benefits resulting from its development



- Protecting and, where appropriate, enhancing biodiversity through the preservation of habitats and species and creating new habitats through development

5.2.4. Both the execution of the works and the finished product will need to comply with the environmental constraints.

5.2.5. Environmental constraints which have been identified and discussed within Chapters 2 and 3 will be taken into account during construction and will require more detailed assessment once a preferred route is chosen. While the construction of the NWL is not considered to give rise to exceedances of the EU limit value for annual mean nitrogen dioxide, consideration of impacts of Noise, Landscape, Biodiversity and Historic Environment will be assessed and feed into the Environmental Impact Assessment.

### 5.3 SOURCING TEAM

5.3.1. NCC has an experienced procurement team, which will be led by [REDACTED] for the Authority. The team has extensive relevant experience, including leading the development and delivery of the procurement process for the Great Yarmouth 3<sup>rd</sup> River Crossing project. The procurement team, working alongside the project delivery team, have developed an in depth understanding of the requirements of a major highway infrastructure project and this experience and knowledge will be applied to the delivery of the procurement for the NWL.

### 5.4 PROCUREMENT STRATEGY

5.4.1. The procurement strategy considers:

- The nature and responsibilities of the team to be procured
- The contracting route for appointment of the supply chain

5.4.2. Both the above are inter-related, and the approach taken in this case is to:

- Consider the allocation of design and construction responsibilities
- Identify the preferred allocation
- Consider the contracting route suitable for that allocation
- Take forward a preferred contracting route to OBC stage for finalisation

#### ALLOCATION OF DESIGN AND CONSTRUCTION RESPONSIBILITIES

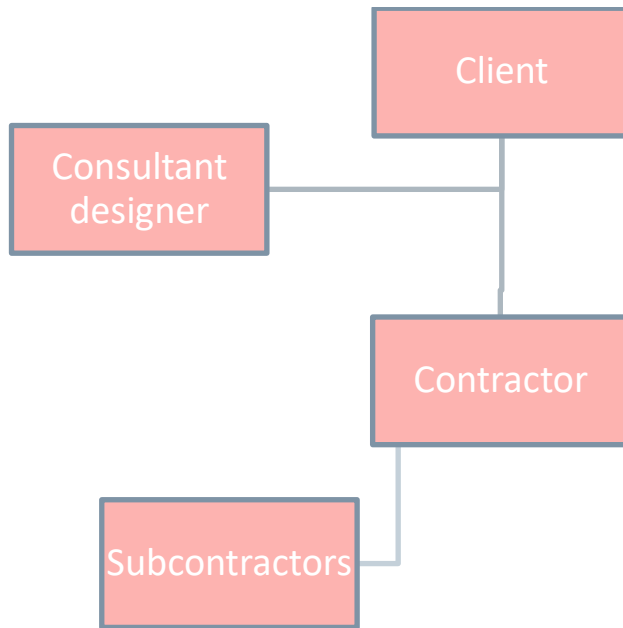
5.4.3. Two possible allocations are considered here: prime contracting, and design-and-build.

##### Prime Contracting

5.4.4. In this route, the client or its consultant leads on design of the scheme, although the tier 1 contractor or sub-contractors may undertake some specialised areas of design. The contractor undertakes the works, appointing sub-contractors and suppliers

5.4.5. The appointed contractor will be expected to have a well-established supply chain, and will co-ordinate and project-manage construction stages.

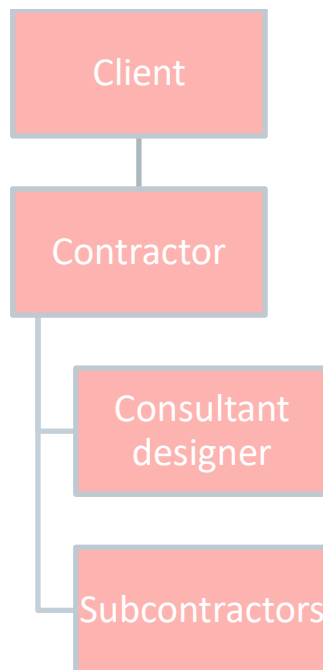
5.4.6. This route enables bidders to price against a detailed design. In theory, this leads to greater cost certainty. But in practice, this route places much of the risk with the client, as the client bears design and change risk



**Figure 5.1 - Prime contracting (design largely or entirely by client or consultant)**

5.4.7. The client’s influence over the design can lead to high aesthetic quality and functionality, but can also result in the product being over-engineered. For example, the consultant designer, not knowing who the selected contractor will be or what its temporary works strategy will be, may over-specify sections because it does not know in detail what forces will be imposed during construction. This may result in excessive costs or in costly rework of the design at a later stage.

**Design and Build**



**Figure 5.2 - Design and build by tier one contractor**

- 5.4.8. In this route, the tier one contractor has single-point design responsibility. It takes the concept design, developed to allow tendering, adopts it and works it up. It is both Principal Contractor and Principal Designer for Construction Design and Management (CDM) purposes.
- 5.4.9. In practice, the contractor is likely to appoint a consultant designer, and specialist aspects of design may be undertaken by the relevant subcontractors.
- 5.4.10. This approach places design risk with the contractor and enables the scheme to benefit from the contractor's experience to make sure that the chosen design is economical and buildable and that hazards (safety and environmental) can most effectively be eliminated at source.
- 5.4.11. The principal disadvantages of this route are:
- Price remains uncertain for longer, compared to the contractor bidding against a fully-designed scheme
  - It is harder to specify aesthetic requirements

### **TWO-STAGE OPEN BOOK**

- 5.4.12. Given the assumption of a design and build option, it is anticipated that the contractor will be appointed using the two-stage open book approach.
- 5.4.13. Two-stage open book may be summarised as follows<sup>6</sup>.
- The client develops a project brief and selects a designer and a cost consultant
  - The client's designer creates a concept design, whilst the cost consultant prepares a project budget
  - The client seeks tenders from prospective design-and-build teams, which may include:
    - Design and other project proposals
    - Consultant fees
    - Contractor fees, profits and overheads
    - Costed tier one contractor proposals
    - Costed package proposals from preferred subcontractors and suppliers
  - The selected design and build team is appointed on a conditional contract to carry out preconstruction phase activities
  - The integrated team develops the detailed design, and then appoints tier 2/3 subcontractors. These may be:
    - The preferred subcontractors named in the bid document, subject to a business case
    - Other subcontractors appointed through competitive tendering
  - The client authorises progression to the construction phase based on pre-agreed criteria including:
    - An agreed detailed design that meets the requirements of the project brief
    - The fixed price or target cost being within budget

---

<sup>6</sup> After *King's College London: Project procurement and delivery guidance: Using two stage open book and supply chain collaboration, HMSO, 2014*

## **BASIS OF TENDER EVALUATION**

- 5.4.14. The critical issue about the sourcing process is how much work the bidders are to be asked to do as part of the competitive process. If too little work is done, there are a number of risks:
- There may be insufficient detail on which to base the tender evaluation, so the chosen contractor may not be the best-value option or the procurement may be open to challenge
  - There is a greater risk of contractual disputes during the subsequent stages, as there will be less clarity about what has been contracted for
  - There is a greater risk of cost escalation, as further design is carried out
  - There is more risk that the aesthetic solution may be unacceptable
- 5.4.15. Conversely, if bidders are asked to do too much work during dialogue or negotiation, there is a risk that there will be insufficient market interest, this could be mitigated by early engagement
- 5.4.16. The key differentiators between bidders are expected to be:
- The capability and experience of the proposed team
  - Construction approach, in particular the approach to minimising the environmental impact on the Wensum river of the construction phase
  - Design, including aesthetics and minimising the environmental impact of the completed scheme
  - Price
- 5.4.17. Of these criteria, capability and experience can be evaluated regardless of the degree of design undertaken. The construction approach can be evaluated to some degree, but if more design has been done, construction proposals can be expected to be more detailed and realistic and hence to provide a better basis for evaluation. Aesthetics and the environmental impact of the completed scheme can only be evaluated if design has been taken forward to a sufficient stage.
- 5.4.18. The approach to price evaluation will depend on the degree of design completeness. If a worked-up design has not been undertaken as part of the competitive process, evaluation would need to be based on:
- Fee, based on an assumed construction cost
  - Costs for design and participation in the planning process
  - The cost of preliminaries
- 5.4.19. If a worked-up design has been produced, evaluation would be based on:
- Fee
  - Actual construction cost
  - An assumed level of compensation events, to which fee would be applied
  - Costs for design, further surveys and participation in the planning process
  - The cost of preliminaries
- 5.4.20. An intermediate position could involve:
- Bidders fully pricing the scheme other than the crossing and its immediate approaches, based on a concept design developed by the council's consultants
  - The price evaluation for the crossing being based on fee, an assumed construction cost and an assumed level of compensation events

## PREFERRED PROCUREMENT STRATEGY

5.4.21. Work has been under way on the commercial case and discussions have been held internally and with potential bidders and consultants.

5.4.22. The following are emerging as the preferred procurement strategy.

- The design and build route will be used
  - Substantial input into design is needed by the winning bidder
    - ECI by a contractor prior to procurement is unlikely to be helpful:
      - it makes managing the risk of procurement challenge more difficult
      - it may deter other bidders
      - it will be based on the equipment available to and “house style” of the ECI contractor
    - A consultant-led design would be likely to be more expensive to build, or would require substantial rework post-award. For example, the consultant would have to design without knowing the contractor’s temporary works strategy, and as a result would be likely to over-size sections to cover all eventualities
- The bidders will undertake a tender design during the dialogue period, building on a reference design provided at the outset
  - This approach reduces price uncertainty for the council
  - The risk of a challenge is reduced<sup>[1]</sup> because the basis of pricing is clear. Tenderers can be judged on aesthetics, which will be important in light of the sensitivity of the site.

## 5.5 SOURCING OPTIONS

### SUMMARY OF AVAILABLE SOURCING ROUTES

- 5.5.1. There are a small number of credible sourcing routes for the NWL. The open procedure and restricted procedure are not considered appropriate for a scheme of this scale and complexity: there will be a need for dialogue or negotiation during the process. For the same reason, use of an existing framework is not considered a viable route.
- 5.5.2. The available routes are therefore the competitive procedure with negotiation (“negotiated procedure”) and the competitive dialogue. The use of either route is justified by the complexity of the scheme in accordance with Regulation 26 (4) of the Public Contracts Regulations 2015.
- 5.5.3. Competitive dialogue has the advantage that it allows greater flexibility at the final stages – regulation 30 (17) permits tenders to be “clarified, specified and optimised” whilst regulation 30 (20) permits limited negotiations with the tenderer identified as having submitted the tender presenting the best price-quality ratio.
- 5.5.4. These advantages are considered to outweigh the main benefit of the negotiated procedure – that bidders may consider it less burdensome.

---

<sup>[1]</sup> See for example *Henry Brothers (Magherafelt) Ltd & Ors vs Department of Education for Northern Ireland* for an example of a case where the court found against a contracting authority that went to tender on the basis of fees plus prelims

## **MINIMISING THE BURDEN OF THE COMPETITIVE PROCESS**

- 5.5.5. Regardless of the chosen route, a number of steps will be taken to minimise the burden of the competitive process. These include:
- Undertaking the necessary ground investigations, surveys, concept design and environmental surveys prior to the Official Journal of the European Union (OJEU) contract notice being placed and then freezing these aspects
  - The council setting out its commercial position in full at the outset of the process
- 5.5.6. This approach has been agreed by the project board. Environmental surveys are already under way, and ground investigation and design work will be commissioned as soon as the preferred route announcement has been made.
- 5.5.7. The council's commercial position, including risk allocation, will be based on the experience of the Great Yarmouth Third River Crossing. As a result of that procurement, the council has a good understanding of what the market will bear. The Great Yarmouth Third River Crossing contract documents (NEC 4) will form the basis of the NWL procurement.

## 6 MANAGEMENT CASE

---

### 6.1 INTRODUCTION

- 6.1.1. The Management Case assesses whether a proposal is deliverable. It tests the project planning, governance structure, risk management, communications and stakeholder management, benefits realisation and assurance.
- 6.1.2. The Management Case demonstrates that the NWL scheme is capable of being delivered successfully. It describes the processes that are being put in place to ensure that the project is effectively delivered, and properly evaluated.
- 6.1.3. The Management Case also sets out a plan to ensure that the benefits set out in the Economic Case are realised and will include measures to assess and evaluate this.
- 6.1.4. Specifically, this chapter sets out:
- Examples of other large-scale projects that have been successfully delivered by NCC
  - The governance arrangements which will be put in place to oversee delivery
  - How stakeholders are being involved in the development of the scheme
  - The strategy for identifying and managing project risks
  - The programme for delivery
  - How the intended benefits of the scheme will be realised
  - How the performance of the scheme will be monitored

### 6.2 EVIDENCE OF SIMILAR PROJECTS

- 6.2.1. NCC has successfully procured and delivered a large number of projects since 1999 using the NEC Engineering and Construction Contract. Projects vary in size and complexity and include:
- Broome Ellingham Bypass
  - King's Lynn Household Waste Recycling Centre
  - Nar Ouse Regeneration Scheme
  - Sprowston, Harford and Thickthorn park and ride sites
  - Cringleford Cluster (including new development link road)
  - A140 refurbishment at Scole
  - King's Lynn South Lynn Transport Major
  - King's Lynn Major Developments (including new development link road)
  - King's Lynn Transport Interchange
  - A47/A1042 Postwick Hub Junction
  - A12/A143 Link Road
  - Norwich Northern Distributor Road (NNDR)
- 6.2.2. **Table 6.1** sets out the scope of the works, costs, timescale and procurement strategy followed for the three most recent schemes.

**Table 6.1 – Experience of Similar Recent Projects**

<b>Scheme name</b>	<b>Description</b>	<b>Contract</b>	<b>Form of contract</b>	<b>Approximate total project value</b>	<b>Construction date</b>
A47/A1042 Postwick Hub Junction Improvement	Construction of a new bridge over the A47 and the construction of associated link roads, slip roads, roundabouts junctions, a signal controlled junction and new access arrangements to the existing Park and Ride site	NEC3 Engineering and Construction Contract	Option C, with a Target Price developed from first principles and an incentivised approach which aimed to deliver the construction works below the target figure	£28m	Construction commenced in May 2014 and opened to traffic in December 2015
A12/A143 Link Road	Construction of a new link between the A12 trunk road and the A143	NCC Term Service Contract - NEC3 Engineering and Construction Contract	Option C, with a Target Price developed from first principles and an incentivised approach which aimed to deliver the construction works below the target figure	£8m	Construction commenced in September 2014 and opened to traffic in December 2015
Norwich Northern Distributor Road	Construction of 20km dual carriageway including eight bridges (one over a railway), a grade separated junction, and associated link roads and roundabout junctions	NEC3 Engineering and Construction Contract	Option C, with a Target Price developed from first principles and an incentivised approach which aimed to deliver the construction works below the target figure	£177m	Construction commenced December 2015 and fully opened to traffic April 2018



- 6.2.3. All of the schemes have been developed and tendered by the County Council or procured using the Council's Strategic Partnership Contract or the Highways Term Service Contract using an Option C Target Cost Contract. The Council has fulfilled the role of Project Manager.
- 6.2.4. A Delivery Team has been used successfully on major infrastructure schemes and this approach will again be followed for the NWL.
- 6.2.5. Opportunities will be taken, wherever possible, to improve delivery processes by acting upon the lessons learnt from recent schemes. For example:
- Using knowledge and experience gained during the Town and Country Planning Act (TCPA) process to assist with the development of the TCPA application submission, preparation for the Examination in Public and attendance at examination hearings
  - Maintaining good stakeholder consultation and engagement, including developing statements of common ground wherever possible, during design development and construction phases of the project
  - Finalising as much design work as possible before moving to the construction phase. Any change to the design during the construction phase is disruptive
  - Early engagement with utility providers as part of the detailed design phase including establishing the location of apparatus on site using trial holes
  - Early procurement of the main contractor and engagement with sub-contractors to provide early contractor involvement during the detailed design. (need to conform delivery programme)
  - Where significant archaeological excavation is necessary, planning to carry out this work prior to the main start of works where this is possible
  - Aiming to carry out as much utility diversion work as possible prior to main start of works

### **CONSULTANT EXPERIENCE**

- 6.2.6. NCC is being advised by WSP Ltd, the Council's consultant, and a major provider of highway consultancy services to local authorities.
- 6.2.7. WSP has experience and expertise in business case proposals, optioneering for cost benefit analysis, planning applications and detailed design for major infrastructure projects for central and local government clients. Recent projects include the M4 Smart Motorway for Highways England, the A5 Western Transport Corridor for Transport Northern Ireland, the Lowestoft Lake Lothing Third Crossing for Suffolk County Council and the Great Yarmouth 3<sup>rd</sup> River Crossing. WSP is also one of the UK's leading providers of support services to the statutory procedures required to plan, deliver and maintain infrastructure projects, providing land referencing, stakeholder engagement and consultation service, and order management.

### **CONTRACTOR EXPERIENCE**

- 6.2.8. It will be essential to appoint a contractor with significant experience in delivering similar large-scale bridge and highway projects. The selection and procurement of the contractor is summarised in the Commercial Case, and the management of the contractor is considered in the project governance section below.

### **PROGRAMME / PROJECT DEPENDENCIES**

- 6.2.9. The NWL is a stand-alone scheme, which can be delivered independently of any other scheme or development. Similarly, no other future schemes or developments are dependent upon it.

- 6.2.10. However, the County Council is aware that Highways England is currently progressing statutory consultation of plans to dual the section of the A47 between north Tuddenham and Easton (as part of the Government's Road Investment Strategy for 2015 – 2020 (RIS 1)), which has a planned construction date of 2021. Due to safety and traffic capacity requirements, the NWL would need to join into a dualled section of the A47.
- 6.2.11. NCC are working closely with Highways England in order to produce a design which takes in to account the NWL during the development of the A45 North Tuddenham to Easton improvement scheme.
- 6.2.12. From the legislative perspective, there are no dependencies for the NWL.

### **6.3 PROJECT GOVERNANCE, ORGANISATIONAL STRUCTURE & ROLES**

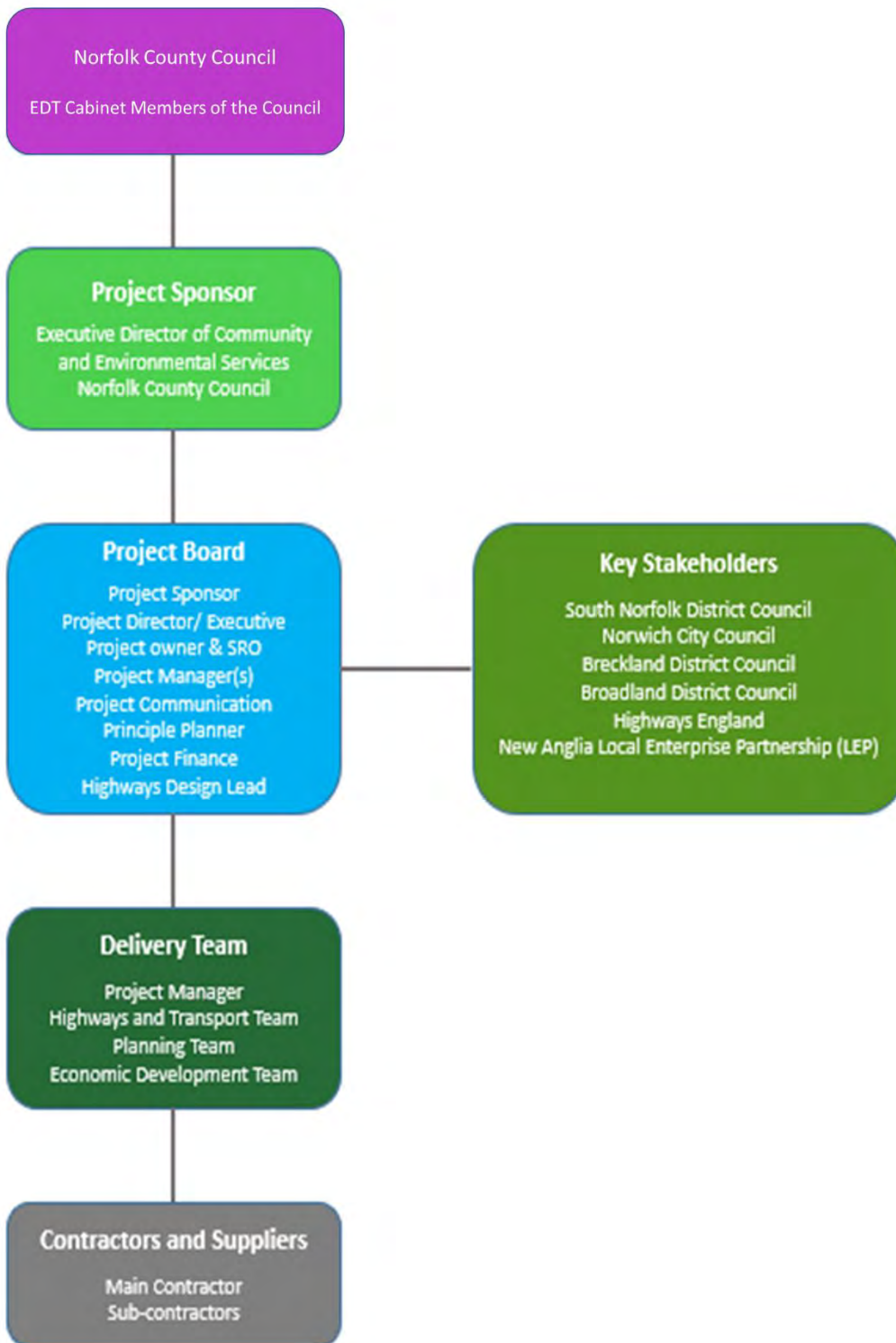
- 6.3.1. The governance structure for delivery of the NWL is described below. This follows an established structure that has been used by NCC for successful delivery of previous schemes, including those identified in the previous local experience in section 6.2.
- 6.3.2. To ensure successful delivery of the scheme, NCC has established and will continue to resource the following bodies:
- Project Board
  - Project Delivery Team
  - Stakeholder Group
- 6.3.3. The organisational and governance structure is illustrated in **Figure 6.1** which shows the essential lines of accountability and responsibility. At the heart of project governance is the Project Board, which is accountable through the Project Sponsor to NCC, and is responsible for reviewing the scheme and taking key decisions. The Senior Responsible Officer is accountable to the Project Board, and is responsible for the work of the Delivery Team. The diagram also shows how the Local Enterprise Partnership and stakeholders relate to project governance.

#### **PROJECT SPONSOR**

- 6.3.4. The Project Sponsor is NCC, represented by [REDACTED] the Council's Executive Director of Community and Environmental Services and Head of Paid Service.

#### **SENIOR RESPONSIBLE OFFICER**

- 6.3.5. The Senior Responsible Officer will be [REDACTED] who is currently Infrastructure Delivery Manager, Highways and Waste, Communities and Environmental Services at NCC.
- 6.3.6. [REDACTED] is a Chartered Civil Engineer and a Member of the Institution of Civil Engineers (ICE). He has 28 years' experience working in the construction industry. For the last 25 years he has worked for NCC specialising in highways design and maintenance, and supervising and delivering a wide range of highway maintenance and major improvement schemes, including:
- The Nar Ouse Regeneration Route in King's Lynn
  - A47/A1042 Postwick Hub Junction
  - Norwich Northern Distributor Road



**Figure 6.1: - Project Governance Diagram**

**Project Board**

- 6.3.7. NCC has established a Project Board for the scheme. In line with best practice the board will include representatives of the customer, user, and supplier aspects of the project. The main roles of the board are decision taking and review.

- 6.3.8. The Project Board will meet monthly until the project has been completed, after which it will make arrangements for ongoing oversight and reporting of monitoring and evaluation.
- 6.3.9. The current Project Board is shown in the table below and will consist of people in the following roles shown within **Table 6.2**:

**Table 6.2 – Project Board**

<b>Role</b>	<b>Responsibilities</b>	<b>Name</b>	<b>Position</b>
<b>Project Sponsor</b>	Chair of Project board	[REDACTED]	Executive Director of Community and Environmental Services (NCC)
<b>Project Director/Executive</b>	Oversee the development and coordination of the case for the project and ensure it remains in line with the wider county council and LEP priorities	[REDACTED]	Assistant Director Highways & Waste (NCC)
<b>Project Owner and Senior Responsible Owner (SRO)</b> The “customer for the scheme”, representing the public’s interests	Responsible for the successful delivery of the project, ensuring that it meets its objectives and delivers its intended benefits	[REDACTED]	Infrastructure Delivery Manager (NCC)
<b>Principle Planner</b>	Responsible for Economic Development including transport policy	[REDACTED]	Principal Planner for Local Plan review (NCC)
<b>Project Finance</b>	Review budget and costs to ensure funding is available	[REDACTED]	Finance lead and CES Business Partner (NCC)
<b>Project Stakeholder and Engagement Manager</b>	Responsible for communication planning and management	[REDACTED]	Project communication lead officer (NCC)
<b>Project Manager – NWL</b>	Managing the project to ensure that it delivers the required products within the agreed constraints. Coordinating the work of the delivery team	[REDACTED]	Project Manager (NCC)
<b>Head of Procurement</b>	Responsible for the procurement delivery	[REDACTED]	Head of Procurement (NCC)

Role	Responsibilities	Name	Position
<b>Technical &amp; Stakeholder Manager (WSP)</b>	Responsible for communicating with external stakeholders to ensure successful delivery of the project	[REDACTED]	Stakeholder Manager (WSP)
<b>Project Manager - WSP</b>	Managing the project to ensure that WSP delivers the required product within the agreed constraints	[REDACTED]	Project Manager (WSP)
<b>New Anglia LEP Representative</b>	Represents the interests of the LEP	[REDACTED]	Infrastructure Manager (NA LEP)
<b>Broadland District Council &amp; South Norfolk District Council Representative</b>	Represents the interest of Broadland District Council & South Norfolk District Council	[REDACTED]	Head of Planning (Broadland & SNDC)
<b>Breckland Council Representative</b>	Represents the interest of Breckland Council	[REDACTED]	Strategic Planning Manager (Breckland Council)
<b>Norwich City Council Representative</b>	Represents the interest of Norwich City Council	[REDACTED]	Head of City Development Services (Norwich City Council)
<b>Highways England Representative</b>	Highways England representative, feeding in to the A47 project	[REDACTED]	Project Leader A47 Schemes (Highways England)

### Delivery Team

- 6.3.10. NCC has established a Delivery Team for the scheme. The team will be led by the Project Owner and will include representatives of the various disciplines and work streams involved in delivering the project to completion. The delivery team will meet monthly, or as required, and the Project Manager will be responsible for determining which disciplines or work streams need to be represented at any particular meeting. The Delivery Team approach runs from 'cradle to grave', right through the design and construction stages. Each work stream will have an individual, detailed, agreed action plan to meet the target milestones for the coming year and beyond. This ensures coordination of activities and is a forum for discussing issues/problems as they arise.
- 6.3.11. The main responsibilities of the delivery team are to:
- Coordinate the different activities which make up the project
  - Provide direction to the technical delivery of the project
  - Undertake monthly reviews of progress against targets and programme
  - Undertake monthly review of the risk register, and initiate corrective action where appropriate
  - Provide as a minimum quarterly progress reports for the project board. The board will consider any matters of a strategic nature and give advice accordingly

- 6.3.12. Costs are monitored and presented to the Project Delivery Team on a monthly basis. The Project Manager maintains the system and takes account of any known committed costs in updating forecast outturn.
- 6.3.13. The Senior Responsible Officer reviews the actual and forecast expenditure against profile and budget and reports by exception to the Project Board.
- 6.3.14. The current Delivery Team is shown in the table below and will consist of people in the following roles show within **Table 6.3**:

**Table 6.3 – Delivery Team members and roles**

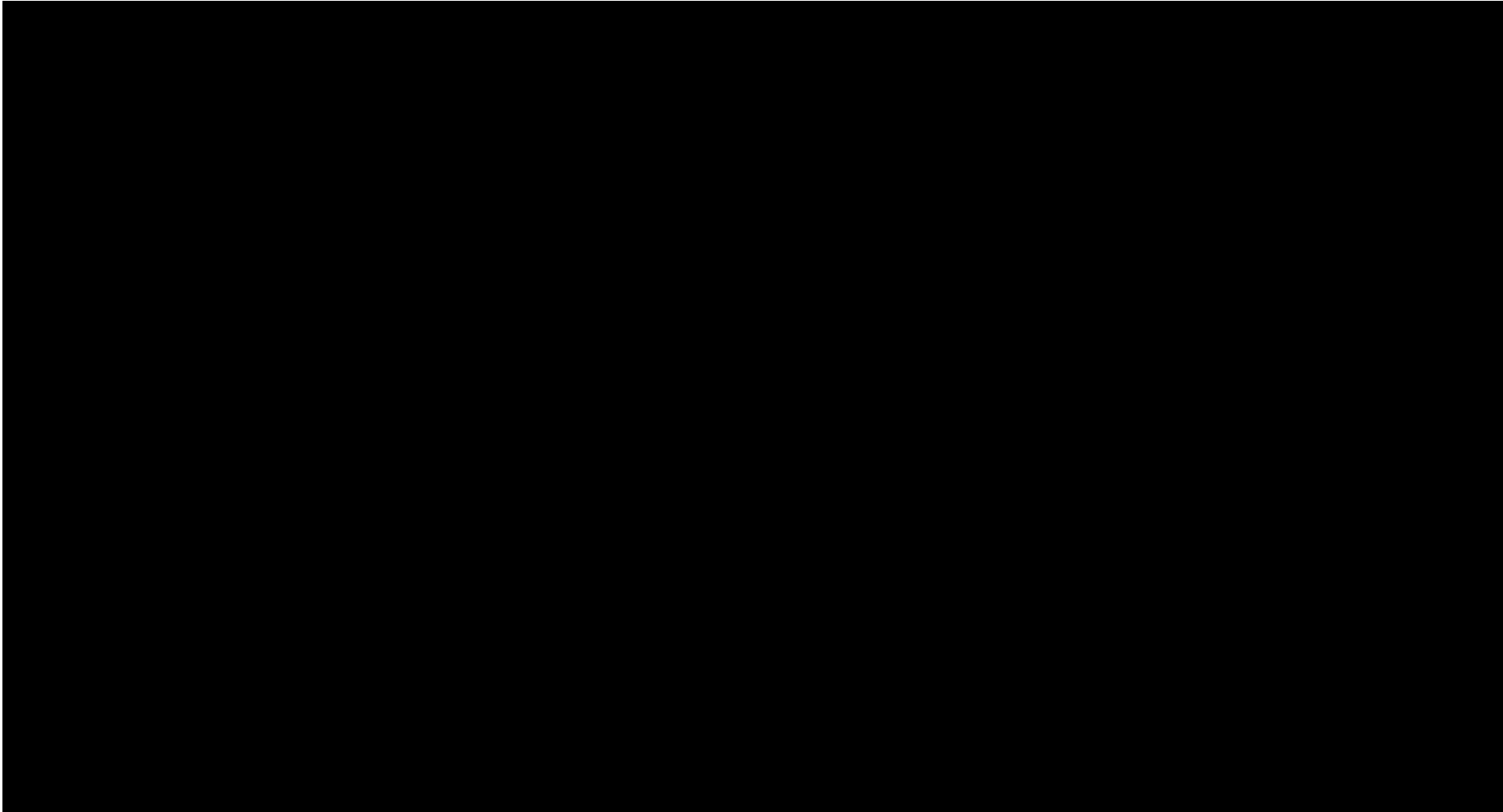
Role	Responsibility	Name
<b>Senior Responsible Officer/ Project Owner (NCC)</b>	Chair of Delivery Team Provides reports to Project Board	██████████ (Infrastructure Delivery Manager)
<b>Project Manager (NCC)</b>	Project delivery lead, coordinating work streams and key activities	██████████ (Project Manager)
<b>Stakeholder &amp; Communications Lead (NCC)</b>	Develop communications plan Options Consultation Stakeholder management	██████████ (Project communications lead officer)
<b>Finance Team (NCC)</b>	Financial monitoring and reporting	██████████ (Finance Business Partner)
<b>Legal Team (NCC)</b>	Specialist legal advice	NP Law
<b>Highways and Transport Team (NCC)</b>	Supporting project delivery	██████████ (Project Engineer) ██████████ (Project Delivery Coordinator) ██████████ (Engineer)
<b>Project Director (WSP)</b>	WSP Project Owner	██████████ (Project Director)

<p><b>Technical &amp; Stakeholder Manager (WSP)</b></p>	<p>Develop Full Business Case.            Coordinate design and delivery.            Manage the technical delivery            Monitoring and evaluation.            Communication with stakeholders</p>	<p>[Redacted] (Technical &amp; Stakeholder Manager)</p>
<p><b>Project Manager (WSP)</b></p>	<p>Develop Full Business Case.            Coordinate design and delivery.</p>	<p>[Redacted] (Project Manager)</p>
<p><b>Assistant Project Manager (WSP)</b></p>	<p>Support the WSP Project Manager to deliver the project.</p>	<p>[Redacted]</p>
<p><b>Local Project Management Support &amp; Coordination</b></p>	<p>Responsible for managing the delivery of traffic modelling</p>	<p>[Redacted] (Support and Coordination)</p>
<p><b>Specialist Teams (WSP)</b></p>	<p>Ecology             Environmental            Water Quality            Archaeology &amp; Heritage            Air Quality            Noise            Landscape &amp; Urban Design            3D Visualisation            Modelling &amp; Appraisal            Drainage</p>	<p>[Redacted]            [Redacted]            [Redacted]            [Redacted]            [Redacted]            [Redacted]            [Redacted]            [Redacted]            [Redacted]            [Redacted]            [Redacted]            [Redacted]</p>

	<p>Geotechnical</p> <p>Hydrogeology</p> <p>Costing Consultation</p> <p>Structures</p> <p>Business Case</p> <p>Transport Planning</p> <p>Construction Design (CDM) Land Referencing</p>	
<b>Project Support (NCC)</b>	Support to project manager and delivery team.	 (Project Officer – Infrastructure Delivery)

6.3.15. The organisation diagram of the delivery team is shown in **Figure 6.2**





**Figure 6.2 - Project Organogram**

## 6.4 PROGRAMME AND PROJECT PLAN

- 6.4.1. A high-level project programme has been developed and is provided in **Appendix H**. NCC are committed to continuing work on design and planning for the scheme post-SOBC submission, which has been incorporated in the programme, and will be progressed by NCC. The key milestones are included in **Table 6.4**.

**Table 6.4 – Key Delivery Milestones**

Milestone	Current estimate
Completion of non-statutory options Consultation	January 2019
Options Selection Report (OSR)	June 2019
Regional Priority Status as a Large Local Major	July 2019
Preferred route established – decision at July Cabinet	July 2019
Strategic Outline Business Case (SOBC) together with the Regional Evidence Base (REB) submission	July 2019
Outline Business Case (OBC) submission	January 2020
Outline Business Case (OBC) programme entry	March 2020 (assumed)
OJEU notice (start of procurement process)	March 2020
Design and Build Contractor appointment	October 2020
Formal Pre- application Public Consultation	February 2021
Planning Application submission	April 2021
Full Business Case (FBC) submission	June 2022
Start of construction work	Late 2022
Road open	Early 2025

## 6.5 ASSURANCE & APPROVALS PLAN

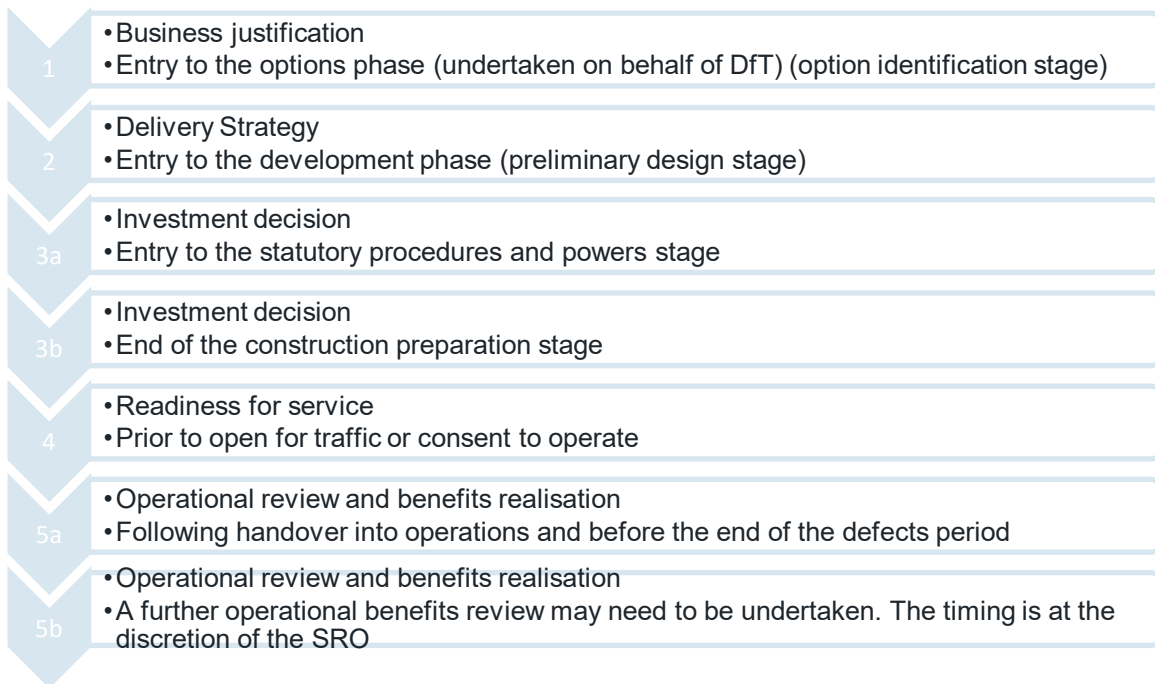
- 6.5.1. The scheme will follow the relevant assurance and approval processes, at both a national and local level. As the scheme has a value of over £20 million the business case will be developed in line with the required WebTAG processes as to be discussed and agreed with the Department for Transport. Furthermore, the business case will need to be signed off to the satisfaction of NCC Section 151 Officer in their role as the Chief Financial Officer.
- 6.5.2. The business case will be taken to Cabinet for approval at a local level, and follow the relevant LLM funding approval processes to go forward.
- 6.5.3. The local funding contribution is discussed within the Financial Case. However, to confirm, NCC Section 151 Officer has underwritten the local contribution and will approve the release of local funding, when satisfied and appropriate to do so.

### ASSURANCE – GATEWAY REVIEWS

- 6.5.4. It is essential that large, complex and long running projects are monitored effectively. All major transport schemes have to demonstrate that a system for monitoring progress is part of the management structure and plan. The Gateway review process is a formal assessment of the progress of a project at key stages in its development.
- 6.5.5. Gateway reviews will be undertaken in line with the principles set out in the Project Control Handbook<sup>47</sup>. A Gateway review is a 'peer review' in which independent project managers from outside the project use their experience and expertise to examine the progress and likelihood of successful delivery of the project.
- 6.5.6. A Gateway review provides assurance and support to the SRO that:
- Suitable skills and experience are deployed on the project
  - All stakeholders understand the project status and issues
  - There is assurance that the project can progress to the next phase
  - Time and cost targets have a realistic basis
  - Lessons are learned
  - The project team are gaining input from appropriate stakeholders
- 6.5.7. Gateway reviews are a mandated assurance process for all publicly funded major projects, although not all reviews will apply to all projects. The SRO and project manager will engage early with the Centre of Excellence to agree which gateways are required and when. Throughout the process with the Department's centres of expertise (e.g. finance, procurement, economists) provide advice and scrutiny.
- 6.5.8. The OGC Gateway will assess the project's viability, the value for money to be achieved, and the proposed approach for achieving delivery of the project's objectives. This approach will allow the review to assure the Project Board that the selected delivery approach is appropriate.

6.5.9. The following are the normal stages for Gateway Reviews, as part of the process of managing stage boundaries:

### Gateway Major project phase/stage



6.5.10. The next stage for the NWL is the Stage 2 Delivery Strategy and an appropriate Gateway Review, via an independent external provider, will be undertaken. It is expected that this will be completed prior to the submission of the Outline Business Case (OBC). NCC will liaise with the DfT and the New Anglia LEP to develop and agree the Assurance and Approvals plan during the development of the OBC.

## 6.6 COMMUNICATIONS & STAKEHOLDER MANAGEMENT

- 6.6.1. As part of any major scheme development, it is important to conduct formal consultation and stakeholder engagement.
- 6.6.2. Two non-statutory consultations have been carried out to date. The first ran between Tuesday 08 May and Tuesday 03 July 2018 and sought people's views on and experience of transport issues in the area to the west of Norwich as well as what, if anything, respondents thought should be done to tackle any of these issues. This consultation attracted more than 1,700 responses.
- 6.6.3. The second consultation ran between Monday 26 November 2018 and Friday 18 January 2019 and asked for people's opinions and feedback on four shortlisted options for a NWL. The responses will help the council identify a preferred route. This consultation attracted more than 1,900 responses.
- 6.6.4. Both consultations were primarily conducted via Commonplace, a web-based portal. People were also able to respond in person at a series of consultation events and in writing by letter or email.

- 6.6.5. An advisory group made up of representatives from 29 local parish councils has been established since 2017 and has met regularly to provide local insight and input to the project. In addition, representatives from key partner organisations sit on the NWL project board. These organisations are:
- Highways England
  - New Anglia Local Enterprise Partnership
  - Norwich City Council
  - Broadland District Council
  - Breckland Council
  - South Norfolk Council
- 6.6.6. In recognition of the interest in the council's approach to environmental and ecological considerations, from summer 2019 a wildlife liaison group is due to be established. This will be a technical forum for representatives from groups with a genuine ecological interest and will help the project team build good relationships with these organisations and help inform the project, ensuring appropriate actions are being taken in respect of the relevant ecological issues.
- 6.6.7. A stakeholder database is maintained by the project team and updates on the project's progress are provided to the list as appropriate. Groups this database include:
- Norfolk MPs
  - County and district councillors and officers
  - Local businesses
  - Transport associations and bus and haulage companies
  - Environmental groups
- 6.6.8. The local media and community newsletters have been informed at key points throughout the project so far via briefings, press releases and targeted content such as copy, photos, maps and artist's impressions. The NCC website has a dedicated NWL section which is updated regularly and features a frequently asked questions page.
- 6.6.9. A communication strategy is being developed and included in a future iteration of this business case. The objectives of the communication strategy are to:
- Ensure consistency of approach by setting out key messages, audiences and communications channels
  - Programme communication activity in a planned and methodical way
  - Identify and reflect on communications and engagement already undertaken to avoid duplication and ensure future effectiveness
  - Minimise objections and stakeholder challenges to the schemes based on misinformation and poor engagement

## 6.7 PROJECT REPORTING

- 6.7.1. Project reporting will be a live process, which will be kept up-to-date over the life cycle of the project. This relates to reporting of progress, risks and issues. This will involve the following regular actions, as well as additional reporting as and when required:
- The Project Manager will report to the Project Board and each Project Board meeting

- The Delivery Team leads will report to the Project Manager monthly in advance of Project Board meeting and hold “bi-weekly calls” to discuss progress and issues

6.7.2. Progress will be reported to the County Council’s Cabinet formally the Environment and Development and Transport committee which has executive powers. Intervening reports are prepared where decisions by the Administration are needed. The Senior Responsible Officer will provide regular updates to the Chair of the Cabinet. This ensures appropriate involvement of the elected members in this important project.

6.7.3. In specific circumstances the Cabinet can give powers to either the Project Board or the Executive Director of Community and Environmental Services to make specific decisions on projects.

6.7.4. The Senior Responsible Officer reviews the actual and forecast expenditure against profile and budget and reports by exception to the Project Board.

## **6.8 RISK MANAGEMENT STRATEGY**

6.8.1. In line with project reporting, the risk management strategy will be updated on an on-going basis to capture the progress of the scheme and assist the programme management.

### **IDENTIFYING RISKS**

6.8.2. A Risk register was developed June 2018 to consider risks associated with the preferred scheme, and to provide up-to-date input to the above process. Risks have been identified by specialists in highways and structural engineering, geotechnics, transport planning, quantity surveying and the environmental disciplines and entered into the risk register.

### **MANAGING RISKS**

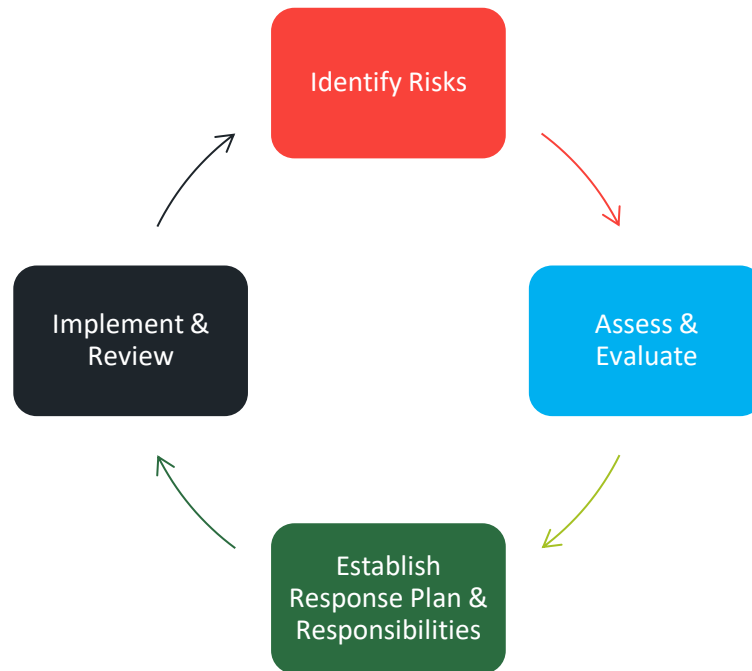
6.8.3. The Treasury Green Book states that “effective risk management helps the achievement of wider aims, such as effective change management, the efficient use of resources, better project management, minimising waste and fraud, and supporting innovation”.

6.8.4. NCC recognises that in order to successfully achieve its own fundamental transformation, effective risk management is vital. The Council has a dedicated Risk Management Policy where managers are encouraged and supported to be innovative whilst understanding the risk and implications so they might make informed decisions in order to achieve objectives and deliver results. By being risk aware, reviewing its risk appetite and tolerance, the Council will be better placed to both take advantage of opportunities and manage threats.

6.8.5. Risk management is a continual process involving the identification and assessment of risks, prioritisation of them and the implementation of actions to mitigate the likelihood of them occurring and impact if they did. The project boards approach to risk management will be proportionate to the decision being made or the impact of the risk, to enable the Council to manage risks in a consistent manner, at all levels.

6.8.6. In line with project reporting, the risk management strategy will be updated on an on-going basis to capture the progress of the scheme and assist the programme management.

6.8.7. A four-stage risk management process has been followed, as illustrated in **Figure 6.3**:



**Figure 6.3 - The 4-stage risk management process**

#### Identifying risks

- 6.8.8. Risks have been identified by specialists from all relevant disciplines, including highways and structural engineering, geotechnics, mechanical and electrical, transport planning, quantity surveying and the environmental disciplines.
- 6.8.9. A Risk Management Workshop was held on 06 March 2019 to consider risks associated with the scheme options, and to provide up-to-date input to the above process. Assumptions were tested for stability and sensitivity, and where they were deemed to be unstable, a corresponding risk was assigned and assessed.
- 6.8.10. Taking a ‘bottom up’ and ‘top down’ approach, the workshop also considered:
- A range of specific risks previously identified by the project team
  - Risks prompted by consideration of a range of risk categories:
- 6.8.11. Risks were categorised as strategic or operational and were further classified as:
- Funding/ Third Parties
  - Programme/Contract
  - Scope Change
  - Weather
  - Design Risk
  - Environmental
  - Third parties’ stats
  - Existing structures
  - Approvals
  - Modelling

- Construction

6.8.12. These are catalogued in the Risk Register, this is a live document which is updated as the project progresses, the current version is included within **Appendix I**.

### **Quantified risk**

6.8.13. *TAG Unit A1.2* requires that all project related risks that may impact on the scheme costs should be identified and quantified in a Quantified Risk Assessment (QRA), in order to produce a risk-adjusted cost estimate.

6.8.14. At this stage the risks have been quantified in a Quantified Risk Assessment (QRA), in order to produce a risk-adjusted cost estimate. A scheme specific QRA was carried out using @Risk 7.6 (one risk register for all options). Ownership of the register has been the client NCC with interim scoring being by NCC/WSP unilaterally during the estimating process with the final scoring being done by the NCC. The costing of the risks within the register has been carried out using a cost matrix based upon the base estimating per each option.

6.8.15. The range of possible costs associated with each risk has been estimated initially and each risk assigned a high, medium or low value. The likelihood of each risk occurring was then estimated, and assigned a high, medium, or low value, both before and, where appropriate, after mitigation. For each risk, the cost multiplied by its likelihood gives an expected value.

### **Managing risk (Response plans and mitigation)**

6.8.16. Having identified scheme risks and undertaken an initial assessment, responsibilities will be allocated to the most appropriate party and response plans developed. One of four possible strategies will be adopted:

- **Accept or tolerate consequences** in the event that the risk occurs – In the event that a) the cost of taking any action exceeds the potential benefit gained; or b) there are no alternative courses of action available
- **Treating the risk** – Continuing with the activity that caused the risk by employing four different types of control including preventative, corrective, directive and detective controls
- **Transferring the risk** – Risks could be transferred to a third party e.g. insurer or contractor
- **Terminating the activity** that gives rise to the risk

6.8.17. The effectiveness of the response plans will depend on the proper implementation of the plans, and review of the residual risk, including any secondary risk associated with implementation, at key decision points in the life of the scheme.

6.8.18. To achieve this, scheme risk assessments and their associated response plans will be reported regularly to the Project Board throughout the detailed design and construction stages.

### **Risk response plans and mitigation**

6.8.19. Having identified scheme risks and undertaken an initial assessment, responsibilities were allocated to the most appropriate party and response plans developed. One of four possible strategies has been adopted:

- **Accept or tolerate consequences** in the event that the risk occurs – In the event that a) the cost of taking any action exceeds the potential benefit gained; or b) there are no alternative courses of action available



- **Treating the risk** – Continuing with the activity that caused the risk by employing four different types of control including preventative, corrective, directive and detective controls
- **Transferring the risk** – Risks could be transferred to a third party e.g. insurer or contractor
- **Terminating the activity** - that gives rise to the risk

6.8.20. Development of the response plans to manage risks have been undertaken and will be taken where the likelihood of occurrence and impact can be cost effectively managed.

#### **Transfer of risk to the contractor**

6.8.21. The Commercial case describes how the procurement strategy will seek to place risk with the party best placed to manage or mitigate that risk, or manage the consequences should they transpire. Early involvement with the contractor will include an assessment of the appropriate balance of risk. Design risk could be retained by the council or transferred to the contractor. Delivery and programme risk will substantially rest with the contractor.

6.8.22. The contractor will be required to produce a priced risk register. This will be reviewed as part of the process of target setting and decisions made on the mechanism for sharing risk between the contractor and NCC, ensuring that the proposed allocation provides the best value for money for the project. The risks on which the council will need to take a view are noted within the commercial case.

6.8.23. A pain-gain share mechanism where the basic principle is that a target cost is agreed and then the contractor is paid for the work undertaken on a cost reimbursable basis may be negotiated and agreed with the contractor and used to provide incentive for value engineering and robust cost and programme management.

## **6.9 BENEFITS REALISATION PLAN (OUTLINE)**

6.9.1. This section outlines the approach that is being taken to the preparation of a Benefits Realisation Plan. The full Benefits Realisation Plan will form part of the Outline Business Case.

6.9.2. A Benefits Realisation Plan will be prepared for the NWL scheme. It will enable the benefits and disbenefits that are expected to derive from the project to be planned, tracked, managed, and realised. It will help demonstrate whether the scheme objectives identified in the Strategic Case are being achieved in terms of the desired “measures for success”.

6.9.3. The desired outputs are those tangible effects that are funded and produced directly as a result of the scheme. The desired outcomes are the final impacts brought about by the scheme in the short, medium and long term. The strategic objectives, together with the desired outputs and outcomes are summarised in Table 6.5 in consideration of the strategic objectives.

**Table 6.5 – Strategic Objectives (High Level), outputs and outcomes**

Strategic objectives	Desired outputs	Desired outcomes
H1 Support sustainable growth	A scheme encourages growth locally and regionally while minimising the impact on the environment	Sustain growth Environmental assets protected and adverse impacts minimised or mitigated. Improved access to potential housing and business
H2 Improve the quality of life for local communities	Improve access to local facilities while reducing severance	Improve accessibility to local amenities Reduce severance Reduce injury and or death
H3 Support economic growth	A scheme which makes it easier for people to access housing and economic drivers such as business while reducing journey time	Improved: <ul style="list-style-type: none"> <li>▪ connection to airport</li> <li>▪ connection to new or existing housing</li> <li>▪ connection to Norwich Research Park</li> <li>▪ connection to Norfolk Broads – Tourism significant to local economy</li> <li>▪ connection to Food Enterprise Zone</li> </ul> Journey Time Improvements
H4 Promote an improved environment	A scheme which helps reduce traffic in environmentally sensitive areas, and which will aim to minimise its total emissions of greenhouse gases and pollutants where possible, particularly in areas with lower air quality. A scheme which has been designed to minimise its own impact on the local built and natural environment	Contribution towards carbon reduction targets wherever possible. Improved health and well-being. Impacts on environmental assets and adverse impacts minimised or mitigated wherever possible
H5 Improve strategic connectivity with the national road network	A scheme which provides a direct road link between the A1067/A1270 and A47 and which reduces journey time for people moving between the respective destinations	Reduced journey time and distance between the A1067/A1270 and the A47. Improved access to the strategic road network Easier, quicker, access between employment, education, social and recreational
H6 Minimise any detrimental impact on valued landscapes, the built environment and heritage assets, including through high quality design	Provision of a scheme which minimises the potential impact through improved choice of route, avoiding where possible sensitive areas and where not possible using smart design to reduce and mitigate any potential impact	The route should avoid physical impacts to above ground heritage assets and valued landscape The route should avoid or minimise harm to above ground heritage assets and valued landscape resulting from changes to setting

6.9.4. The scheme objectives, together with the desired outputs and outcomes are summarised in **Table 6.6** in consideration of the strategic objectives.

**Table 6.6 - Scheme Objectives, outputs and outcomes**

<b>Scheme specific objectives</b>	<b>Desired outputs</b>	<b>Desired outcomes</b>
S1 Reduce congestion and delay, and improve journey time reliability, on routes through the study area	A scheme which reduces traffic on existing routes including the those between A1067 and the A47 and the A1067 and A47 themselves	Less traffic and reduced journey times on town centre roads A more attractive town centre, and a more efficient road network
S2 Improve network resilience and efficiency of the strategic and local transport network	A new highway link which provides additional capacity to cope with situations when one of the other routes is unavailable	Improved network reliability
S3 Reduce the number of Heavy Goods Vehicles using minor roads	Removal of Heavy Goods Vehicles, from roads between the A1067 and A47, especially those associated with Rat Running	Reduction of HGV movements on routes between the A1067 and A47
S4 Make the transport network safer for all users (including Non-Motorised Users)	Improvement in safety over the network	Reduction in the number fatal and serious incidents Reduced traffic flows through towns
S5 Encourage modal shift to more sustainable modes of transport	Improvement in access to, and servicing of, more sustainable modes of transport and	Improved journey times of PT options Increased access to active modes
S6 Provide traffic relief (and reduce noise & emissions) within residential areas	Reassignment of traffic away from local roads and communities reducing noise and emissions in locally sensitive areas	Reduced fuel consumption and emissions Reduce noise impacts
S7 Enable improved accessibility to existing and new housing and employment sites	Improved access to existing and new housing through improved routes and journey times	Reduced journey times Improved reliability
S8 Improve emergency response times	Reduced traffic on existing road improving the flow of traffic enabling improved emergency response times	Improved Journey time, Journey time reliability Improved resilience Improved access to the Norfolk and Norwich University Hospital
S9 Improve access to green space	Improved routing options with the new link and the re assignment of traffic away from local roads which provide access to green space	Improved access to green space through the reduction in journey times
S10 Not affect the ecological integrity of the River Wensum SAC	Minimise the impact of the proposed scheme option on the River Wensum SAC through design	Minimised SAC impact

Scheme specific objectives	Desired outputs	Desired outcomes
S11 Contribute to the improved health and well-being of local residents	Enabling people to enjoy access to a range of goods, services, people and places, while reducing road fatalities and improved access to active modes	Reduced severance Improved access to key services Reduced accident rate Increased use of active modes
S12 Improve connectivity and accessibility to Norwich International Airport, Norwich Research Park and Norfolk & Norwich University Hospital	Improved routing through the introduction of the new higher standard link road	Reduced journey time to key destinations

6.9.5. The Benefits Realisation Plan will be linked to the Monitoring and Evaluation Plan described below, and will be owned by the Project Manager.

## 6.10 MONITORING AND EVALUATION PLAN

6.10.1. This section outlines the approach that is being taken to the preparation of a Monitoring and Evaluation Plan. The full Plan will form part of the Full Business Case.

6.10.2. **Monitoring** involves checking progress against the targets set for the scheme. Evidence of expenditure and the delivery of outputs is formally reported.

6.10.3. **Evaluation** involves assessing the effectiveness and efficiency of the scheme both during and after implementation. It seeks to measure the success of the scheme in delivering planned outcomes. It assesses whether, and how, the anticipated benefits have been achieved, or if any benefits have not been achieved, the reasons why.

6.10.4. Department for Transport guidance sets out three levels of monitoring and evaluation:

- Standard monitoring
- Enhanced monitoring
- Fuller evaluation

6.10.5. The standard monitoring is required for all schemes, and schemes costing over £50 million are expected to be subject to “enhanced” monitoring. Only selected schemes, identified by the DfT are expected to conduct ‘fuller’ evaluation. As the NWL scheme will cost more than £50 million, the DfT’s enhanced monitoring guidance will be in addition to the standard measures.

6.10.6. The measures that fall into the ‘enhanced monitoring’ category are summarised in **Table 6.7**.

**Table 6.7 - Enhanced monitoring**

Item	Stage	Collection Timing	Rationale	Information Required
Noise	Impact	Pre- or during delivery / post opening (up to 5 years)	Accountability / Knowledge	Effect of the scheme on noise levels at important receptor locations and analysis of the difference between outturn results and scheme forecasts
Local Air Quality	Impact	Pre- or during delivery / post opening (up to 5 years)	Accountability / Knowledge	Effect of the scheme on local air quality in the area of interest and analysis of the difference between outturn results and scheme forecasts
Accidents	Impact	Pre- or during delivery / post opening (up to 5 years)	Accountability / Knowledge	Effect of the scheme on traffic accidents in the area of interest and analysis of the difference between outturn results and scheme forecasts

6.10.7. The scheme will be subject to an outcome evaluation. This will compare the existing situation (before construction of the NWL) against the situation with the scheme in place. Any observed changes in the measurements outlined below are assumed to be attributable to the scheme.

### DATA REQUIREMENTS

6.10.8. The proposed measurements, data required and frequency of data collection are set out in **Table 6.8**:

**Table 6.8 - Data requirements (outline)**

Metric	Frequency	Data
INPUTS		
Expenditure	Post Opening	Financial monitoring of project
Funding Breakdown	Post Opening	Financial monitoring of project
In kind resources provided	During delivery	Monitoring of resources delivering the project (use of project diary)
OUTPUTS		
Delivered scheme	Post Opening	Full description of implemented scheme outputs including design changes post funding approval with reasons for such changes, post scheme as built drawings of works completed
OUTCOMES		
Air quality	Pre- and post-construction, Annual up to 5 years post opening	Data from Broadland Council review and assessment of Local Air Quality (statutory duty)

Metric	Frequency	Data
Average daily traffic and by peak / non-peak periods	Pre- and post-construction, Years 1 and 5 post opening	Annual ATCs and turning counts, collected at junctions where interventions are and wider ATCs across the network
Average AM and PM peak journey time on key routes (journey time measurement)	Pre- and post-construction, Years 1 and 5 post opening	Journey time surveys and DfT Congestions Statistics on LA A Roads
Cycling and walking usage	Pre- and post-construction, Years 1 and 5 post opening	Cyclist and pedestrian counts on existing routes.
Accident and casualty rates	Pre- and post-construction, Years 1 and 5 post opening	Annual monitoring of collisions (STATS 19)
Average annual CO <sub>2</sub> emissions	Pre- and post-construction, Years 1 and 5 post opening	DfT's Local Authority Carbon Toolkit

6.10.9. The monitoring and Evaluation Plan will be developed further and included with the Outline and Full Business Case.

### DATA SOURCES

6.10.10. The monitoring and evaluation for the NWL project will be undertaken by NCC. It is considered that the following surveys will be undertaken:

- Journey times
- Automatic Traffic Counts
- Turning counts

6.10.11. Manual traffic count data will be collected by the Council on an annual basis including accidents (STATS19), financial and planning data (e.g. Annual Monitoring Report).

6.10.12. The survey costs will be calculated at Full Business Case stage and will be funded through the County Council's monitoring budget.

### TIMESCALE FOR EVALUATION

6.10.13. Prior to starting on site, any gaps in the required baseline evidence will be collected. A baseline evidence report will be completed prior to construction of the crossing. Quarterly reports on progress against programme, costs and risks will be provided to the Project Board during construction of the scheme, and an annual monitoring summary will be produced. Principles of monitoring and evaluation will be in line with Highway England Post Opening Project Evaluation (POPE) requirements.

6.10.14. Monitoring and Evaluation will be conducted in line with the main funding bodies criteria. It is considered that it is likely to follow the methodology set out in the following paragraph.

6.10.15. Data will be collected one year and five years after opening and will be compared against the baseline data. Evaluation reports will be developed at these stages, containing an analysis of all scheme evaluations carried out to date, highlighting any interesting and emerging trends. It is, however, anticipated that wider economic benefits may take longer time frames to manifest. This would invariably have a bearing on the timing of surveys and subsequent reporting.

## **SETTING TARGETS**

6.10.16. The Council recognises the importance of setting specific indicators and targets. These will be set at the Full Business Case stage and included in the Plan. It may be possible to involve stakeholders to take ownership of some parts of the monitoring and evaluation.

## **SUMMARY OF ANALYSIS**

6.10.17. The monitoring and evaluation will be used to answer the following key questions:

- Have the anticipated outcomes and impacts been achieved?
  - To what extent are the observed changes additional to what would have happened in the absence of the intervention?
  - Were there any unanticipated impacts / displacement effects?
  - Which elements of the scheme were particularly influential in achieving the overall goals?
  - What lessons can be learnt for future scheme / policy development?
  - What is the contribution of the policy to the LEPs strategic goals?
- To what extent did the anticipated costs and benefits match the actual outcome?
- Has the scheme been successful? If not, why not?

6.10.18. The evaluation of the scheme will:

- Measure the level of traffic congestion on the existing network
- Measure the level of traffic congestion on the improved network
- Measure the levels of accidents on the existing and improved network

6.10.19. The initial one-year impact assessment will be used to understand the impact mainly on journey times and travel patterns. There may be some evidence at this stage of the scheme impact in terms of developments and jobs. The five-year assessment will look at longer term benefits including accidents, travel patterns and jobs / additional investment.

## **6.11 CONCLUSIONS**

- 6.11.1. The management case of the NWL demonstrates that the scheme is capable of being delivered successfully in line with the recognised best practice and existing guidance. It sets out the processes that are being put in place to ensure that the project is effectively delivered.
- 6.11.2. NCC has successfully procured and delivered a number of projects of varying sizes and complexity and has worked to successfully deliver these projects with the numerous groups and organisations.
- 6.11.3. The knowledge gained and the strategic procedures developed/adopted during the delivery of these schemes will be used for the delivery of the NWL. Opportunities will be taken, wherever possible, to improve delivery processes by acting upon the lessons learnt from recent schemes.

- 6.11.4. The NWL is a “stand-alone” scheme in terms of its management, which can be delivered independently of any other highway infrastructure schemes or development. However, in terms of its final junction strategy relating to the tie in with the A47, this will be subject to Highways England’s final A47 dualling design for the A47 Easton to North Tuddenham.
- 6.11.5. From the legislative perspective, NWL is dependent on the following:
- Planning permission being granted
  - Completion of other statutory duties such as Compulsory Purchase Orders where necessary
- 6.11.6. To ensure the successful delivery of major schemes NCC has established a governance structure which will be applicable to the NWL. The Project Governance Structure consists of a two-tier structure which includes, the NWL Project Board and Delivery Teams responsible for scheme delivery.
- 6.11.7. The scheme delivery team will take a collaborative approach led by the Local Highway Authority (NCC) to maximise expertise, and follow on from the recent successful delivery of the Broadland Northway.
- 6.11.8. A robust Communications Strategy is in the process of being developed to define and set out the principles, objectives and approach for the engagement with stakeholders and consultation throughout the delivery process.
- 6.11.9. NCC has a dedicated Risk Management Policy that will be used to identify and evaluate the risk implications so they might make informed decisions in order to achieve objectives and deliver results.
- 6.11.10. NCC have begun to construct a benefits realisation chapter which will be further developed during the Outline Business Case stage, while the monitoring and evaluation plan which will be fully developed as part of the Full Business Case has also been partially developed.



# Appendix A



TECHNICAL NOTE 1 - TRAFFIC  
DATA AND FORECAST  
CONDITIONS OVERVIEW

# TECHNICAL NOTE 1 – NWL Data and Traffic Conditions

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	TRAFFIC DATA AND FORECAST CONDITIONS OVERVIEW		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	[REDACTED]
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

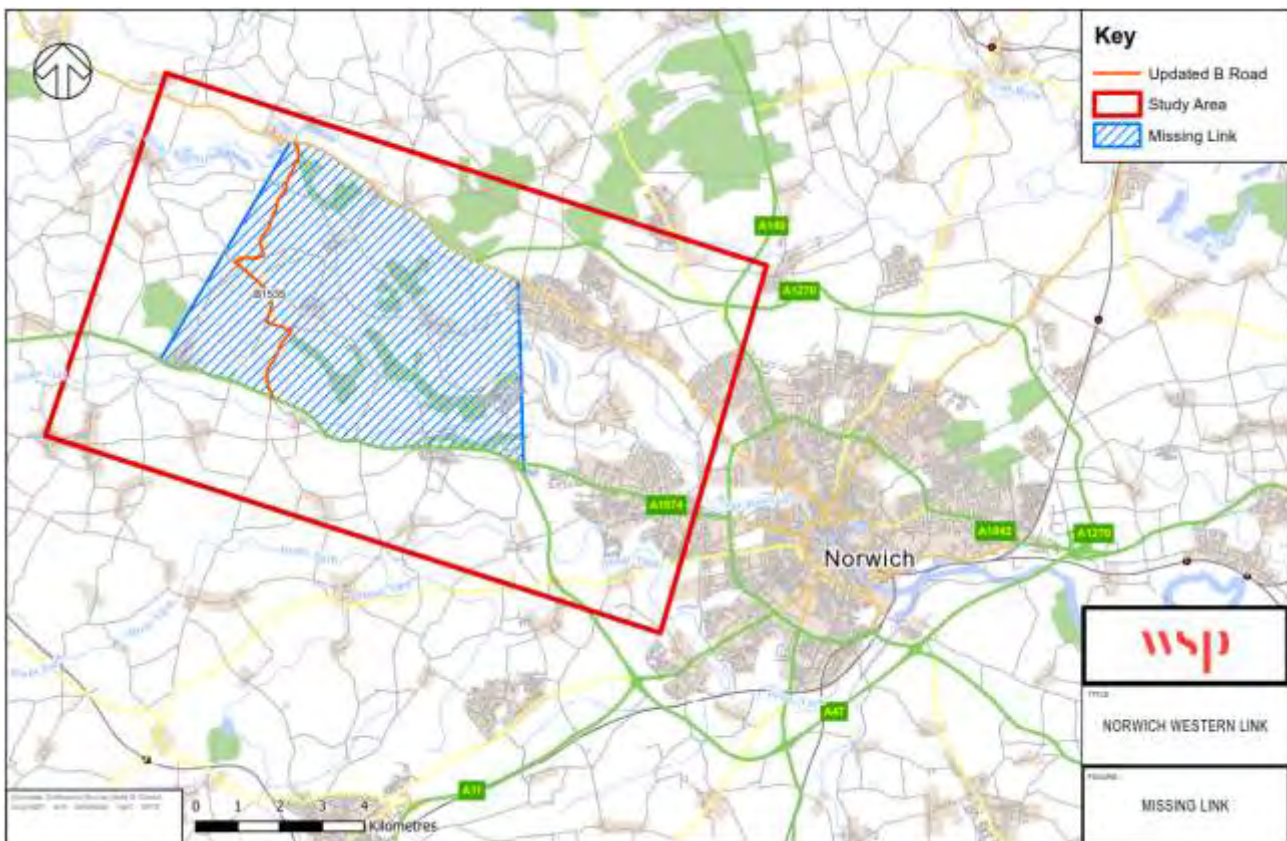
## NWL - TRAFFIC DATA AND FORECAST CONDITIONS OVERVIEW

This Technical Note is intended to provide a brief overview of data collection gathered in order to inform the Norwich Western Link Model and Appraisal process.

As part of the Business Case development Traffic Survey Data has been collected in order to determine the existing conditions on the network within the NWL Study Area and update the existing NATS model in order to provide forecast of future conditions and develop the economic case for the Norwich Western Link.

**Figure 1** provides an overview of study area.

*Figure 1 Study Area*



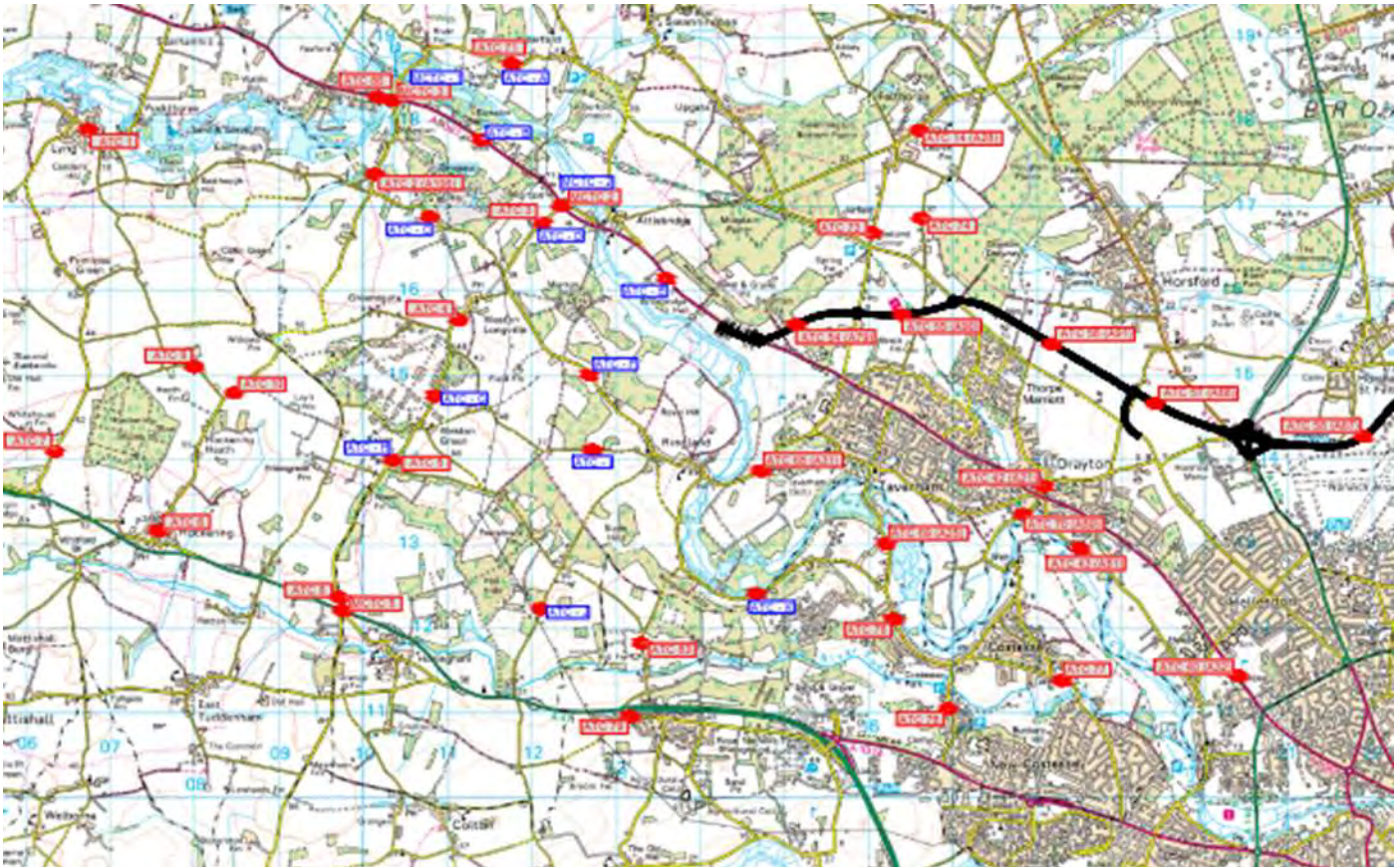
Traffic Survey data was collected in October 2015, July 2018 and September and October 2018 (six-months after the A1270 opening). **Figure 2** demonstrates where the Automatic Traffic Counts (ATCs) were undertaken within the study

# TECHNICAL NOTE 1 – NWL Data and Traffic Conditions

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	TRAFFIC DATA AND FORECAST CONDITIONS OVERVIEW		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	[REDACTED]
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

A review of the data indicates that none of the existing routes that can be used for north to south movements exceed 10,000 on an average weekday apart from Longwater Lane in Costessey where the daily traffic flow is recorded as around 11,000 vehicles indicating that no preferred route currently exists.

*Figure 2 Survey Data Collection Points*



**Table 1** 2015 & 2018 Survey Data - Composition

shows the Average Daily Traffic (ADT) flow (two-way) and the proportion of traffic that are HGVs based on the 2015 traffic flow counts and the most recent survey data. This is for those count locations that are located on the north/south routes that pass close to residential areas such as Taverham, Costessey, Lyng and Weston Longville. The roads are all single carriageway either set in rural or suburban locations. This table also shows the proportion of vehicles which are classed as TB2 in the survey, this means that the vehicle has only two axles and the distance between the axles is greater than 3.2m. Vehicles with axle distances of greater than 3.2m are normally the bigger vans which can carry over 3.5 tonnes. There was no



# TECHNICAL NOTE 1 – NWL Data and Traffic Conditions

**DATE:** 18 June 2019 **CONFIDENTIALITY:** Public  
**SUBJECT:** TRAFFIC DATA AND FORECAST CONDITIONS OVERVIEW  
**PROJECT:** Norwich Western Link **AUTHOR:** [REDACTED]  
**CHECKED:** EM **APPROVED:** LA

data collected in 2015 at the sites in Taverham and Costessey which is why there are no entries in the table.

*Table 1 2015 & 2018 Survey Data - Composition*

<b>ATC Site</b>	<b>Location</b>	<b>2015 ADT</b>	<b>2015 TB2 %</b>	<b>2015 HGV%</b>	<b>2018 ADT</b>	<b>2018 TB2 %</b>	<b>2018 HGV%</b>
1	The Common, Lyng	1727	5.4%	0.8%	1847	8.8%	1.7%
2	On improved B1535 south of Weston Hall	3828	11.0%	6.8%	4169	12.2%	6.2%
3	Marl Hill Road, North of Weston Longville	2812	8.1%	0.7%	3042	11.5%	0.5%
4	Honingham Road, Weston Longville	2610	8.2%	0.1%	2949	13.5%	0.5%
5	Paddys Lane,	2299	11.3%	0.3%	2434	11.5%	0.5%
6	Heath Road, Hockering	1626	7.6%	0.6%	1568	8.6%	1.0%
7	Lyng Road,	1765	7.5%	3.3%	2327	9.2%	3.0%
8	Wood Lane at Give way sign at junction with A47	4677	5.4%	4.7%	4978	9.3%	4.6%
68	Ringland Road, east of River Wensum, Taverham				3899	5.2%	0.3%
69	Taverham Lane, south of River Wensum, Taverham				6389	6.5%	0.7%
75	Taverham Road, east of Penn Road, Taverham				2821	4.8%	2.1%
76	W End, Costessey				6864	6.2%	1.4%
77	Town House Road, Costessey				4352	6.2%	0.6%



# TECHNICAL NOTE 1 – NWL Data and Traffic Conditions

**DATE:** 18 June 2019 **CONFIDENTIALITY:** Public  
**SUBJECT:** TRAFFIC DATA AND FORECAST CONDITIONS OVERVIEW  
**PROJECT:** Norwich Western Link **AUTHOR:** [REDACTED]  
**CHECKED:** EM **APPROVED:** LA

ATC Site	Location	2015 ADT	2015 TB2 %	2015 HGV%	2018 ADT	2018 TB2 %	2018 HGV%
78	Longwater Lane, Costessey				10056	5.8%	0.5%

**Table 1** 2015 & 2018 Survey Data - Composition

indicates that overall there are relatively low numbers of HGV flowing on the south to north routes between the A47 and A1067. The B1535 designated HGV route takes the largest percentage of HGV trips located at Site 2. The remainder of the network routes are lightly trafficked by HGVs. However, analysis summarised in **Table 1** 2015 & 2018 Survey Data - Composition

shows that some of these routes have a significant proportion of TB2 vehicles (Larger Vans) recorded.

All of the recorded flows fall beneath 11,000 and the HGV proportions are all under 5%, with the majority under 3%, apart from the B1535 which is signed for HGV use. The roads with the highest flows are in Costessey and Taverham, the majority of these have higher flows than the B1535. During the week the HGV levels on the B1535 increase to 7.4% of total traffic, while the other roads maintain a similar proportion to the ADT flows.

Congestion Reference Flow calculations conducted on specific survey sites indicates that Longwater Lane, Costessey is operating at capacity with current traffic levels. At opening year traffic levels this location are forecast to be operating above capacity with the link suffering congestion and delay.

The proportion of larger vans ranges from 4.8% on the Taverham Road to 13.5% on the Honingham Road (2018 data). Where data is available for both 2015 and 2018, the majority of sites show an increase in proportions across the two years, which the largest on Honingham Road with an increase from 8.2% to 13.5% and Wood Lane with an increase from 5.4% to 9.3 %.

A review has also been made of the speed of vehicles using these routes based on the survey data. **Table 2** 2015 & 2018 Survey Data - Speed

shows the speed limit at the point of survey and the proportion of vehicles exceeding this limit.

Based on the data the roads with the lower speed limits (20 and 30 mph) have the highest incidents of vehicles exceeding the stated speed limit. With three sites showing that over 75% of vehicles exceeded the stated speed limits at the time of the surveys (2018 data). Where we have both 2015 and 2018 data, on the roads with 60 mph speed limits the change is small, on the roads with lower speed limits site 1 saw an



# TECHNICAL NOTE 1 – NWL Data and Traffic Conditions

**DATE:** 18 June 2019 **CONFIDENTIALITY:** Public  
**SUBJECT:** TRAFFIC DATA AND FORECAST CONDITIONS OVERVIEW  
**PROJECT:** Norwich Western Link **AUTHOR:** [REDACTED]  
**CHECKED:** EM **APPROVED:** LA

increase of 4.4%, site 4 had an increase of 65.7% although it should be noted that the speed limit in 2018 was 20 which had reduced from the 30 mph recorded in 2015, and site 6 saw a decrease of 7.3%.

*Table 2 2015 & 2018 Survey Data - Speed*

<b>ATC Site</b>	<b>Location</b>	<b>2015 Speed Limit (mph)</b>	<b>2015 % &gt; Speed Limit</b>	<b>2018 Speed Limit (mph)</b>	<b>2018 % &gt; Speed Limit</b>
1	The Common, Lyng	30	19.4%	30	23.8%
2	On improved B1535 south of Weston Hall	60	0.2%	60	0.2%
3	Marl Hill Road, North of Weston Longville	60	2.0%	60	1.1%
4	Honingham Road, Weston Longville	30	29.0%	20	94.7%
5	Paddys Lane,	60	0.1%	60	0.0%
6	Heath Road, Hockering	30	55.0%	30	47.3%
7	Lyng Road,	60	1.2%	60	2.6%
8	Wood Lane at Give way sign at junction with A47	60	0.0%	60	0.0%
68	Ringland Road, east of River Wensum, Taverham			30	79.9%
69	Taverham Lane, south of River Wensum, Taverham			40	14.0%
75	Taverham Road, east of Penn Road, Taverham			30	56.1%
76	West End, Costessey			20	89.1%
77	Town House Road, Costessey			40	11.6%
78	Longwater Lane, Costessey			30	46.1%

# TECHNICAL NOTE 1 – NWL Data and Traffic Conditions

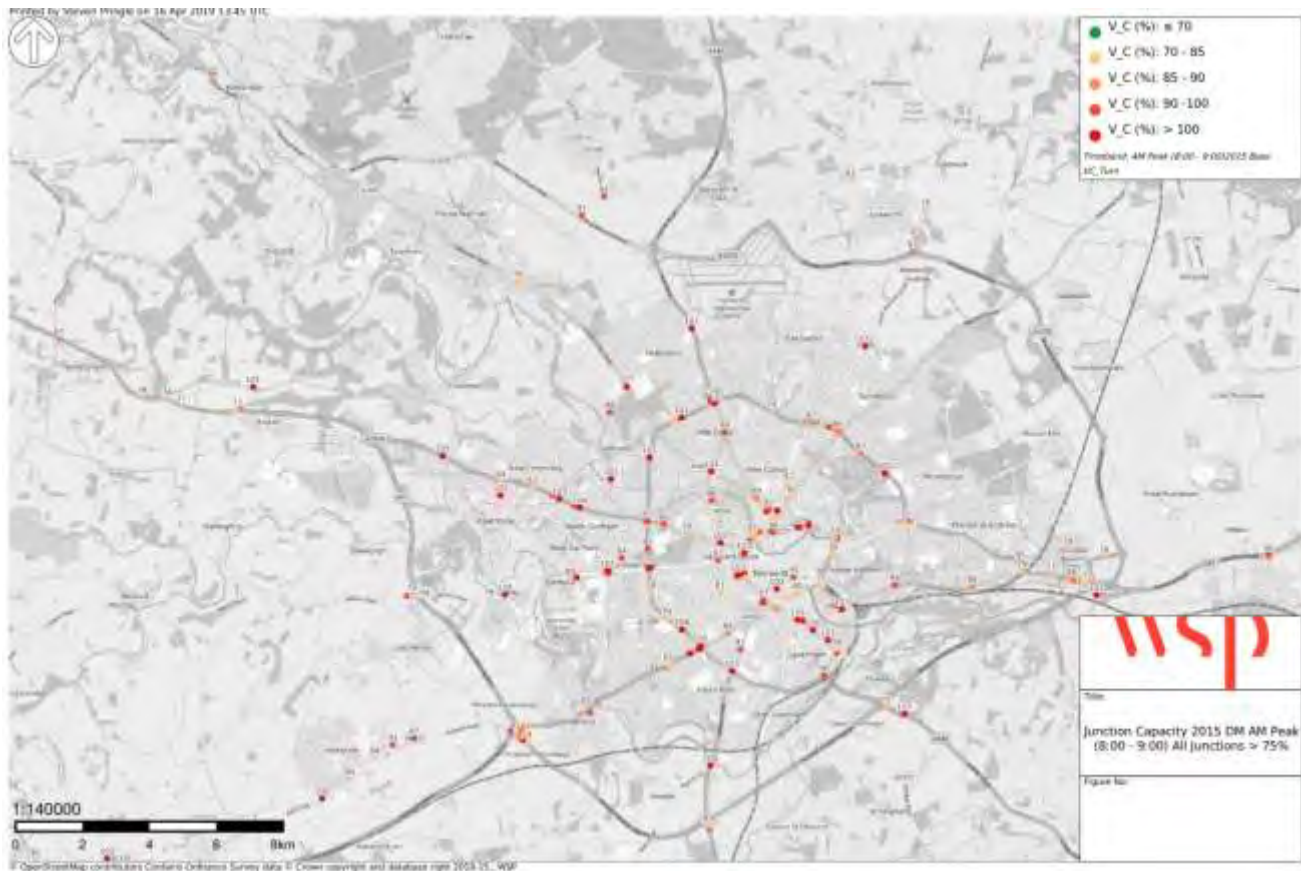
<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	TRAFFIC DATA AND FORECAST CONDITIONS OVERVIEW		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	[REDACTED]
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

## Modelled Junction Capacity

The traffic models that have been developed on behalf of highways England for the A47 dualling scheme indicate that a significant number of the junctions within Norwich on the radial routes and the ring roads are operating over capacity during the modelled periods causing congestion and delay at these junctions and along the related road links. The models reflect an average peak hour for the three hour morning and evening peak periods, and therefore will not reflect the actual peak hour road conditions as the traffic demand is smoothed across the three hour period.

**Figure 3 and 4** show the junctions operating over capacity and the link delays reported by the 2015 base year AM model.

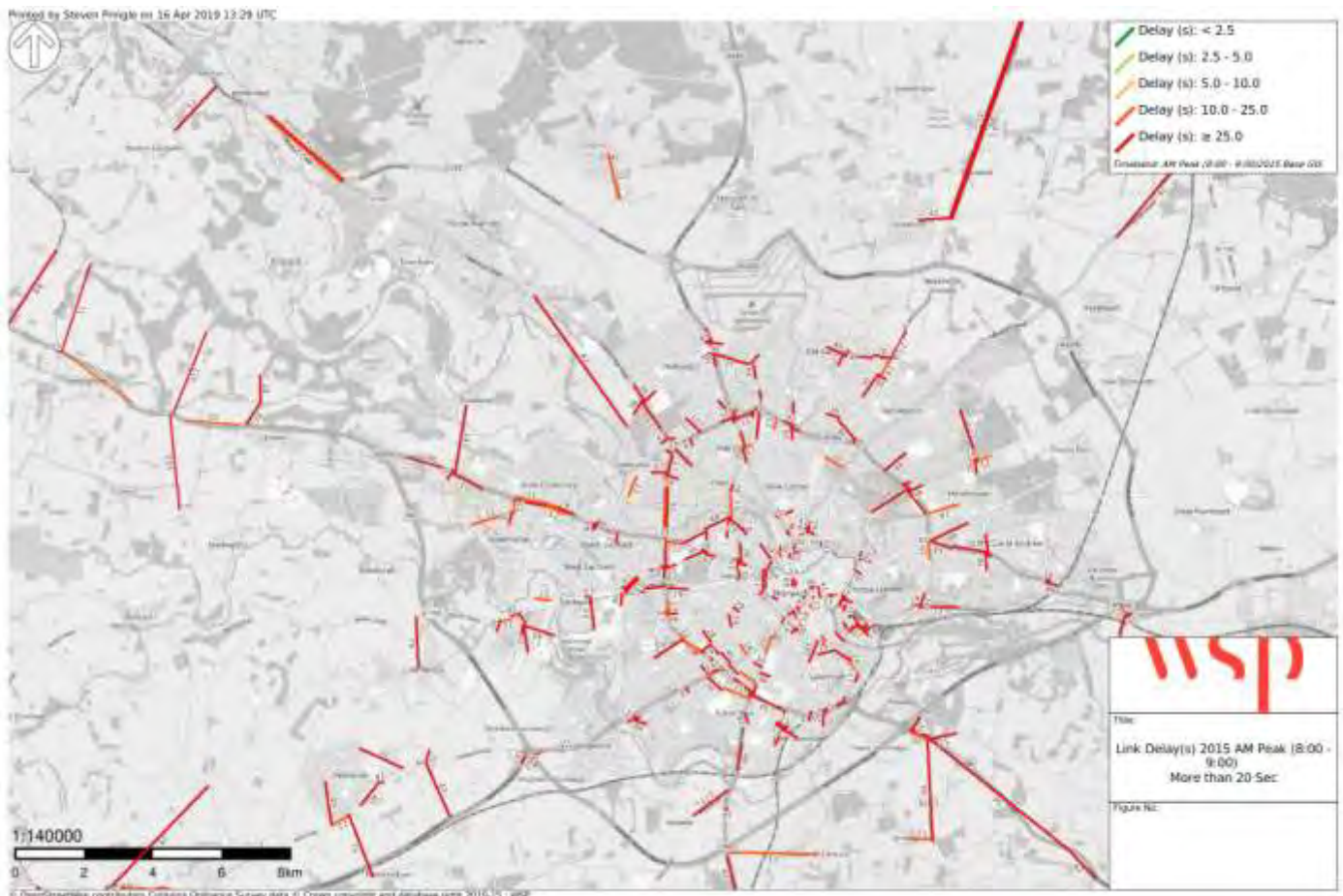
*Figure 3– Junction Capacity 2015 AM Period*



# TECHNICAL NOTE 1 – NWL Data and Traffic Conditions

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	TRAFFIC DATA AND FORECAST CONDITIONS OVERVIEW		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	[REDACTED]
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

Figure 4– Link Delay 2015 AM Period



A future year traffic model has been developed to reflect the network operation at 2025, which is the planned opening year of the scheme. The road network in this model has been adjusted to reflect the committed and completed schemes which will have been delivered by this time. This includes the NDR which opened in 2018 and the A47 dualling scheme between Easton and Tuddenham which is being delivered by Highways England. The vehicle demand in the model has been adjusted to reflect the forecasted growth planned in the area. The development of the future year model is set out in the forecasting report.



# TECHNICAL NOTE 1 – NWL Data and Traffic Conditions

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	TRAFFIC DATA AND FORECAST CONDITIONS OVERVIEW		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

Based on the modelling report traffic is expected to grow between 2015 the current model base year and 2025 the scheme opening year. The growth rates used are different for cars, LGVs and HGVs and are shown in **Table 3**.

*Table 3 – Growth in matrices by user class 2015-2025*

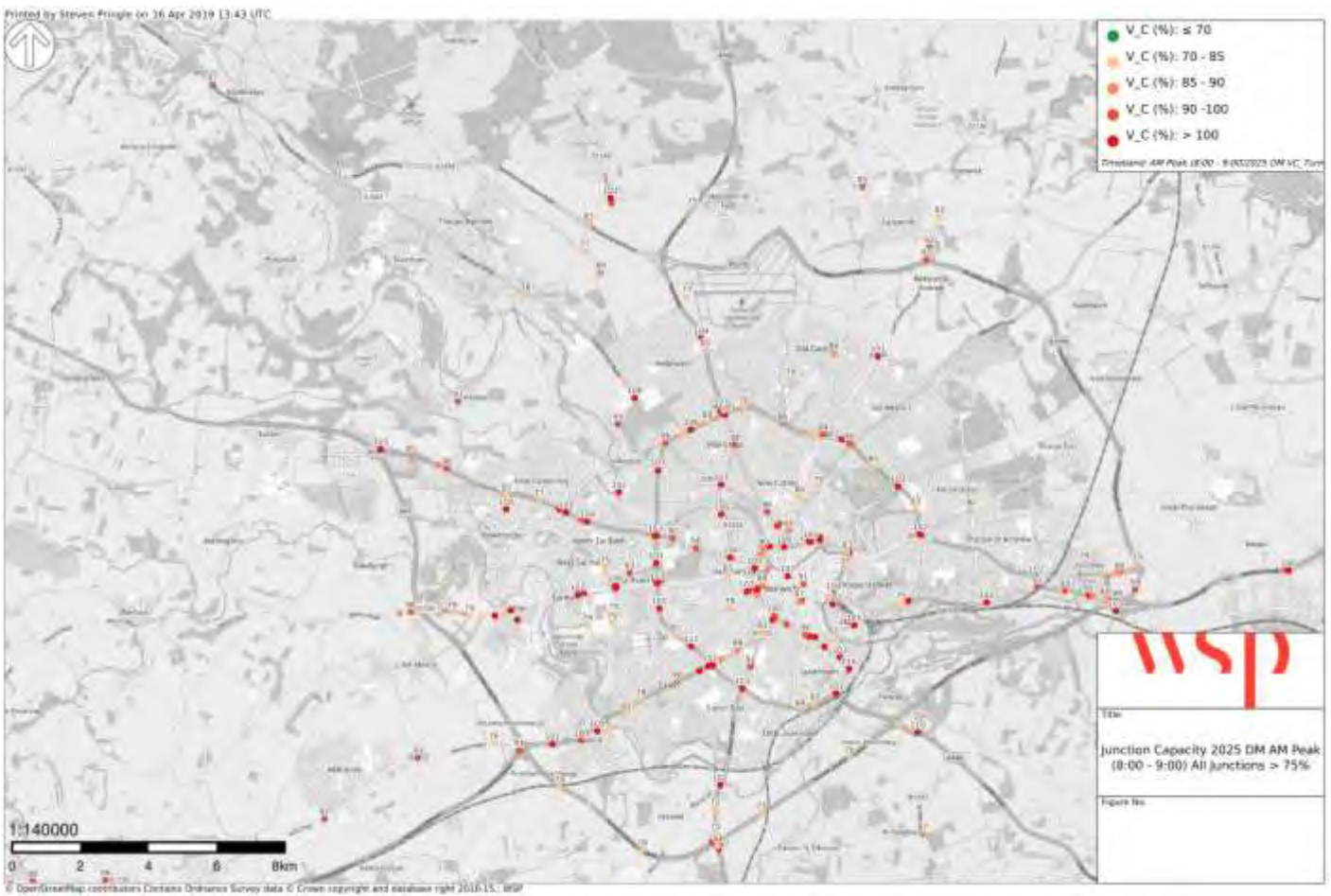
User Class	AM %	IP %	PM %
Car Employers Business	8	7	8
Car Commuting	7	7	6
Car Other	18	17	14
LGV	15	15	15
HGV	3	3	3
Total Model Growth	<b>11</b>	<b>13</b>	<b>10</b>

Outputs from the 2025 AM peak period model are shown in **Figure 5** and **Figure 6**, these show a worsening of conditions for junction capacity and link delay, even after the committed road schemes are included. The outputs are forecasting delays increasing along the outer ring road in comparison to the 2015 outputs, and new delays occurring along the A47 to the south of Norwich.

# TECHNICAL NOTE 1 – NWL Data and Traffic Conditions

**DATE:** 18 June 2019 **CONFIDENTIALITY:** Public  
**SUBJECT:** TRAFFIC DATA AND FORECAST CONDITIONS OVERVIEW  
**PROJECT:** Norwich Western Link **AUTHOR:** [REDACTED]  
**CHECKED:** EM **APPROVED:** LA

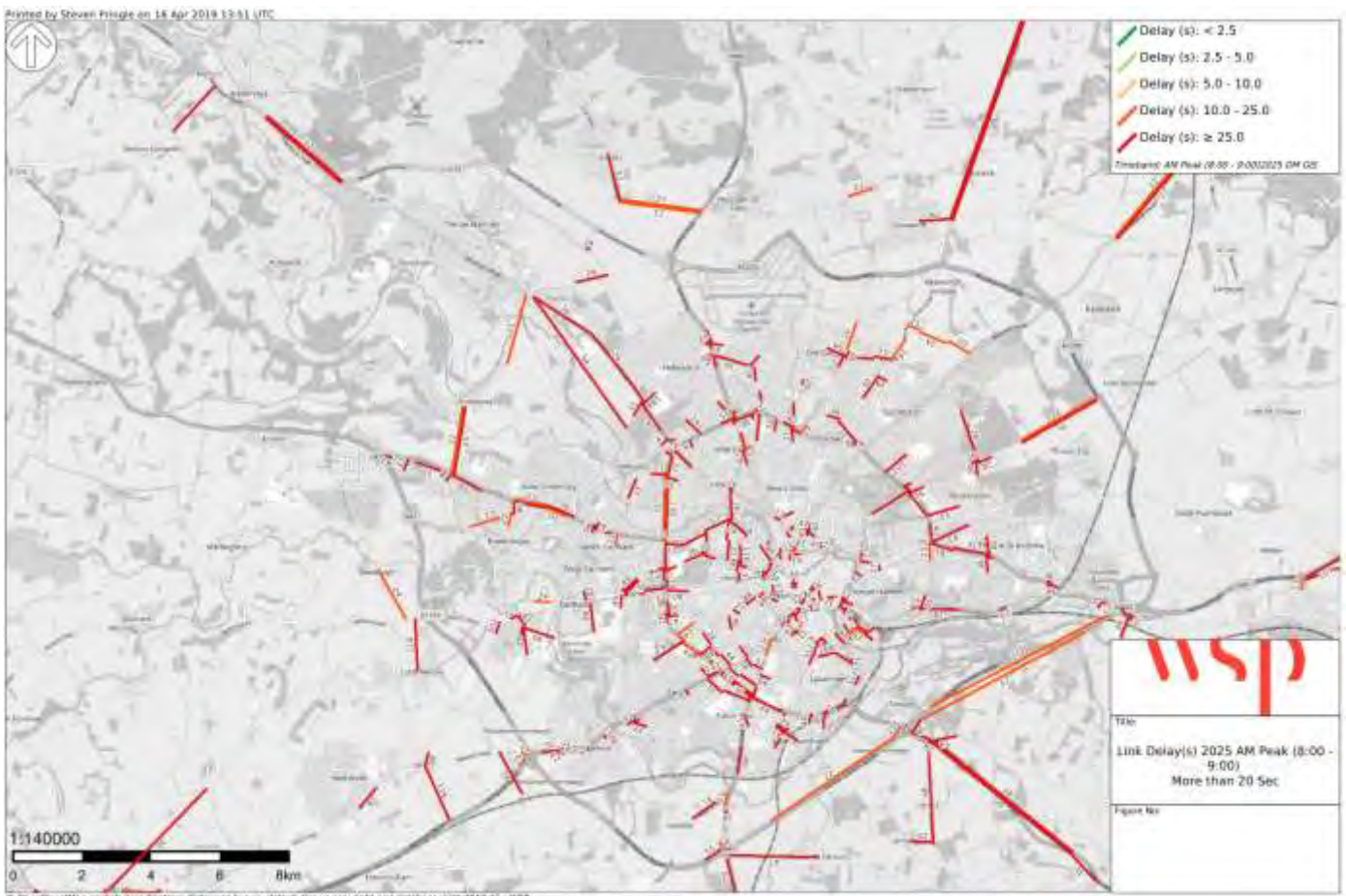
Figure 5– Junction Capacity 2025 AM Period



# TECHNICAL NOTE 1 – NWL Data and Traffic Conditions

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	TRAFFIC DATA AND FORECAST CONDITIONS OVERVIEW		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

Figure 6– Link Delay 2025 AM Period



There are strategic connectivity issues for some strategic movements, any vehicles travelling between the west and south of Norwich to the north of Norwich, where the airport is located, and vice versa, currently have three options. Use the A47 and the A1270 to circumnavigate Norwich, use the outer or inner ring road, or use the local roads between the A47 and the A1067.

The A47/A1270 route is a high standard dual carriageway route which is subject to faster speed limits although it is double the distance of using the outer ring road. Both the inner and outer ring roads have numerous junctions and lower speed limits than the dual carriageway route, and in the peak and interpeak periods this shorter route would take longer to drive than the A47/A1270 route. The local roads to the west of Norwich would only be viable for traffic routeing between the A47 west or the A11 south and the north of



# TECHNICAL NOTE 1 – NWL Data and Traffic Conditions

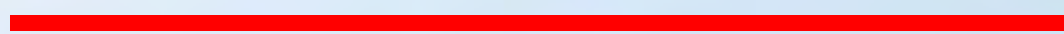
<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	TRAFFIC DATA AND FORECAST CONDITIONS OVERVIEW		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	[REDACTED]
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

Norwich, this route is only really suitable for cars and light vehicles due to the narrow roads and tight bends found along these roads.

The model outputs indicate that in 2025 north to south/west journeys will take longer than currently, leading to increases in congestion and delay, resulting in increased journey time for all users. It will take longer for commuters to get to/from work and will affect the efficiency of transporting goods through/around Norwich and Norfolk.

When the current single carriageway section of the A47 between North Tuddenham and Easton is dualled, this will remove a constraint on the highway network leading to increased traffic throughput on this section of the network. It will also impact on the routes used for north-south traffic as a reduced number of junctions are being provided compared to what currently exists along this section of the A47. This could lead to increased traffic along some of the north-south routes depending on where the A47 junctions are located.

# Appendix B



LETTERS OF SUPPORT

Rt Hon Chris Grayling MP  
Secretary of State for Transport  
Great Minster House  
33 Horseferry Road  
London  
SW1P 4DR

Friday, 1<sup>st</sup> February 2019

Further to my letter to you of 21<sup>st</sup> December 2018 in relation to transport priorities for the East, I return to you with the views of Norfolk Conservative MPs.

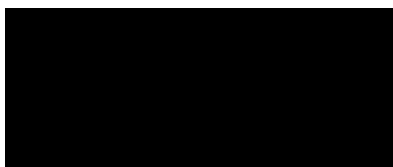
We urge you to prioritise:

1. The full dualling of the A47, including the Acle Straight, after completing the current committed works, and consideration of the Western Link between the A47 and the Norwich Northern Distributor Road
2. The feasibility study and associated actions to improve the Ely North rail junction – to unlock half hourly train services to King’s Lynn and Norwich from Cambridge.
3. The promises already made by this Government to make infrastructure improvements to the Great Eastern Mainline so that the new rolling stock will enable ‘Norwich in Ninety’ across the whole timetable rather than the short form promoted in this franchise

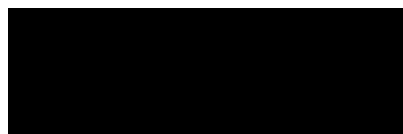
We look forward to helping you campaign for these priorities in the Spending Review and elsewhere.

Yours ever,

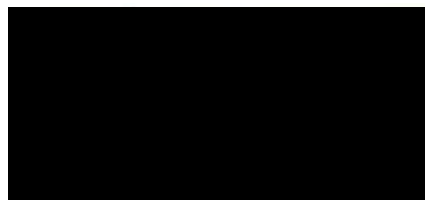
Chloe Smith MP



Richard Bacon MP



George Freeman MP



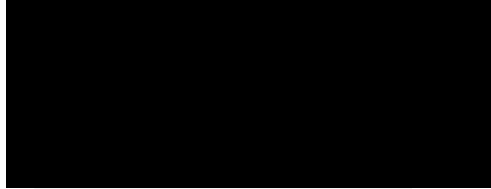
Henry Bellingham MP



Brandon Lewis MP



Rt Hon Keith Simpson MP



Rt Hon Elizabeth Truss MP

Cc:

Rt Hon Liz Truss MP  
Rt Hon Brandon Lewis MP  
Rt Hon Keith Simpson MP  
Sir Henry Bellingham MP  
Richard Bacon MP  
George Freeman MP



HOUSE OF COMMONS  
LONDON SW1A 0AA



Chloe Smith MP  
Working Hard for Norwich North

[REDACTED]  
[REDACTED]  
County Hall  
Norwich  
NR1 2HD

Friday, 24<sup>th</sup> May 2019

Dear [REDACTED]

**Norwich Western Link**

I am writing to you to reiterate Chloe's strong support for the bid being made by Norfolk County Council and others for funding for the Norwich Northern Distributor Road Western Link "the Western Link").

Chloe has been a longstanding supporter of both Northern Broadway and the Western Link, having been the subject of one of her very first interventions in Parliament. It has long been her contention the road is necessary for future development, for jobs, for growing our economy – and to reduce the environmental impact of traffic queueing in and around Norwich. Chloe is pleased to have led lobbying for funding in the past and to have been a part of the campaign that successfully welcomed the NDR opening last year and I am pleased to confirm her strong, ongoing support for the Western Link.

As you are aware, the NDR has made travel in and around Norwich much easier but ends on a small A-class road leaving Norwich heading towards Fakenham (the A1067) and inevitably leads to problems with congestion. The Western Link will allow a complete circuit of dual carriageways to the north and south of the city, making journeys through the historic, and crowded, city centre unnecessary and will make a significant contribution to the flow of traffic, congestion and air quality in Norwich. It will also support the significant housing growth that is already planned and improve the strategic connectivity of the national road network.

We look forward to continuing to work with you, the rest of the council and others to make the Western Link a reality.

With best wishes,

[REDACTED]  
[REDACTED]  
For and on behalf of Chloe Smith  
Member of Parliament for Norwich North



**From:** [redacted] <[redacted]@north-norfolk.gov.uk>  
**Sent:** 17 January 2019 10:25  
**To:** Norwich Western Link  
**Cc:** [redacted]  
**Subject:** Norwich Western Link Options Consultation - response from North Norfolk District Council

Dear Sir

I write in respect of the above consultation and to inform you that North Norfolk District Council supports the proposals in principle but we do not feel that it would be appropriate for us to express a preference as to the route options.

Kind regards

[redacted]

[redacted]  
PA to Corporate Leadership Team  
[redacted]



\*\*\*\*\*  
\*\*\*\*\*

North Norfolk District Council  
This E-mail and any files transmitted with it are private and intended solely for the use of the individual or entity to whom they are addressed. It may contain sensitive or protectively marked material up to **OFFICIAL-SENSITIVE** and should be handled accordingly. If you are not the intended recipient, the E-mail and any files have been transmitted to you in error and any copying, distribution or other use of the information contained in them is strictly prohibited. Please notify the sender immediately if you have received it in error.

Nothing in this E-mail message amounts to a contractual or other legal commitment on the part of the Council unless confirmed by a communication signed by a properly authorised officer of the Council.

We may have to make this message and any reply to it public if asked to under the Freedom of Information Act 2000, Data Protection Act 1998 or for litigation. All emails maybe monitored in accordance with relevant legislation.

<http://www.north-norfolk.gov.uk>  
Follow us on Twitter - <http://twitter.com/NorthNorfolkDC>

\*\*\*\*\*  
\*\*\*\*\*

Think before you ink - do you really need to print this?



[REDACTED]  
Stakeholder and Communications Coordinator  
Infrastructure Delivery  
Norfolk County Council  
County Hall  
Martineau Lane  
Norwich  
NR1 2DH

Tuesday, 08 January 2019

Dear [REDACTED]

### **Norwich Western Link – Shortlisted Route Options**

The successful delivery of the Broadland Northway, formally known as the NDR is a clear signal that Norfolk is embracing growth and development in order to create the jobs and houses that our region needs and has been strongly welcomed by the Norfolk business community.

However, to maximise the potential for this region – the missing link from the A1067 to the A47 needs to be completed as soon as possible.

Norfolk Chamber of Commerce is a business membership organisation representing over 900 Chamber members across the county, who employ over 100,000 people. Having considered the four shortlisted options, Norfolk Chamber would like to offer our views, on behalf of our members, as follows:

#### **Option A – a single carriageway upgrade of the B1535 and a section of the A1067, significantly realigning the current B-Road and smoothing it out to make it a higher standard route.**

Whilst this route upgrades existing carriageway and appears to be a 'cheap' option; the reality is that it is the longest route (7.2 miles) and still takes traffic over an existing bridge, which will in time restrict overall traffic movements. The value for money is low and the route will impact on three County Wildlife Sites and passes within 500m of fifteen listed buildings. When you consider the overall impact and it being a longer route, this will not benefit business and commuter traffic.

#### **Option B - a new dual carriageway route and dual carriageway upgrade of a section of the A1067.**

This route, whilst being shorter than Option A at 5.1 miles long, involves either widening the existing River Wensum Bridge or building a viaduct – both a which could impact on the Special Area of Conservation and Site of Special Scientific interest. The route would also pass within 500m of four listed buildings. Again the overall benefit to business users would be limited due to the length of this route and the impact along the route.

**Option C - a new dual carriageway route and a short section of dual carriageway upgrade of the A1067.**

This route is one of the shortest routes, connecting easily with existing transport routes; it only crosses one river; is of minimal impact to the majority of the villages; and avoids designated areas of protected woodland. It is also classed as high value for money and will offer the most efficient route in terms of travel time. **Therefore this is the route that Norfolk Chamber believes is the most appropriate route option that will benefit the majority of our members.**

**Option D - a new dual carriageway route and a short section of dual carriageway upgrade of the A1067.**

As the shortest route option, with high value for money, on the face of it this looks to be a good route. However, we are very concerned with the high impact of this route, in that it crosses not one but two rivers. With the need for both a viaduct and the final route being dependent on the placement of the roundabout on the A47 – it the most expensive of the four options at £161m. The high impact and the need for two river crossings, as well as the overall cost, means that we do not feel this route would offer the most effective use of resources and therefore overall value for our members.

We would encourage a speedy delivery of the Norwich Western Link. As completing this 'missing link' will create stronger and more effective links to the Midlands and the North and will help Norfolk businesses to thrive and deliver greater economic growth and jobs in our region.

Yours sincerely

[Redacted signature]

**Head of Policy, Governance & Public Affairs  
& Company Secretary**

South Norfolk Council  
Cygnet Court  
Long Stratton  
Norwich  
NR15 2XE

██████████  
Executive Director of Community  
and Environmental Services

Sent by email to:  
norwichwesternlink@norfolk.gov.uk

18 January 2019

Dear ██████████

### **Norwich Western Link Options Consultation**

Thank you for the opportunity to comment on the options put forward for the continuation of the Broadland Northway to the A47. You will already be aware that South Norfolk Council supported the principle of the Western Link through the previous consultation, see letter of 25 June 2018, attached.

The Council is aware of the environmental challenges that prevented this section being included in the original Broadland Northway scheme and welcomes the County Council's commitment to work to protect and enhance the environment through development of these proposals. Similarly, the commitment to enhance options for walking, cycling and public transport, whichever route is chosen, is welcomed.

In terms of the four routes proposed, the Council considers that Option A cannot be supported; the length of the route (at over 2 miles more than any of the other options), which takes traffic considerably further west of the city, means that it does not adequately fulfil the stated Objectives of the scheme. As noted in the County Council's own summary, this option results in substantially fewer vehicles using the new route, with presumably a continuation of some of the 'rat running' already affecting local communities. Although the least costly of the options put forward, it is noted that County Council has concluded that this scheme represents 'Low' value for money.

It is noted that the remaining three options perform broadly similarly in terms of the reduction in journey time, the volume of traffic they are likely to attract and their assessed value for money.

---

Hours of opening: Monday to Friday 8.15am to 5pm  
Text phone: 01508 533622  
Out of hours service: 01508 533633  
Freephone: 0808 168 2000

[www.south-norfolk.gov.uk](http://www.south-norfolk.gov.uk)

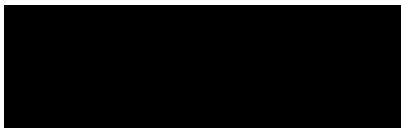


The Council has concerns that Options B and C join the A47 further to the west, consequently further from existing and emerging growth locations including the Food Enterprise Park, Longwater, the Norwich Research Park, the Norfolk and Norwich University Hospital, the University of East Anglia and the housing in this southwest sector. Locally there are concerns that accessing the A47 at this point will promote more 'rat running' to the south of the A47, increasing some of the traffic problems already experienced in these settlements; at present the consultation leaflet does not show any predicated changes in traffic volumes south of the A47 for the different options. Option B also pushes the link to the existing Broadland Northway further out on the Fakenham Road, and therefore is seen as less attractive than Option C.

It is acknowledged that Option D runs closer to a number of Listed Buildings and that it also has to cross both the River Tud and the National Grid Gas Line, making it the most expensive of the options; however, this route also shows the most significant reductions in traffic on Ringland Lane and Taverham Lane. Therefore, at this stage this would be the preferred route based on the information presented to date.

In conclusion, South Norfolk Council would be supportive of further investigation into the pros and cons of Options C and D, in order to establish which is the most appropriate to take forward.

Yours sincerely



**Leader of the Council & Portfolio Holder for The Economy and External Affairs**

South Norfolk Council  
Cygnet Court  
Long Stratton  
Norwich  
NR15 2XE

[REDACTED]  
Infrastructure Delivery Manager  
Community and Environmental Services  
Norfolk County Council  
County Hall  
Martineau Lane  
Norwich

By email to:  
[norwichwesternlink@norfolk.gov.uk](mailto:norwichwesternlink@norfolk.gov.uk)

[REDACTED]  
**Norwich Western Link  
Public Consultation on Transport Issues and Options**

Thank you for your email of 6 June concerning the above public consultation.

South Norfolk Council has for many years been supportive of initiatives to provide the infrastructure needed to ensure that the growing population and economy is properly supported; be this through the use of pooled CIL to support the NDR/Broadland Northway, lobbying of Highways England for dualling of the trunk roads, or working directly with the development industry to deliver one of the County's other top priorities, the Long Stratton Bypass.

The Council fully appreciates the potential benefits that this key piece of infrastructure could bring to both the communities directly affected by existing (and future) traffic issues, and also to the wider economy of Greater Norwich and Norfolk. In particular:

- Whilst the Broadland Northway and the A47 Norwich Southern Bypass have enhanced the opportunities for economic growth at key locations, including Norwich Research Park, Norwich Airport, Longwater and the Easton/Honingham Food Enterprise Zone, the Western Link would widen the opportunities still further, giving local people more options in terms of access to jobs and services;
- With the completion of the Broadland Northway and the planned dualling of the A47, communities in South Norfolk are concerned that this will increase rat-running along unsuitable routes across the Wensum and Tud Valleys, with associated environmental implications, safety concerns and impacts on quality of life;

---

Hours of opening: Monday to Friday 8.15am to 5pm  
Text phone: 01508 533622  
Out of hours service: 01508 533633  
Freephone: 0808 168 2000



**IN  
TRAN**  
communication for all

- The lack of a Western Link also impacts on some of the congested routes into Norwich, such as the Dereham Road, where valuable road space could be freed up for public transport;
- With significant investment made in the Broadland Northway, and future investments planned as part of the A47 Corridor Improvement Programme; the Western Link is an opportunity to capitalise on these investments and maximise their benefits through quicker and more reliable journeys, encouraging investment and potentially shortening journey times to the Norfolk and Norwich Hospital.

Through our already close collaboration with partner authorities on the emerging Greater Norwich Local Plan and the review of the Norwich Area Transportation Strategy, we are aware that development of this link needs to be considered alongside the wider growth plans for Greater Norwich.

The Council is fully supportive of an approach to developing this scheme which addresses the environmental impacts as far as practicably possible, including making the most of opportunities to encourage more sustainable transport, particularly on those roads which subsequently benefit from reduced vehicle numbers.

The Council continues to support working up the case for a Norwich Western Link, and looks forward to participating in future stages of this process.

Yours

**Leader of the Council & Cabinet Member for The Economy and External Affairs**

---

**From:** [REDACTED] <[REDACTED]@norwich.gov.uk>  
**Sent:** 23 January 2019 14:05  
**To:** Norwich Western Link  
**Subject:** Norwich city council - Response to consultation  
**Attachments:** Response to the Norfolk County Council consultation on the Norwich Western Link route options.pdf; Minutes Cabinet 16 January 2019.pdf

Dear colleagues

Please find attached the cabinet report that sets out Norwich city council's response to the Western Link consultation and the minutes of the meeting. Please note that the recommendation of the report differs from what was actually decided at the meeting. The final resolution is as follows:

- (1) advise Norfolk County Council that the city council fully supports the principal of the proposal to construct the Norwich Western Link and that while the city council does not support option A it has no preference between options B, C and D; and
- (2) remind Norfolk County Council that the council's support for the Western Link is subject to the delivery of a programme of measures to secure significant transport improvements to encourage sustainable forms of transport, as promoted by Transport for Norwich and more specifically:
  - to increase walking, cycling and use of public transport;
  - to improve air quality; and
  - to encourage inclusive growth and economic development.

The documents are also online and can be accessed through these links: [report](#) [minutes](#)

Regards

[REDACTED]

[REDACTED]  
Transportation & network manager  
Norwich City Council

e: [REDACTED]@norwich.gov.uk  
t: [REDACTED]

www.norwich.gov.uk



Finalist in the 'Housing initiative' category for the LGC Awards 2019



\*\*\*\*\*

**Norwich City Council Legal Disclaimer:**

"This message is for the named person's use only. It may contain confidential, proprietary or legally privileged information. No confidentiality or privilege is waived or lost by any mistransmission. If you receive this message in error, please immediately delete it and all copies of it from your system, destroy any hard copies of it and notify the sender. You must not, directly or indirectly, use, disclose, distribute, print, or copy any part of this message if you are not the intended recipient. Norwich City Council reserves the right to monitor all e-mail communications through its networks. Any views expressed in this message are those of the individual sender, except where the message states otherwise and the sender is authorised to state them to be the views of any such entity. Senders and recipients of email should be aware that, under the General Data Protection Regulation (GDPR) (EU) 2016 and the Freedom of Information Act 2000 the contents may have to be disclosed in response to a request."

Scanned by the Email Gateway.

\*\*\*\*\*



**Breckland Council**  
Elizabeth House  
Walpole Loke  
Dereham  
Norfolk  
NR19 1EE

Date: 12<sup>th</sup> February 2019

Our reference:

Your reference:

Dear Mr [REDACTED]

**Re: Norwich Western Link consultation**

Thank you for consulting Breckland Council on the route options for the Norwich Western Link project. As you will be aware from our previous correspondence, Breckland Council supports the principle of the Norwich Western Link. The Council welcomes Norfolk County Council's commitment to progressing the proposals for the Western Link of the Northern Distributer Road (now known as Broadland Northway) and the opportunity to express its' views on the preferred route options.

On 5<sup>th</sup> February, Breckland Council's Cabinet considered a report summarising the route options as set out in the County Council's consultation material. At that meeting, Cabinet resolved to support Option D following the eastern spur connection as the Council's favoured route alignment. The Council considers that this option has the greatest potential benefits by virtue of its attractiveness in transport terms for users, particularly for those communities in the north east of the district to access the Broadland Northway and the soon-to-be dualled A47 between Tuddenham and Easton.

Breckland Council notes that the current consultation does not provide the detail on other mitigation measures. The Council therefore considers that Norfolk County Council should complement whichever route option is ultimately selected with a package of other transport measures. These should include accompanying walking and cycling routes and the implementation of traffic management measures on other local roads. This is in order that opportunities to maximise the use of non-car modes of transport are integrated into the proposed scheme as well as the vehicular link, but also to discourage traffic from using other rural routes for rat running, the effects of which adversely affect local amenity.

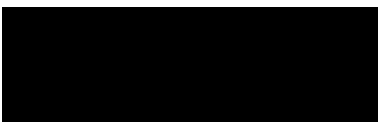
I hope this is of assistance to you.

Yours sincerely,

[contactus@breckland.gov.uk](mailto:contactus@breckland.gov.uk)

Breckland Council Elizabeth House, Walpole Loke, Dereham, Norfolk NR19 1EE  
Telephone: 01362 656870 [www.breckland.gov.uk](http://www.breckland.gov.uk)





Strategic Planning Manager  
Breckland Council

[contactus@breckland.gov.uk](mailto:contactus@breckland.gov.uk)

Breckland Council Elizabeth House, Walpole Loke, Dereham, Norfolk NR19 1EE  
Telephone: 01362 656870 [www.breckland.gov.uk](http://www.breckland.gov.uk)



**Re: Norwich Western Link consultation**

Broadland District Council welcomes the Norwich Western Link route options consultation and appreciates the opportunity to comment. The Council recognises the important benefits of the scheme to residents, businesses, visitors and people travelling through the area and therefore offers its full endorsement.

The Council also recognises that the Norwich Western Link could: improve quality of life for residents by reducing rat running through villages; encourage walking and cycling; reduce air pollution; improve road safety and increase the resilience of the highway network. This should be taken into account when finalising the route design.

With regard to the 4 route options presented through the consultation the following comments were submitted by the Economic Success panel and approved by Cabinet:

Option A

It was strongly felt that a dual carriageway is needed. This option is too far out of Norwich and the junction with Broadland Northway to deliver maximum benefits such as reducing traffic along other routes.

Option B

Too far out of Norwich and the junction with the Broadland Northway and would not connect to FEP as well as NNUH, NRP and UEA. There are concerns that this route passes very closely to Weston Longville, Morton-on-the-Hill and Weston Green.

There is also potential for detrimental impact on Wensum Valley Special Area of Conservation, Country Wildlife Sites and surrounding farmland – however it was understood that Natural England had expressed a preference for a viaduct to minimise environmental impact and this was therefore favoured over using the existing bridge is used.

Option C

This option provides the closest junction to Broadland Northway but further away from access to the FEP, NNUH, NRP and UEA and would connect to the A47 further away from the City. However this option would have the least damaging environmental impact upon Country Wildlife Site and surrounding farmland.

This option was considered to be the most resilient and would avoid crossing the Bacton high pressure gas line.

Whilst it would help to reduce rat running, it was not considered that this option would achieve this as effectively as route D.

*Continued overleaf...*

Option D

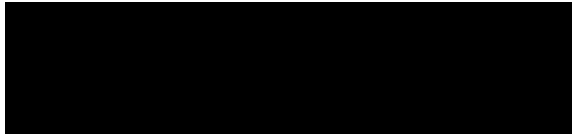
This option provides the best connectivity, shortest route and closest junction to the Broadland Northway. Environmental concerns do need to be addressed and therefore it was acknowledged this route is likely to be the most expensive but will deliver maximum benefits.

At the southern end, the Eastern option is favoured, dependant on where upon Highways England put the Easton roundabout on the A47.

However, this route option may give rise to a greater impact upon heritage assets than other options.

Therefore the Council recommends that Options C and D are the preferred routes for reasons set out within individual comments.

Yours sincerely,

A large black rectangular redaction box covering the signature area.A small black rectangular redaction box covering the name of the signatory.

**Head of Economic Development**

Our ref:  
Your ref:

Norfolk County Council  
County Hall  
Martineau Lane  
Norwich  
NR1 2DH

[REDACTED]  
Network Delivery & Development - East  
Woodlands  
Manton Lane  
Bedford MK41 7LW

Direct Line: [REDACTED]

9 January 2019

Dear Sirs

### **Norwich Western Link Consultation**

Thank you for consulting Highways England on proposals for a Norwich Western Link (NWL) road connecting the A47 to the west of Easton with the A1270/Fakenham Road corridor to the north.

As you will be aware Highways England is currently progressing with a Road Investment Strategy project to upgrade the A47 between North Tuddenham and Easton to a dual carriageway standard with a proposed start of works of 2021/2022. A date for a submission for a Development Consent Order (DCO) has yet to be established.

Currently, it is too early to confirm a junction strategy for the scheme, but at this stage of development, Highways England's assumption is that the upgraded A47 corridor will link to the existing local road network and a developing junction strategy will be based on this scenario. In the event the NWL is taken forward, and depending on NWL route corridor selection, it will be important to ensure that there is synergy between the two schemes with a coordinated approach on the junction design. It would be expected if there is any need to upgrade the emerging A47 junction designs to accommodate the NWL, the additional junction costs will be part of the NWL scheme budget.

In addition to a coordinated approach with the junctions, should there be a future change in government policy or through the DCO process, a change to our proposals, it will be important to ensure that there is a consistency of highway standard between the link road and the A47. Highways England would wish to avoid any short sections of single A47 trunk road between separate sections of dualling.

At this stage Highways England does not have a view on a preferred link road option, save opting for a route which maximises the design life of the A47. This is a strategic corridor linking the east coast ports and Norwich with the Midlands and the north, and it should have primacy over any local connecting road. Therefore in developing junction options and route choice, consideration will need to be given to ensuring no significant delay to through traffic.



Highways England looks forward to working in partnership with Norfolk County Council as both our schemes are taken forward, and where appropriate sharing data and knowledge to ensure the outcome of our work provides an improved and connected road network.

Yours faithfully



Asset Development Team Leader  
Network Delivery & Development (East)  
Email: [redacted]@highwaysengland.co.uk

---

# Norwich Western Link

Representations by Norwich Airport Ltd

January 2019



**Norwich Western Link**  
**Representations by Norwich Airport Ltd**

<b>Project Ref:</b>	27293/A5/P7/VY/SO	27293/A5/P7/VY/SO
<b>Status:</b>	Draft	Draft
<b>Issue/Rev:</b>	01	02
<b>Date:</b>	January 2019	January 2019
<b>Prepared by:</b>	██████████	██████████
<b>Checked by:</b>	██████████	██████████
<b>Authorised by:</b>	██████████	██████████

██████████  
St Andrews House  
St Andrews Road  
Cambridge  
CB4 1WB

Tel: ██████████

Ref: 27293/A5/P7/VY/SO  
File Ref: 27293.P7.NWL.VY  
Date: January 2019

**COPYRIGHT**

**The contents of this document must not be copied or reproduced in whole or in part without the written consent of Barton Willmore Planning LLP.**

**All Barton Willmore stationery is produced using recycled or FSC paper and vegetable oil based inks.**

## **CONTENTS**

- 1.0 Introduction
- 2.0 Norwich Airport – A Regional Airport and Business Centre
- 3.0 Airport Economic Growth
- 4.0 Key Considerations
- 5.0 Specific Benefits to Norwich Airport
- 6.0 Western Link Route Options
- 7.0 Conclusions

## 1.0 INTRODUCTION

- 1.1 These representations have been prepared by Barton Willmore LLP (“Barton Willmore”) on behalf of Norwich Airport Ltd (“NAL”) in respect of the four potential route options for the Norwich Western Link.
- 1.2 NAL fully supports this proposal to build a western link which will bring significant economic benefits to the region as well as improving the Airport’s connectivity and accessibility in the Greater Norwich Area and beyond.
- 1.3 In April 2018, the final section of the Northern Distributor Road (NDR), also now known as Broadland Northway, was opened. This road runs from the A47 in the east at Postwick to the A1067 (Fakenham Road) in the west. It is a newly built dual carriageway serving the north of Norwich, allowing traffic to avoid the city centre and providing better access and improved journey time reliability.
- 1.4 Norfolk County Council (NCC) has now stated its intention to build a ‘Western Link’, a further dual carriageway, connecting Broadland Northway via Fakenham Road in the north to the A47 at Honingham in the south. This would complete a dual carriageway ‘ring road’ around Norwich city centre as well as improving connectivity to the Midlands and the North via Peterborough from the A47.

## **2.0 NORWICH AIRPORT – A REGIONAL AIRPORT AND BUSINESS CENTRE**

- 2.1 Norwich Airport provides the region with a network of routes to a wide range of domestic and European cities and is the second biggest heliport in the UK serving the North Sea oil and gas industry. It is also a major regional employment and skills centre specialising in the maintenance, repair and overhaul of aircraft.
- 2.2 The Airport is located approximately 4.5km to the north of Norwich City Centre and is within the administrative boundaries of Norwich City Council (NCC) and Broadland District Council (BDC). It is 280 hectares in size and surrounding residential communities include Horsham St Faith, Spixworth, Hellesdon, Old Catton and Norwich City.
- 2.3 Since the official opening in 1933 at Mousehold Heath on a former First World War Aerodrome, significant change and investment has taken place at the airport. The civil airport opened for passengers in 1968. In 1971, holiday charter flights started, and Customs allocated it to be an approved customs airfield. The main terminal was opened in 1988 after the Airport became a limited company in 1987 and could invest in a better terminal. The corporate identity of “Norwich International” was established in 1999 and replaced by “Norwich Airport” in April 2017.
- 2.4 In 2006, a new extension to the terminal building costing £4.5 million was completed, which comprised a new arrivals hall for both domestic and international passengers and the completion of an improved departure lounge with the provision of more retail and catering outlets. Passenger numbers reached an all-time high of 772,666 in 2007.
- 2.5 In 2014, Omniport’s shares in Norwich Airport (80.1%) were acquired by Regional & City Airports Holdings Ltd, part of the Rigby Group Plc, with Norwich City and Norfolk County Councils retaining the remaining interest.
- 2.6 The growth of new routes and services reflects the UK and European trend of increased demand for air travel for social and business purposes, the increased capacity and demand in the low-cost airline sector and the gradual trend for increased direct services from the regions rather than via the London airport system.

## 3.0 AIRPORT ECONOMIC GROWTH

### Passenger Market

- 3.1 Norwich Airport operates daily flights to Amsterdam which provides onward connections to circa 500 worldwide destinations. Flights to Aberdeen, Manchester, Edinburgh, Exeter and Spain are available all year round and flights to the Channel Islands are also operated over the summer months.
- 3.2 In addition to the scheduled network, Norwich Airport has a strong inclusive tour and charter (package holiday) network. Norwich Airport has numerous seat only charter and fully inclusive package holidays on offer throughout the year to the Channel Islands and European destinations. The majority of these flights are provided through major tour operators such as First Choice, TUI, Newmarket Holidays, Omega Holidays, Super Break, Premier Holidays and Balkan Holidays.
- 3.3 To inform its Airport Masterplan, York Aviation LLP undertook a passenger forecast, analysing the potential increase in passengers from 2015 to 2030, 2045 and 2090. From a base of around 460,000 passengers in 2015, it is forecast that passenger numbers will grow to around 930,000 by 2030, increasing again to 1.4 million by 2045. These represent compound annual growth rates (CAGR) of 4.9% to 2030 and 2.8% thereafter to 2045. By 2090, the potential number of passengers could rise to over 4,000,000.

### Offshore Oil & Gas Market

- 3.4 The East of England is an established hub for the oil and gas industry. The region's industry comprises more than 500 companies who directly employ 2,100 people and a further 13,200 indirectly. Currently, 10 offshore fields and two interconnectors are located in the Southern North Sea. Consequently, Norwich Airport is the busiest UK heliport serving the North Sea oil and gas industry after Aberdeen International Airport. In 2017, over 101,000 passengers travelled to and from offshore gas platforms from the Airport.
- 3.5 The following major offshore helicopter operators are based at the Airport:
- Bristow Helicopters Ltd (located to the south-east and south-west of the runway);
  - CHC Scotia Ltd (located to the south-west of the runway); and
  - NHV Helicopter Ltd (located to the south-west of the runway).

3.6 The offshore sector and the helicopter operations supporting this represent a significant proportion of the passengers at Norwich Airport. In 2017, over 19% of all passengers at the Airport were travelling to and from the offshore gas platforms. Furthermore, the sector also generates significant travel on key scheduled routes, including Aberdeen and Amsterdam.

### **Maintenance, Repair and Overhaul Market**

3.7 Norwich Airport is home to two major Maintenance, Repair and Overhaul (MRO) organisations:

- KLM UK Engineering Ltd (KLMUKE), a leading regional aircraft and narrow body MRO and subsidiary of Air France-KLM; and
- Air Livery Ltd, an established aircraft repainting company.

3.8 KLMUKE has been providing aircraft maintenance at Norwich Airport for 46 years. Their service includes base maintenance, component sales, technical training and decommissioning of several types of aircraft. KLMUKE's facilities include three hangars, five heavy maintenance bays, onsite workshops, disassembly and recycling centre and a technical training college. It has around 400 staff and a turnover of over £30 million.

3.9 Air Livery Ltd has its headquarters at Norwich Airport. It has three aircraft painting bays and works in conjunction with other MROs. It has plans to grow having recently been acquired by an international industrial and aerospace conglomerate, Satys.

### **Business and General Aviation Market**

3.10 Regional Freight Services Ltd (a company that specialises in international freight logistics) has their headquarters at Norwich Airport. It has a turnover of £5.5 million.

3.11 Norwich Airport also provides a service for private air charter, which includes helicopters and private planes. The use of private air charter has become a more popular travel choice for both business and personal use. Hiring a private jet can take you from Norwich to virtually any European destination.

3.12 NAL forecasts that this market will continue to grow and that a number of operators will base aircraft at the Airport reflecting the economic growth and development of the region.

### **Other Investment & Growth**

- 3.13 The Airport has opened a new state of the art high power Engine Test Facility, representing an £1.4 million investment to the MRO industry in Norwich.
- 3.14 In addition, the Airport, in collaboration with KLMUKE, City College Norwich and the University of East Anglia opened the International Aviation Academy, to the south of the Airport. It is a unique world-class training facility for careers in the aviation industry, further strengthening Norwich Airport's prominence in the Greater Norwich region.

## 4.0 KEY CONSIDERATIONS

### Importance of Improved Connectivity to the Sub-Region

- 4.1 NAL strongly encourages Norfolk County Council to progress the important Western Link to the NDR, to improve connectivity in the region.
- 4.2 In order for Norwich Airport to grow, improved road connectivity is essential. The Airport's expansion plans require improved connectivity in the area to enhance accessibility for passengers and other users. The Western Link will build on the connectivity of Broadland Northway, providing improved access to the Midlands and the North. This will help open up Norwich Airport to a wider passenger market, with significant regional economic benefits.
- 4.3 Whilst the NDR in its current form is recognised as an important step towards greater connectivity around Norwich, it is essential that the broader objective of achieving a fully connected city orbital road is delivered in the short to medium term. It is recognised that one of barriers to growth in this part of the city and region is a lack of accessibility and considerable congestion, particularly in peak times.
- 4.4 The Western Link, alongside other highway improvements, will provide the following benefits to the City and Airport:
- Direct traffic around and away from the City Centre, providing an orbital road, with shorter feeder corridors into the central and business areas, that are intended to manage high volumes of traffic;
  - Remove peak hour traffic from congested roads and 'rat runs' through residential and other constrained areas of the City;
  - Provide a more accessible and less intimidating environment for cyclists and pedestrians, improving sustainability across the City and to the Airport business centres;
  - Through the provision of cycle and pedestrian routes and links, further improve modal shift to more sustainable forms of transport;



- The Western Link would provide the necessary orbital connections improving the effectiveness of the Broadland Northway which will have direct benefits to the accessibility and sustainability of the Airport, including its land holdings to the north which benefits from a roundabout and spur into the north east of the Airport;
- The improved effectiveness of the Broadland Northway will benefit wider businesses associated with the Airport as well as other employment centres in Broadland District. The investment in the Western Link will send a positive message to businesses that will provide confidence to grow, invest, and relocate to the area.

## 5.0 SPECIFIC BENEFITS TO NORWICH AIRPORT

5.1 NAL is fully committed to maximising economic growth in the region. In its draft Airport Masterplan, it is estimated that its Gross Value Added (GVA) is expected to grow to £170m by 2045. This assumes an increase in passengers and other airport users.

5.2 The Western Link is a critical infrastructure improvement that will help facilitate this economic growth objective by increasing the Airport's accessibility and connectivity. This improvement will assist the airport in achieving the following economic growth objectives:

- One of the principal measures of economic growth at the Airport is the increase in passengers from a base of around 460,000 passengers in 2015 to its forecast of around 930,000 by 2030, increasing again to 1.4 million by 2045. A further increase in passenger growth to 4 million passengers per annum by 2090 could be achieved under the right economic conditions.
- In addition, benefits to the existing MRO businesses at Norwich Airport including KLMUKE, Air Livery and their suppliers, would be achieved from improved connectivity and accessibility to the Airport.
- Norwich Airport is a leading provider of UK heliport services to the North Sea oil and gas industry. The proposed highway infrastructure will assist in retaining Norwich Airport's enviable position in this sector, and to diversify when the opportunity arises into the emerging offshore windfarm maintenance sector.
- The total number of direct and indirect jobs is expected to increase at Norwich Airport in the coming years. Currently, there are 1,240 direct jobs and a further £15.9 million GVA resulting from 'local' indirect and induced jobs. These are predicted to increase over the coming decades in line with the growth predictions outlined in the draft Airport Masterplan.
- The Airport has planning permission for 95,035 sqm (GEA) of employment floorspace, which has direct access to Broadland Northway. A planning application is currently being determined by Norwich City and Broadland District Councils to safeguard a minimum of 30,000 sqm (GEA) of aviation-related employment floorspace releasing a maximum of 65,035 sqm (GEA) for general employment floorspace, including light industrial and warehouse uses. The Western Link will

help reduce the number of heavy goods vehicles using minor roads as well as unlocking sites such as this for economic growth.

## **6.0 WESTERN LINK ROUTE OPTIONS**

- 6.1 NAL fully supports the principal of a Western Link and the eventual creation of a City orbital road.
- 6.2 Whilst the well understood environmental and technical challenges must be navigated, the final route chosen should provide the maximum highways capacity and efficiency for the long term, accounting for the growth ambitions of the Airport, its associated businesses and the wider emerging sub-regional Development Plan targets.
- 6.3 It should be planned positively, safeguard sufficient land for future-proofing additional capacity and provide a comprehensive network of cycle and pedestrian routes and links to allow people the choice to travel by sustainable modes.
- 6.4 Importantly, the new road should be prioritised for construction by 2022.

## **7.0 CONCLUSIONS**

- 7.1 Norwich Airport is a major regional transport provider and employment centre and is a significant economic driver for the City and the wider region. It is fully supportive of the proposals to build a Western Link with the wider objective of creating an effective orbital road around Norwich with sufficient capacity to serve the growth needs of the City and its adjacent communities.
- 7.2 NAL has ambitious plans for growth which require the investment and commitment to improved road infrastructure serving the Airport and the City. Such investment will help facilitate these plans and make the Airport a more attractive and viable destination for employers and passengers, allowing the objectives in set out in the draft Airport Masterplan to be realised.

[bartonwillmore.co.uk](http://bartonwillmore.co.uk)

TOWN PLANNING  
MASTERPLANNING & URBAN DESIGN  
ARCHITECTURE  
LANDSCAPE PLANNING & DESIGN  
ENVIRONMENTAL PLANNING  
HERITAGE  
GRAPHIC COMMUNICATION  
PUBLIC ENGAGEMENT  
DEVELOPMENT ECONOMICS

All Barton Willmore  
stationery is  
produced using recycled  
or FSC paper and  
vegetable oil based inks

Norwich Western Link Project Team,  
Norfolk County Council,  
County Hall,  
Martineau Lane,  
Norwich, NR1 2DH

17<sup>th</sup> January 2019

### Norwich Western Link Consultation – Response on behalf of intu Chapelfield

intu Chapelfield is a major contributor to Norwich's economy, with over 2,000 staff employed at our centre and an annual footfall of 15 million. Latest Gross Value Added figures show we contributed £101m to the local economy through employment, regional investment and business rates.

The results of our 2017 Travel Survey found 37% of staff travel to work by car (as driver or passenger) and a further 25% travel by bus; the equivalent 2017 modal split for customers is 55% by 'private' mode (car, taxi or motorcycle) and 45% by 'public' modes of travel.

intu Chapelfield recognise the need for the Norwich Western Link (NWL) to prevent rat running and traffic congestion in the areas west of Norwich. It is also hoped the NWL will remove traffic from congested city streets and the outer ring road west of the city, which could help unlock benefits for both public transport users and car users accessing Norwich city centre, helping make the journey into Norwich more attractive for intu Chapelfield's customers and staff.

Overall, based on the consultation materials provided, it appears **Option C** offers the highest value for money and appears to minimise the environmental impact of the NWL scheme.

Unlocking overall city centre capacity is especially important if the proposals set out in the separate Greater Norwich Transforming Cities Fund bid are ultimately successful, helping to deliver a new bus network to replace Norwich Park & Ride, thereby improving accessibility by bus to the city centre from outlying growth areas and a better connection to the rail station.

intu Chapelfield note the NWL consultation document states a keenness to ensure the scheme encourages people to use more sustainable forms of transport such as walking, cycling and public transport. We would therefore like to see concerted efforts to align additional mitigation measures included in the final NWL option selection with the proposals in the TCF bid.

Whilst we recognise the benefits NWL will deliver once operational, we are seeking more information about the possible traffic impacts during the construction period. It is likely that the construction of the NWL will overlap with Highway England's scheme to dual the A47 between North Tuddenham and Easton. Therefore, the two construction programmes should be planned in a way that minimises impacts on existing road users.

When planning the construction programme, there should be a high level of engagement with local communities and businesses who may be affected, including ourselves. This engagement should continue throughout the construction period.

Wherever possible, works with the most significant impact on existing road users should be planned so that they do not coincide with peak trading times (e.g. Christmas). Options to undertake overnight works on the live highway should be explored to reduce the impacts on existing road users. Furthermore, we would encourage a realistic degree of contingency be included in the overall work programme to help ensure the published end date is achievable.

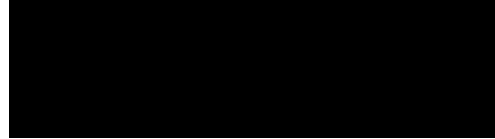
From our experience elsewhere, highway improvement schemes can result in reduced footfall at intu centres as customers avoid travelling while works are underway. To help prevent this, we urge Norfolk County Council and their contractors work closely with stakeholders to develop a comprehensive communications plan prior to the roadworks starting, to ensure customers know they can access Norwich city centre and intu Chapelfield throughout the construction period.

We look forward to learning of the final option for the NWL and will be happy to continue our liaison with the project team.

Kind regards,

A large black rectangular redaction box covering the signature of the National Sustainable Travel & Transport Manager.A small black rectangular redaction box covering the name of the National Sustainable Travel & Transport Manager.

National Sustainable Travel & Transport Manager

A large black rectangular redaction box covering the signature of the Highways Manager.A small black rectangular redaction box covering the name of the Highways Manager.

Highways Manager



[REDACTED]  
Norfolk County Council  
County Hall  
Martineau Lane  
Norwich  
NR1 2DH

6<sup>th</sup> December 2018

Dear [REDACTED]

## **NORWICH WESTERN LINK**

I am writing in support of Norfolk County Council's consultation on the Norwich Western Link. The Norwich Western Link, connecting the new Broadland Northway from the A1067 to the A47 west of Norwich, will help deliver the Economic Strategy for Norfolk and Suffolk, which sets out ambitious targets to grow our economy by £17.5 billion, creating 88,000 new jobs and 140,000 new homes and increasing GVA by £39 per hour by 2036. The Norwich Western Link is also identified as a priority in our recently adopted Integrated Transport Strategy.

The project will encourage further investment into Norwich and Greater Norwich, a Priority Place in the Norfolk and Suffolk Economic Strategy, covering Broadland District Council, Norwich City Council and South Norfolk Council areas to further boost economic growth. The scheme will support the ambitions of our Economic Strategy by reducing city centre congestion and improving transport links and journey reliability to economic opportunities to the north and east of the city to the rest of the County and beyond to the Midlands and the north particularly Norwich Airport, a centre for operations for our internationally significant Energy Coast and home to the world's first Aviation Academy.

The Norwich Western Link also has the opportunity to add to the benefits that will be realised by Highways England's A47 improvements and improve connectivity to the centres of global excellence in food and health at Norwich Research Park, the Food Enterprise Zone at Easton and the Cambridge Norwich Tech Corridor.

This is why we strongly support route D identified in the current consultation. We believe this option will best serve the agri-food sector around Norwich, one of the pillar sectors in our developing Local Industrial Strategy. However we also can see merit in option C. We do however recognise the importance of appropriate environmental mitigation for either route. We do not have a specific opinion on where option D should join the A47 but assume this will be developed alongside Highways England's dualling scheme between Easton and North Tuddenham and its junction strategy.

We continue to look forward to hearing more about the scheme as it develops.

Yours Sincerely

[REDACTED]  
[REDACTED]  
Chief Executive Officer

████████████████████  
Director of Strategy  
Norfolk and Norwich University Hospital  
Colney Lane  
Norwich  
NR4 7UY

Direct dial: ██████████  
Email: ██████████@nnuh.nhs.uk  
Website: [www.nnuh.nhs.uk](http://www.nnuh.nhs.uk)

████████████████████  
Chairman  
Environment, Development and Transport Committee  
Norfolk County Council  
County Hall  
Martineau Lane  
Norwich  
NR1 2DH

18 January 2019

Dear Councillor ██████████

**Norwich Western Link**

I am writing on behalf of the Trust to express our support for the development of the road infrastructure linking the Broadland Northway, formerly known as the Northern Distributor Road (NDR), from the A1067 to the A47 west of Norwich.

This development will provide a significant improvement in access to the hospital from the North Norfolk area, an issue which is particularly apparent with a 69% increase in ambulance services and a 40% increase in outpatients over recent years.

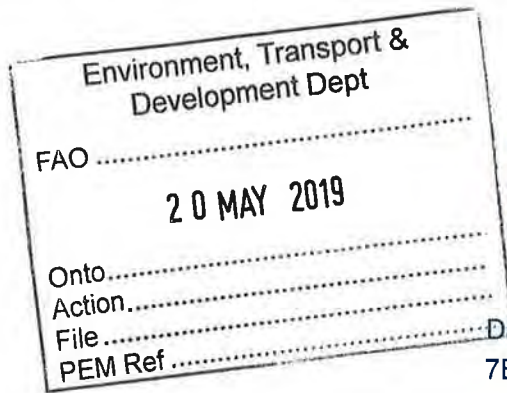
At present, the route to the hospital from the North Norfolk area is not straightforward and it can take some time to navigate across the city. We estimate that approximately 24% of our patient admissions and 23% of our outpatient attendances come from the North Norfolk area, highlighting the issue of transport for patients, ambulances and other emergency vehicles.

As you know the NNUH has experienced a significant and sustained period of increasing demand and it is therefore important that the surrounding infrastructure is able to manage this growth.

We believe the Norwich Western Link is in the interests of our patients and are able to give it our full support.

Yours Sincerely

████████████████████  
Director of Strategy



**Norwich Western Link,**  
Infrastructure Delivery,  
CES department,  
Norfolk County Council  
County Hall,  
Martineau Lane,  
Norwich,  
NR1 2DH

Davey House  
7B Castle Meadow  
Norwich, Norfolk  
NR1 3DE  
Tel: 03456 020 121

17<sup>th</sup> May 2019

Dear Sirs

**RE: Proposed Norwich Western Link**

As the main public transport provider in Norwich, we are acutely aware of the impact that traffic congestion has on our services and the lives of our passengers. With the planned introduction of thousands of new houses, not only in the Greater Norwich area, but specifically to the west of the city, this congestion is only going to get worse.

A good public transport system is a key part of any thriving city and this is almost impossible to deliver if buses are stuck in traffic queues along with general traffic.

The Broadland Northway has already delivered viable alternative routes for general traffic to traverse the city, instead of going directly through the centre and we have as a result, seen a reduction in congestion on some corridors.

There is however, still a significant amount of traffic that uses Dereham Road, the outer ring road and many of the rural roads through Costessey, Drayton and Taverham along with its surrounding areas to travel between the A47 and the A1067 and beyond, to link with the Broadland Northway.

The proposal to build a western link that would remove the need to either use key arterial routes in the city, or rat run through rural roads, therefore reducing congestion, is one that First Eastern Counties would entirely support.

Yours faithfully,

[Redacted signature]

[Redacted name]

Manging Director  
First Eastern Counties Buses Ltd

**From:** [REDACTED] <[REDACTED]@goeastanglia.co.uk>  
**Sent:** 17 January 2019 15:14  
**To:** Norwich Western Link  
**Subject:** Re: Norwich Western Link Options Consultation reminder

Hello

Firstly thank you for giving me the chance to comment on the proposed link between the NDR (Broadland Northway) and the A47.

As someone who lives in [REDACTED] and makes great use of the current new road the link across to the A47 is greatly needed to allow full access across the north of Norwich.

As a bus operator the NDR has allowed us to make more efficient use of buses operating from our depot in Rackheath, buses from here are allocated to the Park and Ride routes as well as our other City operations, all of which can access their starting points from the NDR, this has led to a reduction in time spent between depot and terminal point.

We have our other operating depot based in Dereham and any link from the A47 would have a similar effect for buses operating from this location which would make more efficient use of time and resource.

I would strongly recommend the link road is built as close to the Longwater junction as possible. The success of this link would be the perception that it forms as much of a circle around the North West of Norwich as possible, without the feeling of driving away from the City first.

Bus service development to the North of Norwich, especially with the continuing house building needs access roads fit for purpose and the main roads to the West of Norwich are, at the very best, barely managing with the traffic levels, Dereham Road and Earlham Road being good examples where we have to adapt bus timetables to take account of traffic levels, if these additional resources could be saved by less congested roads we would be able to redirect them to developing bus services elsewhere.

The A47 generally between Dereham and Norwich does suffer from frequent accidents which can disrupt our services, traffic, displaced from the A47, including our buses, are left to use country lanes causing widespread disruption and potential secondary accidents. A Western link road would give a pressure release for the A47 redirecting traffic north onto the A1067 from Norwich meaning less oncoming traffic on the side roads.

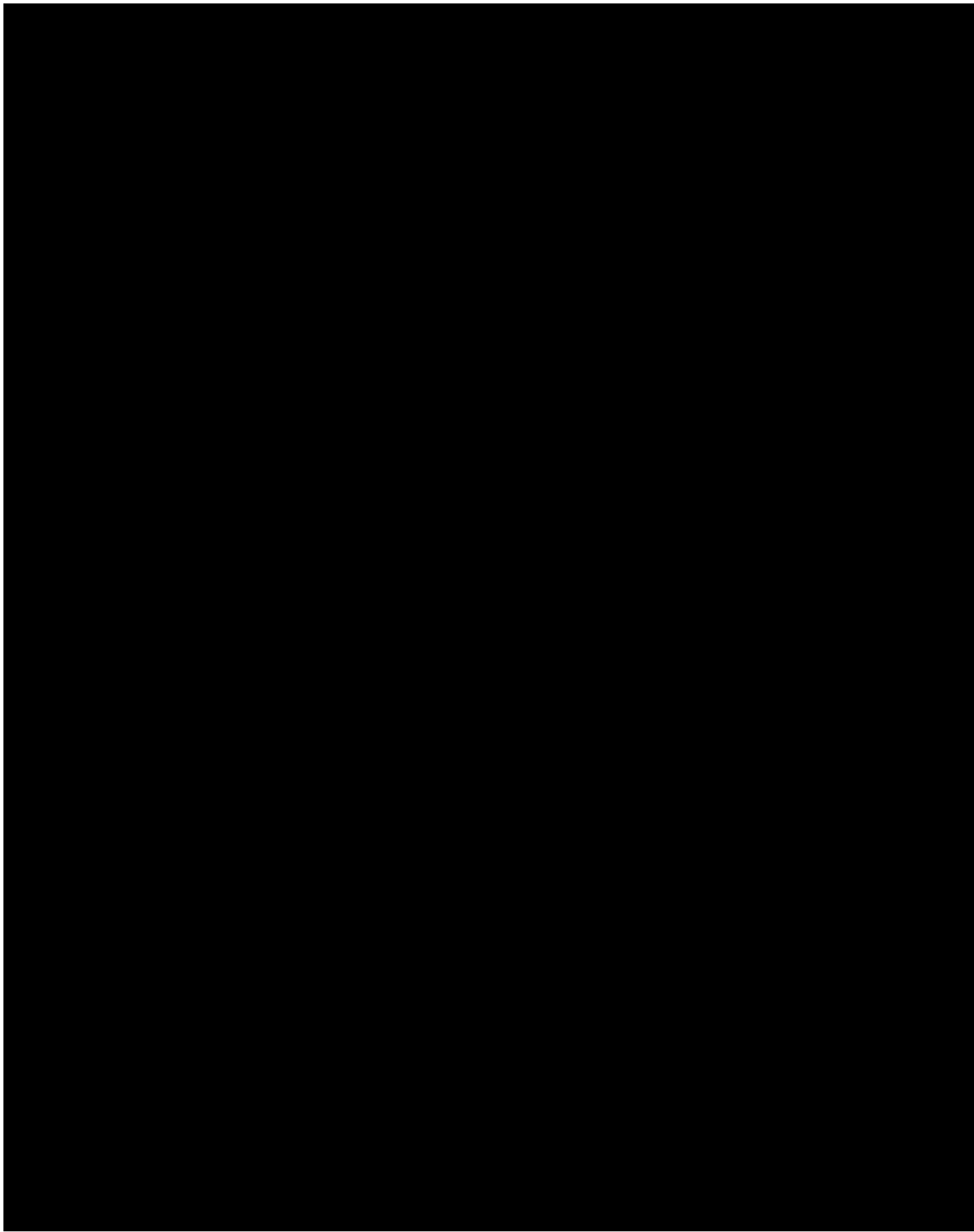
A further suggestion for a link road would be a more user friendly cross country routes between the A47 Dereham bypass at North Tuddenham and the A1067 at Lenwade, this would not only give another or alternative link to the NDR but would also take traffic off the A47 which is heading East Bound from Kings Lynn towards Great Yarmouth, a busy HGV route. Taking pressure off the A47 between Dereham and Longwater would automatically make the junction with the Western Link road less busy encouraging traffic away from the Western Suburbs more readily.

Completing the NDR would provide us with the opportunity to explore new links, especially ones which would not be possible without the use of the a completed road but again I would emphasis it needs to be built as close to the Longwater junction as possible.

I hope the above comments are of use.



Konectbus



[REDACTED]

---

**From:** [REDACTED].ac.uk>  
**Sent:** 18 January 2019 17:23  
**To:** [REDACTED]  
**Subject:** Route choice for Norwich Western Link

Dear Sir

I write to support route D as Easton and Otley College's preferred route for the Western Link. Our second choice route would be C.

Easton and Otley College provides Landbased and wider Further Education opportunities to students from across the whole county. Access to the Easton campus from the north of Norwich currently involves either significantly extending journeys skirting Norwich to the east and south or negotiating the traffic on the routes through the city. The success of students is widely understood to be impacted by the ease or difficulty of access the campus, any extension to journey times has a negative impact on students.

Our reasoning for selecting Route D is that route D offers the shortest route and is likely to allow the avoiding of use of the A47 for journey's from north of Norwich to the College campus. The users of the new link who are coming to the College, the Food Enterprise Zone and possibly the Norfolk Showground, could cross the A47 directly on the road that will link Easton village to the A47 after the extension of the duelling of the A47 and replacement of the existing Easton roundabout. Route D will also offer the shortest journey and time to connect with the important sites west of Norwich; including the UEA, NRP and the NNUH, while simply replacing additional journey time on the A1067 with time on the A47 for those traveling west towards Swaffham. The marginal cost difference indicated in the proposal at less than 6% would be relatively modest for the advantages offered.

Route C, our second choice route, is the second shortest route and lowest estimated cost for a dual carriage way connection. It does not however offer the potential to connect directly to the College without using the A47.

Any route that is not a dual carriage way, Option A in the consultation, would, in our view, be flawed from the outset creating additional bottle necks where dual carriage ways meet single carriage way for however short a link and the cost of rectifying this retrospectively will be significantly higher than constructing a dual carriage in the first instance.

Your faithfully

[REDACTED]  
Director of Estates  
Easton and Otley College  
Easton  
Norwich

IMPORTANT: This email and its attachments are intended for the addressee only and may be confidential. If they have come to you in error you must take no action based on them nor must you copy or show them to anyone. The contents represent the views of the sender and are not necessarily representative of the views of Easton and Otley College.

[REDACTED]

---

**From:** [REDACTED]@btinternet.com  
**Sent:** 15 January 2019 12:13  
**To:** Norwich Western Link  
**Subject:** Public consultation on Western Link

Dear sirs

I am writing on behalf of the Friends of the Tud Valley in Costessey. FoTV is a community based group with the objective of conserving and enhancing the River Tud Valley.

We support the completion of the Northern Distributor Road. We also support the green route as this would be the least damaging the environment of the River valleys and would avoid crossing the Tud valley Yours faithfully

[REDACTED]  
Chair Friends of the Tud Valley

[REDACTED]

**From:** [REDACTED] CMILT [REDACTED]@rha.uk.net>  
**Sent:** 01 May 2019 10:32  
**To:** Norwich Western Link  
**Subject:** Western Link Road A47 A1067

Dear Sir/Madam

This link would enable traffic to take a much shorter route making the area north of Norwich, which contains considerable critical infrastructure, considerably more accessible. It would provide a resilience route in the event the existing A47 failing, or being closed.

The RHA supports the proposal to build a road, ideally dual carriageway, linking the A47 and A1067, as soon as possible. This would reduce journey time, improve air quality and assist the economic growth in the area north of Norwich. Also access to national critical infrastructure, such as the airport and hospital.

Kind Regards

[REDACTED]  
**Area Manager**

**Road Haulage Association Ltd**  
Roadway House, Bretton Way, Bretton, Peterborough, PE3 8DD

[REDACTED]  
Web: [Website](#) [Facebook](#) [Twitter](#) [LinkedIn](#)



Copyright in this message and any attachments remains with us. It is confidential and may be legally privileged. If this message is not intended for you it must not be read, copied or used by you or disclosed to anyone else. Please advise the sender by e-mail immediately if you think you may have received this message in error. This message and any attachments are believed to be free of any virus or other defect that might affect any computer system into which it is received and opened, but it is the responsibility of any recipients to ensure that it is virus free and no responsibility is accepted by RHA Ltd for any loss or damage in any way arising from it. Road Haulage Association Ltd, Bretton Way, Peterborough PE3 8DD. Registered in England number 391886.

**Please consider the environment before printing this email**





**NORFOLK**  
CONSTABULARY  
*Our Priority is You*

---

Norfolk Constabulary

Roads & Armed Policing Team  
OCC Wymondham  
Wymondham  
Norfolk NR18 0WW

---

Tel: [REDACTED]

---

[www.norfolk.police.uk](http://www.norfolk.police.uk)

[REDACTED]  
Non-Emergency Tel: 101

9<sup>th</sup> May 2019

To whom it may concern:

**Re: Norwich Western Link Road.**

I am the Force Traffic Management Officer for Norfolk Constabulary and on behalf of the Chief Constable of Norfolk speak on all traffic related matters.

I have recently been involved in the new Western Link Road project and visited one of the roadshows in the County where the proposal and plans were on public display for public consultation.

On behalf of Norfolk Constabulary I then submitted my comments to the project stating the I am very much in favor of the new western link road and gave my reasons which included cost, distance out of the city of Norwich, and most important the one that I saw as the most environmentally friendly.

On behalf of Norfolk Constabulary, I chose the proposed route C.

One of my main options for picking this particular option was that it took the traffic a bit farther away from the city of Norwich and out onto the A47.

Let's not forget that a lot of traffic using this route will require access to the western end of the A47 and then traverse out of the County either by heading west or South and the new western link will make this a much easier and a more environmentally friendly option.

The western link road for me would greatly reduce the traffic in the northern end of the city of Norwich, which has the added advantages that it will decrease journey times, reduce congestion and pollution.

Also it will allow through traffic to get around Norwich City without having to get onto the outer ring road which in the past has been problematic and extremely busy at times extending journey times, increasing congestion and pollution.

As already stated, journey times will also be cut. I have read a lot in the local media since the Broadland Northway was opened about how much time is saved by using the new road by businesses but also it has cut a lot of members of the public's journey time down also.

As a member of the public, I use the road on a very regular basis and would very much welcome the Western Link Road to be opened giving much easier access to the western end of the A47.

From a policing point of view, it would be very useful to have the Western Link Road completed which would save my officers time when they are on an emergency call rather than go partially around the route and then have to traverse through the city roads which inevitably means much slower traffic and a delayed response.

Completing the western end would have the advantages of a faster police response which allows us to attend incidents faster and this will actually save lives.

During the time the Broadland Northway has been open, I have seen many cyclists using the route (and the few cycle paths) that are on and around it. I have also seen a number of dog walkers utilizing the footpaths that adjoin the road both of which can only assist to help in raising the fitness levels of the local residents who are using these routes.


The Broadland Northway currently hugely increases the access to Norwich International Airport from the eastern end, but not currently from the western end. Once the Western Link Road is built and open, this will also have the effect of increasing the access to the Norwich International Airport from the western end also reducing traffic in the city.

Journey time reliability is also incredibly important for businesses as it allows them to plan their logistics better and improve business. I believe that should the Western Link Road be opened, this would increase journey time reliability not only for the members of the public using the route, but also for the many businesses that use it adding to the economic strategy of the area.

To allow heavy goods vehicles to use this new route once built will take a lot of the heavy traffic away from the Northern end of the City, improving journey times and reducing pollution.

Therefore as can be seen, I am very much in favour of completing the western link of the Broadland and provide much easier access to the A47.

Yours sincerely

  
Traffic Management Officer,  
Norfolk Constabulary.



**Norfolk** County Council

Norfolk Fire and Rescue Service  
Joint Operations and Communications  
Centre  
Norfolk Fire and Rescue Service  
Jubilee House  
Falconers Chase  
Wymondham  
NR18 OWW

**By Email**

Norwichwesternlink@norfolk.gov.uk

NCC contact number: 0344 800 8020  
Text relay no.: 18001 0344 800 8020

Your Ref: Norwich Western Link support  
Date: 30 May 2019

My Ref: N/A  
Tel No.: [REDACTED]  
Email: [REDACTED]@fire.norfolk.gov.uk

Dear Sir/Madam

Please accept this letter as my formal support for the proposal to create a Norwich Western Link road. Norfolk Fire and Rescue Service (NFRS) would welcome developments to improve the road infrastructure in the general area highlighted by the proposals.

In addition to the objective of improving overall road safety for our community, the key outcome of this proposal which NFRS would specifically welcome is reduced traffic congestion and increased traffic flow which we believe will bring a significant benefit in reducing our overall attendance time to incidents in the affected area. NFRS utilise a nearest available asset mobilising system for our emergency response model, and improved road infrastructure can have a positive impact on our response times.

We would also welcome the opportunity to reduce the number of heavy goods vehicles using minor roads around the Norwich area, in addition to the possible positive environmental vehicle emission efficiencies this proposal could deliver.

Please do not hesitate to contact me should you wish for further comment from NFRS.

Yours faithfully,

[REDACTED]

[REDACTED]  
Chief Fire Officer



---

## Proposed Norwich Western Link

**Representations to the short-listed options for a new road  
linking Broadland Northway from the A1067 to the  
A47 west of Norwich**

**on behalf of Clarion Housing Group**

**January 2019**

---

Prepared by: [REDACTED] DipEP, MRTPI

Checked by: [REDACTED] MRTPI

For and on behalf of Brown & Co.

Brown & Co is a leading provider of agency, professional and consultancy services across the whole range of rural, commercial, residential, and agricultural markets.

Date: January 2019.

---

## 1. INTRODUCTION

- 1.1 This document is submitted by Brown & Co on behalf of the Clarion Housing Group in relation to the public consultation being undertaken by Norfolk County Council (NCC) regarding proposals to form a western link between Broadland Northway from the A1067 to the A47 west of Norwich. In addition to this document attached is a technical note from our client's highway consultants, Transport Planning Associates on these proposals.
- 1.2 The purpose of these representations is to draw attention to the context within which these options are being considered, and to highlight the benefits that certain particular routes have above others. Firstly, we wish to fully support the need for a western link to be constructed as it would logically link the Broadland Northway with the Norwich southern by-pass. This will bring significant economic, social and environmental benefits to the Greater Norwich area.
- 1.3 These representations outline the context within which the Western Link is being proposed and identifies which of the Options our clients wish to support.

---

## 2. CONTEXT

- 2.1 The County Council is one of four constituent Authorities to who are preparing a Greater Norwich Local Plan (GNLP) which is intended to replace the Joint Core Strategy as the strategic plan for Broadland, Norwich City and South Norfolk Councils. Currently, the proposed Local Plan is at a Regulation 18 stage in its preparation.
- 2.2 There are no adopted policies prepared at this stage of the Local Plan. There, however, a number of emerging proposals around the edge of the city that need to be considered. One such proposals relates to a new settlement being formed on the western edge of Norwich south of the A47. Known as Honingham Thorpe, this proposal is a mixed use development proposed between the villages of Honingham, Easton, Colton and Barford. The site, currently undeveloped farmland, is adjacent to the committed Food Enterprise Park (FEP), which benefits from a recently approved Local Development Order.
- 2.3 We are currently preparing the proposals for the site which is based on the following:
- 72 hectares of employment space
  - 189 hectares of residential development
  - 66.5 hectares of Country Park
  - 3.5 hectares of Nature Reserve
- 2.4 The broad parameters of the new settlement are fixed by the A47 trunk road (and its proposed improvements) and the land sloping away to the River Tud valley to the north, and the sensitive landscape associated with the River Yare valley to the south. The proposals seek to promote a holistic approach to bringing forward growth to the area. The location already benefits from a Food Enterprise Park where development will shortly commence with its first occupiers. It is intended that a minimum of 3,900 homes of the next 20 years (i.e. the plan period of the GNLP), with the potential for a further 3,600 over the following 15 years. The new settlement has been the subject of representations to the GNLP officers preparing the emerging new Local Plan and we believe it should be considered as an important factor in defining the location of the Norwich Western Link.
- 2.5 Our clients, Clarion Housing Group, is one of the largest Housing Association Groups in England and owns or manages 125,000 homes and welcomes the opportunity to assist in the delivery of growth within Greater Norwich. Formed thorough the merger of Affinity Sutton and Circle Housing Clarion currently works in 176 local authorities, including those Councils that are preparing the Greater Norwich Local Plan (GNLP) – namely, Broadland, South Norfolk and Norwich City Councils. The Group has a strong local presence with over 4,200 properties in Broadland, and a further 650 homes in South Norfolk and Norwich. As a financially strong business for social purpose, the Clarion Housing Group have a long term relationship with the Greater Norwich area and are committed to investing in homes for residents as well as providing a range of community initiatives.
- 2.6 We believe that Honingham Thorpe potentially will become an important element in delivering growth in the future. Under the circumstances, we believe it should be factored into any decision concerning the proposed Western Link Road.

---

## 3. POTENTIAL BENEFITS

3.1 The consultation document describes the high-level and specific project objectives for the Norwich Western Link. In addition, it refers to the potential benefits that could accrue by virtue of the proposed road. We believe that the benefits include:

- Alleviating rat-running that occurs between the Easton roundabout and the A1067 through Ringland and Weston Longville
- The quality of life in the area will be improved through directing traffic along a well-designed road rather than via existing roads and lanes that are not fit for purpose
- It will create better links between the city and the rest of the county which, in turn, will encourage economic growth
- It should free up road space on along arterial roads within the city to improve public transport links
- It will allow better connectivity between the northern side of the city and the southern and western links to the rest of the country
- Assuming Honingham Thorpe comes forward, the new road will provide better links to Norwich Airport, and businesses that occupy the northern edge of Norwich and links to the northern side of the county.
- It will assist in unlocking Honingham Thorpe as a growth location creating opportunities for job creation, new homes over a wide range of tenure, and access to the countryside via the proposed country park.



---

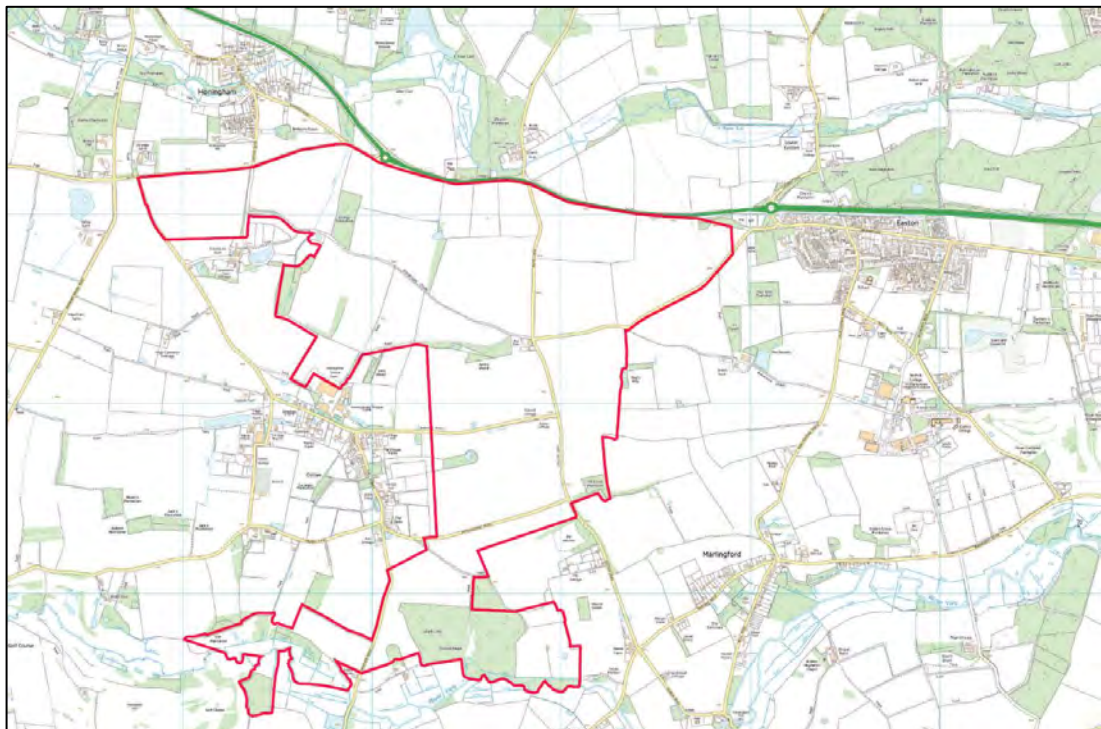
## 4. PREFERRED OPTION

- 4.1 Having reviewed the 4 options being proposed by the County Council, we believe the Option that's likely to deliver the benefits identified above is **Option D**. This would establish a route that is close into the edge of the western edge of the city and deal with most of the traffic issues relating to the immediate area. Whilst it would need to cross both the Rivers Tud and Wensum and will need to resolve certain ecologically sensitive areas, we believe it is the most cost effective way forward in driving through the benefits of the link. We would acknowledge that if the ecological issues are so significant they cannot be dealt with, then **Option C** would be our second preference.
- 4.2 We have considered the remaining two Options A and B but we do not believe they are acceptable in terms of dealing with the traffic issues related to the area or providing the benefits as described. Essentially the routes are too far removed from the edge of Norwich.
- 4.3 In conclusion, our clients, the Clarion Housing Group would support **Option D** as the preferred route of the Norwich Western Link.

## 1 INTRODUCTION

- 1.1 Transport Planning Associates (TPA) have been appointed by Clarion Housing Group to consider the transport and highways implications of a proposed new development, "Honingham Thorpe", to the south of the A47 between the villages of Honingham, Easton, Colton and Barford, in Norfolk.

**Figure 1 – Honingham Thorpe Red Line boundary**



Source: Brown and Co. architects

- 1.2 We are currently preparing the proposals for the Site, which are based on the following:

- 72 hectares of employment space
- 189 hectares of residential development
- 66.5 hectares of Country Park
- 3.5 hectares of Nature Reserve

- 1.3 The broad parameters of the new settlement are fixed by the A47 trunk road (and its proposed improvements) and the land sloping away to the River Tud valley to the north, and the sensitive landscape associated with the River Yare valley to the south. The proposals seek to promote a holistic approach to bringing forward growth to the area. The location already benefits from a Food Enterprise Park where development will shortly commence with its first occupiers. It is intended that the development will include a range of residential tenures with a minimum of 3,900 homes of the next 20 years (i.e. the plan period of the Greater Norwich Local Plan, GNLP), with the potential for a further 3,600 over the following 15 years.
- 1.4 The proposed scheme is being promoted to be included in the GNLP, being produced by Broadland District Council, Norwich City Council and South Norfolk Council working together with Norfolk County Council (NCC) through the Greater Norwich Development Partnership (GNDP). Consultation with the Strategic and Local Highway Authorities, Highways England and Norfolk County Council respectively, are being undertaken to ensure the best transport solutions are identified for the area to accommodate future growth.
- 1.5 This Technical Note is prepared in relation to the Norwich Western Link and the corresponding consultation on the four shortlisted options.

## **2 THE NORWICH WESTERN LINK (NWL)**

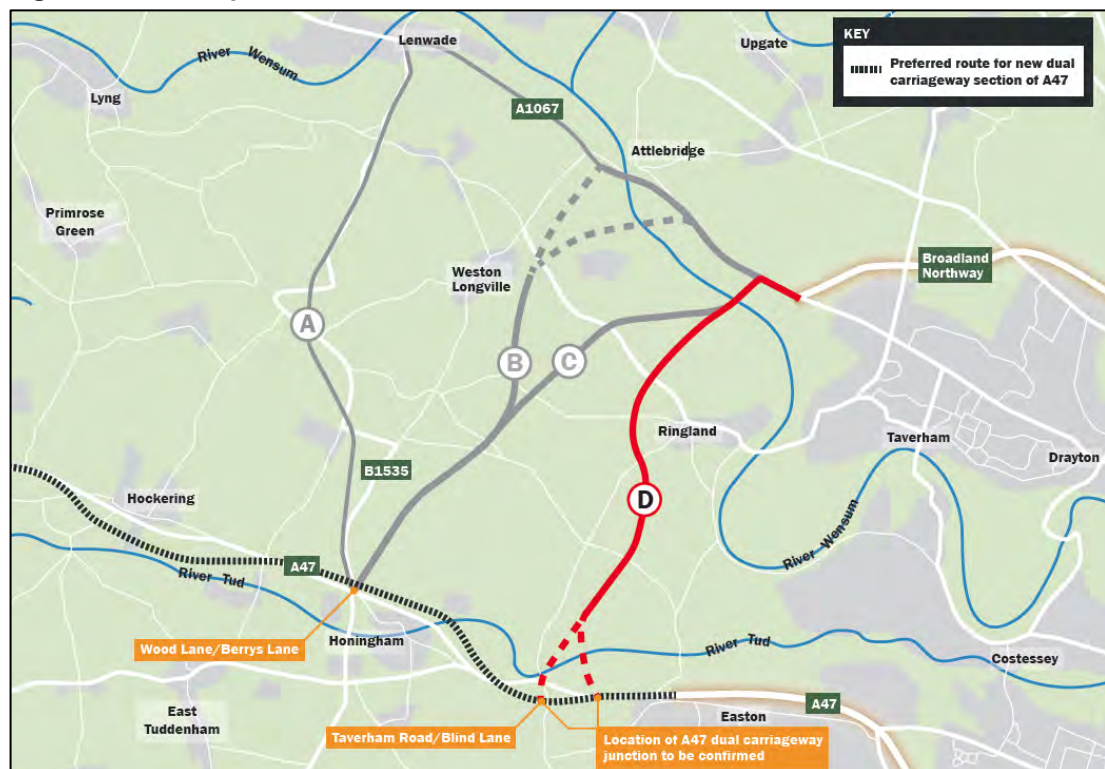
- 2.1 Four potential road options for a NWL, designed to improve travel between the A47 and the western end of Broadland Northway (formerly Northern Distributor Road), have been published.
- 2.2 The creation of this long anticipated “missing link” that closes the Norwich bypass should be seen in the context of significant growth in the Greater Norwich area, with new homes and jobs proposed over the next plan period that will make the new infrastructure needed to accommodate future growth.
- 2.3 We are strongly supportive of the creation of the NWL, and we acknowledge the importance it would play to achieve its five main objectives, namely:
- Support sustainable growth
  - Improve the quality of life for local communities
  - Support economic growth
  - Promote an improved environment
  - Improve strategic connectivity with the national road network.
- 2.4 We have had sight of the “Traffic Flow Map”, referring to a future year 2040 scenario, that accompanies the consultation material and, on the basis of the information therein contained, it appears that the NWL would reduce traffic volumes in the local roads and rat-running via the villages. Whilst we have not been able to confirm the growth assumptions and flows re-distributions forming the basis of the map itself, it is clear that the overall improvements would be significant.
- 2.5 Local knowledge, supported by the results of the junction modelling we have undertaken of the junction, suggests that the Longwater interchange could potentially become a future

constraint over the next few years. The creation of the NWL would help relieve the interchange, reducing the traffic flow from and to the west currently using the A47 and Dereham Road to reach the northern area of the City.

## Alignment Options

- 2.6 The consultation material produced by NCC on the four alignment options has been considered with a view to understanding what alignment might be the preferred one. The following considerations are based on the information published by NCC and not specific capacity modelling undertaken by TPA.
- 2.7 Out of the four options, we note that “A” has been classified as “Low” Value for Money. We agree, based on the alignment and the anticipated vehicles using the route (less than 10,000, by far the lowest out of the four options), that this option appears to be the least preferable.
- 2.8 Out of the three remaining options, all having “High” Value for Money, we believe that the routes that are closer to the City (C or D) would be preferable and provide a more direct connection to Broadland Northway.
- 2.9 Considering the approved Food Enterprise Park at Easton and that Honingham Thorpe is promoted to be included in the GNLP unlocking significant growth, with both new homes and jobs, we deem Option D (illustrated below) being the preferred route. This Option connects to a junction on the A47 proposed immediately to the north of our site and, as such, a north/south corridor would link our site directly to Broadland Northway.

**Figure 2 – NWL Option D**



Source: NCC

- 2.10 We note that two alternatives for how option D could join the A47 are shown. This is due to the aforementioned HE's plans to dual the section of the A47 between North Tuddenham and Easton. NCC states that ***“There is currently limited detail available on the new junction location near Easton and, until more detail is known, the Council has accounted for the possibility of the junction being located near Blind Lane and Taverham Road or closer to the current Easton roundabout junction”***. As confirmed at consultation with HE, the junction form and location could change, however it seems unlikely due to the LDO<sup>1</sup> recently approved for the Food Enterprise Park. The location of the junction makes a small difference to the overall length of the route – 3.8 miles if the route connects near Blind Lane and Taverham Road and 3.7 miles if it connects near the current Easton roundabout.
- 2.11 In the light of the above, we understand that Option D would be more likely to join the A47 at the most western of the two locations identified and we strongly support this to be the case.

### **Sustainable modes**

- 2.12 We understand that the proposed cross section of the NWL is yet to be considered (aside from being a dual carriageway). We strongly support sustainable modes of travel and we would suggest that provision is made for all modes of transport when the route and cross section are further assessed.

## **3 CONCLUSIONS**

- 3.1 In summary, on behalf of Clarion Housing Group, TPA strongly support the concept of the NWL, with a preference of Option D, followed by Options C and B, with Option A being the least preferred, for the reasons stated in this Technical Note.
- 3.2 We suggest that weight is given to the provision of sustainable modes of travel when the Option is chosen and the cross section is designed.

---

<sup>1</sup> South Norfolk planning ref: 2014/1792; Broadland planning ref: 20170052

**DOCUMENT SIGNATURE AND REVIEW SHEET**

	Prepared By:	Checked By:	Approved for issue
<b>Name</b>	██████████	██████████	██████████
<b>Signature</b>	<i>GDG</i>	<i>DE</i>	<i>DE</i>
<b>Date</b>	10/01/19	11/01/19	11/01/19

**Document Review**

Revision	Date	Description	Checked By

# Appendix C



---

TECHNICAL NOTE 2 - MODEL  
OVERVIEW

# TECHNICAL NOTE 2 – NWL Model Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	DM CD
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

## NWL - TRANSPORT MODEL OVERVIEW

### INTRODUCTION

The assessment of highway user benefits for the NWL utilises the Highways England updated NATS 2015 transport model which was updated for the assessment of the A47 RIS schemes assessments. The model was developed in line with WebTAG guidance and calibrated and validated within acceptable industry recognised standards.

The 2015 base models were validated prior to the opening of the A1270 Broadland Northway. In order to confirm the validity of models after the inclusion of the A1270 Broadland Northway a sensitivity model that includes the Broadland Northway was developed for AM peak, Inter peak and PM peak periods using the 2015 validated matrices. The resultant model outputs have been checked in order to determine any significant changes in travel patterns resulting from the inclusion of the Broadland Northway.

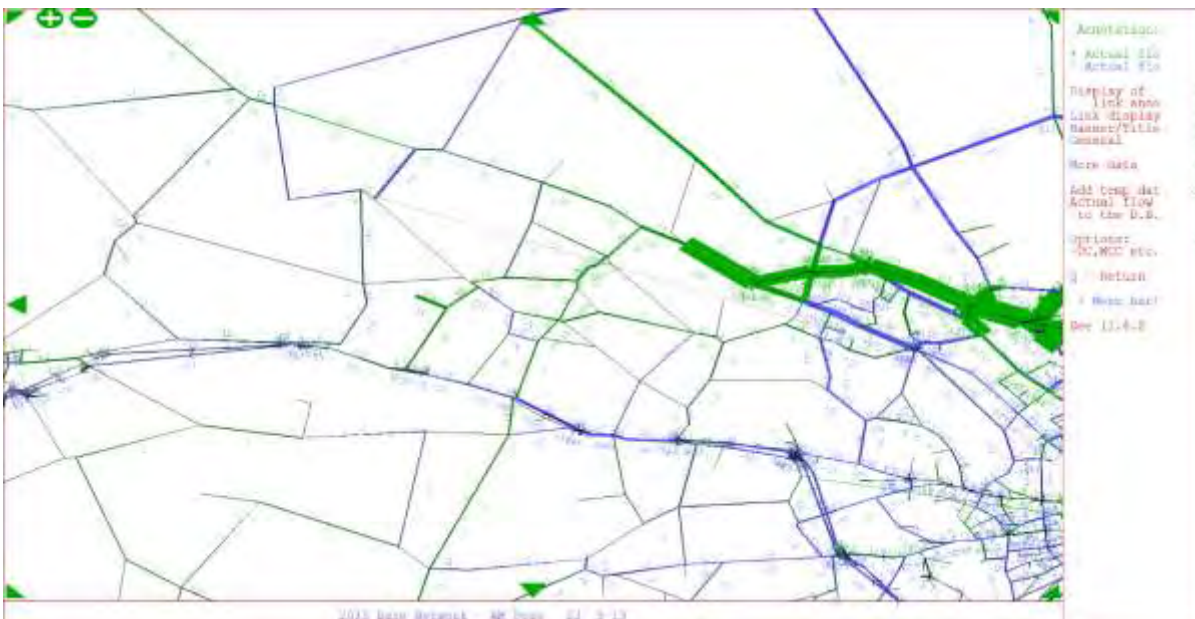


Figure 1 Flow difference (PCU with and without Broadland Northway - AM Peak 2015)



# TECHNICAL NOTE 2 – NWL Model Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	DM CD
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

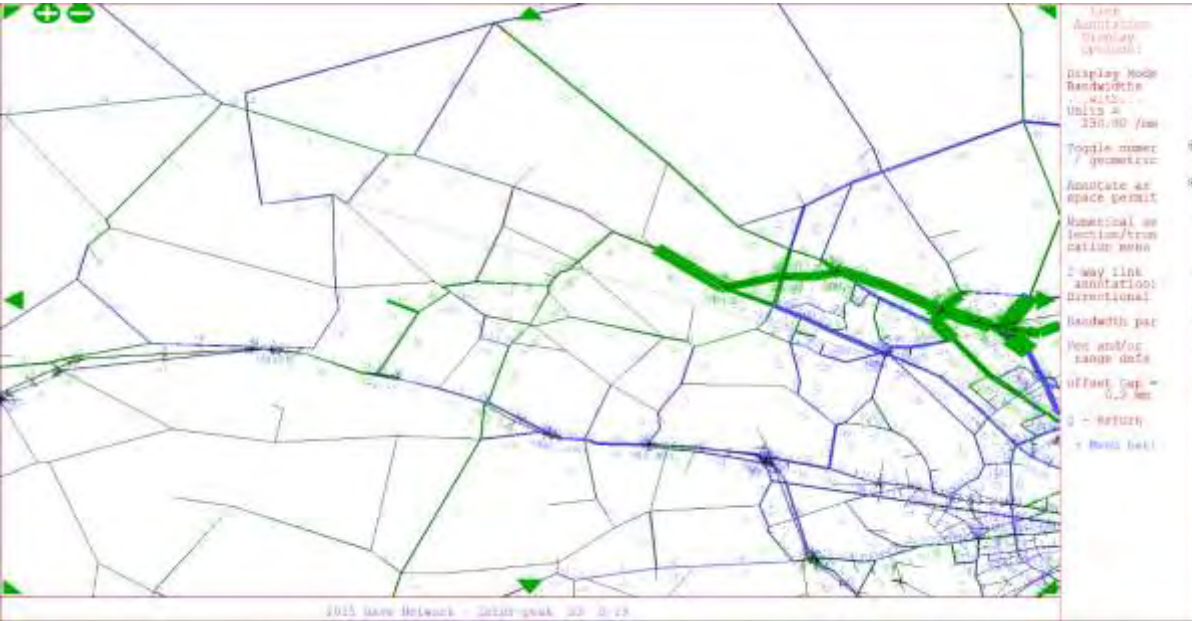


Figure 2 Flow difference (pcu) with and without Broadland Northway – Inter Peak

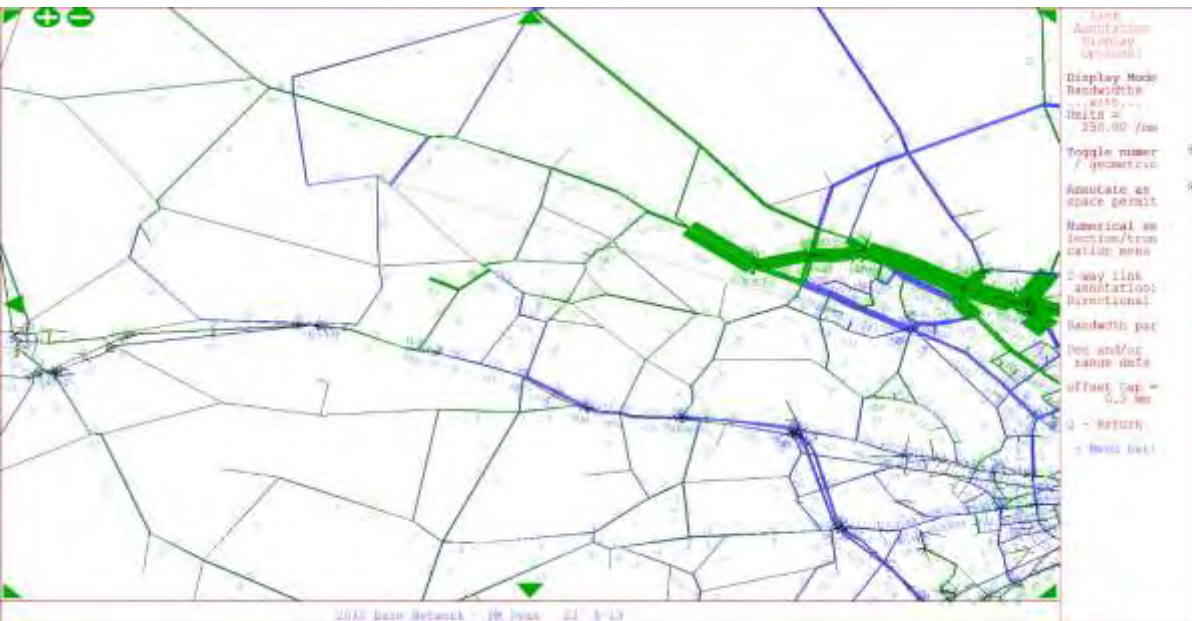


Figure 3 Flow difference (pcu) with and without Broadland Northway – PM Peak 2015

Figure 1 Flow difference (PCU with and without Broadland Northway - AM Peak 2015

Figure 2 Flow difference (pcu) with and without Broadland Northway – Inter Peak and Figure 3 Flow difference (pcu) with and without Broadland Northway – PM Peak 2015



## TECHNICAL NOTE 2 – NWL Model Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	DM CD
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

show that there are no significant differences in modelled flow between the with and without Broadland Northway models. Therefore, it can be concluded that Broadland Northway does not affect traffic volumes within the NWL study area which demonstrates that existing pressures have not been alleviated in this section of the network with the opening of the A1270 Northland Broadway.

### ASSESSMENT OF THE NEED FOR A VARIABLE DEMAND MODEL

DfT guidance on variable demand modelling is provided within WebTAG Unit M2 (March 2017). This states that VDM is not required if the scheme capital cost is below £5M, or both of the following criteria are true:

- There is no crowding or congestion on the network in the forecast year, in the absence of the scheme;
- The scheme will have no appreciable effect on travel choices in the corridor containing the scheme

The Norwich Western Link Appraisal Specification Report ASR (May 2019) suggest that a scheme will have capital cost of at least £56 million. Therefore, it is necessary to evaluate the scheme against the criteria above in order to assess the need for VDM.

The proposed methodology is based on guidance from WebTAG Unit M2. It states that an elastic assignment procedure can be used to give an initial indication of the effects of variable demand. It is therefore proposed to use an elastic assignment model as a proxy for a Variable Demand Model.

To check whether the network is congested in the forecast year a comparison will be made between the core growth forecast (fixed demand approach) and the forecast matrix applied by the elastic assignment. If there is an appreciable difference between the two matrices that would suggest the travel costs in the model is large enough to suppress demand in the elastic assignment. This would imply a congested network.

To check whether the scheme will have an appreciable effect on travel choices a comparison will be made on the expected benefits of the scheme between the fixed demand model and the elastic assignment model. The fixed demand forecast assumes that the only benefits will be derived from a growth of traffic already using the existing routes. An elastic model may assign additional traffic from other origins and destinations to take advantage of the scheme. This induced traffic would therefore affect the expected benefits of the scheme. This would imply that the scheme would have an appreciable effect on travel choices.

WebTAG Unit M2 suggests that a change in benefits of less than 10% in the opening year and less than 15% in the forecast year would be sufficient evidence for a fixed demand model to be deemed acceptable for assessing the scheme.

SATURN contains a number of functional forms for applying the elastic assignment. The simplest of these is the constant elasticity function, which is defined as follows:

$$T = T^0 \left( \frac{c}{c^0} \right)^p$$

## TECHNICAL NOTE 2 – NWL Model Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	DM CD
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

Where:

- T = Trips from the elastic assignment
- T<sup>0</sup> = Trips from the fixed assignment
- c = Generalised costs from the elastic assignment
- c<sup>0</sup> = Generalised costs from the fixed assignment
- p = A power value used to calibrate the elastic assignment

The power value was calibrated by applying the elastic assignment to two variations of the 2015 base year model:

- The base year scenario as defined in the A47 model; and
- A reference case scenario where the fuel costs have been increased by 10%

By comparing the results from these two scenarios it is possible to determine how the elastic assignment reacts to a change in the cost of fuel, otherwise known as the fuel cost elasticity. The fuel cost elasticity is defined in WebTAG Unit M2 as follows

$$e = \frac{[\ln(T^1) - \ln(T^0)]}{[\ln(C^1) - \ln(C^0)]}$$

Where:

- e = Fuel cost elasticity
- T<sup>1</sup> = The demand after the change in cost, in vehicle kilometres
- T<sup>0</sup> = The demand before the change in cost, in vehicle kilometres
- C<sup>1</sup> = The reference case costs, where fuel costs have been increased by 10%
- C<sup>0</sup> = The base year costs, as defined in the Databook.

WebTAG guidance requires that for realism the fuel cost elasticity of the model should be between **-0.25 and -0.35**.

In addition, elasticities for specific trip purposes should be as follows:

*Table 1 Fuel Cost Elasticities per specific Trip Purpose*

Trip Purpose	Value	Acceptable Range
Employer's Business	-0.1	-0.09 > e > -0.11
Commuting	-0.3	-0.27 > e > -0.33
Discretionary (Other) trips	-0.4	-0.36 > e > -0.44



## TECHNICAL NOTE 2 – NWL Model Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	DM CD
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

The calibration process is an iterative process, with power values varying until the fuel cost elasticity of the model converges to a set of values within the ranges listed above.

The calibrated elastic assignment process is then applied to the forecast year scenarios to test the conditions outlined above.

### ELASTIC ASSIGNMENT CALIBRATION

The transport model has five user classes, corresponding to the following categories of vehicle type and trip purpose:

*Table 2 User Classes in the Transport Model*

User Class	Vehicle Type	Trip Purpose
1	Car	Business
2	Car	Commuting
3	Car	Other
4	LGV	Personal (Freight) / Business (Freight)
5	Average HGV	Business (Freight)

For the purposes of the elastic assignment, LGV and HGV trips were assumed not to be affected by changes in fuel cost. Therefore, these trips were fixed in the elastic assignment. Car trips are affected by changes to fuel cost, so these will vary between the elastic and fixed assignments.

As each user class has different target elasticities, the power values for each user class will be different. Since the conditions of the model also vary between peaks, each peak has to be calibrated separately. The resulting power values therefore for each peak and user class are set out in **Table 3** below.

*Table 3 Calibrated Power Values used in the Elastic Assignment*

Model Peak	Vehicle Type   Trip Purpose	Calibrated Power Value
------------	-----------------------------	------------------------



## TECHNICAL NOTE 2 – NWL Model Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	DM CD
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

<b>AM Peak</b>	Car   Employer's Business	-0.55
	Car   Commuting	-1.18
	Car   Discretionary (Other)	-1.39
<b>Inter Peak</b>	Car   Employer's Business	-0.5
	Car   Commuting	-1.05
	Car   Discretionary (Other)	-1.38
<b>PM Peak</b>	Car   Employer's Business	-0.55
	Car   Commuting	-1.18
	Car   Discretionary (Other)	-1.43

These power values were taken forward into the forecast models, which have been evaluated in the sections below.

The elastic forecast assignments were generated by running the fixed assignments.

For each fixed assignment (model year, peak and scenario) a generalised cost matrix was skimmed from the fixed assignment model.

This cost matrix was used as an input into the elastic assignment along with the fixed matrix. This created a new demand matrix for each model year, peak and scenario based on the output of the elastic assignment.

A final fixed assignment was then run using the new demand matrices to generate the final output which is used in the economic comparisons below.

### DO MINIMUM FORECAST YEAR MATRIX TOTAL COMPARISON

The following tables outline the differences in trip numbers between the fixed and elastic matrices in the 2040 Do Nothing scenario, for each modelled peak.

*Table 4 Fixed and Elastic Assignment Matrix Comparison – AM Peak 2040*

	<b>AM</b>
--	-----------



## TECHNICAL NOTE 2 – NWL Model Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	DM CD
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

	<b>Fixed Assignment</b>	<b>Elastic Assignment</b>	<b>Diff</b>	<b>% Diff</b>
<b>Car EB</b>	5806.24	5804.96	-1.28	-0.02%
<b>Car Commuting</b>	39085.59	39085.6	0.01	0.00%
<b>Car Other</b>	49228.38	49223.55	-4.83	-0.01%
<b>LGV</b>	10732.79	10732.24	-0.55	-0.01%
<b>HGV</b>	13665.3	13664	-1.3	-0.01%

*Table 5 Fixed and Elastic Assignment Matrix Comparison – Inter Peak 2040*

	<b>IP</b>			
	<b>Fixed Assignment</b>	<b>Elastic Assignment</b>	<b>Diff</b>	<b>% Diff</b>
<b>Car EB</b>	7198.16	7196.59	-1.57	-0.02%
<b>Car Commuting</b>	6661.96	6660.14	-1.82	-0.03%
<b>Car Other</b>	63139.16	63131.39	-7.77	-0.01%
<b>LGV</b>	8088.28	8087.75	-0.53	-0.01%
<b>HGV</b>	13581.1	13579.74	-1.36	-0.01%

*Table 6 Fixed and Elastic Assignment Matrix Comparison – PM Peak 2040*



## TECHNICAL NOTE 2 – NWL Model Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	DM CD
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

	PM			
	Fixed Assignment	Elastic Assignment	Diff	% Diff
Car EB	7445.59	7444.28	-1.31	-0.02%
Car Commuting	35766.83	35764.89	-1.94	-0.01%
Car Other	60778.39	60779.44	1.05	0.00%
LGV	8978.68	8978.07	-0.61	-0.01%
HGV	6821.71	6820.13	-1.58	-0.02%

**Table 4** Fixed and Elastic Assignment Matrix Comparison – AM Peak 2040

**Table 5** Fixed and Elastic Assignment Matrix Comparison – Inter Peak 2040

Table 7 Comparison of Economic Benefits – Fixed vs Elastic Assignments show that for the AM, Inter and PM peak model respectively, the changes in matrix totals are negligible between the fixed and elastic assignment. This suggests that there is little trip suppression in the peak periods.

### ECONOMIC BENEFIT COMPARISON

The total value of benefits has been calculated for the opening year of 2025, the forecast year of 2040 and 2050 and the horizon year of 2084. Monetary results are presented in 2010 prices, discounted to 2010. These results are shown in **Table 7** Comparison of Economic Benefits – Fixed vs Elastic Assignment

*Table 7 Comparison of Economic Benefits – Fixed vs Elastic Assignment*

Option	Model Year	Fixed Assignment	Elastic Assignment	Percentage Diff
Option A	2025	804,085	805,798	0%
	2040	861,991	881,727	2%
	2050	1,341,994	1,161,502	-13%



## TECHNICAL NOTE 2 – NWL Model Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	DM CD
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

Option	Model Year	Fixed Assignment	Elastic Assignment	Percentage Diff
Option B West	2084	940,509	814,754	-13%
	2025	3,996,169	3,987,399	0%
	2040	4,797,412	4,839,074	1%
	2050	6,767,579	6,567,666	-3%
	2084	4,856,616	4,717,027	-3%
Option B East	2025	3,732,889	3,735,778	0%
	2040	4,492,797	4,405,220	-2%
	2050	6,388,089	6,347,164	-1%
	2084	4,597,166	4,567,590	-1%
Option C	2025	4,650,039	4,604,376	-1%
	2040	5,485,982	5,350,022	-2%
	2050	7,257,531	7,200,835	-1%
	2084	5,155,626	5,115,022	-1%
Option D	2025	4,175,097	4,207,188	1%
	2040	5,282,996	5,316,879	1%
	2050	6,348,408	4,918,037	-23%
	2084	4,537,412	3,531,805	-22%

These values are in excess of the limits of 15% variation for the forecast year for Option D as set out within WebTAG. It has therefore been determined that a Variable Demand Model will be required for the assessment of the proposed NWL options.

*Table 8 Comparison of BCR – Fixed vs Elastic Assignment*

Scenario	Fixed Ass	Elastic Ass	% Diff
Option A	1.265	1.144	-10%
Option B west	2.372	2.324	-2%





## TECHNICAL NOTE 2 – NWL Model Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	DM CD
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

Scenario	Fixed Ass	Elastic Ass	% Diff
Option B east	2.792	2.768	-1%
Option C	2.611	2.581	-1%
Option D	2.217	1.875	-15%

- 1.1.1. The values show that there is a reduction of 10% and 15 % Option A and Option D respectively when elastic demand assignment has been used.

Traffic flow information from the models has been supplied to the environmental teams for the purpose of developing air quality and/or noise models. For each modelled year and design option, the following data has been provided:

- Average link flow data:
  - 24-hour annual average daily traffic (AADT) data for air quality modelling
  - 24-hour annual average weekday traffic (AAWT) data for noise modelling.
- Percentage mix of HGV traffic (all vehicles greater than 3.5 tonnes).

# Appendix D



---

TECHNICAL NOTE 3  
ECONOMIC NARRATIVE



# TECHNICAL NOTE 3 – NWL Economic Narrative

<b>DATE:</b>	20 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link Economic Narrative		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	LA SP EM
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

## NWL - ECONOMIC NARRATIVE

### Geographical Context

Norwich is the county city of Norfolk, and is a key regional centre in the East of England. It is approximately 185km north-east of London, and occupies a strategically significant position within East Anglia. Norwich is directly served by a number of trunk roads, including the A11 (linking Norwich to London, via the M11), and the A47 (linking Norwich to Great Yarmouth and Lowestoft in the east and to Leicester, Peterborough and King's Lynn in the west). Norwich is also served by the A140 (linking Norwich to Cromer in the north and Ipswich in the south, via the A14) and the A146 (linking Norwich to Lowestoft).

Norwich is also an important rail node for the East of England, with a mainline link to London and providing connections to coastal locations such as Cromer, Great Yarmouth and Lowestoft. The station is the northern terminus of the Great Eastern Main Line providing connections to Ipswich, Colchester and Chelmsford. Direct connections are also available to Cambridge, Peterborough, Manchester and Liverpool although it is expected that direct connection to Liverpool will be split by 2021. **Figure 1** identifies Norwich in the context of key urban settlements and transport links in the surrounding area.

The city performs a regional role in delivering growth and as a major employment, shopping and service centre, and a focus for transportation. The Norwich Research Park is located to the south the Longwater junction and currently provides various roles to 12,000 people with an annual research budget of £130 million. The Food Enterprise Park is located to the west of Easton and includes 100 acres of potential development within the Food Enterprise Zone. Norwich is also acknowledged as a leading centre in the UK finance and insurance services and has the largest general insurance centre in the UK, with support functions and supply chain companies located throughout the Greater Norwich area.

A longstanding partnership between the three district councils and the County Council has delivered a joint Core Strategy, a City Deal, and large scale jobs and housing growth. Planned growth includes what is believed to be the largest urban extension in the country (13,500 homes), underway to the north east of Norwich. A new joint Local plan is currently at Regulation 18 stage.

The completion of the NDR, which was subsequently designated as an A-Road in the route hierarchy (A1270) and named Broadland Northway, has highlighted the 'missing link' between the A47 and A1067 and there has been continued support for a western link solution to be delivered

# TECHNICAL NOTE 3 – NWL Economic Narrative

<b>DATE:</b>	20 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link Economic Narrative		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	LA SP EM
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA



**Figure 1 – Geographical context of Norwich**

## Study Area

- 1.1. The focus of this study is the north-west area of Norwich, known as the Norwich Western Quadrant (NWQ), as illustrated in **Figure 2**. The broad study area includes the key radial routes of the A47 trunk road, the A1074 (Dereham Road), and the A1067 (Drayton High Road / Fakenham Road).
- 1.2. The study area encompasses the western fringe of Norwich and settlements, including; Bawburgh, Marlingford, Honingham, Hellesdon, Drayton, Taverham, Costessey, New Costessey, Ringland, Hockering, Weston Green, Weston Longville, North Tuddenham, Primrose Green, Lenwade, Alderford, Marton, Ugate, Felthorpe, Thorpe Marriot, Horsford, Elsing and Lyng.

# TECHNICAL NOTE 3 – NWL Economic Narrative

<b>DATE:</b>	20 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link Economic Narrative		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	LA SP EM
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA



Source: About the Norwich Western Link, Location Map (Norfolk County Council)

Figure 2 – Study area

## Wider Road Network

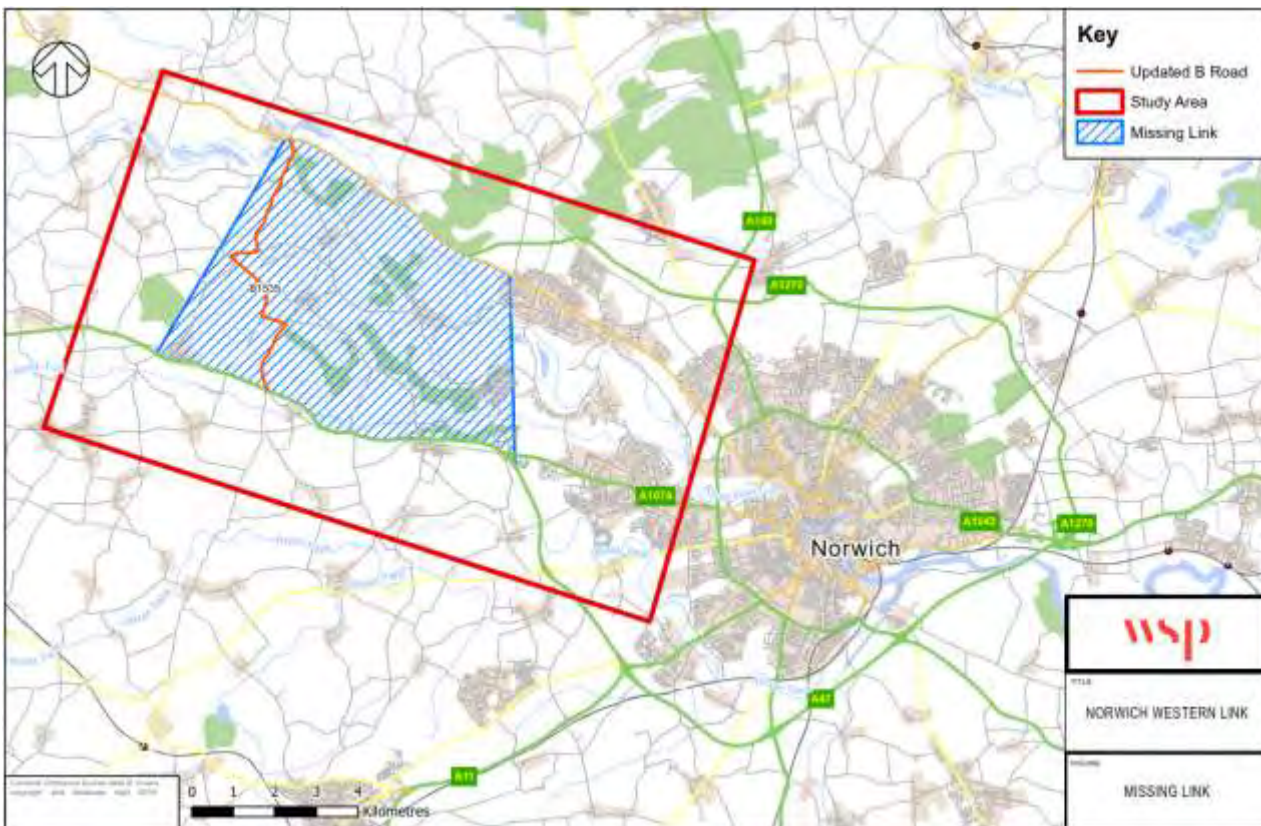
### HIGHWAY NETWORK

- 1.3. The study area is bounded to the south by the A47 which forms part of the Strategic Road Network (SRN) , which is to be dualled between Tuddenham and Easton, Hospital, and provides a link from Lowestoft and Great Yarmouth in the east, via Norwich towards King’s Lynn, Peterborough and the A1. Just outside of the study area to the south-east, the A47 connects with the A11 which also forms part of the SRN and provides connections from Norwich to Cambridge and London (via the M11). The A1270/Broadland Northway is located to the north.

# TECHNICAL NOTE 3 – NWL Economic Narrative

<b>DATE:</b>	20 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link Economic Narrative		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	LA SP EM
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

- 1.4. Within the study area there is a key ‘gap’ between the A47 and A1067 and the A1270 (Broadland Northway), with a limited number of routes connecting the two. The existing links are rural single carriageway roads and pass through residential areas including Costessey, Taverham, Ringland and Weston Longville.
- 1.5. Improvements have been delivered along Sandy Lane, Walnut Tree Lane, Wood Lane, Stone Road and Lyng Road to provide an enhanced link between the A47 and north Norwich for Heavy Goods Vehicle (HGV) movements, primarily to reduce long-standing HGV traffic problems in Hockering. Since the improvements, this route has now been designated as a B-Road (B1535) in the route hierarchy. However, the alignment of the B1535 is constrained by existing property boundaries and consequently includes a number of tight bends.
- 1.6. **Figure 3** demonstrates the study area, indicating the B1535 and the key ‘gap’ between the A47 and A1067 in relation to the newly completed A1270 and the existing A47.



**Figure 3 – Key ‘gap’ between the A47 and A1067**

The final section of the A1270, from the A1151 Wroxham Road to the A47 at Postwick, opened on Tuesday 17 April 2018. The A1270 significantly increases network capacity, providing an improved route for trips

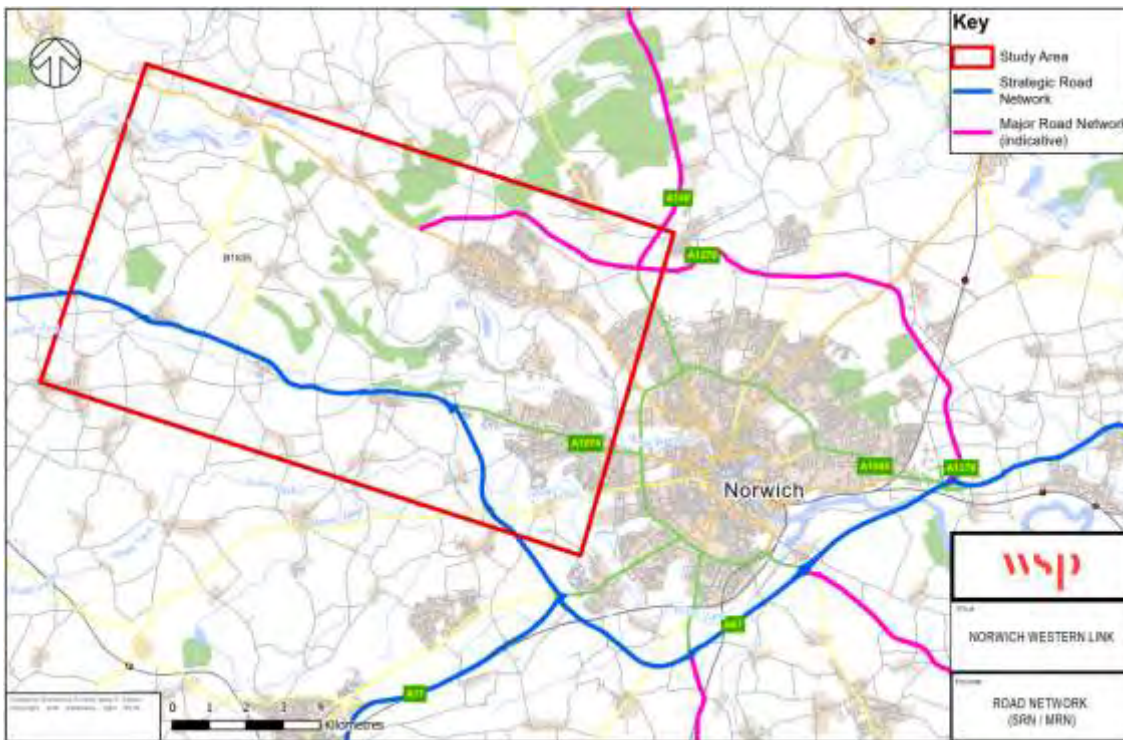
# TECHNICAL NOTE 3 – NWL Economic Narrative

<b>DATE:</b>	20 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link Economic Narrative		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	LA SP EM
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

whilst relieving traffic pressures and congestion on existing routes. However, the lack of a western link reduces the orbital connectivity, and existing traffic issues within the NWQ remain.

The A140 and A1270 are Major Road Network (MRN) routes, connecting to the A47 at the Postwick Hub, as shown in **Figure 4**. The MRN forms the middle tier of the UKs busiest and most economically important local authority 'A' roads, sitting between the national Strategic Road Network (SRN) and the rest of the local road network.

A NWL would fill in the missing link between the A47 and A1067 in the west, extending the A1270 to meet the A47 on the west of Norwich. This route would increase orbital connectivity and provide a suitable east-west alternative for vehicles to circumnavigate Norwich to the north, providing a connection for traffic from the west to economic and business centres in the east and locally and would be appropriate to form part of the MRN due to its connectivity with the A47 (SRN) and the A1270 (MRN). The Link would help to alleviate current traffic issues in local communities while providing greater access to the wider network through an appropriate higher standard routing option.



Source: Major Road Network, Map (Department for Transport)

**Figure 4 –MRN routes**



## TECHNICAL NOTE 3 – NWL Economic Narrative

<b>DATE:</b>	20 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link Economic Narrative		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	LA SP EM
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

### DEVELOPMENT

The study area has a mixture of land uses, including; rural farmland, parkland, the River Wensum, the River Tud, residential areas (including 2,000 homes under construction at Queens Hills and 1,000 at Lodge Farm; and an allocation at Easton for nearly 1,000 homes), Longwater Business and Retail Park, the Food Enterprise Park, the Norfolk Showground and Easton & Otley college. The study area also includes the River Wensum Valley and a number of environmental designations including the River Wensum SAC, designated due to its international importance in biodiversity conservation, and a Site of Special Scientific Interest (SSSI). The environmental constraints of the NWL scheme are outlined in more detail in Technical Note.

### Local Economy

#### EMPLOYMENT

Norwich is the largest labour market in the county, accounting for approximately 60% of all jobs in Norfolk, and as such, creates large volumes of movements of goods and people. Transport efficiency is a critical component of economic growth nationally and locally. **Figure 5** shows the economic activity of the population aged 16 to 74 within the NWQ, derived from the National Institute for Statistics (NIS). The graph includes the percentage of population in employment (including those in full or part-time employment and self-employed), unemployed, in full time education, retired, and economically inactive (including those looking after family or suffering from long-term sickness or disabilities).

Across the study area, the employment rate ranges from 16% around the electoral ward of University and 50% in Wensum (located to the south-east and including North Earlham) to 79% in Horsford and Felthorpe located to the north-east. Unemployment rates range from 4% in Cringleford, University, Drayton and Great Witchingham to 13% in Wensum. Apart from the eastern part of the study area (Bowthorpe and North Earlham), the NWQ has higher levels of employment than the surrounding county, region and country as a whole.

As a result of an ageing population within the NWQ, and in order to fill future employment roles, it is expected that employees will have to travel from further afield and will need to journey through the study area to reach these destinations. Therefore, routes within the NWQ can be considered as key desire lines. Key employment centres and potential growth areas, including the Norwich Research Park (NRP), the Food Enterprise Zone and Norwich International Airport, as well as employment at the University of East Anglia (UEA), Norfolk and Norwich University Hospital (NNUH), could benefit from the introduction of a NWL.

Census journey to work data, using the origins of usual residents to various employment centres undertaken during the Option Assessment Report (OAR) phase of the study are shown in **Figure 6** with larger versions of these figures found within Error! Reference source not found..

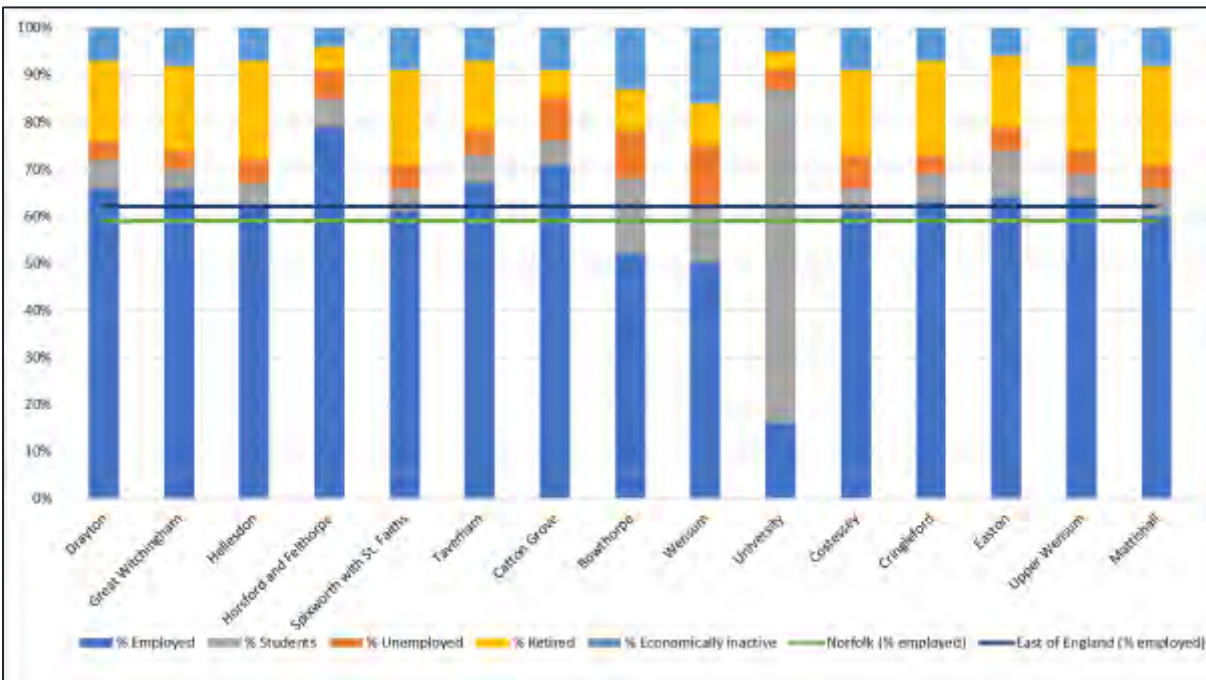


# TECHNICAL NOTE 3 – NWL Economic Narrative

<b>DATE:</b>	20 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link Economic Narrative		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	LA SP EM
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

Analysis undertaken by WSP shows that large number of employees and potential employees are located to the west and south west of the airport. Currently these trips use routes through Norwich or on the local roads between the A1067 and A47. Airline Passenger numbers exceeded 500,000 in 2017, and are forecast to rise to potentially 1.4 million by 2045. Currently Norwich Airport is estimated to be worth £70 million to the local economy which could increase to £170 million by 2045. It is estimated that this would see employment grow to 2,500 direct, indirect and induced jobs by 2030. By 2045, it is estimated that, in total, Norwich Airport will support up to 3,350 direct, indirect and induced jobs. Of these, around 3,250 jobs may be in the ‘local economy’. Without the NWL the success of business associated with Norwich International Airport will be significantly impacted as existing routes become clogged and access to employees reduced rather than expanded.

Further to this there is currently discussion underway in relation to the potential redevelopment of the Airport land adjacent the A1270 which would incorporate significant employment opportunities for the region. Again, without the provision of the NWL access to this employment opportunity for those in the south and west of Norwich would be greatly impacted.



Source: Norfolk Insight Statistics

Figure 5 – Economic activity across the study area

# TECHNICAL NOTE 3 – NWL Economic Narrative

<b>DATE:</b>	20 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link Economic Narrative		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	LA SP EM
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

**Figure 6** also demonstrates the origins of residents to various employment locations in Norwich and the North West Quadrant in particular. The census data indicates that many commuter journeys have potential desire lines through the NWQ, which, dependent on whether their locations of work are to the north or south of the city, could benefit from a NWL. In addition, key workplaces such as NNUH, UEA, Norwich Research Park, Norwich International Airport, Hethel and further afield locations such as Attleborough / Wymondham, attract a large proportion of journeys to work from the NWQ, and could benefit from a NWL, avoiding the need to use the local road network, or the outer ring road of Norwich to access the A11 heading south-west out of the city.

It is considered that future economic growth, based on the Local Plan and the LEP’s economic strategy, will increase the demand of these trips while non delivery of the NWL will significantly impact the accessibility of these potential employment opportunities.

The Norfolk and Suffolk areas are home to an advanced and nationally significant farming sector, which includes globally renowned food and drink companies and a world-leading agri research base centred at Norwich Research Park (NRP). The sector accounts for 111,136 jobs and while jobs in traditional agricultural production have declined, there has been job growth in higher value food processing. The food enterprise zone located at Easton will continue to help this industry grow, however the existing congestion and lack of suitable north to south routes capable of handling large number of goods vehicles is likely to hinder future development.

Norwich International Airport



Hethel



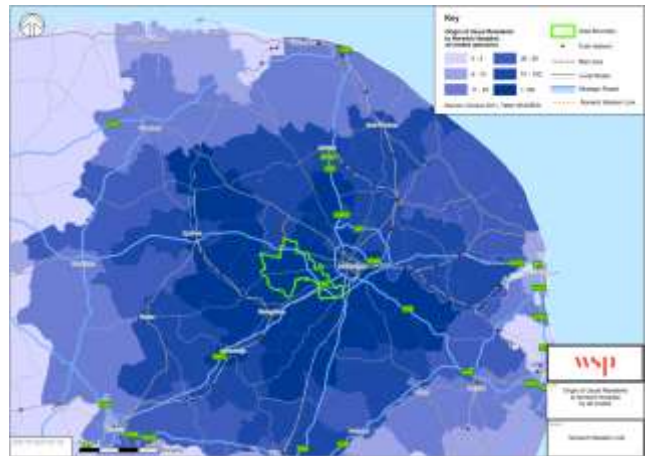
# TECHNICAL NOTE 3 – NWL Economic Narrative

<b>DATE:</b>	20 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link Economic Narrative		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	LA SP EM
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

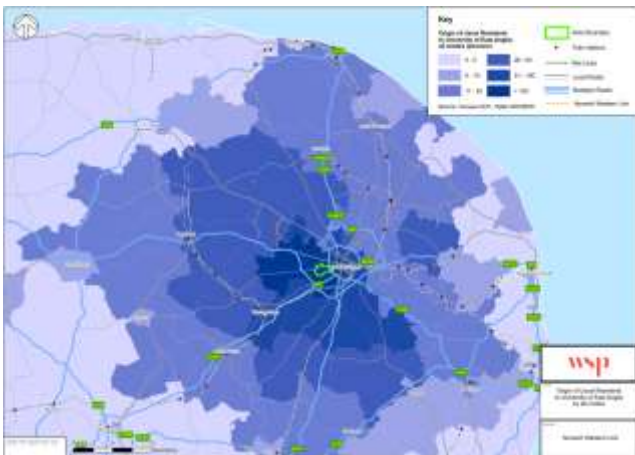
Norwich city centre



NNUH



UEA



Attleborough / Wymondham

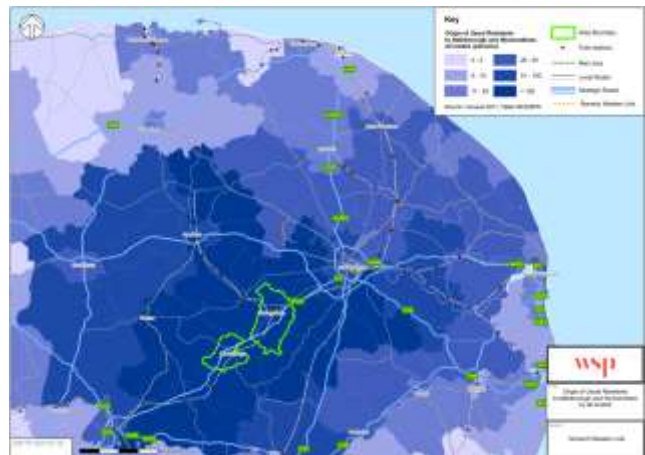


Figure 6 - Origins of residents to various employment locations

## Freight and Goods Movement

The NWQ sits strategically to the west and south of Norwich International Airport, and 59 miles north of Felixstowe Port which is the region's and nation's largest freight gateway. Currently goods movements to Felixstowe from the coastal areas north of Norwich are constrained in terms of potential routing alternatives, with high levels of congestion currently associated with the A47 and A1067 west of Norwich. The A47 between North Tuddenham and Easton is currently single carriageway with at grade junctions and



## TECHNICAL NOTE 3 – NWL Economic Narrative

<b>DATE:</b>	20 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link Economic Narrative		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	LA SP EM
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

observed average speed data taken from WebTRIS data has shown an average peak hour speed of 26mph in the AM peak eastbound and 45 mph westbound, and an average speed of 44mph eastbound and westbound in the PM peak to the east of Honingham.

The A1067 in study area is single carriageway with numerous at grade junctions and points of access and is known to suffer from significant congestion in the peak hours to the east of the town of Drayton.

As discussed in above the recent upgrade of the B1535 has helped reduce HGV movements on some local links, however, the alignment of the B1535 is constrained by existing property boundaries and consequently includes a number of tight bends and HGVs therefore still tend to use the A47 or A1067 before using more suitable roads to transfer from north to south.

An early morning study was carried out by a local transport operator in November 2018 comparing the impacts of using the B1535 with a section of the existing A47. It found that using the B1535 took 8 minutes to travel the 4.9 miles between the A1067 and the A47 at an average speed of 36.75mph, using 4.28 litres of diesel or 5.2miles per gallon (MPG). In the same conditions the same vehicle travelled 7 miles in 8 minutes at an average speed of 52.50mph on the A47 with a vehicle MPG reading for that period of 8.3MPG. This indicates that higher standard roads allow freight traffic to travel further and more efficiently than on lower standard roads. While the B1535 improved conditions for HGVs using local roads, the current lack of an appropriate link in the NWQ negatively impacts goods movement in the area resulting in reassignment and extended journey times.

Improved access to international markets is critical for future growth which will help business to business connectivity in terms of realising opportunities and developing trade. The Port of Felixstowe, the UK's largest container port, handling over 40% of national container traffic is expected to grow by an additional million containers by 2025. This is likely to place significant strain on existing routes both in a national and regional context. Currently the missing link within the NWQ will constrain existing goods movements and may impact potential for growth within the NWQ and regionally due to the longer route around Norwich equating to higher transport costs for business.

Norwich International Airport is located 2.5 miles to the north of Norwich on the boundary of the study area, adjacent the A140 Holt Road and to the south of the A1270 Broadland Northway. In order for Norwich Airport to grow, improved road connectivity is essential. The Airport's expansion plans require improved connectivity in the area to enhance accessibility for passengers and other users. While the A1270 Broadland Northway has helped to significantly improve access, the current network provision is limited for potential users from the west of Norfolk and the West Midlands.

The provision of a more appropriate route for goods movements, in terms of conditions, directness and length of route, would prove more economically efficient for business and produce a more freight and goods-friendly environment for the region as a whole as demonstrated in the W's Transport study.



## TECHNICAL NOTE 3 – NWL Economic Narrative

<b>DATE:</b>	20 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link Economic Narrative		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	LA SP EM
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

### EDUCATION

Currently there are a large number of educational opportunities at Easton & Otley College and UEA, along with healthcare at the NNUH. While transport to Easton & Otley College from Fakenham is provided, improved routing and journey times via an NWL would significantly improve accessibility to these establishments. This would reduce the impact of constrained access to education by residents to the west and north of Norwich and within the NWQ.

Improved journey times for all modes of transport would increase educational options and opportunities to a far greater number of potential students and allow significantly improved access by poorer students in rural areas to the west and north of Norwich.

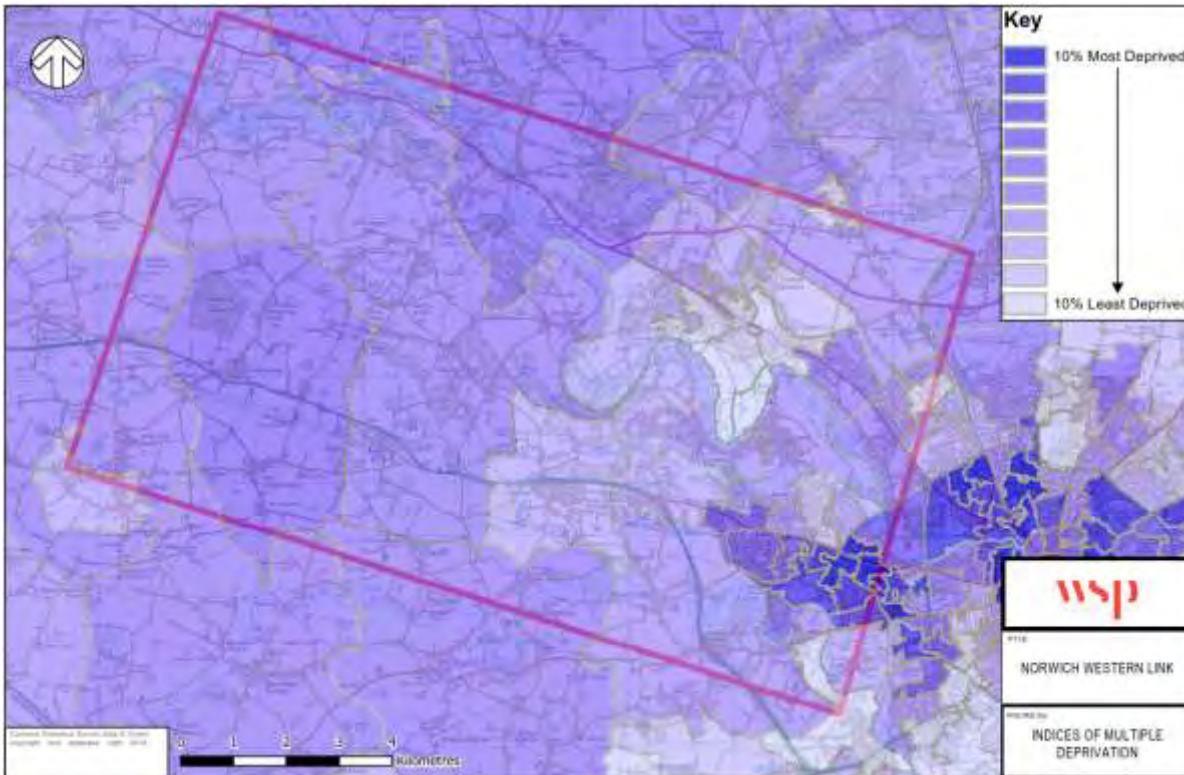
Furthermore, the provision of transport from the NWQ and beyond to special schools in the south-west of the city at Harford Manor and Parkside would be significantly improved through increased accessibility improving inclusiveness of educational services provided in the region.

### DEPRIVATION

The NWQ has two of its Lower Super Output Areas (LSOAs) in the 10% most deprived areas of the country, measured against the Indices of Multiple Deprivation (IMD). The IMD includes various factors influencing the level of affluence in an area including income, employment, education, health, crime, barriers to housing services and the living environment. The areas experiencing the highest levels of multiple deprivation are located west of Norwich and include parts of the Bowthorpe and North Earlham residential areas, as shown in **Figure 7**.

# TECHNICAL NOTE 3 – NWL Economic Narrative

<b>DATE:</b>	20 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link Economic Narrative		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	LA SP EM
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA



Source: Indices of Multiple Deprivation (Ministry of Housing, Communities and Local Government)

**Figure 7 –Norwich Indices of Multiple Deprivation**

Higher deprivation exists across the study area when education, skills and training indices are considered. The most deprived LSOAs are located south-east in Bowthorpe and North Earlham. The Larkman estate area, which includes Motum Road and Beecheno Road is in the 10pc most deprived neighbourhoods in the country.

Other areas are amongst the 30% most deprived neighbourhoods in the country. The total estimated population in the most deprived wards is approximately 15,800 which accounts for 20% of the NWQ population.

Beyond the North West Quadrant to the east several areas of Norwich are currently found within the top 10% most deprived areas of the country including Norwich’s Crome Ward, and the area where Thorpe St Andrew meets Norwich is also among the 10pc most deprived parts of the country. In the north of Norwich, Mile Cross, south of Boundary Road also suffers from high levels of deprivation

To the north and east of the NWQ in Breckland Upper Wensum both Hockering and East Tuddenham have higher levels of deprivation than surrounding areas while the area around Fakenham covering the areas of Raynhams, Wensum and Walsingham all have higher than average levels of deprivation.



## TECHNICAL NOTE 3 – NWL Economic Narrative

<b>DATE:</b>	20 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	Norwich Western Link Economic Narrative		
<b>PROJECT:</b>	NWL	<b>AUTHOR:</b>	LA SP EM
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

In terms of health deprivation, the study area is less deprived, with some locations within the top 10% least deprived areas nationally. The most deprived location within the study area in terms of health is in the south-east towards Norwich city centre.

### TOURISM

A large amount of tourism is attracted to East Anglia every year. The latest information available (2013 ONS) shows that The East accounted for over £10.2 billion of Total Tourism Consumption with £5.2 billion of that associated with the East Anglia Area.

Norwich is a regionally important gateway to the Norfolk Broads and the North Norfolk coastline. North Norfolk, on average, attracts 5.86 million visitor days per year, worth approximately £117 million to the local economy<sup>1</sup>. Across England, cars were by far the most popular mode of transport with 862 million tourism day visits using this method (66%), followed by 216 million using public transport modes (17%). Applying national percentages, approximately 3.87 million visitor days are made by car to North Norfolk, many of which will use the SRN in and around Norwich.

### EXISTING ACCESSIBILITY ISSUES

Accessibility in the network at present is significantly impacted by congestion and poor journey times. The A1067 and A47 which provide the main strategic corridors within the NWQ suffer from poor journey times and delay during the peak hours. This impact on journey times limits the accessibility of key institutions, resources, employment opportunities and access to housing. This can discourage economic growth not only locally but regionally as a lack of access will generally lead to higher business costs.

While several routes exist between the A47 and A1067, these routes are generally considered to be lower standard, constrained by narrow carriageways with tight bends and are therefore prone to poorer journey times. These narrow roads are unsuitable for use by HGVs and other large vehicles with the exception of the B1535 which has been categorised as an official HGV route. The B1535, though not a trunk road, would not meet the DMRB road geometry standards for its current speed limit.

Currently there are limited walking and cycling opportunities in the study area away from residential areas where there is limited provision, especially between villages. There is also community severance, particularly at peak hour periods, where traffic flows restrict community accessibility.

Whilst walking and cycling could provide a sustainable alternative means for short length journeys, the infrastructure available is limited, and much of the study area is largely inaccessible due to the distances involved and associated journey times. Issues with rat running, derived from public consultation responses, along with a high proportion of large vans on local roads, derived from survey data, further exacerbates accessibility issues and discourages walkers and cyclists (non-motorised users (NMU)) from using these routes.

# Technical Note 3

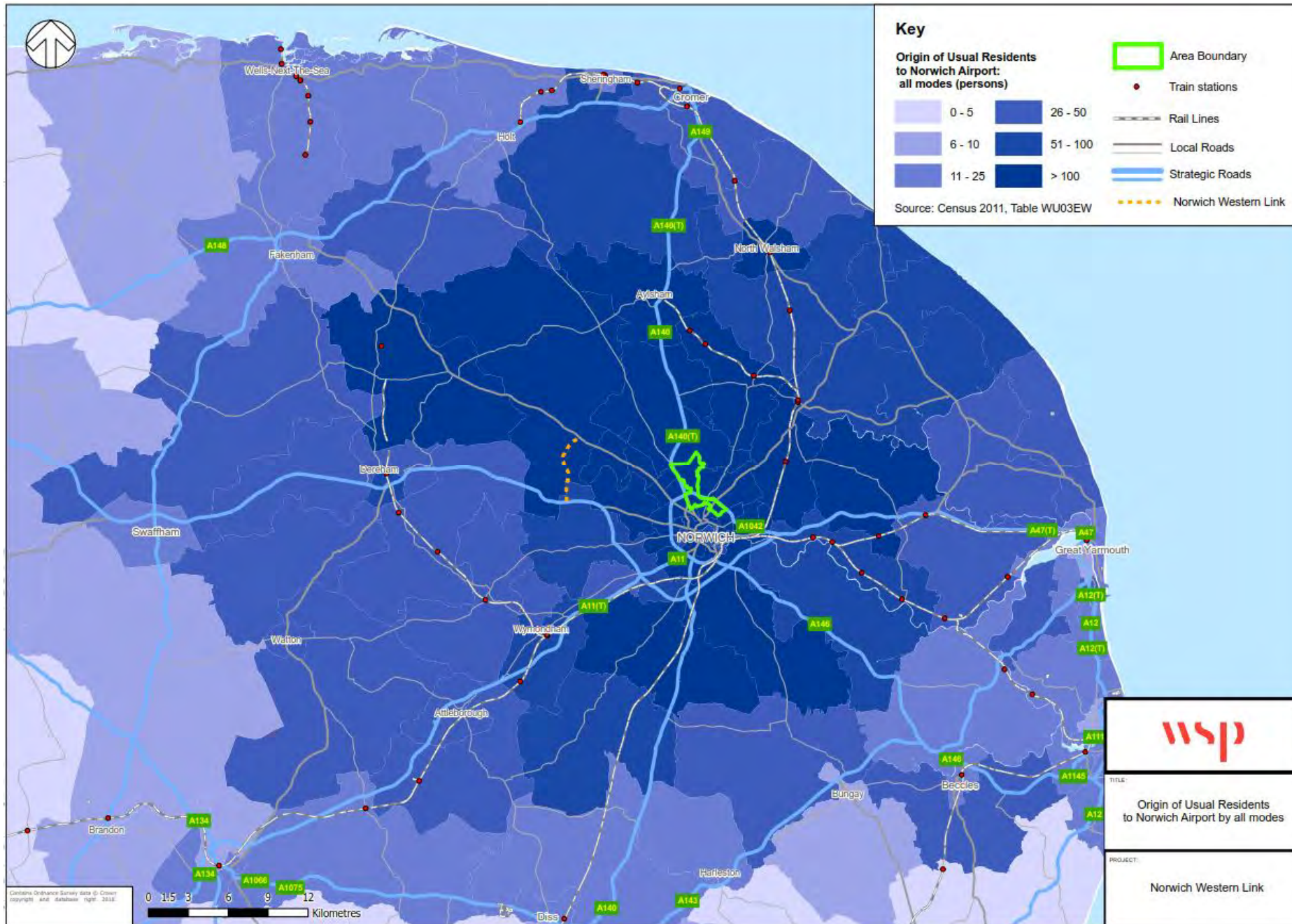
## Appendix A



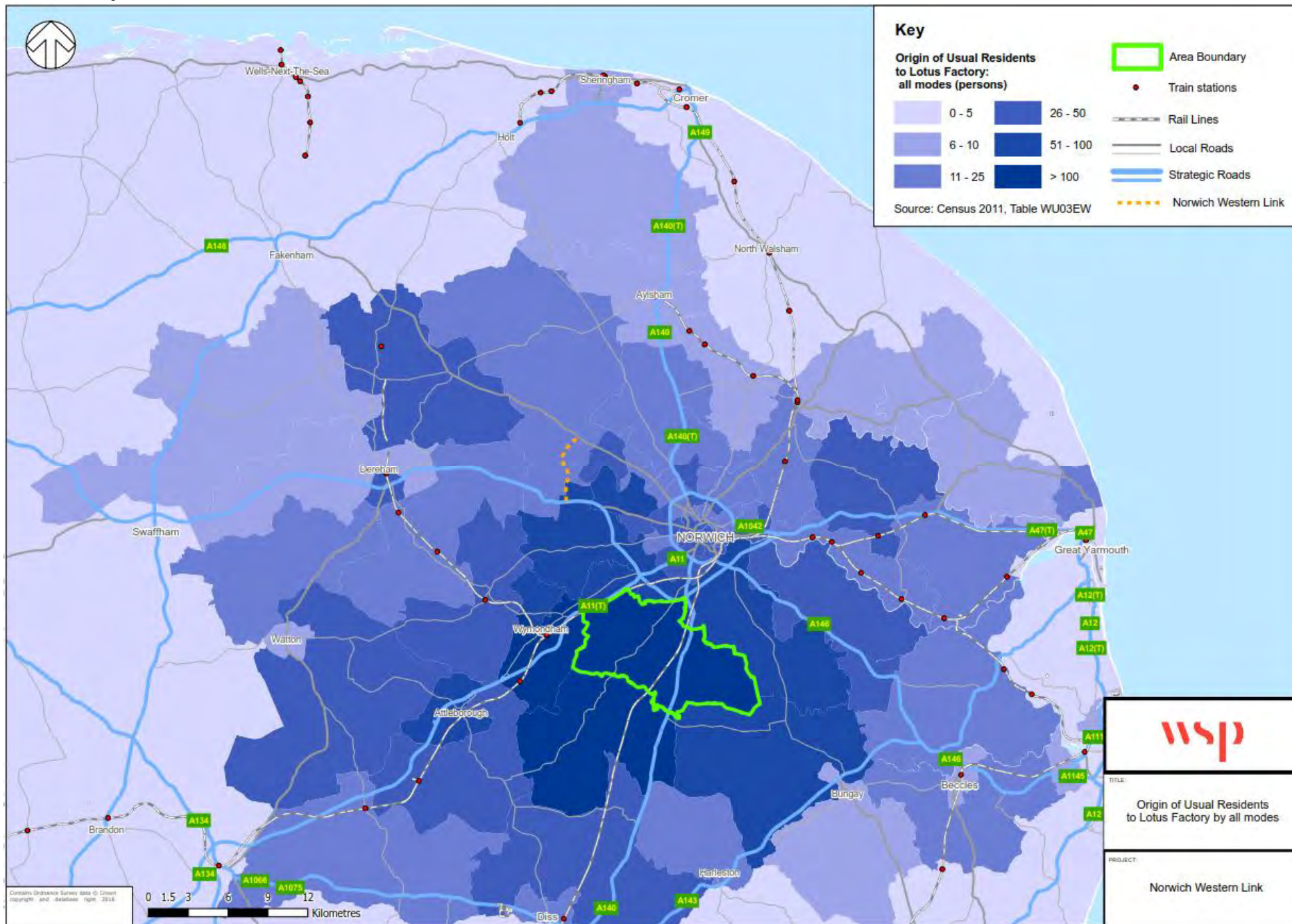
ORIGINS OF USUAL  
RESIDENTS



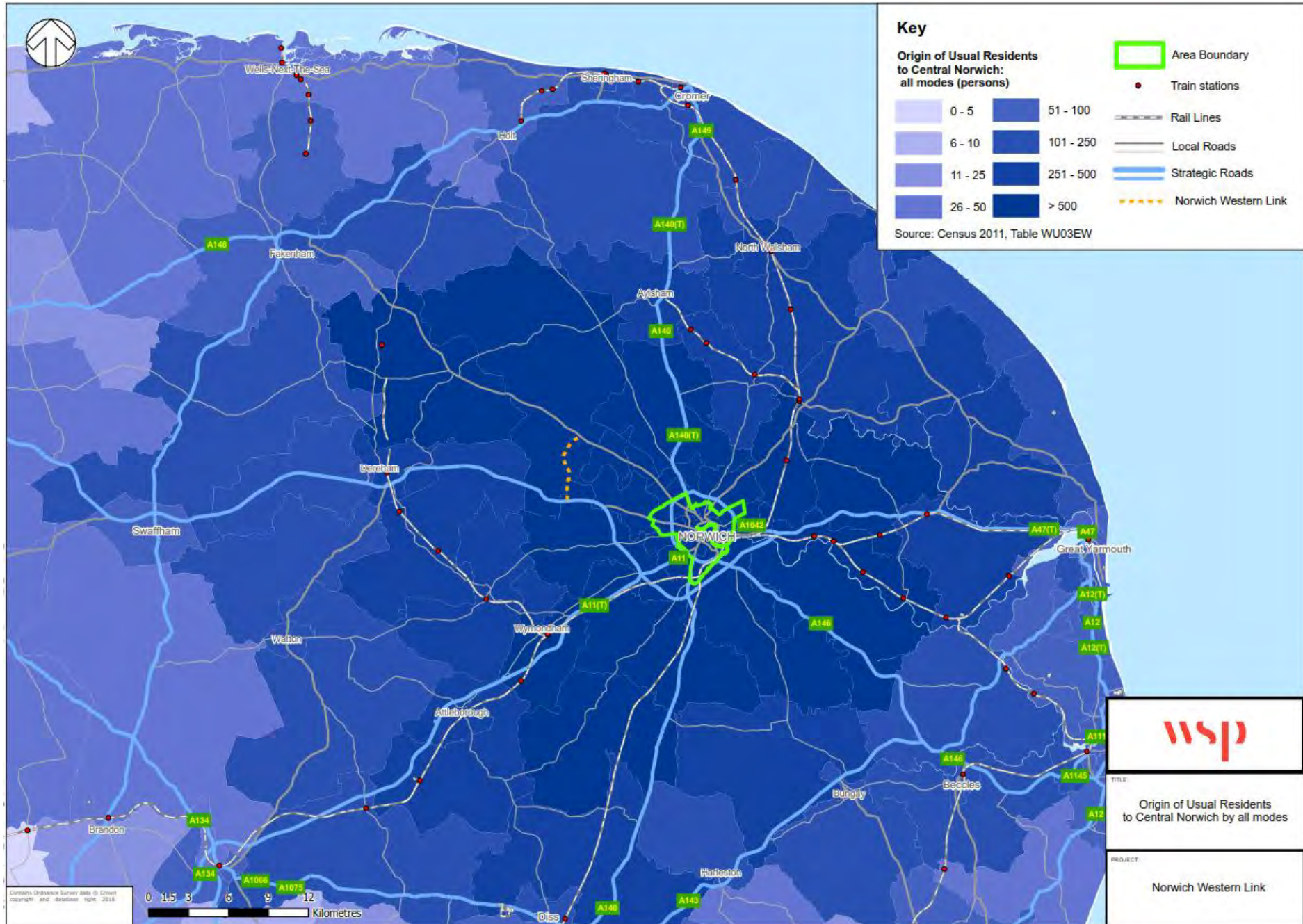
# Norwich International Airport

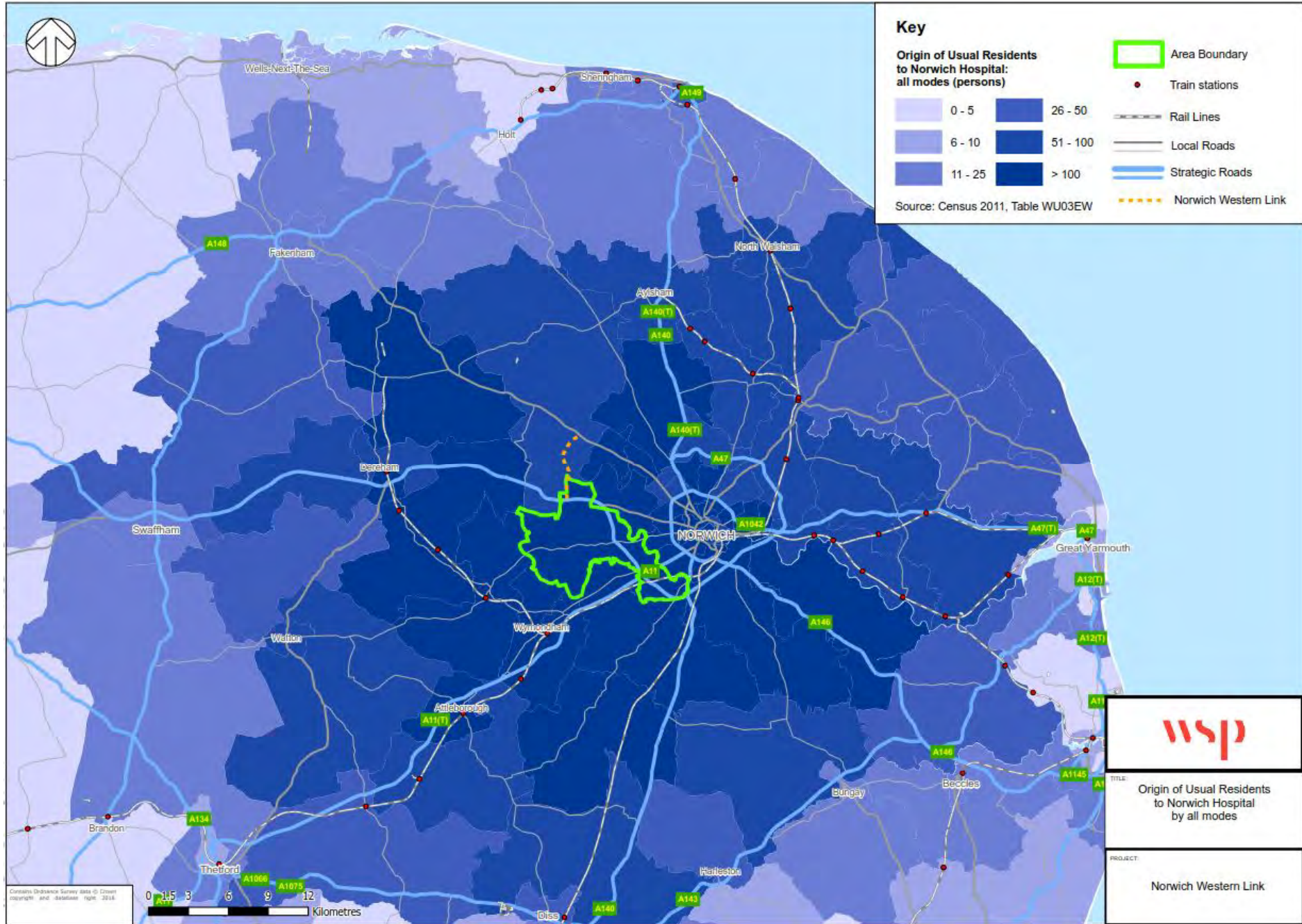


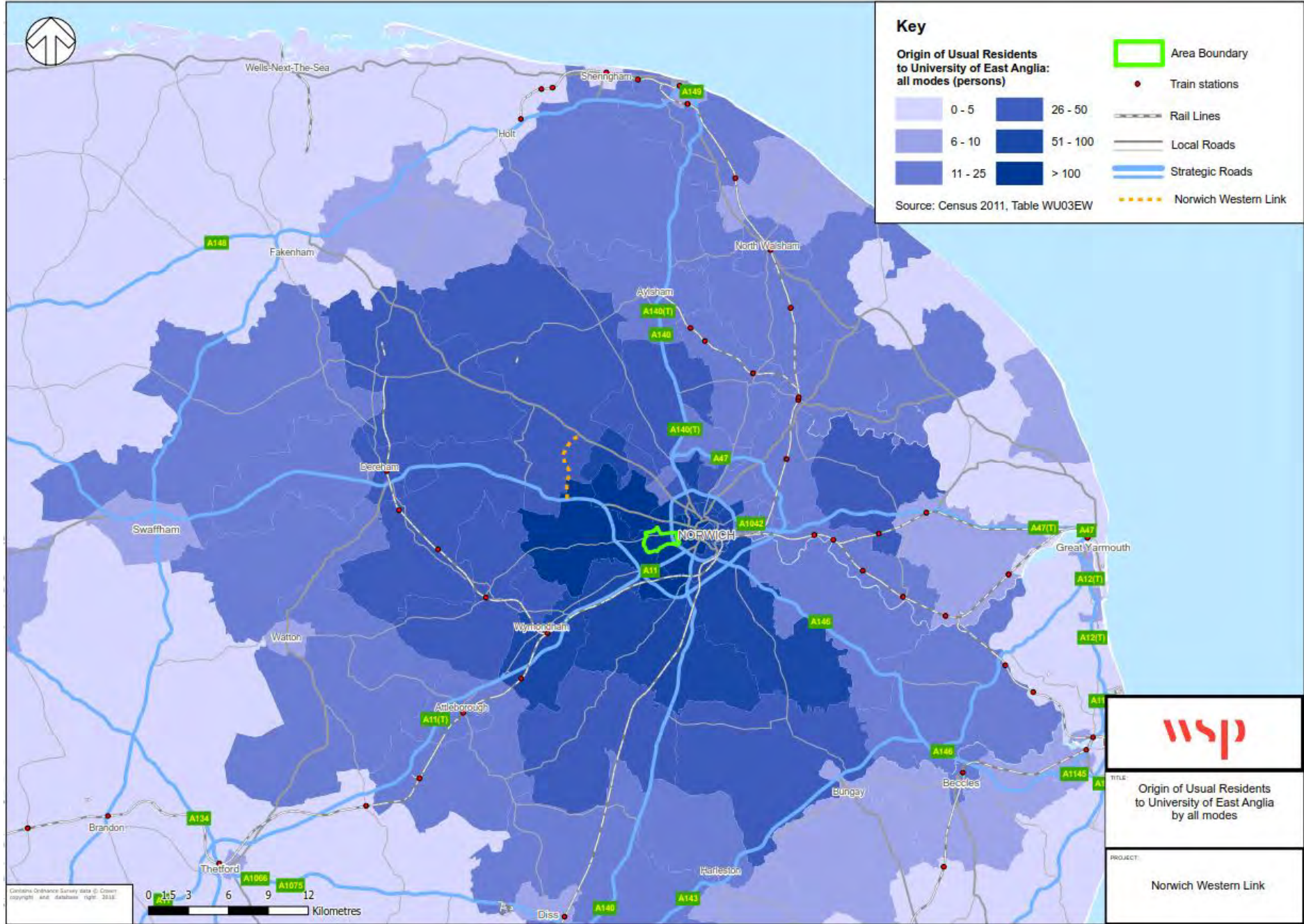
# Lotus factory



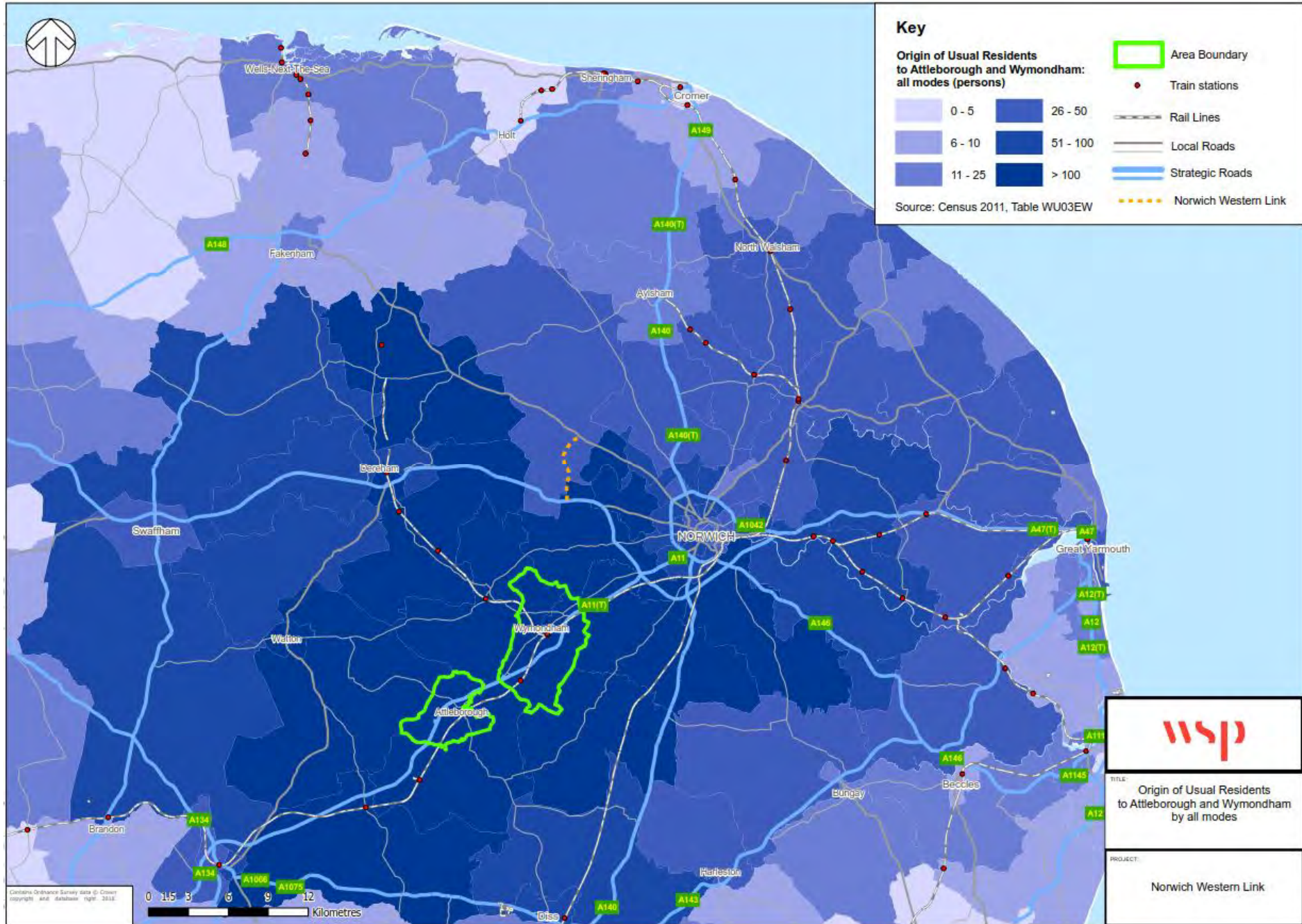
# Norwich city centre







# Attleborough / Wymondham



# Appendix E



---

TECHNICAL NOTE 4  
ENVIRONMENTAL  
IMPACT APPRAISAL  
OVERVIEW



# TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
██████████	██████████	<b>APPROVED:</b>	LA

## ENVIRONMENTAL IMPACT APPRAISAL OVERVIEW

### Introduction

To help inform the business case for NWL, a series of WebTAG appraisals of the five route options (including individual appraisals of the two Route B variants) has been undertaken. These appraisals consider the potential impacts of the various route options on the built and natural environment and on people, and also consider the strategic, policy and physical constraints and opportunities for the scheme. The appraisals have been undertaken on the following environmental topics that are identified in TAG Unit A3 'Transport Analysis Guidance – Environmental Impact Appraisal' (December 2015):

- Noise (Qualitative);
- Air Quality;
- Greenhouse gases;
- Landscape;
- Historic Environment;
- Biodiversity; and
- Water Environment.

The environmental appraisals have been undertaken using the methods set out in TAG Unit A3 and with regard to current European and UK legislation, regulations, policy, and best practice. The noise assessment undertaken here does not use the TAG Unit methods, for the reasons set out in the section below.

An entry for each of the identified topics has been made for each route option in the Appraisal Summary Table (AST) and relevant worksheets for each topic are provided in Appendix F of the SOBC.

### Noise

Noise can have an effect on the natural environment health, wellbeing and productivity, and should be considered for all new developments, including transport schemes such as NWL.

A qualitative noise impact appraisal of the five route options for NWL has been conducted which includes a count of the properties within a specific distance from each of the route options.

A qualitative appraisal of the roads and wider highway network that would be bypassed by NWL route options has also been undertaken so that key areas that may experience an increase or decrease in noise both during the construction and operational phase for NWL can be identified.





# TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

A qualitative appraisal, rather than a quantitative assessment, of the five route options has been carried out. Although this approach is not fully in accordance with the preference for a quantitative appraisal set out in DMRB, it does follow some of the assessment principles set out in the DMRB and is considered to be a proportionate basis to assess the impacts of the route options. As each route is likely to have broadly similar levels of traffic, the likely impact of each option can be correlated to the number of properties and used as a broad indicator of relative merit. A Technical Memorandum, setting out the methodology is included within Appendix A of this document.

**Table 1** outlines the results of the property counts from various distances from the five routes.

*Table 1 Property Counts*

Route Option	Property Count Distance Bands					Totals	
	0 to 50m	50 to 100m	100 to 200m	200 to 300m	300 to 600m	Within 300m	Within 600m
<b>Route Option A</b>	14	10	28	38	180	90	270
<b>Route Option B West</b>	0 (9)	2 (8)	7 (22)	17 (18)	123 (139)	26 (57)	149 (165)
<b>Route Option B East</b>	0 (3)	2 (5)	3 (21)	8 (20)	102 (136)	13 (49)	115 (149)
<b>Route Option C</b>	0 (0)	0 (0)	2 (2)	3 (3)	37 (41)	5 (5)	42 (46)
<b>Route Option D East</b>	0 (0)	2 (2)	11 (11)	5 (5)	41 (46)	18 (18)	59 (64)
<b>Route Option D West</b>	0 (0)	2 (2)	11 (11)	5 (5)	41 (46)	18 (18)	59 (64)

Note: Figures in brackets relate to each option plus the A1067 upgrades



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

### ROUTE OPTION A

Route Option A runs from the A47 at its junction with Wood Lane and Berrys Lane to the A1067 Fakenham Road, at its junction with Porters Lane and the B1535, to the south.

The closest properties to this route are on Sandy Lane, approximately 12 m away from the proposed route's carriageway edge. The proposed works in this area include stopping up of existing roads, new junctions and accesses, and the installation of pedestrian crossing bridges. It is forecast that Route Option A would reduce the amount of traffic using Sandy Lane as a through route and taking the traffic through the new Route Option A route which will be B1535. However, a greater impact than currently exists at the closest receptors may still occur if the net result of the scheme is more traffic using the new route than currently uses Sandy Lane. During the construction phase it is also anticipated that the amount of construction works and the proximity to dwellings in this area is likely to lead to an adverse impact at the closest properties.

To the north, close to the junction of Heath Road and Breck Road, the route passes Woodforde Farm. The proximity of Woodforde Farm may result in significant levels of construction noise and vibration. Operational noise may also be an issue, again due to the proximity of the receptor to the route.

Properties along the B1535 may be adversely impacted during any widening or realignment construction works due to the proximity of these works to the properties. Any operational impacts will depend on the difference in vehicle movements using the proposed route compared to the existing level of use of the B1535 in this location.

The closest villages to Route Option A are Lenwade and Great Witchingham, which are located on the A1067, immediately on either side of the existing B1535 junction. These villages would be close to the proposed junction with Route Option A and the proposed works in the location include the creation of a roundabout. During the construction phase adverse impacts may occur at the closest properties due to the proximity of works. Any operational impacts will depend on the difference in vehicle movements as a result of the proposed route relative to the existing levels of use of the A1067 and B1535.

### ROUTE OPTION B WEST

Route Option B West runs from the A47 at its junction with Wood Lane and Berrys Lane to the A1067 Fakenham Road, between Morton on the Hill and Attlebridge.

This option passes immediately to the east of a small number of properties around the junction of Weston Green Road, approximately 45m from the proposed carriageway. There would be a greater chance of adverse noise impacts on these properties during the operational phases due to their proximity. This part of the route also includes proposed widening and possible replacement of the existing road bridge, which is likely to result in significant levels of construction noise and vibration at the properties.



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

Close to the junction with the A1067, there are a number of properties to the north-east, on The Street road parallel to the A1067. There are also properties to the west of this junction in Morton on the Hill, and to the east in the village of Attlebridge.

The proposed works at this junction include the widening of the bridge crossing over the River Wensum, and an upgrade to the A1067. During the construction phase adverse impacts may occur at the closest properties due to the proximity of the proposed works. Operational impacts may occur at the closest properties, although the level of impact will depend on the level of traffic using the route, and any changes to traffic flow on the A1067 around the junction with the proposed route.

### ROUTE OPTION B EAST

Route Option B East runs from the A47 at its junction with Wood Lane and Berrys Lane to the A1067 Fakenham Road to the east of Attlebridge.

The route passes immediately to the east of a small number of properties around the junction of Weston Green Road, approximately 45m from the proposed carriageway. Due to the proximity of these properties, there would be a greater chance of adverse noise impacts during the operational phases. This part of the route also includes a new road bridge, which is likely to result in significant levels of construction noise and vibration at the properties.

The route also passes within 280m of Morton Hall, and within 85m of Ivy Cottages, close to the A1067. The proposed works in this area include a viaduct crossing over the River Wensum and the construction of a roundabout to form a junction with the A1067.

The proximity of the proposed construction works, and the fact that the bridge would be elevated and require significant construction activity over an extended period, means that there is an increased risk of adverse impacts due to construction noise and vibration. Operational noise may also be an issue at Ivy Cottages close to the A1067, due to their proximity to the proposed route and its roundabout with the A1067.

### ROUTE OPTION C

Route Option C runs from the A47 at its junction with Wood Lane and Berrys Lane to the A1067 Fakenham Road to the west of its junction with the A1270.

The route only passes close to a small number of properties, notably Low Farm and Old Hall Farm, Old Hall Farm Cottages and Woodstock close to the junction with the A1067.

The works in this area include a viaduct crossing over the River Wensum, a drainage basin, and the construction of a roundabout to form a junction with the A1067. During the construction phase there would be a risk of adverse impact in terms of noise and vibration during the construction phase. There may be



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

adverse impacts from to operational noise on the properties closest to this route option, such as those at Weston Green.

### ROUTE OPTION D

Route Option D runs from the A47 at its junction with Taverham Road to the A1067 Fakenham Road to the west of its junction with the A1270. Route Option D comprises two separate legs and is referred to as “Route Option D east” and “Route Option D west”. The option which was assessed for this noise qualitative noise impact appraisal, was Route Option D west which passes to within approximately 47m of houses on Taverham Road.

The route passes close to a small number of properties, including Low Farm, Old Hall Farm, Old Hall Farm Cottages, Woodstock, Gamekeepers Cottage and The Kennels, Ebony Hall and properties near the junction with the A47.

A road crossing bridge is proposed close to Gamekeepers Cottage and The Kennels. The proximity of these properties means that there is an increased risk of adverse impacts during the construction phase due to construction noise and vibration. The proximity of the route also means that there may be adverse impacts due to operational noise.

For properties close to the junction with the A1067, including Low Farm, Old Hall Farm, Old Hall Farm Cottages and Woodstock, the works in this area include a viaduct crossing over the River Wensum, a drainage basin, and the construction of a roundabout to form a junction with the A1067. The proximity of the proposed construction works, and the fact that the bridge would be elevated and require significant construction activity over an extended period, means that there is an increased risk of adverse impacts due to construction noise and vibration. The proximity of the route also means that there may be adverse impacts due to operational noise.

For properties close to the junction with the A47, the works in this area include a viaduct crossing over the River Tud and a drainage basin. Due to the proximity and nature of these works, there is an increased risk of adverse impacts due to construction noise and vibration. The proximity of the route also means that there may be adverse impacts due to operational noise.

### CONCLUSION

Overall, **Table 1** and the qualitative assessments above indicate that Route Option C passes close to the fewest properties and is therefore considered the route option likely to generate the fewest adverse effects. Route Option A passes close to the most residential properties, and for this reason is considered likely to generate the most adverse effects. All the routes are anticipated to generate benefits by reducing the traffic flow, and therefore the noise level, on some existing routes.



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

Route Options B East, B West, C and D will all involve significant civil engineering works in the form of a viaduct over the River Wensum. Depending on how this viaduct is constructed, there is potential for significant construction noise and vibration from its installation. However, such noise and vibration will be temporary and does not significantly detract from the conclusion that Route Option C is likely to lead to the least impact.

### *Next steps*

An Option Selection Report (OSR) has been produced in which, a noise quantitative assessment has been carried out on the five route options which includes noise modelling of traffic data. This helps to identify the route option with the least noise impacts, which can then inform the overall selection process of the preferred route option.

Once the preferred route is established further assessment work on the potential noise impacts will help identify appropriate mitigation measures that will be identified and assessed through the planning application process.

### **AIR QUALITY**

The air quality impacts of the six NWL scheme options have been appraised following TAG Unit A3 Environmental Impact Appraisal Guidance: Chapter 3.3 'Air Quality Impacts' (31 May 2019). The appraisal considers the scheme impacts in terms of changes in ambient annual mean concentrations of nitrogen dioxide (NO<sub>2</sub>) and fine particulates (PM<sub>2.5</sub>) at locations with relevant human exposure (residential premises, schools and hospitals). The appraisal reports its findings in terms of:

- Changes in the numbers of properties with improvement, worsening or no change in annual mean NO<sub>2</sub> and PM<sub>2.5</sub> in the scheme opening year (in this case 2025).
- Changes in total emissions of oxides of nitrogen (NO<sub>x</sub>) and PM<sub>2.5</sub> between the opening year and forecast year (in this case 2040) and beyond to 60-years after the opening year.
- Monetary valuation of the health impacts in terms of changes in exposure to annual mean NO<sub>2</sub> and PM<sub>2.5</sub> over a 60-year period from the opening year. The method used for monetary valuation depends on if the scheme is likely to affect compliance with EU limit values and then if the air quality impacts are likely to have a net present value (NPV) of more than £50,000,000 – as may be the case for very large transport infrastructure projects. In the case of the NWL scheme options it is considered likely that the NPV would be substantially lower than this threshold.

Notable limitations of the TAG methodology include:

- Emission factors for NO<sub>x</sub> and PM<sub>2.5</sub> have been published by Defra for each year up to and including 2030. Predictions beyond 2030 (including the forecast year) assume 2030 emissions, which means that

## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

progressive improvements to the vehicle fleet giving rise to lower/zero emissions are not accounted for in later years.

- Traffic growth between the open year and forecast year is assumed to linear. Beyond the forecast year it is assumed to be zero up to the 60<sup>th</sup> year in the appraisal period (i.e. traffic levels are constant from the forecast year onwards).
- The TAG methodology is not intended for formal Environmental Impact Assessment purposes (TAG provides a high-level scheme appraisal). It is not possible to address air quality impacts at specific individual premises or determine likely significant effects.

The findings are summarised in **Table 2**. In considering the results it should be noted that a negative valuation (i.e. -£ for the NPV) indicates a net dis-benefit, whilst a positive valuation indicates a net benefit. The valuations for NO<sub>x</sub> and PM<sub>2.5</sub> were based on damage costs there are no exceedances of EU limit values in the study area and the likely total NPV for the air quality impacts of any option is less than £50,000,000.

*Table 2 Air Quality Appraisal Results*

Impact of the Scheme	Route Option A	Route Option B West	Route Option B East	Route Option C	Route Option D	
					WEST	EAST
Number of properties with an improvement in open year	1,500	10,214	8,249	8,613	10,112	10,112
Number of properties with no change in opening year	0	0	0	0	129	129
Number of properties with a deterioration in opening year	2,235	5,339	5,338	5,729	7,178	7,196
Change in NO <sub>x</sub> emissions (tonnes) over 60-year appraisal period following opening	-290	9	119	112	308	308
Change in PM <sub>2.5</sub> emissions (tonnes) over 60-year appraisal period following opening	-25	1	10	8	28	28

# TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

Impact of the Scheme	Route Option A	Route Option B West	Route Option B East	Route Option C	Route Option D	
					WEST	EAST
NPV of changes in NO <sub>x</sub> emissions over 60-year appraisal period following opening	£1,382,496	£331,271	-£144,635	-£184,194	-£1,058,211	-£1,058,211
NPV of changes in PM <sub>2.5</sub> emissions over 60-year appraisal period following opening	£2,220,433	£397,228	-£403,887	-£269,001	-£1,971,176	-£1,971,176
Total NPV of changes in air quality over 60-year appraisal period following opening	<u>£3,602,929</u>	<u>£728,499</u>	<u>-£548,522</u>	<u>-£453,195</u>	<u>-£3,029,388</u>	<u>-£3,029,388</u>

## CONCLUSIONS

In the short-term (opening year) there are apparent benefits with all options, except Route Option A, in terms of greater numbers of properties experiencing improvements in air quality rather than worsening. The greatest benefit in the opening year is with Route Option B West.

Beyond the opening year, with the clear exception of Route Option A, the year-on-year increases in vehicle kilometres mean that option benefits are eroded. Over the 60-year period, Route Option A has most benefit with an NPV of £3,602,929. Route Option B West has some benefit with an NPV of £728,499 whilst the other options have dis-benefits. The greatest long-term dis-benefits are indicated for Route Option D where both the West and East variants have an NPV of -£3,029,388. The options with dis-benefits are consistent with the associated increases in vehicle kilometres generated from the opening year onwards.

### Next steps

During the detailed design stage, further modelling will be carried out to predict ambient annual mean NO<sub>2</sub> concentrations on the preferred route. At this stage, identification of any significant effects in sufficient detail should be outlined and suitable mitigation measures will be drawn up.

## Greenhouse Gases

The scheme will result in changes in vehicle flow and composition that have the potential to impact on emissions of greenhouse gases from the ARN.



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

The appraisal has been undertaken following TAG Unit A3.4 'Greenhouse Gases' (31 May 2019) methodology. CO<sub>2</sub> emissions have been calculated for the opening and forecast years. The monetary valuation method requires emission to be forecast for a 60-year appraisal period. To provide this data, the emissions between the opening and forecast years have been estimated by linear interpolation. CO<sub>2</sub> emissions have been calculated on the same basis as NO<sub>x</sub> and PM<sub>2.5</sub> emissions and is subject to similar limitations (see preceding section).

The results of the assessment are summarised in **Table 3** which shows the change in CO<sub>2</sub> equivalent (CO<sub>2e</sub>) emissions, in tonnes, attributable to the scheme being in place and demonstrates the Net Present Value (NPV) of the CO<sub>2e</sub> emissions associated with the implementation of the proposed scheme over a 60-year period.





# TECHNICAL NOTE 4 – NWL EIA Overview

**DATE:** 18 June 2019      **CONFIDENTIALITY:** Public  
**SUBJECT:** NWL Environmental Impacts Appraisal Overview  
**PROJECT:** Norwich Western Link      **AUTHOR:** [REDACTED]  
**CHECKED:** EM      **APPROVED:** LA

*Table 3 Green House Emissions*

	Without Scheme	Route Option A	Route Option B West	Route Option B East	Route Option C	Route Option D	
						West	East
<b>Opening Year 2025</b>							
CO <sub>2e</sub> (tonnes)	293,996	289,468 (-4,527)	279,664 (-14,332)	279,535 (-14,461)	282,008 (-11,987)	282,782 (-11,213)	282,782 (-11,213)
Veh Km travelled	5,950,805	5,857,892 (-92,913)	5,666,571 (-284,234)	5,662,877 (-287,928)	5,707,558 (-243,247)	5,716,648 (-234,157)	5,716,648 (-234,157)
<b>Forecast Year 2040</b>							
CO <sub>2e</sub> (tonnes)	333,008	329,445 (-3,563)	335,889 (2,880)	337,659 (4,650)	336,907 (3,898)	339,963 (6,954)	339,963 (6,954)
Veh Km travelled	6,788,116	6,713,175 (-74,941)	6,834,367 (46,251)	6,869,683 (81,567)	6,853,722 (65,606)	6,924,931 (136,815)	6,924,931 (136,815)



## TECHNICAL NOTE 4 – NWL EIA Overview

**DATE:** 18 June 2019      **CONFIDENTIALITY:** Public  
**SUBJECT:** NWL Environmental Impacts Appraisal Overview  
**PROJECT:** Norwich Western Link      **AUTHOR:** [REDACTED]  
**CHECKED:** EM      **APPROVED:** LA

	Without Scheme	Route Option A	Route Option B West	Route Option B East	Route Option C	Route Option D West	Route Option D East
<b>Overall Assessment Score</b>							
Change in CO <sub>2e</sub> emissions (tonnes) over 60-year appraisal period following opening	NA	-196,560	14,970	93,590	79,530	223,240	223,240
Total NPV of changes in CO <sub>2e</sub> over 60-year appraisal period following opening	NA	<u>£8,622,855</u>	<u>-£1,358,528</u>	<u>-£4,900,284</u>	<u>-£4,149,699</u>	<u>-£10,575,555</u>	<u>-£10,575,555</u>



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	[REDACTED]
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

### CONCLUSION

The most beneficial of the options in terms of greenhouse gases is Route Option A where there is a net reduction in CO<sub>2e</sub> emissions over the 60-year appraisal period associated with reductions in vehicle kilometres travelled on the road network. The other options have net dis-benefits due to increases in vehicle kilometres travelled. The greatest dis-benefit is with Route Option D West and East variants.

Dis-benefits in CO<sub>2e</sub> emissions are not uncommon for schemes that create additional road space to relieve congestion in other areas. However, over the 60-year appraisal period the changes in CO<sub>2e</sub> emissions are relatively very small in the context of regional emissions for road transport and do not account for electrification of the vehicle fleet beyond 2030.

### LANDSCAPE

Landscape is a broad category in terms of environmental impact and is assessed using a qualitative measure. The potential impact of a scheme on both the physical characteristics and cultural characteristics of a place is accounted for, with the impact on landscape criterion assessing how a scheme may affect an area's "sense of place".

The landscape impacts of the various NWL route options has been assessed using Tag Unit A3.3 to identify the existing landscape character and visual baseline in relation to the following landscape features: Pattern; Tranquillity; Cultural; Landcover, Summary of Character. Each of these sections above were described and assessed against the following indicators: Scale, Rarity, Importance and Substitutability. The impact on the landscape is summarised using the Appraisal Summary Table (AST) standard seven point scale.

### ROUTE OPTION A

Route Option A would not result in a substantial change to the landscape character in the surrounding area, and it is considered that this option would result in a slight adverse effect on the landscape. This is on the basis that the proposed route would substantially comprise a realignment and straightening of an existing road, and that this would largely reflect the existing landscape pattern. Route Option A would mainly run at grade, with small sections of embankment, so its influence on the landscape will be broadly similar as a single lane road which is largely consistent with the existing road layout.

### ROUTE OPTION B WEST

Route Option B West may result in a slight adverse effect because the proposed scheme would result in a slight adverse impact on the landscape character. This route option would result in the subdivision of existing fields. It would partially replace historic field pattern eroded by recent enlargement and would also result in the subdivision of smaller fields in the north, or total loss which will alter the pattern. The road,



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

which is dualled, will reduce tranquillity locally, particularly where it is on a low embankment. The loss of small sections of hedgerows and woodlands will alter the landcover locally. Upgrades to the existing A1067 will result in the loss of existing roadside planting, a widened corridor and new, wider bridge crossing of the River Wensum at Attlebridge.

### ROUTE OPTION B EAST

Route Option B East may result in a moderate adverse effect on landscape character because the majority of the landscape will have some minor changes, mostly in the south. However, in the north there will be substantial change due to the introduction of the viaduct over the River Wensum. The road will be dualled and a large proportion will be on an embankment and viaduct reducing the perception of tranquillity. The scheme will be visible from a number of farmsteads throughout the landscape. In the north the viaduct will have an influence on the wider landscape.

### ROUTE OPTION C

Route Option C may result in a moderate adverse effect on the landscape character, this is a result of the route disrupting field patterns locally and causing the subdivision of fields. There would be sections of embankment and cutting through the landscape which would affect the pattern locally and the viaduct would also have a wider impact on the landscape. The viaduct across the River Wensum will have a substantial impact on tranquillity in the north and the road will alter and reduce the tranquillity locally along the length. The alignment, which will be dualled, is reflective of the pattern of roads through this landscape and there will be some loss of woodland and arable farmland altering land cover locally.

### ROUTE OPTION D WEST

Route Option D may result in a moderate adverse effect on the landscape character because there would be subdivision of fields and a disruption of field patterns locally. The road runs at grade through the centre of this corridor however the viaduct across the River Wensum will have a substantial impact on tranquillity and introduce a new element into this landscape which will have a wider effect. The bridge over the River Tud will also alter the character of the landscape locally. The alignment, which is dualled, is reflective of the pattern of roads through this landscape. There will be some loss of woodland and arable farmland altering the land cover locally.

### ROUTE OPTION D EAST

Option D East may result in a moderate adverse effect on the landscape character because there would be subdivision of fields and a disruption of field patterns locally. The road runs at grade through the centre of this corridor, however the viaduct across the River Wensum will have a substantial impact on tranquillity and will introduce a new element into this landscape which will have a wider effect. The bridge over the



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

River Tud, to the east of Church Lane will also alter the character of the landscape locally. The alignment, which is dualled, is reflective of the pattern of roads through this landscape. There will be some loss of woodland and arable farmland, which will alter the land cover locally.

### CONCLUSION

Overall, Route Options A has the least impact because it is a realignment of an existing road and will not result in a substantial change to the landscape character. Route Option B West results in a slight adverse impact due to the new dualled road being built and will lead to a minor impact on the landscape character. Route Option B East, Route Option C and Route Option D West and D East will all result in a moderate adverse effect on landscape character due to the introduction of a viaduct at the north of the route options.

#### *Next steps*

A more detailed assessment of both operational and construction impacts will be carried out once preferred route is chosen, this will feed into the EIA assessment.

### Townscape

The closest large settlement to the study area is Norwich itself, however the study area encompasses a relatively rural landscape with small settlements and isolated dwellings. Therefore, the baseline conditions for townscape as an environmental constraint are not applicable.

### Historic Environment

Within the study area there are a number of statutory designated and non-statutory designated heritage assets. This appraisal has been informed by the proximity of these assets and through an identification of their value.

To reflect the rural location of the route options a 500m buffer for the identification of heritage assets has been applied, due to the longer views (and hence the potential impacts upon the setting of these assets). The 500m buffer is based on professional judgement and the characterisation of the area and any potential impacts on the setting of listed buildings.

The historical designations appraised for this WebTAG include Scheduled Monuments, Listed Buildings, Registered Parks and Gardens and Local Planning Authority (LPA) Conservation Areas. Within the study area there are a total of 32 listed buildings, of which two are Grade I, three are Grade II\* and 27 are Grade II. There are two Scheduled Monuments in the study area: a round barrow south-east of the Lodges and a Tumulus in The Warren.

The River Wensum and River Tud Valley geology includes areas of natural sand and gravel which, along with the riverine topography, provide an indication of suitability for early settlement due to the preference for



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

well-drained gravels close to predictable resources provided by rivers. The study area therefore has high potential for archaeological deposits, the value and integrity of which, are likely to be insufficiently understood to inform an assessment at this stage.

This appraisal is based on information derived from the National Heritage List for England, the Norfolk Historic Environment Record and a Heritage Constraints Report for the Norwich Western Link which was produced by WSP in November 2018. WebTAG sheets have been produced for each option according to the DMRB guidance.

A site visit was undertaken on the 6th of June 2019 to provide a high level visual assessment of designated heritage assets potentially impacted by the route options.

A formal assessment of the impact of the scheme on designated heritage assets will accompany a planning application that will be made after the preferred route announcement.

In order to obtain more information and a better understanding of the potential unknown archaeological remains a more detailed assessment will be required, such as Ground Investigation works and potentially trial trenching.

### ROUTE OPTION A

There is the potential for physical impact from Route Option A south of Lenwade as it includes a drainage feature in close proximity to the gatepiers of the Grade II listed Gates and Railings to Lenwade Lodge to Weston House.

The option will retain the route of the existing A1067 which goes through Attlebridge. Any infrastructure changes or increase in traffic noise could affect the setting of a total of 20 Listed Buildings, one Grade II\* and 19 Grade II listed buildings, and two Scheduled Monuments.

The proposed route could potentially impact areas from which isolated prehistoric and Roman finds have been made. Possible palaeoenvironmental remains in the Wensum and Tud valleys and previously unrecorded remains could be impacted. The proposed route would potentially impact two post-medieval landscape parks, Attlebridge World War 2 airfield and the area of a later medieval settlement. There would be no direct impact on the two Scheduled Monuments.

The archaeological sensitivity of the route, based on the distribution of known buried heritage assets and perceived potential for previously unrecorded remains, is considered medium.

### ROUTE OPTION B WEST

There would be a potential physical impact on the Grade II listed building, The Lodge (formerly Morton Lodge), through widening of the road.



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

Route Option B West will retain part of the existing A1067 route through Attlebridge, leaving the current route just to the west of the village. Any infrastructure changes or increase in traffic noise could affect the setting of a total of nine designated heritage assets, one Grade I, one Grade II\* and seven Grade II listed buildings.

The proposed route could potentially impact an area of possible Roman field boundaries and areas where isolated prehistoric and Roman finds have been made. It would also potentially impact a post-medieval landscape park, a World War 2 airfield, the course of an old road, field boundaries and areas where isolated finds of medieval and post-medieval have been made. Previously unrecorded remains and possible palaeoenvironmental remains in the Wensum and Tud valleys could also be impacted.

The archaeological sensitivity of the route, based on the distribution of known buried heritage assets and perceived potential for previously unrecorded remains, is considered medium.

### ROUTE OPTION B EAST

There would be no direct impacts on designated heritage assets.

This option will retain part of the route of the existing A1067 to the east of Attlebridge. Any infrastructure changes or increase in traffic noise could affect the setting of a total of nine designated heritage assets, one Grade I, one Grade II\* and seven Grade II listed buildings. Visually prominent views from these assets of Route Option B East are likely and therefore will lead to a visual impact from the route. The proposed route could potentially impact an area of possible Roman field boundaries and where isolated Roman finds have been made. Possible palaeoenvironmental remains in the Wensum and Tud valleys and previously unrecorded remains could be impacted. The proposed route would also potentially impact a post-medieval landscape park, a World War 2 airfield, the course of an old road and field boundaries.

The archaeological sensitivity of the route, based on the distribution of known buried heritage assets and perceived potential for previously unrecorded remains, is considered medium.

### ROUTE OPTION C

There would be no direct impacts on designated heritage assets.

Proximity to the route means Route Option C would impact on the setting of the Grade II listed Barn 50m north west of Low Farm House with the loss of surrounding rural and agricultural land. The proposed viaduct across the River Wensum would be prominent in views out from the asset towards the north-east. Traffic noise and road lighting would also be prominent in the asset's setting.

The Grade II listed Berry Hall is located approximately 350m south west of the southern end of the route, therefore there is unlikely to be any impact to the setting of the asset.



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

The proposed route could potentially impact a possible Roman field system and possible Iron Age/Roman field boundaries. Possible palaeoenvironmental remains in the Wensum and Tud valleys and previously unrecorded remains could be impacted. The proposed route would potentially impact later medieval/post-medieval field systems; field boundaries/trackways; Attlebridge Airfield; a military training site; and Honingham Park.

The archaeological sensitivity of the route, based on the distribution of known buried heritage assets and perceived potential for previously unrecorded remains, is considered low to medium.

### ROUTE OPTION D (WEST AND EAST)

Where there are differences between Route Options D west and east, these are noted within the text below.

There would be no direct impacts on designated heritage assets associated with Route Option D.

The setting of five designated heritage assets, one Grade I, one Grade II\* and three Grade II listed buildings may possibly be affected by potential impacts from the viaduct and traffic noise. All listed buildings are within 500m of Route Option D west, two listed buildings are within 500m of Route Option D east.

Route Option D east would take the route further to the east of the Grade II listed Church Farm House and Barn at Church Farm reducing the impact of the option on these assets.

The proposed route could potentially impact possible Roman field systems and field boundaries. Route Option D east could impact an area of Roman enclosures. The route also passes through an area where relatively rare Mesolithic flint tools have been recovered. Previously unrecorded remains from these periods and possible palaeoenvironmental remains in the Wensum and Tud valleys could also be impacted.

The proposed route would potentially impact later medieval field systems, field boundaries, ditches and trackways. The site of World War 2 practice trenches and weapons facilities could also be impacted. The western leg of the route could impact an area of earthworks of medieval tofts (small farms).

The archaeological sensitivity of the route, based on the distribution of known buried heritage assets and perceived potential for previously unrecorded remains, is considered medium to high.

### CONCLUSION

The route options with the highest and lowest potential impacts, with regards to the adverse effects on known buried heritage assets, and the potential for possible, previously unrecorded remains, is summarised below:



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

- The option with the least impact is Route Option C. This option passes through the fewest buried heritage assets.
- The option with the highest impact is Route Option D. Within Option D the western leg has a higher impact as it passes through the medieval tofts, which the eastern leg avoids.

In terms of options with the least and highest impact in respect of adverse effects on designated heritage assets is as follows:

- The option with the least impact is Route Option C. It was concluded that the potential impacts to assets along this route would be low.
- The options with the highest impacts are Route Options A and B West. These routes have the potential to physically impact on built heritage assets.

### Next steps

Consultation with Historic England will be undertaken and further detailed assessment work will be undertaken, such as ground investigation works and potentially trial trenching to get a better understanding of unknown archaeology.

## Biodiversity

To date, a Preliminary Ecological Appraisal (PEA) has been produced covering the study area. This comprised of habitat mapping (largely using freely available mapping) and a desk study. Bat hibernation and winter bird surveys have been completed within 500m of the route options. The results of these surveys indicate that there are no significant assemblages of wintering birds or hibernating bats in buildings which might be affected by the scheme. The results of these surveys are therefore not discussed further in this section.

Bat surveys primarily focussing on the rare barbastelle bat begun in May 2019 and will continue until September 2019. The results of these surveys as well as desk study records have been used to help inform this assessment. Known roost locations of barbastelle bat have also been provided by NCC Ecology team during informal discussions to help inform potential impacts on the colony at this early stage. The barbastelle bat *Barbastella barbastellus* receives European legal protection and is a significant ecological consideration for the scheme. Additional habitat and species surveys are currently being undertaken.

The desk study results indicated that within the study area a diversity of wildlife has been recorded including protected species: otter *Lutra lutra*, water vole *Arvicola amphibius*, great crested newt *Triturus cristatus*, Norfolk hawk dragonfly *Aeshna isoceles*, Desmoulin's, whorl snail *Vertigo moulinsiana*, brook

## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

lamprey *Lampetra planeri*, bullhead *Cottus gobio* and ten species of bat including barbastelle<sup>1</sup>. Also recorded are a number of rare plant species including: fen pondweed *Potamogeton coloratus*, opposite-leaved pondweed *Groenlandia densa*, large yellow-sedge *Carex flava* and tubular water-dropwort *Oenanthe fistulosa*.

Within the study area the most significant site of conservation value is the River Wensum Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI). The river is designated as it is a good example of a lowland river and supports species of conservation importance: White-clawed crayfish *Austropotamobius pallipes*; *Desmoulin`s whorl snail*, *Brook lamprey* and *Bullhead*. Within the study area there are also other County Wildlife Sites (CWS) and Roadside Nature Reserves (RNR).

The different route options are expected to have direct impacts on habitats and species, such as those caused by the removal of habitat to facilitate construction, as well as indirect impacts such as those arising from habitat fragmentation and disturbance. The data collected from the methods outlined above was used to undertake a WebTAG assessment in accordance with TAG Unit A.3.

In addition to the WebTAG a matrix was used to further assess and compare the impacts of the route options. The below table provides a comparison of the potential impacts of each route on the key ecological features identified at this stage. This comparison is based on information from online resources, baseline data available to date and professional judgement. The evaluation considers potential impacts in the absence of mitigation but with consideration for design mitigation i.e. a viaduct is proposed to cross the River Wensum on route B west, C and D.

*Table 4 Route Comparison Key*

Key	Likely Impacts
Red	Major
Orange	Moderate
Blue	Minor
Grey	Not applicable

<sup>1</sup> The barbastelle *Barbastella barbastellus* is one of the UK's rarest mammals. Few maternity roost sites are known in the UK. The great majority of other records come from caves or abandoned mines, which are important hibernation sites for a range of bat species. The barbastelle is widely distributed across southern England and across Wales but is likely to have been significantly under-recorded within its range (JNCC).

# TECHNICAL NOTE 4 – NWL EIA Overview

**DATE:** 18 June 2019 **CONFIDENTIALITY:** Public  
**SUBJECT:** NWL Environmental Impacts Appraisal Overview  
**PROJECT:** Norwich Western Link **AUTHOR:** [REDACTED]  
**CHECKED:** EM **APPROVED:** LA

Table 5 Route Impact Matrix

Impact <sup>2</sup>	Routes					Route with biggest impact
	A	B (Western variant)	B (Eastern variant)	C	D Both variants	
River Wensum SAC	Blue	Red	Yellow	Yellow	Yellow	B (Western variant)
Barbastelle bats	Red	Red	Red	Yellow	Yellow	A and B
Site of Special Scientific Interest (SSSI)	Blue	Red	Yellow	Yellow	Yellow	B (Western variant)
Ancient woodland – direct and indirect – approx.. within 200m	Blue	Grey	Grey	Blue	Yellow	D
Habitat of Principle Importance (HPI)	Blue	Yellow	Yellow	Red	Red	C and D
Woodland	Blue	Yellow	Yellow	Red	Red	C and D
County Wildlife Sites	Blue	Blue	Yellow	Yellow	Red	D
Watercourses (excluding the River Wensum)	Yellow	Blue	Yellow	Yellow	Red	D

<sup>2</sup> In order of significance in relation to legislation and policy.



# TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

Habitat fragmentation	Blue	Yellow	Yellow	Yellow	Red	D
Pond loss	Red	Yellow	Yellow	Grey	Grey	A
Reduction in HPI quality	Blue	Yellow	Yellow	Yellow	Red	D
Number of hedgerows dissected	Yellow	Yellow	Yellow	Yellow	Yellow	B (Western variant)

## ROUTE OPTION A

Two designated sites are located within the Route Option A 100m corridor. An additional two non-statutory designated sites located within 250m of the route may also be indirectly affected. Designated sites within proximity to the route may be subject to deterioration in air quality (particularly within 200m), and increased noise and vehicle lighting. The River Wensum Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) may experience minor impacts through changes in flows associated with new drainage features required for construction and operation of the road.

Habitats of Principal Importance (HPI) identified from MAGIC<sup>3</sup>, that are present within Route Option A corridor, which may be affected by construction, comprise lowland deciduous woodland, floodplain grazing marsh and traditional orchard. Other habitats that could meet HPI criteria may also be affected, including hedgerows, watercourses, arable field margins and ponds. This option would lead to the loss of a number of ponds which could support protected species and species of conservation significance.

Barbastelle could be dependent on the woodland habitat along the route, as a known barbastelle maternity colony is located within 300m of the route near to Morton. Areas where maternity colonies are located are of high conservation significance and can be vulnerable to disturbance. The severance of woodland and hedgerows may have significant impacts on barbastelle commuting between roosts and foraging habitat.

Route Option A was considered to have least impact across the 11 key ecological features identified (including for the Wensum). The route is largely located within a more arable landscape than the other route options and so fragmentation impacts are considered to be minimal. However, this route has the potential to have a significant impact on the Morton barbastelle colony due to the very close proximity of the

<sup>3</sup> Multi Agency Geographic Information for the Countryside (<https://magic.defra.gov.uk/>)



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

roosts to the route. Additionally due to the proximity and large area of known roost trees within the Morton area, mitigation would be difficult. Due to the European level legal protection the barbastelle bat receives and the proximity of the roost sites to the route, Route Option A is considered to have very large adverse impacts.

### ROUTE OPTION B WEST

Three designated sites are located within 100m of Route Option B West, including the River Wensum SAC and SSSI. This route option requires the replacement of the existing bridge over the A1067 at Attlebridge to allow for a wider bridge to support the additional traffic. This will require excavation works in the banks of the River Wensum SAC that may have effects of ecological features within the river which will increase the risk of pollution of the watercourse during the construction phase.

In addition to impacts onto the Wensum, this route is likely to give rise to severance of land adjoining a County Wildlife Site (CWS), which is a site that forms part of a larger area of deciduous woodland. Such severance is likely to affect protected species that use these habitats to move through the wider landscape. Dualling of the A1067 is likely to result in the complete loss of a roadside nature reserve and land take from another CWS.

HPI within the route corridor, that are likely to be impacted, comprise lowland deciduous woodland and floodplain grazing marsh. Other habitat that could meet HPI criteria may also be impacted, including hedgerows, watercourses, arable field margins and ponds. Barbastelle could be dependent on the woodland habitat along the route, as a known barbastelle maternity colony is located within 300m of the route near to Morton. Areas where maternity colonies are located are of high conservation significance and can be vulnerable to disturbance. The severance of woodland and hedgerows may have significant impacts on barbastelle commuting between roosts and foraging habitat.

Route Option B West has the potential to affect ecological features of particular importance namely the River Wensum SAC and the barbastelle bat. Route B West has the potential to give rise to significant effects on the Wensum because of the requirement for a new bridge crossing which is likely to give rise to loss of river habitat.

Both variants for Route B are close to the Morton area barbastelle maternity colony and a possible maternity roost recorded along The Broadway in the south of the study area during the May 2019 bat surveys. The roost could be used by bats to gather before they form maternity roosts in which to give birth or it could be used by bats to give birth; additional data collection will help to confirm this. The routes also bisect core barbastelle bat foraging areas and commuting habitat. The habitats in the northern part of route B include multiple small blocks of woodland which would make mitigation options difficult and potentially very expensive as multiple new crossing points would be required. Due to the impacts on the Wensum and barbastelle bat, Route Option B West is considered to have very large adverse impacts.



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	[REDACTED]
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

### ROUTE OPTION B EAST

Four designated sites are located along the Route of Option B East, including the River Wensum SAC and SSSI. Designated sites within proximity to the route will likely be subject to deterioration in air quality and an increase in noise and vehicle lighting. Dualling of the A1067 is likely to result in the complete loss of a roadside nature reserve and land take from another CWS.

HPI within 100m of the route option that are likely to be impacted comprise lowland deciduous woodland and floodplain grazing marsh. The proposed viaduct across the River Wensum is likely to affect floodplain grazing marsh during construction. Other habitat that could meet HPI criteria may also be impacted, including hedgerows, watercourses, arable field margins and ponds.

Both variants for Route B are close to the Morton area barbastelle maternity colony and a possible maternity roost recorded along The Broadway in the south of the study area during the May 2019 bat surveys. The roost could be used by bats to gather before they form maternity roosts in which to give birth or it could be used by bats to give birth; additional data collection will help to confirm this. The routes also bisect core barbastelle bat foraging areas and commuting habitat. The habitats in the northern part of route B include multiple small blocks of woodland which would make mitigation options difficult and potentially very expensive as multiple new crossing points would be required. Due to the impacts on the Wensum and barbastelle bat, Route Option B West is considered to have very large adverse impacts.

Route Option B East avoids direct impacts on the Wensum through crossing the river by use of a viaduct. However, Route Option B East has the potential to cause significant effects on the barbastelle bat (as outlined above) which may be difficult to mitigate. Overall, Route Option B East is considered to have very large adverse impacts.

### ROUTE OPTION C

Route Option C passes through three designated sites including the River Wensum SAC and SSSI. An additional three non-statutory designated sites within 250m of the route may be indirectly impacted. Designated sites within proximity to the route will likely be subject to deterioration in air quality and an increase in noise and vehicle lighting.

HPI within 100m of Route Option C that are likely to be impacted comprised lowland deciduous woodland and floodplain grazing marsh. The proposed viaduct across the River Wensum is likely to affect floodplain grazing marsh during construction.

A possible maternity roost of barbastelle bat has been recorded along The Broadway and another in Hall Hills wood. The Broadway and the woodland directly south: Foxburrow Plantations (which is a CWS) will be bisected by the road. Due to the linear form of these woodlands, bat mitigation measures (green bridges or



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

underpasses) would potentially be easier, cheaper (as fewer crossing points would be required) and more successful than mitigation required for Route Option B.

Route Option C avoids direct impacts on the Wensum through crossing the river by use of a viaduct. Although Route Option C would cause severance of areas of woodlands it would not result in as much habitat fragmentation as Route Option D as fewer woodlands are divided by the route. Overall, Route Option C is considered to have large adverse impacts.

### ROUTE OPTION D (WEST AND EAST)

Option D Eastern and Western variants are expected to have very similar impacts and so have been assessed together.

Route Option D passes through five designated sites including the River Wensum SAC and SSSI. An additional six non-statutory designated sites within 250m of the route may be indirectly impacted. Designated sites within proximity to the route will likely be subject to deterioration in air quality and an increase in noise and vehicle lighting. Severance of a CWS, which forms part of a larger area of deciduous woodland (some of which is identified as ancient woodland) would occur.

HPI within 100m of the route option that are likely to be impacted comprise lowland deciduous woodland and floodplain grazing marsh. The proposed viaduct across the River Wensum is likely to affect floodplain grazing marsh during construction.

Route D has the potential to have an impact on bats using the possible maternity roost within Hall Hills wood as it is likely that the bats within this roost use woodlands around the route for commuting and foraging. The bat activity's surveys conducted this year indicate that there is a higher level of bat activity on Route D compared to the other routes that were surveyed. Mitigation for habitat fragmentation along this route could be very expensive due to the number of potentially severances and blocks of woodland fragmented.

Route Option D is likely to have the greatest ecological impact on the most ecological features, as it would affect seven of the 11 key ecological features identified worse than the other routes. Route D would be likely to cause the greatest amount of severance and fragmentation of habitats of conservation importance. The habitat fragmentation may lead to potentially significant impacts that would be expensive to mitigate for including the barbastelle bat. Overall, Route Option D is considered to have large adverse impacts.

### CONCLUSION

The WebTAG and matrix is largely informed by desk-based information and the surveys that have been undertaken at this stage and therefore the comparison of route options has been further guided by



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

professional judgement. It should be noted that, because of this, impacts may change following the development of the baseline.

Based on the conclusion from the WebTAG, it is concluded that Option A, B West and East will have a very large adverse impact on ecological features. Option C and Option D both variants will have a large adverse impact.

The very large adverse impact categorisation for routes A and B West and East are due to these routes impacting the ecological features in the study area (recorded so far) that receive the highest legal and policy protection; namely the River Wensum (SAC and SSSI) and barbastelle bat.

From the matrix that was put together to help further guide the assessment, Route D is the route that impacts the highest number of ecological features at a moderate or major level compared to the other routes. Route A impacts the least number of features at a moderate or major level followed by routes B West and C.

### WATER ENVIRONMENT

The potential impacts of the NWL on the Water Environment have been assessed in accordance with WebTAG Guidance (Unit A3.10 Impacts on the Water Environment, DfT, December 2015). This comprises a qualitative assessment of the impacts of the scheme options upon various features of the water environment and a Summary Assessment of the environmental impacts has been produced for each route option.

Receptors identified in this assessment include: The River Wensum; River Tud; Weston Fisheries; several unnamed ordinary watercourses; mapped fluvial floodplains; and the underlying groundwater body.

### ROUTE OPTION A

The overall Summary Assessment score for Route Option A is minor adverse. This is a result of low significance effects to the River Wensum and fluvial floodplain given the close proximity of the proposed junction to the watercourse. A conservative approach to the loss of floodplain has been taken until quantitative analysis of potential effects is assessed to inform the need for compensatory storage.

### ROUTE OPTION B WEST

The overall Summary Assessment score for Route Option B West is minor adverse. This is attributable to potential effects to the ecological quality of the River Wensum and its fluvial floodplain associated with works to the existing or new bridge crossing.





## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

### ROUTE OPTION B EAST

The overall Summary Assessment score for Route Option B East is moderate adverse. This is attributable to potential effects to the ecological quality of the River Wensum and its fluvial floodplain associated with the proposed viaduct crossing, as well as potential effects to the conveyance of flow through the floodplain. A conservative approach to the loss of floodplain has been taken until quantitative analysis of potential effects is undertaken to inform the need for compensatory storage or other mitigation.

### ROUTE OPTION C

The overall Summary Assessment score for Route Option C is moderate adverse. Similarly, to Route Option B East, this is attributable to potential effects to the ecological quality of the River Wensum and its fluvial floodplain associated with the proposed viaduct crossing, as well as potential effects to the conveyance of flow through the floodplain. A conservative approach to the loss of floodplain has been taken until quantitative analysis of potential effects is undertaken to inform the need for compensatory storage or other mitigation.

### ROUTE OPTION D

The overall Summary Assessment score for Route Option D is moderate adverse. This is attributable to potential effects to the ecological quality of the River Wensum and River Tud and their fluvial floodplains associated with the proposed viaduct crossings, as well as potential effects to the conveyance of flow through the floodplain of the River Wensum.

A conservative approach to the loss of floodplain has been taken until quantitative analysis of potential effects is undertaken to inform the need for compensatory storage or other mitigation. It is also noted that the River Tud may be reclassified as an ordinary watercourse from its current status as a Main River. This proposed reclassification is not expected to change the determined assessment score presented in this report.

### CONCLUSION

In conclusion Route Options A and B West give rise to the slight adverse impacts to the water environment and Route Options B East, C and D have greater impacts as they will lead to moderate adverse impacts.

#### *Next steps*

During the detailed design stage, further assessment work on the potential impacts to the water course will be undertaken. Groundwater assessment work will also be included in the EIA assessment.



## TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

### Environmental Appraisal Summary

In conclusion, it is clear that there are a lot of potential important environmental issues that need to be taken into account during all stages of the process of this scheme. All route options have environmental impacts associated with them, however in general at this stage, and as outlined in **Table 6**.

Route Option A is the least environmentally impactful, with the exceptions of biodiversity and historic environment, and Option D, for most disciplines, has some of the largest environmental impacts.

**Table 6** is a summary of the environmental appraisals from the WebTAG worksheets for each environment discipline. The noise appraisal results are the conclusions taken from the qualitative noise assessment.

# TECHNICAL NOTE 4 – NWL EIA Overview

<b>DATE:</b>	18 June 2019	<b>CONFIDENTIALITY:</b>	Public
<b>SUBJECT:</b>	NWL Environmental Impacts Appraisal Overview		
<b>PROJECT:</b>	Norwich Western Link	<b>AUTHOR:</b>	██████████
<b>CHECKED:</b>	EM	<b>APPROVED:</b>	LA

Table 6 Environmental Appraisal Summary Table

Environmental Impacts	Route Options					
	Option A	Option B West	Option B East	Option C	Option D (west)	Option D (east)
<b>Noise</b>	Route Option A adversely impacts more properties and benefits fewer properties than the other route options in the short-term. However, the changes in noise that result from Route Option A are almost all less than ±1dB, which would be classed as negligible changes.	Slightly larger changes when compared to Option A, however overall they would still be classed as negligible in magnitude.	Very similar to the outcomes for Route Option B West. All of the changes would be classed as negligible in magnitude.	Similar to those of Route Options B western and eastern variants, but overall they would be classed as minor impacts, both adverse and beneficial, rather than negligible.	Similar to those from Route Option B western and eastern variants and Route Option C and would be classed as negligible in magnitude.	Similar to those from Route Option B western and eastern variants and Route Option C and would be classed as negligible in magnitude.
<b>Air Quality</b>	Total NPV of changes in air quality over 60-year appraisal period following opening is <b>£3,602,929</b>	Total NPV of changes in air quality over 60-year appraisal period following opening is <b>£728,499</b>	Total NPV of changes in air quality over 60-year appraisal period following opening is <b>-£548,522</b>	Total NPV of changes in air quality over 60-year appraisal period following opening is <b>-£453,195</b>	Total NPV of changes in air quality over 60-year appraisal period following opening is <b>-£3,029,388</b>	Total NPV of changes in air quality over 60-year appraisal period following opening is <b>-£3,029,388</b>
<b>Greenhouse Gases</b>	Total NPV of changes in (CO <sub>2</sub> ) <sub>e</sub> over 60-year appraisal period following opening is <b>£8,622,855</b>	Total NPV of changes in (CO <sub>2</sub> ) <sub>e</sub> over 60-year appraisal period following opening is - <b>£1,358,528</b>	Total NPV of changes in (CO <sub>2</sub> ) <sub>e</sub> over 60-year appraisal period following opening is - <b>£4,900,284</b>	Total NPV of changes in (CO <sub>2</sub> ) <sub>e</sub> over 60-year appraisal period following opening is - <b>£4,149,699</b>	Total NPV of changes in (CO <sub>2</sub> ) <sub>e</sub> over 60-year appraisal period following opening is - <b>£10,575,555</b>	Total NPV of changes in (CO <sub>2</sub> ) <sub>e</sub> over 60-year appraisal period following opening is - <b>£10,575,555</b>
<b>Landscape</b>	Slight Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse
<b>Historic Environment</b>	Large Adverse	Large Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse
<b>Biodiversity</b>	Very Large Adverse	Very Large Adverse	Very Large Adverse	Large Adverse	Large Adverse	Very Large Adverse
<b>Water Environment</b>	Minor Adverse	Minor Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse
<b>Geology and Soils</b>	This Option has the least exposure to the construction of embankments/piled structures over Alluvium layer.	This Option has a limited exposure to construction of embankments and piled structure over Alluvium layer.	This Option has a considerable exposure to construction of embankments and piled structure over Alluvium layer.	This Option has a considerable exposure to construction of embankments and piled structure over Alluvium layer.	This Option has the greatest exposure to construction of embankments and piled structure over Alluvium layer.	This Option has the greatest exposure to construction of embankments and piled structure over Alluvium layer.

# Technical Note 4

## Appendix A



---

ENVIRONMENTAL  
WORKSHEETS



# Technical Memorandum

<b>TO</b>	██████████	<b>FROM</b>	██████████
<b>DATE</b>	08 February 2019	<b>CONFIDENTIALITY</b>	Internal
<b>SUBJECT</b>	Norwich Western Link Road – Noise Assessment		

## Introduction

This Technical Memorandum sets out a qualitative noise impact assessment of five route options for the Norwich Western Link Road to feed into the Strategic Outline Business Case.

The assessment includes a property count within specific distances from each of the five route options, to identify the route likely to affect the fewest properties.

A qualitative assessment of each of the routes and along the bypassed road(s) and wider road network has also been undertaken, identifying any key areas/towns that may experience an increase or decrease in noise both during construction and once the route is operational.

## Property Count

A property count has been undertaken for each route option, identifying the number of properties within each of the following distance bands from the route:

- 50 metres;
- 100 metres;
- 200 metres;
- 300 metres; and
- 600 metres.

The distances are measured relative to the centreline of each route option.

The alignments for each route option are based on the following draft WSP drawings:

- *Norwich Western Link – Proposed Link Road Option A Layout Plan* (reference 1922-WSP-00-ZZ-CE-SK-8001\_DRAFT Revision P01, dated January 2019);
- *Norwich Western Link – Proposed Link Road Option B (West) Layout Plan* (reference 1922-WSP-00-ZZ-CE-SK-8002\_DRAFT Revision P01, dated January 2019);
- *Norwich Western Link – Proposed Link Road Option B (East) Layout Plan* (reference 1922-WSP-00-ZZ-CE-SK-8005\_DRAFT Revision P01, dated January 2019);
- *Norwich Western Link – Proposed Link Road Option C Overview Plan* (reference 1922-WSP-00-ZZ-CE-SK-8003\_DRAFT Revision P01, dated January 2019);
- *Norwich Western Link – Proposed Link Road Option D Layout Plan* (reference 1922-WSP-00-ZZ-CE-SK-8004\_DRAFT Revision P01, dated January 2019).

In addition to the alignment drawings, coordinates and address details for properties within 1km of the five route options has been supplied in the form of an OS Address Database. This address information has been sorted to remove commercial properties, duplicates, and other non-sensitive elements such as archaeological features or caravans parked on driveways. The location of each sensitive address included in the property count has been adjusted so that it is approximately centred on the relevant building.

The results of the property counts are shown in Table 1.

**Table 1: Property counts**

Route Option	Distance bands					Totals	
	0 to 50m	50 to 100m	100 to 200m	200 to 300m	300 to 600m	Within 300m	Within 600m
Option A	14	10	28	38	180	90	270
Option B	0 (9)	2 (8)	7 (22)	17 (18)	123 (108)	26 (57)	149 (165)
Option B1	0 (3)	2 (5)	3 (21)	8 (20)	102 (100)	13 (49)	115 (149)
Option C	0 (0)	0 (0)	2 (2)	3 (3)	37 (41)	5 (5)	42 (46)
Option D	0 (0)	2 (2)	11 (11)	5 (5)	41 (46)	18 (18)	59 (64)

Note: Figures in brackets relate to each option plus the A1067 upgrades

It can be seen from Table 1 that Option C is proposed close to the fewest properties, and on that basis, is the least likely to give rise to adverse effects. Option A is proposed close to the most properties, and is therefore the most likely to give rise to adverse effects.

## Qualitative Assessment

Each route option has been reviewed to qualitatively comment on areas that are likely to be susceptible to noise and/or vibration impacts.

### ROUTE OPTION A

Option A runs from the A47 at its junction with Wood Lane and Berrys Lane to the A1067 Fakenham Road at its junction with Porters Lane and the B1533.

From the proposed junction with the A47 it initially follows a similar alignment to Wood Lane, before branching off to the north-west and skirting the western edge of the former RAF Attlebridge. To the north-west of the former airfield it roughly follows the alignment of the B1533 until joining with the A1067.

Throughout its length it passes close to a small number of isolated properties off Sandy Lane and Leys Lane, and along the existing B1533.

The closest properties on Sandy Lane are approximately 120 metres away from the proposed carriageway edge. The proposed works in this area include stopping up of existing roads, new junctions and accesses, and installation of pedestrian crossing bridges. This should reduce the amount of traffic using Sandy Lane as a through route. However, a greater impact than currently exists at the closest receptors may still occur if the net result of the scheme is more traffic using the route than currently using Sandy Lane. The amount and proximity of construction works in this area is likely to lead to an adverse impact at the closest properties.

Further north the route passes close to Woodforde Farm, as it crosses Breck Road. The proposed method of crossing is a road bridge, and the construction works involved with this may result in significant levels of



construction noise and vibration at this receptor due to its proximity. Operational noise may also be an issue, again due to the proximity of the receptor to the route.

Properties along the current B1533 may be adversely impacted during any widening or realignment construction works due to the proximity of these works. Any operational impacts will depend on the difference in vehicle movements using the proposed route in comparison to those using the existing B1533.

The closest villages are Lenwade and Great Witchingham, which lie along the A1067 immediately either side of the existing junction with the B1533 and the proposed junction with Option A. The proposed works at this junction include the creation of a roundabout, and adverse impacts may occur at the closest properties during the construction phase due to the proximity of works. Any operational impacts will depend on the difference in vehicle movements as a result of the proposed route in comparison to those currently using the A1067 and B1533.

## ROUTE OPTION B

Option B runs from the A47 at its junction with Wood Lane and Berrys Lane to the A1067 Fakenham Road between Morton on the Hill and Attlebridge.

From the proposed junction with the A47 it heads north-east then north after crossing Breck Road, running roughly parallel with Wood Lane until it skirts the eastern edge of the village of Weston Longville, approximately 280 metres from the proposed carriageway. After crossing Ringland Lane it turns slightly north-east again, running roughly parallel with Marl Hill Road until joining with the A1067.

The route passes immediately to the east of a small number of properties around the junction of Weston Green Road, approximately 45 metres from the proposed carriageway. Due to the proximity of these properties, there would be a greater chance of adverse noise impacts during the operational phases. This part of the route also includes a road bridge, which is likely to result in significant levels of construction noise and vibration at the properties.

Close to the junction with the A1067, there are a number of properties to the north-east, on The Street. There are also properties to the west of this junction in Morton on the Hill, and to the east in the village of Attlebridge.

The proposed works at this junction include the creation of a roundabout, a widened bridge crossing over the River Wensum, and an upgrade to the A1067. Adverse impacts may occur at the closest properties during the construction phase due to the proximity of works. Operational impacts may occur at the closest properties, although the level of impact will depend on the amount of traffic using the route, and any changes to traffic flow on the A1067 around the junction with the proposed route.

## ROUTE OPTION B1

Option B1 runs from the A47 at its junction with Wood Lane and Berrys Lane to the A1067 Fakenham Road to the east of Attlebridge.

From the proposed junction with the A47 it heads north-east then north after crossing Breck Road, running roughly parallel with Wood Lane until it skirts the eastern edge of the village of Weston Longville. After crossing Ringland Lane it turns eastwards, skirting the northern edge of Morton Hall, until joining with the A1067.



The route passes immediately to the east of a small number of properties around the junction of Weston Green Road, approximately 45 metres from the proposed carriageway. Due to the proximity of these properties, there would be a greater chance of adverse noise impacts during the operational phases. This part of the route also includes a road bridge, which is likely to result in significant levels of construction noise and vibration at the properties.

The route also passes within 280 metres of Morton Hall, and within 85 metres of Ivy Cottages, close to the A1067. The proposed works in this area include a viaduct crossing over the River Wensum and the construction of a roundabout to form a junction with the A1067.

Due to the proximity and nature of these works, there is an increased risk of adverse impacts due to construction noise and vibration. Operational noise may also be an issue at Ivy Cottages close to the A1067, due to their proximity to the proposed route and its roundabout with the A1067.

## ROUTE OPTION C

Option C runs from the A47 at its junction with Wood Lane and Berrys Lane to the A1067 Fakenham Road to the west of its junction with the A1270.

From the proposed junction with the A47 it heads north-east, following the same alignment as Routes B and B1 and running roughly parallel with Wood Lane. After crossing Breck Road it continues north-east, turning more easterly after crossing Ringland Lane before turning northward again and joining with the A1067.

The route only passes close to a small number of properties, notably Low Farm and Old Hall Farm, Old Hall Farm Cottages and Woodstock close to the junction with the A1067.

The works in this area include a viaduct crossing over the River Wensum, a drainage basin, and the construction of a roundabout to form a junction with the A1067. Due to the proximity and nature of these works, there is an increased risk of adverse impacts due to construction noise and vibration. The proximity of the route also means that there may be adverse impacts due to operational noise.

## ROUTE OPTION D

Option D runs from the A47 at its junction with Taverham Road to the A1067 Fakenham Road to the west of its junction with the A1270. The route passes to within approximately 47 metres of the houses on Taverham Road.

From the proposed junction with the A47 it heads north-east, running roughly parallel with Taverham Road, until it turns north-west and crosses Honingham Lane. It then turns back north-eastwards as it passes the village of Ringland, before joining the A1067.

The route passes close to a small number of properties, including Low Farm, Old Hall Farm, Old Hall Farm Cottages, Woodstock, Gamekeepers Cottage and The Kennels, Ebony Hall and properties near the junction with the A47.

For Gamekeepers Cottage and The Kennels, a road crossing bridge is proposed close by. Due to the proximity and nature of these works, there is an increased risk of adverse impacts due to construction noise and vibration. The proximity of the route also means that there may be adverse impacts due to operational noise.





For properties close to the junction with the A1067, including Low Farm, Old Hall Farm, Old Hall Farm Cottages and Woodstock, the works in this area include a viaduct crossing over the River Wensum, a drainage basin, and the construction of a roundabout to form a junction with the A1067. Due to the proximity and nature of these works, there is an increased risk of adverse impacts due to construction noise and vibration. The proximity of the route also means that there may be adverse impacts due to operational noise.

For properties close to the junction with the A47, the works in this area include a viaduct crossing over the River Tud and a drainage basin. Due to the proximity and nature of these works, there is an increased risk of adverse impacts due to construction noise and vibration. The proximity of the route also means that there may be adverse impacts due to operational noise.

## SUMMARY

Route Option C passes close to the fewest sensitive properties and is therefore considered the least likely to generate adverse effects. Route Option A passes close to the most sensitive properties, and is considered likely to generate the most adverse effects.

However, Option C, in common with Options B1 and D, will contain significant civil engineering works in the form of a viaduct over the River Wensum. Depending on how this viaduct is constructed, there is potential or significant construction noise and vibration from its installation. However, such noise and vibration will be temporary and does not significantly detract from the conclusion that Option C is likely to lead to the least impact.

  
Principal Consultant

## Air Quality Valuation Workbook - Worksheet 3

Scheme Name: NWL Option A

Present Value Base Year:

Current Year:

Proposal Opening year:

Project (Road/Rail or Road and Rail):

### Overall Assessment Score:

#### Damage Costs Approach (Emissions)

Present value of change in NOx emissions (£):

Present value of change in PM2.5 emissions (£):

**OR**

Present value of change in PM10 emissions (£):

#### Impact Pathways Approach (Concentrations)

Present value of change in NO2 concentrations (£):

Of which:

Concentration costs:

Other impacts:

Present value of change in PM2.5 concentrations (£):

Of which:

Concentration costs:

Other impacts:

#### Total Change

Total value of change in air quality (£):

\*positive value reflects a net benefit (i.e. air quality improvement)

### Quantitative Assessment:

#### Impact Pathways Approach (Concentrations)

Change in NO2 assessment scores over 60 year appraisal period:  
(between 'with scheme' and 'without scheme' scenarios)

Net total route assessment (opening year) for PM2.5 (ug/m-3):  
(between 'with scheme' and 'without scheme' scenarios)

#### Damage Costs Approach (Emissions)

Change in NOX emissions over 60 year appraisal period (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

Change in PM2.5 emissions over 60 year appraisal period (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

**OR**

Change in PM10 emissions over 60 year appraisal period (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

### Qualitative Comments:

N/A

---

---

**Sensitivity Analysis:**

Upper estimate net present value of change in air quality (£):

-£332,466

Lower estimate net present value of change in air quality (£):

-£16,576

---

---

**Data Sources:**

Traffic data supplied by WSP Transport Planners

---

---

## Air Quality Valuation Workbook - Worksheet 3

Scheme Name: NWL Option B East

Present Value Base Year:

Current Year:

Proposal Opening year:

Project (Road/Rail or Road and Rail):

**Overall Assessment Score:**

### Damage Costs Approach (Emissions)

Present value of change in NOx emissions (£):

Present value of change in PM2.5 emissions (£):

**OR**

Present value of change in PM10 emissions (£):

### Impact Pathways Approach (Concentrations)

Present value of change in NO2 concentrations (£):

Of which:

Concentration costs:

Other impacts:

Present value of change in PM2.5 concentrations (£):

Of which:

Concentration costs:

Other impacts:

### Total Change

Total value of change in air quality (£):

\*positive value reflects a net benefit (i.e. air quality improvement)

**Quantitative Assessment:**

### Impact Pathways Approach (Concentrations)

Change in NO2 assessment scores over 60 year appraisal period:

(between 'with scheme' and 'without scheme' scenarios)

Net total route assessment (opening year) for PM2.5 (ug/m-3):

(between 'with scheme' and 'without scheme' scenarios)

### Damage Costs Approach (Emissions)

Change in NOX emissions over 60 year appraisal period (tonnes):

(between 'with scheme' and 'without scheme' scenarios)

Change in PM2.5 emissions over 60 year appraisal period (tonnes):

(between 'with scheme' and 'without scheme' scenarios)

**OR**

Change in PM10 emissions over 60 year appraisal period (tonnes):

(between 'with scheme' and 'without scheme' scenarios)

**Qualitative Comments:**

N/A

---

---

**Sensitivity Analysis:**

Upper estimate net present value of change in air quality (£):

£84,592

Lower estimate net present value of change in air quality (£):

£3,550

---

---

**Data Sources:**

Traffic data supplied by WSP Transport Planners

---

---

## Air Quality Valuation Workbook - Worksheet 3

Scheme Name: NWL Option B West

Present Value Base Year:

Current Year:

Proposal Opening year:

Project (Road/Rail or Road and Rail):

### Overall Assessment Score:

#### Damage Costs Approach (Emissions)

Present value of change in NOx emissions (£):

Present value of change in PM2.5 emissions (£):

**OR**

Present value of change in PM10 emissions (£):

#### Impact Pathways Approach (Concentrations)

Present value of change in NO2 concentrations (£):

Of which:

Concentration costs:

Other impacts:

Present value of change in PM2.5 concentrations (£):

Of which:

Concentration costs:

Other impacts:

#### Total Change

Total value of change in air quality (£):

\*positive value reflects a net benefit (i.e. air quality improvement)

### Quantitative Assessment:

#### Impact Pathways Approach (Concentrations)

Change in NO2 assessment scores over 60 year appraisal period:

(between 'with scheme' and 'without scheme' scenarios)

Net total route assessment (opening year) for PM2.5 (ug/m-3):

(between 'with scheme' and 'without scheme' scenarios)

#### Damage Costs Approach (Emissions)

Change in NOx emissions over 60 year appraisal period (tonnes):

(between 'with scheme' and 'without scheme' scenarios)

Change in PM2.5 emissions over 60 year appraisal period (tonnes):

(between 'with scheme' and 'without scheme' scenarios)

**OR**

Change in PM10 emissions over 60 year appraisal period (tonnes):

(between 'with scheme' and 'without scheme' scenarios)

### Qualitative Comments:

N/A

---

---

**Sensitivity Analysis:**

Upper estimate net present value of change in air quality (£):

£595,201

Lower estimate net present value of change in air quality (£):

£31,942

---

---

**Data Sources:**

Traffic data supplied by WSP Transport Planners

---

---

## Air Quality Valuation Workbook - Worksheet 3

Scheme Name: NWL Option C

Present Value Base Year:

Current Year:

Proposal Opening year:

Project (Road/Rail or Road and Rail):

### Overall Assessment Score:

#### Damage Costs Approach (Emissions)

Present value of change in NOx emissions (£):

Present value of change in PM2.5 emissions (£):

**OR**

Present value of change in PM10 emissions (£):

#### Impact Pathways Approach (Concentrations)

Present value of change in NO2 concentrations (£):

Of which:

Concentration costs:

Other impacts:

Present value of change in PM2.5 concentrations (£):

Of which:

Concentration costs:

Other impacts:

#### Total Change

Total value of change in air quality (£):

\*positive value reflects a net benefit (i.e. air quality improvement)

### Quantitative Assessment:

#### Impact Pathways Approach (Concentrations)

Change in NO2 assessment scores over 60 year appraisal period:  
(between 'with scheme' and 'without scheme' scenarios)

Net total route assessment (opening year) for PM2.5 (ug/m-3):  
(between 'with scheme' and 'without scheme' scenarios)

#### Damage Costs Approach (Emissions)

Change in NOx emissions over 60 year appraisal period (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

Change in PM2.5 emissions over 60 year appraisal period (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

**OR**

Change in PM10 emissions over 60 year appraisal period (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

### Qualitative Comments:



N/A

---

---

**Sensitivity Analysis:**

Upper estimate net present value of change in air quality (£):

£571,674

Lower estimate net present value of change in air quality (£):

£31,818

---

---

**Data Sources:**

Traffic data supplied by WSP Transport Planners

---

---



N/A

---

---

**Sensitivity Analysis:**

Upper estimate net present value of change in air quality (£):

£1,004,334

Lower estimate net present value of change in air quality (£):

£48,834

---

---

**Data Sources:**

Traffic data supplied by WSP Transport Planners

---

---

## Air Quality Valuation Workbook - Worksheet 3

Scheme Name: NWL Option D - West

Present Value Base Year:

Current Year:

Proposal Opening year:

Project (Road/Rail or Road and Rail):

**Overall Assessment Score:**

**Damage Costs Approach (Emissions)**

Present value of change in NOx emissions (£):

Present value of change in PM2.5 emissions (£):

**OR**

Present value of change in PM10 emissions (£):

**Impact Pathways Approach (Concentrations)**

Present value of change in NO2 concentrations (£):

Of which:

Concentration costs:

Other impacts:

Present value of change in PM2.5 concentrations (£):

Of which:

Concentration costs:

Other impacts:

**Total Change**

Total value of change in air quality (£):

\*positive value reflects a net benefit (i.e. air quality improvement)

**Quantitative Assessment:**

**Impact Pathways Approach (Concentrations)**

Change in NO2 assessment scores over 60 year appraisal period:

(between 'with scheme' and 'without scheme' scenarios)

Net total route assessment (opening year) for PM2.5 (ug/m-3):

(between 'with scheme' and 'without scheme' scenarios)

**Damage Costs Approach (Emissions)**

Change in NOX emissions over 60 year appraisal period (tonnes):

(between 'with scheme' and 'without scheme' scenarios)

Change in PM2.5 emissions over 60 year appraisal period (tonnes):

(between 'with scheme' and 'without scheme' scenarios)

**OR**

Change in PM10 emissions over 60 year appraisal period (tonnes):

(between 'with scheme' and 'without scheme' scenarios)

**Qualitative Comments:**

N/A

---

---

**Sensitivity Analysis:**

Upper estimate net present value of change in air quality (£):

£947,985

Lower estimate net present value of change in air quality (£):

£46,497

---

---

**Data Sources:**

Traffic data supplied by WSP Transport Planners

---

---

## Greenhouse Gases Workbook - Worksheet 1

Scheme Name: NWL Opt A

Present Value Base Year

2010

Current Year

2019

Proposal Opening year:

2025

Project (Road/Rail or Road and Rail):

road

### Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):

£8,622,885

\*positive value reflects a net benefit (i.e. CO2E emissions reduction)

### Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

-196,560

Of which Traded

0

Change in carbon dioxide equivalent emissions in opening year (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

-4,527

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£):

£0

(N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)

\*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	0
Non-traded sector	0	0	0	-12676.61276

### Qualitative Comments:

N/A

### Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

£13,351,249

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

£3,899,449

### Data Sources:

Traffic data supplied by WSP Transport Planners

## Greenhouse Gases Workbook - Worksheet 1

Scheme Name: NWL Opt A

Present Value Base Year

2010

Current Year

2019

Proposal Opening year:

2025

Project (Road/Rail or Road and Rail):

road

### Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):

-£4,900,284

\*positive value reflects a net benefit (i.e. CO2E emissions reduction)

### Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

93,585

Of which Traded

0

Change in carbon dioxide equivalent emissions in opening year (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

-14,461

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£):

£0

(N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)

\*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	0
Non-traded sector	0	0	0	-40490.05132

### Qualitative Comments:

N/A

### Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

-£7,888,263

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

-£1,909,056

### Data Sources:

Traffic data supplied by WSP Transport Planners

## Greenhouse Gases Workbook - Worksheet 1

Scheme Name: NWL Opt A

Present Value Base Year

2010

Current Year

2019

Proposal Opening year:

2025

Project (Road/Rail or Road and Rail):

road

### Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):

-£1,358,528

\*positive value reflects a net benefit (i.e. CO2E emissions reduction)

### Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

14,966

Of which Traded

0

Change in carbon dioxide equivalent emissions in opening year (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

-14,332

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£):

£0

(N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)

\*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	0
Non-traded sector	0	0	0	-40128.78209

### Qualitative Comments:

N/A

### Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

-£2,369,254

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

-£343,235

### Data Sources:

Traffic data supplied by WSP Transport Planners



## Greenhouse Gases Workbook - Worksheet 1

Scheme Name: NWL Opt C

Present Value Base Year

2010

Current Year

2019

Proposal Opening year:

2025

Project (Road/Rail or Road and Rail):

road

### Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):

-£4,149,699

\*positive value reflects a net benefit (i.e. CO2E emissions reduction)

### Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

79,525

Of which Traded

0

Change in carbon dioxide equivalent emissions in opening year (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

-11,987

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£):

£0

(N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)

\*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	0
Non-traded sector	0	0	0	-33564.69853

### Qualitative Comments:

N/A

### Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

-£6,675,439

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

-£1,621,298

### Data Sources:

Traffic data supplied by WSP Transport Planners

## Greenhouse Gases Workbook - Worksheet 1

Scheme Name: NWL Opt D East

Present Value Base Year

2010

Current Year

2019

Proposal Opening year:

2025

Project (Road/Rail or Road and Rail):

road

### Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):

-£10,575,555

\*positive value reflects a net benefit (i.e. CO2E emissions reduction)

### Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

223,239

Of which Traded

0

Change in carbon dioxide equivalent emissions in opening year (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

-11,213

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£):

£0

(N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)

\*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	0
Non-traded sector	0	0	0	-31396.93862

### Qualitative Comments:

N/A

### Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

-£16,670,841

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

-£4,480,358

### Data Sources:

Traffic data supplied by WSP Transport Planners

## Greenhouse Gases Workbook - Worksheet 1

Scheme Name: NWL Opt D West

Present Value Base Year

2010

Current Year

2019

Proposal Opening year:

2025

Project (Road/Rail or Road and Rail):

road

### Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):

-£10,575,555

\*positive value reflects a net benefit (i.e. CO2E emissions reduction)

### Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

223,239

Of which Traded

0

Change in carbon dioxide equivalent emissions in opening year (tonnes):  
(between 'with scheme' and 'without scheme' scenarios)

-11,213

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£):

£0

(N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)

\*positive value reflects a net benefit (i.e. CO2E emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	0
Non-traded sector	0	0	0	-31396.93862

### Qualitative Comments:

N/A

### Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

-£16,670,841


Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

-£4,480,358

### Data Sources:

Traffic data supplied by WSP Transport Planners

**TAG Landscape Impacts Worksheet: Option A**

Features	Step 2	Step 3			Step 4	
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	This landscape is characterised by a small to medium scale regular landscape pattern on gently undulating landform, flattening to the south of the study area. Fields are contained by trimmed hedgerows with occasional hedgerow trees, woodland cover is sparse giving an open appearance with expansive views. This is in contrast to the north, which is a shallow river valley, containing the River Wensum, fields are smaller and irregular with more winding belts of trees creating a smaller scale intimate landscape with short range views. Settlement is sparse throughout this landscape, often scattered houses and farmsteads, the large settlements are Lenwade in the north and Honingham in the south. The Old Airfield, now a solar farm, wind farm and turkey farm are a noticeable development in this landscape.	Local	Common feature at a local scale	Important at the local and regional level	Easily substitutable, although loss of mature hedgerow trees would take much longer (over 25 years) to re-establish.	<b>Slight Adverse</b> , due to the realignment of the existing road in part there would be a minor modification to the pattern.
Tranquillity	The study area is not located in any Landscape Designations. There are a number of urban influences within this landscape. The small settlements to the north and south, along with the Old Airfield, two solar farms and wind turbines reduce the tranquillity within this landscape. Traffic along the A1067 and A47 and to a lesser degree along Sandy Lane. In the north there is an adventure park and Weston Park Golf Club, along with former and active quarry workings, however woodland screening around these does reduce their influence on this landscape.	Local	Not rare locally	Important at the local level.	Easily substitutable through replacement hedgerow planting.	<b>Slight Adverse</b> , due to realignment of existing road, particularly where a new road would be introduced between Sandy Lane and Wood Lane.
Cultural	The landscape has long been associated with farming, field patterns are largely intact from 14th century, however there is evidence of larger fields and removal of hedgerows in some areas. There are medieval manors which form 18th-century country house estates, of which is the easton estate in the south east. There is a former World War II airfield in the central part of the corridor.	Local, Regional due to WWII interest.	Some elements of high cultural significance, but not designated.	Important at local and regional scale.	Not easily substitutable, although former field boundaries can be readily replaced.	<b>Neutral</b> , due to realignment of existing road, disruption of enclosure would be limited and existing settlements would remain connected.
Landcover	Landcover is predominately arable farmland with more extensive woodland, becoming evident in the north. There are other types of landcover which include a former airfield, now comprising solar farms and turkey farm in the centre of this corridor. To the north there is a golf course, an adventure park, active quarry working and lakes from former workings.	Dominant landcover common at local to regional scale, others less common.		Important at the local level.	Easily substitutable.	<b>Neutral</b> , due to the realignment of existing road, the impacts on landcover would not be readily perceptible
Summary of character	The landscape is predominantly arable farmland, with small to medium regular fields enclosed by trimmed hedgerow and infrequent mature trees to the south of the corridor. There are infrequent woodlands, predominately surrounding human interventions as screening blocks. To the north the landscape becomes a shallow river valley, containing the River Wensum. There are a number of small lakes from former quarry workings and belts of woodland with meadow pasture along the lowland valley. There are a number of urban influences within this landscape, including quarry workings, solar farms and intensive farming eroding the largely arable characteristics.	Common locally	Not rare locally or regionally	Important at the local level.	The majority of elements are easily suitable, although the loss of mature hedgerow trees would take much longer to re-establish. Historic elements would not be easily replaceable.	<b>Slight Adverse</b> , due to realignment of existing road there would be minor modification to the features of the landscape.

**Reference Sources**

MAGIC, Google Earth, Ordnance Survey Mapping, Natural England - National Character Area 78: Central North Norfolk, Breckland District LCA (2007), South Norfolk Landscape Assessment (2001), Broadland District Council Local Development framework - Landscape Character Assessment SPD (2013)

**Summary assessment score**

**Slight Adverse**

**Qualitative Comments**

There would be no substantial change to the landscape character due to the proposed route substantially being a realignment and straightening of an existing road which is reflective of the existing landscape pattern. The road will run mainly at grade, with small sections of embankment so its influence will be broadly similar as a single lane, however will be a more substantial road, particularly where it crosses between Sandy Lane and Wood Lane.

**TAG Landscape Impacts Worksheet: Option B West**

Features	Step 2	Step 3			Step 4	
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	The landscape is a wet lowland shallow valley in the north containing the River Wensum. To the south the land rises and gently undulates becoming a plateau with small to medium regular fields contained by hedgerow. Irregular tracts of woodland cut through this landscape, reducing the ordered appearance of the landscape. There are scattered farmsteads through this landscape, with the most notable settlement of Ringland in the east of this landscape and Weston Longville to the west. Small lanes cut through the landscape, typically straight with long gentle curves.	Local	Common feature at a local scale	Important at the local and regional level	Easily substitutable, although loss of mature hedgerow trees would take much longer (over 25 years) to re-establish.	<b>Slight Adverse</b> The proposed route would bisect and subdivide fields locally, however the alignment is reflective of the pattern of existing roads within this landscape.
Tranquillity	There are scattered farmsteads and small settlements, with estates such as Morton Hall to the north. The overhead line to the east which runs north to south is a notable influence within this landscape. Several arable fields have been turned into pig rearing. Weston Longville is notable settlements within this landscape. Views from the plateau give a wider perception of human influence, particularly of traffic along the A47 and A1067. The settlements of Weston Longville, Weston Green to the west, Honingham to the south and Attlebridge to the north, along with the wind turbines at the Old Airfield are notable human influences on the perception of tranquillity in this landscape.	Local	Not rare locally	Important at the local level.	Easily substitutable through replacement hedgerow planting.	<b>Moderate Adverse</b> The proposed route would partially reduce tranquillity in the immediate surroundings, due the route being primarily in cutting or at grade with short sections on embankment where its effect would be more widespread.
Cultural	The landscape has long been associated with farming, historic field patterns are largely intact, however there is evidence of larger fields and removal of hedgerows in some areas. There are medieval manors which have subsequently formed 18th-century country house estates such as Morton Hall to the north and Easton Estate to the south.	Local	Not rare locally or regionally	Important at local and regional scale.	Not easily substitutable, although former field boundaries can be readily replaced.	<b>Slight Adverse</b> The proposed route would bisect the landscape and alter the historic field patterns.
Landcover	Landcover is predominately arable farming throughout this landscape with mixed plantation tracts of mature woodland, although some fields have been turned over for pig rearing with numerous small shelters scattered through the fields. There are small ponds throughout this landscape often regular in shape. The river valley to the north and east following the River Wensum is wet meadow and small lakes. Field are contained by hedgerows and infrequent mature trees.	Predominant landcover common at local to regional scale, others less common.	Not rare locally or regionally	Important at the local level.	Easily substitutable.	<b>Moderate Adverse</b> The proposed scheme would introduce a large scale dual carriageway through the landscape, and result in the loss of some of the plantation woodland and arable fields.
Summary of character	The landscape is gently undulating arable farmland, flattening to the south, located between two shallow river valleys. River Tud in the south and River Wensum in the north being the larger of the valleys with noticeable difference in character of wet meadow and mosaic of lakes and drainage ditches. There is some human influence, of note is the overhead power lines and two wind turbines to the west, with the A47 and A1067 noticeable from the plateau. Settlement is sparse, mainly small farm steads, the biggest settlements are Ringland and Weston Longville located within the central part of this landscape. Land cover is predominately arable fields, contained by trimmed hedgerow and infrequent mature trees, with some fields turned to pig rearing. Mixed plantation woodland is common throughout this landscape, often following field boundaries. With the exception of the A47 and the A1067, local roads are generally small lanes, reflecting the field boundaries. There are limited public rights of way within this Landscape, there is a Bridleway to the south which has views to the east over the study area.	Common locally	Not rare locally or regionally	Important at the local level.	The majority of elements are easily suitable, although the loss of mature hedgerow trees would take much longer to re-establish. Historic elements would not be easily replaceable.	<b>Moderate Adverse</b> The proposed scheme would partially alter the character, loss of woodland and the road being dualled, largely in cutting limiting reduction in tranquillity in the immediate surrounding.

**Reference Sources**

MAGIC, Google Earth, Ordnance Survey Mapping, Natural England - National Character Area 78: Central North Norfolk, Breckland District LCA (2007), South Norfolk Landscape Assessment (2001), Broadland District Council Local Development framework - Landscape Character Assessment SPD (2013)

**Summary assessment score**

|||||

**Qualitative Comments**

There would be minor impact on the landscape character by the proposed scheme. There will be subdivision of existing fields, that will in part replace historic field pattern eroded by recent enlargement, however there will be subdivision of smaller fields in the north, or total loss which will alter the pattern. The road which is dualled will reduce tranquillity locally, particularly where it is on embankment to the north. The loss of small sections of hedgerows and woodlands will alter the landcover locally.

**TAG Landscape Impacts Worksheet: Option B East**

Features	Step 2	Step 3			Step 4	
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	The landscape is a wet lowland shallow valley in the north containing the River Wensum. To the south the land rises up and gently undulates becoming a plateau with small to medium regular fields contained by hedgerow. Irregular blocks of woodland cut through this landscape, reducing the order of the landscape. There are scattered farmsteads through this landscape, with the most notable settlement is Weston Longville to the west. Small lanes cut through the landscape, generally fairly straight with gentle curves.	Local	Common feature at a local scale	Important at the local and regional level	Easily substitutable, although loss of mature hedgerow trees would take much longer (over 25 years) to re-establish.	<b>Slight Adverse</b> The proposed route would bisect and subdivide fields locally, however the alignment is reflective of the pattern of existing roads within this landscape.
Tranquillity	There are scattered farmsteads and small settlements, with estates such as Morton Hall to the north. The overhead line to the east which runs north to south is a notable influence within this landscape. Several arable fields have been turned into pig rearing. Weston Longville is notable settlements within this landscape. Views from the plateau give a wider perception of human influence, particularly of traffic along the A47 and A1067. The settlements of Weston Longville, Weston Green to the west, Honingham to the south and Attlebridge to the north, along with the wind turbines at the Old Airfield are notable human influences on the perception of tranquillity in this landscape.	Local	Not rare locally	Important at the local level.	Not Easily substitutable in the north, but easily substitutable in the south through replacement hedgerow planting.	<b>Moderate Adverse</b> The proposed route would partially reduce tranquillity in the immediate surrounding, and the substantially north of Ringland Lane where the Route is on embankment and the Viaduct over River Wensum which would impact a wider area.
Cultural	The landscape has long been associated with farming, historic field patterns are largely intact, however there is evidence of larger fields and removal of hedgerows in some areas. There are medieval manors which have subsequently formed 18th-century country house estates such as Morton Hall to the north and Easton to the south.	Local	Not rare locally or regionally	Important at local and regional scale.	Not easily substitutable, although former field boundaries can be readily replaced.	<b>Slight Adverse</b> The proposed route would bisect the landscape and alter the pattern of enclosure.
Landcover	Landcover is predominately arable farming throughout this landscape with mixed plantation tracts of mature woodland, although some fields have been turned over for pig rearing with numerous small shelters scattered through the fields. There are small ponds throughout this landscape often regular in shape. The river valley to the north and east following the River Wensum is wet meadow and small lakes. Field are contained by hedgerows and infrequent mature trees.	Predominant landcover common at local to regional scale, others less common.	Not rare locally or regionally	Important at the local level.	Easily substitutable.	<b>Moderate Adverse</b> The proposed scheme would introduce a new viaduct and large dual carriageway through the landscape, and result in the loss of some of the plantation woodland and arable fields.
Summary of character	The landscape is gently undulating arable farmland, with plateau to the south, located between two shallow river valleys. River Tud in the south and River Wensum in the north being the larger of the valleys with noticeable difference in character of wet meadow and mosaic of lakes and drainage ditches. There is some human influence, of note is the OHL and two wind turbines to the west, with the A47 and A1067 noticeable from the plateau. Settlement is sparse, mainly small farm steads, the biggest settlement is Ringland and Weston Longville located within the central part of this landscape. Land cover is predominately arable fields, contained by clipped hedgerow and infrequent mature trees, with some fields turned to pig rearing. Mixed plantation woodland is common throughout this landscape, often following field boundaries. Roads are generally small lanes, generally gently curved following the field boundaries.	Common locally	Not rare locally or regionally	Important at the local level.	The majority of elements are easily suitable, although the loss of mature hedgerow trees would take much longer to re-establish. Loss of long views along the river valley is not easily substitutable along with historic elements would not be easily replaceable.	<b>Moderate Adverse</b> The proposed scheme would partially alter the character through the introduction of the viaduct, loss of woodland and the road being dualled and on embankment to north and south, along with the viaduct reducing the tranquillity.

**Reference Sources**

MAGIC, Google Earth, Ordnance Survey Mapping, Natural England - National Character Area 78: Central North Norfolk, Breckland District LCA (2007), South Norfolk Landscape Assessment (2001), Broadland District Council Local Development framework - Landscape Character Assessment SPD (2013)

**Summary assessment score**

**Moderate Adverse**

**Qualitative Comments**

The majority of the landscape will have minor changes, particularly in the south, however in the north there will be substantial change due to the introduction of the viaduct over the River Wensum and roundabout. The road will be dualled and a large proportion to the north and south being on embankment, reducing the perception of tranquillity. The scheme will be visible from a number of farmsteads throughout the landscape. In the north the viaduct will have an influence on the wider landscape.

**TAG Landscape Impacts Worksheet: Option C**

Features	Step 2	Step 3			Step 4	
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	The landscape is a wet lowland shallow valley in the north containing the River Wensum. To the south the land rises up and gently undulates becoming a plateau with small to medium regular fields contained by hedgerow. Irregular blocks of woodland cut through this landscape, reducing the order of the landscape. There are scattered farmsteads through this landscape, with the most notable settlement is Weston Longville to the west. Small lanes cut through the landscape, generally fairly straight with gentle curves.	Local	Common feature at a local scale	Important at the local and regional level	Easily substitutable, although loss of mature hedgerow trees would take much longer (over 25 years) to re-establish.	<b>Slight Adverse</b> The proposed route would bisect and subdivide fields locally, however the alignment is reflective of the pattern of existing roads within this landscape.
Tranquillity	There is some human influence within this landscape, scattered farmsteads and small settlements, with estates such as Morton Hall to the north. The wind turbines to the east on the old airfield and overhead line which runs north to south are notable influences within this landscape. Arable fields have been turned into pig rearing. Ringland and Weston Longville are notable settlements within this landscape. Views from the plateau give a wider perception of human influence, particularly of traffic along the A47 and A1067. The eastern and western fringes of the study area have the greatest human influence.	Local	Not rare locally	Important at the local level.	Not Easily substitutable in the north, but easily substitutable in the south through replacement hedgerow planting.	<b>Moderate Adverse</b> The introduction of the viaduct over the R. Wensum will substantially reduce tranquillity in the wider area, and locally to the south due to the road being largely in cutting or grade, with short sections on embankment influencing a wider area.
Cultural	The landscape has long been associated with farming, field patterns are largely intact from 14th century, however there is evidence of larger fields and removal of hedgerows in some areas. There are medieval manors which form 18th-century country house estates such as Morten Hall to the north and Easton Estate to the south.	Local	Not rare locally or regionally	Important at local and regional scale.	Not easily substitutable, although former field boundaries can be readily replaced.	<b>Slight Adverse</b> The proposed route would bisect the landscape and alter the pattern of enclosure.
Landcover	Landcover is predominately arable farming throughout this landscape with mixed plantation woodland, although some fields have been turned over for pig rearing. There are small ponds throughout this landscape often regular in shape. The river valley to the north and east following the River Wensum is wet meadow and small lakes. Field are contained by hedgerows and infrequent mature trees.	Predominant landcover common at local to regional scale, others less common.	Not rare locally or regionally	Important at the local level.	Easily substitutable.	<b>Moderate Adverse</b> The proposed scheme would introduce a new viaduct and large dual carriageway through the landscape, and result in the loss of some of the plantation woodland and arable fields.
Summary of character	The landscape is gently undulating arable farmland, with plateau to the south, located between two shallow river valleys. River Tud in the south and River Wensum in the north being the larger of the valleys with noticeable difference in character of wet meadow and mosaic of lakes and drainage ditches. There is some human influence, of note is the OHL and two wind turbines to the west, with the A47 and A1067 noticeable from the plateau. Settlement is sparse, mainly small farm steads, the biggest settlement is Honingham located to the south. Land cover is predominately arable fields, contained by clipped hedgerow and infrequent mature trees, with some fields turned to pig rearing. Mixed plantation woodland is common throughout this landscape, often following field boundaries. Roads are generally small lanes, generally gently curved following the field boundaries.	Common locally	Not rare locally or regionally	Important at the local level.	The majority of elements are easily suitable, although the loss of mature hedgerow trees would take much longer to re-establish. Loss of long views along the river valley is not easily substitutable along with historic elements would not be easily replaceable.	<b>Moderate Adverse</b> The proposed scheme would partially alter the character through the introduction of the viaduct, loss of woodland and the road being dualled, it's impact is limited to immediate surroundings due to the road being largely in cutting or grade.

**Reference Sources**

MAGIC, Google Earth, Ordnance Survey Mapping, Natural England - National Character Area 78: Central North Norfolk, Breckland District LCA (2007), South Norfolk Landscape Assessment (2001), Broadland District Council Local Development framework - Landscape Character Assessment SPD (2013)

**Summary assessment score**

**Moderate Adverse**

**Qualitative Comments**

There would be subdivision of fields, disrupting field patterns locally. There would be sections of embankment and cutting through the landscape which would affect the pattern locally and the viaduct would have a wider impact. The viaduct across the R. Wensum will introduce a new feature into this landscape and will have a substantial impact on tranquillity in the north, the road will alter tranquillity locally along the length, limited due it largely being at grade or in cutting. The alignment which is duelled which is larger than the existing pattern of roads through this Landscape but is at a larger scale. There will be some loss of woodland and arable farmland altering land cover locally.

**TAG Landscape Impacts Worksheet: Option D**

Features	Step 2	Step 3			Step 4	
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	The landscape is a wet lowland shallow valley in the north containing the River Wensum. To the south the land rises via a series of undulating slopes, forming a plateau with small to medium regular shaped fields contained by hedgerow. Irregular blocks of woodland cut through this landscape, reducing the order of the landscape. There are scattered farmsteads through this landscape, with the most notable settlement of Ringland towards the centre of the corridor. Small lanes cut through the landscape, generally fairly straight with gentle curves.	Local	Common feature at a local scale	Important at the local and regional level	Easily substitutable, although loss of mature hedgerow trees would take much longer (over 25 years) to re-establish.	<b>Slight Adverse</b> The proposed route would bisect and subdivide fields locally, however the alignment is reflective of the pattern of existing roads within this landscape.
Tranquillity	There is some human influence within this landscape, scattered farmsteads and small settlements, with estates such as Morton Hall to the north. The wind turbines to the west on the Old Airfield and overhead power line which runs north to south are notable influences within this landscape. Arable fields have been turned into pig rearing with scattered shelters. Ringland is a notable settlement within this landscape. Views from the plateau give a wider perception of human influence, particularly of traffic along the A47 and A1067. The eastern fringe of the study area has the greatest human influence from the western fringes of Norwich.	Local	Not rare locally	Important at the local level.	Not Easily substitutable in the north, but easily substitutable in the south through replacement hedgerow planting.	<b>Moderate Adverse</b> The proposed route would substantially reduce tranquillity in the immediate surrounding of the route, where the route is on viaduct over River Wensum and River Tud, this would impact a large area.
Cultural	The landscape has long been associated with farming, historic field patterns are largely intact, however there is evidence of larger fields arising from the removal of hedgerows in the central part of the study area. There are medieval manors which form 18th-century country house estates such as Ringland Estate in the central part of the corridor and Easton in the south.	Local	Not rare locally or regionally	Important at local and regional scale.	Not easily substitutable, although former field boundaries can be readily replaced.	<b>Slight Adverse</b> The proposed route would bisect the landscape and alter the pattern of enclosure.
Landcover	Landcover is predominately arable farming throughout this landscape with tracts of mixed plantation woodland, although some fields have been turned over for pig rearing. There are small ponds throughout this landscape often regular in shape. The river valley to the north and east following the River Wensum is wet meadow and small lakes. Fields are contained by hedgerows and infrequent mature trees.	Predominant landcover common at local to regional scale, others less common.	Not rare locally or regionally	Important at the local level.	Easily substitutable.	<b>Moderate Adverse</b> The proposed scheme would introduce a new viaduct and large dual carriageway through the landscape, and result in the loss of some of the plantation woodland and arable fields.
Summary of character	The landscape is gently undulating arable farmland, with plateau to the south, located between two shallow river valleys. River Tud in the south and River Wensum in the north being the larger of the valleys with noticeable difference in character of wet meadow and mosaic of lakes and drainage ditches. There is some human influence, of note is the OHL and two wind turbines to the west, with the A47 and A1067 noticeable from the plateau. Settlement is sparse, mainly small farm steads, the biggest settlement is Ringland. Land cover is predominately arable fields, contained by trimmed hedgerow and infrequent mature trees, with some fields turned to pig rearing. Mixed plantation woodland is common throughout this landscape, often following field boundaries. Roads are generally small lanes that gently wind following the field boundaries. There are a number of public rights of way in the north which have views over the study corridor with some private views in the south largely contained by woodland.	Common locally	Not rare locally or regionally	Important at the local level.	The majority of elements are easily suitable, although the loss of mature hedgerow trees would take much longer to re-establish. Loss of long views along the river valley is not easily substitutable along with historic elements would not be easily replaceable.	<b>Moderate Adverse</b> The proposed scheme would partially alter the character through the introduction of the viaducts, loss of woodland and the road being dualled, along with sections on embankment and viaducts substantially reducing the tranquillity of the wider landscape.

**Reference Sources**

MAGIC, Google Earth, Ordnance Survey Mapping, Natural England - National Character Area 78: Central North Norfolk, Breckland District LCA (2007), South Norfolk Landscape Assessment (2001), Broadland District Council Local Development framework - Landscape Character Assessment SPD (2013)

**Summary assessment score**

**Moderate Adverse**

**Qualitative Comments**

There would be subdivision of fields, disrupting field patterns locally. The road is on viaduct in the north, then running in sections of cutting and on embankment through the central part and onto embankment and a viaduct over the River Tud in the south, where on viaduct it will have a substantial impact on tranquillity and introduce a new element into this landscape which will have a wider effect. The alignment which is dualled is larger than the existing roads in the surrounding Landscape. There will be some loss of woodland and arable farmland altering land cover locally.



**TAG Landscape Impacts Worksheet: Option D**

Features	Step 2	Step 3			Step 4	
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact
Pattern	The landscape is a wet lowland shallow valley in the north containing the River Wensum. To the south the land rises via a series of undulating slopes, forming a plateau with small to medium regular shaped fields contained by hedgerow. Irregular blocks of woodland cut through this landscape, reducing the order of the landscape. There are scattered farmsteads through this landscape, with the most notable settlement of Ringland towards the centre of the corridor. Small lanes cut through the landscape, generally fairly straight with gentle curves.	Local	Common feature at a local scale	Important at the local and regional level	Easily substitutable, although loss of mature hedgerow trees would take much longer (over 25 years) to re-establish.	<b>Slight Adverse</b> The proposed route would bisect and subdivide fields locally, however the alignment is reflective of the pattern of existing roads within this landscape.
Tranquillity	There is some human influence within this landscape, scattered farmsteads and small settlements, with estates such as Morton Hall to the north. The wind turbines to the west on the Old Airfield and overhead power line which runs north to south are notable influences within this landscape. Arable fields have been turned into pig rearing with scattered shelters. Ringland is a notable settlement within this landscape. Views from the plateau give a wider perception of human influence, particularly of traffic along the A47 and A1067. The eastern fringe of the study area has the greatest human influence from the western fringes of Norwich.	Local	Not rare locally	Important at the local level.	Not Easily substitutable in the north, but easily substitutable in the south through replacement hedgerow planting.	\\
Cultural	The landscape has long been associated with farming, historic field patterns are largely intact, however there is evidence of larger fields arising from the removal of hedgerows in the central part of the study area. There are medieval manors which form 18th-century country house estates such as Ringland Estate in the central part of the corridor and Easton in the south.	Local	Not rare locally or regionally	Important at local and regional scale.	Not easily substitutable, although former field boundaries can be readily replaced.	<b>Slight Adverse</b> The proposed route would bisect the landscape and alter the pattern of enclosure.
Landcover	Landcover is predominately arable farming throughout this landscape with tracts of mixed plantation woodland, although some fields have been turned over for pig rearing. There are small ponds throughout this landscape often regular in shape. The river valley to the north and east following the River Wensum is wet meadow and small lakes. Fields are contained by hedgerows and infrequent mature trees.	Predominant landcover common at local to regional scale, others less common.	Not rare locally or regionally	Important at the local level.	Easily substitutable.	<b>Moderate Adverse</b> The proposed scheme would introduce a new viaduct and large dual carriageway through the landscape, and result in the loss of some of the plantation woodland and arable fields.
Summary of character	The landscape is gently undulating arable farmland, with plateau to the south, located between two shallow river valleys. River Tud in the south and River Wensum in the north being the larger of the valleys with noticeable difference in character of wet meadow and mosaic of lakes and drainage ditches. There is some human influence, of note is the OHL and two wind turbines to the west, with the A47 and A1067 noticeable from the plateau. Settlement is sparse, mainly small farm steads, the biggest settlement is Ringland. Land cover is predominately arable fields, contained by trimmed hedgerow and infrequent mature trees, with some fields turned to pig rearing. Mixed plantation woodland is common throughout this landscape, often following field boundaries. Roads are generally small lanes that gently wind following the field boundaries. There are a number of public rights of way in the north which have views over the study corridor with some private views in the south largely contained by woodland.	Common locally	Not rare locally or regionally	Important at the local level.	The majority of elements are easily suitable, although the loss of mature hedgerow trees would take much longer to re-establish. Loss of long views along the river valley is not easily substitutable along with historic elements would not be easily replaceable.	<b>Moderate Adverse</b> The proposed scheme would partially alter the character through the introduction of the viaducts, loss of woodland and the road being dualled, along with sections on embankment and viaducts substantially reducing the tranquillity of the wider landscape.

**Reference Sources**

MAGIC, Google Earth, Ordnance Survey Mapping, Natural England - National Character Area 78: Central North Norfolk, Breckland District LCA (2007), South Norfolk Landscape Assessment (2001), Broadland District Council Local Development framework - Landscape Character Assessment SPD (2013)

**Summary assessment score**

**Moderate Adverse**

**Qualitative Comments**

There would be subdivision of fields, disrupting field patterns locally. The road is on viaduct in the north, then running in sections of cutting and on embankment through the central part and onto embankment and a viaduct over the River Tud in the south, where on viaduct it will have a substantial impact on tranquillity and introduce a new element into this landscape which will have a wider effect. The alignment which is dualled is larger than the existing roads in the surrounding Landscape. There will be some loss of woodland and arable farmland altering land cover locally.

**TAG Historic Environment Impacts Worksheet Option A**

Step 2		Step 3			Step 4	
Feature	Description	Scale it matters	Significance	Rarity	Impact	Justification
Form	<p><b>Designated heritage assets (physically affected by the scheme)</b> 1. One Grade II listed building. If A1067 route widened potential to impact on two Grade II listed buildings.</p> <p><b>Designated heritage assets (possible setting impact)</b> 2. One Grade II* listed building. 3. 19 Grade II listed buildings. 4. Two Scheduled Monuments.</p> <p><b>Non-designated heritage assets (palaeoenvironmental, prehistoric and Roman)</b> 5. An area where metal detecting found a Roman brooch (55319). 6. An area where metal detecting found a prehistoric flint flake, part of an Early Bronze Age copper alloy flat axehead (49798). 7. An area where metal detecting found prehistoric flint flakes and Roman pottery (53063). 8. A moderate to high potential for previously unrecorded remains from these periods. 9. A moderate potential for palaeoenvironmental remains in the Wensum and Tud Valleys.</p> <p><b>Non-designated heritage assets (medieval and post-medieval)</b> 10. Weston Park, a post-medieval landscape park (33733). 11. Attlebridge World War Two Airfield (3063). 12. The later medieval settlement of Hungate Common (40462). 13. Honingham Park a post-medieval landscape park (44183). 14. A high potential for previously unrecorded remains from these periods.</p>	<p>1-3. The protection of Listed Buildings is a national concern (<i>Planning (Listed Buildings and Conservation Areas) Act 1990</i>).</p> <p>4. The protection of Scheduled Monuments is a national concern</p> <p>5. The area is of local importance.</p> <p>6. The area is of local importance.</p> <p>7. The area is of local importance.</p> <p>8. Previously unrecorded remains are of unknown importance.</p> <p>9. Palaeoenvironmental remains are of local importance.</p> <p>10. Weston Park is of regional importance.</p> <p>11. Attlebridge World War Two Airfield is of regional importance.</p> <p>12. The later medieval settlement of Hungate Common is of regional importance.</p> <p>13. Honingham Park is of regional importance.</p> <p>14. Previously unrecorded remains are of unknown importance.</p>	<p>1. The Grade II listed building is of Medium significance.</p> <p>2. The Grade II* listed building is of High significance.</p> <p>3. The Grade II Listed Buildings are of Medium significance.</p> <p>4. Scheduled Monuments are of High significance.</p> <p>5. The area is of Low significance.</p> <p>6. The area is of Low significance.</p> <p>7. The area is of Low significance.</p> <p>8. Previously unrecorded remains are of unknown significance.</p> <p>9. Palaeoenvironmental remains are of Low significance.</p> <p>10. Weston Park is of Medium significance.</p> <p>11. Attlebridge World War Two Airfield is of Medium significance.</p> <p>12. The later medieval settlement of Hungate Common is of Medium significance.</p> <p>13. Honingham Park is of Medium significance.</p> <p>14. Previously unrecorded remains are of unknown significance.</p>	<p>1. Nationally, 92% of listed buildings are Grade II, making them less rare but still of national importance.</p> <p>2. Nationally, 5.8% of listed buildings are Grade II* making them of exceptional interest.</p> <p>3. Nationally, 92% of listed buildings are Grade II, making them less rare but still of national importance.</p> <p>4. Scheduled Monuments are of national importance.</p> <p>5. Roman brooches are relatively common.</p> <p>6. Prehistoric flint flakes and Early Bronze Age axeheads are relatively common.</p> <p>7. Prehistoric flint flakes and Roman pottery are relatively common.</p> <p>8. Previously unrecorded remains are of unknown rarity.</p> <p>9. Palaeoenvironmental remains are common.</p> <p>10. Post-medieval landscape parks are relatively rare.</p> <p>11. World War Two Airfields are relatively rare.</p> <p>12. Later medieval settlements are relatively rare.</p> <p>13. Post-medieval landscape parks are relatively rare.</p> <p>14. Previously unrecorded remains are of unknown rarity.</p>	<p>Large Adverse (Built heritage)</p> <p>Moderate Adverse (Archaeology)</p>	<p><b>Designated heritage assets (physically affected by the scheme)</b> Yes. Potential for physical impact from the proposed new road south of Lenwade as it includes a drainage feature in close proximity to the gatepiers of the Grade II listed Gates and Railings to Lenwade Lodge to Weston House. However if widening of the A1067 is proposed there is a potential impact on two other assets: the Grade II listed The Lodge (formerly Morton Lodge) and the Grade II listed North Lodges to Weston House, Connected by Railings, Piers and Gates, Norwich Road.</p> <p><b>Designated heritage assets (possible setting impact)</b> The option will retain the route of the existing A1067 which goes through Attlebridge. Any infrastructure changes or increase in traffic noise would affect the setting of assets within the village including the Grade II* listed Church of St Andrew. The option is unlikely to impact on six of the Grade II listed assets in Lenwade due to intervening built structures and vegetation. Aside from potential for physical impact on the Grade II listed Gates and Railings to Lenwade Lodge to Weston House would be impacted by the drainage feature, by the visual impact of the new road and by increased traffic noise. The route is likely to be prominent in views out towards the route from the Grade II listed Lenwade Mills, impacting on its wider rural setting through new road infrastructure, lighting and traffic noise. The route is in close proximity to the Grade II listed gates and railings to Lenwade Lodge to Weston House. Potential for physical impact has been stated above. Its wider setting would also be impacted by an increase in traffic noise, road infrastructure and lighting, impacting on its significance. Three Grade II listed buildings at Weston Hall (Weston Hall, Garden House 100m nw of Weston Hall and Barn 50m W of Weston Hall) will also be impacted as the assets are located in proximity to the route. Views out from the hall and the barn towards the route would impact on setting. Traffic noise and lighting would also likely impact on the setting of all three assets. Although not in close proximity to the route, long views out towards the new road would be likely from the Grade II listed Willows Farmhouse and the Grade II listed Green Farm House. Traffic noise and lighting would also likely impact on setting. The route is unlikely to have an impact on the Grade II listed Berry Hall located 350m to the south of the southern end of the route. The route passes close to two Scheduled Monuments, the round barrow south-east of the Lodges is 25m to the south-west of the A1067; the Tumulus in the Warren is 120m to the north-east of the A1067.</p> <p><b>Non-designated heritage assets (palaeoenvironmental, prehistoric and Roman)</b> The proposed route could potentially impact areas from which isolated prehistoric and Roman finds have been made. Previously unrecorded remains from these periods could also be impacted. Possible palaeoenvironmental remains in the Wensum and Tud valleys could be impacted.</p> <p><b>Non-designated heritage assets (medieval and post-medieval)</b> The proposed route would potentially impact two post-medieval landscape parks, a World War 2 airfield and the area of a later medieval settlement. Previously unrecorded remains could also be impacted.</p>
Survival	<p>1. N/A.</p> <p>2-4. The survival of the listed buildings is good</p> <p>5. The survival of the possible Roman or later medieval/post-medieval field system is unknown.</p> <p>6. The survival of undated linear ditches likely to be former field boundaries is unknown.</p> <p>7. The survival of the Upper Palaeolithic flint blade is unknown.</p> <p>8. The survival of the Neolithic flint artefacts is unknown.</p> <p>9. The survival of the Neolithic flint artefacts is unknown.</p> <p>10. The survival of the Mesolithic and Neolithic worked flints and Iron Age pottery is unknown.</p> <p>11. The survival of the enclosures and fields of probable Roman date is unknown.</p> <p>12. The survival of the previously unrecorded remains of these periods is unknown.</p> <p>13. The survival of the palaeoenvironmental remains in the Wensum and Tud valleys is unknown.</p> <p>14. The survival of the later medieval/post-medieval field system is unknown.</p> <p>15. The survival of the former field boundaries is unknown.</p> <p>16. The survival of the field boundaries and trackways is unknown.</p> <p>17. The survival of the World War Two practice trenches and pits and possible gun emplacements is unknown.</p> <p>18. The survival of the World War Two weapon pits is unknown.</p> <p>19. The survival of the medieval and post-medieval pottery sherds is unknown.</p> <p>20. The survival of the platforms and ditched enclosures relating to former medieval tofts is unknown.</p> <p>21. The survival of the foot from a late medieval copper alloy vessel is unknown.</p> <p>22. The survival of previously unrecorded remains of these periods is unknown.</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>		
Condition	<p>1-3. The condition of the listed buildings is unknown.</p> <p>4. The condition of the Scheduled Monuments is unknown.</p> <p>5. The condition of the Roman brooch is unknown.</p> <p>6. The condition of the prehistoric flint flake and Early Bronze Age copper alloy flat axehead is unknown.</p> <p>7. The condition of the prehistoric flint flakes and Roman pottery is unknown.</p> <p>8. The condition of the previously unrecorded remains is unknown.</p> <p>9. The condition of the palaeoenvironmental remains is unknown.</p> <p>10. The condition of Weston Park is unknown.</p> <p>11. The condition of the Attlebridge World War Two Airfield is unknown.</p> <p>12. The condition of the later medieval settlement of Hungate Common is unknown.</p> <p>13. The condition of Honingham Park is unknown.</p> <p>14. The condition of previously unrecorded remains is unknown.</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>		
Complexity	<p>1-3. The complexity of the listed buildings is unknown.</p> <p>4. The complexity of the Scheduled Monuments is unknown.</p> <p>5. The complexity of the Roman brooch is unknown.</p> <p>6. The complexity of the prehistoric flint flake and Early Bronze Age copper alloy flat axehead is unknown.</p> <p>7. The complexity of the prehistoric flint flakes and Roman pottery is unknown.</p> <p>8. The complexity of the previously unrecorded remains from these periods.</p> <p>9. The complexity of the palaeoenvironmental remains is unknown.</p> <p>10. The complexity of Weston Park is unknown.</p> <p>11. The complexity of the Attlebridge World War Two Airfield is unknown.</p> <p>12. The complexity of the later medieval settlement of Hungate Common is unknown.</p> <p>13. The complexity of Honingham Park is unknown.</p> <p>14. The complexity of previously unrecorded remains is unknown.</p>	<p>The complexity is not directly relevant to the impacts on heritage assets</p>	<p>The complexity is not directly relevant to the impacts on heritage assets</p>	<p>The complexity is not directly relevant to the impacts on heritage assets</p>		

Context	1. Rural. 2. Rural. 3. Rural. 4. Rural. 5. Rural. 6. Rural. 7. Rural. 8. Rural. 9. Rural. 10. Rural. 11. Rural. 12. Rural. 13. Rural. 14. Rural.	The context is not impacted	The context is not impacted	The context is not impacted		
Period	1. N/A. 2. Medieval 3. Post-medieval. 4. Prehistoric. 5. Roman. 6. Prehistoric flint flake, Early Bronze Age. 7. Prehistoric, Roman. 8. Previously unrecorded remains are from an unknown period. 9. Palaeoenvironmental. 10. Post-medieval. 11. Modern. 12. Later medieval. 13. Post-medieval. 14. Previously unrecorded remains are from an unknown period..	The period is not impacted	The period is not impacted	The period is not impacted		

**Reference Sources**

National Heritage List for England  
Norfolk Historic Environment Record  
Norwich Western Link Heritage Constraints Report (WSP 2018)  
A site visit was undertaken on 6 June 2019.

**Step 5 - Summary Assessment Score**

Large adverse, due to impact on Built heritage

**Qualitative Comments**

The scheme would have a major direct impact on nationally significant historic environmental assets such that they are lost or their integrity is severely damaged.

**TAG Historic Environment Impacts Worksheet Option B west**

Step 2		Step 3			Step 4	
Feature	Description	Scale it matters	Significance	Rarity	Impact	Justification
Form	<p><b>Designated heritage assets (physically affected by the scheme)</b> 1. One Grade II listed building.</p> <p><b>Designated heritage assets (possible setting impact)</b> 2. One Grade I listed building. 3. One Grade II* listed building. 4. Seven Grade II listed buildings.</p> <p><b>Non-designated heritage assets (palaeoenvironmental, prehistoric and Roman)</b> 5. Cropmarks of possible Roman field boundaries (50667). 6. The findspot of a Roman brooch (37422). 7. An area of metal detecting which found a Roman ring (51714). 8. An area of metal detecting which found Neolithic flint blade and Roman pottery (29962). 9. A <b>moderate to high potential</b> for previously unrecorded remains from these periods. 10. A <b>moderate potential</b> for palaeoenvironmental remains in the Wensum and Tud Valleys.</p> <p><b>Non-designated heritage assets (medieval and post-medieval)</b> 11. An area of metal detecting which found a medieval strap fitting and a post-medieval coin weight (51714). 12. An area of metal detecting which found a Late Saxon strap end, Late Saxon, medieval and post medieval pottery (29962). 13. The earthworks and cropmarks of a series of medieval to post medieval boundaries and drains (35933). 14. Cropmarks of undated field boundaries (53485). 15. Cropmarks of undated field boundaries (50668). 16. Cropmarks of undated field boundaries (50673). 17. The possible course of an old road (7736). 18. Attlebridge World War 2 Airfield (3063). 19. Honingham Park, a post-medieval landscape park (44183). 20. A <b>high potential</b> for previously unrecorded remains from these periods.</p>	<p>1-4. The protection of Listed Buildings is a national concern (<i>Planning (Listed Buildings and Conservation Areas) Act 1990</i>).</p> <p>5. Roman field boundaries are of regional importance. 6. Roman brooches are of local importance. 7. Roman rings are of local importance. 8. A Neolithic flint blade and Roman pottery are of local importance. 9. Previously unrecorded remains are of unknown importance. 10. Palaeoenvironmental remains are of local importance. 11. The strap fitting and coin weight are of local importance. 12. The strap end and pottery are of local importance. 13. The boundaries and drains are of local importance. 14. Undated field boundaries are of local importance. 15. Undated field boundaries are of local importance. 16. Undated field boundaries are of local importance. 17. The old road is of local importance. 18. Attlebridge World War Two Airfield is of regional importance. 19. Honingham Park is of regional importance. 20. Previously unrecorded remains are of unknown importance.</p>	<p>1. The Grade II listed building is of Medium significance. 2. The Grade I listed building is of High significance. 3. The Grade II* listed building is of High significance. 4. The Grade II listed buildings are of Medium significance. 5. Roman field boundaries are of Medium significance. 6. Roman brooches are of Low significance. 7. Roman rings are of Low significance. 8. The Neolithic flint blade and Roman pottery are of Low significance. 9. Previously unrecorded remains are of unknown significance. 10. Palaeoenvironmental remains are of Low significance. 11. The strap fitting and coin weight are of Low significance. 12. The strap end and pottery are of Low significance. 13. The boundaries and drains are of Low significance. 14. Undated field boundaries are of Low significance. 15. Undated field boundaries are of Low significance. 16. Undated field boundaries are of Low significance. 17. The old road is of Low significance. 18. Attlebridge World War Two Airfield is of Medium significance. 19. Honingham Park is of Medium significance. 20. Previously unrecorded remains are of unknown significance.</p>	<p>1. Nationally 92% of listed buildings are Grade II, making them less rare but still of national importance. 2. Nationally 2.5% of listed buildings are listed Grade I making them of exceptional importance. 3. Nationally 5.8% of listed buildings are Grade II* making them more than special interest. 4. Nationally, 92% of listed buildings are Grade II, making them less rare but still of national importance. 5. Roman field boundaries are relatively rare. 6. Roman brooches are relatively common. 7. Roman rings are relatively common. 8. Neolithic flint blade and Roman pottery are relatively common. 9. Previously unrecorded remains are of unknown rarity. 10. Palaeoenvironmental remains are common. 11. The strap fitting and coin weight are relatively common. 12. The strap end and pottery are of relatively common. 13. The boundaries and drains are of relatively common. 14. Undated field boundaries are relatively common. 15. Undated field boundaries are relatively common. 16. Undated field boundaries are relatively common . 17. Old Roads are relatively common. 18. World War Two Airfields are relatively rare. 19. Post-medieval landscape parks are relatively rare. 20. Previously unrecorded remains are of unknown rarity.</p>	<p>Large Adverse (Built heritage) Moderate Adverse (Archaeology)</p>	<p><b>Designated heritage assets (physically affected by the scheme)</b> Potential physical impact on the Grade II listed The Lodge (formerly Morton Lodge) through widening of the road.</p> <p><b>Designated heritage assets (possible setting impact)</b> The option will retain part of the existing A1067 route through Attlebridge, leaving the current route just to the west of the village. Any infrastructure changes or increase in traffic noise would affect the setting of assets within the village including the Grade II* listed Church of St Andrew. The settings of a group of five heritage assets around Morton Hall to the south of the route are likely to be impacted by traffic noise and lighting. This group includes the Grade II* Church of St Margaret and the Grade II listed Morton Hall. However, this route is unlikely to be visually prominent in views out from these assets towards the road due to intervening woodland. This option is likely to impact on the group of assets at Weston Longville including the Grade I listed Church of All Saints and boundary wall. It is unlikely that the route would be visually prominent in views out from assets towards the road due to intervening woodland. However, the agricultural land to the south-east of Weston Longville is historically part of the wider rural landscape which forms part of the setting for these assets. There would be potential for traffic noise and lighting impacts on the assets in the village. The proposed route is unlikely to impact on the setting of the Grade II listed Berry Hall located 350m to the south of the southern end of the route.</p> <p><b>Non-designated heritage assets (palaeoenvironmental, prehistoric and Roman)</b> The proposed route could potentially impact an area of possible Roman field boundaries and areas where isolated prehistoric and Roman finds have been made. Previously unrecorded remains from these periods could also be impacted. Possible palaeoenvironmental remains in the Wensum and Tud valleys could be impacted.</p> <p><b>Non-designated heritage assets (medieval and post-medieval)</b> The proposed route would potentially impact a post-medieval landscape park, a World War 2 airfield, the course of and old road, field boundaries and areas where isolate finds if medieval and post-medieval have been made. Previously unrecorded remains could also be impacted.</p>
Survival	<p>1. N/A. 2-4. The survival of the listed buildings is good 5. The survival of the possible Roman or later medieval/post-medieval field system is unknown. 6. The survival of undated linear ditches likely to be former field boundaries is unknown. 7. The survival of the Upper Palaeolithic flint blade is unknown. 8. The survival of the Neolithic flint artefacts is unknown. 9. The survival of the Neolithic flint artefacts is unknown. 10. The survival of the Mesolithic and Neolithic worked flints and Iron Age pottery is unknown. 11. The survival of the enclosures and fields of probable Roman date is unknown. 12. The survival of the previously unrecorded remains of these periods is unknown. 13. The survival of the palaeoenvironmental remains in the Wensum and Tud valleys is unknown. 14. The survival of the later medieval/post-medieval field system is unknown. 15. The survival of the former field boundaries is unknown.. 16. The survival of the field boundaries and trackways is unknown. 17. The survival of the World War Two practice trenches and pits and possible gun emplacements is unknown. 18. The survival of the World War Two weapon pits is unknown. 19. The survival of the medieval and post-medieval pottery sherds is unknown. 20. The survival of the platforms and ditched enclosures relating to former medieval tofts is unknown. 21. The survival of the foot from a late medieval copper alloy vessel is unknown. 22. The survival of previously unrecorded remains of these periods is unknown.</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>		
Condition	<p>1. N/A. 2-4. The condition of the listed buildings is unknown. 5. The condition of the possible Roman field boundaries is unknown. 6. The condition of the Roman brooch is unknown. 7. The condition of the Roman ring is unknown. 8. The condition of the Neolithic blade and Roman pottery is unknown. 9. The condition of previously unrecorded remains is unknown. 10. The condition of the palaeoenvironmental remains is unknown. 11. The condition of the medieval strap fitting and a post-medieval coin weight is unknown. 12. The condition of the Late Saxon strap end, Late Saxon, medieval and post medieval pottery is unknown. 13. The condition of the series of medieval to post medieval boundaries and drains is unknown. 14. The condition of the field boundaries is unknown. 15. The condition of the field boundaries is unknown. 16. The condition of the field boundaries is unknown. 17. The condition of the old road is unknown. 18. The condition of Attlebridge World War 2 Airfield is unknown. 19. The condition of Honingham Park is unknown. 20. The condition of previously unrecorded remains is unknown.</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>		

Complexity	<p>1. N/A.  2-4. The complexity of the listed buildings is unknown.  5. The complexity of the possible Roman field boundaries is unknown.  6. The complexity of the Roman brooch is unknown.  7. The complexity of the Roman ring is unknown.  8. The complexity of the Neolithic blade and the Roman pottery is unknown.  9. The complexity of any previously unrecorded remains is unknown.  10. The complexity of the palaeoenvironmental remains is unknown.  11. The complexity of the medieval strap fitting and a post-medieval coin weight is unknown.  12. The complexity of the Late Saxon strap end, Late Saxon, medieval and post medieval pottery is unknown.  13. The complexity of the series of medieval to post medieval boundaries and drains is unknown.  14. The complexity of the field boundaries is unknown.  15. The complexity of the field boundaries is unknown.  16. The complexity of the field boundaries is unknown.  17. The complexity of the old road is unknown.  18. The complexity of Attlebridge World War 2 Airfield is unknown.  19. The complexity of the Honingham Park is unknown.  20. The complexity of the previously unrecorded remains is unknown.</p>	The complexity is not directly relevant to the impacts on heritage assets	The complexity is not directly relevant to the impacts on heritage assets	The complexity is not directly relevant to the impacts on heritage assets		
Context	<p>1. N/A.  2. Rural.  3. Rural.  4. Rural.  5. Rural.  6. Rural.  7. Rural.  8. Rural.  9. Rural.  10. Rural.  11. Rural.  12. Rural.  13. Rural.  14. Rural.  15. Rural.  16. Rural.  17. Rural.  18. Rural.  19. Rural.  20. Rural.</p>	The context is not impacted	The context is not impacted	The context is not impacted		
Period	<p>1. N/A.  2. Medieval.  3. Medieval.  4. Post-medieval.  5. Roman.  6. Roman.  7. Roman.  8. Neolithic/Roman.  9. Previously unrecorded remains are from an unknown period.  10. Palaeoenvironmental.  11. Later medieval/post-medieval.  12. Early medieval/late medieval/post-medieval.  13. Later medieval/post-medieval.  14. Undated.  15. Undated.  16. Undated.  17. Later medieval/post-medieval.  18. Modern.  19. Post-medieval.  20. Previously unrecorded remains are from an unknown period.</p>	The period is not impacted	The period is not impacted	The period is not impacted		

**Reference Sources**

National Heritage List for England  
Norfolk Historic Environment Record  
Norwich Western Link Heritage Constraints Report (WSP 2018)  
A site visit was undertaken on 6 June 2019.

**Step 5 - Summary Assessment Score**

Large adverse, due to impact on Built heritage

**Qualitative Comments**

The scheme would have a major direct impact on nationally significant historic environmental assets such that they are lost or their integrity is severely damaged.

Feature	Step 2	Step 3			Step 4	
	Description	Scale it matters	Significance	Rarity	Impact	Justification
Form	<p><b>Designated heritage assets (physically affected by the scheme)</b> 1. None.</p> <p><b>Designated heritage assets (possible setting impact)</b> 2. One Grade I listed building. 3. One Grade II* listed building. 4. Seven Grade II listed buildings.</p> <p><b>Non-designated heritage assets (palaeoenvironmental, prehistoric and Roman)</b> 5. Cropmarks of possible Roman field boundaries (50667). 6. The findspot of a Roman brooch (37422). 7. A <b>moderate to high potential</b> for previously unrecorded remains from these periods. 8. A <b>moderate potential</b> for palaeoenvironmental remains in the Wensum and Tud Valleys.</p> <p><b>Non-designated heritage assets (medieval and post-medieval)</b> 9. Cropmarks of undated field boundaries (53485). 10. Cropmarks of undated field boundaries (50668). 11. Cropmarks of undated field boundaries (50673). 12. The possible course of an old road (7736). 13. Attlebridge World War 2 Airfield (3063). 14. Honingham Park, a post-medieval landscape park (44183). 15. A <b>high potential</b> for previously unrecorded remains from these periods.</p>	<p>1. N/A 2-4. The protection of Listed Buildings is a national concern (<i>Planning (Listed Buildings and Conservation Areas) Act 1990</i>). 5. Roman field boundaries are of regional importance. 6. Roman brooches are of local importance. 7. Previously unrecorded remains are of unknown importance. 8. Palaeoenvironmental remains are of local importance. 9. Undated field boundaries are of local importance. 10. Undated field boundaries are of local importance. 11. Undated field boundaries are of local importance. 12. The old road is of local importance. 13. Attlebridge World War Two Airfield is of regional importance. 14. Honingham Park is of regional importance. 15. Previously unrecorded remains are of unknown importance.</p>	<p>1. N/A 2. The Grade I listed building is of High significance. 3. The Grade II* listed building is of High significance. 4. The Grade II listed buildings are of Medium significance. 5. Roman field boundaries are of Medium significance. 6. Roman brooches are of Low significance. 7. Previously unrecorded remains are of unknown importance. 8. Palaeoenvironmental remains are of Low significance. 9. Undated field boundaries are of Low significance. 10. Undated field boundaries are of Low significance. 11. Undated field boundaries are of Low significance. 12. The old road is of Low significance. 13. Attlebridge World War Two Airfield is of Medium significance. 14. Honingham Park is of Medium significance. 15. Previously unrecorded remains are of unknown importance.</p>	<p>1. N/A 2. Nationally 2.5% of listed buildings are listed Grade I making them of exceptional importance. 3. Nationally 5.8% of listed buildings are Grade II* making them of more than special interest. 4. Nationally, 92% of listed buildings are Grade II, making them less rare but still of national importance. 5. Roman field boundaries are relatively rare. 6. Roman brooches are relatively common. 7. Previously unrecorded remains are of unknown rarity. 8. Palaeoenvironmental remains are common. 9. Undated field boundaries are relatively common. 10. Undated field boundaries are relatively common. 11. Undated field boundaries are relatively common. 12. Old Roads are relatively common. 13. World War Two Airfields are relatively rare. 14. Post-medieval landscape parks are relatively rare. 15. Previously unrecorded remains are of unknown rarity.</p>	<p>Moderate Adverse (Built heritage) Moderate Adverse (Archaeology)</p>	<p><b>Designated heritage assets (physically affected by the scheme)</b> None.</p> <p><b>Designated heritage assets (possible setting impact)</b> The option will retain part of the route of the existing A1067 to the east of Attlebridge. The proposal to construct a viaduct across the River Wensum would make the route prominent in views out from The Lodge (Grade II) looking towards the south-east. Even without the viaduct option, the route is still likely to be visually prominent in views out from this asset. The option would also impact on The Lodge's relationship to the group of five heritage assets located around Morton Hall. The setting of the assets around Morton Hall to the south of the route is likely to be impacted by traffic noise and lighting. This group includes the Grade II* listed Church of St Margaret and the Grade II listed Morton Hall. However, the route is unlikely to be visually prominent in views out from this group of assets towards the road due to intervening woodland. This option would impact on the group of assets at Weston Longville including the Grade I listed Church of All Saints and boundary wall. It is unlikely that the route would be visually prominent in views out from the assets in the village towards the road due to intervening woodland. However, the agricultural land to the south-east of Weston Longville is historically part of the wider rural landscape which forms part of the setting for these assets. There would be potential for traffic noise and lighting impacts on the heritage assets in the village. The proposed route is unlikely to impact on the setting of the Grade II listed Berry Hall located 350m to the south of the southern end of the route.</p> <p><b>Non-designated heritage assets (palaeoenvironmental, prehistoric and Roman)</b> The proposed route could potentially impact an area of possible Roman field boundaries and where isolated Roman finds have been made. Previously unrecorded remains from these periods could also be impacted. Possible palaeoenvironmental remains in the Wensum and Tud valleys could be impacted.</p> <p><b>Non-designated heritage assets (medieval and post-medieval)</b> The proposed route would potentially impact a post-medieval landscape park, a World War 2 airfield, the course of an old road and field boundaries. Previously unrecorded remains could also be</p>
Survival	<p>1. N/A. 2-4. The survival of the listed buildings is good 5. The survival of the possible Roman or later medieval/post-medieval field system is unknown. 6. The survival of undated linear ditches likely to be former field boundaries is unknown. 7. The survival of the Upper Palaeolithic flint blade is unknown. 8. The survival of the Neolithic flint artefacts is unknown. 9. The survival of the Neolithic flint artefacts is unknown. 10. The survival of the Mesolithic and Neolithic worked flints and Iron Age pottery is unknown. 11. The survival of the enclosures and fields of probable Roman date is unknown. 12. The survival of the previously unrecorded remains of these periods is unknown. 13. The survival of the palaeoenvironmental remains in the Wensum and Tud valleys is unknown. 14. The survival of the later medieval/post-medieval field system is unknown. 15. The survival of the former field boundaries is unknown. 16. The survival of the field boundaries and trackways is unknown. 17. The survival of the World War Two practice trenches and pits and possible gun emplacements is unknown. 18. The survival of the World War Two weapon pits is unknown. 19. The survival of the medieval and post-medieval pottery sherds is unknown. 20. The survival of the platforms and ditched enclosures relating to former medieval tofts is unknown. 21. The survival of the foot from a late medieval copper alloy vessel is unknown. 22. The survival of previously unrecorded remains of these periods is unknown.</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>		
Condition	<p>1. N/A. 2-4. The condition of the listed buildings is unknown. 5. The condition of the possible Roman field boundaries is unknown. 6. The condition of the Roman brooch is unknown. 7. The condition of the for previously unrecorded remains is unknown. 8. The condition of the palaeoenvironmental remains is unknown. 9. The condition of the field boundaries is unknown. 10. The condition of the field boundaries is unknown. 11. The condition of the field boundaries is unknown. 12. The condition of the old road is unknown. 13. The condition of Attlebridge World War 2 Airfield is unknown. 14. The condition of Honingham Park is unknown. 15. The condition of the previously unrecorded remains is unknown.</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>		
Complexity	<p>1. N/A. 2-4. The complexity of the listed buildings is unknown. 5. The complexity of the possible Roman field boundaries is unknown. 6. The complexity of the Roman brooch is unknown. 7. The complexity of the for previously unrecorded remains is unknown. 8. The complexity of the palaeoenvironmental remains is unknown. 9. The complexity of the field boundaries is unknown. 10. The complexity of the field boundaries is unknown. 11. The complexity of the field boundaries is unknown. 12. The complexity of the old road is unknown. 13. The complexity of Attlebridge World War 2 Airfield is unknown. 14. The complexity of Honingham Park is unknown. 15. The complexity of the previously unrecorded remains is unknown.</p>	<p>The complexity is not directly relevant to the impacts on heritage assets</p>	<p>The complexity is not directly relevant to the impacts on heritage assets</p>	<p>The complexity is not directly relevant to the impacts on heritage assets</p>		
Context	<p>1. N/A. 2. Rural. 3. Rural. 4. Rural. 5. Rural. 6. Rural. 7. Rural. 8. Rural. 9. Rural. 10. Rural. 11. Rural. 12. Rural. 13. Rural. 14. Rural. 15. Rural.</p>	<p>The context is not impacted</p>	<p>The context is not impacted</p>	<p>The context is not impacted</p>		

Period	1. N/A. 2. Medieval. 3. Medieval. 4. Post-medieval. 5. Roman. 6. Roman. 7. Previously unrecorded remains are from an unknown period. 8. Palaeoenvironmental. 9. Undated. 10. Undated. 11. Undated. 12. Later medieval/post-medieval. 13. Modern. 14. Post-medieval. 15. Previously unrecorded remains are from an unknown period.	The period is not impacted	The period is not impacted	The period is not impacted		
--------	---	----------------------------	----------------------------	----------------------------	--	--

**Reference Sources**

National Heritage List for England  
Norfolk Historic Environment Record  
Norwich Western Link Heritage Constraints Report (WSP 2018)  
A site visit was undertaken on 6 June 2019.

**Step 5 - Summary Assessment Score**

Moderate Adverse

**Qualitative Comments**

The scheme would be intrusive in the setting (context), and will adversely affect the appreciation and understanding of the characteristic historic environmental resource.  
The scheme would be a major direct impact on regionally or locally significant historic environment non-designated assets, resulting in loss of features such that their integrity is substantially compromised, but adequate mitigation can be specified.

**TAG Historic Environment Impacts Worksheet Option C**

Step 2		Step 3			Step 4	
Feature	Description	Scale it matters	Significance	Rarity	Impact	Justification
Form	<p><b>Designated heritage assets (physically affected by the scheme)</b> 1. None.</p> <p><b>Designated heritage assets (possible setting impact)</b> 2. Two Grade II listed buildings.</p> <p><b>Non-designated heritage assets (palaeoenvironmental, prehistoric and Roman)</b> 3. Cropmarks of a possible Roman field system (53485). 4. The findspot of prehistoric flint flakes (18044). 5. Cropmarks of possible Iron Age/Roman field boundaries (54357). 6. <b>Moderate to high potential</b> for possible, previously unrecorded remains of these periods 7. <b>Moderate potential</b> for palaeoenvironmental remains in the Wensum and Tud valleys.</p> <p><b>Non-designated heritage assets (medieval and post-medieval)</b> 8. Cropmarks of a possible later medieval/post-medieval field system (52485). 9. Cropmarks of field boundaries and trackways of probable post medieval date (50608). 10. Cropmarks of a linear boundary or trackway of unknown, but possibly later medieval to post medieval date (60616). 11. Attlebridge World War Two Airfield (3063). 12. World War One to World War Two military training site (50618). 13. Honingham Park, a post-medieval landscape park (44183). 14. <b>High potential</b> for possible, previously unrecorded remains of these periods.</p>	<p>1. N/A 2. The protection of Listed Buildings is a national concern (<i>Planning (Listed Buildings and Conservation Areas) Act 1990</i>). 3. The Roman field system is of regional importance. 4. The findspot of prehistoric flint flakes is of local importance. 5. Iron Age/Roman field boundaries are of regional importance. 6. Previously unrecorded remains are of undetermined importance. 7. Possible palaeoenvironmental remains are of local importance. 8. The possible later medieval/post-medieval field system is of regional importance. 9. Field boundaries and trackways of probable post medieval date are of regional importance. 10. The linear boundary or trackway of unknown, but possibly later medieval to post medieval date is of regional importance. 11. Attlebridge World War Two Airfield is of regional importance. 12. The World War One to World War Two military training site is of regional importance. 13. Honingham Park is of regional importance. 14. Previously unrecorded remains are of undetermined importance.</p>	<p>1. N/A 2. The Grade II Listed Buildings are of Medium significance. 3. The Roman field system is of Medium significance. 4. The findspot of prehistoric flint flakes is of Low significance. 5. Iron Age/Roman field boundaries are of Medium significance. 6. Previously unrecorded remains are of undetermined significance. 7. Possible palaeoenvironmental remains are of Low significance. 8. The possible later medieval/post-medieval field system is of Medium significance. 9. Field boundaries and trackways of probable post medieval date are of Medium significance. 10. The linear boundary or trackway of unknown, but possibly later medieval to post medieval date is of Medium significance. 11. Attlebridge World War Two Airfield is of Medium significance. 12. The World War One to World War Two military training site is of Medium significance. 13. Honingham Park is of Medium significance. 14. Previously unrecorded remains are of undetermined significance.</p>	<p>1. N/A 2. Nationally, 92% of listed buildings are Grade II, making them less rare but still of national importance. 3. Roman field systems are relatively rare. 4. Findspots of prehistoric flint flakes are fairly common. 5. Iron Age/Roman field boundaries are relatively rare. 6. The rarity of any unrecorded remains is unknown. 7. Palaeoenvironmental remains are common within alluvial deposits. 8. Later medieval/post-medieval field systems are fairly common. 9. Linear boundaries or trackways are common. 10. World War One to World War Two military training sites are relatively rare. 11. World War One to World War Two military training sites are relatively rare. 12. World War One to World War Two military training sites are relatively rare. 13. Landscape parks are relatively rare. 14. The rarity of previously unrecorded remains is unknown.</p>	<p>Moderate Adverse (Built heritage) Moderate Adverse (Archaeology)</p>	<p><b>Designated heritage assets (physically affected by the scheme)</b> None.</p> <p><b>Designated heritage assets (possible setting impact)</b> Proximity to the route means this option would impact on the setting of the Grade II listed Barn 50m north west of Low Farm House with the loss of surrounding rural and agricultural land. Potential viaduct across the River Wensum would be prominent in views out from the asset towards the north-east. Traffic noise and road lighting would also be prominent in the asset's setting. The Grade II listed Berry Hall is located approximately 350m south west of the southern end of the route. Any visual impact is unlikely. Traffic noise from A47 is prominent in the setting. The route option is unlikely to significantly increase traffic noise. No impact to the asset's setting is predicted.</p> <p><b>Non-designated heritage assets (palaeoenvironmental, prehistoric and Roman)</b> The proposed route could potentially impact a possible Roman field system and possible Iron Age/Roman field boundaries. Previously unrecorded remains from these periods could also be impacted. Possible palaeoenvironmental remains in the Wensum and Tud valleys could be impacted.</p> <p><b>Non-designated heritage assets (medieval and post-medieval)</b> The proposed route would potentially impact a later medieval/post-medieval field systems; field boundaries/trackways; Attlebridge Airfield; a military training site; and Honingham Park. Previously unrecorded remains could also be impacted.</p>
Survival	<p>1. N/A. 2-4. The survival of the listed buildings is good 5. The survival of the possible Roman or later medieval/post-medieval field system is unknown. 6. The survival of undated linear ditches likely to be former field boundaries is unknown. 7. The survival of the Upper Palaeolithic flint blade is unknown. 8. The survival of the Neolithic flint artefacts is unknown. 9. The survival of the Neolithic flint artefacts is unknown. 10. The survival of the Mesolithic and Neolithic worked flints and Iron Age pottery is unknown. 11. The survival of the enclosures and fields of probable Roman date is unknown. 12. The survival of the previously unrecorded remains of these periods is unknown. 13. The survival of the palaeoenvironmental remains in the Wensum and Tud valleys is unknown. 14. The survival of the later medieval/post-medieval field system is unknown. 15. The survival of the former field boundaries is unknown. 16. The survival of the field boundaries and trackways is unknown. 17. The survival of the World War Two practice trenches and pits and possible gun emplacements is unknown. 18. The survival of the World War Two weapon pits is unknown. 19. The survival of the medieval and post-medieval pottery sherds is unknown. 20. The survival of the platforms and ditched enclosures relating to former medieval tofts is unknown. 21. The survival of the foot from a late medieval copper alloy vessel is unknown. 22. The survival of previously unrecorded remains of these periods is unknown.</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>		
Condition	<p>1. N/A. 2. The condition of the listed buildings is unknown. 3. The condition of the possible Roman field system is unknown. 4. The condition of the prehistoric flint flakes is unknown. 5. The condition of the possible Iron Age/Roman field boundaries is unknown. 6. The condition of the previously unrecorded remains of these periods is unknown. 7. The condition of the palaeoenvironmental remains is unknown. 8. The condition of the possible later medieval/post-medieval field system is unknown. 9. The condition of the field boundaries and trackways is unknown. 10. The condition of the linear boundary or trackway is unknown. 11. The condition of Attlebridge World War Two Airfield is unknown. 12. The condition of the World War One to World War Two military training site is unknown. 13. The condition of Honingham Park is unknown. 14. The condition of the previously unrecorded remains of these periods is unknown.</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>		
Complexity	<p>1. N/A. 2. The complexity of the listed buildings is unknown. 3. The complexity of the possible Roman field system is unknown. 4. The complexity of the prehistoric flint flakes is unknown. 5. The complexity of the possible Iron Age/Roman field boundaries is unknown. 6. The complexity of the previously unrecorded remains of these periods is unknown. 7. The complexity of the palaeoenvironmental remains is unknown. 8. The complexity of the possible later medieval/post-medieval field system is unknown. 9. The complexity of the field boundaries and trackways is unknown. 10. The complexity of the linear boundary or trackway is unknown. 11. The complexity of Attlebridge World War Two Airfield is unknown. 12. The complexity of the World War One to World War Two military training site is unknown. 13. The complexity of Honingham Park is unknown. 14. The complexity of the previously unrecorded remains of these periods is unknown.</p>	<p>The complexity is not directly relevant to the impacts on heritage assets</p>	<p>The complexity is not directly relevant to the impacts on heritage assets</p>	<p>The complexity is not directly relevant to the impacts on heritage assets</p>		



Context	1. N/A. 2. Rural. 3. Rural. 4. Rural. 5. Rural. 6. Rural. 7. Rural. 8. Rural. 9. Rural. 10. Rural. 11. Rural. 12. Rural. 13. Rural. 14. Rural.	The context is not impacted	The context is not impacted	The context is not impacted		
Period	1. N/A. 2. Post-medieval. 3. Roman. 4. Prehistoric. 5. Iron Age/Roman. 6. Unknown. 7. Palaeoenvironmental. 8. Later medieval/post-medieval. 9. Post-medieval. 10. Later medieval/post-medieval date. 11. Modern. 12. Modern. 13. Post-medieval. 14. Unknown.	The period is not impacted	The period is not impacted	The period is not impacted		

**Reference Sources**

National Heritage List for England  
Norfolk Historic Environment Record  
Norwich Western Link Heritage Constraints Report (WSP 2018)  
A site visit was undertaken on 6 June 2019.

**Step 5 - Summary Assessment Score**

Moderate Adverse

**Qualitative Comments**

The scheme would be intrusive in the setting (context), and will adversely affect the appreciation and understanding of the characteristic historic environmental resource.  
The scheme would be a major direct impact on regionally or locally significant historic environment non-designated assets, resulting in loss of features such that their integrity is substantially compromised, but adequate mitigation can be specified.

**TAG Historic Environment Impacts Worksheet Option D West**

Step 2		Step 3			Step 4	
Feature	Description	Scale it matters	Significance	Rarity	Impact	Justification
Form	<p><b>Designated heritage assets (physically affected by the scheme)</b> 1. None.</p> <p><b>Designated heritage assets (possible setting impact)</b> 2. One Grade I listed buildings. 3. One Grade II* listed building (western leg only) 4. Three Grade II listed buildings (two on western leg only)</p> <p><b>Non-designated heritage assets (palaeoenvironmental, prehistoric and Roman)</b> 5. Cropmarks of a possible Roman or later medieval/post-medieval field system (53485). 6. Cropmarks of undated linear ditches likely to be former field boundaries of Roman or post-medieval date (50605). 7. The findspot of an Upper Palaeolithic flint blade (21013) 8. The findspot of Neolithic flint artefacts (23428) 9. The findspot of Neolithic flint artefacts (23427) 10. An area of fieldwalking which recovered Mesolithic and Neolithic worked flints and Iron Age pottery (23429) 11. The cropmarks of an area of enclosures and fields of probable Roman date (53628) (eastern leg only) 12. Moderate to high potential for possible, previously unrecorded remains of these periods 13. <b>Moderate potential</b> for palaeoenvironmental remains in the Wensum and Tud valleys.</p> <p><b>Non-designated heritage assets (medieval and post-medieval)</b> 14. Cropmarks of a possible Roman or later medieval/post-medieval field system (53485). 15. Cropmarks of undated linear ditches likely to be former field boundaries of Roman or post-medieval date (50605). 16. Cropmarks of fragmentary field boundaries and trackways of unknown date (53632). 17. The site of World War Two practice trenches and pits and possible gun emplacements (53630). 18. The site of probable World War Two weapon pits (53629). 19. An area of fieldwalking which recovered medieval and post-medieval pottery sherds (23429). 20. The earthworks of a series of platforms and ditched enclosures relating to former medieval tofts (small farms) (28552). (western leg only). 21. The findspot of a foot from a late medieval copper alloy vessel (25701) (eastern leg only). 22. <b>High potential</b> for possible, previously unrecorded remains of these periods.</p>	<p>1. N/A. 2-4. The protection of Listed Buildings is a national concern (<i>Planning (Listed Buildings and Conservation Areas) Act 1990</i> ). 5. The field system is of regional importance. 6. The field boundaries are of regional importance. 7. The findspot is of local importance. 8. The findspot is of local importance. 9. The findspot is of local importance. 10. The area is of regional importance. 11. The field boundaries are of regional importance. 12. Unrecorded remains are of unknown importance. 13. Palaeoenvironmental remains are of local importance. 14. The field system is of regional importance. 15. The field boundaries are of regional importance. 16. The field boundaries/trackways are of regional importance. 17. The trenches would be of regional importance. 18. The weapons pits would be of regional importance. 19. The area of finds would be of local importance. 20. The earthworks would be of regional importance. 21. The findspot is of local importance. 22. Unrecorded remains are of unknown importance.</p>	<p>1. N/A. 2. The Grade I listed building is of High significance. 3. The Grade II* listed building is of High significance. 4. The Grade II Listed Buildings are of Medium significance. 5. The field system is of Medium significance. 6. The field boundaries are of Medium significance. 7. The findspot is of Low significance. 8. The findspot is of Low significance. 9. The findspot is of Low significance. 10. The area is of Medium significance. 11. The fields/enclosures are of Medium significance. 12. Unrecorded remains are of unknown importance. 13. Palaeoenvironmental remains are of Low significance. 14. The field system is of Medium significance. 15. The field boundaries are of Medium significance. 16. The field boundaries/trackways are of Medium significance. 17. The trenches would be of Medium significance. 18. The weapons pits would be of Medium significance. 19. The area of finds would be of Low significance. 20. The earthworks would be of Medium significance. 21. The findspot is of Low significance. 22. Unrecorded remains are of unknown significance.</p>	<p>1. N/A. 2. Nationally, 2.5% of listed buildings are Grade I making them of exceptional interest. 3. Nationally, 5.8% of listed buildings are Grade II* making them of exceptional interest. 4. 92% of listed buildings are Grade II, making them less rare but still of national importance. 5. Roman field systems are relatively rare. 6. Roman field boundaries are relatively rare. 7. Findspots of flint tools are common. 8. Findspots of flint tools are common. 9. Findspots of flint tools are common. 10. Mesolithic flints are rare, Neolithic flints and Iron Age pottery is more common. 11. Roman fields/enclosures are relatively rare. 12. Unrecorded remains are of unknown rarity. 13. Palaeoenvironmental remains are common. 14. The field system is relatively common. 15. The field boundaries are relatively common. 16. The field boundaries/trackways are relatively common. 17. The trenches are relatively rare. 18. The weapons pits are relatively rare. 19. Later medieval/post-medieval pottery is common. 20. The earthworks are relatively rare. 21. The findspot is common. 22. Unrecorded remains are of unknown rarity.</p>	Moderate Adverse (Built heritage) Moderate Adverse (Archaeology)	<p><b>Designated heritage assets (physically affected by the scheme)</b> None.</p> <p><b>Designated heritage assets (possible setting impact)</b> The proximity of the Grade II listed Barn 50m NW of Low Farm House means that views out from the asset towards the route is likely, affecting its rural setting. A viaduct option is also likely to be prominent in views out from the asset. Other impacts would include traffic noise and lighting. The Grade I listed Church of St Peter is located c 500m east of the route. It is experienced by its relationship to its churchyard and the village of Ringland. Intervening vegetation means that views of the route are unlikely, although there would be an impact to setting through traffic noise and lighting. Church Farm House (listed Grade II) and Barn at Church Farm (listed Grade II) are located 150m to the west of the route. Views of the route are likely as are impacts from traffic noise and lighting. Setting of the asset would be impacted. The Grade II* listed Church of St Andrew is located off the A47, 500m to the west of the southern end of the route. Views of the route are unlikely. Traffic noise is already prominent in the setting. Any traffic noise from the route is unlikely to impact on the asset's setting.</p> <p><b>Non-designated heritage assets (palaeoenvironmental, prehistoric and Roman)</b> The proposed route could potentially impact possible Roman field systems and field boundaries. The route passes through an area where relatively rare Mesolithic flint tools have been recovered. Previously unrecorded remains from these periods could also be impacted. Possible palaeoenvironmental remains in the Wensum and Tud valleys could be impacted.</p> <p><b>Non-designated heritage assets (medieval and post-medieval)</b> The proposed route would potentially impact later medieval field systems, field boundaries, ditches and trackways. The site of World War 2 practice trenches and weapons facilities could be impacted.</p>
Survival	<p>1. N/A. 2-4. The survival of the listed buildings is good 5. The survival of the possible Roman or later medieval/post-medieval field system is unknown. 6. The survival of undated linear ditches likely to be former field boundaries is unknown. 7. The survival of the Upper Palaeolithic flint blade is unknown. 8. The survival of the Neolithic flint artefacts is unknown. 9. The survival of the Neolithic flint artefacts is unknown. 10. The survival of the Mesolithic and Neolithic worked flints and Iron Age pottery is unknown. 11. The survival of the enclosures and fields of probable Roman date is unknown. 12. The survival of the previously unrecorded remains of these periods is unknown. 13. The survival of the palaeoenvironmental remains in the Wensum and Tud valleys is unknown. 14. The survival of the later medieval/post-medieval field system is unknown. 15. The survival of the former field boundaries is unknown.. 16. The survival of the field boundaries and trackways is unknown. 17. The survival of the World War Two practice trenches and pits and possible gun emplacements is unknown. 18. The survival of the World War Two weapon pits is unknown. 19. The survival of the medieval and post-medieval pottery sherds is unknown. 20. The survival of the platforms and ditched enclosures relating to former medieval tofts is unknown. 21. The survival of the foot from a late medieval copper alloy vessel is unknown. 22. The survival of previously unrecorded remains of these periods is unknown.</p>	The level of survival is not directly relevant to the impacts on heritage assets	The level of survival is not directly relevant to the impacts on heritage assets	The level of survival is not directly relevant to the impacts on heritage assets		
Condition	<p>1. N/A. 2. The condition of the Grade I listed buildings is unknown. 3. The condition of the Grade II* listed building is unknown. 4. The condition of the Grade II listed buildings is unknown. 5. The condition of the possible Roman or later medieval/post-medieval field system is unknown. 6. The condition of the undated linear ditches is unknown. 7. The condition of the Upper Palaeolithic flint blade is unknown. 8. The condition of the Neolithic flint artefacts is unknown. 9. The condition of the Neolithic flint artefacts is unknown. 10. The condition of the Mesolithic and Neolithic worked flints and Iron Age pottery is unknown. 11. The condition of the enclosures and fields is unknown. 12. <b>The condition of</b> previously unrecorded remains is unknown. 13. The condition of palaeoenvironmental remains is unknown. 14. The condition of the later medieval/post-medieval field system is unknown. 15. The condition of the undated linear ditches likely to be former field boundaries is unknown. 16. The condition of the fragmentary field boundaries and trackways is unknown. 17. The condition of the World War Two practice trenches and pits and possible gun emplacements is unknown. 18. The condition of the World War Two weapon pits is unknown. 19. The condition of the medieval and post-medieval pottery sherds is unknown. 20. The condition of the earthworks of a series of platforms and ditched enclosures relating to former medieval tofts is unknown. 21. The condition of the foot from a late medieval copper alloy vessel is unknown. 22. <b>The condition of the previously unrecorded remains is unknown.</b></p>	The condition is not directly relevant to the impacts on heritage assets	The condition is not directly relevant to the impacts on heritage assets	The condition is not directly relevant to the impacts on heritage assets		

Complexity	<ol style="list-style-type: none"> <li>1. N/A.</li> <li>2. The complexity of the Grade I listed buildings is unknown.</li> <li>3. The complexity of the Grade II* listed building is unknown.</li> <li>4. The complexity of the Grade II listed buildings is unknown.</li> <li>5. The complexity of the possible Roman or later medieval/post-medieval field system is unknown.</li> <li>6. The complexity of the undated linear ditches is unknown.</li> <li>7. The complexity of the Upper Palaeolithic flint blade is unknown.</li> <li>8. The complexity of the Neolithic flint artefacts is unknown.</li> <li>9. The complexity of the Neolithic flint artefacts is unknown.</li> <li>10. The complexity of the Mesolithic and Neolithic worked flints and Iron Age pottery is unknown.</li> <li>11. The complexity of the enclosures and fields is unknown.</li> <li>12. The complexity of previously unrecorded remains is unknown.</li> <li>13. The complexity of palaeoenvironmental remains is unknown.</li> <li>14. The complexity of the later medieval/post-medieval field system is unknown.</li> <li>15. The complexity of the undated linear ditches likely to be former field boundaries is unknown.</li> <li>16. The complexity of the fragmentary field boundaries and trackways is unknown.</li> <li>17. The complexity of the World War Two practice trenches and pits and possible gun emplacements is unknown.</li> <li>18. The complexity of the World War Two weapon pits is unknown.</li> <li>19. The complexity of the medieval and post-medieval pottery sherds is unknown.</li> <li>20. The complexity of the earthworks of a series of platforms and ditched enclosures relating to former medieval tofts is unknown.</li> <li>21. The complexity of the foot from a late medieval copper alloy vessel is unknown.</li> <li>22. The complexity of the previously unrecorded remains is unknown.</li> </ol>	The complexity is not directly relevant to the impacts on heritage assets	The complexity is not directly relevant to the impacts on heritage assets	The complexity is not directly relevant to the impacts on heritage assets		
Context	<ol style="list-style-type: none"> <li>1. None.</li> <li>2. Rural.</li> <li>3. Rural.</li> <li>4. Rural.</li> <li>5. Rural.</li> <li>6. Rural.</li> <li>7. Rural.</li> <li>8. Rural.</li> <li>9. Rural.</li> <li>10. Rural.</li> <li>11. Rural.</li> <li>12. Rural.</li> <li>13. Rural.</li> <li>14. Rural.</li> <li>15. Rural.</li> <li>16. Rural.</li> <li>17. Rural.</li> <li>18. Rural.</li> <li>19. Rural.</li> <li>20. Rural.</li> <li>21. Rural.</li> </ol>	The context is not impacted.	The context is not impacted.	The context is not impacted.		
Period	<ol style="list-style-type: none"> <li>1. N/A.</li> <li>2. Later medieval.</li> <li>3. Later medieval.</li> <li>4. Post-medieval.</li> <li>5. Roman (possible).</li> <li>6. Roman (possible).</li> <li>7. Upper Palaeolithic.</li> <li>8. Neolithic.</li> <li>9. Neolithic.</li> <li>10. Mesolithic, Neolithic and Iron Age.</li> <li>11. Roman.</li> <li>12. Unknown.</li> <li>13. Palaeoenvironmental.</li> <li>14. Later medieval/post-medieval</li> <li>15. Post-medieval.</li> <li>16. Unknown.</li> <li>17. Modern.</li> <li>18. Modern.</li> <li>19. Medieval and post-medieval.</li> <li>20. Medieval.</li> <li>21. Later medieval.</li> <li>22. Unknown.</li> </ol>	The period is not impacted.	The period is not impacted.	The period is not impacted.		

**Reference Sources**

National Heritage List for England  
Norfolk Historic Environment Record  
Norwich Western Link Heritage Constraints Report (WSP 2018)  
A site visit was undertaken on 6 June 2019.

**Step 5 - Summary Assessment Score**

Moderate Adverse

**Qualitative Comments**

The scheme would be intrusive in the setting (context), and will adversely affect the appreciation and understanding of the characteristic historic environmental resource.  
The scheme would be a major direct impact on regionally or locally significant historic environment non-designated assets, resulting in loss of features such that their integrity is substantially compromised, but adequate mitigation can be specified.

**TAG Historic Environment Impacts Worksheet Option D East**

Step 2		Step 3			Step 4	
Feature	Description	Scale it matters	Significance	Rarity	Impact	Justification
Form	<p><b>Designated heritage assets (physically affected by the scheme)</b> 1. None.</p> <p><b>Designated heritage assets (possible setting impact)</b> 2. One Grade I listed buildings. 3. One Grade II* listed building (western leg only) 4. Three Grade II listed buildings (two on western leg only)</p> <p><b>Non-designated heritage assets (palaeoenvironmental, prehistoric and Roman)</b> 5. Cropmarks of a possible Roman or later medieval/post-medieval field system (53485). 6. Cropmarks of undated linear ditches likely to be former field boundaries of Roman or post-medieval date (50605). 7. The findspot of an Upper Palaeolithic flint blade (21013) 8. The findspot of Neolithic flint artefacts (23428) 9. The findspot of Neolithic flint artefacts (23427) 10. An area of fieldwalking which recovered Mesolithic and Neolithic worked flints and Iron Age pottery (23429) 11. The cropmarks of an area of enclosures and fields of probable Roman date (53628) (eastern leg only) 12. Moderate to high potential for possible, previously unrecorded remains of these periods 13. <b>Moderate potential</b> for palaeoenvironmental remains in the Wensum and Tud valleys.</p> <p><b>Non-designated heritage assets (medieval and post-medieval)</b> 14. Cropmarks of a possible Roman or later medieval/post-medieval field system (53485). 15. Cropmarks of undated linear ditches likely to be former field boundaries of Roman or post-medieval date (50605). 16. Cropmarks of fragmentary field boundaries and trackways of unknown date (53632). 17. The site of World War Two practice trenches and pits and possible gun emplacements (53630). 18. The site of probable World War Two weapon pits (53629). 19. An area of fieldwalking which recovered medieval and post-medieval pottery sherds (23429). 20. The earthworks of a series of platforms and ditched enclosures relating to former medieval tofts (small farms) (28552). (western leg only). 21. The findspot of a foot from a late medieval copper alloy vessel (25701) (eastern leg only). 22. <b>High potential</b> for possible, previously unrecorded remains of these periods.</p>	<p>1. N/A. 2-4. The protection of Listed Buildings is a national concern (<i>Planning (Listed Buildings and Conservation Areas) Act 1990</i>). 5. The field system is of regional importance. 6. The field boundaries are of regional importance. 7. The findspot is of local importance. 8. The findspot is of local importance. 9. The findspot is of local importance. 10. The area is of regional importance. 11. The fields/enclosures are of regional importance. 12. Unrecorded remains are of unknown importance. 13. Palaeoenvironmental remains are of local importance. 14. The field system is of regional importance. 15. The field boundaries are of regional importance. 16. The field boundaries/trackways are of regional importance. 17. The trenches would be of regional importance. 18. The weapons pits would be of regional importance. 19. The area of finds would be of local importance. 20. The earthworks would be of regional importance. 21. The findspot is of local importance. 22. Unrecorded remains are of unknown importance.</p>	<p>1. N/A. 2. The Grade I listed building is of High significance. 3. The Grade II* listed building is of High significance. 4. The Grade II Listed Buildings are of Medium significance. 5. The field system is of Medium significance. 6. The field boundaries are of Medium significance. 7. The findspot is of Low significance. 8. The findspot is of Low significance. 9. The findspot is of Low significance. 10. The area is of Medium significance. 11. The fields/enclosures are of Medium significance. 12. Unrecorded remains are of unknown importance. 13. Palaeoenvironmental remains are of Low significance. 14. The field system is of Medium significance. 15. The field boundaries are of Medium significance. 16. The field boundaries/trackways are of Medium significance. 17. The trenches would be of Medium significance. 18. The weapons pits would be of Medium significance. 19. The area of finds would be of Low significance. 20. The earthworks would be of Medium significance. 21. The findspot is of Low significance. 22. Unrecorded remains are of unknown significance.</p>	<p>1. N/A. 2. Nationally, 2.5% of listed buildings are Grade I making them of exceptional interest. 3. Nationally, 5.8% of listed buildings are Grade II* making them of exceptional interest. 4. 92% of listed buildings are Grade II, making them less rare but still of national importance. 5. Roman field systems are relatively rare. 6. Roman field boundaries are relatively rare. 7. Findspots of flint tools are common. 8. Findspots of flint tools are common. 9. Findspots of flint tools are common. 10. Mesolithic flints are rare, Neolithic flints and Iron Age pottery is more common. 11. Roman fields/enclosures are relatively rare. 12. Unrecorded remains are of unknown rarity. 13. Palaeoenvironmental remains are common. 14. The field system is relatively common. 15. The field boundaries are relatively common. 16. The field boundaries/trackways are relatively common. 17. The trenches are relatively rare. 18. The weapons pits are relatively rare. 19. Later medieval/post-medieval pottery is common. 20. The earthworks are relatively rare. 21. The findspot is common. 22. Unrecorded remains are of unknown rarity.</p>	<p>Moderate Adverse (Built heritage) Moderate Adverse (Archaeology)</p>	<p><b>Designated heritage assets (physically affected by the scheme)</b> None.</p> <p><b>Designated heritage assets (possible setting impact)</b> The proximity of the Grade II listed Barn 50m NW of Low Farm House means that views out from the asset towards the route is likely, affecting its rural setting. A viaduct option is also likely to be prominent in views out from the asset. Other impacts would include traffic noise and lighting. The Grade I listed Church of St Peter is located c 500m east of the route. It is experienced by its relationship to its churchyard and the village of Ringland. Intervening vegetation means that views of the route are unlikely, although there would be an impact to setting through traffic noise. Traffic noise is already prominent in the setting. Any traffic noise from the route is unlikely to impact on the asset's setting.</p> <p><b>Non-designated heritage assets (palaeoenvironmental, prehistoric and Roman)</b> The proposed route could potentially impact possible Roman field systems and field boundaries and an area of Roman enclosures. The route passes through an area where relatively rare Mesolithic flint tools have been recovered. Previously unrecorded remains from these periods could also be impacted. Possible palaeoenvironmental remains in the Wensum and Tud valleys could be impacted.</p> <p><b>Non-designated heritage assets (medieval and post-medieval)</b> The proposed route would potentially impact later medieval field systems, field boundaries, ditches and trackways. The site of World War 2 practice trenches and weapons facilities could be impacted. Previously unrecorded remains could also be impacted.</p>
Survival	<p>1. N/A. 2-4. The survival of the listed buildings is good 5. The survival of the possible Roman or later medieval/post-medieval field system is unknown. 6. The survival of undated linear ditches likely to be former field boundaries is unknown. 7. The survival of the Upper Palaeolithic flint blade is unknown. 8. The survival of the Neolithic flint artefacts is unknown. 9. The survival of the Neolithic flint artefacts is unknown. 10. The survival of the Mesolithic and Neolithic worked flints and Iron Age pottery is unknown. 11. The survival of the enclosures and fields of probable Roman date is unknown. 12. The survival of the previously unrecorded remains of these periods is unknown. 13. The survival of the palaeoenvironmental remains in the Wensum and Tud valleys is unknown. 14. The survival of the later medieval/post-medieval field system is unknown. 15. The survival of the former field boundaries is unknown. 16. The survival of the field boundaries and trackways is unknown. 17. The survival of the World War Two practice trenches and pits and possible gun emplacements is unknown. 18. The survival of the World War Two weapon pits is unknown. 19. The survival of the medieval and post-medieval pottery sherds is unknown. 20. The survival of the platforms and ditched enclosures relating to former medieval tofts is unknown. 21. The survival of the foot from a late medieval copper alloy vessel is unknown. 22. The survival of previously unrecorded remains of these periods is unknown.</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>	<p>The level of survival is not directly relevant to the impacts on heritage assets</p>		
Condition	<p>1. N/A. 2. The condition of the Grade I listed buildings is unknown. 3. The condition of the Grade II* listed building is unknown. 4. The condition of the Grade II listed buildings is unknown. 5. The condition of the possible Roman or later medieval/post-medieval field system is unknown. 6. The condition of the undated linear ditches is unknown. 7. The condition of the Upper Palaeolithic flint blade is unknown. 8. The condition of the Neolithic flint artefacts is unknown. 9. The condition of the Neolithic flint artefacts is unknown. 10. The condition of the Mesolithic and Neolithic worked flints and Iron Age pottery is unknown. 11. The condition of the enclosures and fields is unknown. 12. <b>The condition of</b> previously unrecorded remains is unknown. 13. The condition of palaeoenvironmental remains is unknown. 14. The condition of the later medieval/post-medieval field system is unknown. 15. The condition of the undated linear ditches likely to be former field boundaries is unknown. 16. The condition of the fragmentary field boundaries and trackways is unknown. 17. The condition of the World War Two practice trenches and pits and possible gun emplacements is unknown. 18. The condition of the World War Two weapon pits is unknown. 19. The condition of the medieval and post-medieval pottery sherds is unknown. 20. The condition of the earthworks of a series of platforms and ditched enclosures relating to former medieval tofts is unknown. 21. The condition of the foot from a late medieval copper alloy vessel is unknown. 22. The condition of the previously unrecorded remains is unknown.</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>	<p>The condition is not directly relevant to the impacts on heritage assets</p>	

Complexity	<ol style="list-style-type: none"> <li>1. N/A.</li> <li>2. The complexity of the Grade I listed buildings is unknown.</li> <li>3. The complexity of the Grade II* listed building is unknown.</li> <li>4. The complexity of the Grade II listed buildings is unknown.</li> <li>5. The complexity of the possible Roman or later medieval/post-medieval field system is unknown.</li> <li>6. The complexity of the undated linear ditches is unknown.</li> <li>7. The complexity of the Upper Palaeolithic flint blade is unknown.</li> <li>8. The complexity of the Neolithic flint artefacts is unknown.</li> <li>9. The complexity of the Neolithic flint artefacts is unknown.</li> <li>10. The complexity of the Mesolithic and Neolithic worked flints and Iron Age pottery is unknown.</li> <li>11. The complexity of the enclosures and fields is unknown.</li> <li>12. The complexity of previously unrecorded remains is unknown.</li> <li>13. The complexity of palaeoenvironmental remains is unknown.</li> <li>14. The complexity of the later medieval/post-medieval field system is unknown.</li> <li>15. The complexity of the undated linear ditches likely to be former field boundaries is unknown.</li> <li>16. The complexity of the fragmentary field boundaries and trackways is unknown.</li> <li>17. The complexity of the World War Two practice trenches and pits and possible gun emplacements is unknown.</li> <li>18. The complexity of the World War Two weapon pits is unknown.</li> <li>19. The complexity of the medieval and post-medieval pottery sherds is unknown.</li> <li>20. The complexity of the earthworks of a series of platforms and ditched enclosures relating to former medieval tofts is unknown.</li> <li>21. The complexity of the foot from a late medieval copper alloy vessel is unknown.</li> <li>22. The complexity of the previously unrecorded remains is unknown.</li> </ol>	The complexity is not directly relevant to the impacts on heritage assets	The complexity is not directly relevant to the impacts on heritage assets	The complexity is not directly relevant to the impacts on heritage assets		
Context	<ol style="list-style-type: none"> <li>1. None.</li> <li>2. Rural.</li> <li>3. Rural.</li> <li>4. Rural.</li> <li>5. Rural.</li> <li>6. Rural.</li> <li>7. Rural.</li> <li>8. Rural.</li> <li>9. Rural.</li> <li>10. Rural.</li> <li>11. Rural.</li> <li>12. Rural.</li> <li>13. Rural.</li> <li>14. Rural.</li> <li>15. Rural.</li> <li>16. Rural.</li> <li>17. Rural.</li> <li>18. Rural.</li> <li>19. Rural.</li> <li>20. Rural.</li> <li>21. Rural.</li> <li>22. Rural.</li> </ol>	The context is not impacted.	The context is not impacted.	The context is not impacted.		
Period	<ol style="list-style-type: none"> <li>1. N/A.</li> <li>2. Later medieval.</li> <li>3. Later medieval.</li> <li>4. Post-medieval.</li> <li>5. Roman (possible).</li> <li>6. Roman (possible).</li> <li>7. Upper Palaeolithic.</li> <li>8. Neolithic.</li> <li>9. Neolithic.</li> <li>10. Mesolithic, Neolithic and Iron Age.</li> <li>11. Roman.</li> <li>12. Unknown.</li> <li>13. Palaeoenvironmental.</li> <li>14. Later medieval/post-medieval</li> <li>15. Post-medieval.</li> <li>16. Unknown.</li> <li>17. Modern.</li> <li>18. Modern.</li> <li>19. Medieval and post-medieval.</li> <li>20. Medieval.</li> <li>21. Later medieval.</li> <li>22. Unknown.</li> </ol>	The period is not impacted.	The period is not impacted.	The period is not impacted.		

**Reference Sources**

National Heritage List for England  
 Norfolk Historic Environment Record  
 Norwich Western Link Heritage Constraints Report (WSP 2018)  
 A site visit was undertaken on 6 June 2019.

**Step 5 - Summary Assessment Score**

Moderate adverse

**Qualitative Comments**

The scheme would be intrusive in the setting (context), and will adversely affect the appreciation and understanding of the characteristic historic environmental resource.  
 The scheme would be a major direct impact on regionally or locally significant historic environment non-designated assets, resulting in loss of features such that their integrity is substantially compromised, but adequate mitigation can be specified.

## TAG Biodiversity Impacts Worksheet

## Route Option A

Step 2		Step 3			Step 4	Step 5	
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
River Wensum SAC.	<p><b>Biodiversity:</b> Chalk-fed river, designated for Annex I habitat as a primary reason for selection: Water courses of plain to montane levels with the Ranunculion fluitans and Callitriche-Batrachion vegetation. The Wensum represents sub-type 1 in lowland eastern England.</p> <p>Annex II species as a primary reason for selection: White-clawed (or Atlantic stream) crayfish <i>Austropotamobius pallipes</i></p> <p>Annex II species present as a qualifying feature: Desmoulin's whorl snail <i>Vertigo moulinsiana</i></p> <p>Brook lamprey <i>Lampetra planeri</i></p> <p>Bullhead <i>Cottus gobio</i></p>	International	<p><b>High</b> - Primary habitat: Sub-type 1 has a limited distribution in the UK, being found only in those areas where chalk is present, and is therefore restricted to southern and eastern England.</p>	<p><b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this habitat type.</p>	<p><b>Very high</b> - Internationally important site with limited potential for substitution.</p>	<p><b>Neutral</b> - Further baseline required in order to develop an assessment.</p>	<p><b>Neutral</b></p>
			<p><b>High</b> - Primary species: White-clawed crayfish. One of only four watercourses in Norfolk that are known to support white-clawed crayfish.</p>	<p><b>Target species</b> - Population decline in Norfolk since 1990. The Norfolk Biodiversity Action Plan has targets to maintain the present distribution of this species, limit the spread of non-native species and maintain and create appropriate habitat conditions. As with most of the remaining crayfish populations in the south and east of England, the threats from non-native crayfish species and crayfish plague are severe.</p> <p>This species is likely absent from the Wensum due to the presence of the signal crayfish.</p>		<p><b>Neutral</b> - Further baseline required in order to develop an assessment.</p>	<p><b>Neutral</b></p>
			<p><b>High</b> - Other qualifying feature: Desmoulin's whorl snail. The site supports one of the largest populations in the UK.</p>	<p><b>Target species</b> - Population decline in Norfolk due to destruction of wetlands. Habitat degradation, particularly as a result of changes in hydrology and possibly the introduction of grazing.</p>		<p><b>Neutral</b> - Further baseline required in order to develop an assessment.</p>	<p><b>Neutral</b></p>
			<p><b>High</b> - Other qualifying feature: Brook lamprey. The Wensum has a healthy population of brook lamprey, with clean water and suitable areas of gravels, silt or sand required for spawning.</p>	<p><b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.</p>		<p><b>Neutral</b> - Further baseline required in order to develop an assessment.</p>	<p><b>Neutral</b></p>
River Wensum SSSI.	<p><b>Biodiversity:</b> Overlaps with River Wensum SAC (see above cell).</p> <p>Notified for:</p> <p>Flowing waters - Type I: naturally eutrophic lowland rivers with a high base flow.</p> <p>Flowing waters - Type III: base-rich, low-energy lowland rivers and streams, generally with a stable flow regime. Population of RDB mollusc - Desmoulin's whorl snail, S25 - <i>Phragmites australis</i> - <i>Eupatorium cannabinum</i> tall-herb fen, S3 - <i>Carex paniculata</i> swamp, S4 - <i>Phragmites australis</i> swamp and reed-beds, S5 - <i>Glyceria maxima</i> swamp, S7 - <i>Carex acutiformis</i> swamp and white-clawed crayfish</p>	National	<p><b>High</b> - The River Wensum is a SSSI of national importance, supporting a diverse range of protected habitats and species.</p>	<p><b>Unknown</b> - The national and local trends for SSSIs are unknown.</p>	<p><b>High</b> - Nationally important site with limited potential for substitution.</p>	<p><b>Neutral</b> - Further baseline required in order to develop an assessment.</p>	<p><b>Neutral</b></p>
			<p><b>High</b> - Other qualifying feature: Bullhead. Sites have been selected to encompass the natural geographical range of the species and to represent the range of ecological situations in which it occurs, e.g. both upland and lowland rivers, and both acidic and base-rich situations.</p>	<p><b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.</p>		<p><b>Neutral</b> - Further baseline required in order to develop an assessment.</p>	<p><b>Neutral</b></p>
Fakenham Road (Ref. 59) RNR	<b>Biodiversity:</b> Species: Hoary mulein <i>Verbascum pulverulentum</i>	County	<b>Medium</b> - Site of county value, with only one qualifying feature behind the designation.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.	<b>Medium</b> - County value site with potential for substitution.	<b>Neutral</b> - Potential loss of full site through A1067 widening. Further baseline required in order to develop an assessment.	<b>Neutral</b>
Attlebridge Hills CWS (adjacent to A1067)	<b>Biodiversity:</b> Structurally varied, broad-leaved semi-natural woodland. The canopy is dominated by mature oak, sycamore, sweet chestnut with extensive areas of mixed coppice of hazel, sycamore and sweet chestnut.	County	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Weston Meadow CWS	<b>Biodiversity:</b> Lowland marshy grassland divided by a ditch. North of the ditch is tall herb with sedges <i>Carex</i> spp., nettle, great willowherb and meadowsweet and marsh thistle <i>Cirsium palustre</i> .	County	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Old Covert, Wood Lane CWS	<b>Biodiversity:</b> A coppice woodland with standards that are not listed on the Ancient Woodland Inventory, although it may have once been part of a larger, Ancient Woodland. The wood is managed as coppice and for shooting.	County	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Mouse Wood CWS (c.50m east of scheme)	<b>Biodiversity:</b> Citation refers to an ancient, replanted woodland which is now predominantly a commercially-managed conifer plantation surrounded mainly by arable farmland. The extent of the existing ancient woodland is unknown.	County	<b>Medium</b> - Ancient woodland is an important habitat on a county level.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with limited potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Marricot's Way CWS (c. 35m north of scheme)	<b>Recreational:</b> Line which closed finally in 1985, and is now used by walkers, cyclists and horse-riders. A firm track has been laid along its whole length.	County	<b>Low</b> - Recreational use on a local level.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the recreational use associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Meadow adjacent to Sandy Lane CWS (c. 150m west of scheme)	<b>Biodiversity:</b> Obviously unimproved meadow rich in herbs although rather heavily grazed. A stream runs alongside before joining the River Wensum. Grass and soft rush are dominant with widespread buttercup <i>Ranunculus</i> spp, plantain <i>Plantago</i> spp. and dock.	County	<b>Low</b> - Important habitat on a local level. Hydrological connectivity to River Wensum (SAC and SSSI).	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Lenwade Pits East CWS (c. 60m north of scheme)	<b>Biodiversity:</b> This site is a complex of gravel pits with mature varied woodland, with several pools. Woodland is dominated by alder, with oak <i>Quercus robur</i> , ash <i>Fraxinus excelsior</i> , willow and grey willow <i>Salix cinerea</i> forming a dense canopy.	County	<b>Low</b> - Important habitat on a local level.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Lenwade Pits West CWS (c. 35m north-west of scheme)	<b>Biodiversity:</b> This site is a complex of disused gravel pits, woodland and wet grassland. The pools contain yellow water-lily <i>Nuphar lutea</i> and water forget-me-not <i>Myosotis scorpioides</i> , fringed by reed grass, reed canary grass <i>Phalaris arundinacea</i> , bramble <i>Rubus fruticosus</i> , grey willow and oat-grass <i>Avenula</i> spp. One pond is surrounded by purple-loosestrife <i>Lythrum salicaria</i> .	County	<b>Low</b> - Important habitat on a local level.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Land adjacent to Concrete Plant CWS (c. 110m north of scheme)	<b>Biodiversity:</b> A large water-filled gravel pit with woodland around its margins, contains stands of common reed <i>Phragmites australis</i> and reedmace <i>Typha latifolia</i> in shallow areas. The banks are largely wooded with alder <i>Alnus glutinosa</i> and willow <i>Salix</i> spp.	County	<b>Low</b> - Important habitat on a local level.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Ancient woodland	<b>Biodiversity:</b> The woodland to be impacted is also listed as an HPI and is now listed as a CWS.	County	<b>High</b> - Detailed baseline data has not been collected, although the route has been potential to impact on ancient woodland. Ancient woodland is considered one of the richest land-based habitats for wildlife.	<b>Declining</b> - Ancient woodland is in significant national decline, with a current UK coverage of only 2%.	<b>High</b> - County value site with no potential for substitution.	<b>Minor Negative</b> - Indirect impacts on ancient woodland by changing abiotic conditions. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Habitats of Principal Importance (HPI)	<b>Biodiversity:</b> Lowland deciduous woodland, coast and floodplain grazing marsh, traditional orchard, watercourses, water bodies and hedgerows.	County	<b>Medium</b> - it is expected that the route will impact HPI of county value.	<b>Declining</b> - These habitats are listed as a priority under the Natural and Rural Communities Act (2006) due to the declining trend nationally. The Norfolk BAP does not identify a trend in relation to these habitat types locally.	<b>Medium</b> - County value habitat with limited potential for substitution.	<b>Minor Negative</b> - The route will directly impact HPI through habitat loss and indirectly through a decline in habitat quality. Further assessment necessary. Estimated direct impact to Lowland Deciduous Woodland, Coast and Floodplain Grazing Marsh and Traditional Orchard. Additional habitat loss of hedgerows, watercourses and water bodies expected. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Birds	<b>Biodiversity:</b> Habitats present are suitable for use by nesting birds. The arable fields and grasslands provide potential foraging habitat for passage/over-wintering birds such as mixed thrush flocks, skylarks and pipits. Arable fields and areas of grassland could also be used by flocks of migrant/over-wintering bird species such as geese.	Local	<b>Medium</b> - Detailed baseline data has not yet been collected, although it is expected that the route will impact birds at a local level.	<b>Unknown</b> - The Norfolk BAP identifies a range of bird species in significant decline on a local level.	<b>Medium</b> - The site is likely to support a diversity range of breeding and wintering bird species of county importance.	<b>Minor Negative</b> - The route will result in the loss of habitats likely to be used by birds and may give rise to further impacts arising from changes in biotic conditions. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Bats	<b>Biodiversity:</b> Woodlands, hedgerows, mature trees and scrub provide suitable habitat for foraging, commuting and roosting bats.	Regional	<b>High</b> - Detailed baseline data has not yet been collected, although habitats present that are likely to be impacted are likely to support foraging, commuting and roosting bats. Maternity colony of barbastelle bats are located within 300m of the route and so therefore significant negative impacts and considered likely.	<b>Target species</b> - Although a trend in relation to the target species is not known the Norfolk BAP targets four species (including barbastelle) to reduce decline.	<b>High</b> - Bats are protected under the Conservation of Habitats and Species Regulations 2017 and are notably in decline across the UK due to widespread habitat loss. Barbastelle is an Annex II species of European importance.	<b>Major Negative</b> - The route will affect habitat known to support commuting, foraging and roosting bats (including barbastelle). The route could also have indirect impacts through habitat severance which may require extensive mitigation.	<b>Very large adverse</b>
Badgers	<b>Biodiversity:</b> Woodlands, hedgerows and grassland provide suitable habitat for foraging badgers, and suitable locations for sett construction.	County	<b>Medium</b> - Detailed baseline data has not yet been collected. However badgers are widespread across the UK and are likely to be present.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species, although nationally badgers have shown a significant increase in numbers (c.88% since the 1980s).	<b>Medium</b> - badger setts may be present in the vicinity of the route, especially in areas of woodland.	<b>Minor Negative</b> - The route is likely to result in the loss of habitat used by badgers, and may affect setts, foraging and commuting habitat. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Aquatic Macroinvertebrates	<b>Biodiversity:</b> Watercourses and ponds are likely to support aquatic macroinvertebrates, which may include notable or protected species.	County	<b>High</b> - The River Wensum SAC and SSSI is designated for white-clawed crayfish and Desmoulin's whorl snail. The extent of these species in relation to the site is unknown.	<b>Target species</b> - the only aquatic macroinvertebrate in decline across Norfolk and is targeted by the Norfolk BAP is the Norfolk hawkler <i>Aeshna</i> / <i>soles</i> . The local objective is to maintain the current range in Norfolk by preventing loss of freshwater sites and create new habitat with a view to increase the range in Norfolk by 2020.	<b>Medium</b> - freshwater habitats may support notable aquatic macroinvertebrate species.	<b>Minor negative</b> - The loss of ponds is likely to have the largest impact, although further baseline required in order to develop an assessment.	<b>Slight adverse</b>
White-clawed Crayfish	<b>Biodiversity:</b> Primary reason behind the designation of the SAC.	International	<b>High</b> - See SAC information above. Additionally the route will cross minor watercourses that may support this species. Further assessment will be required to confirm this.	<b>Target species</b> - The River Wensum is one of only four watercourses in Norfolk that are known to support white-clawed crayfish. The Norfolk Biodiversity Action Plan has targets to maintain the present distribution of this species, limit the spread of non-native species and maintain and create appropriate habitat conditions.	<b>Very high</b> - Primary feature of SAC.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Fish	<b>Biodiversity:</b> The River Wensum SAC and its tributaries are designated for brook lamprey and bullhead.	International	<b>High</b> - See SAC information above. Additionally the route will cross minor watercourses (including drains), that may support fish.	<b>Unknown</b> - No trend has been identified nationally or locally for the two fish for which the SAC is designated.	<b>Very high</b> - Designated features of SAC.	<b>Neutral</b> - The importance of the minor watercourses in relation to fish is not known so there is the potential to impact fish through culverting works. Further baseline required in order to develop an assessment.	<b>Neutral</b>
Desmoulin's Whorl Snail	<b>Biodiversity:</b> Desmoulin's whorl snail has been recorded within the area, with 12 records pertaining to the River Wensum. The route will cross minor watercourses (including drains), that may support this species.	International	<b>High</b> - See SAC information above.	<b>Target species</b> - Targeted because of its declining in Norfolk, due to destruction of wetlands, habitat degradation, particularly as a result of changes in hydrology and possibly the introduction of grazing.	<b>Very high</b> - Primary feature of SAC. Internationally important site with limited potential for substitution.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>
Otter	<b>Biodiversity:</b> In addition to the River Wensum and Tud a series of small watercourses and drains, in connection with the route may support otter.	County	<b>Medium</b> - Otter are targeted by the Norfolk Biodiversity Action Plan and are protected under Schedule 5 of the Wildlife and Countryside Act (1981) and the Conservation of Habitats and Species Regulations (2017).	<b>Target species</b> - Although the Norfolk population of otter is thought to be increasing, they are declining at National level.	<b>High</b> - Otter are a species of high biodiversity value on a national and local level.	<b>Minor Negative</b> - There is likely to be an increase in abiotic disturbance, notably noise and lighting on nearby watercourses. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>

Water Vole	<b>Biodiversity:</b> In addition to the River Wensum and Tud a series of small watercourses and drains, in connection with the route may support water vole.	<b>Local</b>	<b>Medium</b> - Water vole are targeted by the Norfolk Biodiversity Action Plan and are protected under Schedule 5 of the Wildlife and Countryside Act (1981).	<b>Target species</b> - Water vole decline in Norfolk is mainly due to population fragmentation and isolation.	<b>Medium</b> - Water vole are a species of medium biodiversity value on a national and local level.	<b>Minor Negative</b> - There is likely to be an increase in abiotic disturbance, notably noise and lighting on nearby watercourses. Where box culverts are proposed, these may impact water vole habitat connectivity. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Reptiles	<b>Biodiversity:</b> Areas of rough grassland and scrub are likely to be suitable to support reptiles.	<b>Local</b>	<b>Medium</b> - widespread species of reptile, including common lizard, slow worm and grass snake are likely to be present in areas of suitable habitat.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to these species.	<b>Medium</b> - the scheme may affect grassland and scrub that is used by reptiles.	<b>Minor Negative</b> - The route option is likely to affect reptiles that are present in areas of suitable habitat. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Terrestrial Invertebrates	<b>Biodiversity:</b> Habitats including woodland, scrub and grassland are likely to support terrestrial invertebrates.	<b>Local</b>	<b>Medium</b> - It is expected that the range of habitats along the route will support terrestrial invertebrates that are widespread and common throughout the UK.	<b>Target species</b> - The Norfolk BAP identifies a declining trend in certain invertebrate species. Ground beetle, brush-thighed seed-eater beetle, fixweed flea beetle and silver-studded blue butterfly are all target species of the Norfolk BAP. It is unknown whether these species are present in the vicinity of the route option.	<b>Medium</b> - The project has the potential to affect terrestrial invertebrate species.	<b>Minor Negative</b> - The route is likely to result in the loss of habitat used by terrestrial invertebrates. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Great Crested Newts (GCN)	<b>Biodiversity:</b> Low numbers of great crested newt records have been identified from data search. The route is likely to result in the loss of terrestrial and breeding habitat for this species.	<b>Local</b>	<b>High</b> - the route has potential to affect terrestrial habitat and breeding ponds used by this species.	<b>Target species</b> - GCN are targeted by the Norfolk BAP due to a major population decline in the Broads. The main objective in Norfolk is to maintain range and viability of the local population.	<b>High</b> - GCN are of high biodiversity value on a local and national level.	<b>Positive</b> - A significant meta-population is unlikely to be present given the wide distribution of water bodies. There is the potential for the scheme to impact terrestrial and breeding habitat although the extent of this is unknown until further assessment has been undertaken.	<b>Large beneficial</b>

**Reference Sources**

WSP Desk Study (2018), Norfolk BAP, JNCC, Natural England

**Summary Assessment Score**

Very large adverse

**Qualitative Comments**

This option directly impacts the least ecological features however because bats are of high conservation importance and the route is located very close to a known maternity roost and so potential impacts and considered likely the impact of the route is very large adverse.

**TAG Biodiversity Impacts Worksheet**      **Route Option B West**

Step 2		Step 3				Step 4	Step 5
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
River Wensum SAC	<p><b>Biodiversity:</b> Chalk-fed river, designated for Annex I habitat as a primary reason for selection. Water courses of plain to montane levels with the Ranunculus fluitans and Callitriche-Batrachion vegetation. The Wensum represents sub-type 1 in lowland eastern England. Annex II species as a primary reason for selection: White-clawed (or Atlantic stream) crayfish <i>Austropotamobius pallipes</i> Annex II species present as a qualifying feature: Desmoulin's whorl snail <i>Vertigo moulinsiana</i> Brook lamprey <i>Lampetra planeri</i> Bullhead <i>Cottus gobio</i></p>	International	<p><b>High</b> - Primary habitat: Sub-type 1 has a limited distribution in the UK, being found only in those areas where chalk is present, and is therefore restricted to southern and eastern England.</p>	<p><b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this habitat type.</p>	<p><b>Very high</b> - Internationally important site with limited potential for substitution.</p>	<p><b>Major negative</b> - Further baseline required in order to develop an assessment.</p>	<p><b>Very large adverse</b></p>
			<p><b>High</b> - Primary species: White-clawed crayfish. One of only four watercourses in Norfolk that are known to support white-clawed crayfish.</p>	<p><b>Target species</b> - Population decline in Norfolk since 1990. The Norfolk Biodiversity Action Plan has targets to maintain the present distribution of this species, limit the spread of non-native species and maintain and create appropriate habitat conditions. As with most of the remaining crayfish populations in the south and east of England, the threats from non-native crayfish species and crayfish plague are severe.</p>		<p><b>Major negative</b> - Further baseline required in order to develop an assessment.</p>	
			<p><b>High</b> - Other qualifying feature: Desmoulin's whorl snail. The site supports one of the largest populations in the UK.</p>	<p><b>Target species</b> - Population decline in Norfolk due to destruction of wetlands. Habitat degradation, particularly as a result of changes in hydrology and possibly the introduction of grazing.</p>		<p><b>Major negative</b> - Further baseline required in order to develop an assessment.</p>	
			<p><b>High</b> - Other qualifying feature: Brook lamprey. The Wensum has a healthy population of brook lamprey, with clean water and suitable areas of gravels, silt or sand required for spawning.</p>	<p><b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.</p>		<p><b>Major negative</b> - Further baseline required in order to develop an assessment.</p>	
River Wensum SSSI	<p><b>Biodiversity:</b> Overlaps with River Wensum SAC (see above cell). Notified for: Flowing waters - Type I: naturally eutrophic lowland rivers with a high base flow, Flowing waters - Type III: base-rich, low-energy lowland rivers and streams, generally with a stable flow regime, Population of RDB mollusc – Desmoulin's whorl snail, S25 - Phragmites australis - Eupatorium cannabinum tall-herb fen, S3 - Carex paniculata swamp, S4 - Phragmites australis swamp and reed-beds, S5 - Glyceria maxima swamp, S7 - Carex acutiformis swamp and white-clawed crayfish</p>	National	<p><b>High</b> - The River Wensum is a SSSI of national importance, supporting a diverse range of protected habitats and species.</p>	<p><b>Unknown</b> - The national and local trends for SSSIs are unknown.</p>	<p><b>High</b> - Nationally important site with limited potential for substitution.</p>	<p><b>Minor negative</b> - Further baseline required in order to develop an assessment.</p>	<p><b>Slight adverse</b></p>
			<p><b>Target species</b> - See above for trends regarding white-clawed crayfish and Desmoulin's whorl snail</p>	<p><b>Neutral</b> - Further baseline required in order to develop an assessment.</p>		<p><b>Neutral</b></p>	
Fakenham Road (Ref. 59) RNR	<p><b>Biodiversity:</b> Species: Hoary mullein <i>Verbascum pulverulentum</i></p>	County	<p><b>Medium</b> - Site of county value, with only one qualifying feature behind the designation.</p>	<p><b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.</p>	<p><b>Medium</b> - County value site with potential for substitution.</p>	<p><b>Neutral</b> - Potential loss of full site through A1067 widening. Further baseline required in order to develop an assessment.</p>	<p><b>Neutral</b></p>
Attlebridge Hills CWS	<p><b>Biodiversity:</b> Structurally varied, broad-leaved semi-natural woodland. The canopy is dominated by mature oak, sycamore, sweet chestnut with extensive areas of mixed coppice of hazel, sycamore and sweet chestnut.</p>	County	<p><b>Medium</b> - Site of county value supporting Habitat of Principal Importance.</p>	<p><b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.</p>	<p><b>Medium</b> - County value site with potential for substitution.</p>	<p><b>Minor negative</b> - Potential loss of County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.</p>	<p><b>Slight adverse</b></p>
Land adjoining Foxborough plantation CWS	<p><b>Biodiversity:</b> Part of a larger area known collectively as Foxborough Plantation and The Waterfence. It consists of an extensive area of wet, species-rich grassland situated in the bottom of a spring-fed valley.</p>	County	<p><b>Medium</b> - Site of county value supporting Habitat of Principal Importance.</p>	<p><b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.</p>	<p><b>Medium</b> - County value site with potential for substitution.</p>	<p><b>Minor negative</b> - Potential loss of County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.</p>	<p><b>Slight adverse</b></p>
Wensum Pastures at Morton Hall CWS (adj. to southern boundary)	<p><b>Biodiversity:</b> Predominantly improved cattle-grazed pasture adjacent to River Wensum, crossed by a network of drains supporting a species-rich flora associated with aquatic habitats.</p>	County	<p><b>Medium</b> - Site of county value supporting Habitat of Principal Importance.</p>	<p><b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.</p>	<p><b>Medium</b> - County value site with potential for substitution.</p>	<p><b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.</p>	<p><b>Slight adverse</b></p>
Old Covert, Wood Lane CWS (c. 200m northwest of scheme)	<p><b>Biodiversity:</b> A coppice woodland with standards that are not listed on the Ancient Woodland Inventory, although it may have once been part of a larger, Ancient Woodland. The wood is managed as coppice and for shooting.</p>	County	<p><b>Medium</b> - Site of county value supporting Habitat of Principal Importance.</p>	<p><b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.</p>	<p><b>Medium</b> - County value site with potential for substitution.</p>	<p><b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.</p>	<p><b>Slight adverse</b></p>
Triumph and Foxborough Plantations CWS (c. 270m north of scheme)	<p><b>Biodiversity:</b> Mixed broad-leaved woodland with rides.</p>	County	<p><b>Medium</b> - Site of county value supporting Habitat of Principal Importance.</p>	<p><b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.</p>	<p><b>Medium</b> - County value site with potential for substitution.</p>	<p><b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.</p>	<p><b>Slight adverse</b></p>
Mouse Wood CWS (c. 430m northwest of scheme)	<p><b>Biodiversity:</b> Citation refers to an ancient, replanted woodland which is now predominantly a commercially-managed conifer plantation surrounded mainly by arable farmland. The extent of the existing ancient woodland is unknown.</p>	County	<p><b>Medium</b> - Ancient woodland is an important habitat on a county level.</p>	<p><b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.</p>	<p><b>Medium</b> - County value site with limited potential for substitution.</p>	<p><b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.</p>	<p><b>Slight adverse</b></p>
Habitats of Principal Importance (HPI)	<p><b>Biodiversity:</b> Features comprise lowland deciduous woodland, coast and floodplain grazing marsh, traditional orchard, watercourses, water bodies and hedgerows.</p>	County	<p><b>Medium</b> - Detailed habitat surveys have not been undertaken although it is expected that the route will impact HPI of county value.</p>	<p><b>Declining</b> - These habitat are listed as a priority under the Natural and Rural Communities Act (2006) due to the declining trend nationally. The Norfolk BAP does not identify a trend in relation to these habitat types locally.</p>	<p><b>Medium</b> - County value habitat with limited potential for substitution.</p>	<p><b>Minor negative</b> - The route will directly impact several HPI through habitat loss and indirectly through a decline in habitat quality. Further appropriate assessment necessary. Estimated direct impact to Lowland Deciduous Woodland, Coast and Floodplain Grazing Marsh. Additional habitat loss for hedgerows, watercourses and water bodies expected, although no data collected yet. Further baseline required in order to develop an assessment.</p>	<p><b>Slight adverse</b></p>
Birds	<p><b>Biodiversity:</b> Habitats present are suitable for use by nesting birds. The arable fields and grasslands provide potential foraging habitat for passage/over-wintering birds such as mixed thrush flocks, skylarks and pipits. Arable fields and areas of grassland could also be used by flocks of migrant/over-wintering bird species such as geese.</p>	Local	<p><b>Medium</b> - Detailed baseline data has not yet been collected, although it is expected that the route will impact birds at a local level.</p>	<p><b>Unknown</b> - The Norfolk BAP identifies a range of bird species in significant decline on a county level.</p>	<p><b>Medium</b> - The site is likely to support a diversity range of breeding and wintering bird species of local importance.</p>	<p><b>Minor Negative</b> - The route will result in the loss of habitats likely to be used by birds and may give rise to further impacts arising from changes in biotic conditions. Further baseline required on Schedule 1 birds including, but not limited to kingfisher, barn owl and red kite, in order to develop an assessment.</p>	<p><b>Slight adverse</b></p>
Bats	<p><b>Biodiversity:</b> Woodlands, hedgerows, mature trees and scrub provide suitable habitat for foraging, commuting and roosting bats.</p>	Regional	<p><b>High</b> - Detailed baseline data has not yet been collected, although data collected to date indicates the route could impact significant areas of foraging, commuting and roosting bats (including barbastelle). Maternity barbastelle bat roosts are located within woodlands very close to the route which could be significantly adversely impacted.</p>	<p><b>Target species</b> - Although a trend in relation to the target species group is not known the Norfolk BAP targets four species of bat (including barbastelle) to reduce decline.</p>	<p><b>High</b> - Bats are protected under the Conservation of Habitats and Species Regulations 2017 and are notably in decline across the UK due to widespread habitat loss. Barbastelle is an Annex II species of European importance.</p>	<p><b>Major Negative</b> - The route will affect habitat known to support commuting, foraging and roosting bats (including barbastelle). The route could also have indirect impacts through habitat severance which may require extensive mitigation.</p>	<p><b>Very Large adverse</b></p>
Badgers	<p><b>Biodiversity:</b> Woodlands, hedgerows and grassland provide suitable habitat for foraging badgers, and suitable locations for sett construction.</p>	County	<p><b>Medium</b> - Detailed baseline data has not yet been collected. However badgers are widespread across the UK and are likely to be present.</p>	<p><b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species, although nationally badgers have shown a significant increase in numbers (c. 88% since the 1980s).</p>	<p><b>Medium</b> - badger setts may be present in the vicinity of the route, especially in areas of woodland.</p>	<p><b>Minor Negative</b> - The route is likely to result in the loss of habitat used by badgers, and may affect setts, foraging and commuting habitat. Further baseline required in order to develop an assessment.</p>	<p><b>Slight adverse</b></p>
Aquatic Macroinvertebrates	<p><b>Biodiversity:</b> Watercourses and ponds are likely to support aquatic macroinvertebrates, which may include notable or protected species.</p>	County	<p><b>High</b> - The River Wensum SAC and SSSI is designated for white-clawed crayfish and Desmoulin's whorl snail. The extent of these species in relation to the site is unknown.</p>	<p><b>Target species</b> - the only aquatic macroinvertebrate in decline across Norfolk and is targeted by the Norfolk BAP is the Norfolk hawkler <i>Aeshna isocetes</i>. The local objective is to maintain the current range in Norfolk by preventing loss of freshwater sites and create new habitat with a view to increase the range in Norfolk by 2020.</p>	<p><b>Medium</b> - freshwater habitats may support notable aquatic macroinvertebrate species.</p>	<p><b>Minor negative</b> - The loss ponds is likely to have the largest impact, although further baseline required in order to develop an assessment.</p>	<p><b>Slight adverse</b></p>



White-clawed Crayfish	<b>Biodiversity:</b> Primary reason behind the designation of the SAC.	<b>International</b>	<b>High</b> - See SAC information above. Additionally the route will cross minor watercourses that may support this species. Further assessment will be required to confirm this.	<b>Target species</b> - The River Wensum is one of only four watercourses in Norfolk that are known to support white-clawed crayfish. The Norfolk Biodiversity Action Plan has targets to maintain the present distribution of this species, limit the spread of non-native species and maintain and create appropriate habitat conditions.	<b>Very high</b> - Primary feature of SAC.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Fish	<b>Biodiversity:</b> The River Wensum SAC and its tributaries are designated for brook lamprey and bullhead.	<b>International</b>	<b>High</b> - See SAC information above. Additionally the route will cross minor watercourses (including drains), that may support fish.	<b>Unknown</b> - No trend has been identified nationally or locally for the two fish for which the SAC is designated.	<b>Very high</b> - Designated features of SAC.	<b>Neutral</b> - The importance of the minor watercourses in relation to fish is not known so there is the potential to impact fish through culverting works. Further baseline required in order to develop an assessment.	<b>Neutral</b>
Desmoulin's Whorl Snail	<b>Biodiversity:</b> Desmoulin's whorl snail has been recorded within the area, with 12 records pertaining to the River Wensum. The route will cross minor watercourses (including drains), that may support this species.	<b>International</b>	<b>High</b> - See SAC information above.	<b>Target species</b> - Targeted because of its declining in Norfolk due to destruction of wetlands, habitat degradation, particularly as a result of changes in hydrology and possibly the introduction of grazing.	<b>Very high</b> - Primary feature of SAC. Internationally important site with limited potential for substitution.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>
Otter	<b>Biodiversity:</b> In addition to the River Wensum and Tud a series of small watercourses and drains, in connection with the route may support otter.	<b>County</b>	<b>Medium</b> - Otter are targeted by the Norfolk Biodiversity Action Plan and are protected under Schedule 5 of the Wildlife and Countryside Act (1981) and the Conservation of Habitats and Species Regulations (2017).	<b>Target species</b> - Although the Norfolk population of otter is thought to be increasing, they are declining at National level.	<b>High</b> - Otter are a species of high biodiversity value on a national and local level.	<b>Minor Negative</b> - There is likely to be an increase in abiotic disturbance, notably noise and lighting on nearby watercourses. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Water Vole	<b>Biodiversity:</b> In addition to the River Wensum and Tud a series of small watercourses and drains, in connection with the route may support water vole.	<b>Local</b>	<b>Medium</b> - Water vole are targeted by the Norfolk Biodiversity Action Plan and are protected under Schedule 5 of the Wildlife and Countryside Act (1981).	<b>Target species</b> - Water vole decline in Norfolk is mainly due to population fragmentation and isolation.	<b>Medium</b> - Water vole are a species of medium biodiversity value on a national and local level.	<b>Minor Negative</b> - There is likely to be an increase in abiotic disturbance, notably noise and lighting on nearby watercourses. Where box culverts are proposed, these may impact water vole habitat connectivity. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Reptiles	<b>Biodiversity:</b> Areas of rough grassland and scrub are likely to be suitable to support reptiles.	<b>Local</b>	<b>Medium</b> - widespread species of reptile, including common lizard, slow worm and grass snake are likely to be present in areas of suitable habitat.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to these species.	<b>Medium</b> - the scheme may affect grassland and scrub that is used by reptiles.	<b>Minor Negative</b> - The route option is likely to affect reptiles that are present in areas of suitable habitat. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Terrestrial Invertebrates	<b>Biodiversity:</b> Habitats including woodland, scrub and grassland are likely to support terrestrial invertebrates.	<b>Local</b>	<b>Medium</b> - It is expected that the range of habitats along the route will support terrestrial invertebrates that are widespread and common throughout the UK.	<b>Target species</b> - The Norfolk BAP identifies a declining trend in certain invertebrate species. Ground beetle, brush-thighed seed-eater beetle, flixweed flea beetle and silver-studded blue butterfly are all target species of the Norfolk BAP. It is unknown whether these species are present in the vicinity of the route option.	<b>Medium</b> - The project has the potential to affect terrestrial invertebrate species.	<b>Minor Negative</b> - The route is likely to result in the loss of habitat used by terrestrial invertebrates. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Great Crested Newts (GCN)	<b>Biodiversity:</b> Low numbers of great crested newt records have been identified from data search. The route is likely to result in the loss of terrestrial and breeding habitat for this species.	<b>County</b>	<b>High</b> - the route has potential to affect terrestrial habitat and breeding ponds used by this species.	<b>Target species</b> - GCN are targeted by the Norfolk BAP due to a major population decline in the Broads. The main objective in Norfolk is to maintain range and viability of the local population.	<b>High</b> - GCN are of high biodiversity value on a local and national level.	<b>Positive</b> - A significant meta-population is unlikely to be present given the wide distribution of water bodies. There is the potential for the scheme to impact terrestrial and breeding habitat although the extent of this is unknown until further assessment has been undertaken.	<b>Large beneficial</b>

**Reference Sources**

WSP Desk Study (2018), Norfolk BAP, JNCC, Natural England

**Summary Assessment Score**

Very large adverse

**Qualitative Comments**

This option has the potential to cause impacts to the River Wensum SAC and could also impact a known maternity colony of barbastelle bats and therefore the impact of the route is very large adverse.

## TAG Biodiversity Impacts Worksheet

## Route Option B East

Step 2		Step 3				Step 4	Step 5		
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score		
River Wensum SAC	<b>Biodiversity:</b> Chalk-fed river, designated for: Annex I habitat as a primary reason for selection: Water courses of plain to montane levels with the Ranunculus fluitans and Callitriche-Batrachion vegetation. The Wensum represents sub-type 1 in lowland eastern England. Annex II species as a primary reason for selection: White-clawed (or Atlantic stream) crayfish <i>Austropotamobius pallipes</i> Annex II species present as a qualifying feature: Desmoulin's whorl snail <i>Vertigo moulinsiana</i> Brook lamprey <i>Lampetra planeri</i> Bullhead <i>Cottus gobio</i>	<b>International</b>	<b>High</b> - Primary habitat: Sub-type 1 has a limited distribution in the UK, being found only in those areas where chalk is present, and is therefore restricted to southern and eastern England.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this habitat type.	<b>Very high</b> - Internationally important site with limited potential for substitution.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>		
			<b>High</b> - Primary species: White-clawed crayfish. One of only four watercourses in Norfolk that are known to support white-clawed crayfish.	<b>Target species</b> - Population decline in Norfolk since 1990. The Norfolk Biodiversity Action Plan has targets to maintain the present distribution of this species, limit the spread of non-native species and maintain and created appropriate habitat conditions. As with most of the remaining crayfish populations in the south and east of England, the threats from non-native crayfish species and crayfish plague are severe.				<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>
			<b>High</b> - Other qualifying feature: Desmoulin's whorl snail. The site supports one of the largest populations in the UK.	<b>Target species</b> - Population decline in Norfolk due to destruction of wetlands. Habitat degradation, particularly as a result of changes in hydrology and possibly the introduction of grazing.				<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>
			<b>High</b> - Other qualifying feature: Brook lamprey. The Wensum has a healthy population of brook lamprey, with clean water and suitable areas of gravels, silt or sand required for spawning.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.				<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>
			<b>High</b> - Other qualifying feature: Bullhead. Sites have been selected to encompass the natural geographical range of the species and to represent the range of ecological situations in which it occurs, e.g. both upland and lowland rivers, and both acidic and base-rich situations.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.				<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>
River Wensum SSSI	<b>Biodiversity:</b> Overlaps with River Wensum SAC (see above cell). Notified for: Flowing waters - Type I: naturally eutrophic lowland rivers with a high base flow, Flowing waters - Type III: base-rich, low-energy lowland rivers and streams, generally with a stable flow regime, Population of RDB mollusc - Desmoulin's whorl snail, S25 - Phragmites australis - Eupatorium cannabinum tall-herb fen, S3 - Carex paniculata swamp, S4 - Phragmites australis swamp and reed-beds, S5 - Glyceria maxima swamp, S7 - Carex acutiformis swamp and white-clawed crayfish	<b>National</b>	<b>High</b> - The River Wensum is a SSSI of national importance, supporting a diverse range of protected habitats and species.	<b>Unknown</b> - The national and local trends for SSSIs are unknown.	<b>High</b> - Nationally important site with limited potential for substitution.	<b>Minor negative</b> - Further baseline required in order to develop an assessment.	<b>Slight adverse</b>		
				<b>Target species</b> - See above for trends regarding white-clawed crayfish and Desmoulin's whorl snail				<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>
Fakenham Road (Ref. 59) RNR	<b>Biodiversity:</b> Species: Hoary mullein <i>Verbascum pulverulentum</i>	<b>County</b>	<b>Medium</b> - Site of county value, with only one qualifying feature behind the designation.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.	<b>Medium</b> - County value site with potential for substitution.	<b>Neutral</b> - Potential loss of full site through A1067 widening. Further baseline required in order to develop an assessment.	<b>Neutral</b>		
Attlebridge Hills CWS	<b>Biodiversity:</b> Structurally varied, broad-leaved semi-natural woodland. The canopy is dominated by mature oak, sycamore, sweet chestnut with extensive areas of mixed coppice of hazel, sycamore and sweet chestnut.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>		
Land adjoining Foxborough plantation CWS	<b>Biodiversity:</b> Part of a larger area known collectively as Foxborough Plantation and The Waterfence. It consists of an extensive area of wet, species-rich grassland situated in the bottom of a spring-fed valley.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>		
Old Covert, Wood Lane CWS (c. 200m northwest of proposed scheme)	<b>Biodiversity:</b> A coppice woodland with standards that are not listed on the Ancient Woodland Inventory, although it may have once been part of a larger, Ancient Woodland. The wood is managed as coppice and for shooting.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>		
Triumph and Foxborough Plantations CWS (c. 270m north of scheme)	<b>Biodiversity:</b> Mixed broad-leaved woodland with rides.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>		
Mouse Wood CWS (c. 430m northwest of scheme)	<b>Biodiversity:</b> Citation refers to an ancient, replanted woodland which is now predominantly a commercially-managed conifer plantation surrounded mainly by arable farmland. The extent of the existing ancient woodland is unknown.	<b>County</b>	<b>Medium</b> - Ancient woodland is an important habitat on a county level.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with limited potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>		
Broom and Spring Hills CWS (c. 440m south of scheme)	<b>Biodiversity:</b> Semi-natural deciduous woodland dominated by oak and sycamore.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>		
Habitats of Principal Importance (HPI)	<b>Biodiversity:</b> Features comprise lowland deciduous woodland, coast and floodplain grazing marsh, traditional orchard, watercourses, water bodies and hedgerows.	<b>County</b>	<b>Medium</b> - Detailed habitat surveys have not been undertaken although it is expected that the route will impact HPI of county value.	<b>Declining</b> - These habitat are listed as a priority under the Natural and Rural Communities Act (2006) due to the declining trend nationally. The Norfolk BAP does not identify a trend in relation to these habitat types locally.	<b>Medium</b> - County value habitat with limited potential for substitution.	<b>Minor negative</b> - The route will directly impact several HPI through habitat loss and indirectly through a decline in habitat quality. Further appropriate assessment necessary. Estimated direct impact to Lowland Deciduous Woodland, Coast and Floodplain Grazing Marsh. Additional habitat loss for hedgerows, watercourses and water bodies expected, although no data collected yet. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>		
Birds	<b>Biodiversity:</b> Habitats present are suitable for use by nesting birds. The arable fields and grasslands provide potential foraging habitat for passage/over-wintering birds such as mixed thrush flocks, skylarks and pipits. Arable fields and areas of grassland could also be used by flocks of migrant/over-wintering bird species such as geese.	<b>Local</b>	<b>Medium</b> - Detailed baseline data has not yet been collected, although it is expected that the route will impact birds at a local level.	<b>Unknown</b> - The Norfolk BAP identifies a range of bird species in significant decline on a county level.	<b>Medium</b> - The site is likely to support a diversity range of breeding and wintering bird species of local importance.	<b>Minor Negative</b> - The route will result in the loss of habitats likely to be used by birds and may give rise to further impacts arising from changes in biotic conditions. Further baseline required on Schedule 1 birds including, but not limited to kingfisher, barn owl and red kite, in order to develop an assessment.	<b>Slight adverse</b>		
Bats	<b>Biodiversity:</b> Woodlands, hedgerows, mature trees and scrub provide suitable habitat for foraging, commuting and roosting bats.	<b>Regional</b>	<b>High</b> - Detailed baseline data has not yet been collected, although data collected to date indicates the route could impact significant areas of foraging, commuting and roosting bats (including barbastelle). Maternity barbastelle bat roosts are located within woodlands very close to the route which could be significantly adversely impacted.	<b>Target species</b> - Although a trend in relation to the target species is not known the Norfolk BAP targets four species (including barbastelle) to reduce decline.	<b>High</b> - Bats are protected under the Conservation of Habitat and Species Regulations 2017 and are notably in decline across the UK due to widespread habitat loss. Barbastelle is an Annex II species of European importance.	<b>Major Negative</b> - The route will affect habitat known to support commuting, foraging and roosting bats (including barbastelle). The route could also have indirect impacts through habitat severance which may require extensive mitigation.	<b>Very Large adverse</b>		
Badgers	<b>Biodiversity:</b> Woodlands, hedgerows and grassland provide suitable habitat for foraging badgers, and suitable locations for sett construction.	<b>County</b>	<b>Medium</b> - Detailed baseline data has not yet been collected. However badgers are widespread across the UK and are likely to be present.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species, although nationally badgers have shown a significant increase in numbers (c.88% since the 1980s).	<b>Medium</b> - badger setts may be present in the vicinity of the route, especially in areas of woodland.	<b>Minor Negative</b> - The route is likely to result in the loss of habitat used by badgers, and may affect setts, foraging and commuting habitat. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>		
Aquatic Macroinvertebrates	<b>Biodiversity:</b> Watercourses ponds are likely to support aquatic macroinvertebrates, which may include notable or protected species.	<b>County</b>	<b>High</b> - The River Wensum SAC and SSSI is designated for white-clawed crayfish and Desmoulin's whorl snail. The extent of these species in relation to the site is unknown.	<b>Target species</b> - the only aquatic macroinvertebrate in decline across Norfolk and is targeted by the Norfolk BAP is the Norfolk hawkler <i>Aeshna isoceles</i> . The local objective is to maintain the current range in Norfolk by preventing loss of freshwater sites and create new habitat with a view to increase the range in Norfolk by 2020.	<b>Medium</b> - freshwater habitats may support notable aquatic macroinvertebrate species.	<b>Minor negative</b> - The loss of an estimated two ponds is likely to have the largest impact, although further baseline required in order to develop an assessment.	<b>Slight adverse</b>		

White-clawed Crayfish	<b>Biodiversity:</b> Primary reason behind the designation of the SAC.	<b>International</b>	<b>High</b> - See SAC information above. Additionally the route will cross minor watercourses that may support this species. Further assessment will be required to confirm this.	<b>Target species</b> - The River Wensum is one of only four watercourses in Norfolk that are known to support white-clawed crayfish. The Norfolk Biodiversity Action Plan has targets to maintain the present distribution of this species, limit the spread of non-native species and maintain and create appropriate habitat conditions.	<b>Very high</b> - Primary feature of SAC.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Fish	<b>Biodiversity:</b> The River Wensum SAC and its tributaries are designated for brook lamprey and bullhead.	<b>International</b>	<b>High</b> - See SAC information above. Additionally the route will cross minor watercourses (including drains), that may support fish.	<b>Unknown</b> - No trend has been identified nationally or locally for the two fish for which the SAC is designated.	<b>Very high</b> - Designated features of SAC.	<b>Neutral</b> - The importance of the minor watercourses in relation to fish is not known so there is the potential to impact fish through culverting works. Further baseline required in order to develop an assessment.	<b>Neutral</b>
Desmoulin's Whorl Snail	<b>Biodiversity:</b> Desmoulin's whorl snail has been recorded within the area, with 12 records pertaining to the River Wensum. The route will cross minor watercourses (including drains), that may support this species.	<b>International</b>	<b>High</b> - See SAC information above.	<b>Target species</b> - Targeted because of its declining in Norfolk due to destruction of wetlands, habitat degradation, particularly as a result of changes in hydrology and possibly the introduction of grazing.	<b>Very high</b> - Primary feature of SAC. Internationally important site with limited potential for substitution.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>
Otter	<b>Biodiversity:</b> In addition to the River Wensum and Tud a series of small watercourses and drains, in connection with the route may support otter.	<b>County</b>	<b>Medium</b> - Otter are targeted by the Norfolk Biodiversity Action Plan and are protected under Schedule 5 of the Wildlife and Countryside Act (1981) and the Conservation of Habitats and Species Regulations (2017).	<b>Target species</b> - Although the Norfolk population of otter is thought to be increasing, they are declining at National level.	<b>High</b> - Otter are a species of high biodiversity value on a national and local level.	<b>Minor Negative</b> - There is likely to be an increase in abiotic disturbance, notably noise and lighting on nearby watercourses. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Water Vole	<b>Biodiversity:</b> In addition to the River Wensum and Tud a series of small watercourses and drains, in connection with the route may support water vole.	<b>Local</b>	<b>Medium</b> - Water vole are targeted by the Norfolk Biodiversity Action Plan and are protected under Schedule 5 of the Wildlife and Countryside Act (1981).	<b>Target species</b> - Water vole decline in Norfolk is mainly due to population fragmentation and isolation.	<b>Medium</b> - Water vole are a species of medium biodiversity value on a national and local level.	<b>Minor Negative</b> - There is likely to be an increase in abiotic disturbance, notably noise and lighting on nearby watercourses. Where box culverts are proposed, these may impact water vole habitat connectivity. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Reptiles	<b>Biodiversity:</b> Areas of rough grassland and scrub are likely to be suitable to support reptiles.	<b>Local</b>	<b>Medium</b> - widespread species of reptile, including common lizard, slow worm and grass snake are likely to be present in areas of suitable habitat.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to these species.	<b>Medium</b> - the scheme may affect grassland and scrub that is used by reptiles.	<b>Minor Negative</b> - The route option is likely to affect reptiles that are present in areas of suitable habitat. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Terrestrial Invertebrates	<b>Biodiversity:</b> Habitats including woodland, scrub and grassland are likely to support terrestrial invertebrates.	<b>Local</b>	<b>Medium</b> - It is expected that the range of habitats along the route will support terrestrial invertebrates that are widespread and common throughout the UK.	<b>Target species</b> - The Norfolk BAP identifies a declining trend in certain invertebrate species. Ground beetle, brush-thighed seed-eater beetle, flixweed flea beetle and silver-studded blue butterfly are all target species of the Norfolk BAP. It is unknown whether these species are present in the vicinity of the route option.	<b>Medium</b> - The project has the potential to affect terrestrial invertebrate species.	<b>Minor Negative</b> - The route is likely to result in the loss of habitat used by terrestrial invertebrates. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Great Crested Newts (GCN)	<b>Biodiversity:</b> Low numbers of great crested newt records have been identified from data search. The route is likely to result in the loss of terrestrial and breeding habitat for this species.	<b>County</b>	<b>High</b> - the route has potential to affect terrestrial habitat and breeding ponds used by this species.	<b>Target species</b> - GCN are targeted by the Norfolk BAP due to a major population decline in the Broads. The main objective in Norfolk is to maintain range and viability of the local population.	<b>High</b> - GCN are of high biodiversity value on a local and national level.	<b>Positive</b> - A significant meta-population is unlikely to be present given the wide distribution of water bodies. There is the potential for the scheme to impact terrestrial and breeding habitat although the extent of this is unknown until further assessment has been undertaken.	<b>Large beneficial</b>

**Reference Sources**

WSP Desk Study (2018), Norfolk BAP, JNCC, Natural England

**Summary Assessment Score**

Very Large adverse

**Qualitative Comments**

This option has the potential to cause impacts to a known maternity colony of barbastelle bats and therefore the impact of the route is very large adverse.

## TAG Biodiversity Impacts Worksheet

## Route Option C

Step 2		Step 3				Step 4	Step 5	
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score	
River Wensum SAC	<b>Biodiversity:</b> Chalk-fed river, designated for: Annex I habitat as a primary reason for selection: Water courses of plain to montane levels with the Ranunculus fluitans and Callitriche-Batrachion vegetation. The Wensum represents sub-type 1 in lowland eastern England. Annex II species as a primary reason for selection: White-clawed (or Atlantic stream) crayfish <i>Austropotamobius pallipes</i> Annex II species present as a qualifying feature: Desmoulin's whorl snail <i>Vertigo moulinsiana</i> Brook lamprey <i>Lampetra planeri</i> Bullhead <i>Cottus gobio</i>	<b>International</b>	<b>High</b> - Primary habitat: Sub-type 1 has a limited distribution in the UK, being found only in those areas where chalk is present, and is therefore restricted to southern and eastern England.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this habitat type.	<b>Very high</b> - Internationally important site with limited potential for substitution.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>	
			<b>High</b> - Primary species: White-clawed crayfish. One of only four watercourses in Norfolk that are known to support white-clawed crayfish.	<b>Target species</b> - Population decline in Norfolk since 1990. The Norfolk Biodiversity Action Plan has targets to maintain the present distribution of this species, limit the spread of non-native species and maintain and created appropriate habitat conditions. As with most of the remaining crayfish populations in the south and east of England, the threats from non-native crayfish species and crayfish plague are severe.				<b>Neutral</b> - Further baseline required in order to develop an assessment.
			<b>High</b> - Other qualifying feature: Desmoulin's whorl snail. The site supports one of the largest populations in the UK.	<b>Target species</b> - Population decline in Norfolk due to destruction of wetlands. Habitat degradation, particularly as a result of changes in hydrology and possibly the introduction of grazing.				<b>Neutral</b> - Further baseline required in order to develop an assessment.
			<b>High</b> - Other qualifying feature: Brook lamprey. The Wensum has a healthy population of brook lamprey, with clean water and suitable areas of gravels, silt or sand required for spawning.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.				<b>Neutral</b> - Further baseline required in order to develop an assessment.
River Wensum SSSI	<b>Biodiversity:</b> Overlaps with River Wensum SAC (see above cell). Notified for: Flowing waters - Type I: naturally eutrophic lowland rivers with a high base flow. Flowing waters - Type III: base-rich, low-energy lowland rivers and streams, generally with a stable flow regime. Population of RDB mollusc - Desmoulin's whorl snail, S25 - Phragmites australis - Eupatorium cannabinum tall-herb fen, S3 - Carex paniculata swamp, S4 - Phragmites australis swamp and reed-beds, S5 - Glyceria maxima swamp, S7 - Carex acutiformis swamp and white-clawed crayfish	<b>National</b>	<b>High</b> - The River Wensum is a SSSI of national importance, supporting a diverse range of protected habitats and species.	<b>Unknown</b> - The national and local trends for SSSIs are unknown.	<b>High</b> - Nationally important site with limited potential for substitution.	<b>Minor negative</b> - Further baseline required in order to develop an assessment.	<b>Slight adverse</b>	
				<b>Target species</b> - See above for trends regarding white-clawed crayfish and Desmoulin's whorl snail				<b>Neutral</b> - Further baseline required in order to develop an assessment.
Fakenham Road (Ref. 59) RNR	<b>Biodiversity:</b> Species: Hoary mullein <i>Verbascum pulverentum</i>	<b>County</b>	<b>Medium</b> - Site of county value, with only one qualifying feature behind the designation.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.	<b>Medium</b> - County value site with potential for substitution.	<b>Neutral</b> - Potential loss of full site through A1067 widening. Further baseline required in order to develop an assessment.	<b>Neutral</b>	
River Wensum Pastures, Ringland Estate Proposed CWS (Ref. 6)	<b>Unknown</b>	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b>	<b>Medium</b> - County value site with limited potential for substitution.	<b>Minor negative</b> - Potential loss of County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>	
Land adjoining Foxborough plantation CWS	<b>Biodiversity:</b> Part of a larger area known collectively as Foxborough Plantation and The Waterfence. It consists of an extensive area of wet, species-rich grassland situated in the bottom of a spring-fed valley.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further assessment necessary.	<b>Slight adverse</b>	
Part of 'Long Plantation' (Other land meeting designation for CWS (Ref. 3))	<b>Unknown</b>	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>	
Wensum Pastures at Morton Hall CWS (c. 20m north of scheme)	<b>Biodiversity:</b> Predominantly improved cattle-grazed pasture adjacent to River Wensum, crossed by a network of drains supporting a species-rich flora associated with aquatic habitats.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>	
Broom and Spring Hills CWS (c. 30m north of scheme)	<b>Biodiversity:</b> Semi-natural deciduous woodland dominated by oak and sycamore.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>	
Attlebridge Hills CWS (c. 80m north of scheme)	<b>Biodiversity:</b> Structurally varied, broad-leaved semi-natural woodland. The canopy is dominated by mature oak, sycamore, sweet chestnut with extensive areas of mixed coppice of hazel, sycamore and sweet chestnut.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>	
Old Covert, Wood Lane CWS (c. 200m northwest of scheme)	<b>Biodiversity:</b> A coppice woodland with standards that are not listed on the Ancient Woodland Inventory, although it may have once been part of a larger, Ancient Woodland. The wood is managed as coppice and for shooting.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>	
Mouse Wood CWS (c.430m northwest of scheme)	<b>Biodiversity:</b> Citation refers to an ancient, replanted woodland which is now predominantly a commercially-managed conifer plantation surrounded mainly by arable farmland. The extent of the existing ancient woodland is unknown.	<b>County</b>	<b>Medium</b> - Ancient woodland is an important habitat on a county level.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with limited potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>	
Habitats of Principal Importance (HPI)	<b>Biodiversity:</b> Features comprise lowland deciduous woodland, coast and floodplain grazing marsh, traditional orchard, watercourses, waterbodies and hedgerows.	<b>County</b>	<b>Medium</b> - Detailed habitat surveys have not been undertaken although it is expected that the route will impact HPI of county value.	<b>Declining</b> - These habitat are listed as a priority under the Natural and Rural Communities Act (2006) due to the declining trend nationally. The Norfolk BAP does not identify a trend in relation to these habitat types locally.	<b>Medium</b> - County value habitat with limited potential for substitution.	<b>Minor negative</b> - The route will directly impact several HPI through habitat loss and indirectly through a decline in habitat quality. Further appropriate assessment necessary. Estimated direct impact to Lowland Deciduous Woodland, Coast and Floodplain Grazing Marsh. Additional habitat loss for hedgerows, watercourses and water bodies expected, although no data collected yet. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>	
Birds	<b>Biodiversity:</b> Habitats present are suitable for use by nesting birds. The arable fields and grasslands provide potential foraging habitat for passage/over-wintering birds such as mixed thrush flocks, skylarks and pipits. Arable fields and areas of grassland could also be used by flocks of migrant/over-wintering bird species such as geese.	<b>Local</b>	<b>Medium</b> - Detailed baseline data has not yet been collected, although it is expected that the route will impact birds at a local level.	<b>Unknown</b> - The Norfolk BAP identifies a range of bird species in significant decline on a county level.	<b>Medium</b> - The site is likely to support a diversity range of breeding and wintering bird species of local importance.	<b>Minor Negative</b> - The route will result in the loss of habitats likely to be used by birds and may give rise to further impacts arising from changes in biotic conditions. Further baseline required on Schedule 1 birds including, but not limited to kingfisher, barn owl and red kite, in order to develop an assessment.	<b>Slight adverse</b>	
Bats	<b>Biodiversity:</b> Woodlands, hedgerows, mature trees and scrub provide suitable habitat for foraging, commuting and roosting bats.	<b>Regional</b>	<b>High</b> - Detailed baseline data has not yet been collected, although data collected to date indicates the route could impact foraging, commuting and roosting bats (including barbastelle). Gathering (pre-maternity) barbastelle bat roosts are located within woodlands very close to the route which could be significantly adversely impacted.	<b>Target species</b> - Although a trend in relation to the target species is not known the Norfolk BAP targets four species (including barbastelle) to reduce decline.	<b>High</b> - Bats are protected under the Conservation of Habitats and Species Regulations 2017 and are notably in decline across the UK due to widespread habitat loss. Barbastelle is an Annex II species of European importance.	<b>Intermediate Negative</b> - The route will affect habitat known to support commuting, foraging and roosting bats (including barbastelle). The route could also have indirect impacts through habitat severance which may require mitigation.	<b>Large adverse</b>	
Badgers	<b>Biodiversity:</b> Woodlands, hedgerows and grassland provide suitable habitat for foraging badgers, and suitable locations for sett construction.	<b>County</b>	<b>Medium</b> - Detailed baseline data has not yet been collected. However badgers are widespread across the UK and are likely to be present.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species, although nationally badgers have shown a significant increase in numbers (c.88% since the 1980s).	<b>Medium</b> - badger setts may be present in the vicinity of the route, especially in areas of woodland.	<b>Minor Negative</b> - The route is likely to result in the loss of habitat used by badgers, and may affect setts, foraging and commuting habitat. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>	

Aquatic Macroinvertebrates	<b>Biodiversity:</b> Watercourses and ponds are likely to support aquatic macroinvertebrates, which may include notable or protected species.	County	<b>High</b> - The River Wensum SAC and SSSI is designated for white-clawed crayfish and Desmoulin's whorl snail. The extent of these species in relation to the site is unknown.	<b>Target species</b> - the only aquatic macroinvertebrate in decline across Norfolk and is targeted by the Norfolk BAP is the Norfolk hawkler <i>Aeshna /soceles</i> . The local objective is to maintain the current range in Norfolk by preventing loss of freshwater sites and create new habitat with a view to increase the range in Norfolk by 2020.	<b>Medium</b> - freshwater habitats may support notable aquatic macroinvertebrate species.	<b>Minor negative</b> - The loss of ponds is likely to have the largest impact, although further baseline required in order to develop an assessment.	<b>Slight adverse</b>
White-clawed Crayfish	<b>Biodiversity:</b> Primary reason behind the designation of the SAC.	International	<b>High</b> - See SAC information above. Additionally the route will cross minor watercourses that may support this species. Further assessment will be required to confirm this.	<b>Target species</b> - The River Wensum is one of only four watercourses in Norfolk that are known to support white-clawed crayfish. The Norfolk Biodiversity Action Plan has targets to maintain the present distribution of this species, limit the spread of non-native species and maintain and create appropriate habitat conditions.	<b>Very high</b> - Primary feature of SAC.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Fish	<b>Biodiversity:</b> The River Wensum SAC and its tributaries are designated for brook lamprey and bullhead.	International	<b>High</b> - See SAC information above. Additionally the route will cross minor watercourses (including drains), that may support fish.	<b>Unknown</b> - No trend has been identified nationally or locally for the two fish for which the SAC is designated.	<b>Very high</b> - Designated features of SAC.	<b>Neutral</b> - The importance of the minor watercourses in relation to fish is not known so there is the potential to impact fish through culverting works. Further baseline required in order to develop an assessment.	<b>Neutral</b>
Desmoulin's Whorl Snail	<b>Biodiversity:</b> Desmoulin's whorl snail has been recorded within the area, with 12 records pertaining to the River Wensum. The route will cross minor watercourses (including drains), that may support this species.	International	<b>High</b> - See SAC information above.	<b>Target species</b> - Targeted because of its declining in Norfolk due to destruction of wetlands, habitat degradation, particularly as a result of changes in hydrology and possibly the introduction of grazing.	<b>Very high</b> - Primary feature of SAC. Internationally important site with limited potential for substitution.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>
Otter	<b>Biodiversity:</b> In addition to the River Wensum and Tud a series of small watercourses and drains, in connection with the route may support otter.	County	<b>Medium</b> - Otter are targeted by the Norfolk Biodiversity Action Plan and are protected under Schedule 5 of the Wildlife and Countryside Act (1981) and the Conservation of Habitats and Species Regulations (2017).	<b>Target species</b> - Although the Norfolk population of otter is thought to be increasing, they are declining at National level.	<b>High</b> - Otter are a species of high biodiversity value on a national and local level.	<b>Minor Negative</b> - There is likely to be an increase in abiotic disturbance, notably noise and lighting on nearby watercourses. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Water Vole	<b>Biodiversity:</b> In addition to the River Wensum and Tud a series of small watercourses and drains, in connection with the route may support water vole.	Local	<b>Medium</b> - Water vole are targeted by the Norfolk Biodiversity Action Plan and are protected under Schedule 5 of the Wildlife and Countryside Act (1981).	<b>Target species</b> - Water vole decline in Norfolk is mainly due to population fragmentation and isolation.	<b>Medium</b> - Water vole are a species of medium biodiversity value on a national and local level.	<b>Minor Negative</b> - There is likely to be an increase in abiotic disturbance, notably noise and lighting on nearby watercourses. Where box culverts are proposed, these may impact water vole habitat connectivity. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Reptiles	<b>Biodiversity:</b> Areas of rough grassland and scrub are likely to be suitable to support reptiles.	Local	<b>Medium</b> - widespread species of reptile, including common lizard, slow worm and grass snake are likely to be present in areas of suitable habitat.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to these species.	<b>Medium</b> - the scheme may affect grassland and scrub that is used by reptiles.	<b>Minor Negative</b> - The route option is likely to affect reptiles that are present in areas of suitable habitat. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Terrestrial Invertebrates	<b>Biodiversity:</b> Habitats including woodland, scrub and grassland are likely to support terrestrial invertebrates.	Local	<b>Medium</b> - It is expected that the range of habitats along the route will support terrestrial invertebrates that are widespread and common throughout the UK.	<b>Target species</b> - The Norfolk BAP identifies a declining trend in certain invertebrate species. Ground beetle, brush-tighed seed-eater beetle, flixweed flea beetle and silver-studded blue butterfly are all target species of the Norfolk BAP. It is unknown whether these species are present in the vicinity of the route option.	<b>Medium</b> - The project has the potential to affect terrestrial invertebrate species.	<b>Minor Negative</b> - The route is likely to result in the loss of habitat used by terrestrial invertebrates. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Great Crested Newts (GCN)	<b>Biodiversity:</b> Low numbers of great crested newt records have been identified from data search. The route is likely to result in the loss of terrestrial and breeding habitat for this species.	County	<b>High</b> - the route has potential to affect terrestrial habitat and breeding ponds used by this species.	<b>Target species</b> - GCN are targeted by the Norfolk BAP due to a major population decline in the Broads. The main objective in Norfolk is to maintain range and viability of the local population.	<b>High</b> - GCN are of high biodiversity value on a local and national level.	<b>Positive</b> - A significant meta-population is unlikely to be present given the wide distribution of water bodies. There is the potential for the scheme to impact terrestrial and breeding habitat although the extent of this is unknown until further assessment has been undertaken.	<b>Large beneficial</b>

**Reference Sources**

WSP Desk Study (2018), Norfolk BAP, JNCC, Natural England

**Summary Assessment Score**

Large adverse

**Qualitative Comments**

This route has the potential to cause impacts to gathering (pre-maternity) roosts of barbastelle bats. Given the recorded roosts are gathering roosts and are further away from the main maternity roost area (around Morton) the impact is Large (rather than very large) Adverse.

## TAG Biodiversity Impacts Worksheet

## Route Option D eastern

Step 2		Step 3				Step 4	Step 5
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score
River Wensum SAC	<b>Biodiversity:</b> Chalk-fed river, designated for Annex I habitat as a primary reason for selection: Water courses of plain to montane levels with the Ranunculetum fluitantis and Callitriche-Batrachion vegetation. The Wensum represents sub-type 1 in lowland eastern England. Annex II species as a primary reason for selection: White-clawed (or Atlantic stream) crayfish <i>Austropotamobius pallipes</i> Annex II species present as a qualifying feature: Desmoulin's whorl snail <i>Vertigo moulinsiana</i> Brook lamprey <i>Lampetra planeri</i> Bullhead <i>Cottus gobio</i>	<b>International</b>	<b>High</b> - Primary habitat: Sub-type 1 has a limited distribution in the UK, being found only in those areas where chalk is present, and is therefore restricted to southern and eastern England.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this habitat type.	<b>Very high</b> - Internationally important site with limited potential for substitution.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>
			<b>High</b> - Primary species: White-clawed crayfish. One of only four watercourses in Norfolk that are known to support white-clawed crayfish.	<b>Target species</b> - Population decline in Norfolk since 1990. The Norfolk Biodiversity Action Plan has targets to maintain the present distribution of this species, limit the spread of non-native species and maintain and created appropriate habitat conditions. As with most of the remaining crayfish populations in the south and east of England, the threats from non-native crayfish species and crayfish plague are severe.			
			<b>High</b> - Other qualifying feature: Desmoulin's whorl snail. The site supports one of the largest populations in the UK.	<b>Target species</b> - Population decline in Norfolk due to destruction of wetlands. Habitat degradation, particularly as a result of changes in hydrology and possibly the introduction of grazing.			
			<b>High</b> - Other qualifying feature: Brook lamprey. The Wensum has a healthy population of brook lamprey, with clean water and suitable areas of gravels, silt or sand required for spawning.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.			
River Wensum SSSI	<b>Biodiversity:</b> Overlaps with River Wensum SAC (see above cell). Notified for: Flowing waters - Type I: naturally eutrophic lowland rivers with a high base flow, Flowing waters - Type III: base-rich, low energy lowland rivers and streams, generally with a stable flow regime, Population of RDB mollusc – Desmoulin's whorl snail, S25 - Phragmites australis - Eupatorium cannabinum tall-herb fen, S3 - Carex paniculata swamp, S4 - Phragmites australis swamp and reed-beds, S5 - Glyceria maxima swamp, S7 - Carex acutiformis swamp and white-clawed crayfish	<b>National</b>	<b>High</b> - The River Wensum is a SSSI of national importance, supporting a diverse range of protected habitats and species.	<b>Unknown</b> - The national and local trends for SSSIs are unknown.	<b>High</b> - Nationally important site with limited potential for substitution.	<b>Minor negative</b> - Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
				<b>Target species</b> - See above for trends regarding white-clawed crayfish and Desmoulin's whorl snail			
Fakenham Road (Ref. 59) RNR	<b>Biodiversity:</b> Species: Hoary mullein <i>Verbascum pulverulentum</i>	<b>County</b>	<b>Medium</b> - Site of county value, with only one qualifying feature behind the designation.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.	<b>Medium</b> - County value site with potential for substitution.	<b>Neutral</b> - Potential loss of full site through A1067 widening. Further baseline required in order to develop an assessment.	<b>Neutral</b>
Primrose Grove Proposed CWS (Ref. 5)	<b>Unknown</b>	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b>	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of Proposed County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
River Wensum Pastures, Ringland Estate Proposed CWS (Ref. 6)	<b>Unknown</b>	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b>	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of Proposed County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Aves Gap Proposed CWS (Ref. 1)	<b>Unknown</b>	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b>	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of Proposed County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Other land meeting designation for CWS (Ref. 2)	<b>Unknown</b>	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b>	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of Proposed County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Gravel pit Plantation and Church Hills Proposed CWS (Ref. 4)	<b>Unknown</b>	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b>	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of Proposed County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Church Hill Common CWS	<b>Biodiversity:</b> Dominated by dense bracken with scattered scrub and young trees.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Jennis' Wood CWS	<b>Biodiversity:</b> Semi-natural Ancient Woodland. The wood has been partly replanted in the past with conifer and both native and ornamental broad-leaved species. Most conifers have now been removed, leaving a large open area at the centre of the wood.	<b>County</b>	<b>Medium</b> - Ancient woodland is an important habitat on a county level.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with limited potential for substitution.	<b>Minor negative</b> - Potential loss of County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Wensum Pastures at Morton Hall CWS (c. 20m north of scheme)	<b>Biodiversity:</b> Predominantly improved cattle-grazed pasture adjacent to River Wensum, crossed by a network of drains supporting a species-rich flora associated with aquatic habitats.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Attlebridge Hills CWS (c. 80m north of scheme)	<b>Biodiversity:</b> Structurally varied, broad-leaved semi-natural woodland. The canopy is dominated by mature oak, sycamore, sweet chestnut with extensive areas of mixed coppice of hazel, sycamore and sweet chestnut.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Broom and Spring Hills CWS (c. 370m north of scheme)	<b>Biodiversity:</b> Semi-natural deciduous woodland dominated by oak and sycamore.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Harman's Grove and adj. grassland CWS (c. 180m south of scheme)	<b>Biodiversity:</b> A semi-natural Ancient Woodland managed as coppice.	<b>County</b>	<b>Medium</b> - Ancient woodland is an important habitat on a county level.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with limited potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Land Adjoining River Tud (c. 200m east of scheme)	<b>Biodiversity:</b> rough pasture and wet meadow overgrown with greater pond sedge.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>

River Tud at Eastern and Honingham CWS	<b>Biodiversity:</b> Species-rich aquatic, marginal and emergent riverine flora.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential direct impact to stretch of County Wildlife Site. Likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Church Meadow, Alder Carr, Three Corner Thicket and Nursery Plantation CWS (c. 650m west of scheme)	<b>Biodiversity:</b> Mainly cattle-grazed, unimproved wet pasture, divided by spring-fed ditches with areas of wet and dry woodland. Area of former lake which has reverted to wetland, including a large reedbed. River Tud flows west to east through the centre of the site.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Ancient woodland	<b>Biodiversity:</b> The woodland to be impacted is also listed as an HPI and is now listed as a CWS.	<b>County</b>	<b>High</b> - Detailed baseline data has not been collected, although the route has potential to impact on ancient woodland. Ancient woodland is considered one of the richest land-based habitats for wildlife.	<b>Declining</b> - Ancient woodland is in significant national decline, with a current UK coverage of only 2%.	<b>High</b> - County value site with no potential for substitution.	<b>Minor Negative</b> -Indirect impacts on ancient woodland by changing abiotic conditions. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
River Tud	<b>Biodiversity:</b> A small, relatively straight chalk stream known to support otter and water vole.	<b>County</b>	<b>High</b> - More than 85% of all the chalk streams in the world are in England and they are treated nationally due to impacts from agricultural and urban development.	<b>Declining</b> - Increases in population pressure leading to water pumping.	<b>High</b> - County value site with no potential for substitution.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>
Habitats of Principal Importance (HPI)	<b>Biodiversity:</b> Features comprise lowland deciduous woodland, coast and floodplain grazing marsh, traditional orchard, watercourses, water bodies and hedgerows.	<b>County</b>	<b>Medium</b> - Detailed habitat surveys have not been undertaken although it is expected that the route will impact HPI of county value.	<b>Declining</b> - These habitats are listed as a priority under the Natural and Rural Communities Act (2006) due to the declining trend nationally. The Norfolk BAP does not identify a trend in relation to these habitat types locally.	<b>Medium</b> - County value habitat with limited potential for substitution.	<b>Minor negative</b> - The route will directly impact several HPI through habitat loss and indirectly through a decline in habitat quality. Further appropriate assessment necessary. Estimated direct impact to Lowland Deciduous Woodland, Coast and Floodplain Grazing Marsh. Additional habitat loss of hedgerows, watercourses and water bodies expected, although no data collected yet. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Birds	<b>Biodiversity:</b> Habitats present are suitable for use by nesting birds. The arable fields and grasslands provide potential foraging habitat for passage/over-wintering birds such as mixed thrush flocks, skylarks and pipits. Arable fields and areas of grassland could also be used by flocks of migrant/over-wintering bird species such as geese.	<b>Local</b>	<b>Medium</b> - Detailed baseline data has not yet been collected, although it is expected that the route will impact birds at a local level.	<b>Unknown</b> - The Norfolk BAP identifies a range of bird species in significant decline on a county level.	<b>Medium</b> - The site is likely to support a diversity range of breeding and wintering bird species of local importance.	<b>Minor Negative</b> - The route will result in the loss of habitats likely to be used by birds and may give rise to further impacts arising from changes in biotic conditions. Further baseline required on Schedule 1 birds including, but not limited to kingfisher, barn owl and red kite, in order to develop an assessment.	<b>Slight adverse</b>
Bats	<b>Biodiversity:</b> Woodlands, hedgerows, mature trees and scrub provide suitable habitat for foraging, commuting and roosting bats.	<b>Regional</b>	<b>High</b> - Detailed baseline data has not yet been collected, although data collected to date indicates the route could impact foraging and commuting barbastelle bat.	<b>Target species</b> - Although a trend in relation to the target species is not known the Norfolk BAP targets four species (including barbastelle) to reduce decline.	<b>High</b> - Bats are protected under the Conservation of Habitats and Species Regulations 2017 and are notably in decline across the UK due to widespread habitat loss. Barbastelle is an Annex II species of European importance.	<b>Intermediate Negative</b> - The route will affect habitat known to support commuting, foraging and roosting bats (including barbastelle). The route could also have indirect impacts through habitat severance which may require mitigation.	<b>Large adverse</b>
Badgers	<b>Biodiversity:</b> Woodlands, hedgerows and grassland provide suitable habitat for foraging badgers, and suitable locations for sett construction.	<b>County</b>	<b>Medium</b> - Detailed baseline data has not yet been collected. However badgers are widespread across the UK and are likely to be present.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species, although nationally badgers have shown a significant increase in numbers (c.88% since the 1980s).	<b>Medium</b> - badger setts may be present in the vicinity of the route, especially in areas of woodland.	<b>Minor Negative</b> - The route is likely to result in the loss of habitat used by badgers, and may affect setts, foraging and commuting habitat. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Aquatic Macroinvertebrates	<b>Biodiversity:</b> Four watercourses and c. three ponds are likely to support aquatic macroinvertebrates, which may include notable or protected species.	<b>County</b>	<b>High</b> - The River Wensum SAC and SSSI is designated for white-clawed crayfish and Desmoulin's whorl snail. The extent of these species in relation to the site is unknown.	<b>Target species</b> - the only aquatic macroinvertebrate in decline across Norfolk and is targeted by the Norfolk BAP is the Norfolk hawk Aeshna isocetes. The local objective is to maintain the current range in Norfolk by preventing loss of freshwater sites and create new habitat with a view to increase the range in Norfolk by 2020.	<b>Medium</b> - freshwater habitats may support notable aquatic macroinvertebrate species.	<b>Minor negative</b> - The loss of ponds is likely to have the largest impact, although further assessment is required.	<b>Slight adverse</b>
White-clawed Crayfish	<b>Biodiversity:</b> Primary reason behind the designation of the SAC.	<b>International</b>	<b>High</b> - See SAC information above. Additionally the route will cross minor watercourses that may support this species. Further assessment will be required to confirm this.	<b>Target species</b> - The River Wensum is one of only four watercourses in Norfolk that are known to support white-clawed crayfish. The Norfolk Biodiversity Action Plan has targets to maintain the present distribution of this species, limit the spread of non-native species and maintain and create appropriate habitat conditions.	<b>Very high</b> - Primary feature of SAC.	<b>Neutral</b> - Further assessment necessary.	<b>Slight adverse</b>
Fish	<b>Biodiversity:</b> The River Wensum SAC and its tributaries are designated for brook lamprey and bullhead.	<b>International</b>	<b>High</b> - See SAC information above. Additionally the route will cross minor watercourses (including drains), that may support fish.	<b>Unknown</b> - No trend has been identified nationally or locally for the two fish for which the SAC is designated.	<b>Very high</b> - Designated features of SAC.	<b>Neutral</b> - The importance of the minor watercourses in relation to fish is not known so there is the potential to impact fish through culverting works. Further baseline required in order to develop an assessment.	<b>Neutral</b>
Desmoulin's Whorl Snail	<b>Biodiversity:</b> Desmoulin's whorl snail has been recorded within the area, with 12 records pertaining to the River Wensum. The route will cross minor watercourses (including drains), that may support this species.	<b>International</b>	<b>High</b> - See SAC information above.	<b>Target species</b> - Targeted because of its declining in Norfolk due to destruction of wetlands, habitat degradation, particularly as a result of changes in hydrology and possibly the introduction of grazing.	<b>Very high</b> - Primary feature of SAC. Internationally important site with limited potential for substitution.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>
Otter	<b>Biodiversity:</b> In addition to the River Wensum and Tud a series of small watercourses and drains, in connection with the route may support otter.	<b>County</b>	<b>Medium</b> - Otter are targeted by the Norfolk Biodiversity Action Plan and are protected under Schedule 5 of the Wildlife and Countryside Act (1981) and the Conservation of Habitats and Species Regulations (2017).	<b>Target species</b> - Although the Norfolk population of otter is thought to be increasing, they are declining at National level.	<b>High</b> - Otter are a species of high biodiversity value on a national and local level.	<b>Minor Negative</b> - There is likely to be an increase in abiotic disturbance, notably noise and lighting on nearby watercourses. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Water Vole	<b>Biodiversity:</b> In addition to the River Wensum and Tud a series of small watercourses and drains, in connection with the route may support water vole.	<b>Local</b>	<b>Medium</b> - Water vole are targeted by the Norfolk Biodiversity Action Plan and are protected under Schedule 5 of the Wildlife and Countryside Act (1981).	<b>Target species</b> - Water vole decline in Norfolk is mainly due to population fragmentation and isolation.	<b>Medium</b> - Water vole are a species of medium biodiversity value on a national and local level.	<b>Minor Negative</b> - There is likely to be an increase in abiotic disturbance, notably noise and lighting on nearby watercourses. Where box culverts are proposed, these may impact water vole habitat connectivity. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Reptiles	<b>Biodiversity:</b> Areas of rough grassland and scrub are likely to be suitable to support reptiles.	<b>Local</b>	<b>Medium</b> - widespread species of reptile, including common lizard, slow worm and grass snake are likely to be present in areas of suitable habitat.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to these species.	<b>Medium</b> - the scheme may affect grassland and scrub that is used by reptiles.	<b>Minor Negative</b> - The route option is likely to affect reptiles that are present in areas of suitable habitat. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Terrestrial Invertebrates	<b>Biodiversity:</b> Habitats including woodland, scrub and grassland are likely to support terrestrial invertebrates.	<b>Local</b>	<b>Medium</b> - It is expected that the range of habitats along the route will support terrestrial invertebrates that are widespread and common throughout the UK.	<b>Target species</b> - The Norfolk BAP identifies a declining trend in certain invertebrate species. Ground beetle, brush-thighed seed-eater beetle, flixweed flea beetle and silver-studded blue butterfly are all target species of the Norfolk BAP. It is unknown whether these species are present in the vicinity of the route option.	<b>Medium</b> - The project has the potential to affect terrestrial invertebrate species.	<b>Minor Negative</b> - The route is likely to result in the loss of habitat used by terrestrial invertebrates. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Great Crested Newts (GCN)	<b>Biodiversity:</b> Low numbers of great crested newt records have been identified from data search. The route is likely to result in the loss of terrestrial and breeding habitat for this species.	<b>County</b>	<b>High</b> - the route has potential to affect terrestrial habitat and breeding ponds used by this species.	<b>Target species</b> - GCN are targeted by the Norfolk BAP due to a major population decline in the Broads. The main objective in Norfolk is to maintain range and viability of the local population.	<b>High</b> - GCN are of high biodiversity value on a local and national level.	<b>Positive</b> - A significant meta-population is unlikely to be present given the wide distribution of water bodies. There is the potential for the scheme to impact terrestrial and breeding habitat although the extent of this is unknown until further assessment has been undertaken.	<b>Large beneficial</b>

**Reference Sources**

WSP Desk Study (2018), Norfolk BAP, JNCC, Natural England

**Summary Assessment Score**

Large adverse

**Qualitative Comments**

This route has the potential to cause impacts to gathering (pre-maternity) roosts of barbastelle bats. Given the recorded roosts are gathering roosts and are further away from the main maternity roost area (around Morton) the impact is Large (rather than very large) Adverse.

## TAG Biodiversity Impacts Worksheet

## Route Option D western

Step 2		Step 3			Step 4	Step 5					
Area	Description of feature/ attribute	Scale (at which attribute matters)	Importance (of attribute)	Trend (in relation to target)	Biodiversity and earth heritage value	Magnitude of impact	Assessment Score				
River Wensum SAC	<b>Biodiversity:</b> Chalk-fed river, designated for Annex I habitat as a primary reason for selection: Water courses of plain to montane levels with the Ranunculus fluitans and Callitriche-Batrachion vegetation. The Wensum represents sub-type 1 in lowland eastern England. Annex II species as a primary reason for selection: White-clawed (or Atlantic stream) crayfish <i>Austropotamobius pallipes</i> Annex II species present as a qualifying feature: Desmoulin's whorl snail <i>Vertigo moulinsiana</i> Brook lamprey <i>Lampetra planeri</i> Bullhead <i>Cottus gobio</i>	<b>International</b>	<b>High</b> - Primary habitat: Sub-type 1 has a limited distribution in the UK, being found only in those areas where chalk is present, and is therefore restricted to southern and eastern England.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this habitat type.	<b>Very high</b> - Internationally important site with limited potential for substitution.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>				
			<b>High</b> - Primary species: White-clawed crayfish. One of only four watercourses in Norfolk that are known to support white-clawed crayfish.	<b>Target species</b> - Population decline in Norfolk since 1990. The Norfolk Biodiversity Action Plan has targets to maintain the present distribution of this species, limit the spread of non-native species and maintain and created appropriate habitat conditions. As with most of the remaining crayfish populations in the south and east of England, the threats from non-native crayfish species and crayfish plague are severe.				<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>		
			<b>High</b> - Other qualifying feature: Desmoulin's whorl snail. The site supports one of the largest populations in the UK.	<b>Target species</b> - Population decline in Norfolk due to destruction of wetlands. Habitat degradation, particularly as a result of changes in hydrology and possibly the introduction of grazing.						<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>
			<b>High</b> - Other qualifying feature: Brook lamprey. The Wensum has a healthy population of brook lamprey, with clean water and suitable areas of gravels, silt or sand required for spawning.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.							
<b>High</b> - Other qualifying feature: Bullhead. Sites have been selected to encompass the natural geographical range of the species and to represent the range of ecological situations in which it occurs, e.g. both upland and lowland rivers, and both acidic and base-rich situations.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>								
River Wensum SSSI	<b>National</b>			<b>High</b> - The River Wensum is a SSSI of national importance, supporting a diverse range of protected habitats and species.	<b>Unknown</b> - The national and local trends for SSSIs are unknown.	<b>High</b> - Nationally important site with limited potential for substitution.	<b>Minor negative</b> - Further baseline required in order to develop an assessment.	<b>Slight adverse</b>			
					<b>Target species</b> - See above for trends regarding white-clawed crayfish and Desmoulin's whorl snail				<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>	
Fakenham Road (Ref. 59) RNR	<b>Biodiversity:</b> Species: Hoary mullein <i>Verbascum pulverulentum</i>			<b>County</b>	<b>Medium</b> - Site of county value, with only one qualifying feature behind the designation.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.	<b>Medium</b> - County value site with potential for substitution.	<b>Neutral</b> - Potential loss of full site through A1067 widening. Further baseline required in order to develop an assessment.			<b>Neutral</b>
Primrose Grove Proposed CWS (Ref. 5)	<b>Unknown</b>	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b>	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of Proposed County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>				
River Wensum Pastures, Ringland Estate Proposed CWS (Ref. 6)	<b>Unknown</b>	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b>	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of Proposed County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further assessment necessary.	<b>Slight adverse</b>				
Aves Gap Proposed CWS ref. 1	<b>Unknown</b>	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b>	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of Proposed County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>				
Blackbreck Plantation, Poetsbreck Plantation (Other land meeting designation for CWS (Ref. 2)	<b>Unknown</b>	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b>	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of Proposed County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>				
Gravel pit Plantation and Church Hills Proposed CWS (Ref. 4)	<b>Unknown</b>	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b>	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of Proposed County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>				
Church Hill Common CWS	<b>Biodiversity:</b> Dominated by dense bracken with scattered scrub and young trees.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor negative</b> - Potential loss of County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>				
Jennis' Wood CWS	<b>Biodiversity:</b> Semi-natural Ancient Woodland. The wood has been partly replanted in the past with conifer and both native and ornamental broad-leaved species. Most conifers have now been removed, leaving a large open area at the centre of the wood.	<b>County</b>	<b>Medium</b> - Ancient woodland is an important habitat on a county level.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with limited potential for substitution.	<b>Minor negative</b> - Potential loss of County Wildlife Site. Area loss likely to have direct and indirect impacts on the habitat and species associated with the CWS. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>				
Wensum Pastures at Morton Hall CWS (c. 20m north of scheme)	<b>Biodiversity:</b> Predominantly improved cattle-grazed pasture adjacent to River Wensum, crossed by a network of drains supporting a species-rich flora associated with aquatic habitats.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>				
Attlebridge Hills CWS (c. 80m north of scheme)	<b>Biodiversity:</b> Structurally varied, broad-leaved semi-natural woodland. The canopy is dominated by mature oak, sycamore, sweet chestnut with extensive areas of mixed coppice of hazel, sycamore and sweet chestnut.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>				
Broom and Spring Hills CWS (c. 370m north of scheme)	<b>Biodiversity:</b> Semi-natural deciduous woodland dominated by oak and sycamore.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>				
Harman's Grove and adjoining grassland CWS (c. 180m south of scheme)	<b>Biodiversity:</b> A semi-natural Ancient Woodland managed as coppice.	<b>County</b>	<b>Medium</b> - Ancient woodland is an important habitat on a county level.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species.	<b>Medium</b> - County value site with limited potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>				
River Tud at Easton and Honingham CWS (c. 100m west of proposed scheme)	<b>Biodiversity:</b> Species-rich aquatic, marginal and emergent riverine flora support otter and water vole.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance and protected species.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Neutral</b> The site will have hydrological links to the CWS section of the River Tud. Further baseline required in order to develop an assessment.	<b>Neutral</b>				
Church Meadow, Alder Carr, Three Corner Thicket and Nursery Plantation CWS (c. 200m west of scheme)	<b>Biodiversity:</b> Mainly cattle-grazed, unimproved wet pasture, divided by spring-fed ditches with areas of wet and dry woodland. Area of former lake which has reverted to wetland, including a large reedbed. River Tud flows west to east through the centre of the site.	<b>County</b>	<b>Medium</b> - Site of county value supporting Habitat of Principal Importance.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to the habitats associated with this CWS.	<b>Medium</b> - County value site with potential for substitution.	<b>Minor Negative</b> Potential indirect impact through changes in abiotic conditions (air quality, noise and lighting). Further baseline required in order to develop an assessment.	<b>Slight adverse</b>				
Ancient woodland	<b>Biodiversity:</b> The woodland to be impacted is also listed as an HPI and is now listed as a CWS.	<b>County</b>	<b>High</b> - Detailed baseline data has not been collected, although the route has potential to impact on ancient woodland. Ancient woodland is considered one of the richest land-based habitats for wildlife.	<b>Declining</b> - Ancient woodland is in significant national decline, with a current UK coverage of only 2%.	<b>High</b> - County value site with no potential for substitution.	<b>Minor Negative</b> -Indirect impacts on ancient woodland by changing abiotic conditions. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>				
River Tud	<b>Biodiversity:</b> A small, relatively straight chalk stream known to support otter and water vole.	<b>County</b>	<b>High</b> - More than 85% of all the chalk streams in the world are in England and they are threatened nationally due to impacts from agricultural and urban development.	<b>Declining</b> - Increases in population pressure leading to water pumping.	<b>High</b> - County value site with no potential for substitution.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>				



Habitats of Principal Importance (HPI)	<b>Biodiversity:</b> Features comprise lowland deciduous woodland, coast and floodplain grazing marsh, traditional orchard, watercourses, water bodies and hedgerows.	County	<b>Medium</b> - Detailed habitat surveys have not been undertaken although it is expected that the route will impact HPI of county value.	<b>Declining</b> - These habitat are listed as a priority under the Natural and Rural Communities Act (2006) due to the declining trend nationally. The Norfolk BAP does not identify a trend in relation to these habitat types locally.	<b>Medium</b> - County value habitat with limited potential for substitution.	<b>Minor negative</b> - The route will directly impact several HPI through habitat loss and indirectly through a decline in habitat quality. Further appropriate assessment necessary. Estimated direct impact to Lowland Deciduous Woodland, Coast and Floodplain Grazing Marsh. Additional habitat loss for hedgerows, watercourses and water bodies expected, although no data collected yet. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Birds	<b>Biodiversity:</b> Habitats present are suitable for use by nesting birds. The arable fields and grasslands provide potential foraging habitat for passage/over-wintering birds such as mixed thrush flocks, skylarks and pipits. Arable fields and areas of grassland could also be used by flocks of migrant/over-wintering bird species such as geese.	Local	<b>Medium</b> - Detailed baseline data has not yet been collected, although it is expected that the route will impact birds at a local level.	<b>Unknown</b> - The Norfolk BAP identifies a range of bird species in significant decline on a county level.	<b>Medium</b> - The site is likely to support a diversity range of breeding and wintering bird species of local importance.	<b>Minor Negative</b> - The route will result in the loss of habitats likely to be used by birds and may give rise to further impacts arising from changes in biotic conditions. Further baseline required on Schedule 1 birds including, but not limited to kingfisher, barn owl and red kite, in order to develop an assessment.	<b>Slight adverse</b>
Bats	<b>Biodiversity:</b> Woodlands, hedgerows, mature trees and scrub provide suitable habitat for foraging, commuting and roosting bats.	Regional	<b>High</b> - Detailed baseline data has not yet been collected, although data collected to date indicates the route could impact foraging and commuting barbastelle bat.	<b>Target species</b> - Although a trend in relation to the target species is not known the Norfolk BAP targets four species (including barbastelle) to reduce decline.	<b>High</b> - Bats are protected under the Conservation of Habitats and Species Regulations 2017 and are notably in decline across the UK due to widespread habitat loss. Barbastelle is an Annex II species of European importance.	<b>Intermediate Negative</b> - The route will affect habitat known to support commuting, foraging and roosting bats (including barbastelle). The route could also have indirect impacts through habitat severance which may require mitigation.	<b>Large adverse</b>
Badgers	<b>Biodiversity:</b> Woodlands, hedgerows and grassland provide suitable habitat for foraging badgers, and suitable locations for sett construction.	County	<b>Medium</b> - Detailed baseline data has not yet been collected. However badgers are widespread across the UK and are likely to be present.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to this species, although nationally badgers have shown a significant increase in numbers (c.88% since the 1980s).	<b>Medium</b> - badger setts may be present in the vicinity of the route, especially in areas of woodland.	<b>Minor Negative</b> - The route is likely to result in the loss of habitat used by badgers, and may affect setts, foraging and commuting habitat. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Aquatic Macroinvertebrates	<b>Biodiversity:</b> Watercourses and ponds are likely to support aquatic macroinvertebrates, which may include notable or protected species.	County	<b>High</b> - The River Wensum SAC and SSSI is designated for white-clawed crayfish and Desmoulin's whorl snail. The extent of these species in relation to the site is unknown.	<b>Target species</b> - the only aquatic macroinvertebrate in decline across Norfolk and is targeted by the Norfolk BAP is the Norfolk hawkler <i>Aeshna isoceles</i> . The local objective is to maintain the current range in Norfolk by preventing loss of freshwater sites and create new habitat with a view to increase the range in Norfolk by 2020.	<b>Medium</b> - freshwater habitats may support notable aquatic macroinvertebrate species.	<b>Minor negative</b> - The loss of an estimated two ponds is likely to have the largest impact, although further baseline required in order to develop an assessment.	<b>Slight adverse</b>
White-clawed Crayfish	<b>Biodiversity:</b> Primary reason behind the designation of the SAC.	International	<b>High</b> - See SAC information above. Additionally the route will cross minor watercourses that may support this species. Further assessment will be required to confirm this.	<b>Target species</b> - The River Wensum is one of only four watercourses in Norfolk that are known to support white-clawed crayfish. The Norfolk Biodiversity Action Plan has targets to maintain the present distribution of this species, limit the spread of non-native species and maintain and create appropriate habitat conditions.	<b>Very high</b> - Primary feature of SAC.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Fish	<b>Biodiversity:</b> The River Wensum SAC and its tributaries are designated for brook lamprey and bullhead.	International	<b>High</b> - See SAC information above. Additionally the route will cross minor watercourses (including drains), that may support fish.	<b>Unknown</b> - No trend has been identified nationally or locally for the two fish for which the SAC is designated.	<b>Very high</b> - Designated features of SAC.	<b>Neutral</b> - The importance of the minor watercourses in relation to fish is not known so there is the potential to impact fish through culverting works. Further baseline required in order to develop an assessment.	<b>Neutral</b>
Desmoulin's Whorl Snail	<b>Biodiversity:</b> Desmoulin's whorl snail has been recorded within the area, with 12 records pertaining to the River Wensum. The route will cross minor watercourses (including drains), that may support this species.	International	<b>High</b> - See SAC information above.	<b>Target species</b> - Targeted because of its declining in Norfolk due to destruction of wetlands, habitat degradation, particularly as a result of changes in hydrology and possibly the introduction of grazing.	<b>Very high</b> - Primary feature of SAC. Internationally important site with limited potential for substitution.	<b>Neutral</b> - Further baseline required in order to develop an assessment.	<b>Neutral</b>
Otter	<b>Biodiversity:</b> In addition to the River Wensum and Tud a series of small watercourses and drains, in connection with the route may support otter.	County	<b>Medium</b> - Otter are targeted by the Norfolk Biodiversity Action Plan and are protected under Schedule 5 of the Wildlife and Countryside Act (1981) and the Conservation of Habitats and Species Regulations (2017).	<b>Target species</b> - Although the Norfolk population of otter is thought to be increasing, they are declining at National level.	<b>High</b> - Otter are a species of high biodiversity value on a national and local level.	<b>Minor Negative</b> - There is likely to be an increase in abiotic disturbance, notably noise and lighting on nearby watercourses. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Water Vole	<b>Biodiversity:</b> In addition to the River Wensum and Tud a series of small watercourses and drains, in connection with the route may support water vole.	Local	<b>Medium</b> - Water vole are targeted by the Norfolk Biodiversity Action Plan and are protected under Schedule 5 of the Wildlife and Countryside Act (1981).	<b>Target species</b> - Water vole decline in Norfolk is mainly due to population fragmentation and isolation.	<b>Medium</b> - Water vole are a species of medium biodiversity value on a national and local level.	<b>Minor Negative</b> - There is likely to be an increase in abiotic disturbance, notably noise and lighting on nearby watercourses. Where box culverts are proposed, these may impact water vole habitat connectivity. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Reptiles	<b>Biodiversity:</b> Areas of rough grassland and scrub are likely to be suitable to support reptiles.	Local	<b>Medium</b> - widespread species of reptile, including common lizard, slow worm and grass snake are likely to be present in areas of suitable habitat.	<b>Unknown</b> - The Norfolk BAP does not identify a trend in relation to these species.	<b>Medium</b> - the scheme may affect grassland and scrub that is used by reptiles.	<b>Minor Negative</b> - The route option is likely to affect reptiles that are present in areas of suitable habitat. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Terrestrial Invertebrates	<b>Biodiversity:</b> Habitats including woodland, scrub and grassland are likely to support terrestrial invertebrates.	Local	<b>Medium</b> - It is expected that the range of habitats along the route will support terrestrial invertebrates that are widespread and common throughout the UK.	<b>Target species</b> - The Norfolk BAP identifies a declining trend in certain invertebrate species. Ground beetle, brush-thighed seed-eater beetle, flitweed flea beetle and silver-studded blue butterfly are all target species of the Norfolk BAP. It is unknown whether these species are present in the vicinity of the route option.	<b>Medium</b> - The project has the potential to affect terrestrial invertebrate species.	<b>Minor Negative</b> - The route is likely to result in the loss of habitat used by terrestrial invertebrates. Further baseline required in order to develop an assessment.	<b>Slight adverse</b>
Great Crested Newts (GCN)	<b>Biodiversity:</b> Low numbers of great crested newt records have been identified from data search. The route is likely to result in the loss of terrestrial and breeding habitat for this species.	County	<b>High</b> - the route has potential to affect terrestrial habitat and breeding ponds used by this species.	<b>Target species</b> - GCN are targeted by the Norfolk BAP due to a major population decline in the Broads. The main objective in Norfolk is to maintain range and viability of the local population.	<b>High</b> - GCN are of high biodiversity value on a local and national level.	<b>Positive</b> - A significant meta-population is unlikely to be present given the wide distribution of water bodies. There is the potential for the scheme to impact terrestrial and breeding habitat although the extent of this is unknown until further assessment has been undertaken.	<b>Large beneficial</b>

**Reference Sources**

WSP Desk Study (2018), Norfolk BAP, JNCC, Natural England

**Summary Assessment Score**

Large adverse

**Qualitative Comments**

This route has the potential to cause impacts to gathering (pre-maternity) roosts of barbastelle bats. Given the recorded roosts are gathering roosts and are further away from the main maternity roost area (around Morton) the impact is Large (rather than very large) Adverse.

**TAG Water Environment Impacts Worksheet: Option A**

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Study area:	River Wensum	Water Supply	Medium - main river, good chemical quality, supports private abstractions.	Regional	Medium		Medium	Negligible	Insignificant
Potential Impacts:		Biodiversity	Very High - designated SAC and SSSI.	Regional	High	Cannot be substituted	Very High	Negligible	Low significance
		Transport and dilution of waste products	Medium - large catchment, receives local discharge, WWTW downstream of study area.	Regional	Medium	Limited potential for substitution	Medium	Negligible	Insignificant
		Recreation	Medium - flow through urban and public areas, supports fishery downstream.	Local	Low	Limited potential for substitution	Medium	Negligible	Insignificant
		Hydromorphology	Medium - heavily modified classification but supports good ecological status	Local	Medium		Medium	Negligible	Insignificant
		Conveyance of flow and material	High - main river, large catchment, flows through mix of urban and rural areas	Regional	Medium	Cannot be substituted	High	Negligible	Insignificant
		Weston Fisheries	Water Supply	Medium - quality unknown, may support agricultural uses.	Local	Low		Medium	Negligible
	Biodiversity		Medium - significantly modified, potential supporting habitat for otter and water vole	Local	Medium		Medium	Minor adverse	Insignificant
	Transport and dilution of waste products		Low - likely to receive runoff from adjacent land	Local	Low		Low	Negligible	Insignificant
	Recreation		Medium - flows through Weston Hall	Local	Low	Limited potential for substitution	Medium	Minor adverse	Insignificant
	Hydromorphology		Low - heavily modified	Local	Low		Low	Minor adverse	Insignificant
	Conveyance of flow and material		Medium - provides local flood flow conveyance route	Local	Low	Limited potential for substitution	Medium	Minor adverse	Insignificant
	Flood Plain		Conveyance of flow and material	Very High - functional floodplain protecting Lenwade	Local	Medium	Limited potential for substitution	High	Minor adverse
		Biodiversity	High - habitat of principal importance - floodplain grazing marsh, likely to support River Wensum designation	Local	Medium	Limited potential for substitution	High	Negligible	Insignificant

	Groundwater	Water Supply	Very High - Principal aquifer, Source Protection Zone 3, multiple private abstractions.	Regional	High	Cannot be substituted	Very High	Negligible	Insignificant
		Biodiversity	High - provides important baseflow to River Wensum, supports statutory designation	Regional	High	Cannot be substituted	Very High	Negligible	Insignificant

**Reference Sources**

OS mapping, EA Flood Map for Planning, EA Flood Risk from Surface Water mapping, EA Catchment Data Explorer, Defra MAGIC geographical information portal, British Geological Survey viewer.

**Summary Assessment Score**

Minor Adverse

**Qualitative Comments**

Impacts to the River Wensum are negligible as there is minimal change to the existing infrastructure at this watercourse. Potential impacts during construction can be mitigated to negligible effect. Culverting the ordinary watercourses can cause slight adverse impacts to conveyance of flow and material and biodiversity. Construction of new embankments in the flood plain will cause minor adverse impact to flood risk. Compensatory storage is likely to be required in this scheme design. Impact to groundwater is considered negligible due to suitable drainage mitigation.

**TAG Water Environment Impacts Worksheet: Option B West**

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Study area:	River Wensum	Water Supply	Medium - main river, good chemical quality, supports private abstractions.	Regional	Medium		Medium	Negligible	Insignificant
Potential Impacts:		Biodiversity	Very High - designated SAC and SSSI.	Regional	High	Cannot be substituted	Very High	Negligible	Low significance
		Transport and dilution of waste products	Medium - large catchment, receives local discharge, WWTW downstream of study area.	Regional	Medium	Limited potential for substitution	Medium	Negligible	Insignificant
		Recreation	Medium - flow through urban and public areas, supports fishery downstream.	Local	Low	Limited potential for substitution	Medium	Negligible	Insignificant
		Hydromorphology	Medium - heavily modified classification but supports good ecological status	Local	Medium		Medium	Negligible	Insignificant
		Conveyance of flow and material	High - main river, large catchment, flows through mix of urban and rural areas	Regional	Medium	Cannot be substituted	High	Negligible	Insignificant
		Unnamed Watercourse South of Weston Green	Water Supply	Low - quality unknown, may support agricultural uses.	Local	Low		Low	Negligible
	Biodiversity		Medium - flows adjacent to woodland, potential supporting habitat for otter and water vole	Local	Medium		Medium	Minor adverse	Insignificant
	Transport and dilution of waste products		Low - likely to receive runoff from adjacent land	Local	Low		Low	Negligible	Insignificant
	Recreation		Low - no known recreational or amenity value	Local	Low		Low	Negligible	Insignificant
	Hydromorphology		Low - small watercourse with small catchment	Local	Low		Low	Minor adverse	Insignificant
	Conveyance of flow and material		Low - provides local flood flow conveyance route through rural area	Local	Low	Limited potential for substitution	Low	Minor adverse	Insignificant
	Flood Plain		Conveyance of flow and material	Medium - functional floodplain In rural area	Local	Medium		Medium	Minor adverse
		Biodiversity	High - habitat of principal importance - floodplain grazing marsh, likely to support River Wensum designation	Local	Medium	Limited potential for substitution	High	Minor adverse	Low significance

	Groundwater	Water Supply	Very High - Principal aquifer, Source Protection Zone 3, multiple private abstractions.	Regional	High	Cannot be substituted	Very High	Negligible	Insignificant
		Biodiversity	High - provides important baseflow to River Wensum, supports statutory designation	Regional	High	Cannot be substituted	Very High	Negligible	Insignificant

**Reference Sources**

OS mapping, EA Flood Map for Planning, EA Flood Risk from Surface Water mapping, EA Catchment Data Explorer, Defra MAGIC geographical information portal, British Geological Survey viewer.

**Summary Assessment Score**

Minor Adverse

**Qualitative Comments**

Changes to the existing bridge are likely to have a minor adverse effect on the River Wensum and adjacent riparian habitat in the short term, but with negligible long term effect. Potential impacts during construction can be mitigated to negligible effect. Culverting the ordinary watercourses can cause slight adverse impacts to conveyance of flow and material and biodiversity. Construction of new embankments in the flood plain will cause a minor adverse impact to flood risk. Compensatory storage and hydraulic modelling is likely to be required in this scheme design. Impact to groundwater is considered negligible due to suitable drainage mitigation.

**TAG Water Environment Impacts Worksheet: Option B east**

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Study area:	River Wensum	Water Supply	Medium - main river, good chemical quality, supports private abstractions.	Regional	Medium		Medium	Negligible	Insignificant
Potential Impacts:		Biodiversity	Very High - designated SAC and SSSI.	Regional	High	Cannot be substituted	Very High	Minor adverse	Significant
		Transport and dilution of waste products	Medium - large catchment, receives local discharge, WWTW downstream of study area.	Regional	Medium	Limited potential for substitution	Medium	Negligible	Insignificant
		Recreation	Medium - flow through urban and public areas, supports fishery downstream.	Local	Low	Limited potential for substitution	Medium	Negligible	Insignificant
		Hydromorphology	Medium - heavily modified classification but supports good ecological status	Local	Medium		Medium	Minor adverse	Insignificant
		Conveyance of flow and material	High - main river, large catchment, flows through mix of urban and rural areas	Regional	Medium	Cannot be substituted	High	Negligible	Insignificant
		Unnamed Watercourse South of Weston Green	Water Supply	Low - quality unknown, may support agricultural uses.	Local	Low		Low	Negligible
	Biodiversity		Medium - flows adjacent to woodland, potential supporting habitat for otter and water vole	Local	Medium		Medium	Minor adverse	Insignificant
	Transport and dilution of waste products		Low - likely to receive runoff from adjacent land	Local	Low		Low	Negligible	Insignificant
	Recreation		Low - no known recreational or amenity value	Local	Low		Low	Negligible	Insignificant
	Hydromorphology		Low - small watercourse with small catchment	Local	Low		Low	Minor adverse	Insignificant
	Conveyance of flow and material		Low - provides local flood flow conveyance route through rural area	Local	Low	Limited potential for substitution	Low	Minor adverse	Insignificant
	Flood Plain		Conveyance of flow and material	Medium - functional floodplain In rural area	Local	Medium		Medium	Moderate adverse
		Biodiversity	High - habitat of principal importance - floodplain grazing marsh, likely to support River Wensum designation	Local	Medium	Limited potential for substitution	High	Minor adverse	Low significance

	Groundwater	Water Supply	Very High - Principal aquifer, Source Protection Zone 3, multiple private abstractions.	Regional	High	Cannot be substituted	Very High	Negligible	Insignificant
		Biodiversity	High - provides important baseflow to River Wensum, supports statutory designation	Regional	High	Cannot be substituted	Very High	Negligible	Insignificant

**Reference Sources**

OS mapping, EA Flood Map for Planning, EA Flood Risk from Surface Water mapping, EA Catchment Data Explorer, Defra MAGIC geographical information portal, British Geological Survey viewer.

**Summary Assessment Score**

Moderate Adverse

**Qualitative Comments**

Construction of a new viaduct over the River Wensum and flood plain is likely to have a minor adverse effect on the riparian habitat, water quality and conveyance during construction phase. Some potential impacts during construction can be mitigated to negligible effect. Culverting the ordinary watercourses can cause slight adverse impacts to conveyance of flow and material and biodiversity. Construction of bridge piers in the flood plain will cause a moderate adverse impact to flood risk. Compensatory storage and hydraulic modelling is likely to be required in this scheme design. Impact to groundwater is considered negligible due to suitable drainage mitigation.

**TAG Water Environment Impacts Worksheet: Option C**

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Study area:	River Wensum	Water Supply	Medium - main river, good chemical quality, supports private abstractions.	Regional	Medium		Medium	Negligible	Insignificant
Potential Impacts:		Biodiversity	Very High - designated SAC and SSSI.	Regional	High	Cannot be substituted	Very High	Minor adverse	Significant
		Transport and dilution of waste products	Medium - large catchment, receives local discharge, WWTW downstream of study area.	Regional	Medium	Limited potential for substitution	Medium	Negligible	Insignificant
		Recreation	Medium - flow through urban and public areas, supports fishery downstream.	Local	Low	Limited potential for substitution	Medium	Negligible	Insignificant
		Hydromorphology	Medium - heavily modified classification but supports good ecological status	Local	Medium		Medium	Minor adverse	Insignificant
		Conveyance of flow and material	High - main river, large catchment, flows through mix of urban and rural areas	Regional	Medium	Cannot be substituted	High	Negligible	Insignificant
		Unnamed Watercourse South of Weston Green	Water Supply	Low - quality unknown, may support agricultural uses.	Local	Low		Low	Negligible
	Biodiversity		Medium - flows adjacent to woodland, potential supporting habitat for otter and water vole	Local	Medium		Medium	Minor adverse	Insignificant
	Transport and dilution of waste products		Low - likely to receive runoff from adjacent land	Local	Low		Low	Negligible	Insignificant
	Recreation		Low - no known recreational or amenity value	Local	Low		Low	Negligible	Insignificant
	Hydromorphology		Low - small watercourse with small catchment	Local	Low		Low	Minor adverse	Insignificant
	Conveyance of flow and material		Low - provides local flood flow conveyance route through rural area	Local	Low	Limited potential for substitution	Low	Minor adverse	Insignificant
	Flood Plain		Conveyance of flow and material	Medium - functional floodplain In rural area	Local	Medium		Medium	Moderate adverse
		Biodiversity	High - habitat of principal importance - floodplain grazing marsh, likely to support River Wensum designation	Local	Medium	Limited potential for substitution	High	Minor adverse	Low significance



	Groundwater	Water Supply	Very High - Principal aquifer, Source Protection Zone 3, multiple private abstractions.	Regional	High	Cannot be substituted	Very High	Negligible	Insignificant
		Biodiversity	High - provides important baseflow to River Wensum, supports statutory designation	Regional	High	Cannot be substituted	Very High	Negligible	Insignificant

**Reference Sources**

OS mapping, EA Flood Map for Planning, EA Flood Risk from Surface Water mapping, EA Catchment Data Explorer, Defra MAGIC geographical information portal, British Geological Survey viewer.

**Summary Assessment Score**

Moderate Adverse

**Qualitative Comments**

Construction of a new viaduct over the River Wensum and flood plain is likely to have a minor adverse effect on the riparian habitat, water quality and conveyance during construction phase. Some potential impacts during construction can be mitigated to negligible effect. Culverting the ordinary watercourses can cause slight adverse impacts to conveyance of flow and material and biodiversity. Construction of bridge piers in the flood plain will cause a moderate adverse impact to flood risk. Compensatory storage and hydraulic modelling is likely to be required in this scheme design. Impact to groundwater is considered negligible due to suitable drainage mitigation.

**TAG Water Environment Impacts Worksheet: Option D**

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Study area:	River Wensum	Water Supply	Medium - main river, good chemical quality, supports private abstractions.	Regional	Medium		Medium	Negligible	Insignificant
Potential Impacts:		Biodiversity	Very High - designated SAC and SSSI.	Regional	High	Cannot be substituted	Very High	Minor adverse	Significant
		Transport and dilution of waste products	Medium - large catchment, receives local discharge, WWTW downstream of study area.	Regional	Medium	Limited potential for substitution	Medium	Negligible	Insignificant
		Recreation	Medium - flow through urban and public areas, supports fishery downstream.	Local	Low	Limited potential for substitution	Medium	Negligible	Insignificant
		Hydromorphology	Medium - heavily modified classification but supports good ecological status	Local	Medium		Medium	Minor adverse	Insignificant
		Conveyance of flow and material	High - main river, large catchment, flows through mix of urban and rural areas	Regional	Medium	Cannot be substituted	High	Negligible	Insignificant
	River Tud	Water Supply	Medium - main river, good chemical quality, supports private abstractions.	Local	Medium		Medium	Negligible	Insignificant
		Biodiversity	High - moderate ecological quality, suitable habitat for otter and water vole	Regional	Medium	Limited potential for substitution	High	Minor adverse	Low significance
		Transport and dilution of waste products	Medium - receives local discharge, WWTW downstream of study area	Local	Low	Limited potential for substitution	Medium	Negligible	Insignificant
		Recreation	Low - little recreational or amenity value	Local	Low		Low	Negligible	Insignificant
		Hydromorphology	Medium - heavily modified classification but supports good ecological status	Local	Medium		Medium	Minor adverse	Insignificant
		Conveyance of flow and material	High - main river, large catchment, flows through mix of urban and rural areas	Regional	Medium	Cannot be substituted	High	Negligible	Insignificant
	Flood Plain	Wensum - Conveyance of flow and material	Medium - functional floodplain In rural area	Local	Medium		Medium	Moderate adverse	Low significance
		Tud - Conveyance of flow and material	Low - not significant, in rural area	Local	Medium		Low	Minor adverse	Insignificant

		Biodiversity	High - habitat of principal importance - floodplain grazing marsh, likely to support River Wensum designation	Local	Low	Limited potential for substitution	High	Minor adverse	Low significance
	Groundwater	Water Supply	Very High - Principal aquifer, Source Protection Zone 3, multiple private abstractions.	Regional	High	Cannot be substituted	Very High	Negligible	Insignificant
		Biodiversity	High - provides important baseflow to River Wensum, supports statutory designation	Regional	High	Cannot be substituted	Very High	Negligible	Insignificant

**Reference Sources**

OS mapping, EA Flood Map for Planning, EA Flood Risk from Surface Water mapping, EA Catchment Data Explorer, Defra MAGIC geographical information portal, British Geological Survey viewer.

**Summary Assessment Score**

Moderate Adverse

**Qualitative Comments**

Construction of new viaducts over the River Wensum and River Tud and their associated flood plains is likely to have a minor adverse effect on the riparian habitat, water quality and conveyance during construction phase. Some potential impacts during construction can be mitigated to negligible effect. Construction of bridge piers in the flood plain will cause a moderate adverse impact to flood risk. Compensatory storage and hydraulic modelling is likely to be required in this scheme design. Impact to groundwater is considered negligible due to suitable drainage mitigation.

# Appendix F

---

WSP

APPRAISAL SUMMARY TABLES

Appraisal Summary Table		Date produced:	6th June 2019		Contact:			
Name of scheme:		Norwich Western Link			Name			
Description of scheme:					Organisation			
Impacts		Summary of key impacts			Assessment			
					Quantitative	Qualitative		
					Monetary	Distributional		
					£(NPV)	7-pt scale/ vulnerable grp		
Economy	Business users & transport providers	Journey Time Benefits are the main source of monetised impacts for this option. Business users account for approximately 30% of journey time benefits	Value of journey time changes(£) £13.3m		Beneficial	£13.58m	N/A	
			Net journey time changes (£)					
			0 to 2min	2 to 5min				> 5min
			£3.07m	£8.72m				£1.54m
Reliability impact on Business users	Providing a higher class standard of road than currently exists should lead to improved journey time reliability along this route.	Estimating the value of reliability savings as around 10% of travel time savings would indicate a reliability benefit of £1.3m for Business users.			Beneficial	-		
Regeneration	There is no development dependant on the scheme	Not Calculated				-		
Wider Impacts	The scheme is considered to bring positive wider impacts in addition to transport user benefits as the scheme is likely to enable development with and around Norwich	Not Calculated			Beneficial	-		
Environmental	Noise	<p><b>NB: This assessment did not use the WebTAG worksheet and DMRB guidance. It is based on qualitative methodology set out by WSP in a Technical Memorandum, 2019.</b></p> <p>Route option A has been reviewed to qualitatively comment on areas that are likely to be susceptible to noise and/or vibration impacts.</p> <p>The closest properties on Sandy Lane are approximately 120 metres away from the proposed carriageway edge. The proposed works in this area include stopping up of existing roads, new junctions and accesses, and installation of pedestrian crossing bridges. The amount and proximity of construction works in this area is likely to lead to an adverse impact at the closest properties.</p> <p>Further north the route passes close to Woodforde Farm, as it crosses Breck Road. The proposed method of crossing is a road bridge, and the construction works involved with this may result in significant levels of construction noise and vibration at this receptor due to its proximity. Operational noise may also be an issue, again due to the proximity of the receptor to the route.</p> <p>The closest villages are Lenwade and Great Withingham, which lie along the A1067 immediately either side of the existing junction with the B1533 and the proposed junction with Option A. The proposed works at this junction include the creation of a roundabout, and adverse impacts may occur at the closest properties during the construction phase due to the proximity of works. Any operational impacts will depend on the difference in vehicle movements as a result of the proposed route in comparison to those currently using the A1067 and B1533.</p>	n/a		Route Option A adversely impacts more properties and benefits fewer properties than the other route options in the short-term. However, the changes in noise that result from Route Option A are almost all less than ±1dB, which would be classed as negligible changes.	n/a		
	Air Quality	Overall there is a net improvement in air quality and a decrease in regional NOx emissions. Uncertainties include: no forecast of traffic growth beyond 2040, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2080.	<p>Assessment Score 2025 PM2.5: 17.71 NO2: 73.54</p> <p>Assessment Score 2040 PM2.5: 23.53 NO2: 78.08</p> <p>Emissions 2025 NOx: -8 tonnes</p> <p>Emissions 2040 NOx: -4 tonnes</p> <p>Properties Improved: 1500 Neutral: 0</p>		N/A	<p>NPV of change in PM10 emissions: £2,220,433</p> <p>NPV of change in NOx emissions: £1,382,970 (2019 prices)</p> <p>Total NPV of change in air quality: £3,603,402</p>	N/A	
	Greenhouse gases	The appraisal reflects a net decrease in vehicle kilometres travelled over the modelled road network. Uncertainties include: no forecast of traffic growth beyond 2040, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2080. There is no account of CO2 emissions from power generating sources for electric vehicles.	<p>Change in non-traded carbon over 60y (CO2e) -196,560</p> <p>Change in traded carbon over 60y (CO2e) 0</p>		N/A	NPV: £8,622,885		
	Landscape	There would be no substantial change to the landscape character due to the proposed route substantially being a realignment and straightening of an existing road which is reflective of the existing landscape pattern. The road would run mainly at grade, with small sections of embankment and it's influence would be broadly similar as a single lane, however will be a more substantial road, particularly where it crosses the landscape between Sandy Lane and Wood Lane.	n/a		Slight Adverse	n/a		
	Townscape	Not applicable to the proposed Option A.	n/a		n/a	n/a		
	Historic Environment	The scheme would have a major direct impact on nationally significant historic environmental assets such that they are lost or their integrity is severely damaged.	There is one Grade II listed building, that will be physically affected by the scheme. There are 20 Listed Building assets which could have a setting impact, one Grade II* and 19 Grade II listed buildings, and two Scheduled Monuments.		Large Adverse, due to impacts on Built Heritage	n/a		
	Biodiversity	This option directly impacts the least ecological features however because bats are of high conservation importance and the route is located close to a known maternity roost the impact of the route is very large adverse.	n/a		Very Large Adverse	n/a		
	Water Environment	Impacts to the River Wensum are negligible as there is minimal change to the existing infrastructure at this watercourse. Potential impacts during construction can be mitigated to negligible effect. Culverting the ordinary watercourses can cause slight adverse impacts to conveyance of flow and material and biodiversity. Construction of new embankments in the flood plain will cause minor adverse impact to flood risk. Compensatory storage is likely to be required in this scheme design. Impact to groundwater is considered negligible due to suitable drainage mitigation.	n/a		Minor Adverse	n/a		
	Social	Commuting and Other users	Journey Time Benefits are the main source of monetised impacts for this option. Commuting and other users account for approximately 70% of journey time benefits	Value of journey time changes(£) £24.73m		Beneficial	£25.77	N/A
				Net journey time changes (£)				
		0 to 2min	2 to 5min	> 5min				
		£9.68m	£14.31	£0.73				
Reliability impact on Commuting and Other users		Providing a higher class standard of road than currently exists should lead to improved journey time reliability along this route.				Beneficial	-	
Physical activity		This option does not include measures aimed specifically at walking and cycling, however Walking and Cycling will be considered moving forward potentially through design of the route options and or potentially through the proposed additional non road options carried through from the initial sifting to be considered as part of a package of measures. The reduction in traffic on the local roads due to the scheme is likely to create a better environment for walkers and cyclist, therefore the scheme is likely to generate additional walking and cycling trips. At this current stage the size of the increase is unknown, therefore the impact is assumed as neutral to slight beneficial.				Neutral/slight Beneficial	-	
Journey quality		The impact on traveller care will be neutral - beneficial. All elements will be designed to current industry standards therefore this may be an improvement to traveller environment over the existing local roads that are currently being used. The impact on travellers' views will be neutral as the majority of works will run through countryside. The impact on traveller stress will be beneficial as the scheme will reduce congestion and delay, which will improve route certainty and therefore reduce traveller stress. Overall the impact on journey quality is assumed as beneficial.				Beneficial	-	
Accidents		The proposed options will encourage a reassignment of traffic away from existing lower standard routes to the new higher standard highway links proposed between the A47 and A1067. It is expected that this will produce an overall reduction in accidents in the study area and deliver a beneficial outcome.				Beneficial	-	N/A
Security		No significant security risk will be introduced by the proposed scheme. The security impact is assumed to be neutral.				Neutral	-	N/A
Access to services		At this stage the scheme focuses on highway improvements with no change in the routes served by the public transport system or the transport costs, although this may change in the future. The accessibility impact is currently assumed as neutral.				Neutral	-	N/A
Affordability	The scheme has not been designed to address the affordability of the transport system, there will be no change in fares/travel costs for users apart from those already identified through TUBA via Car Fuel and Non-Fuel operating costs. The affordability impact is assumed as Neutral.				Neutral	-	N/A	
Severance	The scheme is likely to sever existing public rights of way along the new road corridor. However, the reduction in traffic along the existing local roads should reduce severance on the towns and villages. Where routes are severed it is considered that crossing facilities will be provided in line with or in close proximity to existing routes, or if required alternative routes will be provided, which should mitigate the impact of the new road. The severance impact is classed as neutral to slight beneficial.				Neutral/slight Beneficial	-	N/A	
Option and non-use values	At this stage the scheme does not directly provide for new public transport services. The option values impact is assumed as neutral.				Neutral	-		
Public Account	Cost to Broad Transport Budget	It is currently envisaged that the scheme will be fully public funded			-	£54.35m		
	Indirect Tax Revenues	The proposed option would result in changes in fuel use with affects indirect tax revenues.			-	£1.11m		

Appraisal Summary Table		Date produced:	5th June			Contact:				
Name of scheme:	Norwich Western Link					Name				
Description of scheme:						Organisation				
							Role	Promoter/Official		
Impacts	Summary of key impacts	Assessment								
		Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp			
Economy	Business users & transport providers	Journey Time Benefits are the main source of monetised impacts for this option. Business users account for approximately 30% of journey time benefits			Value of journey time changes(£)	£91.4m				
					Net journey time changes (£)					
					0 to 2min	2 to 5min	> 5min			
	Reliability impact on Business users	Providing a higher class standard of road than currently exists should lead to improved journey time reliability along this route.			£34.1m	£22.7m	£34.6m			
	Regeneration	There is no development dependant on the scheme			Not Calculated					
	Wider Impacts	The scheme is considered to bring positive wider impacts in addition to transport user benefits as the scheme is likely to enable development with and around Norwich.			Not Calculated					
Environmental	Noise	<p><b>NB. This assessment did not use the WebTAG worksheet and DMRB guidance. It is based on qualitative methodology set out by WSP in a Technical Memorandum, 2019.</b></p> <p>The route passes immediately to the east of a small number of properties around the junction of Weston Green Road, approximately 45 metres from the proposed carriageway. Due to the proximity of these properties, there would be a greater chance of adverse noise impacts during the operational phases. This part of the route also includes a road bridge, which is likely to result in significant levels of construction noise and vibration at the properties.</p> <p>Close to the junction with the A1067, there are a number of properties to the north-east, on The Street. There are also properties to the west of this junction in Morton on the Hill, and to the east in the village of Attlebridge.</p> <p>The proposed works at this junction include the creation of a roundabout, a widened bridge crossing over the River Wensum, and an upgrade to the A1067. Adverse impacts may occur at the closest properties during the construction phase due to the proximity of works. Operational impacts may occur at the closest properties, although the level of impact will depend on the amount of traffic using the route, and any changes to traffic flow on the A1067 around the junction with the proposed route.</p>			n/a			Slightly larger changes when compared to Option A, however overall they would still be classed as negligible in magnitude.	n/a	
	Air Quality	Overall there is a net worsening in air quality and a decrease in regional NOx emissions. Uncertainties include: no forecast of traffic growth beyond 2040, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2080.			Assessment Score 2025 PM2.5: -35.14 NO2: -153.39  Assessment Score 2040 PM2.5: -47.55 NO2: -95.85  Emissions 2025 NOx: - 25 tonnes  Emissions 2040 NOx: + 4 tonnes  Properties Improved: 10214 Neutral: 0 Worsening: 5339			N/A	NPV of change in PM10 emissions: £397,228  NPV of change in NOx emissions: £332,649 (2019 prices)  Total NPV of change in air quality: £729,877	N/A
	Greenhouse gases	The appraisal reflects a net decrease in vehicle kilometres travelled over the modelled road network. Uncertainties include: no forecast of traffic growth beyond 2040, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2080. There is no account of CO2 emissions from power generating sources for electric vehicles.			Change in non-traded carbon over 60y (CO2e)		14,966	N/A	NPV: -£1,358,528	
						Change in traded carbon over 60y (CO2e)		0		
	Landscape	There would be perceptible impact on the landscape character by the proposed scheme. There would be subdivision of existing fields, that would in part replace historic field pattern eroded by recent enlargement, however there would be further subdivision of smaller fields in the north, or total loss which would alter the pattern. The road which is dualled would reduce tranquillity locally, particularly where it is on embankment to the north. The loss of small sections of hedgerows and woodlands would alter the landcover locally.			n/a			Moderate Adverse	n/a	
	Townscape	Not applicable to the proposed Option B western variant.								
	Historic Environment	The scheme would have a major direct impact on nationally significant historic environmental assets such that they are lost or their integrity is severely damaged.			There is one Grade II listed building, that will be physically affected by the scheme. There are nine designated heritage assets that could have a setting impact, one Grade I, one Grade II* and seven Grade II listed buildings.			Large adverse, due to impact on Built heritage	n/a	
Biodiversity	This option has the potential to cause impacts to the River Wensum SAC and could also impact a known maternity colony of barbastelle bats and therefore the impact of the route is very large adverse.			n/a			Very large adverse	n/a		
Water Environment	Changes to the existing bridge are likely to have a minor adverse effect on the River Wensum and adjacent riparian habitat in the short term, but with negligible long term effect. Potential impacts during construction can be mitigated to negligible effect. Culverting the ordinary watercourses can cause slight adverse impacts to conveyance of flow and material and biodiversity. Construction of new embankments in the flood plain will cause a minor adverse impact to flood risk. Compensatory storage and hydraulic modelling is likely to be required in this scheme design. Impact to groundwater is considered negligible due to suitable drainage mitigation.			n/a			Minor Adverse	n/a		
Social	Commuting and Other users	Journey Time Benefits are the main source of monetised impacts for this option. Commuting and other users account for approximately 70% of journey time benefits			Value of journey time changes(£)		£220.3m			
					Net journey time changes (£)					
					0 to 2min	2 to 5min	> 5min			
		Reliability impact on Commuting and Other users	Providing a higher class standard of road than currently exists should lead to improved journey time reliability along this route.			£82.6m	£65.2m	£72.4m		
	Physical activity	This option does not include measures aimed specifically at walking and cycling, however Walking and Cycling will be considered moving forward potentially through design of the route options and or potentially through the proposed additional non road options carried through from the initial sifting to be considered as part of a package of measures. The reduction in traffic on the local roads due to the scheme is likely to create a better environment for walkers and cyclist, therefore the scheme is likely to generate additional walking and cycling trips. At this current stage the size of the increase is unknown, therefore the impact is assumed as neutral to slight beneficial.						Neutral/slight Beneficial		
	Journey quality	The impact on traveller care will be neutral - beneficial. All elements will be designed to current industry standards therefore this may be an improvement to traveller environment over the existing local roads that are currently being used. The impact on travellers' views will be neutral as the majority of works will run through countryside. The impact on traveller stress will be beneficial as the scheme will reduce congestion and delay, which will improve route certainty and therefore reduce traveller stress. Overall the impact on journey quality is assumed as beneficial.						Beneficial		
	Accidents	The proposed options will encourage a reassignment of traffic away from existing lower standard routes to the new higher standard highway links proposed between the A47 and A1067. It is expected that this will produce an overall reduction in accidents in the study area and deliver a beneficial outcome.						Beneficial		
	Security	No significant security risk will be introduced by the proposed scheme. The security impact is assumed to be neutral.						Neutral		
	Access to services	At this stage the scheme focuses on highway improvements with no change in the routes served by the public transport system or the transport costs, although this may change in the future. The accessibility impact is currently assumed as neutral.						Neutral		
	Affordability	The scheme has not been designed to address the affordability of the transport system, there will be no change in fares/travel costs for users apart from those already identified through TUBA via Car Fuel and Non-Fuel operating costs. The affordability impact is assumed as Neutral.						Neutral		
Severance	The scheme is likely to sever existing public rights of way along the new road corridor. However, the reduction in traffic along the existing local roads should reduce severance on the towns and villages. Where routes are severed it is considered that crossing facilities will be provided in line with or in close proximity to existing routes, or if required alternative routes will be provided, which should mitigate the impact of the new road. The severance impact is classed as neutral to slight beneficial.						Neutral/slight Beneficial			
Option and non-use values	At this stage the scheme does not directly provide for new public transport services. The option values impact is assumed as neutral.						Neutral			
Public Account	Cost to Broad Transport Budget	It is currently envisaged that the scheme will be fully public funded						-	£119.6m	
	Indirect Tax Revenues	The proposed option would result in changes in fuel use with affects indirect tax revenues.						-	-£1.14m	

Appraisal Summary Table				Date produced:		5th June		Contact:					
Name of scheme:		Norwich Western Link						Name					
Description of scheme:								Organisation					
Impacts		Summary of key impacts				Assessment							
						Quantitative		Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp			
Economy	Business users & transport providers	Journey Time Benefits are the main source of monetised impacts for this option. Business users account for approximately 30% of journey time benefits				Value of journey time changes(£)		£96.4m		Beneficial	£97.6m		
						Net journey time changes (£)							
						0 to 2min	2 to 5min	> 5min					
	Reliability impact on Business users	Providing a higher class standard of road than currently exists should lead to improved journey time reliability along this route.				Estimating the value of reliability savings as around 10% of travel time savings would indicate a reliability benefit of £9.6m for				Beneficial	-		
	Regeneration	There is no development dependant on the scheme				Not Calculated					-		
	Wider Impacts	The scheme is considered to bring positive wider impacts in addition to transport user benefits as the scheme is likely to enable development with and around Norwich.				Not Calculated				Beneficial	-		
Environmental	Noise	<b>NB. This assessment did not use the WebTAG worksheet and DMRB guidance. It is based on qualitative methodology set out by WSP in a Technical Memorandum, 2019.</b> The route passes immediately to the east of a small number of properties around the junction of Weston Green Road, approximately 45 metres from the proposed carriageway. Due to the proximity of these properties, there would be a greater chance of adverse noise impacts during the operational phases. This part of the route also includes a road bridge, which is likely to result in significant levels of construction noise and vibration at the properties. The route also passes within 280 metres of Morton Hall, and within 85 metres of Ivy Cottages, close to the A1067. The proposed works in this area include a viaduct crossing over the River Wensum and the construction of a roundabout to form a junction with the A1067. Due to the proximity and nature of these works, there is an increased risk of adverse impacts due to construction noise and vibration. Operational noise may also be an issue at Ivy Cottages close to the A1067, due to their proximity to the proposed route and its roundabout with the A1067.				n/a				Very similar to the outcomes for Route Option B West. All of the changes would be classed as negligible in magnitude.		n/a	
	Air Quality	Overall there is a net worsening in air quality and an increase in regional NOx emissions. Uncertainties include: no forecast of traffic growth beyond 2040, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2080.				Assessment Score 2025 PM2.5: -17.74 NO2: -68.39  Assessment Score 2040 PM2.5: -1.19 NO2: -20.22  Emissions 2025 NOx: - 25 tonnes  Emissions 2040 NOx: + 6 tonnes  Properties Improved: 8246 Neutral: 0 Worsening: 5338		N/A		NPV of change in PM10 emissions: - £403,887  NPV of change in NOx emissions: - £143,254 (2019 prices)  Total NPV of change in air quality: -£547,141		N/A	
	Greenhouse gases	The appraisal reflects a net increase in vehicle kilometres travelled over the modelled road network. Uncertainties include: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2080. There is no account of CO2 emissions from power generating sources for electric vehicles.				Change in non-traded carbon over 60y (CO2e)		93,585		N/A		NPV: -£4,900,284	
						Change in traded carbon over 60y (CO2e)		0					
	Landscape	The majority of the landscape would have minor changes, particularly in the south, however in the north their would be substantial change due to the introduction of the viaduct over the River Wensum and roundabout. The road would be dualled and a large proportion to the north and south being on embankment, reducing the perception of tranquillity. The scheme would be visible from a number of farmsteads throughout the landscape. In the north the viaduct would have an adverse influence on the wider landscape.				n/a				Moderate Adverse		n/a	
	Townscape	Not applicable to the proposed Option B eastern variant.											
	Historic Environment	The scheme would be intrusive in the setting (context), and will adversely affect the appreciation and understanding of the characteristic historic environmental resource. The scheme would be a major direct impact on regionally or locally significant historic environment non-designated assets, resulting in loss of features such that their integrity is substantially compromised, but adequate mitigation can be specified.				There are no designated heritage assets that will be physically affected by the scheme. There are nine designated heritage assets that could have a setting impact, one Grade I, one Grade II* and seven Grade II listed buildings.				Moderate Adverse		n/a	
	Biodiversity	This option has the potential to cause impacts to a known maternity colony of barbastelle bats and therefore the impact of the route is very large adverse.				n/a				Very Large Adverse		n/a	
	Water Environment	Construction of a new viaduct over the River Wensum and flood plain is likely to have a minor adverse effect on the riparian habitat, water quality and conveyance during construction phase. Some potential impacts during construction can be mitigated to negligible effect. Culverting the ordinary watercourses can cause slight adverse impacts to conveyance of flow and material and biodiversity. Construction of bridge piers in the flood plain will cause a moderate adverse impact to flood risk. Compensatory storage and hydraulic modelling is likely to be required in this scheme design. Impact to groundwater is considered negligible due to suitable drainage mitigation.				n/a				Moderate Adverse		n/a	
Social	Commuting and Other users	Journey Time Benefits are the main source of monetised impacts for this option. Commuting and other users account for approximately 70% of journey time benefits				Value of journey time changes(£)		£232.6m		Beneficial	£226.6m		
						Net journey time changes (£)							
						0 to 2min	2 to 5min	> 5min					
		Reliability impact on Commuting and Other users	Providing a higher class standard of road than currently exists should lead to improved journey time reliability along this route.								Beneficial		
	Physical activity	This option does not include measures aimed specifically at walking and cycling, however Walking and Cycling will be considered moving forward potentially through design of the route options and or potentially through the proposed additional non road options carried through from the initial sifting to be considered as part of a package of measures. The reduction in traffic on the local roads due to the scheme is likely to create a better environment for walkers and cyclist, therefore the scheme is likely to generate additional walking and cycling trips. At this current stage the size of the increase is unknown, therefore the impact is assumed as neutral to slight beneficial.								Neutral/slight Beneficial			
	Journey quality	The impact on traveller care will be neutral - beneficial. All elements will be designed to current industry standards therefore this may be an improvement to traveller environment over the existing local roads that are currently being used. The impact on travellers' views will be neutral as the majority of works will run through countryside. The impact on traveller stress will be beneficial as the scheme will reduce congestion and delay, which will improve route certainty and therefore reduce traveller stress. Overall the impact on journey quality is assumed as beneficial.								Beneficial			
	Accidents	The proposed options will encourage a reassignment of traffic away from existing lower standard routes to the new higher standard highway links proposed between the A47 and A1067. It is expected that this will produce an overall reduction in accidents in the study area and deliver a beneficial outcome.								Beneficial			
	Security	No significant security risk will be introduced by the proposed scheme. The security impact is assumed to be neutral.								Neutral			
	Access to services	At this stage the scheme focuses on highway improvements with no change in the routes served by the public transport system or the transport costs, although this may change in the future. The accessibility impact is currently assumed as neutral.								Neutral			
	Affordability	The scheme has not been designed to address the affordability of the transport system, there will be no change in fares/travel costs for users apart from those already identified through TUBA via Car Fuel and Non-Fuel operating costs. The affordability impact is assumed as Neutral.								Neutral			
Severance	The scheme is likely to sever existing public rights of way along the new road corridor. However, the reduction in traffic along the existing local roads should reduce severance on the towns and villages. Where routes are severed it is considered that crossing facilities will be provided in line with or in close proximity to existing routes, or if required alternative routes will be provided, which should mitigate the impact of the new road. The severance impact is classed as neutral to slight beneficial.								Neutral/slight Beneficial				
Option and non-use values	At this stage the scheme does not directly provide for new public transport services. The option values impact is assumed as neutral.								Neutral				
Public Account	Cost to Broad Transport Budget	It is currently envisaged that the scheme will be fully public funded								-		£147.8m	
	Indirect Tax Revenues	The proposed option would results in changes in fuel use with affects indirect tax revenues.								-		-£0.52m	

Appraisal Summary Table		Date produced:	5th June 2019		Contact:					
Name of scheme:	Norwich Western Link				Name					
Description of scheme:					Organisation					
				Role	Promoter/Official					
Impacts	Summary of key impacts	Assessment								
		Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp			
Economy	Business users & transport providers	Journey Time Benefits are the main source of monetised impacts for this option. Business users account for approximately 30% of journey time benefits			Value of journey time changes(£)	£102.5m	Beneficial	£107.50		
				Net journey time changes (£)						
				0 to 2min	2 to 5min	> 5min				
	Reliability impact on Business users	Providing a higher class standard of road than currently exists should lead to improved journey time reliability along this route.			Estimating the value of reliability savings as around 10% of travel time savings would indicate a reliability benefit of £10.2m for Business users.		Beneficial	-		
	Regeneration	There is no development dependant on the scheme			Not Calculated			-		
	Wider Impacts	The scheme is considered to bring positive wider impacts in addition to transport user benefits as the scheme is likely to enable development with and around Norwich			Not Calculated		Beneficial	-		
Environmental	Noise	<p><b>NB. This assessment did not use the WebTAG worksheet and DMRB guidance. It is based on qualitative methodology set out by WSP in a Technical Memorandum, 2019.</b></p> <p>From the proposed junction with the A47 it heads north-east, following the same alignment as Routes B and B1 and running roughly parallel with Wood Lane. After crossing Breck Road it continues north-east, turning more easterly after crossing Ringland Lane before turning northward again and joining with the A1067. The route only passes close to a small number of properties, notably Low Farm and Old Hall Farm, Old Hall Farm Cottages and Woodstock close to the junction with the A1067.</p> <p>The works in this area include a viaduct crossing over the River Wensum, a drainage basin, and the construction of a roundabout to form a junction with the A1067. Due to the proximity and nature of these works, there is an increased risk of adverse impacts due to construction noise and vibration. The proximity of the route also means that there may be adverse impacts due to operational noise.</p> <p>Route Option C passes close to the fewest sensitive properties and is therefore considered the least likely to generate adverse effects.</p>			n/a		Similar to those of Route Options B western and eastern variants, but overall they would be classed as minor impacts, both adverse and beneficial, rather than negligible.	n/a		
	Air Quality	Overall there is a net worsening in air quality and an increase in regional NOx emissions. Uncertainties include: no forecast of traffic growth beyond 2040, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2080.			<p>Assessment Score 2025 PM2.5: -43.74 NO2: -4.47</p> <p>Assessment Score 2040 PM2.5: -46.54 NO2: -104.53</p> <p>Emissions 2025 NOx: - 20 tonnes</p> <p>Emissions 2040 NOx: + 5 tonnes</p> <p>Properties Improved: 8795 Neutral: 0 Worsening: 5729</p>		N/A	NPV of change in PM10 emissions: -£269,001 NPV of change in NOx emissions: -£183,076 (2019 prices) Total NPV of change in air quality: -£452,077	N/A	
	Greenhouse gases	The appraisal reflects a net increase in vehicle kilometres travelled over the modelled road network. Uncertainties include: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2080. There is no account of CO2 emissions from power generating sources for electric vehicles.			<p>Change in non-traded carbon over 60y (CO2e) 79,525</p> <p>Change in traded carbon over 60y (CO2e) 0</p>		N/A	NPV: -£4,149,699		
	Landscape	There would be subdivision of fields, disrupting field patterns locally. There would be sections of embankment and cutting through the landscape which would affect the pattern locally and the viaduct would have a wider impact. The viaduct across the R. Wensum would introduce a new feature into this landscape and would have a substantial adverse impact on tranquility in the north, the road would alter tranquility locally along the length, limited due to it largely being at grade or in cutting. The alignment which is dualled and which is larger in scale than the existing roads through this landscape. There would be some loss of woodland and arable farmland altering land cover locally.			n/a		Moderate Adverse	n/a		
	Townscape	Not applicable to the proposed Option C.								
Historic Environment	The scheme would be intrusive in the setting (context), and will adversely affect the appreciation and understanding of the characteristic historic environmental resource. The scheme would be a major direct impact on regionally or locally significant historic environment non-designated assets, resulting in loss of features such that their integrity is substantially compromised, but adequate mitigation can be specified.			There are no designated heritage assets that will be physically affected by the scheme. There are two Grade II listed buildings that could have a setting impact.		Moderate Adverse	n/a			
Biodiversity	This route has the potential to cause impacts to gathering (pre-maternity) roosts of barbastelle bats. Given the recorded roosts are gathering roosts and are further away from the main maternity roost area (around Morton) the impact is Large (rather than very large) Adverse.			n/a		Large Adverse	n/a			
Water Environment	Construction of a new viaduct over the River Wensum and flood plain is likely to have a minor adverse effect on the riparian habitat, water quality and conveyance during construction phase. Some potential impacts during construction can be mitigated to negligible effect. Culverting the ordinary watercourses can cause slight adverse impacts to conveyance of flow and material and biodiversity. Construction of bridge piers in the flood plain will cause a moderate adverse impact to flood risk. Compensatory storage and hydraulic modelling is likely to be required in this scheme design. Impact to groundwater is considered negligible due to suitable drainage mitigation.			n/a		Moderate Adverse	n/a			
Social	Commuting and Other users	Journey Time Benefits are the main source of monetised impacts for this option. Commuting and other users account for approximately 70% of journey time benefits			Value of journey time changes(£) £249.2m		Beneficial	£249.5m		
				Net journey time changes (£)						
				0 to 2min	2 to 5min	> 5min				
				£100.2m	£47.5m	£101.5m				
	Reliability impact on Commuting and Other users	Providing a higher class standard of road than currently exists should lead to improved journey time reliability along this route.								
	Physical activity	This option does not include measures aimed specifically at walking and cycling, however Walking and Cycling will be considered moving forward potentially through design of the route options and or potentially through the proposed additional non road options carried through from the initial sifting to be considered as part of a package of measures. The reduction in traffic on the local roads due to the scheme is likely to create a better environment for walkers and cyclist, therefore the scheme is likely to generate additional walking and cycling trips. At this current stage the size of the increase is unknown, therefore the impact is assumed as neutral to slight beneficial.								Neutral/slight Beneficial
	Journey quality	The impact on traveller care will be neutral - beneficial. All elements will be designed to current industry standards therefore this may be an improvement to traveller environment over the existing local roads that are currently being used. The impact on travellers' views will be neutral as the majority of works will run through countryside. The impact on traveller stress will be beneficial as the scheme will reduce congestion and delay, which will improve route certainty and therefore reduce traveller stress. Overall the impact on journey quality is assumed as beneficial.								Beneficial
	Accidents	The proposed options will encourage a reassignment of traffic away from existing lower standard routes to the new higher standard highway links proposed between the A47 and A1067. It is expected that this will produce an overall reduction in accidents in the study area and deliver a beneficial outcome.								Beneficial
	Security	No significant security risk will be introduced by the proposed scheme. The security impact is assumed to be neutral.								Neutral
	Access to services	At this stage the scheme focuses on highway improvements with no change in the routes served by the public transport system or the transport costs, although this may change in the future. The accessibility impact is currently assumed as neutral.								Neutral
Affordability	The scheme has not been designed to address the affordability of the transport system, there will be no change in fares/travel costs for users apart from those already identified through TUBA via Car Fuel and Non-Fuel operating costs. The affordability impact is assumed as Neutral.					Neutral				
Severance	The scheme is likely to sever existing public rights of way along the new road corridor. However, the reduction in traffic along the existing local roads should reduce severance on the towns and villages. Where routes are severed it is considered that crossing facilities will be provided in line with or in close proximity to existing routes, or if required alternative routes will be provided, which should mitigate the impact of the new road. The severance impact is classed as neutral to slight beneficial.					Neutral/slight Beneficial				
Option and non-use values	At this stage the scheme does not directly provide for new public transport services. The option values impact is assumed as neutral.					Neutral				
Public Account	Cost to Broad Transport Budget	It is currently envisaged that the scheme will be fully public funded					-	£142.9m		
	Indirect Tax Revenues	The proposed option would result in changes in fuel use with affects indirect tax revenues.					-	£2.65m		



Appraisal Summary Table		Date produced:	5th June 2019		Contact:		
Name of scheme:	Norwich Western Link				Name		
Description of scheme:					Organisation		
Impacts	Summary of key impacts	Assessment					
		Quantitative		Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp	
Economy	Business users & transport providers	Journey Time Benefits are the main source of monetised impacts for this option. Business users account for approximately 30% of journey time benefits		Value of journey time changes (£)	£90.9m		
			Net journey time changes (£)				
			0 to 2min	2 to 5min	> 5min		
			£33.1m	£29.8m	£28.1m		
Reliability impact on Business users	Providing a higher class standard of road than currently exists should lead to improved journey time reliability along this route.	Estimating the value of reliability savings as around 10% of travel time savings would indicate a reliability benefit of £9.1m for Business users.		Beneficial	£92.5m		
Regeneration	There is no development dependant on the scheme	Not Calculated			-		
Wider Impacts	The scheme is considered to bring positive wider impacts in addition to transport user benefits as the scheme is likely to enable development with and around Norwich	Not Calculated		Beneficial	-		
Environmental	Noise	<p><b>NB. This assessment did not use the WebTAG worksheet and DMRB guidance. It is based on qualitative methodology set out by WSP in a Technical Memorandum, 2019.</b></p> <p>For properties close to the junction with the A1067, including Low Farm, Old Hall Farm, Old Hall Farm Cottages and Woodstock, the works in this area include a viaduct crossing over the River Wensum, a drainage basin, and the construction of a roundabout to form a junction with the A1067. Due to the proximity and nature of these works, there is an increased risk of adverse impacts due to construction noise and vibration. The proximity of the route also means that there may be adverse impacts due to operational noise.</p> <p>For properties close to the junction with the A47, the works in this area include a viaduct crossing over the River Tud and a drainage basin. Due to the proximity and nature of these works, there is an increased risk of adverse impacts due to construction noise and vibration. The proximity of the route also means that there may be adverse impacts due to operational noise.</p>		n/a	Similar to those from Route Option B western and eastern variants and Route Option C and would be classed as negligible in magnitude.	n/a	
	Air Quality	Overall there is a net improvement in air quality and an increase in regional NOx emissions. Uncertainties include: no forecast of traffic growth beyond 2040, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2080.	<p>Assessment Score 2025 PM2.5: -25.27 NO2: 11.36</p> <p>Assessment Score 2040 PM2.5: -70.66 NO2: -285.48</p> <p>Emissions 2025 NOx: -19 tonnes</p> <p>Emissions 2040 NOx: +9 tonnes</p> <p>Properties Improved: 10112 Neutral: 129 Worsening: 7178</p>	N/A	NPV of change in PM10 emissions: -£1,971,176 NPV of change in NOx emissions: -£1,057,187 (2019 prices) Total NPV of change in air quality: -£3,028,364	N/A	
	Greenhouse gases	The appraisal reflects a net increase in vehicle kilometres travelled over the modelled road network. Uncertainties include: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2080. There is no account of CO2 emissions from power generating sources for electric vehicles.	Change in non-traded carbon over 60y (CO2e)	223,239	N/A	NPV: -£10,575,555	
			Change in traded carbon over 60y (CO2e)	0			
	Landscape	There would be subdivision of fields, disrupting field patterns locally. The road is on viaduct in the north, then running in sections of cutting and on embankment through the central part and onto embankment and a viaduct over the River Tud in the south, where on viaduct it would have a substantial impact on tranquillity and introduce a new element into this landscape which would have a wider effect. The alignment which is dualled is larger in scale than the existing roads in the surrounding landscape. There would be some loss of woodland and arable farmland altering land cover locally.	n/a		Moderate Adverse	n/a	
	Townscape	Not applicable to the proposed Option D West.					
	Historic Environment	The scheme would be intrusive in the setting (context), and will adversely affect the appreciation and understanding of the characteristic historic environmental resource. The scheme would be a major direct impact on regionally or locally significant historic environment non-designated assets, resulting in loss of features such that their integrity is substantially compromised, but adequate mitigation can be specified.	There are no designated heritage assets that will be physically affected by the scheme. There are five designated heritage assets that could have a setting impact, one Grade I, one Grade II* and three Grade II listed buildings.		Moderate Adverse	n/a	
Biodiversity	This route has the potential to cause impacts to gathering (pre-maternity) roosts of barbastelle bats. Given the recorded roosts are gathering roosts and are further away from the main maternity roost area (around Morton) the impact is Large (rather than very large) Adverse.	n/a		Large Adverse	n/a		
Water Environment	Construction of new viaducts over the River Wensum and River Tud and their associated flood plains is likely to have a minor adverse effect on the riparian habitat, water quality and conveyance during construction phase. Some potential impacts during construction can be mitigated to negligible effect. Construction of bridge piers in the flood plain will cause a moderate adverse impact to flood risk. Compensatory storage and hydraulic modelling is likely to be required in this scheme design. Impact to groundwater is considered negligible due to suitable drainage mitigation.	n/a		Moderate Adverse	n/a		
Social	Commuting and Other users	Journey Time Benefits are the main source of monetised impacts for this option. Commuting and other users account for approximately 70% of journey time benefits		Value of journey time changes (£)	£229.4M		
			Net journey time changes (£)				
			0 to 2min	2 to 5min	> 5min		
			£88.9m	£83.5m	£57.1m		
	Reliability impact on Commuting and Other users	Providing a higher class standard of road than currently exists should lead to improved journey time reliability along this route.			Beneficial	£225.4m	
	Physical activity	This option does not include measures aimed specifically at walking and cycling, however Walking and Cycling will be considered moving forward potentially through design of the route options and or potentially through the proposed additional non road options carried through from the initial sifting to be considered as part of a package of measures. The reduction in traffic on the local roads due to the scheme is likely to create a better environment for walkers and cyclist, therefore the scheme is likely to generate additional walking and cycling trips. At this current stage the size of the increase is unknown, therefore the impact is assumed as neutral to slight beneficial.			Neutral/slight Beneficial		
	Journey quality	The impact on traveller care will be neutral - beneficial. All elements will be designed to current industry standards therefore this may be an improvement to traveller environment over the existing local roads that are currently being used. The impact on travellers' views will be neutral as the majority of works will run through countryside. The impact on traveller stress will be beneficial as the scheme will reduce congestion and delay, which will improve route certainty and therefore reduce traveller stress. Overall the impact on journey quality is assumed as beneficial.			Beneficial		
	Accidents	The proposed options will encourage a reassignment of traffic away from existing lower standard routes to the new higher standard highway links proposed between the A47 and A1067. It is expected that this will produce an overall reduction in accidents in the study area and deliver a beneficial outcome.			Beneficial		
	Security	No significant security risk will be introduced by the proposed scheme. The security impact is assumed to be neutral.			Neutral		
	Access to services	At this stage the scheme focuses on highway improvements with no change in the routes served by the public transport system or the transport costs, although this may change in the future. The accessibility impact is currently assumed as neutral.			Neutral		
Affordability	The scheme has not been designed to address the affordability of the transport system, there will be no change in fares/travel costs for users apart from those already identified through TUBA via Car Fuel and Non-Fuel operating costs. The affordability impact is assumed as Neutral.			Neutral			
Severance	The scheme is likely to sever existing public rights of way along the new road corridor. However, the reduction in traffic along the existing local roads should reduce severance on the towns and villages. Where routes are severed it is considered that crossing facilities will be provided in line with or in close proximity to existing routes, or if required alternative routes will be provided, which should mitigate the impact of the new road. The severance impact is classed as neutral to slight beneficial.			Neutral/slight Beneficial			
Option and non-use values	At this stage the scheme does not directly provide for new public transport services. The option values impact is assumed as neutral.			Neutral			
Public Account	Cost to Broad Transport Budget	It is currently envisaged that the scheme will be fully public funded		-	£166.6m		
	Indirect Tax Revenues	The proposed option would result in changes in fuel use with affects indirect tax revenues.		-	£0.31m		

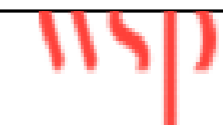
Appraisal Summary Table		Date produced:	5th June 2019	Contact:				
Name of scheme:	Norwich Western Link	Name		Organisation		Role	Promoter/Official	
Description of scheme:		Role		Promoter/Official				
Impacts	Summary of key impacts	Assessment						
		Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp	
Economy	Business users & transport providers	Journey Time Benefits are the main source of monetised impacts for this option. Business users account for approximately 30% of journey time benefits			Value of journey time changes (£)	£90.9m	Beneficial	£92.5m
					Net journey time changes (£)			
		0 to 2min	2 to 5min	> 5min				
	Reliability impact on Business users	Providing a higher class standard of road than currently exists should lead to improved journey time reliability along this route.	£33.1m	£29.8m	£28.1m	Estimating the value of reliability savings as around 10% of travel time savings would indicate a reliability benefit of £9.1m for Business users.	Beneficial	-
Regeneration	There is no development dependant on the scheme	Not Calculated					-	
Wider Impacts	The scheme is considered to bring positive wider impacts in addition to transport user benefits as the scheme is likely to enable development with and around Norwich	Not Calculated				Beneficial	-	
Environmental	Noise	<b>NB. This assessment did not use the WebTAG worksheet and DMRB guidance. It is based on qualitative methodology set out by WSP in a Technical Memorandum, 2019.</b> For properties close to the junction with the A1067, including Low Farm, Old Hall Farm, Old Hall Farm Cottages and Woodstock, the works in this area include a viaduct crossing over the River Wensum, a drainage basin, and the construction of a roundabout to form a junction with the A1067. Due to the proximity and nature of these works, there is an increased risk of adverse impacts due to construction noise and vibration. The proximity of the route also means that there may be adverse impacts due to operational noise. For properties close to the junction with the A47, the works in this area include a viaduct crossing over the River Tud and a drainage basin. Due to the proximity and nature of these works, there is an increased risk of adverse impacts due to construction noise and vibration. The proximity of the route also means that there may be adverse impacts due to operational noise.			n/a		Similar to those from Route Option B western and eastern variants and Route Option C and would be classed as negligible in magnitude.	n/a
	Air Quality	Overall there is a net improvement in air quality and an increase in regional NOx emissions. Uncertainties include: no forecast of traffic growth beyond 2040, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2080.	Assessment Score 2025 PM2.5: -51.69 NO2: -194.71  Assessment Score 2040 PM2.5: -68.10 NO2: -263.38  Emissions 2025 NOx: - 19 tonnes  Emissions 2040 NOx: + 9 tonnes  Properties Improved: 10112 Neutral: 129 Worsening: 7196			N/A	NPV of change in PM10 emissions: -£1,971,176 NPV of change in NOx emissions: -£1,057,187 (2019 prices) Total NPV of change in air quality: -£3,028,364	
	Greenhouse gases							
	Landscape	There would be subdivision of fields, disrupting field patterns locally. The road is on viaduct in the north, then running in sections of cutting and on embankment through the central part and onto embankment and a viaduct over the River Tud in the south, where on viaduct it would have a substantial impact on tranquillity and introduce a new element into this landscape which would have a wider effect. The alignment which is dualled is larger than the existing roads in the surrounding Landscape. There would be some loss of woodland and arable farmland altering land cover locally.	n/a		Moderate Adverse	n/a		
	Townscape	Not applicable to the proposed Option D East.						
	Historic Environment	The scheme would be intrusive in the setting (context), and will adversely affect the appreciation and understanding of the characteristic historic environmental resource. The scheme would be a major direct impact on regionally or locally significant historic environment non-designated assets, resulting in loss of features such that their integrity is substantially compromised, but adequate mitigation can be specified.	There are no designated heritage assets that will be physically affected by the scheme. There are five designated heritage assets that could have a setting impact, one Grade I, one Grade II* and three Grade II listed buildings.			Moderate Adverse	n/a	
	Biodiversity	This route has the potential to cause impacts to gathering (pre-maternity) roosts of barbastelle bats. Given the recorded roosts are gathering roosts and are further away from the main maternity roost area (around Morton) the impact is Large (rather than very large) Adverse.	n/a		Large Adverse	n/a		
Water Environment	Construction of new viaducts over the River Wensum and River Tud and their associated flood plains is likely to have a minor adverse effect on the riparian habitat, water quality and conveyance during construction phase. Some potential impacts during construction can be mitigated to negligible effect. Construction of bridge piers in the flood plain will cause a moderate adverse impact to flood risk. Compensatory storage and hydraulic modelling is likely to be required in this scheme design. Impact to groundwater is considered negligible due to suitable drainage mitigation.	n/a		Moderate Adverse	n/a			
Social	Commuting and Other users	Journey Time Benefits are the main source of monetised impacts for this option. Commuting and other users account for approximately 70% of journey time benefits			Value of journey time changes (£)	£229.4M	Beneficial	£225.4m
					Net journey time changes (£)			
		0 to 2min	2 to 5min	> 5min				
	Reliability impact on Commuting and Other users	Providing a higher class standard of road than currently exists should lead to improved journey time reliability along this route.	£88.9m	£83.5m	£57.1m		Beneficial	
	Physical activity	This option does not include measures aimed specifically at walking and cycling, however Walking and Cycling will be considered moving forward potentially through design of the route options and or potentially through the proposed additional non road options carried through from the initial sifting to be considered as part of a package of measures. The reduction in traffic on the local roads due to the scheme is likely to create a better environment for walkers and cyclist, therefore the scheme is likely to generate additional walking and cycling trips. At this current stage the size of the increase is unknown, therefore the impact is assumed as neutral to slight beneficial.					Neutral/slight Beneficial	
	Journey quality	The impact on traveller care will be neutral - beneficial. All elements will be designed to current industry standards therefore this may be an improvement to traveller environment over the existing local roads that are currently being used. The impact on travellers' views will be neutral as the majority of works will run through countryside. The impact on traveller stress will be beneficial as the scheme will reduce congestion and delay, which will improve route certainty and therefore reduce traveller stress. Overall the impact on journey quality is assumed as beneficial.					Beneficial	
	Accidents	The proposed options will encourage a reassignment of traffic away from existing lower standard routes to the new higher standard highway links proposed between the A47 and A1067. It is expected that this will produce an overall reduction in accidents in the study area and deliver a beneficial outcome.					Beneficial	
	Security	No significant security risk will be introduced by the proposed scheme. The security impact is assumed to be neutral.					Neutral	
	Access to services	At this stage the scheme focuses on highway improvements with no change in the routes served by the public transport system or the transport costs, although this may change in the future. The accessibility impact is currently assumed as neutral.					Neutral	
	Affordability	The scheme has not been designed to address the affordability of the transport system, there will be no change in fares/travel costs for users apart from those already identified through TUBA via Car Fuel and Non-Fuel operating costs. The affordability impact is assumed as Neutral.					Neutral	
Severance	The scheme is likely to sever existing public rights of way along the new road corridor. However, the reduction in traffic along the existing local roads should reduce severance on the towns and villages. Where routes are severed it is considered that crossing facilities will be provided in line with or in close proximity to existing routes, or if required alternative routes will be provided, which should mitigate the impact of the new road. The severance impact is classed as neutral to slight beneficial.					Neutral/slight Beneficial		
Option and non-use values	At this stage the scheme does not directly provide for new public transport services. The option values impact is assumed as neutral.					Neutral		
Public Account	Cost to Broad Transport Budget	It is currently envisaged that the scheme will be fully public funded					-	£155.3m
	Indirect Tax Revenues	The proposed option would result in changes in fuel use with affects indirect tax revenues.					-	£0.31m

# Appendix G

---

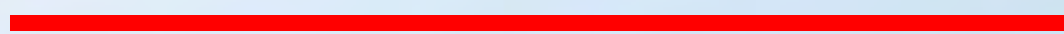
OPTION BASE COSTS





HIGHWAYS DESIGN - ROADWORKS ESTIMATING SYSTEM		Initial interim estimate check file revision 9A w/c 10/06/19 (uses 8A with revised land figures from NCC and risk register run updates 10/06/19.)					
Client - Norfolk County Council		FOR FINANCIAL CASE					
SCHEME Norwich Western Link Project Route Options							
Revised Budget Estimate March 2019							
ESTIMATE PRICE BASE: Q1 2019							
Roadworks Sub Total (1)		£21,453,404	£33,606,129	£31,386,615	£29,070,150	£33,398,298	£32,021,495
Structures Sub Total (2)		£2,417,506	£22,876,152	£44,466,928	£45,383,066	£50,107,626	£46,231,930
Sub-Total (Basic Works Construction Costs)		£23,870,910	£56,482,281	£75,853,543	£74,453,217	£83,505,923	£78,253,425
Preliminaries(incl OH&P)		£5,490,309	£12,143,690	£15,549,976	£15,262,909	£16,492,420	£15,455,051
Sub-Total (Basic Works Construction Costs incl Preliminaries allowance)		£29,361,220	£68,625,971	£91,403,520	£89,716,126	£99,998,343	£93,708,476
Further Identified Items Sub-Total		£500,000	£750,000	£750,000	£1,000,000	£1,000,000	£1,000,000
WORKS BY/FOR OTHER AUTHORITIES							
Statutory Undertakers and others Sub-Total		£1,291,442	£2,342,162	£1,703,065	£1,634,409	£5,637,653	£5,637,653
LAND COSTS including compensation		£5,700,000	£16,900,000	£14,200,000	£10,300,000	£15,400,000	£12,700,000
LAND COSTS including compensation sub-Total		£5,700,000	£16,900,000	£14,200,000	£10,300,000	£15,400,000	£12,700,000
GROSS SCHEME CONSTRUCTION COST Estimate		£36,852,662	£88,618,134	£108,056,585	£102,650,535	£122,035,996	£113,046,129
Preparation & Supervision Sub-Total		£8,833,895	£10,979,902	£12,223,057	£12,130,319	£12,818,826	£12,477,414
Basic SCHEME ESTIMATE incl Prep and Supervision ( Excl RISK).		£45,686,557	£99,598,036	£120,279,642	£114,780,854	£134,854,823	£125,523,543
Overall Scheme Design/Construct Risk Allowance		£10,742,272	£21,504,589	£27,352,083	£26,872,937	£30,729,522	£29,020,000
Forecast Future inflation to mid construction period		£4,218,618	£9,254,385	£10,485,666	£11,030,579	£12,580,924	£11,892,958
INITIAL HIGH LEVEL FINANCIAL CASE ESTIMATE TOTALs for Norwich Western Link Project Route Options (using indicative details(Excl VAT))		£60,647,447	£130,357,009	£158,117,391	£152,684,370	£178,165,269	£166,436,501
		FOR ECONOMIC CASE					
Basic SCHEME ESTIMATE incl Prep and Supervision ( Excl RISK).		£45,686,557	£99,598,036	£120,279,642	£114,780,854	£134,854,823	£125,523,543
Overall Scheme Design/Construct Risk Allowance		£8,820,160	£17,282,940	£21,825,350	£21,336,876	£24,365,777	£23,009,214
Forecast Future inflation to mid construction period		£4,074,921	£8,931,776	£10,093,125	£10,599,486	£12,097,413	£11,430,396
INITIAL HIGH LEVEL ECONOMIC CASE ESTIMATE TOTALs for Norwich Western Link Project Route Options (using indicative details(Excl VAT))		£58,581,638	£125,812,752	£152,198,117	£146,717,216	£171,318,013	£159,963,153
Current Design Stage Recommended OB Allowance (Roadworks as DfT guidance say stage 1.5)		15,837,851	25,171,544	22,292,085	19,951,735	25,348,257	23,788,183
Current Design Stage Recommended OB Allowance (Structures as DfT guidance say stage 1.5)		2,177,834	18,016,041	34,101,119	35,192,476	37,999,314	35,299,734
INITIAL HIGH LEVEL ECONOMIC CASE ESTIMATE TOTALs for Norwich Western Link Project Route Options (using indicative details(Excl Future inflation & VAT))		£76,597,323	£169,000,337	£208,591,321	£201,861,427	£234,665,585	£219,051,070
Approx de-inflating year 2010 90.1		£63,018,759	£127,854,183	£147,759,090	£141,136,020	£166,537,885	£155,601,460

# Appendix H



PROJECT PROGRAMME

ID	Task Name	Duration	Start	Finish	2018				2019				2020				2021				2022				2023				2024				2025		
					Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	<b>Norwich Western Link</b>	<b>1859 days</b>	<b>Mon 05/02/18</b>	<b>Tue 06/05/25</b>	[Gantt bar spanning from Q1 2018 to Q3 2025]																														
2																																			
3	<b>Pre-contractor design</b>	<b>734 days</b>	<b>Mon 05/02/18</b>	<b>Tue 29/12/20</b>	[Gantt bar from Q1 2018 to Q4 2020]																														
9																																			
10	<b>Option Development and Appraisal</b>	<b>178 days</b>	<b>Mon 05/02/18</b>	<b>Wed 17/10/18</b>	[Gantt bar from Q1 2018 to Q4 2018]																														
17																																			
18	<b>October 2018 EDT Committee</b>	<b>30 days</b>	<b>Mon 03/09/18</b>	<b>Fri 12/10/18</b>	[Milestone marker]																														
22																																			
23	<b>November 2018 EDT Committee</b>	<b>35 days</b>	<b>Mon 24/09/18</b>	<b>Fri 09/11/18</b>	[Milestone marker]																														
27																																			
28	<b>Shortlist Consultation</b>	<b>94 days</b>	<b>Thu 18/10/18</b>	<b>Fri 01/03/19</b>	[Gantt bar from Q4 2018 to Q1 2019]																														
33																																			
34	<b>March 2019 EDT Committee</b>	<b>30 days</b>	<b>Mon 28/01/19</b>	<b>Fri 08/03/19</b>	[Milestone marker]																														
38																																			
39	<b>Strategic Outline Business Case (SOBC)</b>	<b>172 days</b>	<b>Thu 13/09/18</b>	<b>Mon 20/05/19</b>	[Gantt bar from Q4 2018 to Q2 2019]																														
46																																			
47	<b>Options Assessment</b>	<b>101 days</b>	<b>Mon 28/01/19</b>	<b>Fri 21/06/19</b>	[Gantt bar from Q1 2019 to Q2 2019]																														
53																																			
54	<b>Preferred Route Announcement (PRA)</b>	<b>67 days</b>	<b>Mon 08/04/19</b>	<b>Mon 15/07/19</b>	[Gantt bar from Q2 2019 to Q3 2019]																														
59																																			
60	<b>Regional Evidence Base (REB)</b>	<b>163 days</b>	<b>Wed 13/02/19</b>	<b>Fri 04/10/19</b>	[Gantt bar from Q4 2018 to Q4 2019]																														
68																																			

Project: Norwich Western Link Version: Rolled Up Version Revision: 1.1 03/07/19	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Critical	
	Milestone		External Milestone		Manual Task		Start-only		Critical Split	
	Summary		Inactive Task		Duration-only		Finish-only		Progress	



# Appendix I

---

RISK REGISTER






Risk Register - Norfolk County Council																					
Risk Register Name		Norwich Western Link										Red		Significant mitigation tasks are falling behind and there are serious concerns that the target score will not be achieved by the target date and the shortcomings must be addressed and/or new tasks introduced.							
Prepared by		[REDACTED]										Amber		One or more of the mitigation tasks are falling behind and there are some concerns that the target score may not be achievable by the target date unless the shortcomings are addressed.							
Date updated		May 2019										Green		The mitigation tasks are on schedule and the risk owner considers that the target score is achievable by the target date.							
Next update due		June 2019										Met		The target score has been met by the target date.							
CDGS/TP	Area	Risk Number	Risk Name	Risk Description	Date entered on risk register	Original Likelihood	Original Impact	Original Risk Score	Current Likelihood	Current Impact	Current Risk Score	Tasks to mitigate the risk	Progress update	Target Likelihood	Target Impact	Target Risk Score	Target Date	Prospects of meeting Target Risk Score by Target Date	Risk Owner	Reviewed and/or updated by	Date of review and/or update
Proj	Strategic	C02	C Scope Change	Design changes post preliminary design result in additional land requirements Risk Impact - Need to buy extra third party land, delays to scheme, extra cost	18 Jun 18	4	4	16	2	2	4	Options to consider robust footprint and requirement to purchase land as appraisal methodology progresses. Include mitigation land and temporary land construction.	Landtake being considered with NCC. Initial scheme footprint developed and indicative spatial requirements road embankments and large features such as basins identified. Temporary works land requirements yet to confirmed.	1	2	2	30 Mar 20	Green	NCC / WSP	[REDACTED]	07 May 19
Proj	Strategic	C03	C Scope Change	Changes in junction design Risk Impact - may impact on alignment, location of river crossings, land take, cost and delay	18 Jun 18	3	3	9	2	3	6	The A1067 junction strategies have been developed considering robust junction design footprint options in terms of land take (e.g. roundabout rather than signals or priority junctions)	Preliminary outlines of main A1067 junctions developed, but junctions with A47 still subject to HE scheme.	1	1	1	31 Dec 20	Green	NCC / WSP	[REDACTED]	07 May 19
Proj	Strategic	C04	C Scope Change	NDR monitoring impact on Business Case and options for NWL Risk Impact: 1. Incorrect information provided 2. misleading model results leading to wrong scheme option selection	18 Jun 18	3	4	12	2	3	6	undertake post opening surveys and share with NWL team	NDR surveys carried out in May/June 2018 and being fed into traffic model	1	1	1	31 Mar 19	Green	NCC	[REDACTED]	07 May 19
Proj	Strategic	C05	C Scope Change	HE Departures may not be granted Risk Impact: 1. Redesign 2. Increased costs 3. Delays	18 Jun 18	3	4	12	2	3	6	Carry out preliminary designs to meet requirements of DMRB/national standards wherever possible - minimise need for departures	Preliminary horizontal route alignment and vertical long section profiles now prepared for options but only based on LIDAR survey at this stage. Preferred scheme expected to broadly meet main geometrical requirements subject to further site constraints identified from further surveys, and detailed cross sections designs prepared. HE Junction options tbc - initial sketches considered in high level for A47 interface. HE aware of NWL and will consider future connectivity in their design once NWL committed.	1	1	1	31 Dec 20	Green	NCC / WSP	[REDACTED]	07 May 19
Proj	Strategic	C06	C Scope Change	Variation between actual site conditions and assumptions used in design, ground and topo Risk Impact - Risk more expansive ground works, land take increases, delay and cost impacts. Drainage design may need revision	18 Jun 18	3	4	12	2	3	6	Intrusive ground investigation surveys to be undertaken sufficiently soon in programme (including ground water monitoring and infiltration testing) and assume robust design in absence of GI (e.g. piled foundations)	desktop review of ground conditions underway	2	3	6	31 Dec 20	Green	NCC / WSP	[REDACTED]	07 May 19
Proj	Strategic	C07	C Scope Change	Last minute design changes either immediately prior to or after planning application submitted Risk Impact - Need for re-consultation, or application not accepted.	18 Jun 18	3	4	12	2	4	8	engage all key stakeholders early on in design process, liaise landowners, design checks and mitigation, EIA and rigorous design process, peer review and consultation to flesh out key issues early	initial round of consultation held, stakeholders engaged in design process	1	3	3	31 Mar 19	Green	NCC / WSP	[REDACTED]	07 May 19
Proj	Strategic	C08	C Scope Change	Design Departures subject to NCC approval. Risk Impact - Approvals not achieved so scheme cannot proceed or requires modification	18 Jul 18	2	4	8	2	3	6	Engage with NCC technical approval team and seek early advice on any potential departures	Initially seek to design scheme outlines with no Departure. Ensure conformity of outline designs to DMRB geometric design standards with tolerances where possible. Further refinements required to preferred route design when more information (utilities, topographical survey, ground investigation etc) is available.	1	1	1	30 Mar 20	Green	NCC / WSP	[REDACTED]	07 May 19
Proj	Strategic	C10	C Scope Change	DfT makes updates which affect traffic modelling Risk Impact - Modelling to be re-worked based on new data	02 Jul 18	2	3	6	1	3	3	Early assessment of any DfT updates.	Working to latest DfT data	1	3	3	31 May 19	Green	NCC / WSP	[REDACTED]	07 May 19
Proj	Strategic	C11	C Scope Change	Risk estimate used to determine round 2 consultation costs found to be inaccurate once further work and information obtained. Risk Impact - Scheme cost may increase	26 Nov 18	4	3	12	2	1	2	Work through surveys once preferred options selected	Initial risk pot identified- QS to review for each option	2	2	4	31 May 19	Green	NCC / WSP	[REDACTED]	07 May 19

Proj	Strategic	C12	<b>C Scope Change</b>	Advances in technology eg driverless cars, results in design requirement changes. Risk Impact - Cost increase, delay to programme. Scheme not future proofed.	13 Dec 18	2	4	8	1	2	2	Keep up to date with industry experts and government guidance and anticipated future requirements to future proof scheme.	Ongoing	1	2	2	30 Jun 20	Green	NCC / WSP	██████	07 May 19
Proj	Strategic	C13	<b>C Scope Change</b>	The current need or provision of cycleways and/or footways or footpaths is not known at this stage, and it is unclear if this infrastructure will adjoin the proposed carriageway or be provided offline by upgrading existing trails, paths and local roads. This is subject to a decision of the preferred route. Risk Impact - additional scope and costs to provide, delays if stakeholder consultations are required	08 May 19	3	3	9	2	2	4	Carry out further investigation to determine existing trails, links and PROW and understand desire line. Liaise with NCC and local stakeholders to gauge their views on measures being proposed. Design and include agreed proposals in package of works to Contractor.	Allowances made for a 2m wide grit footpath /cycleway in base cost, and in Quantified Risk Assessment (QRA) for scope increase due to possible cycleway/footpath/footway provision on basis of similar measures that were implemented for the NDR (A1207) scheme.	1	1	1	31 Dec 20	Green	NCC / WSP	██████	09 May 19
Proj	Strategic	D01	<b>D Weather</b>	Adverse weather conditions/flooding e.g. greater than 1 in 10 year storm Risk Impact: 1. Delays to ground works 2. Compensation for contractors	18 Jun 18	3	3	9	2	2	4	time works to minimise risk, contingency in delivery programme/budget	delivery programme under development	2	2	4	31 Aug 22	Green	NCC	██████	07 May 19
Proj	Operational	E01	<b>E Design Risk Products / Materials</b>	Construction value increases on key materials Risk Impact - Cost increase. Delays whilst construction value negotiations take place	18 Jun 18	2	2	4	2	2	4	Estimates will be calculated in a rigorous manner taking into account inflation along with a realistic delivery programme. Consider alternative materials/construction methods	Estimated undertaken in 2017 for previous study, Further estimates to be undertaken in late 2018. Not directly controlled by scheme. Prices updated to Q1 2019	2	2	4	31 Aug 22	Green	NCC	██████	07 May 19
Proj	Strategic	E02	<b>E Design Risk Products / Materials</b>	OAR does not set out robust approach to choosing preferred options Risk Impact - Delays programme and challenge to process	18 Jun 18	2	3	6	2	3	6	Follow webTAG guidance. Provision of a Robust EAST process. Benchmarking	Project proceeding in accordance with WebTAG and EAST. Benchmarking against other environmentally sensitive schemes.	2	3	6	31 May 19	Green	NCC / WSP	██████	07 May 19
Proj	Strategic	E03	<b>E Design Risk Products / Materials</b>	Inability to achieve acceptable highway geometry Risk Impact - Project may be forced to accept steeper gradient and be non compliant with legislation or design standards	18 Jun 18	2	4	8	1	2	2	Obtain LIDAR surveys. Review survey to ensure site extents are covered. Undertake preliminary geometric designs to design standards based on terrain survey.	Preliminary designs prepared using LIDAR survey to the TD9 requirements with some tolerances if possible. Ground topographical survey required to more accurately assess terrain and refine design profile. Further refinements required to preferred route design when more information (utilities, topographical survey, ground investigation etc) is available.	2	2	4	30 Mar 20	Green	NCC / WSP	██████	07 May 19
Proj	Strategic	E04	<b>E Design Risk Products / Materials</b>	Change in structure type, appearance and span arrangement - Viaducts. Risk Impact: 1. Redesign works and possible delay 2. Increase in costs 3. May impact on land requirements	18 Jun 18	2	3	6	2	2	4	Investigate various structure types, appearance and span arrangements at Options stage. Consider input from architectural advisers. Allow margin in preliminary sizing of bridge elements so later minor changes in parameters don't require significant redesign. Seek agreement from all stakeholder prior to proceeding with design.	Photomontages are in progress which will show what the landscape will look like. Ensure cross functional input from structures, landscape, highway and environmental disciplines to ensure wider considerations are captured at early stages. Arrange stakeholder feedback through NCC to ensure public acceptance.	2	2	4	30 Mar 20	Green	NCC / WSP	██████	07 May 19
Proj	Strategic	E05	<b>E Design Risk Products / Materials</b>	RSA leads to changes in design stage 1, 2 and 3) Risk Impact - Late design changes impact on programme	02 Jul 18	3	3	9	3	3	9	Seek early review/ input from Road safety team at NCC	No formal safety review carried out at current stage. Safety in design being considered as part of CDM process. Stage 1 RSA to be undertaken on preferred route.	1	1	1	30 Mar 20	Green	NCC / WSP	██████	07 May 19
Proj	Strategic	E06	<b>E Design Risk Products / Materials</b>	Proceeding with the preliminary design in the absence of GI Risk Impact - Potential change to foundations if proposed GI does not confirm desktop information. Cost and programme impact.	02 Jul 18	3	3	9	3	3	9	assume worst case- piled foundations, undertake intrusive testing early in the design process	Completing desk study	3	3	9	31 Jan 20	Green	NCC	██████	07 May 19
Proj	Operational	E07	<b>E Design Risk Products / Materials</b>	Unforeseen traffic delays once scheme fully operational. Risk Impact - Reputational impact, further mitigation work required at additional cost and time.	02 Jul 18	2	3	6	2	1	2	Scenario planning to be undertaken. Make allowance for refinements to scheme should they be required.		2	1	2	30 Sep 22	Green	NCC / WSP	██████	07 May 19
Proj	Operational	F01	<b>F Environmental</b>	During construction protected species not previously identified may be found to be present in location of project Risk Impact: 1. Make area safe for protected species 2. Relocate where applicable 3. Schedule relocation at suitable time 4. Delays to project and associated cost for rehoming and delays	18 Jun 18	2	4	8	2	3	6	Maintain survey data and ensure it is up to date, time ecology species surveys to maximise shelf life An ecological watching brief could be maintained prior to the start of construction.	ecology surveys programmed	2	2	4	31 Mar 20	Green	NCC / WSP	██████	07 May 19
Proj	Operational	F02	<b>F Environmental</b>	Contamination is discovered on the land Risk Impact - Additional cost for testing and treating and removal	18 Jun 18	2	3	6	1	2	2	Undertake desk based assessment and intrusive investigation of appropriate areas pre-submission of the application to target these areas.	desk top study initiated	1	3	3	31 Aug 22	Green	NCC / WSP	██████	07 May 19

Proj	Strategic	F03	<b>F Environmental</b>	Lack of access to undertake environmental surveys Risk Impact - Incomplete surveys and hence assessments may not be suitable for submission to the determining authority	18 Jun 18	4	3	12	3	3	9	Work with landowners to agree access and undertake worst case assessment if suitable to do so. Ensure programme has sufficient time for access and seasonal surveys (including statutory powers notifications).	initial landowner meetings held. Seek solution which is acceptable to affected parties programme planned for statutory notices WSP land referencing team working on gaining access to study area	1	1	1	31 May 19	Green	NCC / WSP	██████	07 May 19
Proj	Operational	F04	<b>F Environmental</b>	Invasive species may be found to be present in location of project Risk Impact - Additional cost for testing and treating and removal prior to construction commencing	18 Jun 18	2	2	4	2	2	4	Undertake a suitable survey to identify the presence of these species - opportunity to improve situation	Phase 1 habitat survey to be undertaken July 2019	1	1	1	31 Aug 21	Green	NCC	██████	07 May 19
Proj	Operational	F05	<b>F Environmental</b>	Archaeological remains that require significant intrusive investigation are found to be present Risk Impact - Risk to pre-construction programme and cost from survey requirements pre-application. Re-route scheme to avoid known sites of archaeological value. Will also result in increased costs and delays to activities/ programme	18 Jun 18	3	4	12	3	4	12	Work with Historic England and the archaeological officer of NCC to agree scope of the assessment. Identify a suitable WSI in advance of intrusive works to ensure that archaeological matters are appropriately addressed at all suitable stages. Archaeological desk study, Geotech surveys, trial trenching along preferred route(s), avoid any nationally significant archaeology. Geophys post PRA	desk study initiated	2	4	8	31 Aug 21	Green	NCC	██████	07 May 19
Proj	Strategic	F06	<b>F Environmental</b>	Failure to reach agreement with relevant consultees with regard to significant environmental impacts and mitigation. E.g. SSSI Risk Impact - Potential objectors to the project that could jeopardise delivery	02 Jul 18	3	4	12	3	3	9	Consider upgrading of existing routes or opt for new routes that do not cross the SAC. benchmarking of other recent schemes. Strict contractor requirements - onerous CEMP. A draft CEMP will be submitted with the application. Procurement of contractor progressed at same time as application docs. Experienced contractor. treatment controls and SW attenuation	see above SAC risk	2	2	4	31 Dec 20	Green	NCC / WSP	██████	07 May 19
Proj	Strategic	F07	<b>F Environmental</b>	Negative impact due to environmental objectors to the scheme e.g. Wensum Valley Alliance, Campaign for Rural England Risk Impact - Potential objectors to the project that could jeopardise public support	02 Jul 18	4	3	12	4	3	12	Meet with relevant bodies e.g. CPRE as the scheme progresses through development, including workshops for specific groups to address and reduce concerns where feasible. Stakeholder management plan to be developed.	NCC held meetings with CPRE and Wensum Alliance - LLG includes reps. Met with Norfolk Wildlife Trust.	2	2	4	31 Dec 20	Green	NCC	██████	07 May 19
Proj	Strategic	F08	<b>F Environmental</b>	Noise impacts are deemed to require mitigation Risk Impact - Mitigation required such as acoustic fencing or false cutting; this could lead to additional land take or visual impacts. Cost	02 Jul 18	3	2	6	3	2	6	Noise assessment in EIA - seek adequate buffer zone from nearest receptors. Incorporate bunding in areas in closest proximity to residential receptors at outline design phase. Flexibility in highway fencing arrangements to incorporate a solid acoustic barrier if required. modelling to inform noise assessments and mitigation design.	Traffic modelling to inform noise assessment. Note, that any changes to traffic data may require an update to the noise modelling and assessment, and therefore potentially the mitigation measures adopted.	2	2	4	31 Dec 20	Green	NCC	██████	07 May 19
Proj	Strategic	F09	<b>F Environmental</b>	Significant adverse environmental effects identified in the application Risk Impact - Application would progress with a significant effect presented in the Environmental Statement. This may be deemed unacceptable the determining authority compared to the benefits it would deliver	02 Jul 18	4	4	16	3	3	9	See F10 with regard to ensuring that the mitigation is not wholly inappropriate. Work with engineers to try and 'design out' significant effects so that they don't arise in the first place.	considering wide range of options	2	2	4	31 Dec 20	Green	NCC / WSP	██████	07 May 19
Proj	Strategic	F10	<b>F Environmental</b>	Unclear guidance and currently unconfirmed scope of mitigation required for environmental impacts. Risk Impact - Use of 'Rochdale Envelope' results in mitigation measures that are too onerous given the eventual impacts identified. Only applies to DCO	02 Jul 18	2	3	6	2	3	6	Undertake assessment as soon as practicable to do so, such that measures can be incorporated into the design at an early stage. Work with engineers to ensure that the worst case is not an unrealistic worst case.		2	2	4	31 Dec 20	Green	NCC / WSP	██████	07 May 19
Proj	Strategic	F11	<b>F Environmental</b>	Lack of timely response from stakeholders / consultees on the scope / methodology of environmental surveys and/or a change in requirements following assessment Risk Impact - Risk of surveys being undertaken without agreement on the methodology. This could result in the need to repeat surveys.	02 Jul 18	3	3	9	3	3	9	Work with consultees to develop positive relationships and document all correspondence. Agree survey scope before site work.	Meeting with NE held on 08/03/19 and scope of surveys verbally agreed. HB to seek written confirmation on scope of surveys. Scope cannot be agreed until NE issue licence for radiotracking	1	1	1	31 May 19	Green	NCC / WSP	██████	07 May 19
Proj	Operational	F12	<b>F Environmental</b>	Inclement weather/flooding may affect accessibility of land for surveys Risk Impact - Potential to miss environmental surveys which are seasonal	02 Jul 18	2	4	8	2	2	4	Programme in surveys as soon as the requirement is identified hence providing a suitable window in which to rearrange surveys. Contingency in programme and resource planning for phase 2 surveys		1	1	1	31 May 19	Green	NCC / WSP	██████	07 May 19
Proj	Strategic	F13	<b>F Environmental</b>	Arboricultural surveys identify mitigation works requiring off site works Risk Impact - Cost and programme impact of identifying these locations. Due to Ancient woodlands in proximity to scheme - could have land take impacts (e.g. 1:10 ratio of removal: replacement).	02 Jul 18	3	3	9	2	2	4	Programme an arboricultural survey of the preferred route as soon as feasible. Design to avoid Ancient Woodlands (and potential Ancient Woodland)		2	1	2	31 Jan 20	Green	NCC	██████	07 May 19
Proj	Strategic	F14	<b>F Environmental</b>	listed building effects - setting effects Risk Impact - may require extra mitigation landscaping/ change the scheme to avoid impacts	18 Jun 18	3	4	12	2	3	6	work with Historic England and the heritage officer of NCC to agree scope of the assessment. Review listed buildings and map re proximity for each options seeking to select lower risk options.	EAST/OAF pick up risk in high level terms	1	1	1	31 Jan 20	Green	NCC	██████	07 May 19

Proj	Strategic	F15	F Environmental	Poor SW Drainage Design - inadequate pollution control and management and control of the volume of runoff during flood events designed into scheme. Risk Impact - Adverse effects on SAC/SSSI	18 Jul 18	4	5	20	3	3	9	work with EA to ascertain suitable pollution control mechanisms and location/capacity/Design of attenuation ponds. Strict contractor requirements - onerous CEMP. Procurement of contractor progressed at same time as application docs. Experienced contractor. treatment controls and SW attenuation. Maintain regular correspondence with Natural England and the Environment Agency with regard to any survey information and emerging assessment conclusions. Work with both consultees to identify mitigation measures that draw upon their specialist knowledge.	Meetings held with EA in order to agree principles that will be acceptable. Contract Procurement workshop organised.	1	1	1	31 Dec 20	Green	NCC / WSP	[REDACTED]	07 May 19
Proj	Strategic	F17	F Environmental	Shading risk from viaduct Risk Impact - increased scheme height mitigation/design change	18 Jul 18	3	2	6	2	2	4	design any new bridges with adequate height clearance. Detailed ph2 ecology surveys on proposed alignment	Height of viaduct provisionally agreed at 18m to avoid shading impacts	1	1	1	31 Dec 20	Green	NCC / WSP	[REDACTED]	07 May 19
Proj	Strategic	F18	F Environmental	Objection risk based on insufficient ecological information being available prior to preferred route announcement Risk Impact - opposition, delays, programme, risk of optioneering process being undermined and judicial review	18 Jul 18	3	3	9	2	2	4	scope surveys with EA and NE and NCC ecology at an early stage. Maintain survey data up to date and work with landowners. Delay OSR and potentially preferred route announcement until sufficient ecological information available.	Initial discussions with NCC ecologist held July 2018. Surveys to be carried out at earliest opportunity. Land access holistic approach being undertaken currently.	1	1	1	31 May 19	Green	NCC / WSP	[REDACTED]	07 May 19
Proj	Strategic	F20	F Environmental	Additional flood risk mitigation required - more land take, more cost and delay Risk Impact - Additional flood risk mitigation required - more land take, more cost and delay	18 Jun 18	2	3	6	2	3	6	Design to minimise land take, identify and agree mitigation with EA and land take requirements. Design robust mitigation for 1:100 year + CC (2016 allowances) with level for level flood plain compensation. Early assessment of impacts in hydraulic model to understand likely land take requirements.	constraints map to identify extents of flood zone 2 and 3 areas	1	1	1	31 Dec 19	Green	NCC	[REDACTED]	07 May 19
Proj	Strategic	F22	F Environmental	Landowners may seek designation of additional ecology constraints on proposed alignment Risk Impact - may need to amend alignment to avoid designated CWS ecology	18 Jun 18	2	2	4	2	2	4	Early engagement with NCC ecology, NE and EA, land compensation to enhance CWS or manage/maintain habitats	Strategy to be developed with NCC.	1	1	1	31 Aug 20	Green	NCC	[REDACTED]	07 May 19
Proj	Strategic	F23	F Environmental	Salt spray contamination of watercourses Risk impact - May need to amend alignment to avoid sensitive ecology. Additional treatment may be required beyond that considered typical for a road scheme.	18 Jun 18	3	4	12	3	4	12	Mitigation by design. Consultation with EA, NE and NCC to discuss and agree pollution control measures.	Strategy to be developed with NCC seeking Meeting 13th July.	1	1	1	31 Dec 19	Green	NCC	[REDACTED]	07 May 19
Proj	Strategic	F24	F Environmental	River Wensum SAC prevents crossing of R Wensum (Natura 2000 site) Risk Impact - may result in scheme which has a significant risk to River Wensum. Increased land take for mitigation - ponds outside extents of extreme flood with conveyance system. The proposals will need to meet the tests as set out in the habitats directive. Should the tests not be met, then consent for the scheme would be in jeopardy	18 Jun 18	5	5	25	2	2	4	Consider upgrading of existing routes or opt for new routes that do not cross the SAC, benchmarking of other recent schemes. Strict contractor requirements - onerous CEMP. Procurement of contractor progressed at same time as application docs. Experienced contractor. treatment controls and SW attenuation. Maintain regular correspondence with Natural England and the Environment Agency with regard to any survey information and emerging assessment conclusions. Work with both consultees to identify mitigation measures that draw upon their specialist knowledge.	Strategy to be developed with NCC. Option dependent - seek minimal risk solution. Work to be planned to as not affect the integrity of the SAC. EA/NE did not object to principle of crossing at R2 consultation	1	1	1	31 May 19	Green	NCC	[REDACTED]	07 May 19
Proj	Strategic	F25	F Environmental	scheme effects may extend to wider residential area than first anticipated Risk Impact - Increased mitigation costs to residents impacted. Scheme opposition, Associated delays	18 Jun 18	2	3	6	2	3	6	select options further from dense residential areas, early noise assessments, HIA, EIA, identify mitigation extents	traffic modelling to inform noise assessment	1	1	1	31 May 19	Green	NCC / WSP	[REDACTED]	07 May 19
Proj	Strategic	F26	F Environmental	Adverse visual impacts created onto the Golf course and other sensitive receptors within view of the viaduct options. Risk Impact - May need to have greater than expected mitigation of the visual impacts from the viaduct and other sections of the scheme that may have adverse visual impacts. This could increase the costs of the scheme.	18 Dec 18	3	2	6	3	2	6	carry out photomontages and produce visualisations of the viaducts early in on in the process (during optioneering)	photomontages being undertaken	1	1	1	31 Jan 20	Green	WSP/NCC	[REDACTED]	07 May 19
Proj	Strategic	F30	F Environmental	Erosion control measures required to prevent future migration of River Wensum and Tud that may pose risk to bridge structures. NE and EA not supportive of measures. Risk Impact - Programme delay. Objection from statutory consultees.	29 Jan 19	2	4	8	2	2	4	Consultation with statutory authorities. Locate new structures away from channel edge. Review of historic maps to predict likely lateral movement. Erosion control options sensitive to existing conditions.		1	1	1	TBC	Green	NCC	[REDACTED]	07 May 19
Proj	Strategic	F31	F Environmental	Groundwater monitoring required, potentially requiring long term monitoring prior to construction. Risk Impact - Programme delay. Cost implication.	29 Jan 19	2	4	8	2	2	4	Consultation with statutory authorities.		1	1	1	TBC	Green	NCC	[REDACTED]	07 May 19
Proj	Strategic	F32	F Environmental	Natural England not issued licence for radiotracking for NWL due to local subcontractor working on own volunteer project in the study area and NE concerned that there is too much overlap in the radiotracking studies and concerns over bat welfare	02 Apr 19	3	3	9	3	3	9	Requested call with NE on 04/05 April and also asked David White to assist.	Update will be provided w/c: 08/04/19	1	1	1	20 Apr 19	Green	WSP	[REDACTED]	07 May 19

Proj	Strategic	F33	F Environmental	Risk of scheme not passing NPPF Sequential Test that requires development to first be directed to lower risk flood zones prior to consideration being given to higher risk flood zones. Application of Exception Test will be required to justify that location in flood zones provides wider sustainability benefit that outweighs flood risk.	04 Apr 19	1	4	4	1	4	4	Ensure evidence base used to inform option selection clearly demonstrates drivers for location of scheme in areas of flood risk and demonstrates consideration of flood risk in option selection.	Flood risk considered within SOBC. All options subject to some form of flooding. Clarification to be provided regarding how flood risk was taken into account in selection of SOBC options and understanding of requirement to pass through flood risk areas.	1	1	1	01 Jun 19	Green	WSP		07 May 19
Proj	Strategic	F34	F Environmental	Risk in delay in starting work mid-July due to delays in PRA. This will then impact the programme of the next stages of work which are already on a tight timeframe.	15 May 19	2	3	6	2	2	4							Green	WSP	General Environment	15 May 19
Proj	Operational	G01	G Third parties stats	Utility diversion cost/risk/timescale/access Risk Impact - Increased costs	18 Jun 18	4	2	8	4	2	8	Seek advice from statutory undertakers on utility impacts for shortlisted options.	Preliminary information obtained on strategic utility assets included on constraint plan. Statutory records requested and compiled for existing utilities asset within proposed route highway corridors.	3	2	6	30 Jun 21	Green	NCC		07 May 19
Proj	Strategic	G02	G Third parties stats	Conflict of potential route with Orsted cable route. Risk Impact - feasibility/safety issues leading to redesign of scheme - extra costs and delays	18 Jun 18	2	3	6	2	2	4	Work with UKPN and understand routing of cable at an early stage. Understand Hazard zones with input from LPPA and HSE	Review of published Orsted documentation to identify cable route. Avoid location where possible on route layouts. C2/C3 utility enquiries to be carried out on the preferred route.	1	1	1	30 Mar 20	Green	NCC		07 May 19
Proj	Operational	G03	G Third parties stats	Utility company diversions not given sufficient planning lead in-time Risk Impact - Materials and resourcing scheduling compromised leading to design and/or build change/disruption.	18 Jun 18	2	2	4	2	2	4	Identify utility constraints and liaise with statutory undertakers at an early stage to seek advice on diversion and protection requirements and timescales.	To be engaged as part of preferred route selection.	1	1	1	30 Jun 21	Green	NCC / WSP		07 May 19
Proj	Operational	G04	G Third parties stats	Unknown buried services may be discovered on site above the levels assumed in the estimate Risk Impact: 1. Increased cost 2. Delays to activities whilst services are addressed	18 Jun 18	3	3	9	2	2	4	Undertake asset record searches and consult statutory undertakers	Preliminary information obtained on strategic utility assets included on constraint plan. Statutory records requested and compiled for existing utilities asset within proposed route highway corridors. C2/C3 utility enquiries to be carried out on the preferred route.	2	2	4	30 Mar 20	Green	NCC		07 May 19
Proj	Strategic	M01	M Modelling	Model base year does not fit well with observed flows on minor rural roads not validated by HE based on Post NDR surveys June 2018 Risk Impact - forecast traffic flows may change which may affect selection of options	02 Jul 18	1	1	1	1	1	1	Refine centroid connector locations in model	Centroid connectors relocated and link flows within webTAG criteria but only 80% of links meet GEH test (85% required). Further disaggregation of zones required to improve fit to WebTAG compliance on GEH	1	1	1	31 May 19	Met	NCC / WSP		07 May 19
Proj	Strategic	M02	M Modelling	A47 preferred option scheme for Tuddenham dualling does not include details of junction design - exact location, at grade/grade separated, roundabout/priority Risk Impact - traffic flows may change in response to revised junction layouts. This may affect preferred options selection	02 Jul 18	3	4	12	2	2	4	seek guidance from HE/SWECO on junctions	Strategy to be developed with HE. Assume grade separated as worst case until more detail available from HE.	1	2	2	31 Dec 19	Green	NCC		07 May 19
Proj	Strategic	M04	M Modelling	DfT may not accept traffic modelling used for assessment and economic appraisal Risk Impact - Inability to support the findings extra modelling work and delay	18 Jun 18	3	3	9	3	3	9	follow webTAG guidance. Produce local model validation report at the OBC stage.	good base model validation - seeking further refinement on local links based on post NDR surveys	2	2	4	31 May 19	Green	WSP		07 May 19
Proj	Strategic	M05	M Modelling	Traffic modelling shows that any feasible road alignment does not have sufficient benefits for business case Risk Impact - Insufficient BCR to progress scheme. Project costs (including mitigation) may outweigh benefits	02 Jul 18	3	5	15	2	4	8	update traffic modelling and undertake scenario testing prior to developing preferred options. Consider low cost scheme options. Consider mitigation costs.	Options list includes range of cost options	2	2	4	31 May 19	Green	NCC / WSP		07 May 19
Proj	Strategic	M06	M Modelling	Model base year does not fit well with observed flows on minor rural roads not validated by HE based on Post NDR surveys Oct 2018 Risk Impact - Forecast traffic flows may change which may affect selection of options	02 Jul 18	3	4	12	3	3	9	Review model base year validation once new survey data available	Surveys completed - data awaited	2	2	4	31 May 19	Green	NCC / WSP		07 May 19
Proj	Operational	P18	P Construction	Wildlife overbridges to be assumed to be 15m wide on the basis of preliminary advise from Ecology team, with a recommendation to be non-shared use. As this requirement is yet to be confirmed, the scheme proposals are currently developed on the basis of the wildlife bridges being provided to standard bridge widths. Risk Impact - additional costs for design and construction will be incurred if it is established that wider or more complicated structures are required.	08 May 19	3	3	9	2	2	4	Complete Ecology Summer surveys across the route corridor to determine impact of link on species and habitats. Confirm number, location and requirement for Wildlife bridges from Ecology team. Design and include proposals in works package to Contractor	Allowances made in Quantified Risk Assessment (QRA) for more wider/more extensive structures, in addition to standard structure estimated in scheme base costs.	1	1		31 Dec 20	Green	NCC / WSP		09 May 19

Proj	Operational	P19	<b>P Construction</b>	<p>At the public consultation, supplementary measures to provision of the Norwich Western Link were strongly supported, and this may include associated traffic calming measures on local roads within the Norwich Western Quadrant. The full scope and extent of these measures are yet to be determined as this is subject to confirmation of the preferred route, and full investigation of the local traffic issues and opportunities for improvement.</p> <p>Risk Impact - additional costs for design and construction to provide supplementary measures, and possible delays if further consultation is required.</p>	08 May 19	2	2	4	2	1	2	<p>Carry out further investigation to appreciate local traffic issues that could be addressed - weight restriction, vehicle restrictions, traffic calming etc. Liaise with NCC and local stakeholders to gauge their views on measures being proposed. Design and include agreed proposals in package of works to Contractor.</p>	<p>Allowances made in Quantified Risk Assessment (QRA) for scope increase due to possible supplementary measures on basis of similar measures that were implemented for the NDR (A1207) scheme.</p>	1	1	31 Dec 20	Green	NCC / WSP		09 May 19
------	-------------	-----	-----------------------	--	-----------	---	---	---	---	---	---	---	---	---	---	-----------	-------	-----------	---	-----------



62-64 Hills Road  
Cambridge  
CB2 1LA

[wsp.com](http://wsp.com)

PUBLIC