Great Yarmouth Third River Crossing

OUTLINE BUSINESS CASE

Large Local Major Scheme

MARCH 2017

Norfolk County Council

Great Yarmouth Borough Council

NEWANGLIA Local Enterprise Partnership for Norfolk and Suffolk

Great Yarmouth Third River Crossing

Outline Business Case

Great Yarmouth Third River Crossing

March 2017

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1 Introduction

1.1 Overview

This document is the Outline Business Case (OBC) for the Great Yarmouth Third River Crossing scheme. It has been prepared on behalf of Norfolk County Council (NCC) for consideration by the Department for Transport (DfT). The structure of the business case, and the appraisal described in it, follows published DfT guidance including Web-based Transport Analysis Guidance (WebTAG).

The OBC explains why the scheme should receive support, and provides a clear audit trail for the purposes of public accountability.

The OBC is more than just a bid for financial support. It also explains how and why NCC has decided to put the scheme forward in its current form, and at the present time. It shows that the proposals are based on a realistic analysis of the current situation, a clear vision of how things should be in the future, a careful consideration of options, a robust appraisal of costs and benefits, and a clear plan for delivering the scheme.

1.2 Location of the scheme

Great Yarmouth lies on Norfolk's North Sea coast, about 30 km east of the County town, Norwich. It is further east than any other town in Britain, apart from Lowestoft. The Great Yarmouth urban area has a population of about 68,000 people[1], and the wider Borough of Great Yarmouth a population of about 97,000[2].

As shown in Figure 1-1, Great Yarmouth is connected to Norwich by rail, and by the A47 road which is part of the Strategic Road Network (SRN). It is linked to Lowestoft by rail, and by the A47 (formerly the A12) [3] also part of the SRN. The other important road is the A143 to Bury St Edmunds which terminates in the town. By virtue of its location, Great Yarmouth is relatively isolated. Despite this, it is an important employment centre and tourist destination, with over 1 million staying visitors and about 4 million visitor trips each year, generating a direct and indirect spend of £532 million[4].

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[1] Population 68,317 (ONS, 2002)

[2] Population 97,277 (2011 Census)

[3] The A12 trunk road between Lowestoft and Great Yarmouth was re-numbered A47 in March 2017. This means that the A47 is now a continuous trunk road from Peterborough to Lowestoft, whereas the A12 is a continuous trunk road between Ipswich and London.

[4] Source: Great Yarmouth Borough Council

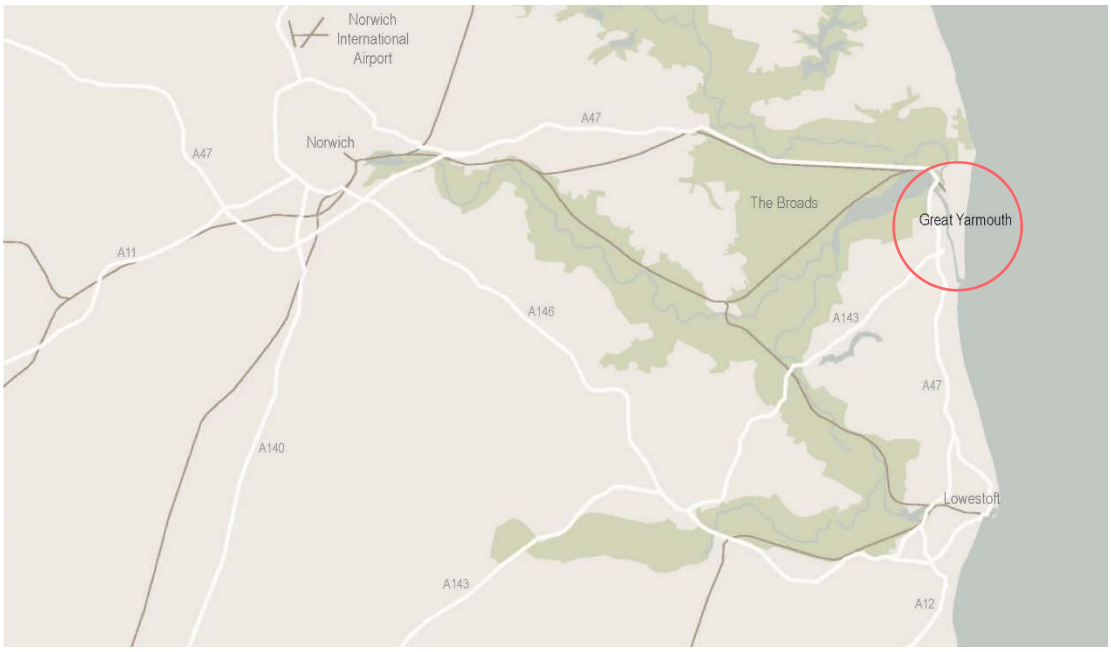

Figure 1-1 Location of Great Yarmouth

Great Yarmouth is located at the mouth of the River Yare, one of the main waterways providing access to the Norfolk Broads. As illustrated in Figure 1-2, the river divides Great Yarmouth in two, with the town centre, seafront, industrial areas and outer harbour located on the narrow, 4 km long, South Denes peninsula between the river and the sea, isolated from the rest of the town. To the west of the River Yare, Gorleston-on-Sea is just a few hundred metres away as the crow flies, but over 7km distant by road.

Great Yarmouth is considered to be England's premier offshore support port. The deep water outer harbour at the southern end of the peninsula is strategically located to serve the oil and gas fields of the southern North Sea, as well as existing and planned offshore wind developments off the UK east coast. It provides state-of-the-art facilities for the larger offshore vessels, complementing the long established facilities for offshore operations and maintenance in the river port. Great Yarmouth is also an established general and cargo port, offering the shortest North Sea crossing between Great Britain and continental Europe. It handles a wide range of cargoes including aggregates, cement, grain, fertilisers, forest products and dry and liquid bulks.

The South Denes Business Park, Enterprise Zone and Great Yarmouth Energy Park are also located on the southern part of the peninsula, which is covered by a Local Development Order (LDO). The LDO provides freedoms and flexibilities in planning regulations, as a way of stimulating employment growth. The regeneration of this area is a key element of the New Anglia Strategic Economic Plan (SEP) and the Great Yarmouth Local Plan Core Strategy.

Figure 1-2 Location of the scheme

Through traffic on the A47 crosses the River Yare on the Breydon Bridge, to the north of the town centre. Access to the peninsula from the south, and from the western part of the town is provided by the Haven Bridge which leads directly into the town centre, also at the northern end of the peninsula. Both are single carriageway lifting bridges. There are no crossings further south to give more direct access to the peninsula. As a result, the main industrial areas and deep water outer harbour are up to 4 km from the nearest bridge. Access to the sea-front is similarly constrained, with all vehicles, cyclists and pedestrians having to use the bridges at the northern end.

The proposed scheme will provide a third crossing of the River Yare, creating a direct link into the southern part of the peninsula. It will greatly improve access to the port, outer harbour, employment areas, the seafront and residential areas. It will connect the peninsula to the strategic road network via the A47 Harfrey's roundabout.

1.3 The need for a third crossing

The existing river crossings do not provide adequate access to the port and employment areas in the southern part of the peninsula. The lack of a direct bridge means that traffic is forced onto unsuitable routes within the town centre, including the historic South Quay. Congestion, especially on the Haven Bridge, causes delays and makes journey times unreliable. The mixture of port-related and local traffic makes it more difficult for people to access the town centre, seafront, and leisure facilities. The lack of a direct river crossing makes Great Yarmouth seem remote, and discourages inward investment. Bus users, cyclists and pedestrians have long, indirect journeys into the peninsula, which discourages commuting to work by more sustainable modes.

The Great Yarmouth Enterprise Zone has the potential to create 5,000 new jobs by 2025, and there are plans for 2,000 new homes and 20-30 hectares of employment development[5]. A new river crossing is needed to accommodate the traffic generated by this planned growth, to improve connectivity to the strategic road network, and to avoid making existing problems worse. Without a new crossing, the full potential for growth in the Enterprise Zone and LDO area, including the port and outer harbour, may not be fully realised.

1.4 Description of the scheme

The proposed scheme is illustrated in Figure 1-3 and Figure 1-4. A more detailed drawing[6] is included as Appendix B and other 3D visualisations of the scheme are included in Appendix C.

[5] In the Waterfront Development and at Beacon Park.

[6] Drawing No. 1076653-MOU-HGN-OPT32-DR-D-0001_Option32 alt plan (P1,S2)

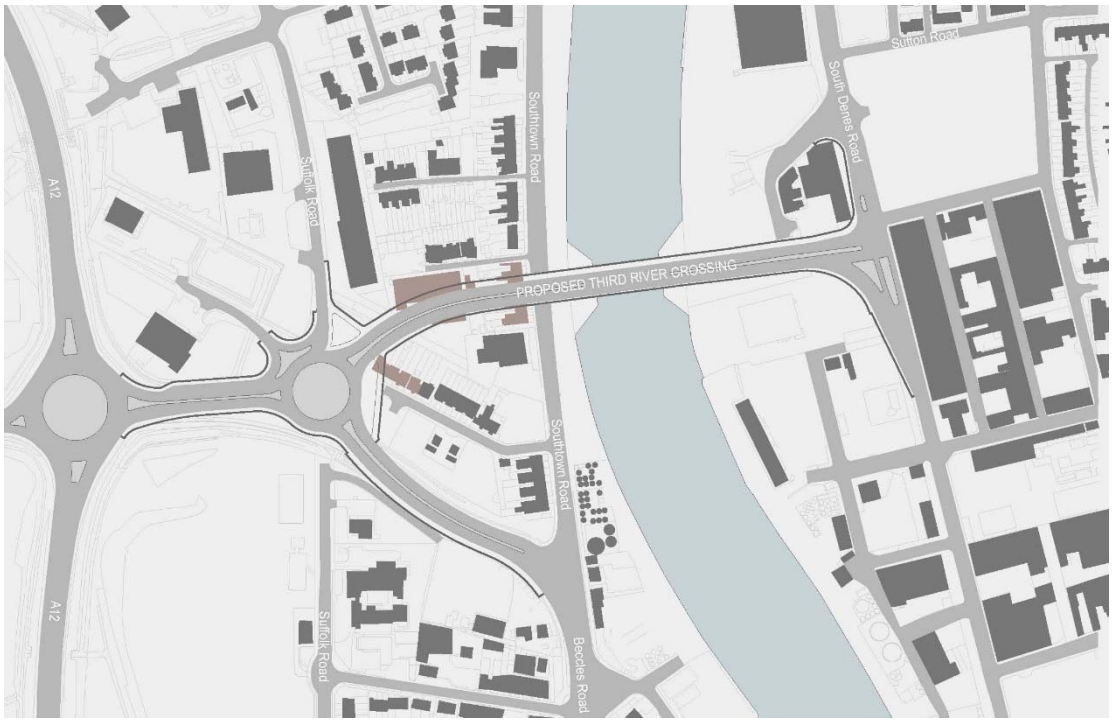

Figure 1-3 Proposed Great Yarmouth Third River Crossing

Figure 1-4 Proposed Great Yarmouth Third River Crossing 3D visualisation

1.4.1 Overview

The scheme will provide a third crossing over the River Yare, creating a new, more direct link between the western and eastern parts of Great Yarmouth. Specifically it will provide a connection between the Strategic Road Network (A47) and the South Denes Business Park, Enterprise Zone, Great Yarmouth Energy Park and the Outer Harbour, all of which are located on the South Denes peninsula (shown in Figure 2-4 of the Strategic Case).

1.4.2 The new bridge

A new lifting bridge will be provided to carry a dual carriageway road across the River Yare, opening when required to allow shipping to pass through. Traffic will be controlled by lifting barriers at either end of the bridge, and queueing space will be provided.

Figure 1-5 Proposed bascule bridge 3D visualisation

The new structure will be a single span, double leaf trunnion Bascule Bridge with a clear span of 55m between the abutment faces, giving a 50m navigational clearance between knuckle wall fenders. It will cross the River Yare at 90% - i.e. with no skew. The superstructure will comprise a steel deck. Each leaf (lifting section) will use three longitudinal steel box beams, which will continue behind the trunnion positions to carry the counterweights. They will be raised and lowered by three hydraulic cylinders on the underside of each leaf. The main piers will be hollow reinforced concrete box structures, founded on reinforced concrete piles and protected from the river by knuckle walls. The piers will support the trunnions, about which the bridge leafs will rotate, and will house the hydraulic cylinders and control systems.

When the bridge is fully raised at approximately 80°, the tips will be positioned to provide unlimited air draft across the 50m navigational channel. With the bridge fully lowered, and open to road traffic, the air draft below the structure will allow smaller vessels to pass under the new bridge without the need for it to be closed to road traffic.

The approach embankments will be retained either by reinforced soil or reinforced concrete retaining walls, with a maximum height of about 7m.

Figure 1-6 Proposed new roundabout and bascule bridge, Great Yarmouth

1.4.3 Connections to the existing road network

On the western side of the river, a new roundabout will be constructed on William Adams Way, at the site of the existing junction with Suffolk Road, to the east of the A47 Harfrey's roundabout. Suffolk Road (north) will connect directly into the roundabout. William Adams Way will be realigned and widened between Harfrey's Roundabout and the new roundabout, and between the new roundabout and Beccles Road / Southtown Road. The scheme does not involve alterations to the A47 trunk road[7] or to Suffolk Road (south).

[7] Highways England is no longer promoting a scheme to improve A47 Harfrey's Roundabout.

From the new roundabout, a new dual carriageway road will be constructed leading eastwards towards the new river bridge. It will cross Southtown Road on a flyover, and continue as a dual carriageway on the new bridge over the River Yare.

On the eastern side of the river, the new dual carriageway will connect to the A1243 South Denes Road at a new signal controlled junction.

1.4.4 Alterations to local roads and traffic management measures

On the western side of the river, alterations will be required to Queen Anne's Road, which provides access to residential properties, a church (the King's Centre) and a veterinary practice. The junction between Queen Anne's Road (west) and Suffolk Road will be relocated north of the new roundabout. The junction between Queen Anne's Road (east) and Southtown Way will be re-opened, replacing the existing connection to Suffolk Road.

On the eastern side of the river, alterations will be required to the direction of traffic flow on Sutton Road and Swanston Road, reversing the existing one-way system to accommodate the new traffic signal junction.

1.4.5 Provision for pedestrians and cyclists

As well as being an important link for vehicular traffic, the new bridge will also provide opportunities for more journeys by cycle and on foot. The scheme will include:

- A 4.5m wide footway and two-way cycleway link from William Adams Way, across the northern side of the new bascule bridge, and linking to a new on carriageway cycle lane on Sutton Road. This route also includes new Toucan crossing facilities at the William Adams Way roundabout, and the new traffic signal controlled junction on South Denes Road.
- A 1.5m wide footway on the southern side of the link across the new bascule bridge.
- A new footway/cycleway link from the William Adams Way roundabout to Suffolk Road, and a new pedestrian crossing on Suffolk Road.
- A footway/cycleway link from William Adams Way to the Harfrey's roundabout.
- Enhanced public realm including a green gateway, pocket parks, enhanced surfacing and the creation of a more interactive public space using new viewing and waiting areas

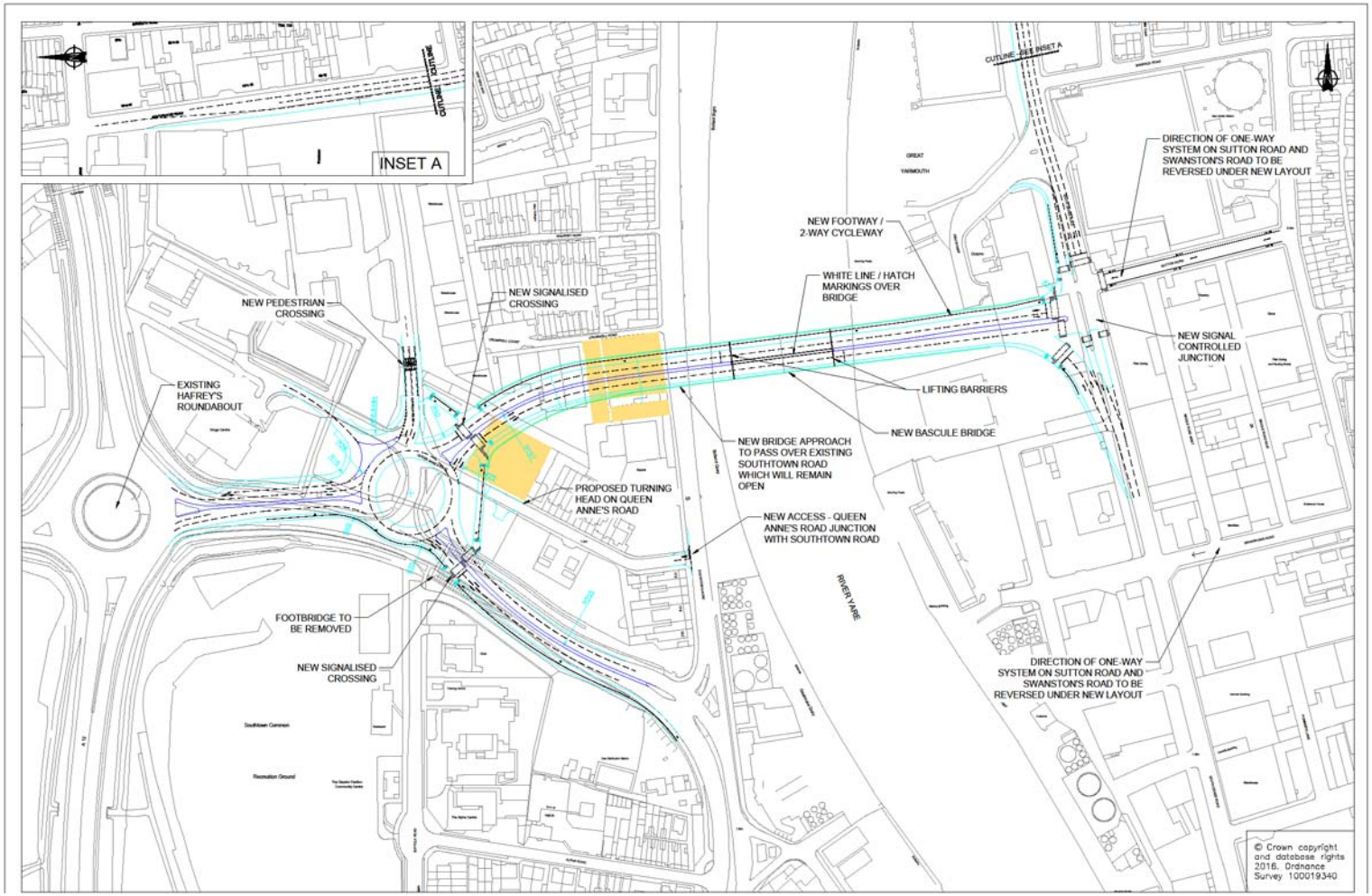

Figure 1-7 Connections and alterations to existing roads

1.5 The five cases

The business case is made up of five separate cases, as prescribed in DfT guidance[8]. These are:

- **The strategic case** which shows that there is a robust 'case for change', closely aligned to wider strategic and public policy objectives
- **The economic case** which shows that the scheme provides **high** value for money, based on a formal appraisal undertaken in line with DfT guidance
- **The financial case** which explains how much the scheme will cost and how it will be paid for, showing that it is affordable
- **The commercial case** which shows that the scheme is commercially viable
- **The management case** which shows that the scheme is achievable in practical terms, and explains how the project will be managed to ensure it achieves its objectives.

1.6 Summary of the Strategic Case

The Strategic Case sets out the reasons why the Great Yarmouth Third River Crossing is needed. It shows how the proposed investment fits into a wider strategy for the regeneration of the town and surrounding region, and demonstrates that it will further the strategic objectives of Norfolk County Council, Great Yarmouth Borough Council, and the New Anglia Local Enterprise Partnership. It describes how the proposed scheme has been identified after consideration of a full range of options and consultation with stakeholders. The Strategic Case explains why this investment is needed now, in order to address existing problems and capitalise on opportunities for economic growth and development.

1.6.1 Policy Background – the business strategy

The strategic policy context is determined by national, regional and local policies:

- The government's Industrial Strategy
- National transport objectives
- International gateways and the strategic road network
- The New Anglia Strategic Economic Plan (2014)
- Local Development Framework documents
- Connecting Norfolk: The Norfolk Local Transport Plan for 2026 (April 2011)
- The Great Yarmouth and Gorleston Area Transportation Strategy (2009)
- The Great Yarmouth Economic Growth Strategy (2016-21)
- The Great Yarmouth Town Centre Masterplan (Draft, 2016)

[8] The Transport Business Cases, DfT, January 2013

Common themes in all of the above policies are:

- The need, and opportunities, for economic regeneration in Great Yarmouth
- The potential for growth associated with the offshore energy industry, especially in the Enterprise Zone and outer harbour
- The lack of adequate links between potential development areas on the peninsula and the strategic road network, especially to the A47 (south)
- The problem of heavy traffic on the existing bridges, and congestion in adjacent parts of the town centre
- The need for a third crossing of the River Yare to provide traffic relief, and better access to strategic routes, supporting regeneration and growth on the peninsula and the town centre.

In essence, the vision for Great Yarmouth is for a once prosperous town to take advantage of the new opportunities for growth and regeneration afforded by offshore energy, commercial and port-related development, and tourism, by dramatically improving accessibility and by providing traffic relief to the historic centre: a more prosperous town, and a better place in which to live.

The provision of a third crossing of the River Yare in Great Yarmouth would create opportunities for growth, regeneration and inward investment.

1.6.2 Problems identified

The scheme will address the following problems:

- Inadequate access to employment areas and the harbour
- Traffic congestion, resulting in queuing and delays to journeys
- Difficulty in accessing the town centre, seafront and leisure facilities
- Inefficient and indirect bus services into the southern part of the peninsula
- Lack of direct walking and cycle routes into the southern part of the peninsula
- Community severance
- Impact of traffic on historic areas
- Impact of traffic on local air quality and CO_2 and greenhouse gas emissions
- Road accidents
- Lack of resilience in the local road network.

All of these problems are related to the way traffic uses the existing road network.

1.6.3 Future problems

Traffic levels in Great Yarmouth are expected to increase from the present levels over the coming years. Without intervention to provide a new crossing into the South Denes peninsula, the problems will inevitably worsen, as more traffic is channelled over the existing bridges and through the town centre.

1.6.4 Objectives

The **desired high level or strategic outcomes** are:

- To support the creation of new jobs, especially in the South Denes Local Development Order area and the Enterprise Zone, by being a catalyst for investment
- To support Great Yarmouth as a Centre for Offshore Renewable Engineering, and as a port
- To support the regeneration of Great Yarmouth, including the town centre and the seafront, helping the visitor and retail economy
- To improve strategic connectivity, and reduce community severance
- To protect and improve the environment.

The **specific, or intermediate, objectives** are:

- To provide traffic relief to Breydon Bridge and Haven Bridge
- To reduce congestion and delay in the town centre
- To improve journey time reliability
- To reduce traffic in historic areas
- To improve vehicular access to South Denes and the outer harbour, especially from the A47
- To improve access to the Great Yarmouth peninsula for buses
- To improve access to the Great Yarmouth peninsula for cyclists
- To improve access to the Great Yarmouth peninsula for pedestrians
- To reduce road accident casualties
- To reduce emissions of greenhouse gases
- To improve the resilience of the local road network.

The **operational objectives** are:

- To provide an additional crossing of the River Yare for vehicles, cyclists and pedestrians
- To reduce overall journey times and vehicle kilometres in Great Yarmouth
- To minimise environmental impact, compulsory purchase and demolition of residential and commercial property.
- To achieve a balance between the needs of road and river traffic.

The scheme has been developed to achieve all of these objectives and contribute to the desired outcomes.

Extensive stakeholder and public consultation and engagement has identified strong support for the scheme.

1.6.5 Options

A very comprehensive set of strategies, options, routes and route standards has been considered and subject to detailed appraisal. The proposed scheme is the one which is best able to deliver the objectives, and give high value for money.

1.6.6 Impacts of the proposed scheme and achievement of objectives

The Great Yarmouth Third River Crossing will have a significant and beneficial impact on traffic in the town, and this will give rise to a range of benefits, helping to deliver the scheme's objectives.

- Traffic levels will be reduced on key links.
- The existing bridges will both experience a reduction in traffic
- Congestion will reduce
- Journey times on key routes will be reduced
- Journey time reliability will be improved
- Historic areas of the town will experience less traffic
- Vehicular access to South Denes and the Outer Harbour will be greatly improved
- Access for pedestrians, cyclists will be improved
- Bus users will benefit
- Road accidents will be reduced
- Greenhouse gas emissions will be reduced
- The resilience of the local road network will be enhanced

In summary, the Great Yarmouth Third River Crossing is expected to deliver on all of the specific objectives set out above – in some cases with very large positive impacts.

The improvements to accessibility and connectivity, and the reductions in travel times, will reduce transport costs and help to deliver the high level, strategic outcomes.

1.7 Summary of the Economic Case

The Economic Case identifies and assesses all the impacts of the scheme to determine its overall value for money. It takes account of the costs of developing, building, operating and maintaining the scheme, and a full range of its impacts, including those impacts which can be monetised.

1.7.1 Value for money category

An analysis of the monetised benefits of the proposed scheme demonstrates that it offers **high** value for money

1.7.2 Present value of costs and benefits assessed

The monetised costs and benefits assessed are set out in Table 1-1.

1.7.3 Benefit Cost Ratio

The value for money category is based on the Benefit Cost Ratio (BCR). The initial BCR is **3.1**. Inclusion of reliability benefits and wider economic impacts gives an adjusted BCR of **3.5**.

Analysis of monetised costs and benefits	£,000 (2010 prices discounted to 2010)
Greenhouse Gases	1,827
Physical Activity (Active Mode Appraisal)	9,353
Accidents	12,539
Economic Efficiency: Consumer Users (Commuting)	62,370
Economic Efficiency: Consumer Users (Other)	144,040
Economic Efficiency: Business Users and Providers	122,632
Wider Public Finances (Indirect Taxation Revenues)	-3,485
Present Value of Benefits (PVB)	**349,276**
Cost to Broad Transport Budget	
Investment cost	107,391
Operating costs	4,172
Present Value of Costs (PVC)	**111,563**
Net Present Value of Costs (NPV)	**237,713**
Initial BCR	**3.1**
Reliability – business	2,483
Reliability – non-business	31,442
Wider impacts - Economic	12,263
Adjusted Present Value of Benefits (PVB)	**395,464**
Adjusted Net Present Value (NPV)	**283,901**
Adjusted BCR	**3.5**

Table 1-1 Present value of costs and benefits assessed

Business will benefit from reduced congestion, faster journeys and improved journey time reliability, with reduced costs and better access to markets, whilst commuters will similarly benefit from shorter, more reliable, journeys to work. These benefits, which are included in the BCR calculations will support local development and the regeneration of Great Yarmouth's economy.

The scheme is expected to lead to a reduction in greenhouse gas emissions; these have been monetised and included in the BCR.

1.7.4 Non-monetised impacts assessed

Other impacts on the environment have been assessed. These will be reviewed for the Full Business Case in the light of more detailed assessment and consideration of measures to mitigate, manage or compensate for the impacts.

1.7.5 Identification of risks, sensitivities and uncertainties

The risk register is set out in Appendix F. The financial impact of a range of risks has been considered in a Quantified Risk Assessment (QRA) and the costs included in the calculation of PVC have been adjusted for risk.

Further sensitivity testing with a range of growth scenarios shows that the scheme would still offer **high** value for money in a low growth scenario.

Sensitivity tests show that the value for money category remains high, even with low growth assumptions. A sensitivity test on higher levels of Optimism Bias allowance similarly did not affect the value for money category, which remains robustly high.

1.7.6 Social and distributional impacts

Analysis of social and distributional impacts shows that areas of Great Yarmouth with lower average incomes will benefit most from the scheme.

1.8 Summary of the Financial Case

- The future cost of delivering the Great Yarmouth Third River Crossing, including allowances for risk and inflation will be **£119.910 million**.
- A total of **£4.9 million** has been spent prior to submission of the OBC, including **£3.8 million** by the County Council.
- A robust risk management strategy is in place to identify, quantify, manage and review risks, including financial risks.
- The scheme will also give rise to costs for annual operation and maintenance, and for the long term renewal of the infrastructure, with an annual average of **£261,685** per year.
- Norfolk County Council is seeking a contribution of **£98.088 million** from the Government's Department for Transport towards the capital costs of the scheme, and the Council will support this with a further local contribution of **£21.822 million**.
- This, together with the Council's expenditure prior to submission of the OBC represents **20%** of the complete cost of delivering the scheme.
- The Council will also meet the ongoing costs of operation, maintenance and renewal.

1.9 Summary of the Commercial Case

The Commercial Case provides evidence of the commercial viability of the proposed scheme, and describes the procurement strategy that will be used to engage the market and deliver the scheme.

1.9.1 Alternative procurement strategies

Alternative procurement strategies were assessed against the following strategic outcomes:

- Achieve cost certainty
- Minimise further preparation costs
- Obtain contractor experience and input to the construction programme
- Obtain contractor input to risk management and appraisals
- Obtain contractor input to the buildability of the design

1.9.2 Proposed procurement strategy and form of contract

The scheme will be procured using the OJEU (Official Journal of the European Union) process.

It is likely that the scheme will use an OJEU ‘restricted procedure’ procurement tendering process. This is appropriate for a large scale infrastructure project as it provides for the "pre-qualification" of suppliers based on their financial standing and technical or professional capability. It also has defined timescales for each stage.

The ‘restricted procedure’ has been successfully used by the Council on a number of large-scale transport infrastructure schemes, and there is a well-developed market for the proposed procurement approach.

After consideration of a range of options, it was concluded that a Two Stage Design and Build form of contract is the most appropriate for this project. It will involve the Contractor at an early stage to develop the design, helping to ensure that the scheme is buildable, affordable and delivered on time.

The proposed form of contract for Stage 1 is NEC3 PSC, using one of two options:

- NEC3 Option A (Priced with activity schedule)
- NEC3 Option E (Time-based contract)

The proposed form of contract for Stage 2 is NEC3 ECC, using one of two options:

- NEC3 Option A (Priced with activity schedule)
- NEC3 Option C (Target cost with activity schedule)

The scheme will be sourced through advertisement in the OJEU, allowing companies from across the EU to bid for the work.

1.9.3 Pricing

Contractors will bid on a pricing model, based on the illustrative design material available. This will provide a basis for the comparison of tenders, and for building up the Stage 2 Prices, tied to the contractor's tendered rates.

The contractor will then work with the design delivery team to develop the Target or Lump Sum price over a number of months as the design is finalised (Stage 1). Once the client is satisfied with the Target or Lump Sum price the contractor will be given the go-ahead to start construction (Stage 2).

1.9.4 Risk

The contractor will produce a priced risk register, and decisions will be made on the risk share mechanism between the contractor and the County Council to ensure that the proposed allocation of risk provides value for money to the council.

1.9.5 Timetable

The Commercial Case sets out the timetable for procurement. The delivery programme is set out in the Management Case and in Appendix M. The Council will perform the role of contract manager. More detail will be provided in the Full Business Case.

1.10 Summary of the Management Case

The Management Case demonstrates that the Great Yarmouth Third River Crossing scheme is capable of being delivered successfully in line with recognised best practice. It describes the processes that are being put in place to ensure that the project is effectively delivered, and properly evaluated.

1.10.1 Experience and expertise

The Council has extensive recent experience in delivering major infrastructure projects.

1.10.2 Dependencies

The Great Yarmouth Third River Crossing 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.

The County Council will liaise very closely with Highways England as the Third River Crossing scheme is taken forward and will actively co-operate with any further appraisal or design work that HE may decide to undertake in relation to improvements to the A47 trunk road.

1.10.3 Project governance, organisation structure and roles

To ensure successful delivery of the scheme, Norfolk County Council has established and will continue to resource the following bodies:

- Project Board
- Project Delivery Team
- Stakeholder Group

The Management case describes the membership, responsibilities and accountability of these groups, and the relationship between them.

1.10.4 Project programme

The scheme is programmed to open to traffic in January 2023. The detailed project programme is included in Appendix M.

The Management case details how stakeholders will be involved in the scheme, and how progress will be monitored and reported.

2 The Strategic Case

2.1 Introduction

The Strategic Case sets out the reasons why a third river crossing is needed in Great Yarmouth. It shows how the proposed investment fits into a wider strategy for the regeneration of the town and surrounding region, and demonstrates that it will further the strategic objectives of Norfolk County Council, Great Yarmouth Borough Council, and the New Anglia Local Enterprise Partnership. It describes how the proposed scheme has been identified after consideration of a full range of options and consultation with stakeholders. Together with the other four cases in the Outline Business Case, the Strategic Case explains why this investment is needed now, in order to address existing problems and capitalise on opportunities for economic growth and development.

Figure 2-1 shows the local road network and features referred to in the Strategic Case.

2.2 Overview

This chapter covers:

- The policy background and business strategy for the scheme
- Opportunities for growth, regeneration and inward investment
- The existing problems which the scheme needs to address
- Future problems - the impacts of not changing
- The aims and objectives of the scheme
- Measures for success
- The scope of the scheme
- Constraints
- Interdependencies
- Stakeholders
- Options considered
- The proposed scheme
- The impacts of the proposed scheme and the achievement of objectives

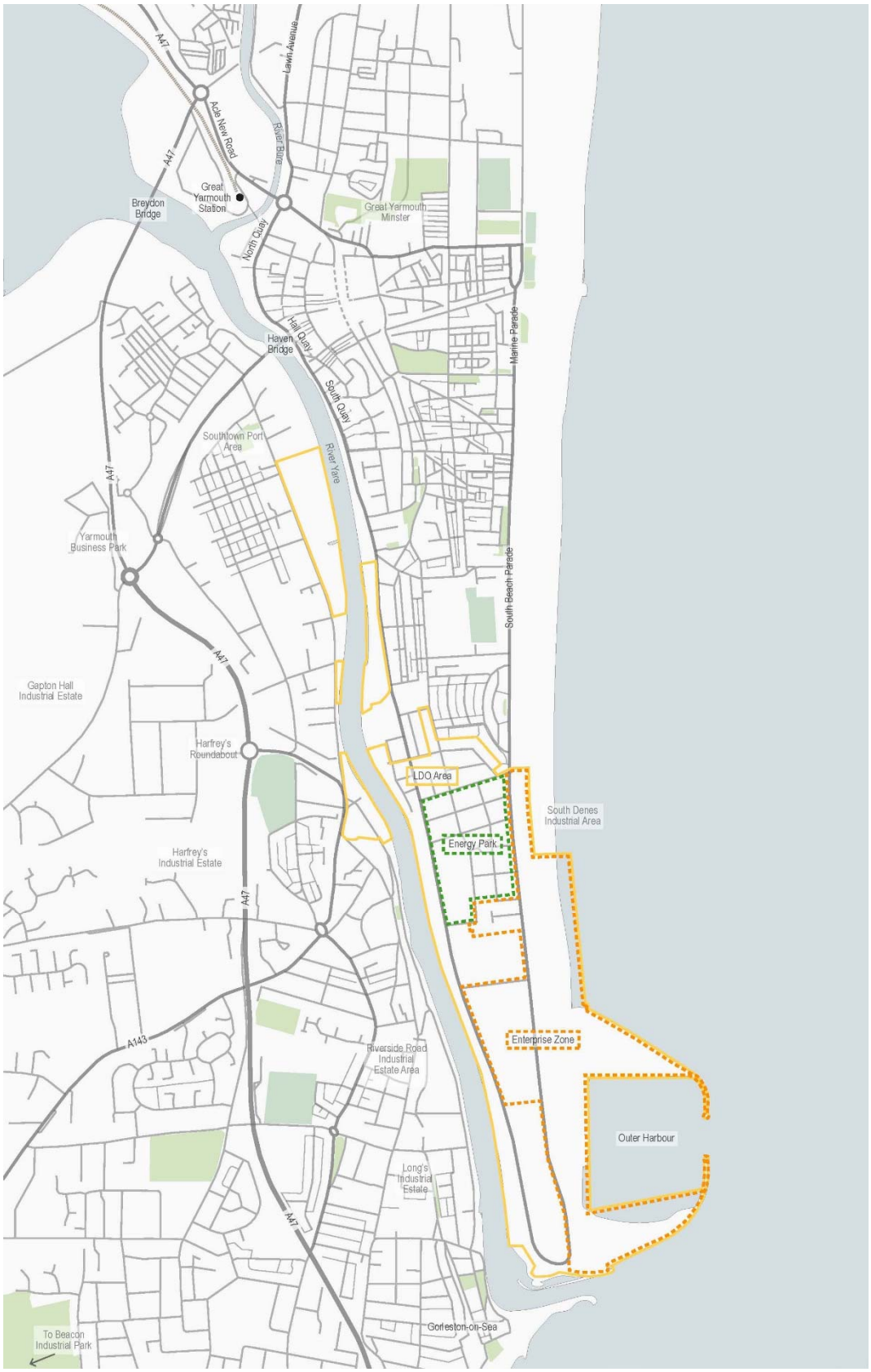

Figure 2-1 Local road network and key features

2.3 Policy Background – the business strategy

The strategic policy context is determined by national, regional and local policies as set out below:

- The government's Industrial Strategy
- National transport objectives
- International gateways and the strategic road network
- The New Anglia Strategic Economic Plan (2014)
- Local Development Framework documents, including:
    - The Great Yarmouth Local Plan Core Strategy (Adopted Dec 2015)
    - Great Yarmouth Waterfront Area Action Plan (Dec 2010)
- Connecting Norfolk: The Norfolk Local Transport Plan for 2026 (April 2011)
- The Great Yarmouth and Gorleston Area Transportation Strategy (2009)
- The Great Yarmouth Economic Growth Strategy (2016-21)
- The Great Yarmouth Town Centre Masterplan (Draft, 2016)

2.3.1 The Government's Industrial Strategy

At the heart of the government's economic agenda is the February 2017 Green Paper "Building our Industrial Strategy[9]". This aims to improve living standards and economic growth by driving productivity and growth across the whole country. The strategy identifies two important areas of priority for energy: affordability and maximising industrial opportunities for UK economy from energy innovations. This includes offshore oil and gas and clusters of excellence such as the east coast.

The Industrial Strategy presents an opportunity for Great Yarmouth to develop its offshore energy cluster further, by building on the existing offshore oil, gas and decommissioning activities, while capitalising on the low carbon agenda with continued investment in offshore wind. If Great Yarmouth is to realise this opportunity, transport connectivity improvements will be needed in order to support the growth of the sector and ensure its future success.

[9] Department for Business, Energy & Industrial Strategy (2017) Building our Industrial Strategy: 10 pillars

The government has set up six Centres for Offshore Renewable Engineering (CORE) across the UK, one of which is in Great Yarmouth and Lowestoft. CORE's aim is to maximise the ability of areas to benefit from opportunities in offshore engineering. Support structures that are in place include the establishment of Enterprise Zones with simplified planning regimes and enhanced capital allowances, among other incentives. These are discussed further in Paragraph 2.3.5 below.

2.3.2 National Transport Objectives

The national transport objectives, set by government, are:

- To ease congestion and provide upgrades on important national, regional or local routes
- To unlock economic and job creation opportunities
- To enable the delivery of new housing developments

The proposed third river crossing will contribute to the first, and especially the second, of these objectives.

Easing congestion and upgrading important routes: By creating an additional river crossing, the scheme will remove traffic from the existing bridges, especially the Haven Bridge. This will ease congestion on the roads around the existing bridges, and in the town centre generally. It will provide additional capacity, improving the resilience of the local road network and improving journey time reliability. The new bridge will significantly enhance the connectivity between Great Yarmouth's deep water harbour, and the national, regional and local routes to and from the town, including the A47 and the A143.

Unlocking economic and job creation opportunities: The proposed scheme will provide a new, direct, high capacity access into the South Denes Industrial area which is designated as an Enterprise Zone. The Third River Crossing is part of a wider strategy to promote this area as a centre for the offshore renewable energy industry, attract new businesses and create new jobs. It will help businesses to reduce their transport costs, and bring more people within easy reach of employment opportunities, including people travelling by sustainable modes.

Housing: Currently planned housing developments in Great Yarmouth are not directly dependent on the provision of a Third River Crossing. However, the Local Plan Core Strategy (see below) identifies a strategic key site for approximately 1,000 new homes in the Great Yarmouth Waterfront Area, of which at least 350 are to be provided in the Plan period (2013 – 2030). The new bridge will provide long term traffic relief to this area, improving accessibility, and enhancing Great Yarmouth as a place in which to live.

These opportunities and benefits are described in more detail in sections 2.3.4 to 2.3.10 below.

2.3.3 International gateways and the strategic road network

In 2016, Highways England commissioned a report[10] on key international gateways (ports and airports) and their importance to England's economy, and the role of the Strategic Road Network in supporting this critical infrastructure. It noted that:

- Ports serve manufacturing sectors and are key inter-modal points for the logistics and distribution sector.
- Ports are highly dependent on road connectivity for the inward and outward movement of freight.
- Ports are significant employment areas.
- Congestion, causing increased travel times and reduced journey time reliability, can increase freight costs and diminish the competitive advantage of parts of the UK, by reducing the effective catchment area of a port.

In 2015, the port of Great Yarmouth handled over 1 million tonnes of traffic , including oil and other bulk liquids (195,000 tonnes), agricultural products and other dry bulk products (726,000 tonnes) and general cargo (174,000 tonnes)[11]. Although it is smaller than the major ports on which the HE report focuses, the principles hold true. The port of Great Yarmouth, especially the new deep water outer harbour, does not enjoy good access to the strategic road network. A Third River Crossing would greatly improve the port's connectivity to the A47 trunk road and the SRN, helping to improve its efficiency and viability, and stimulate port-related growth.

2.3.4 New Anglia Strategic Economic Plan (SEP)

The New Anglia Strategic Economic Plan sets out the ambition of the Local Enterprise Partnership (LEP) to deliver more jobs, improved skills, new business and housing, including:

- 95,000 growth in jobs from 2012 to 2026
- 15,000[12] new businesses from 2012 to 2026
- Increasing GVA by 10% to equal the national average

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[10] "International gateways and the strategic road network". Commissioned by Highways England to inform the emerging Strategic Economic Growth Plan. (Atkins, for HE, 2016)

[11] Source: Port Freight Statistics PORT0418 (DfT Statistics, 2015)

[12] Increased from 10,000 (SEP Impact Report, NCC, September 2016)

Figure 2-2 Greater Anglia Strategic Economic Plan area (Source: SEP)

The SEP identifies Great Yarmouth as a Growth Location, with a strong base in manufacturing and food processing. Manufacturing has seen job losses in the past decade, but there is potential to attract more investment in this sector, as well as in tourism and leisure.

The SEP sees the energy sector as the main opportunity for growth, identifying the area as a major base for the construction, operation, maintenance and servicing of offshore energy production - oil, gas, wind and tidal energy - in the North Sea. It recognises the broader supply chain of energy-related businesses, including design, engineering and manufacturing for the renewable energy industry. Great Yarmouth with Lowestoft has been designated one of six Centres for Offshore Renewable Engineering (CORE), and will receive a comprehensive package of business support. Additional investment in wind energy – including the 6,000 km2 East Anglia Array – will significantly boost activity related to offshore renewables particularly in wind farm assembly and manufacturing.

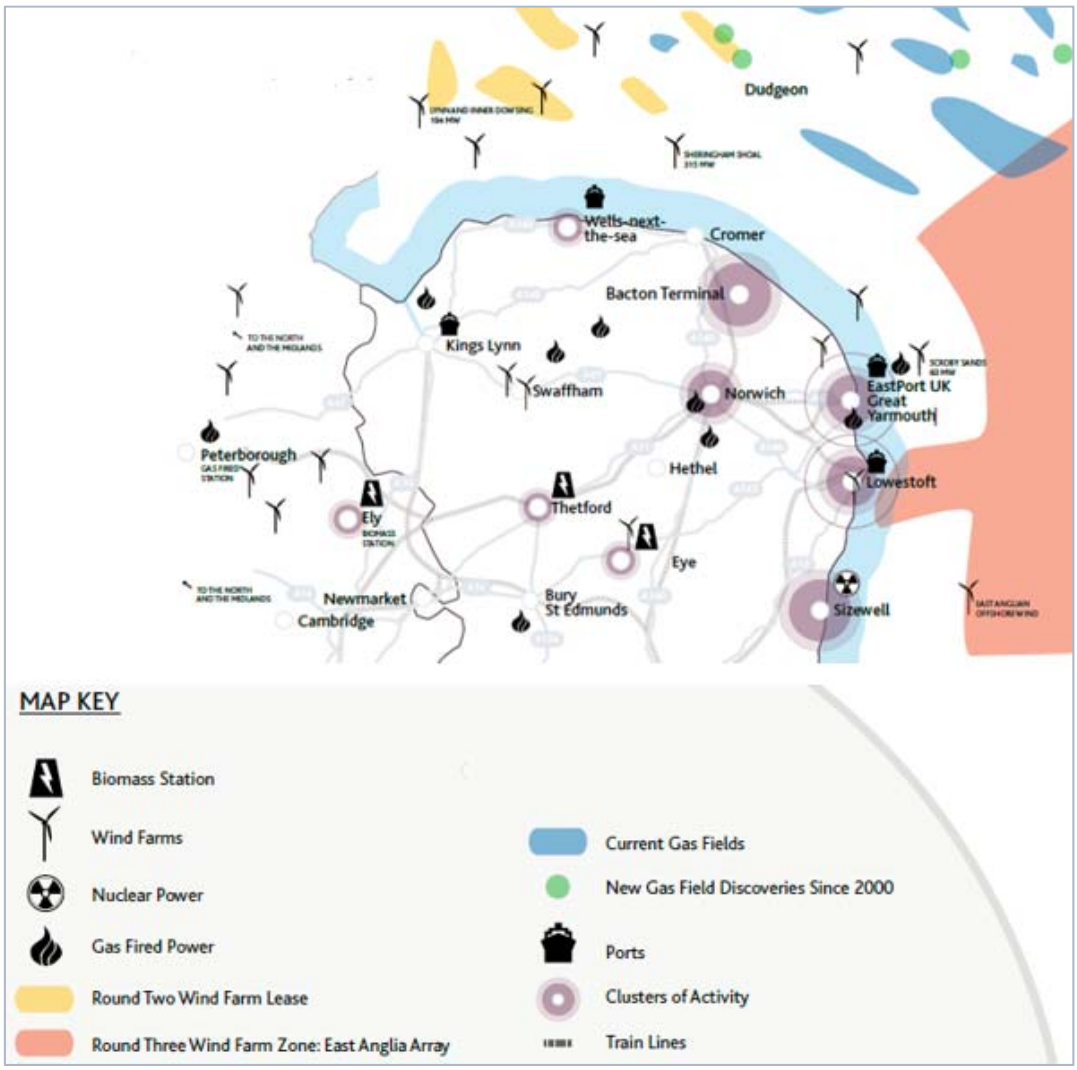

Figure 2-3 Great Yarmouth in the context of the East of England Energy Zone (Source: SEP)

The SEP acknowledges the concentration of offshore engineering businesses in Lowestoft and Great Yarmouth, together with equipment manufacturing supporting both primary production and food processing.

A key part of the SEP "offer" is the Enterprise Zone (EZ) which designates two sites for energy businesses, offshore engineering, ports and logistics in Great Yarmouth. It is one of the best performing EZs in the country, in terms of jobs already created and floor space built. The South Denes Energy Park in Great Yarmouth (Figure 2-4) is covered by a Local Development Order which facilitates energy related development. The EZ is centred on the deep water outer harbour on the South Denes peninsula in Great Yarmouth.

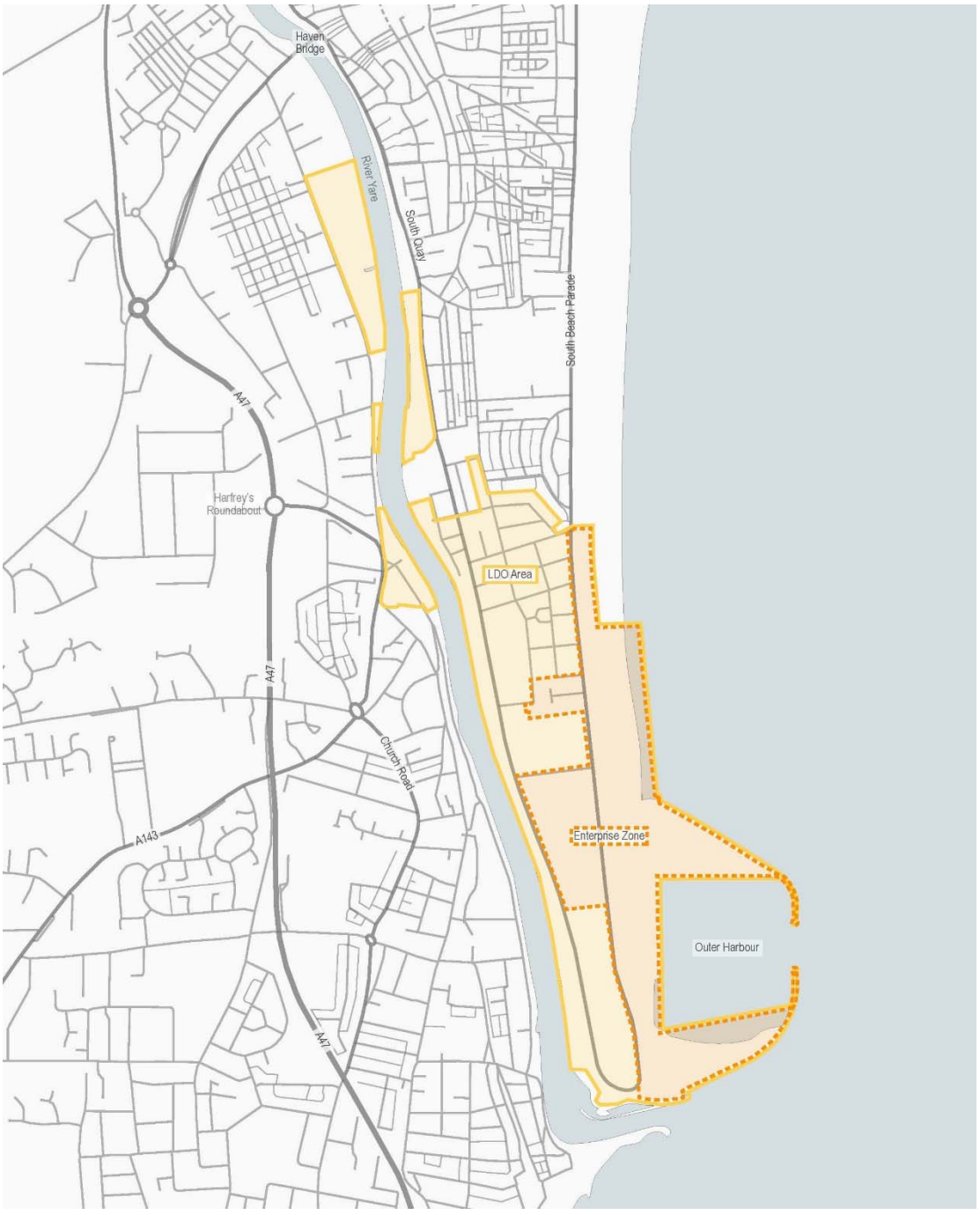

Figure 2-4 Local Development Order and Enterprise Zone, South Denes, Great Yarmouth

Incentives include business rates relief worth up to £275,000 over five years; simplified planning regulations; and Government support for the provision of super-fast broadband. Business rates growth within the Zone will be retained by the LEP to support economic priorities for at least 25 years. It is estimated that the Enterprise Zone as a whole will create up to 9,000 direct jobs and 4,500 indirect jobs by 2025.

The SEP also includes housing growth of around 2,000 dwellings in Great Yarmouth.

Following the strong case presented in the SEP Great Yarmouth and Lowestoft have been given Assisted Area status. This means projects can be given more support from New Anglia's Growing Business Fund and EU pot, thus making the EZ more attractive to inward investment.

The SEP strategy addresses a very real need. Unemployment, including long term worklessness, remains high, especially among the young. This is exacerbated by poor education performance with GCSE attainment consistently failing to meet national levels. Alongside this, 40% of local graduates enter non-graduate jobs and too few enter the SME sector. The SEP will deliver a Skills Capital Investment Programme and prioritise investment that drives capacity and excellence in science and technology including investment in innovative new approaches to skills training in partnership with the private sector. The programme will promote the development of Higher / Further Education clusters linked to major key growth assets including the Great Yarmouth-Lowestoft Enterprise Zone and will seek to address the low participation rates in Higher Education in areas including Great Yarmouth.

The SEP initiatives in Great Yarmouth are, necessarily, centred on parts of the town which are presently isolated with poor accessibility by land. The SEP recognises this and acknowledges that Great Yarmouth suffers from congestion arising from bottlenecks, including at North Quay and the Haven Bridge, and that the limited river crossings force traffic onto a few congested routes. It specifically supports the preparation of a scheme for **a third river crossing in Great Yarmouth**. The SEP, which pre-dates the announcement of the Local Majors Fund, envisaged that this work would lead to the inclusion of a scheme in the (then) Highways Agency's national programme.

2.3.5 Great Yarmouth Local Plan Core Strategy

The Great Yarmouth Local Plan Core Strategy is the main document in Great Yarmouth Borough Council's Local Plan (2013 – 2030). It establishes the spatial vision and objectives for how the borough will develop and grow in the future. It also sets out strategic policies and site allocations, called 'Core Policies' and 'Key Sites', which provide the strategic context for other Local Plan Documents, Supplementary Planning Documents and Neighbourhood Development Plans.

The Core Strategy sets out a vision for the borough as a more attractive and aspirational place to live, work and play, with strong links to Lowestoft, the Broads, Norwich, rural Norfolk and the wider New Anglia Local Enterprise Partnership area. It notes that Great Yarmouth will continue to have a thriving relationship with Lowestoft, and describes a complementary and integrated approach to the regeneration of the two towns, taking advantage of the huge growth potential in the renewable energy and port sectors to create thousands of new jobs.

A **third river crossing** over the River Yare is envisioned in the Core Strategy, along with improvements to public transport and the creation of attractive walking and cycling routes from the train station to the waterfront, town centre and seafront,

which will relieve congestion and provide essential links to key facilities and services, including the outer harbour.

The Core Strategy sets seven strategic objectives:

SO1 Minimising impact on the environment
SO2 Addressing social exclusion and reducing deprivation
SO3 Accommodating a growing population
SO4 Strengthening the competitiveness of the local economy
SO5 Capitalising on the successes of the local visitor economy
SO6 Protecting and enhancing the quality of the local environment
SO7 Securing the delivery of key infrastructure

Under Objective SO7, the Core Strategy aims to encourage efficient patterns of movement by recognising the strategic role that the A47, a **third river crossing**, the river port, outer harbour and rail corridor (including a rail freight interchange) will play in meeting the borough's needs.

The Core Strategy envisages provision of 1,000 new homes at the Great Yarmouth Waterfront area (at least 350 during the plan period), and:

- Encourages the redevelopment and intensification of existing employment sites, and exploring the potential to develop 22 hectares of land reclamation north of the Outer Harbour at South Denes

- Supports port-related development proposals related to the Outer Harbour and existing river port

- Encourages a greater presence of higher value technology and energy-based industries, including offshore renewable energy companies

- Supports the local visitor and retail economies

In safeguarding 118 hectares of existing employment land at South Denes, including the Outer Harbour and South Quay, the Core Strategy considers that there is considerable scope for the already thriving energy and port-related sectors to expand as a result of the Enterprise Zone (EZ) and Local Development Orders.

South Denes is a priority area for industrial and warehousing development, attracting businesses operating in, or providing essential support services to the energy, offshore engineering and ports & logistics sectors. The development of the Outer Harbour is of strategic importance to the borough's economy and is a key driver for the regeneration of Great Yarmouth. It complements the existing river port and increases its overall operating capacity. The prospects for new business for the port are starting to be realised with investment for handling grain, aggregates and wind farm maintenance. The Outer Harbour has the potential to accommodate a large range of vessels and operations, including freight ferries, general and bulk cargo, oil

and gas, decommissioning and special projects, including offshore wind. The concept of a 'roll-on, roll-off' ferry service, though not a current proposal, remains a longer term possibility.

The Core Strategy recognises the challenges of Great Yarmouth's unique geography, noting that the seafront, central shopping area and outer harbour are on a peninsula, separated from a high percentage of the resident population by the River Yare. The two existing river crossings; Breydon Bridge and Haven Bridge are subject to high traffic flows and become severely congested during peak hours. Great Yarmouth and Gorleston also experience a dramatic increase in traffic flows during the holiday season. This extra traffic conflicts with town centre, port and commercial traffic, creating congestion problems on the road network, particularly on the A47, South Quay, North Quay, Fullers Hill and Lawn Avenue.

For these reasons the Core Strategy specifically supports the development of a **third river crossing** to reduce congestion within the heritage area of North Quay and South Quay, reducing pressure on Haven Bridge and generally improving access across the River Yare, and to help the Outer Harbour realise its long-term potential.

2.3.6 Great Yarmouth Waterfront Area Action Plan (AAP)

The Great Yarmouth Waterfront Area Action Plan is a Supplementary Planning Document which covers a total area of some 40 ha of predominantly brownfield land in Great Yarmouth, as shown in Figure 2-5. It sets out a detailed vision, objectives, plans and proposals for development in this area, in line with the Core Strategy. Five Strategic Sites are identified, the development of which will contribute to the regeneration and revitalisation of the Great Yarmouth waterfront area:

- North Quay 6.98 ha
- The Conge 2.4 ha
- Runham Vauxhall 14.6 ha
- Bure Harbour Quay 7.9 ha
- Ice House Quay 7.5 ha

Figure 2-5 Great Yarmouth Waterfront Area Action Plan - Plan area. (Source: AAP)

The North Quay strategic site occupies a triangular area defined by an extensive waterfront on two sides and the North Quay thoroughfare. The site is connected to the Station Gateway via the Vauxhall Bridge to the north of the site where there is a significant amount of vacant land. Much of the site is in fragmented land use and ownership with a mixture of residential, industrial, storage and showroom activities. North Quay provides a significant opportunity to deliver high quality waterfront development and a new focus for activity in Great Yarmouth, complementing the offer provided in the town centre and seafront areas.

The area immediately to the west of Haven Bridge is dominated by a heavily trafficked dual carriageway, Bridge Road, with a poor pedestrian and cycle environment. The inclusion of this area in the AAP seeks to ensure that an appropriate gateway is provided here on the approach to Great Yarmouth's historic river frontage and South Quay area.

The AAP notes that large vehicle flows, and in particular heavy vehicles, passing along North Quay, causes severance between the riverside sites and the town centre. It acknowledges that the development of the port beyond the AAP area will add pressure on the highway network and increase the number of larger vehicles moving through the town.

The AAP states that new developments need to minimise additional vehicle trip generation routing via Bridge Road, as the area of the network around the Haven Bridge is at risk of being declared an Air Quality Management Area (AQMA). However it notes that it is unclear what measures could be employed to mitigate air quality issues on this key route to the port, especially in the conservation area, prior to the construction of the Great Yarmouth Third River Crossing.

The AAP notes that a **third river crossing** would provide a further vehicle connection across the River Yare to the south of Haven Bridge. Though itself outside the AAP area, it would provide access to the port from the strategic network (A47) without the need for port-related traffic to pass through the town centre.

The AAP envisages an improvement scheme at the North Quay / The Conge junction, including bus priority measures and wider footways, but states that more radical proposals for a shared layout at this junction will not be considered until a third river crossing is delivered.

The AAP identifies the Great Yarmouth Third River Crossing as an essential long term infrastructure requirement, justifying contributions from all development sites in the AAP area.

2.3.7 Connecting Norfolk – The Norfolk Local Transport Plan for 2026 (LTP)

The Norfolk Local Transport Plan for 2026 identifies six strategic aims for transport in Norfolk:

- Maintaining and managing the highway network
- Delivering sustainable growth
- Enhancing strategic connections
- Reducing emissions
- Improving road safety
- Improving accessibility

The LTP (Policy 7) identifies a number of strategic connections including to Norfolk's gateways, Norwich Airport and the ports at King's Lynn and Great Yarmouth.

The LTP notes the importance of enhancing connections to Norfolk's three international gateways: Norwich Airport and the ports at Kings Lynn and Great Yarmouth. At Great Yarmouth, the focus is on achieving a sustainable distribution of freight journeys to and from the port, including provision of a future **third crossing** of the River Yare, which will provide an enhanced link to the port from the strategic road network and help remove traffic from the town centre.

2.3.8 Great Yarmouth and Gorleston Area Transportation Strategy

The Great Yarmouth and Gorleston Area Transportation Strategy (2009) examined a wide range of strategic solutions to the areas transport problems and opportunities.

It identified a **Third River Crossing** as a major scheme aimed at overcoming the problem of limited access to the peninsula of Great Yarmouth and the congestion that this causes. It would do this by offering a more direct route into the town from the south, and providing relief to the two existing road bridges. As such it would provide the missing link between the A47 trunk road and the expanding port facilities. In addition, it would provide accessibility benefits to the town by providing more direct routes between housing and employment areas, supporting regeneration.

High levels of support were reported for the provision of a third crossing, with 92% of respondents in a 2009 consultation exercise supporting the need for the Great Yarmouth Third River Crossing.

2.3.9 The Great Yarmouth Economic Growth Strategy 2016-2021

The Great Yarmouth Borough Council's Economic Growth Strategy identifies the key sectors best placed to deliver employment growth:

- Energy and Engineering
- Port and Logistics
- Tourism, Culture and Heritage

The strategic aims include:

- A prosperous physical environment and improved infrastructure.

The strategy concludes, *inter alia*, that "improved infrastructure is essential to raising productivity, enabling urban regeneration and unlocking growth, whilst an improved physical environment is intrinsic to successfully creating a destination in which to invest, work, visit and live".

The strategy identifies the **Great Yarmouth Third River Crossing** as a key component of the infrastructure required to support new development.

2.3.10 The Great Yarmouth Town Centre Masterplan (Draft 2016)

The Borough Council's draft Town Centre Masterplan covers the area between the seafront, the Yare riverfront, and the old town walls. Its vision is for new investment and employment in the town centre, generating renewed pride in Great Yarmouth and building confidence for the future. The plan aims to deliver this vision by focusing on six interconnected objectives, which have been developed in consultation with stakeholders and the general public:

- Strengthening the heart of the town centre
- Improving the market and the Market Place
- Transforming the Conge
- Creating a sense of arrival at the train station
- Unlocking the potential of Hall Plain
- Linking it all together

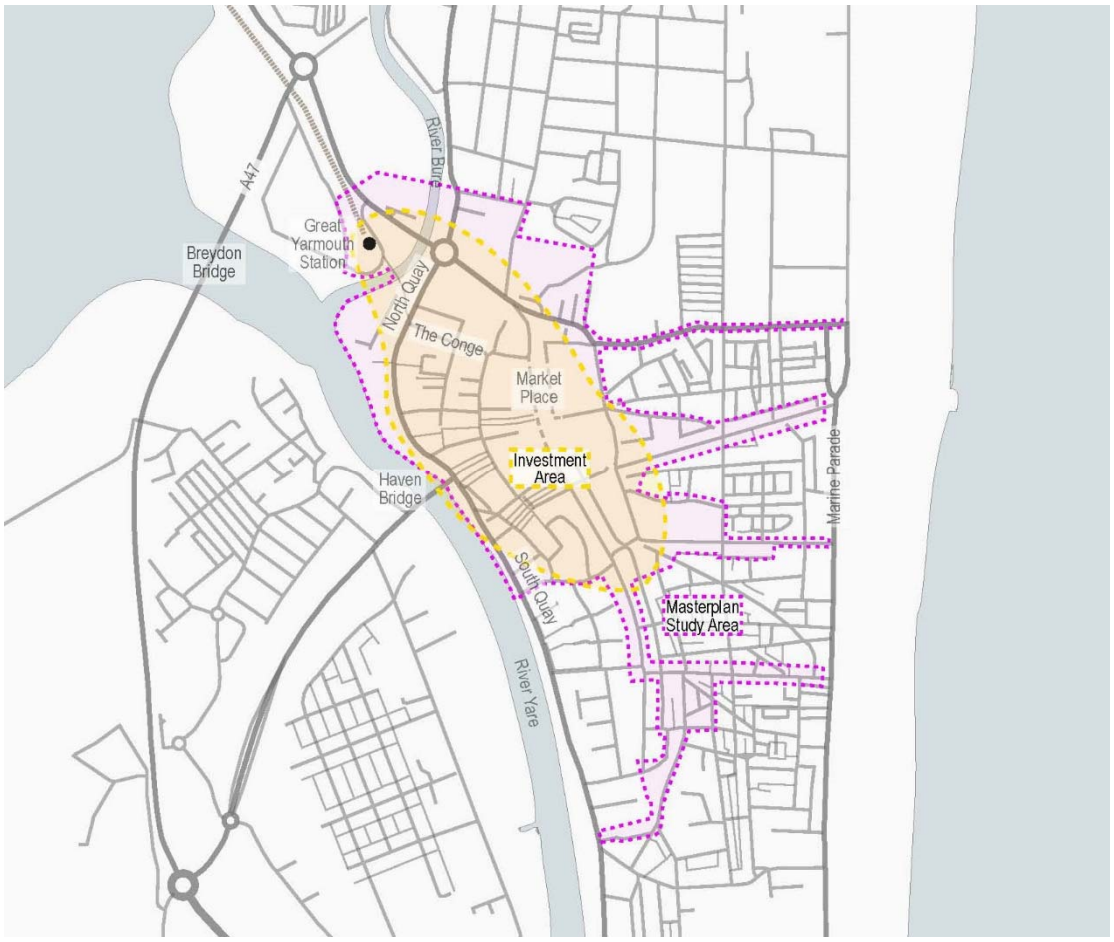

Figure 2-6 Town Centre Masterplan investment area (Source: GYBC)

The Masterplan which, following consultation, will be adopted in April 2017 envisages three phases of improvement, with the third phase (2021 – 2024) linked to the provision of the Great Yarmouth Third River Crossing. In the short term, the Local Growth Fund has allocated £1m in both 2017/18 and 2018/19 to invest in the link from Great Yarmouth's rail station via The Conge to the Market Place.

In the medium term, the Masterplan concludes that no single investment is likely to do more to boost the regeneration of the town centre than the proposed Great Yarmouth Third River Crossing, as it has the potential to significantly relieve the town centre of port-related traffic. The challenge for the town centre will then be to take the opportunity to reallocate road space and invest in the public realm. This has the potential to unlock the value of what were historically the town's most prosperous areas with its finest buildings, along the riverside from Fullers Hill to Hall Plain and South Quay.

Of the six objectives, the regeneration of Hall Plain is most closely linked to the provision of the third river crossing as it will benefit directly from the reduction in traffic using Haven Bridge. It has potential as a focus for leisure uses. The Borough Council will seek consensus among the public and stakeholders on a design concept and development brief which will encourage the refurbishment and regeneration of buildings in the context of the third crossing.

2.3.11 Summary of the policy background and business strategy

Common themes in all of the above policies are:

- The need, and opportunities, for economic regeneration in Great Yarmouth
- The potential for growth associated with the offshore energy industry, especially in the Enterprise Zone and outer harbour
- The lack of adequate links between potential development areas on the peninsula and the strategic road network, especially to the A47 (south)
- The problem of heavy traffic on the existing bridges, and congestion in adjacent parts of the town centre
- The need for a third crossing of the River Yare to provide traffic relief, and better access to strategic routes, supporting regeneration and growth on the peninsula and the town centre

In essence, the vision for Great Yarmouth is for a once prosperous town to take advantage of the new opportunities for growth and regeneration afforded by offshore energy, commercial and port-related development and tourism, by dramatically improving accessibility and by providing traffic relief to the historic centre: a more prosperous town, and a better place in which to live.

2.4 Opportunities for growth, regeneration and inward investment

The provision of a third crossing of the River Yare in Great Yarmouth would create opportunities for growth, regeneration and inward investment by:

- Providing a new direct route into the South Denes Enterprise Zone, including the new Outer Harbour, from the A47 (south) including Lowestoft, the A143, the A47 (west) including Norwich, and the A129 to the north.
- Providing the highway capacity needed to support employment growth in the Great Yarmouth peninsula and Outer Harbour, and encourage more inward investment associated with the renewable energy sector.
- Provide a more direct route into the southern part of the peninsula for pedestrians, cyclists and buses, enabling more people to access employment opportunities in the Enterprise Zone.
- Removing the damaging perception that parts of Great Yarmouth are remote and inaccessible, helping to encourage inward investment.
- Improving access to the seafront and leisure facilities on the peninsula.
- Reducing delays and improving the reliability of journey times for business journeys and freight, helping to reduce costs.

- Improving connectivity between the South Denes Industrial Estate and other employment areas in Great Yarmouth, important for the supply chain.

- Improving accessibility of town centre shops and businesses, and reducing the impact of traffic in historic areas, encouraging regeneration and refurbishment of buildings for new uses.

2.5 Problems identified

This section identifies the problems which the scheme will address. It presents evidence of their severity and impact, and sets out the reasons why the intervention is needed. The problems are listed below, and described in more detail in paragraphs 2.5.1 to 2.5.10.

- Inadequate access to employment areas and the harbour
- Traffic congestion, resulting in queuing and delays to journeys
- Difficulty in accessing the town centre, seafront and leisure facilities
- Inefficient and indirect bus services into the southern part of the peninsula
- Lack of direct walking and cycle routes into the southern part of the peninsula
- Community severance
- Impact of traffic on historic areas
- Impact of traffic on local air quality and CO_2 and greenhouse gas emissions
- Road accidents
- Lack of resilience in the local road network.

All of these problems are related to the way traffic uses the existing road network.

The existing road network is illustrated in Figure 2-1 above, and the existing peak traffic flows (from the calibrated base year SATURN model) are illustrated in Figure 2-7 and Figure 2-8 below.

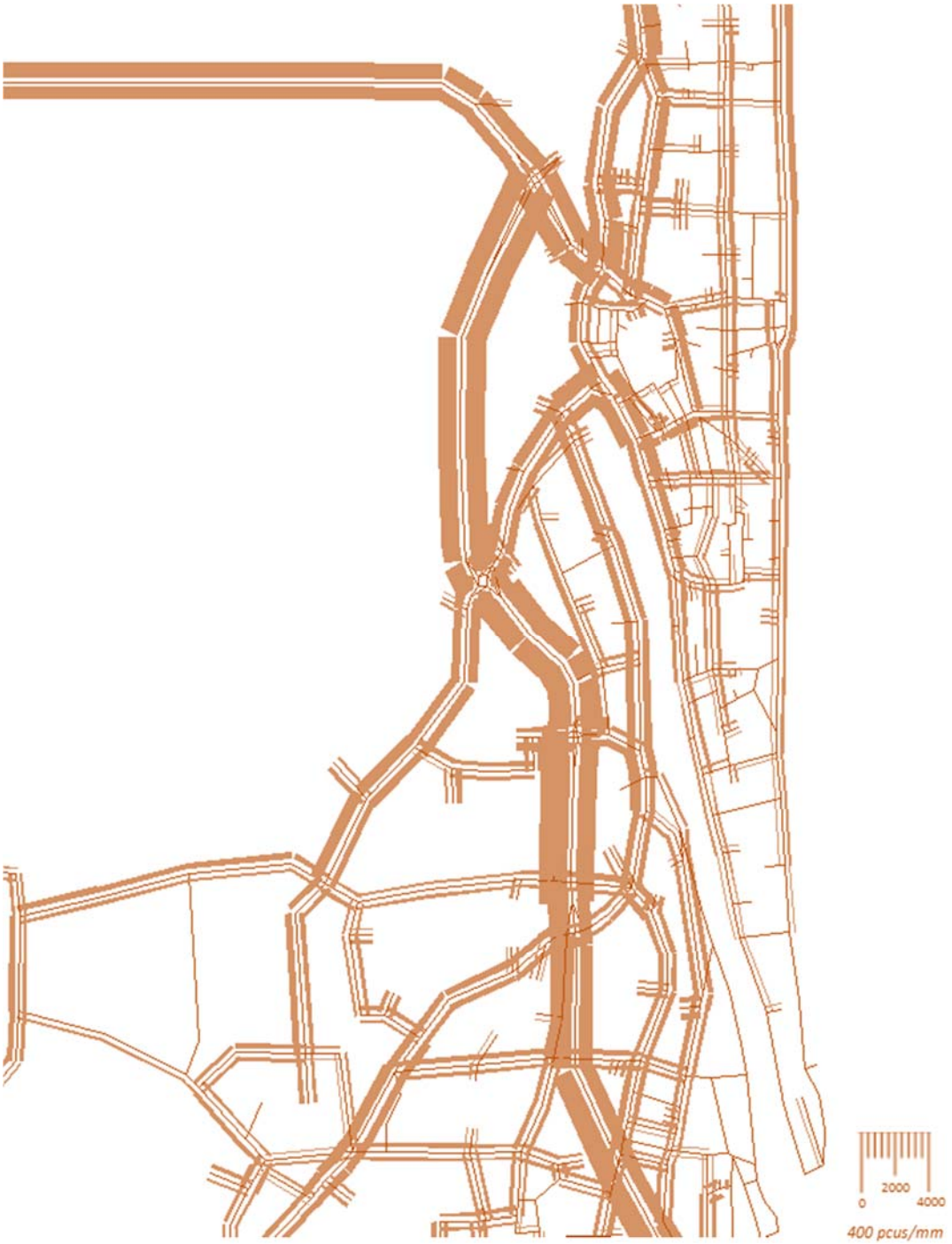

Figure 2-7 Traffic flows, AM peak hour 2016 (from SATURN model)

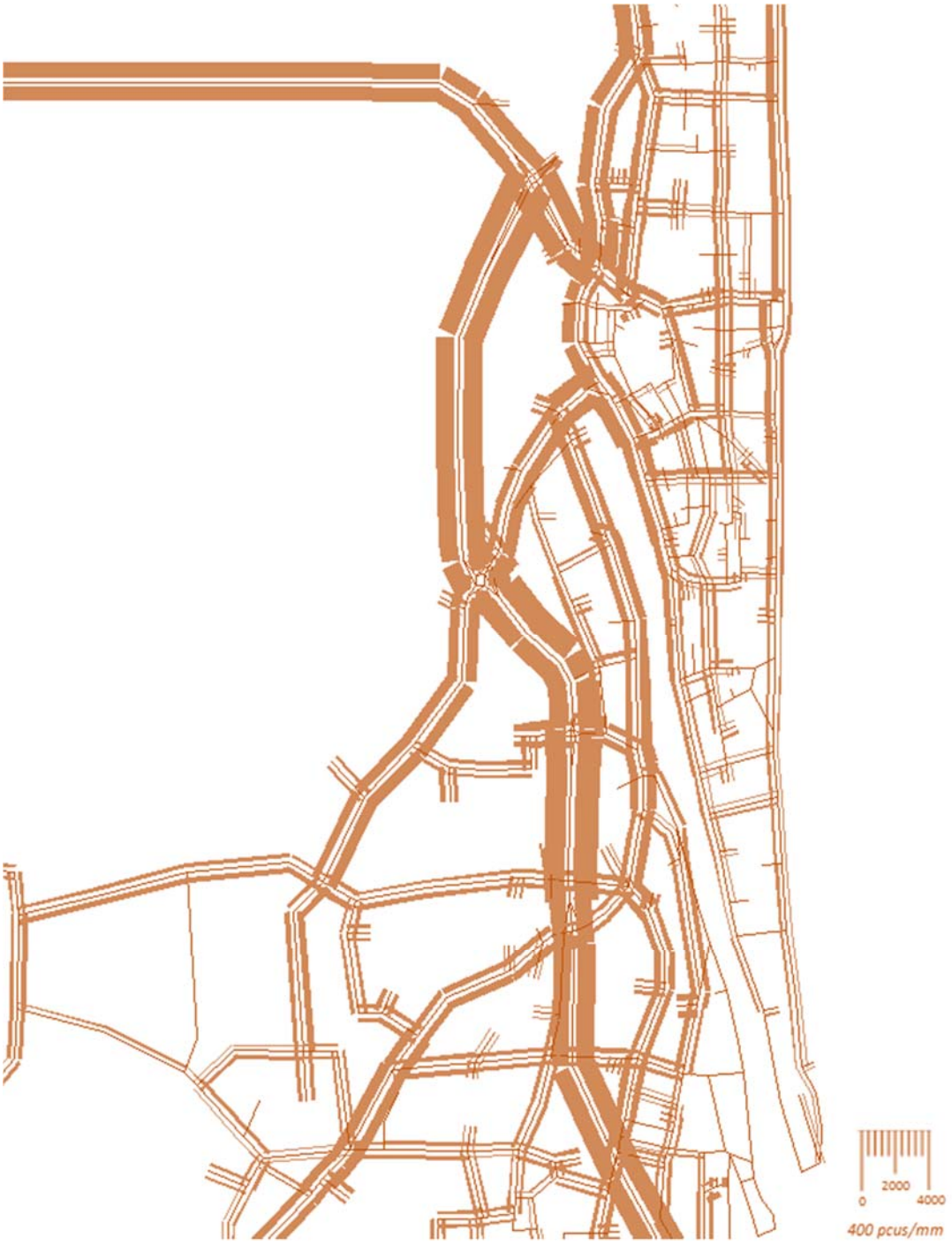

Figure 2-8 Traffic flows PM peak hour 2016 (from SATURN model)

2.5.1 Problem: Inadequate access to employment areas and the harbour

Figure 2-9 shows the principal employment areas and port and harbour facilities in relation to Great Yarmouth's road network.

For most of its history, Great Yarmouth has been a river port, with facilities on both sides of the River Yare. The town grew up around the port, with industrial development on both sides of the river. The South Denes Industrial Estate occupies the southern part of the peninsula. There are two road bridges, the Haven Bridge in the town centre, and the newer A47 Breydon Bridge further north. This means that all traffic to and from the peninsula, including traffic to and from the South Denes Industrial Estate, has to pass through the town centre. This leads to congestion and delay, and adds to the perception that the eastern part of Great Yarmouth is remote and inaccessible.

The decline in the fishing industry led to a decline in related employment, and many sites around the port fell vacant. However the advent of North Sea oil and gas exploration, extraction and servicing brought new industry to the town in the 1960s. New businesses took over the vacated fish processing sheds and warehouses on the peninsula. Similarly, growth occurred to the north of the Haven Bridge and on the west bank of the river, extending southwards towards Gorleston. Growing demand in the 1970s led to the creation of new industrial areas at Gapton Hall and Harfrey's, both west of the river, and demand for premises in these areas remains strong.

The area to the east of the river, the peninsula, is characterised by older, poor quality industrial buildings which can be less attractive to new businesses. However, some existing firms have relocated west of the river, and have more recently been replaced by newer businesses associated with the energy sector. In recent years, the offshore wind power industry has provided a further stimulus. Several energy-related firms (BH Bus, STATOIL, Petersons and Seajacks) have recently located to the peninsula and others are considering moving there. The County and Borough Councils are actively pursuing the regeneration of the area, establishing the Enterprise Zone, Local Development Order and Energy Park.

The new outer harbour, completed in 2010, has the potential to further stimulate growth on the eastern side of the town. It has transformed Great Yarmouth from a declining river port into a modern deep water port. Peel Ports began operations in Great Yarmouth in December 2015. The decision by Scottish Power Renewables to use the new harbour as their construction and marshalling point for North Sea operations has been highly significant. A £7 million investment by Siemens, their main contractor, means that the port is now very busy with contractors' vehicles, and further growth is expected. Norfolk County Council is in discussion with a number of offshore wind component manufacturing businesses who are considering locating in Great Yarmouth. They need deep water access and there are sites close to the outer harbour which are ready to accommodate them. Each component – towers, foundations, blades, cables, or turbines – involves a substantial supply chain and this requires good transport links.

Figure 2-9 Principal employment areas, port and harbour facilities

The problem is, unfortunately, that transport links into the South Denes Industrial estate and the new deep water harbour are not at all good. The prospect of a third river crossing is evidently attractive to potential businesses, but the present reality is that the only route into the area is through the town centre, and is slow, congested and unreliable. The Great Yarmouth Economic Growth Strategy (2017) identified "poor strategic transport infrastructure" as a threat to growth, highlighting the third river crossing as necessary to resolve congestion and provide new access to development sites.

Figure 2-10 Outer Harbour

Employees live on both sides of the river, so there is regular commuting in both directions. There are long delays every day on the A47 as drivers enter the town for work. Lack of a more direct access into the peninsula also means that most journeys are longer than they could be, discouraging people from walking or cycling to work.

Figure 2-11, derived from the 2016 SATURN base model – illustrates the routes currently taken by traffic travelling to and from the South Denes peninsula in the PM peak period. Haven Bridge is the main route into the peninsula.

Provision of a third river crossing would create a new, direct link into the South Denes Industrial Estate and the Enterprise Zone. It would provide both the river port and the deep water harbour with excellent links to the strategic road network. It would improve supply chain access between businesses on the east and west sides of the river, and bring more people within easier reach of new employment opportunities. It would support regeneration and help Great Yarmouth to benefit from growth in the offshore energy sector. A more direct crossing would also enable some journeys to be made by cycle or on foot, instead of by car.

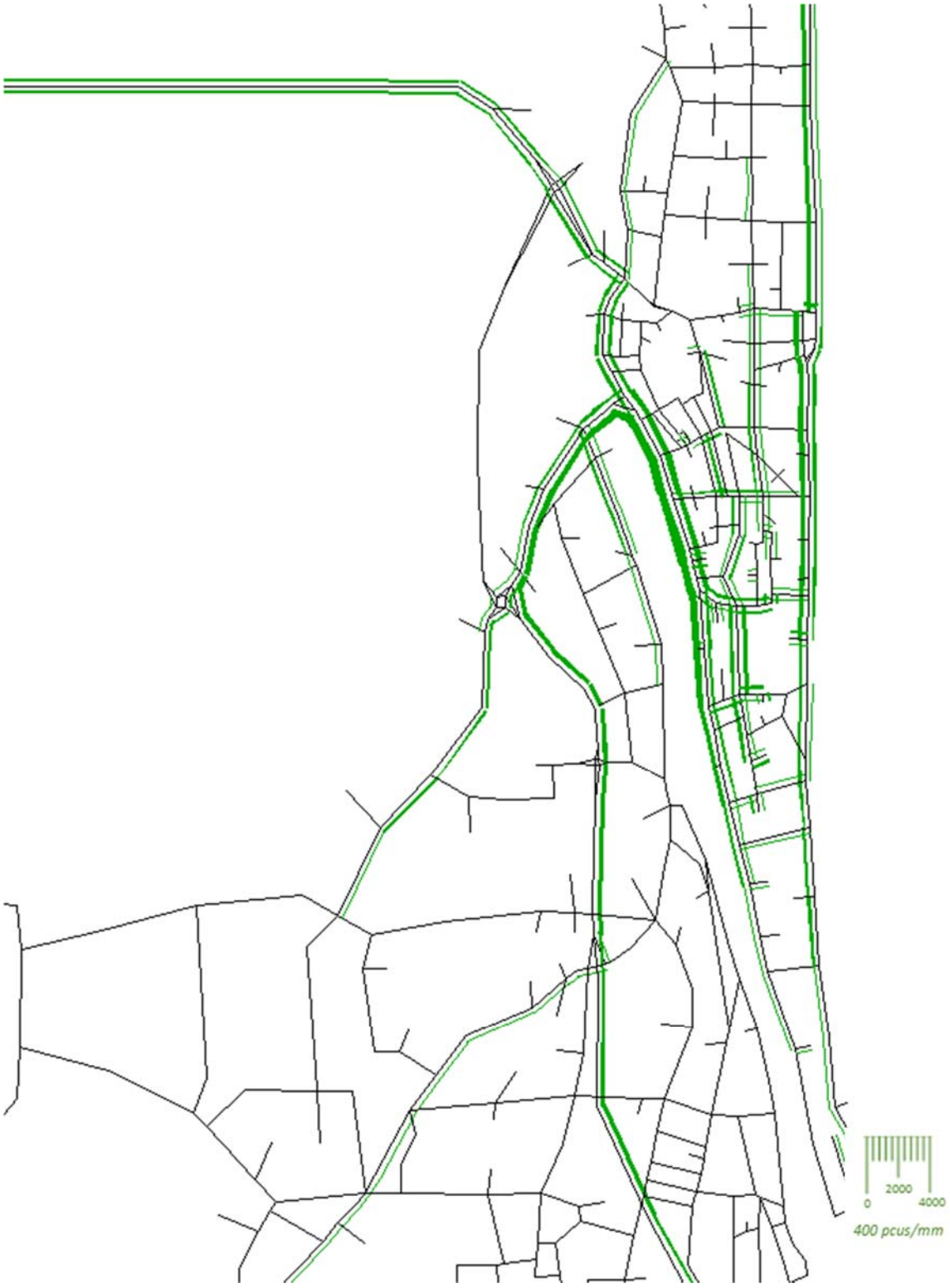

Figure 2-11 Traffic to and from South Denes peninsula PM peak 2016 (from SATURN MODEL)

2.5.2 *Problem: Traffic congestion resulting in queuing and delays to journeys*

A survey of local residents[13] in 2009 identified traffic congestion as the most serious transport problem to be tackled, by a considerable margin, as shown in Figure 2-12.

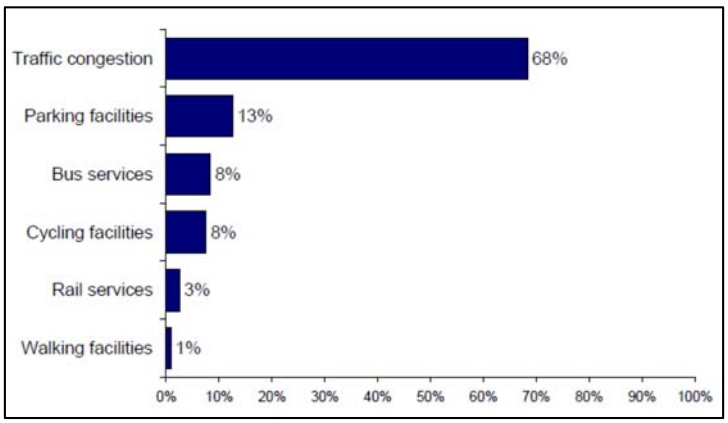

Figure 2-12 Residents' survey (2009) on aspects of transport most important to improve

As it can be quite difficult to measure congestion in absolute terms, a range of survey results, open source data, and model investigations have been used to illustrate the severity of queuing and delay on town centre roads. Taken together, these provide evidence that congestion is a very real problem for people in Great Yarmouth, not just a perception.

Detailed classified traffic counts and queue length surveys were undertaken at key locations in the vicinity of the Haven Bridge and town centre on Thursday 15 October 2015. The survey locations are shown in Figure 2-13 and the observed maximum queue lengths are set out in Table 2-1.

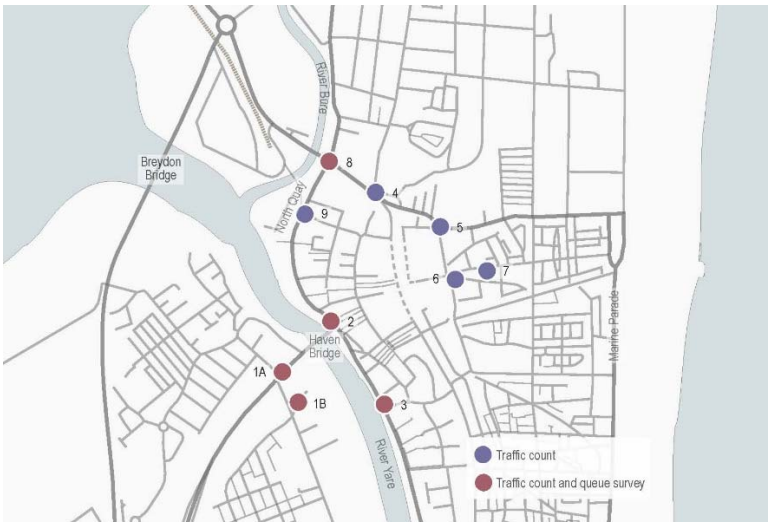

Figure 2-13 Traffic counts and queue survey locations, 2015

[13] Survey for the Great Yarmouth and Gorleston Area Transport Strategy, 2009

Location	Direction	Maximum queue (veh)
1A	From Pasteur Road	>150
1A	From Bridge Road	>150
1A	From Southtown Road	100
2	From North Quay	127
2	From South Quay	>150
2	From Bridge Road	142
3	From the north	137
3	From the south	92
8	From Acle New Road	>150
8	From North Quay (north)	>150
8	From Fullers Hill	40
8	From North Quay (south)	>150

Table 2-1 Maximum queue lengths observed

This queuing is associated with the high volumes of traffic using the Haven Bridge and nearby roads, as shown in Table 2-2.

2-way traffic flows Thursday 15 October 2015	12 hrs (7 am – 7 pm) All traffic
A1243 Haven Bridge (across River Yare)	22,513
South Quay, south of Haven Bridge	19,697
North Quay, north of Haven Bridge	11,709
Acle New Road (across River Bure)	22,226
Fullers Hill	9,316
Temple Road	21,816

Table 2-2 Traffic volumes, October 2015

Journey times are significantly longer in peak periods than in the off-peak. Open access mapping data was used to compare journey times on various routes at different times of the day in November 2016. The start and end points of these routes, all of which cross Haven Bridge, are illustrated in Figure 2-14 and the difference between peak and off-peak journey times is set out in Table 2-3.

Figure 2-14 Journey time start/finish locations

	To:	To E			To F			To G			To H		
From:		**AM**	**OP**	**PM**	**AM**	**OP**	**PM**	**AM**	**OP**	**PM**	**AM**	**OP**	**PM**
E	Minutes				14	10	12	10	7	8	14	12	14
	% over OP				40%		20%	43%		14%	17%		17%
F	Minutes	7	7	8				6	6	7	5	5	5
	% over OP	0%		14%				0%		17%	0%		0%
G	Minutes	6	6	7	6	6	7				8	8	9
	% over OP	0%		17%	0%		17%				0%		13%
H	Minutes	9	9	10	6	5	9	10	9	14			
	% of OP	0%		11%	20%		80%	11%		56%			

Table 2-3 Journey times (from open source data)

A similar exercise was undertaken for routes using the Breydon Bridge and the results are set out in the 2016 Options Assessment Report[14].

The microsimulation model of Great Yarmouth, developed for the final phase of option assessment provides, a further insight into the location of congestion hotspots in and around the town centre. Figure 2-15 is a congestion “heat map” for the calibrated base year (2016) model, providing a snapshot of the locations and intensity of congestion on the local road network in the morning peak period.

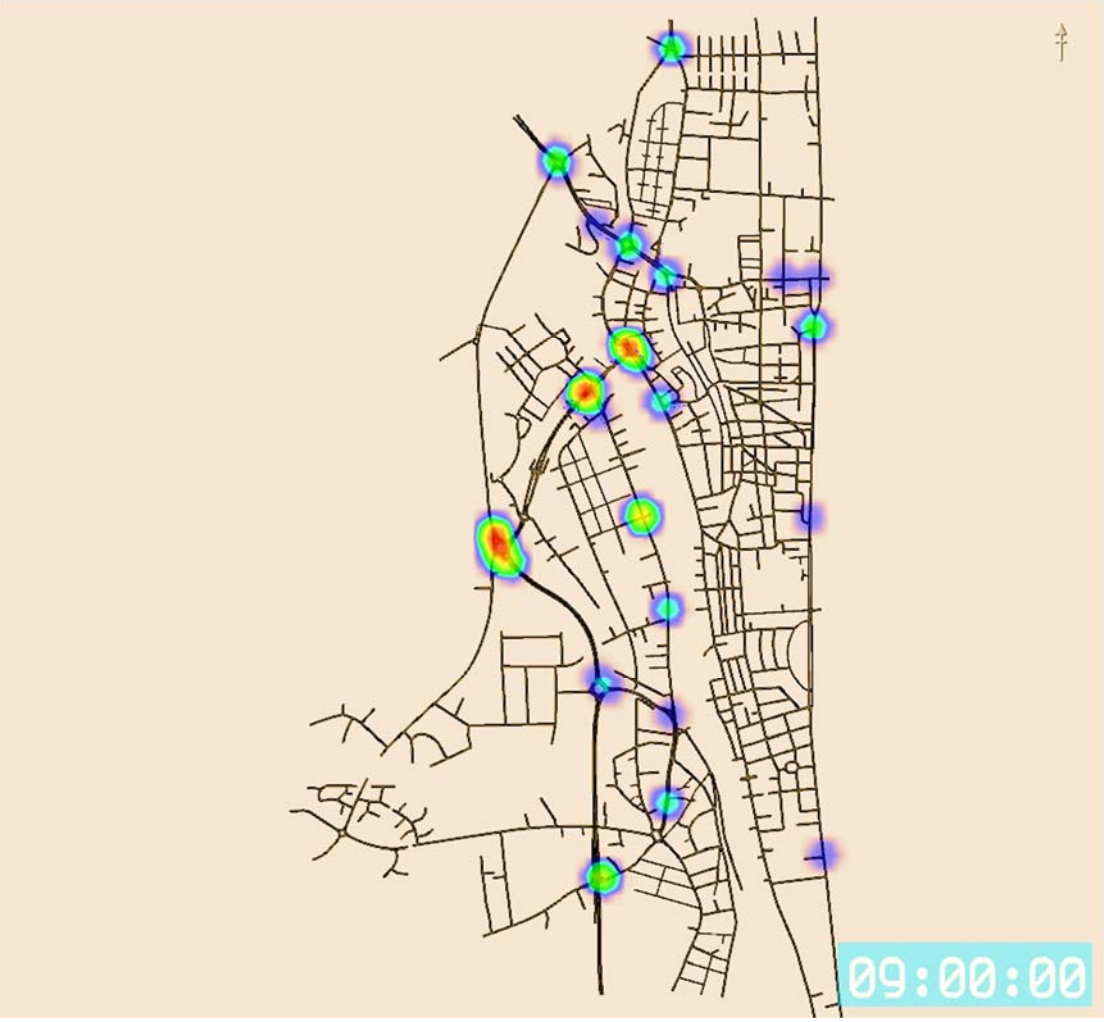

Figure 2-15 Congestion "heat map" AM peak 2016 (from PARAMICS microsimulation model)

Because the heat map can only represent an instant of time, it should be seen as illustrative only, but it does give a further insight into which parts of the network are affected most by congestion. The results from the microsimulation model generally correspond with other surveys and anecdotal reports of congestion.

[14] Supporting document 1

Figure 2-16 Congestion on approach to Haven Bridge

Congestion is a problem in peak periods throughout the year, but also occurs during the summer when many tourists visit the town centre, pleasure beach and seafront attractions. An estimated 4 million people visit the resort every year, including about 1 million staying visitors per year with an estimated visitor spend of £398 million[15]. Seasonal events, such as festivals, fireworks displays and horse races are all associated with increased congestion and traffic delay. On days with especially fine weather, increased numbers of day trippers add to the traffic demand and congestion. The raising of the bridges to allow shipping to pass through creates further significant delays and long queues which can take a very long time to clear. The proposed third crossing, whilst also a lifting bridge, will provide additional network capacity, reducing overall traffic on Haven Bridge and the build-up of queues – in effect increasing resilience.

As already noted, congestion at the bridges makes it difficult to provide adequate access to the important employment areas in the South Denes Enterprise Zone, including the new deep water outer harbour.

Congestion affects bus users and cyclists, as well as car users. Pedestrians are also affected by the long traffic signal cycle times needed to handle demand at junctions.

[15] 2011 Statistics, Local Plan Core Strategy, Great Yarmouth Borough Council

2.5.3 Problem: Difficulty in accessing the town centre, seafront and leisure facilities

The town centre, seafront and the majority of leisure facilities are located on the Great Yarmouth peninsula. Access to these areas from the major routes in the south and east is limited by the bridges at the northern end of the peninsula – Haven Bridge over the River Yare, the A47 (former A12) Breydon Bridge, and A149 Acle New Road over the River Bure via the Fullers Hill roundabout.

Haven Bridge, Breydon Bridge and Fullers Hill roundabout carry heavy traffic flows and are regularly congested at peak times. The narrower streets within the town centre are subject to a one-way system. They can suffer significant congestion when minor disruptions occur, or when there is seasonal extra traffic into the town centre and seafront.

Figure 2-17 Traffic on South Quay

Figure 2-18 below is a visual representation of the traffic flows on and around the Haven Bridge in the morning peak period in 2016.

Figure 2-19 is a visual representation of the traffic delays in the same area during the morning peak period.

The amount of traffic using Haven Bridge, the lack of alternative routes and the limited capacity of the road network around the bridge and in the town centre is a major cause of congestion in Great Yarmouth's town centre and makes it more difficult to access the seafront and other facilities on the South Denes peninsula.

Figure 2-18 Traffic flows around Haven Bridge AM peak 2016 (from PARAMICS microsimulation)

Figure 2-19 Link delays, PM peak, 2016 (from PARAMICS microsimulation model)

The town centre has experienced decline in the past 5-10 years. In January 2015 the Marks & Spencer store in King Street closed and moved to an out-of-town site at Gapton Hall Retail Park – a significant loss to the vitality of the traditional centre.

The popularity of out-of-town shopping with free car parking has added to the problems of access to the traditional town centre. At peak times and at weekends, traffic queues build up on the A47 (former A12) between the Harfrey's and Gapton Hall roundabouts, causing significant delays on Pasteur Road, the main route into the town centre via Haven Bridge.

The result is that Great Yarmouth town centre is seen as inaccessible by potential shoppers and visitors. At a recent consultation event held in Market Gates Shopping Centre (for the emerging Great Yarmouth Town Centre Masterplan) a number of residents remarked on the relative ease of travel to Lowestoft, or even Norwich via the A143 and A146 for their main food and comparison shopping needs, rather than endure congestion in Great Yarmouth. This 'leakage' of expenditure to other major retailing centres such as Norwich or Lowestoft was also noted in the Borough Council's 2012 Retail Study, which reported Great Yarmouth's slippage in the National Centre Ranking from 183rd place in 2007 to 200th place in 2011.

There is now a real concern that some local people no longer recognise Great Yarmouth Town Centre as their principal destination for retailing or other town centre needs. This conflicts with the Local Plan Core Strategy's Retail Hierarchy, which classifies the town centre as the focus for future retail development and investment.

The Borough Council has recently invested £1 million in improvements to the town centre, and has taken other steps through a wider town centre initiative to improve its attractiveness, such as a revitalised market place, grants for shop frontages, and free parking in short stay car parks after 4 p.m.

The seafront suffers from the same access problems as the town centre, and has also suffered decline. Recent investment in the public realm has led to major improvements to the northern part of the seafront. In contrast, the southern, less accessible part is desolate and unfrequented by visitors.

A third river crossing into the peninsula would complement recent investment in both the town centre and seafront by improving accessibility for all modes of transport. It would reduce adverse impacts of traffic, and help dispel perceptions that Great Yarmouth is remote and inaccessible to visitors. It would help to recapture shopping expenditure from more distant centres, strengthen the role of Great Yarmouth as the main town in the borough, and improve its economic vitality. The stimulus which the proposed bridge will bring to employment would also have a positive impact on the economy of the town centre.

Figure 2-20 Bus routes

2.5.4 Problem: Inefficient and indirect bus services into the southern part of the peninsula

Existing bus routes in Great Yarmouth are illustrated in Figure 2-20. The main bus terminus is at the Market Gates shopping centre. Frequent delays at the Haven Bridge, and congestion associated with the traffic signals at either end of the bridge, pose particular problems for scheduled bus services in the area. When the Haven Bridge is raised, for river traffic, buses can be delayed for up to 20 minutes. Services may have to be cancelled, and delays can affect services throughout the day.

Efforts are being made to encourage tourists to use bus services from the holiday villages of Hemsby, Caister-on-Sea and Hopton, but it is difficult to grow this trade when services are badly affected by congestion.

Two existing bus routes penetrate part of the way into the South Denes area. In common with routes into the town centre, these services are affected by congestion at the existing bridges.

Provision of a Third River Crossing would ease this congestion and could allow the development of more efficient services incorporating the new crossing. Discussions with the main bus operators have indicated that they would make use of the Third Crossing to provide more direct services to the town centre.

Figure 2-21 Haven Bridge

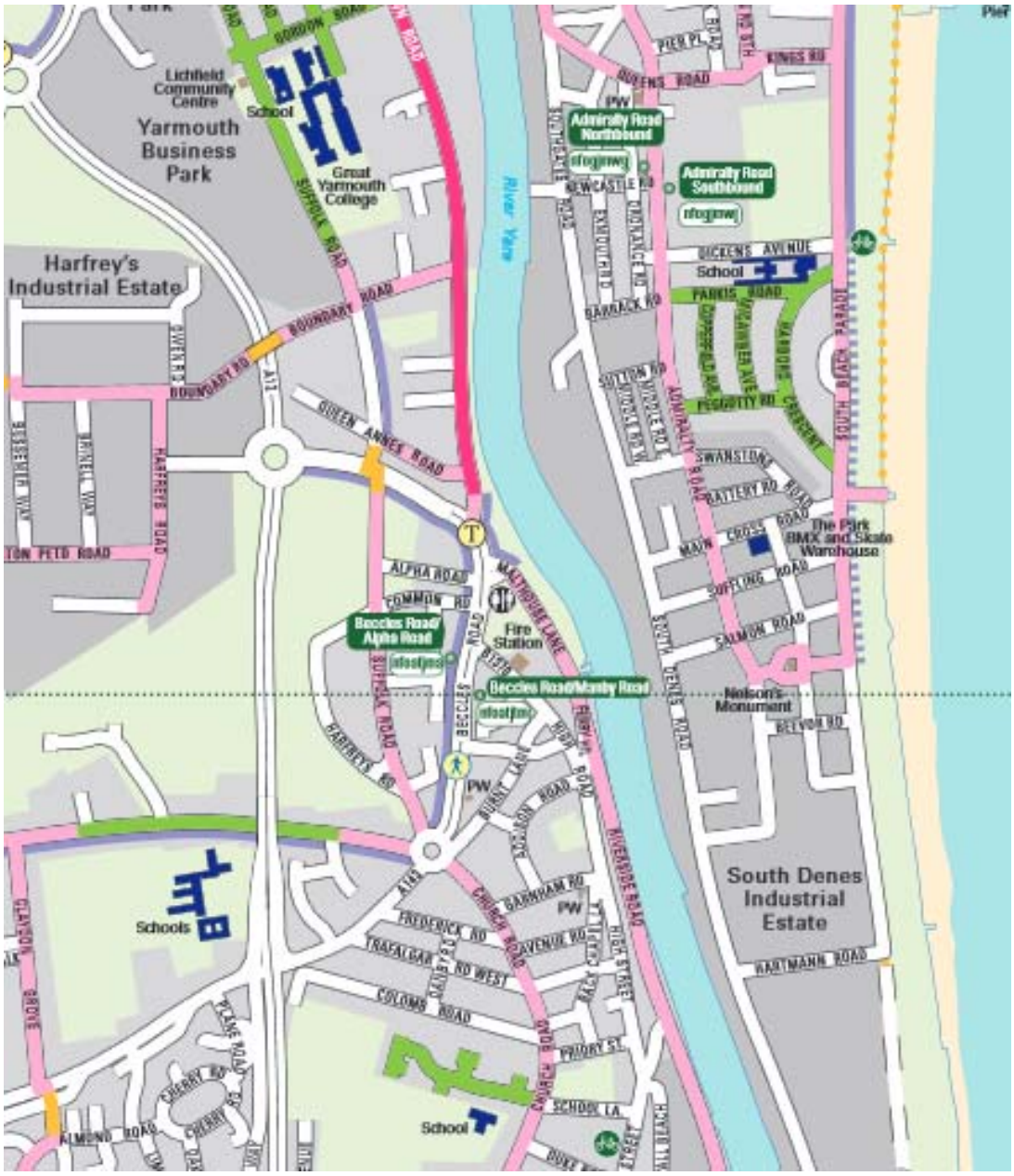

Figure 2-22 Walking and cycling facilities (source: http://www.great-yarmouth.gov.uk)

2.5.5 *Problem: Lack of direct walking and cycle routes into the southern part of the peninsula*

Similarly, pedestrians and cyclists from other parts of Great Yarmouth, or from the south or west have to use the Haven Bridge to access the town centre, seafront and employment areas. Existing facilities are illustrated in Figure 2-22. A dedicated off-road cycle route has recently been provided as part of the improvements to Marine Parade; there is an on-road route on Southtown Road on the west side of the river and a network of advisory or traffic calmed routes on both sides.

A third river crossing to the southern part of the peninsula, with dedicated cycle facilities, would enable these routes to be linked to form a greatly improved cycle

network. It would make it easier to encourage people to walk or cycle to work from locations that are presently too far apart.

A third river crossing to the southern part of the peninsula, with dedicated cycle facilities, would enable these routes to be linked to form a greatly improved cycle network. It would make it easier to encourage people to walk or cycle to work from locations that are presently too far apart.

2.5.6 Problem: Community severance

Great Yarmouth is split into two by the River Yare. The Haven Bridge is about 4 km from the river mouth and harbour, and whilst both the east and west sides of the 80m wide estuary are fully developed, the two communities are physically separate. The South Denes peninsula has a large resident population as well as significant industrial and port related development. The lack of a southern river crossing means that the community on the peninsula is isolated from the western parts of the town.

The Nelson Ward, which covers the peninsula, suffers from high levels of multiple deprivation and falls within the most deprived ten percent nationally in terms of income, education and employment. Residents are less likely to have access to private means of transport, or have the purchasing power for public transport, making it more difficult for them to access employment. For example, a resident of Pegotty Road on the South Denes peninsula would have to travel 2.5 miles to access employment at Harfrey's Industrial Estate, even though the two locations are physically less than 0.6 miles apart.

The economic community at South Denes comprises the Great Yarmouth South Denes Enterprise Zone, which includes the Great Yarmouth Outer Harbour, the South Denes Business Park, and, slightly further to the north, the Great Yarmouth Energy Park. The entire area has the benefit of a Local Development Order and is strategically positioned to capitalise on the burgeoning offshore energy sector. The employment opportunities in these areas are relatively inaccessible to people living in the western part of the town. For example, a person living on Riverside Road, Gorleston, would have to travel 6 miles to reach a place of work on South Denes Road which is physically less than a quarter of a mile away.

The same geographical constraints mean that the other Enterprise Zone site in Great Yarmouth (Beacon Park in Gorleston) is effectively more distant from the South Denes Enterprise Zone site and the Outer Harbour, whilst the routes between them are often congested. This is a problem, as it is essential to have good links between the energy sector businesses in the office-driven business park and the more industrial South Denes site.

The provision of a third river crossing would greatly reduce the severance of the residential and business communities on the peninsula from the rest of the town and local area. A new crossing would bring more people within walking and cycling distance of important industrial areas, expanding employment opportunities for people without access to a car. Residents would have much better access to

Gorleston High Street. A new crossing would therefore help to socially integrate communities within Great Yarmouth, a key aim of the Local Plan Core Strategy. It would also reduce journey times for people and goods, and improve connectivity to destinations such as Felixstowe, Harwich and London via the A12, and to Norwich and the Midlands via the A47.

2.5.7 Problem: Impact of traffic on historic areas

Traffic detracts from the enjoyment of the most important historic areas in Great Yarmouth.

The first Haven Bridge was erected in 1427 at South Quay, connecting Yarmouth with Southtown. South Quay, together with North Quay and Hall Quay (previously called Broad Quay) form the historic heart of the town, described by Daniel Defoe in the 18th century as *"the finest key in England, if not in Europe, not inferior even to that of Marseilles itself".*

South Quay is a conservation area[16], with a significant cluster of listed buildings including former merchants' houses with mediaeval origins (now the Elizabethan House Museum, and Nelson Museum) and the historic frontages of the former Port Authority building (1746) and the Port & Haven Commissioners Office (1909). There are links from South Quay to the Time and Tide Museum, which occupies a former fish curing works (1880), the Greyfriars Franciscan Friary (parts of which date from the 14th century) and a 12th century Toll House.

[16] http://www.heritage.norfolk.gov.uk/record-details?TNF2259-Great-Yarmouth-South-Quay-Heritage-Trail-(Heritage-Trail)

Figure 2-23 Historic merchant houses and Town Hall, South Quay

South Quay is currently the main route for all traffic, including heavy goods vehicles, to the South Denes industrial area and the outer harbour. As such, it carries heavy traffic, typically over 2,000 vehicles in the morning peak hour. This, together with the associated signing and other street furniture seriously detracts from the setting of the historic buildings and the enjoyment of important cultural assets.

Table 2-4 sets out the traffic flows on Haven Bridge, North and South Quay from the calibrated SATURN model.

	Traffic flow (2 way) AM peak 2016	**Traffic flow (2 way) PM peak 2016**
North Quay	899	1,130
Haven Bridge	1,964	1,926
South Quay	2,117	1,814

Table 2-4 Traffic flows near Haven Bridge AM peak 2016 (from SATURN model)

The historic Hall Quay is directly opposite the Haven Bridge, and is dominated by the heavy traffic using the bridge. Traditionally the civic heart of the town, Hall Quay is framed by the waterfront, the listed Town Hall (1882), and several banks with attractive listed frontages. In recent years, most of the banks have relocated, leaving prominent historic buildings vacant.

Figure 2-24 Town Hall and traffic turning from Haven Bridge

The emerging Great Yarmouth Town Centre Masterplan identifies this area as having potential to regenerate as a new premium leisure-based quarter for Great Yarmouth town centre, capitalising on its historic setting, the quality and stock of existing listed buildings and its west-facing vantage over the River Yare and towards the Broads. This is an important economic opportunity for the town, with the potential to broaden the offer and functionality of the town centre and to reduce the seasonality of the tourism economy.

Figure 2-25 Star Hotel and Bank Buildings, Hall Plain

These historic areas are unlikely to achieve their potential without a reduction in the current levels of traffic and congestion. A third river crossing would provide an attractive alternative route to the industrial areas and outer harbour. It would significantly reduce the amount of traffic, including heavy goods vehicles, using the Haven Bridge, Hall Quay and South Quay, supporting the regeneration of these areas and improving the local economy.

2.5.8 Problem: Impact of traffic on local air quality and emissions of CO2 and greenhouse gases

The scientific consensus is that increases in carbon dioxide (CO_2) and other greenhouse gases are causing climate change. Other emissions, especially particulates, are associated with serious risks to health. Transport is a major source of CO_2 and other emissions. Changes in the volume and type of road traffic, and the performance of the local road network, will therefore have a significant impact on local air quality and the emission of greenhouse gases.

By local air quality we mean the ambient air quality outside people's homes, or in areas where people spend a large amount of time. Poor air quality is caused by increased concentrations of gases such as nitrogen dioxide (NO_2) or particles (PM) that are harmful to people and habitats, causing harm to health and, as a consequence of climate change, more extreme weather and flooding.

Local air quality is dealt with under the Local Air Quality Management (LAQM) Regime, introduced under Part IV of the 1995 Environment Act. Great Yarmouth Borough Council produces an Annual Status Report (ASR) on air quality, as required by the 1995 Act. The Council undertakes type-approved real time monitoring of air quality in line with LAQM requirements, but is currently not obliged to monitor greenhouse gases.

The July 2016 ASR did not reveal any exceedance of air quality standards, and did not predict any exceedance over the following year. Therefore, the Borough does not have any Air Quality Management Areas (AQMA). However the possible need for an AQMA for NO_2 at a future date was predicted when the original Outer Harbour was proposed. The 2016 ASR therefore confirms the need for a "watching brief" on the development of the Outer Harbour and new industry in the Enterprise Zone.

Great Yarmouth Borough Council considers that the people most likely to be affected by poor air quality in Great Yarmouth are those who live alongside the quayside (between North Quay and the Outer Harbour), Runham Vauxhall, Southtown, Cobholm, and Pasteur Road/Southtown Road/Bridge Road. These areas are characterised by a large proportion of rented accommodation, and many residents who are young, elderly, sick or socially or economically disadvantaged.

Although it is not required to have a formal action plan, the Council has taken a significant number of measures forward to improve air quality, and reduce the exposure of the public to adverse air quality – these are detailed in ASR. The prospect of a third river crossing is seen as an opportunity for further improvement.

A third river crossing will change traffic patterns over a large area. The impacts on air quality will be monitored, together with the longer term impacts of growth and regeneration. By offering shorter, more reliable journeys and less queuing and congestion, the scheme is expected to reduce fuel consumption and emissions of NO_2, PM, CO_2 and greenhouse gases.

2.5.9 Problem: Road accidents

In the five years from 2011 to 2015, there were 394 recorded collisions in the Great Yarmouth area, involving 489 casualties.

Of the 489 casualties, 99 (20%) were pedestrians and 50 (10%) were cyclists with 72 casualties (15%) involving motorcycle accidents. There are clusters of accidents on the approaches to the existing bridges, including at North Quay.

	Collisions	Casualties
Fatal	2	2
Serious	46	47
Slight	346	440
Total	**394**	**489**

Table 2-5 Collisions and casualties 2011-2015

In the six years to the end of October 2016, collisions on key links and junctions in the town centre were recorded as set out below:

Location	Fatal	Serious	Slight	TOTAL	Peds	Cyclists
LINKS						
Pasteur Road and Bridge Road	1	4	6	**11**	4	4
Southtown Road	0	5	21	**26**	4	8
South Quay and Southgates	0	0	14	**14**	2	2
William Adams Way	0	0	1	**1**	0	0
A12	0	0	6	**6**	0	0
JUNCTIONS						
A12/Pasteur Road	0	0	9	**9**	0	0
A12 William Adams Way	0	0	16	**16**	0	0
Pasteur Road/Southtown Road	0	0	2	**2**	1	0
Bridge Road/Hall Quay	0	0	6	**6**	2	0
Southtown Rd/Williams Adams Way	0	1	1	**2**	0	1

Table 2-6 Accident locations Oct 2010 - Oct 2016

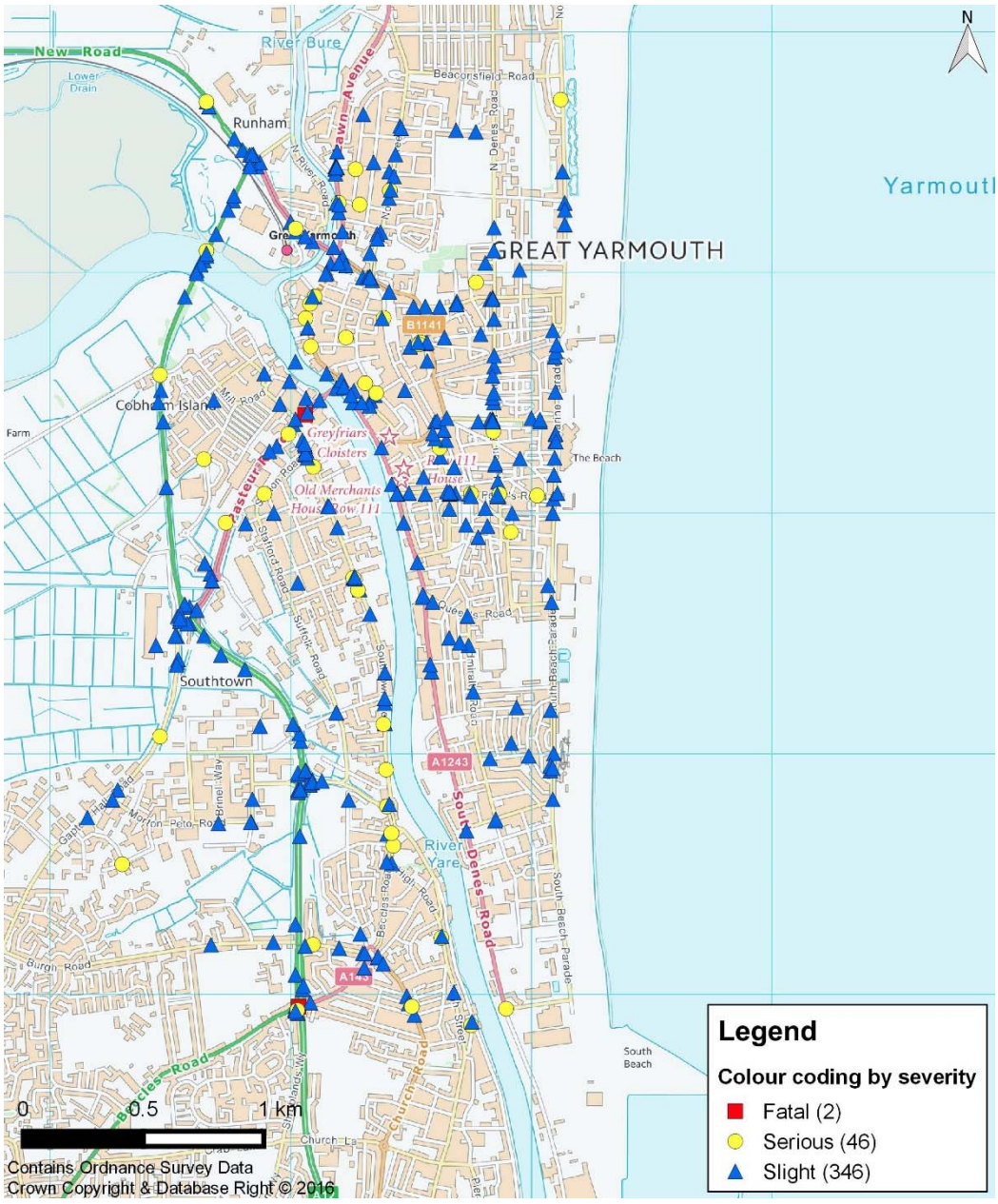

Figure 2-26 Injury accidents 2010-2015

On Pasteur Road and Bridge Road, accidents are grouped around the Pasteur Road/Thamesfield Way roundabout (3 slight) and the Bridge Road link between Southtown Road and Hall Quay signals (1 fatal, 2 serious, 4 slight). Of most concern is the prevalence of accidents on Bridge Road (7). Six of these involved vulnerable road users suggesting problems in this motor vehicle dominated environment around the existing crossing of the River Yare.

The accident rate on Southtown Road is around three times the national average for 'other urban roads'. Accidents are scattered but tend to occur at junctions (Gordon Road and Bridge Station Road). The accident rate on South Quay and Southgates is just under twice the national average for urban A roads. Accidents are generally

scattered, with clusters on Nottingham Way and Queen's Road, which are more heavily trafficked side roads.

It is notable that the number of accidents at the Southtown Road/William Adams Way roundabout is almost twice that of the nearby Pasteur Road roundabout. The large 80m diameter and wide circulatory carriageway without traffic signals may generate higher entry and circulatory speeds. Accidents are mainly "failure to give way" and tail end collisions.

A third crossing is expected to reduce overall distances travelled in and around the town, and therefore reduce exposure to accident risk, leading to a net reduction in casualties. As traffic transfers from routes with higher than average accident rates to safer routes, further reductions may occur. The new bridge and approach roads will be designed to reduce accident risk, following a full safety audit. Accident reductions have been forecast using the traffic model and the assessment is included within the Economic Case, rates will be monitored before and after the scheme construction

2.5.10 Problem: Lack of resilience in the local road network

Resilience in a transport network has been defined[17] as "the ability to absorb shocks gracefully". It may be understood in terms of the way different components of the network work complement each other:

- **Redundancy** Different components serving the same function
- **Diversity** Components are functionally different
- **Efficiency** Network performance is optimised
- **Autonomy** Components are able to function separately
- **Strength** Ability to withstand a disruptive event
- **Collaboration** Information and resources shared amongst components
- **Adaptability** Flexible, able to learn from past experiences
- **Mobility** Ability to reach a chosen destination with an acceptable level of service
- **Safety** Exposes fewer users to hazards
- **Recovery** Level of service can be restored quickly

Lack of resilience is a problem if a transport network is unable to cope with disruptive events, such as surges in demand, accidents, extreme weather conditions or road works. The more common the event, the more important it is for the network to be

[17] Resilience Theory and System Evaluation, Verification and Validation of Complex Systems: Human Factor Issues, Vol.110, p35-60, Harold Foster (1993)

able to recover quickly in order to restore an acceptable level of service and avoid compounding the problem.

Lack of resilience is a serious problem in Great Yarmouth as a result of:

- The frequent, but irregular, openings of the Haven and Breydon Bridges to allow passage of river traffic
- A lack of alternative routes to and from the South Denes Industrial Estate and Outer Harbour
- Seasonal and weather-related variations in traffic demand from visitors
- The high risk of flooding affecting the Haven Bridge

The problems arise because of the frequency, or severity of the disruptive events combined with the inability of the existing network to cope and recover.

When the Haven Bridge is raised to allow ships to pass through, it is very difficult for traffic to divert to alternative routes. The traffic signals at either end of the bridge generate long tailbacks of traffic which is typically stationary for about 10 minutes on each occasion. It can take up to 20 minutes for the queues to clear and for traffic to return to normal. During these times, buses can be severely delayed, but they are unable to divert away from their scheduled routes. The A47 Breydon Bridge is an unsuitable alternative route for pedestrians and cyclists.

There is a further problem in that the Haven Bridge is ageing, and utilities (such as water, gas electricity mains) are affected by corrosion. Power supplies to the traffic signals are frequently disrupted, which causes traffic disruption over a wide area.

Pipes and cables occupy a limited space, and are not easy to maintain efficiently. It can be difficult to locate faults quickly, and work on one utility often exacerbates problems with another. It is difficult to plan repairs and renewals efficiently, reducing the resilience of the power and water supply networks as well as increasing the frequency of road closures.

The delays associated with event-type disruption are detected by traffic monitoring reports which are updated regularly. Recent examples include recorded delays of 19 minutes on the A149 Lawn Avenue on 1 April 2016, caused by extra traffic associated with the Easter Fair and particularly fine weather. The disruption lasted throughout the day. Road accidents also cause disruption from which the network is slow to recover: records from 15 August 2016 show that an overturned vehicle on a critical roundabout caused delays of over 10 minutes.

The Haven Bridge is in an area which is susceptible to flooding. It is the first area of the town to be closed to traffic during flooding incidents[18].

In January 2017 a tidal surge led to the evacuation of parts of the town. When water overtops the flood barriers the existing bridges have to be closed to traffic. Salt water ingress associated with flooding also causes damage to traffic control equipment and corrodes pipes and cables, increasing the need for maintenance and renewal.

The issue in Great Yarmouth is not that such disruptions occur, as they are often unavoidable. Rather, it is the network's inability to cope well with these common, though unpredictable, disruptions because of the lack of capacity for extra traffic in the town centre, and the lack of alternative routes to important destinations on the peninsula.

The provision of an additional river crossing would greatly increase the resilience of the local transport network. In terms of the factors identified above, it would provide:

- **Redundancy:** An alternative, more direct route into the peninsula
- **Diversity** A bridge in a different location
- **Efficiency** Shorter, more direct routes for many journeys
- **Autonomy** The bridges would open independently of one another
- **Strength** The new bridge would be less susceptible to flooding
- **Collaboration** Traffic would be directed to the new bridge if the Haven bridge has to be closed for maintenance
- **Adaptability** The new bridge would have capacity to cope with a present and future traffic demand
- **Mobility** The new bridge would provide much more reliable access to the harbour and Enterprise Zone
- **Safety** Shorter journeys on a bridge and junctions designed to modern standards reduces exposure to accident risk
- **Recovery** Increased total river crossing capacity would enable a normal level of service to be restored quickly after an incident.

[18] Flooding near Haven Bridge, © 2007 EN news EN pics (01603) 772435

Figure 2-27 Flooding in the vicinity of Haven Bridge

2.6 Future problems - the impacts of not changing

Traffic levels in Great Yarmouth are expected to increase from the present levels over the coming years. Figure 2-28 illustrates the forecast traffic growth from 2016 to the opening year (2023) and design year (2038) on the local road network in Great Yarmouth. Without intervention to provide a new crossing into the South Denes peninsula, the problems described in Paragraph 2.5 will inevitably worsen, as more traffic is channelled over the existing bridges and through the town centre.

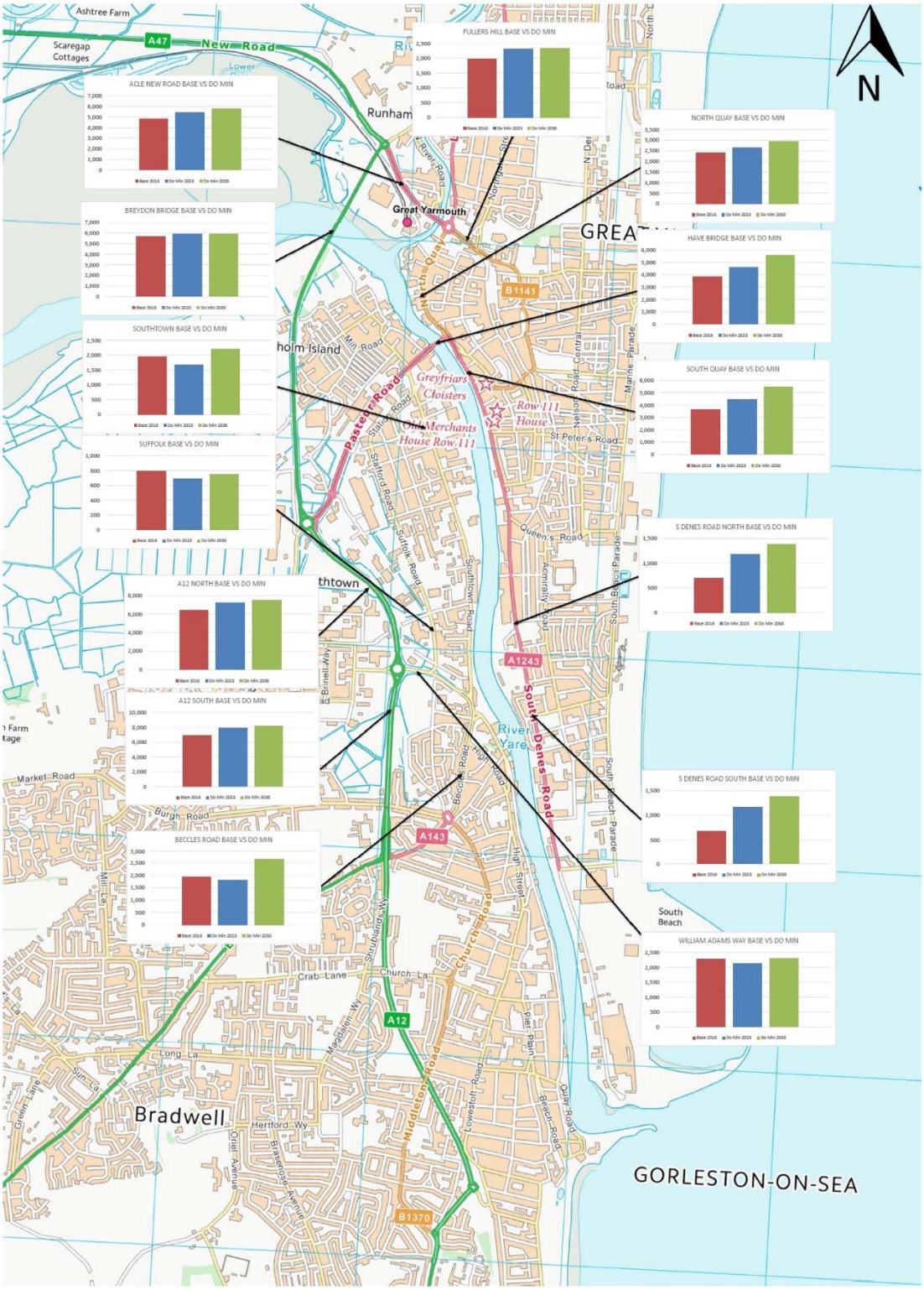

Figure 2-28 Forecast traffic growth 2016 to 2023 and 2038, PM peak hour, from SATURN model

Congestion is expected to increase. Figure 2-29 shows visual representations of congestion in 2016 and 2038 (PM peak) showing the increasing number and intensity of congestion hotspots.

Figure 2-29 Forecast congestion changes 2016 to 2038, PM peak hour from microsimulation

Historic areas of the town will suffer the adverse impacts of extra traffic. Traffic will increasingly dominate these areas, and it will not be possible to improve them to their full potential. Forecast increases in traffic on Haven Bridge and North and South Quay are set out in Table 2-7 below.

Traffic flow (2 way) PM peak	2016	2023 DM	2038 DM
North Quay	1,130	1,317	1,476
Haven Bridge	1,926	2,304	2,783
South Quay	1,814	2,221	2,731

Table 2-7 Forecast traffic growth near Haven Bridge PM peak (from SATURN model)

These are significant increases and will lead to increased congestion and delay and a range of other adverse impacts (e.g. noise, emissions, quality of the public realm etc.) on this sensitive part of the town.

Journeys will experience **longer delays**, and journey times will become less reliable.

Greenhouse gas emissions will increase, and air quality will become worse as traffic and congestion increase.

The **relative isolation** of the harbour, Energy Park, Enterprise Zone and industrial areas on the South Denes peninsula will become worse, because of the impacts of extra congestion on the already poor and indirect access to the A47 and strategic road network.

As a result:

- It will be more difficult to attract new investment.
- The South Denes peninsula will remain relatively inaccessible for pedestrians, cyclists and users of public transport, and it will be more difficult to encourage more people to use active modes of transport.
- Great Yarmouth will remain a physically divided town, both in terms of community severance and with key industrial areas separated by the river, unable to exploit potential synergies.

Traffic growth will bring significant problems, the impacts of which have yet to be experienced. Whilst the job of delivering other strategic objectives will continue, it will undoubtedly become more difficult, and it is likely that some opportunities to regenerate Great Yarmouth and make it more attractive as a place in which to live and work, or to visit, will not be fully realised.

2.7 Objectives

In order to achieve the Council's strategic aims, and in response to the opportunities and problems identified, clear objectives have been established for the scheme. In line with WebTAG[19], we have distinguished between the desired high level or strategic outcomes, the specific or intermediate objectives, and the operational objectives:

The **desired high level or strategic outcomes** are:

- To support the creation of new jobs, especially in the South Denes Local Development Order area and the Enterprise Zone, by being a catalyst for investment
- To support Great Yarmouth as a Centre for Offshore Renewable Engineering, and as a port
- To support the regeneration of Great Yarmouth, including the town centre and the seafront, helping the visitor and retail economy
- To improve strategic connectivity, and reduce community severance
- To protect and improve the environment.

[19] Transport Analysis Guidance (TAG) - The Transport Appraisal Process: Guidance for the Technical Project Manager (DfT, January 2014)

The **specific, or intermediate, objectives** are:

- To provide traffic relief to Breydon Bridge and Haven Bridge
- To reduce congestion and delay in the town centre
- To improve journey time reliability
- To reduce traffic in historic areas
- To improve vehicular access to South Denes and the outer harbour, especially from the SRN
- To improve access to the Great Yarmouth peninsula for buses
- To improve access to the Great Yarmouth peninsula for cyclists
- To improve access to the Great Yarmouth peninsula for pedestrians
- To reduce road accident casualties
- To reduce emissions of greenhouse gases
- To improve the resilience of the local road network.

The **operational objectives** are:

- To provide an additional crossing of the River Yare for vehicles, cyclists and pedestrians
- To reduce overall journey times and vehicle kilometres in Great Yarmouth
- To minimise environmental impact, compulsory purchase and demolition of residential and commercial property.
- To achieve a balance between the needs of road and river traffic.

The intermediate and operational objectives are specific, measurable, realistic and time-bound (SMART). The next section describes how we will measure how successful the scheme is in delivering the objectives. Further detail will be given in the *Monitoring and Evaluation Plan* and the *Benefits Realisation Plan*.

2.8 Measures for success

It is important to consider from the outset what constitutes successful delivery of the objectives, as this informs the development and appraisal of the scheme, the selection of the preferred option, and the monitoring and evaluation of the scheme's performance after construct

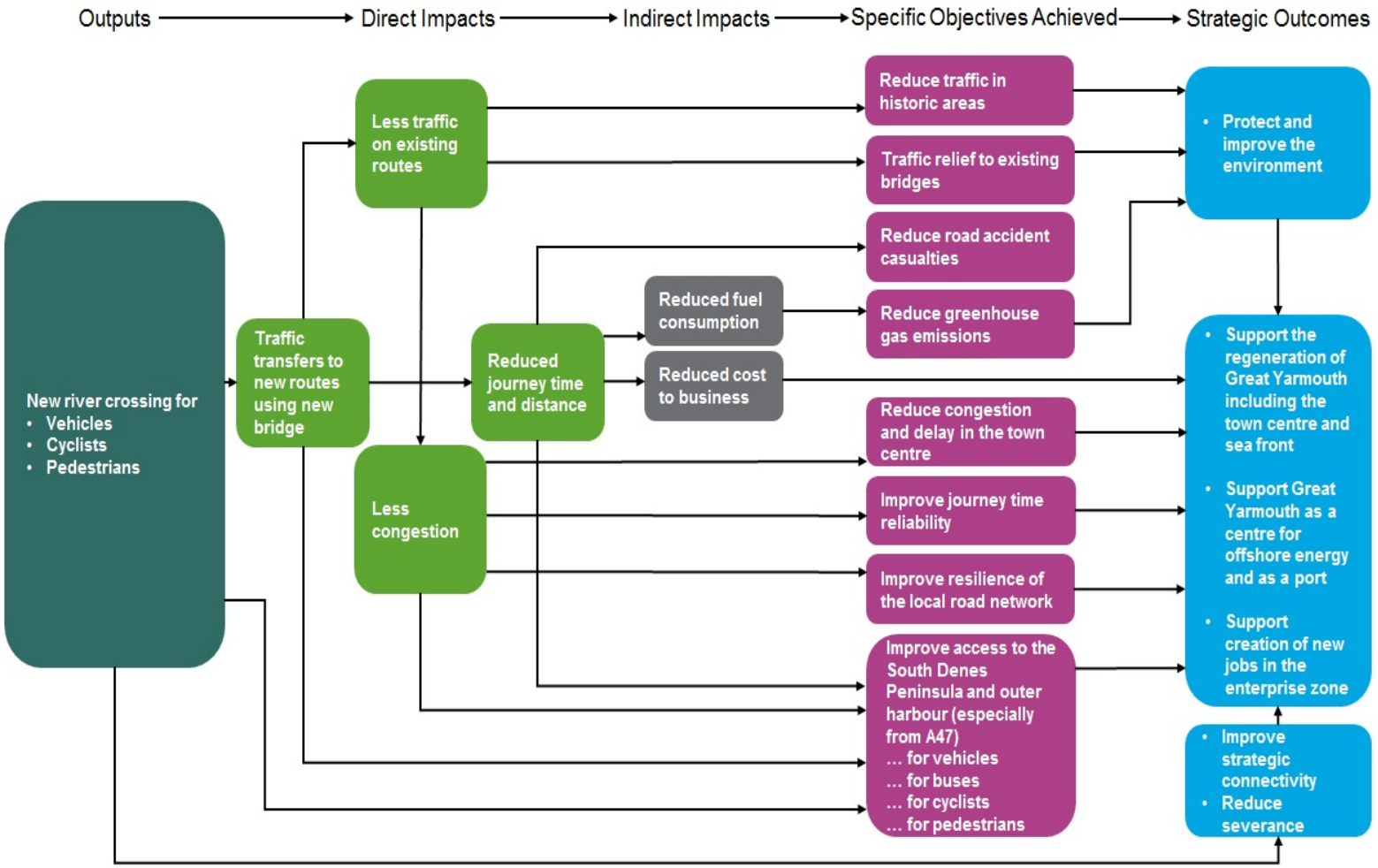

Figure 2-30 Causal chain diagram (logic map)

2.8.1 Cause and effect

Figure 2-30 is a Logic Map or Causal Chain Diagram which shows the expected relationship between the outputs of the scheme, the achievement of objectives, and the delivery of the strategic outcomes.

In general it is easier to measure achievement of the objectives (e.g. changes in traffic volume or journey time) than the strategic outcomes (e.g. support regeneration) because the latter often take time to achieve and can be influenced by factors other than the proposed river crossing.

2.8.2 Achievement of objectives

The specific objectives will have been achieved if the scheme leads to:

- Less traffic on the existing bridges
- Less traffic on existing routes, especially in historic areas
- Fewer road accident casualties
- Less congestion and delay, especially in the town centre
- Reduced journey times on key routes
- Improved accessibility to the South Denes peninsula from the A47, and from western parts of the town, for:
    - Vehicles
    - Buses
    - Cycles
    - Pedestrians
- Reduced greenhouse gas emissions
- Improved reliability

All except the last two of these can, and will, be measured directly. Greenhouse gas emissions and reliability are less easy to measure but, as the causal chain diagram shows, they are predictable consequences of reduced traffic, congestion and delay and the availability of shorter routes.

2.8.3 Monitoring and evaluation

In most cases, achievement of the specific objectives will be measured directly by means of:

- Traffic counts
- Journey time surveys
- Accident statistics

As noted above, greenhouse gas emissions and improved reliability are difficult to measure directly but are predictable consequences of reduced traffic, congestion and delay and the availability of shorter routes.

Strategic outcomes are not so easy to measure directly, but can be seen to be logical consequences of achieving the specific objectives. However longer term monitoring of local development, business growth and relocations, tourist numbers and revenue, employment, air quality and deprivation will continue to take place, and will contribute to an understanding of the success of the scheme.

Anecdotal information, especially in relation to perceptions of congestion and resilience also has a supporting role in evidencing the success of the scheme.

A full monitoring and evaluation plan will be developed and included with the Full Business Case

2.9 Scope of the scheme

The scheme will provide a third crossing over the River Yare, creating a new, more direct link between the western and eastern parts of Great Yarmouth. Specifically it will provide a connection between the Strategic Road Network (A47) and the South Denes Business Park, Enterprise Zone, Great Yarmouth Energy Park and the Outer Harbour, all of which are located on the South Denes peninsula.

2.10 Constraints

2.10.1 Physical constraints

The main physical constraints are:

- Development on either side of the River Yare means there are only a limited number of locations where a third crossing could be constructed
- The need to tie into the existing SRN. The simplest location is for a tie in to the A47 at Harfrey's roundabout.
- The need to acquire land for the construction of the scheme, in addition to the land already acquired by the Council.
- The need to maintain access for shipping. Previous studies indicate the need for a clear navigable width of at least 50m for a bridge. Also, a bridge would either need a clearance of at least 40m above the Mean High Water Spring Tide level, or be able to open to allow the largest vessels to pass through. The clearance when closed will determine the size (and hence the number) of small craft able to pass under a bridge, reducing the number of times it would need to be opened.
- The need to minimise adverse impact on existing port activities. Detailed engagement has taken place with Peel Ports and other port users during the preparation of the OBC and details are set out in the Port Operations Report (Supporting document 14) and Stakeholder Consultation Report (Supporting document 13).

2.10.2 Environmental constraints

The environmental constraints are illustrated in Appendix D (Environmental Constraints Map) and detailed in the Environmental Options Assessment Report (Supporting document 12).

2.10.3 Financial constraints

The Council does not have the resources to deliver a Third River Crossing without funding support from the Government. The New Anglia LEP's guideline threshold is £75 million. Schemes costing more than this cannot be funded from regular Growth Deal funding. It would not be possible to deliver a scheme meeting the objectives for less than £75 million. For this reason the delivery of the scheme is dependent upon funding from the Government's Local Majors Fund. The Council will undertake to contribute 20% of the full capital cost of the scheme, including previous expenditure on land acquisition and scheme preparation, and is able to meet anticipated future operating and maintenance costs of the scheme.

2.10.4 Contractual constraints

The Commercial Case describes the type of contract proposed. There are no contractual constraints which would inhibit delivery of the scheme.

2.10.5 Public acceptability constraints

The scheme has a high degree of acceptance amongst local stakeholders and the public.

2.11 Interdependencies

2.11.1 Other transport proposals

The Great Yarmouth Third River Crossing is a "stand-alone" scheme, which could be delivered independently of any other scheme or development. Similarly, no other future schemes or developments are dependent upon it.

The County Council is aware that Highways England (HE) is consulting on possible improvements to junctions on the A47 Trunk Road (formerly the A47/A12 junction enhancements scheme) as part of the government's Road Investment Strategy for 2015-2020 (RIS 1). Two locations in Great Yarmouth (Illustrated in Figure 6-1) are being considered:

A47 Vauxhall Roundabout and station approach.

- Enlarged roundabout
- Widening and realignment of approaches
- Possible improvements for non-motorised users
- Minor improvements to existing layout and signals, and reinstated right turn at Station Approach

A47 Gapton Roundabout

- Signalisation of roundabout
- Possible improvements for non-motorised users

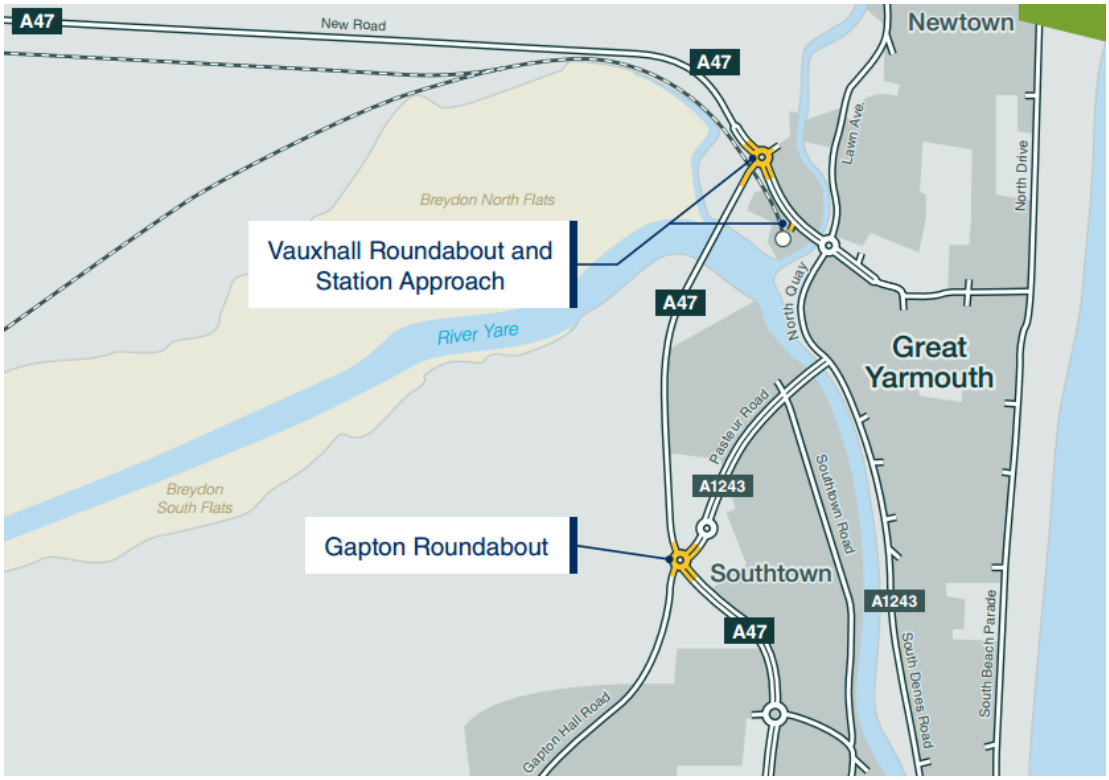

Figure 2-31 Planned RIS - 2 junction improvements (Source: HE)

Subject to the consultation and further work to determine whether there is a compelling case for improvement, HE could announce a preferred route for these improvements in late 2017 and start the pre-application stage of the development consent process, leading to a start of construction in 2020.

Although there is no inter-dependence between these RIS 1 schemes and the proposed Third River Crossing, the County Council will liaise very closely with HE as their respective projects are developed and taken forward.

A47 Harfrey's roundabout

Highways England had also been considering improvements to Harfrey's, Bridge Road and James Paget junctions on the A47, but their assessments have not identified improvements at these locations that would offer good value for money.

HE have therefore removed these junctions from the current consultations but is keeping them under review[20].

LEP funded enhancements

The New Anglia Local Enterprise Partnership Growth Deal allocation for 2016 to 2021 includes £9m funding for Great Yarmouth to help tackle congestion and create attractive alternatives to the car by improving facilities for public transport users, walking and cycling.

NCC, working with partners, is leading the development of these enhancement projects. Improvement schemes for Fuller's Hill roundabout, The Conge and access to the railway station currently being designed, and an evaluation of improvement packages for sustainable transport schemes is currently underway.

The development of all schemes has involved widespread consultation and engagement with local stakeholders and wherever possible this has been combined with the consultation and engagement activities undertaken on the third river crossing.

These schemes will, however, be delivered independently of the Great Yarmouth Third River Crossing, and have been included where appropriate in the "Do Minimum" scenarios.

2.11.2 Major developments

The scheme does not depend on any other developments.

2.11.3 Statutory processes

Delivery of the scheme depends on the successful completion of statutory processes. As the scheme needs to be delivered by 2022/23 the time limited aspects of the Development Consent Order (DCO) process are the preferred means of delivering these.

A DCO is the means of obtaining permission for Nationally Significant Infrastructure Projects (NSIPs), in of place of individual consents such as planning permission, listed building consent and compulsory purchase orders. The process is set out in more detail below:

1. **Pre-application:** The applicant has full responsibility for developing the project. The development consent regime is a front-loaded process – the proposal has to be fully scoped and refined before being submitted to the Planning Inspectorate. It is at this stage that the applicant must formally

[20] Improving the A47 – Great Yarmouth junction improvements: Public consultation. (Highways England, March 2017)

consult with all statutory bodies, community, local authority or affected persons. There is very little scope for change once the application has been submitted. The applicant will take into account all relevant responses received during formal consultation. This stage is driven by the applicant.

2. **Acceptance:** At this stage, the application is fully submitted to the Planning Inspectorate, who must decide within 28 days whether all relevant documents have been submitted to enable the application to proceed. There is a 6-week window for the applicant to challenge if acceptance is refused.

3. **Pre-examination:** The applicant must publicise that the Planning Inspectorate has accepted the application and include when and how parties can register to become involved as interested parties. A single Inspector or a Panel of Inspectors will be appointed to examine the application. A preliminary meeting will then be held to discuss procedural issues and the timetable for examination. All interested parties will be notified of the date of the preliminary meeting. The close of the meeting marks the close of the pre-examination stage.

4. **Examination:** The examination begins the day after the preliminary meeting, at which point the examining authority has 6 months to examine the application. The examination is primarily conducted through written representations, however, hearings can also be held.

5. **Recommendation and Decision:** During this time, the examining authority has 3 months to write its recommendation and submit it to the relevant Secretary of State, who has 3 months to make a decision about whether to grant consent or not.

6. **Post decision:** This is a 6-week window in which the Secretary of State's decision may be challenged in the High Court.

This assumes that the Secretary of State will formerly designate the scheme as a NSIP. This request for NSIP designation would be issued following confirmation that the scheme should proceed to Full Business Case stage. Should NSIP designation not be forthcoming, a traditional approach to planning and obtaining consent would need to be adopted.

Traffic Regulation Orders (TROs) will included in the DCO. A Harbour Revision Order (HRO), if required, will also be included in the DCO.

2.12 Stakeholders

2.12.1 Stakeholders

A list of stakeholders and summary of their specific interests is set out in Table 2-8 below.

Stakeholders	Summary of interests
Department for Transport	Interest in the detailed engineering layout, development of the full business case and submission, funding and planning.
Directly affected landowners	Interest in detailed engineering aspects of the Third River Crossing and how this will impact upon them.
Great Yarmouth Borough Council	Formal planning processes, stakeholder engagement, political engagement, design and
Emergency services	Mainly how the TRC will impact on their services (improvement in response times)
English Heritage	Interest in issues relating to pollution control, protection of natural environments in and around the site of the TRC and the enhancement of areas in the masterplan where traffic will be removed due to the TRC.
Environment Agency	Works in, over, under or adjacent to river, port, environmental legislation relevant to construction, air quality and noise issues
Public and residents	Interested in issues surrounding all aspects of the scheme, such as noise pollution, traffic implications, and traffic management, construction issues, planning issues and procedures and environmental issues, environmental enhancement and design.
Highway England	Access to the strategic road network and the improvements to the surrounding junctions; Gapton Roundabout, Vauxhall Roundabout and Harfrey's Roundabout.
New Anglia LEP	Interest in all aspects of the scheme
Indirectly affected landowners	Interest in engineering aspects of the TRC and the impact on businesses not directly affected.

Local Access Forum (PROW interest groups)	Focus on issues surrounding Public Rights of Way including reducing severance and enhancing the network for public right of way users.
Magistrates Court	Power to authorise stopping up or diversion of highway
Media Groups	All issues relating to the Third River Crossing that may be of public interest.
National Grid	Gas and Overhead power lines if affected
Natural England	General Protected Species
Norfolk Association for the Disabled	Interested in creating a more accessible environment through scheme development and design.
Norfolk County Councillors	Interest in all aspects of the scheme that will have an impact on their constituents.
Great Yarmouth Borough Council Councillors	Interest in all aspects of the scheme that will have an impact on their constituents.
Norwich Geological Society	Regional Important Geological Sites. RIGS
Parish councils	Interest in how the TRC directly or indirectly affect the parish and its residents.
Public Utilities	Affected Utilities
Residents of directly affected parishes	Impact on their property through issues such as noise pollution and traffic implications through construction and impact of traffic movements using TRC.
Transport groups (bus companies, freight associations)	Interest in issues surrounding transport companies such as route changes.
Anglian Water/Environment Agency	Disposal of effluent to sewer/surface water drain/watercourse
Countryside Agency	Interest in issues relating to pollution control, protection of natural environments.
DEFRA	Interest in issues relating to protection of natural environments.

Great Yarmouth Port Authority (Peel Ports)	Impact on port activities directly and indirectly including construction phase. Design and alignment, business impact, construction impact.
Port Users	Impact on port activities directly and indirectly including construction phase. Design and alignment, business impact, construction impact.
Great Yarmouth Tourism and BID	Impact on Great Yarmouth Tourism businesses
GY Cycle Forum	Impact on cycle routes
Federation of small businesses	Interest in how the TRC directly or indirectly affect the businesses in Great Yarmouth and Gorleston
Chamber of Commerce – Great Yarmouth Council	Interest in how the TRC directly or indirectly affect the businesses in Great Yarmouth and Gorleston
Great Yarmouth Community Trust	Interest in how the TRC directly or indirectly affect the local community interests
Great Yarmouth & Waveney Mind – Community ROOTS project	Interest in how the TRC directly or indirectly affect the community ROOTS garden project close to the TRC

Table 2-8 Stakeholders and summary of interests

2.12.2 Stakeholder engagement

Stakeholders have a crucial role in the successful delivery of the scheme. Engagement and consultation gives all stakeholder groups a voice that is heard, and allows concerns to be addressed at an early stage to ensure a successful outcome.

The stakeholder engagement process will provide further evidence of the strong local and political support for a Third River Crossing.

NCC will build upon the extensive stakeholder engagement undertaken for the Outline Business Case, and on the relationships developed with businesses, port users, residents and all other interested parties. Stakeholders will continue to be involved throughout the development of the Full Business Case, and the delivery phase. A Stakeholder Management Plan will be developed as part of the wider Communication and Engagement strategy for the scheme.

More information on stakeholder engagement is given in the Management Case, and in the Consultation and Stakeholder Engagement Report (Supporting document 13). The Port Operations Report (Supporting document 14) includes details of recent engagement with the Port Authority and owner, Peel Ports.

2.12.3 Public and stakeholder support

Public consultation in August 2009 revealed that **92%** of people supported provision of a new river crossing. Key stakeholders were also consulted. The Highways Agency (now Highways England) indicated a preference for a bridge option, as did 1st East, the Great Yarmouth Waterfront Regeneration Company, and Great Yarmouth Borough Council. Details of the 2009 consultation are set out in the Options Appraisal Report (2016) (Supporting document 1).

The Consultation and Stakeholder Engagement Report (Supporting document 13) gives full details of the recent public and stakeholder engagement activity, and reveals that there is strong support for the provision of a third river crossing.

In public consultation (2016 – 2017) the results of a questionnaire survey showed that **81%** of residents would be either likely, or very likely, to use a third river crossing.

Analysis showed that residents and businesses in Great Yarmouth suffer from congestion, with **71.4%** of respondents seeing this as either a serious or a very serious issue, with many being delayed for lengthy periods of time.

The Third River Crossing is clearly seen by respondents to the questionnaire as an important piece of infrastructure that will contribute to the revitalisation of Great Yarmouth and help create jobs, improve quality of life, ease congestion and generate business. Specifically:

- **89.2%** of respondents either strongly agree or agree that access to the port would be improved by a Third River Crossing
- **78.9%** either strongly agree or agree that a new crossing would make journey times shorter
- **80%** either strongly agree or agree congestion would be reduced
- **74.6%** of respondents would either strongly agree or agree that a new Third River crossing would encourage businesses to invest in the area
- **70.8%** either strongly agree or agree that the bridge would help create new jobs in the area
- **75.6%** either strongly agree or agree that the bridge would improve their quality of life
- **60.3%** either strongly agree or agree that the bridge would encourage visitors into Great Yarmouth

2.12.4 Letters of support

Letters of support for the scheme are included at Appendix N.

2.13 Options

The proposed scheme has been identified only after consideration of a wide range of options. An initial long list of potential solutions was drawn up, and these have been,

sifted, refined and evaluated to ensure that the proposed scheme is the best possible option.

The process of generating, refining and appraising options is detailed in the 2016 Options Assessment Report OAR[21]. The OAR was submitted with the application for scheme development costs, and describes assessments undertaken in 2007 (Stage 1)[22] and 2009 (Stage 2)[23]. The OAR identified a preferred corridor for the scheme. Subsequent work to identify the best scheme within this corridor is described in a further Final OAR[24].

At each stage of the assessment, use has been made of the analytical tools available at that time. The models used to determine scheme impacts have been progressively improved, giving increasing confidence in the results, and this process is still continuing. Having identified a preferred scheme in a robust, but simplified assessment, it has now been subject to a more detailed appraisal to determine its value for money.

The Economic Case (Chapter 3) describes the assessment of the proposed scheme using the best models and analytical tools available at the Outline Business Case stage.

The options appraisal process is briefly summarised below:

2.13.1 Area of interest

An area of interest for a third river crossing was identified. Due to the constraints of existing development, the only practical tie-in on the western side is at Harfrey's roundabout on the A47. The southern limit was determined by consideration of shipping movements to the port – a bridge further south would need to open more than 4,000 times per year. The northern limit was constrained by existing development and the need to avoid a structure on the curve of the river.

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[21] Great Yarmouth Third River Crossing – Options Assessment Report, May 2016. Mouchel for Norfolk County Council

[22] Great Yarmouth Third River Crossing – Stage 1 Scheme Assessment Report, March 2007. Mott Macdonald for Norfolk County Council

[23] Great Yarmouth Third River Crossing – Stage 2 Scheme Assessment Report, September 2009. Mott Macdonald for Norfolk County Council

[24] Great Yarmouth Third River Crossing – Options Assessment: Final Report, March 2017. Mouchel for Norfolk County Council

2.13.2 Initial option generation (long list)

Within the area of interest, three broad alignment corridors were considered: northern, central and southern. In each corridor, a high level and low level bridge option (on similar alignments) and a tunnel option were devised, giving nine different options. Both the high and low level bridge options were for lifting bridges, but some small vessels would be able to pass under a high level bridge without it opening.

The nine initial crossing options are described in more detail in the 2016 OAR and the Stage 1 Scheme Assessment Report.

2.13.3 Non-road options

The OAR identified a number of non-road options which might be considered an alternative to a major highway scheme, either separately or in combination:

- **Traffic restraint** – physically restricting movement in sensitive areas by traffic management or traffic calming to reduce capacity and encourage people to choose alternative routes or alternative modes of travel, or to reduce demand overall.
- **Charging** – for use of the existing bridges, to encourage traffic to choose alternative routes or alternative mores of travel, or to reduce demand overall.
- **Improving the existing network** – e.g. increasing the capacity of the existing bridges to accommodate existing and forecast demand without a new bridge.
- **Improving other modes** – e.g. improvements to public transport, cycling and walking without a new bridge.

The OAR concluded that, in the particular context of Great Yarmouth and its needs, the non-road options could not by themselves achieve the objectives of the scheme, as set out in the Strategic Case. The reasons were:

- The scheme objectives focus on improving the connectivity of the Great Yarmouth peninsula so as to support employment growth and the regeneration of the port, the town centre and the resort. Traffic restraint or charging would generally make the peninsula less accessible and less attractive to development.
- Improvements to the existing bridges, even if that were feasible, would not significantly improve access to the port in the south of the peninsula, but would instead exacerbate the current traffic problems in and around the town centre.
- Improvements for other modes, whilst very desirable in themselves, would not significantly improve the connectivity of the port and new or existing industry to suppliers and markets. Furthermore, there are limits on what could

be achieved in terms of road space reallocation to sustainable modes without the removal of through traffic that a third crossing would achieve.

For these reasons, non-road options were not considered further in the initial sifting of options (Stage 1 Assessment). Complementary improvements to the wider network, the management of traffic, and provision for more sustainable modes have instead been considered in the context of, and to support, a third river crossing scheme.

2.13.4 Initial sifting (Stage 1 assessment)

A sifting exercise was undertaken to determine which of the nine crossing options should be taken forward for further development and assessment. The criteria were:

- Cost
- Environmental impact
- Traffic impact
- Benefit-cost ratio (BCR)
- Accident savings

As described in the Stage 1 Scheme Assessment Report, the initial sifting exercise was simplified and focused primarily on understanding the environmental impacts of a third crossing. The criteria were applied as set out below:

Corridor	Type	Cost	Env	Traffic	BCR	Accs
Northern	High level bridge	●	●	●	●	●
	Low level bridge	●	●	●		
	Tunnel	●	●			
Central	High level bridge		●			
	Low level bridge		●			
	Tunnel		●	●	●	●
Southern	High level bridge	●	●	●	●	●
	Low level bridge	●	●	●		
	Tunnel	●	●			

Table 2-9 Initial sifting (simplified)

Initial cost estimates

Initial cost estimates were prepared for options in the northern and southern corridors, as this was considered sufficient to obtain an indication of the range of costs for the scheme. Indicative construction costs at 2015 prices, excluding land, are set out in Table 2-10.

Estimated construction cost (2015)	Northern corridor	Southern corridor
High level bridge	£74,774,000	£68,228,000
Low level bridge	£70,542,000	£66,997,000
Tunnel	£131,181,000	£185,555,000

Table 2-10 Initial cost estimates for option assessment

There was relatively little difference between the costs of a high level and low level bridge, but both tunnel options were significantly more expensive than any of the bridge options.

Stage 1 Environmental Impact Assessment

The Stage 1 Environmental Impact Assessment[25] considered each of the nine route options. It reported that the scheme would have numerous impacts on the local environment, some of which would be beneficial and others adverse. In some cases an adverse impact on the study area could have a corresponding beneficial impact on other parts of Great Yarmouth.

The findings of the Stage 1 EIA are reported in the OAR, and summarised below:

Local air quality	All routes would have a minor adverse impact locally. Options in the central corridor would affect fewer properties; the southern corridor would affect more. All would lead to improved air quality in the town centre due to reduced traffic.
Cultural heritage	Minor impacts only locally with all routes. Potential benefits in the town centre due to reduced traffic.
Construction impacts	Impacts due to noise, vibration, air quality, water quality, drainage, ecology and nature conservation. Partial mitigation of these impacts should be possible.
Landscape and townscape	High level bridge likely to have greatest impact, though not out of place in an industrial townscape. A tunnel would mean less visual intrusion from traffic, but approach ramps could affect residential areas more than the bridge options.
Land use	Adverse impacts due to demolition of buildings. All routes would have a similar impact.

[25] Great Yarmouth Third River Crossing – Stage 1 Environmental Impact Assessment Report. (Mott Macdonald for Norfolk County Council, 2007)

Stage 1 traffic assessment

Three of the options identified at Stage 1 were tested in 2007 using the 2003 Great Yarmouth SATURN model. Full details of this model are set out in the Local Model Validation Report (LMVR)[26] and technical notes[27] prepared in 2003, and summarised in the 2007 Stage 1 Traffic and Economic Appraisal Report. A brief description is given below.

The model covers the urban area of Great Yarmouth and Caister-on-Sea in detail, and the rest of the County's roads as a buffer network. The zoning structure includes the whole of the UK, but the model only includes trips to and from Great Yarmouth, recorded in roadside interviews (RSIs). The model covers three time periods (a.m. peak, inter-peak and p.m. peak). The model uses general purpose trip matrices for light and heavy vehicles, which were split into five user classes (3 car user classes, light goods and other goods vehicles) using RSI data. Car trips were split into three purposes (commuting, employers' business and other) based on WebTAG. The base model was validated against independent counts.

For the Stage 1 Assessment, an opening year of 2015 and a design year of 2030 were assumed. The 2003 trip matrices were adjusted to 2015 using planning data provided by Great Yarmouth Borough Council (GYBC) and TEMPRO forecasts. Overall growth was constrained to the National Trip End Model (NTEM) forecasts for 2015 and 2030. The future Do Minimum network includes two schemes: signalisation of the entrance to ASDA and the railway station, and enhancement schemes on Marine Parade and the Pleasure Beach.

Three representative options were tested:

- Northern corridor, bridge option
- Southern corridor, bridge option
- Central corridor, tunnel option

At this stage, no distinction was made between the high and low level bridge options. A dual carriageway bridge was assumed, with a speed limit of 50 km/hr.

The results of the model tests are set out in the Stage 1 Traffic and Economic Appraisal Report and summarised in the 2016 OAR. Forecast traffic flows for the existing and new crossings in 2030 are set out in Table 2-11 below.

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[26] Great Yarmouth Area Transport Strategy Local Model Validation Report, (Mott Macdonald for Norfolk County Council, 2003)

[27] Great Yarmouth Area Transport Strategy Summer Traffic Model Technical Note, (Mott Macdonald for Norfolk County Council, 2003)

Two-way traffic flow	Do Minimum 2030 AADT	Northern bridge 2030 AADT	Southern bridge 2030 AADT	Central tunnel 2030 AADT
Breydon Bridge	35,400	32,200	33,000	32,600
Haven Bridge	35,000	20,500	24,100	26,500
Third river crossing	-	28,300	24,400	18,900
TOTAL	**70,400**	**81,000**	**81,500**	**78,000**

Table 2-11 Traffic impacts of options (2016 OAR)

A bridge in the northern corridor would provide the greatest relief to the existing river crossings and would be carry more traffic than a tunnel or a bridge further south.

Stage 1 accident assessment

Based on the forecast traffic flows, accidents and casualties in the study area were predicted over a 60 year assessment period using COBA. Expected reductions are set out in Table 2-12 below:

	Total	Change over 60 years		
	Base	Northern bridge	Southern bridge	Central tunnel
Accidents	44,398	-2,260	-2,644	-2,385
Casualties	61,270	-3,092	-3,619	-3,230

Table 2-12 Accident impacts of options (2016 OAR)

All of the options would produce savings in accidents and casualties, and little difference was found between them. By a small margin, the southern bridge option was found to produce the greatest accident savings.

Stage 1 economic assessment

Economic benefits arise mainly from savings in time, fuel and vehicle operating costs and other monetised benefits attributable to the scheme. An economic assessment was undertaken using TUBA, including accident benefits calculated using COBA. All the options tested showed a positive cost-benefit ratio, as set out in Table 2-13 below.

Benefits/disbenefits/costs	Northern bridge £,000	Southern bridge £,000	Central tunnel £,000
Consumer user benefits	112,727	121,295	78,468
Business user benefits	110,153	117,174	83,266
Private sector provider impacts	0	0	0
Carbon benefits	1,501	1,696	987
Accident benefits	85,611	96,844	88,551
Present value of benefits (PVB)	**309,992**	**337,009**	**251,272**
Investment costs	61,674	57,544	109,971

Indirect tax revenue	10,189	11,475	6,714
Present Value of Costs (PVC)	**71,863**	**69,019**	**116,685**
Benefit-cost ratio (BCR)	**4.3**	**4.9**	**2.2**

Table 2-13 Stage 1 Economic Assessment (2016 OAR)

A bridge in the southern corridor was found to offer the greatest monetised benefits and, because it was also likely to be the least expensive option, generated the highest BCR.

The representative tunnel option tested produced significantly lower monetised benefits and, being considerably more expensive than either of the bridge options, produced a BCR that, although still positive, was much less than what could be achieved with a bridge.

Conclusions of the initial sifting (Stage 1 appraisal).

The Stage 1 appraisal was a limited exercise, based on advance design work and a number of simplifying assumptions. Land costs were excluded. Only a representative sample of options was subject to modelling and economic assessment at Stage 1.

Though simplified, the Stage 1 appraisal served to show that a third river crossing was feasible, and highlighted the main design and environmental issues involved. Although a bridge was likely to be more cost-effective than a tunnel, the appraisal showed that both bridge and tunnel options would produce benefits in excess of their likely costs.

The Stage 1 appraisal did not differentiate between high and low bridge heights, nor did it assess the impact of the higher frequency of openings required for a southern bridge option.

The Stage 1 Assessment Report[28] (2007) recommended further, more detailed, consideration of the crossing location, highlighting the need to balance the benefits of relieving congestion in the north and improving access to development in the south. It recommended further consideration of a potential immersed tube tunnel aligned on observed traffic desire lines (NW to SE), as well as more detailed investigation of high and low level bridge options.

[28] Great Yarmouth Third River Crossing – Stage 1 Scheme Assessment Report, March 2007. Mott Macdonald for Norfolk County Council

2.13.5 Further development of potential options

The next stage of the appraisal is described in detail in the Stage 2 Assessment Report[29] (2009) and is summarised below.

Alternative forms of crossing

Further investigation was undertaken into a range of different forms of crossing:

- Fixed bridge
- Swing Bridge
- Lift Bridge
- Bascule Bridge
- Tunnel

The detailed investigation of these options was described in a Structural Options Working Paper[30] (2009), and summarised in the OAR (2016). This investigation led to the rejection of the fixed bridge, swing bridge and lift bridge options on grounds including construction and maintenance costs, visual impact, and risks from collision by ships. It concluded that a bascule bridge would the most appropriate type of bridge for this scheme. Detailed data on commercial vessel movements within the inner harbour was used to determine the likely number of bridge openings required for different locations. It concluded that a bridge on the shortest route across the river, from Harfrey's Roundabout would require about six openings each day. Further south, the number of openings would be greater. Further north, the cost of construction would be higher.

In light of the findings of the Stage 1 Assessment, an improved tunnel alignment was identified, running generally from SW to NE. It was found that this alignment would attract about 35% more traffic than a NW to SE alignment. Technically, the only feasible form of construction would be an immersed tube tunnel, or a tunnel cast *in situ* on the river bed, due to poor ground conditions. It would have a significant physical impact on the operation of the harbour during construction.

Assessment of short-listed options

Three crossing options were therefore shortlisted for further assessment:

[29] Great Yarmouth Third River Crossing – Stage 2 Scheme Assessment Report, September 2009. Mott Macdonald for Norfolk County Council

[30] Great Yarmouth Third River Crossing – Structural Options Working Paper, 2009. Mott Macdonald for Norfolk County Council

- **Bridge option 1: Bascule bridge with roundabout on Southtown Road**

  This option would provide a dual carriageway bascule bridge between the A12 (now A47) Harfrey's Roundabout over Southtown Road and the River Yare to a new three-arm roundabout on South Denes Road between Sutton Road and Swanston's Road. This would give a headroom clearance of 5.3m on Southtown Road and 7.5m clearance to mean high tide level when closed.

  Other changes to the road network would also be necessary to accommodate the bridge. Beccles Road will be stopped up at its junction with Southtown Road, whilst Queen Anne's Road will also be closed from its junction with Suffolk Road. A new roundabout will be provided on Southtown Road beneath the bridge and slip roads will be provided from this junction into the link to Harfrey's Roundabout.

- **Bridge option 2: Bascule Bridge with T-junction on Southtown Road**

  This option would provide a dual carriageway bascule bridge between Harfrey's Roundabout over Southtown Road and the River Yare to a new three-arm roundabout on South Denes Road between Sutton Road and Swanston's Road. This would give a headroom clearance of 5.3m on Southtown Road and 7.5m clearance to mean high tide level when closed.

  Beccles Road would remain open from its junction with Southtown Road, but would provide a westbound one-way link towards the A12 (now A47). Queen Anne's Road would be closed to vehicle traffic from its junction with Suffolk Road. An eastbound off-slip would be provided from the bridge into Southtown Road

- **Tunnel option: Tunnel from A12 (now A47) onto Southgates Road**

  This option would provide a dual carriageway tunnel between the A12 (now A47) south of the existing Harfrey's Roundabout and a new three arm roundabout at the junction of South Quay, Queens Road and Southgates Road. It would also provide improvements to Southgates Road and South Denes Road between Queens Road and Sutton Road. The existing access into the Fish Wharf would be replaced and the northbound carriageway of South Denes Road would run through the area. The tunnel portal would be located between Barrack Street and Newcastle Road.

  A replacement roundabout to the south of the existing Harfrey's Roundabout would be provided with diversions to the existing Beccles Road and Harfrey's Road to link into the new junction. The existing roundabout would be removed. On and off-slips would be provided onto Southtown Road to retain access to the trunk road

  There would be no pedestrian provision through the tunnel, but cyclists could use the tunnel by travelling on-carriageway with other traffic.

The three shortlisted options are illustrated in Figure 2-32 below.

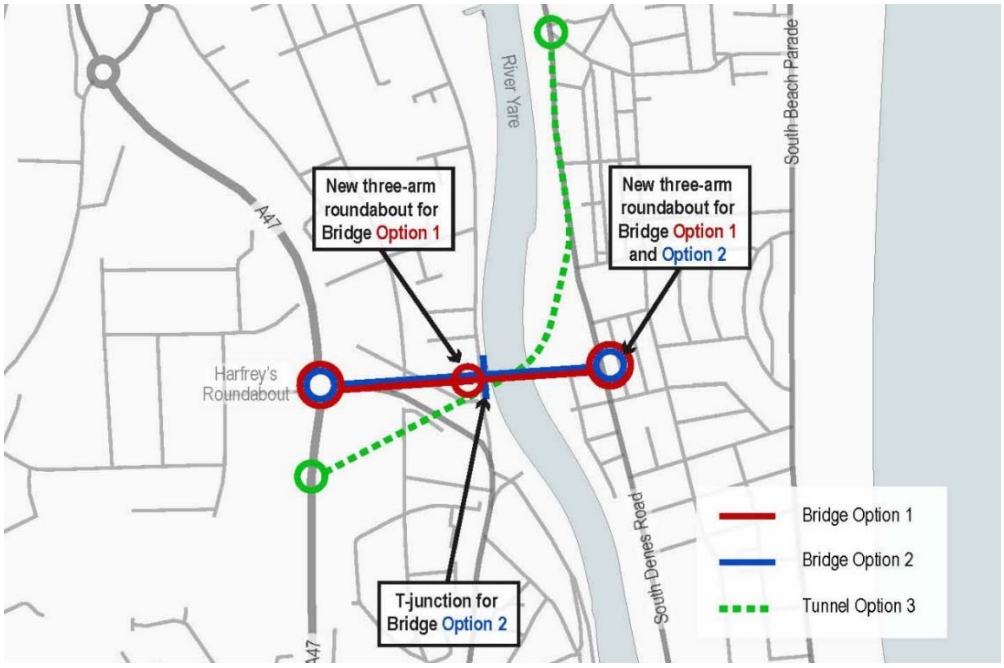


Figure 2-32 Shortlisted options (from Options Assessment 2016)

At this stage it was assumed that both bridge options would have a dual carriageway, with a bridge height when closed of 7.5m above mean high tide level, and a clearance of 5.3m above Southtown Road. A tunnel would require a level change of about 16m, requiring longer approach roads than the bridge options.

A more detailed plan of each option is given in the OAR[31] (2016).

2.13.6 Further assessment of shortlisted options

The assessment of the short-listed options is described in detail in the Stage 2 Assessment Report[32] (2009), and in the Stage 2 Simple Environmental Assessment Report[33] (2009). The findings were summarised in the OAR (2016) and are further summarised briefly below.

[31] Great Yarmouth Third River Crossing – Options Assessment Report, May 2016. Mouchel for Norfolk County Council

[32] Great Yarmouth Third River Crossing – Stage 2 Scheme Assessment Report, September 2009. Mott Macdonald for Norfolk County Council

[33] Great Yarmouth Third River Crossing – Stage 2 Environmental Assessment Report, 2009. Mott Macdonald for Norfolk County Council

Cost

Option	Bridge option 1	Bridge option 2	Tunnel
Cost (2015 out-turn)	£121.676 million	£112.301 million	£375.828 million

Environmental impacts

The results of the Stage 2 Simple Environmental Assessment are summarised in the OAR (2016). No “show stoppers” were identified, and the differences between the two bridge options were fairly small. The tunnel option would have a bigger impact during construction, and in terms of land-take, but fewer impacts during operation.

Traffic impacts

Tests with the Great Yarmouth SATURN model showed that all of the options would reduce traffic on the existing bridges, especially the Haven Bridge.

2030 AADT (two way)	Do minimum	Bridge option 1	Bridge option 2	Tunnel
Breydon Bridge	41,398	39,857	39,347	37,648
Haven Bridge	39,650	27,934	27,341	28,515
Third river crossing	-	26,879	26,957	25,825
TOTAL	**81,048**	**94,670**	**93,645**	**91,988**

Table 2-14 Traffic impacts of options on bridge traffic

The bridge options are more effective than the tunnel in reducing traffic on Haven Bridge, but a tunnel would produce the biggest reductions on Breydon Bridge.

Economic assessment

An economic assessment of the short-listed options was undertaken using TUBA. All of the options tested showed a positive benefit-cost ratio, as set out below:

- Bridge (Option 1) 4.5
- Bridge (Option 2) 4.8
- Tunnel 1.5

Details of the assessment are set out in the Options Appraisal Report (2016). In simple terms, the economic benefits of a tunnel are nearly as high as those of the bridge options, but the costs would be much higher, producing a low BCR, whereas

both bridge options had a BCR of more than 4.0 at this stage of the assessment. Based on DfT guidance[34] they offered very high value for money.

Views of the public and stakeholders

Public consultation in August 2009 revealed that 92% of people supported provision of a new river crossing. Key stakeholders were also consulted. The Highways Agency (now Highways England) indicated a preference for a bridge option, as did 1st East, the Great Yarmouth Waterfront Regeneration Company, and Great Yarmouth Borough Council. Details of the 2009 consultation are set out in the Options Appraisal Report (2016).

2.13.7 Preferred route corridor

In December 2009, Norfolk County Council's Cabinet[35] considered the findings of the technical studies and the public and stakeholder consultation. The Cabinet's conclusion was that:

- "Evidence from all of the technical work to date and the results from the public consultation indicate that the bridge option with a dual carriageway link utilising a 50m span bascule bridge over the river is the best option for a preferred route.

- "The decision on whether the bridge scheme has a roundabout or a T-junction on Southtown Road can be decided during the detailed design."

The Cabinet decided to adopt a preferred corridor for the bridge option – between Harfrey's Roundabout and South Denes Road, as illustrated in Figure 2-33 below. They also authorised the purchase of properties subject to blight notices, and agreed to investigate funding options for the scheme.

[34] Value for Money Assessment: Advice Note for Local Transport Decision Makers. (DfT, December 2013)

[35] Great Yarmouth Third River Crossing Preferred Route, NCC Cabinet, 7 Dec 2009

Figure 2-33 Preferred route corridor (from 2016 OAR)

2.13.8 Scheme options within preferred route corridor

The next stage of option assessment was undertaken in 2016/17. Details are set out in the Final Options Assessment Report (2017) (Supporting document 2). Focusing now on the preferred corridor, a further long-list of options was produced based on different combinations of criteria including the location, form and geometry of the western and eastern tie-ins to the local road network, the bridge height and the carriageway.

Location of the western tie-in

There are three places where new bridge infrastructure could be connected to the existing highway network on the eastern side of the river:

- A: Harfrey's Roundabout
- B: Suffolk Road
- C: Southtown Road

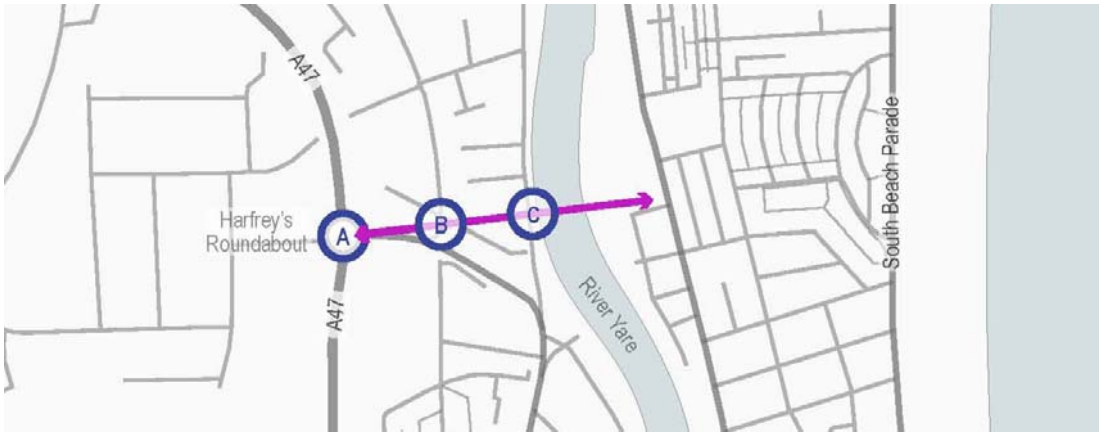


Figure 2-34 Potential locations for western tie-in (from OAR 2017)

Form of the eastern tie-in

Two options were identified for the eastern tie-in to South Denes Road, and tested as stand-alone elements of the scheme:

- Roundabout
- Traffic signals

Bridge height

Two possible bridge heights were considered:

- Low: Minimum clearance 3.0m, allowing a direct tie-in to Southtown Road
- High: Minimum clearance 7.0m, requiring a brige over Southtown Road

Carriageway standard

Three main options were considered:

- 2-lane single carriageway
- 3-lane single carriageway
- Dual carriageway with 2 lanes in each direction

Full details of these options are set out in the Final Options Assessment Report (2017). The process of sifting and prioritising the 40 options to identify a single preferred scheme is described fully in the report, and summarised briefly below.

Not all of the theoretical combinations are feasible in design terms, which simplified the assessment. However, other minor variants were identified as part of the design investigations, leading to an interim long list of 40 options, all broadly within the preferred corridor.

2.13.9 Sifting of options within the preferred corridor

A two stage sifting process was undertaken, as illustrated below:

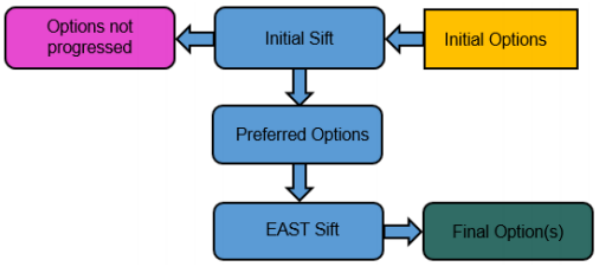


Figure 2-35 Sifting process for options within preferred corridor

An initial sift was undertaken of the potential options. By removing those that did not make significant contributions to meeting the defined objectives, did not resolve the identified problems, or are not deliverable or feasible, the list of 40 options was

reduced to nine. The process is described in more detail in the Final Options Report (2017) (Supporting document 2) and the results are set out in Table 2-15 below:

Option	Western tie -in	Bridge height	Carriageway standard
4	Existing Harfrey's roundabout	High	2 lane single carriageway
5	Existing Harfrey's roundabout	High	Dual carriageway
6	Existing Harfrey's roundabout	High	Three lane carriageway
31	New roundabout at Suffolk Road	High	2 lane single carriageway
32	New roundabout at Suffolk Road	High	Dual carriageway
33	New roundabout at Suffolk Road	High	Three lane carriageway
37	At-grade junction with Southtown Road	Low	2 lane single carriageway
38	At-grade junction with Southtown Road	Low	Dual carriageway
39	At-grade junction with Southtown Road	Low	Three lane carriageway

Table 2-15 Short-listed options within preferred corridor (from Final OAR 2017)

All of the short-listed options involved a signalised T-junction with South Denes Road.

The nine options which successfully met the evaluation criteria within the initial sifting process were taken forward to the final stage of sifting, using the Department for DfT's Early Assessment and Sifting Tool (EAST). EAST is a decision support tool developed to summarise and present evidence on options quickly and in a clear and consistent format. It provides decision makers with relevant, high level, information to help them form an early view of how options perform and compare. It is consistent with Transport Business Case principles and follows the same five cases as the DfT Business Case model.

The EAST assessment identified the high level economic, environmental and social impacts of all nine options based on DfT's five case model approach. The process is described in detail in the Final Options Report (2017). In addition to the EAST assessment, operational assessment was undertaken of the remaining options. This was undertaken using the earlier SATURN models, available at the time of the assessment, as well as further consideration of the queuing of cars and goods vehicles on the bridge approaches.

The assessment process, which is described in more detail in the Final Options Report, resulted in the nine options being narrowed down further to three, which were tested in more detail using the new PARAMICS microsimulation models

developed in 2016-17 for the Outline Business Case. The models are described in the PARAMICS Local Model Validation and Forecasting Reports[36].

The three options selected for further testing were:

- **Option 32** - Suffolk Road tie-in to the west (four lane high level bridge , roundabout as west tie in and traffic signals to the east at South Denes Road)

- **Option 33** - Suffolk Road tie-in to the west (three lane high level bridge, roundabout as west tie in and traffic signals to the east at South Denes Road)

- **Option 37** - Southtown Road tie in to the west (two lane low level bridge with traffic signal junctions to the west and the east at South Denes Road)

The operational assessments, described in the Final Options Assessment Report (2017), showed that Option 32 is forecast to perform better than the other options. Specifically, Option 32 provided

- the best forecast journey time and distance savings
- shorter predicted queues than the other options

Separately, the road safety audits undertaken as part of the design investigations, indicated that Option 33, the 3 lane bridge, would perform least well in safety terms, due to its operational complexity. Option 37 would offer a less resilient solution and would have a bigger impact on residential properties on Southtown Road.

For these reasons, **Option 32** was identified as the preferred option and taken forward for more detailed design and assessment.

2.14 The proposed scheme

The proposed scheme (Option 32) is shown in detail in Drawing No. 1076653-MOU-HGN-OPT32-DR-D-0001_Option32 alt plan (P1,S2) which is included as Appendix B. The location of the proposed scheme is illustrated in Figure 2-36 and its general layout is illustrated in Figure 2-37.

[36] Supporting documents 4 and 8

Figure 2-36 Location of the proposed scheme

2.14.1 Connections to the existing road network

On the western side of the river, a new roundabout will be constructed on William Adams Way, at the site of the existing junction with Suffolk Road, to the east of the A47 Harfrey's roundabout. Suffolk Road (north) will connect directly into the roundabout. William Adams Way will be realigned and widened between Harfrey's Roundabout and the new roundabout, and between the new roundabout and

Beccles Road / Southtown Road. The scheme does not involve alterations to the A47 trunk road[37] or to Suffolk Road (south).

From the new roundabout, a new dual carriageway road will be constructed leading eastwards towards the new river bridge. It will cross Southtown Road on a flyover, and continue as a dual carriageway on the new bridge over the River Yare.

On the eastern side of the river, the new dual carriageway will connect to the A1243 South Denes Road at a new signal controlled junction.

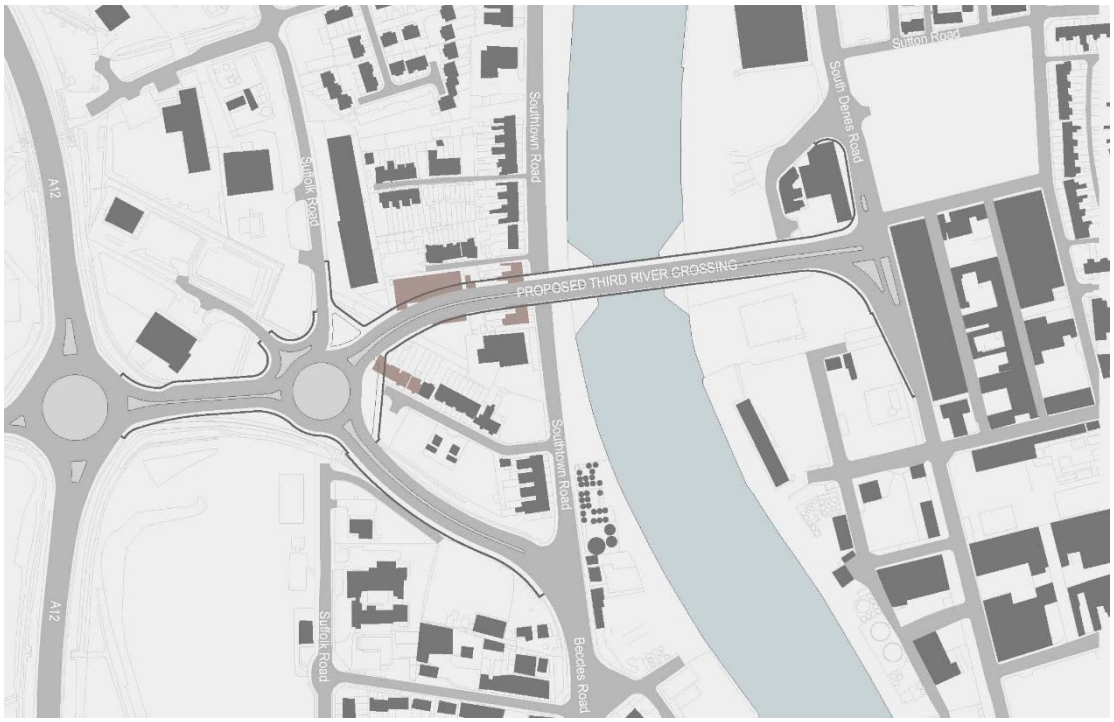


Figure 2-37 Proposed scheme

2.14.2 The new bridge

A new lifting bridge will be provided to carry the dual carriageway across the River Yare, opening when required to allow shipping to pass through. Traffic will be controlled by lifting barriers at either end of the bridge, and queueing space will be provided.

[37] Highways England is no longer promoting a scheme to improve A47 Harfrey's Roundabout.

Figure 2-38 Visualisation of the proposed Great Yarmouth Third River Crossing

The new structure will be a single span, double leaf trunnion Bascule Bridge with a clear span of 55m between the abutment faces, giving a 50m navigational clearance between knuckle wall fenders. It will cross the River Yare at 90% - i.e. with no skew. The superstructure will comprise a steel deck. Each leaf (lifting section) will use three longitudinal steel box beams, which will continue behind the trunnion positions to carry the counterweights. They will be raised and lowered by three hydraulic cylinders on the underside of each leaf. The main piers will be hollow reinforced concrete box structures, founded on reinforced concrete piles and protected from the river by knuckle walls. The piers will support the trunnions, about which the bridge leafs will rotate, and will house the hydraulic cylinders and control systems.

When the bridge is fully raised at approximately 80°, the tips will be positioned to provide unlimited air draft across the 50m navigational channel. With the bridge fully lowered, and open to road traffic, the clearance below the structure will allow smaller vessels to pass under the new bridge without the need for it to be closed to road traffic.

The approach embankments will be retained either by reinforced soil or reinforced concrete retaining walls, with a maximum height of about 7m.

2.14.3 Alterations to local roads and traffic management measures

On the western side of the river, alterations will be required to Queen Anne's Road, which provides access to residential properties, a church (the King's Centre) and a veterinary practice. The junction between Queen Anne's Road (west) and Suffolk

Road will be relocated north of the new roundabout. The junction between Queen Anne's Road (east) and Southtown Way will be re-opened, replacing the existing connection to Suffolk Road.

On the eastern side of the river, alterations will be required to the direction of traffic flow on Sutton Road and Swanston Road, reversing the existing one-way system to accommodate the new traffic signal junction.

Figure 2-39 Proposed new roundabout and bascule bridge, Great Yarmouth

2.14.4 Provision for pedestrians and cyclists

As well as being an important link for vehicular traffic, the new bridge will also provide new opportunities for journeys by cycle and on foot. The scheme will include:

- A 4.5m wide footway and two-way cycleway link from William Adams Way, across the eastbound side of the new bascule bridge, and linking to a new on carriageway cycle lane on Sutton Road. This route also includes new Toucan crossing facilities at the William Adams Way roundabout, and the new traffic signal controlled junction on South Denes Road.

- A 1.5m wide footway on the westbound side of the link across the new bascule bridge.

- A new footway/cycleway link from the William Adams Way roundabout to Suffolk Road, and a new pedestrian crossing on Suffolk Road.

- A footway/cycleway link from William Adams Way to the Harfrey's roundabout.

2.14.5 Urban design

The National Planning Policy Framework (NPPF) acknowledges that good design is a key aspect of sustainable development, is indivisible from good planning and should contribute positively to making places better for people. This is especially important for a nationally significant infrastructure scheme. The Urban Design and Landscape Report (Supporting document 15) describes the urban design aspects of the Great Yarmouth Third River Crossing.

The report considers how the scheme will contribute to and integrate with Great Yarmouth as a "place", not just a piece of infrastructure, to positively enhance the environment and experience for users. This includes consideration of:

- opportunities for circulation improvements for pedestrians, cyclists, vehicles and public transport to provide sustainable travel choices.
- enhancements to streetscape to optimise safety and inclusive access
- opportunities for public realm improvements
- design quality
- sustainable urban drainage

For example, on the western approach to the bridge.

- To further encourage active transport modes, the roundabout at the western end of the scheme will be designed as a green gateway linked to a series of safe, attractive, green pedestrian and cycle routes. There will be a sequence of spaces of differing character leading from the roundabout towards the river.

- The opportunity for a linear pocket park has been established on the south side of the elevated bridge structure. The park provides an informal recreational space and link to the new riverside space at Bollard Quay. The existing allotment space on Queen Anne's Road, where affected by the scheme will be reallocated locally where possible.

- Queen Anne's Road and Cromwell Road will be improved with redesigned parking, surface treatment and buffer planting. Both streets will provide secondary pedestrian and cycle links between the bridge and surrounding networks.

- It is hoped that the proposed linear park to the quayside riverside space will form a model for green finger access routes to the riverside throughout the planned developments further north in the town where industrial/ port land uses may sit alongside retail and residential.

Figure 2-40 Western Gateway

Place making opportunities are more limited on the east side of the river due to physical constraints arising from land ownership and anticipated continuation of port related land-use to the north and south of the bridge approach. Nevertheless consistent application of materials and detailing in the footways will help to ensure the legible identity of the scheme is continuous along its length.

Other opportunities involve new street tree planting where feasible and potential for tree and shrub planting on the new 'knuckle' extension. The bridge creates an exciting new riverside space that will be a seamless extension of the bridge structure providing a new type of public space in the area and activating the bridge pier areas. The physical connection between bridge deck and quayside combined with a relocated bus stop and crossing at Southtown Road create a significant movement node for all modes and users. Planting and seating on the quay side will be scaled to reflect the site and define the cycling and walking space with river viewing points. Tree planting on the both sides of the river in the new 'knuckle' spaces will be informed by views form the opposite banks.

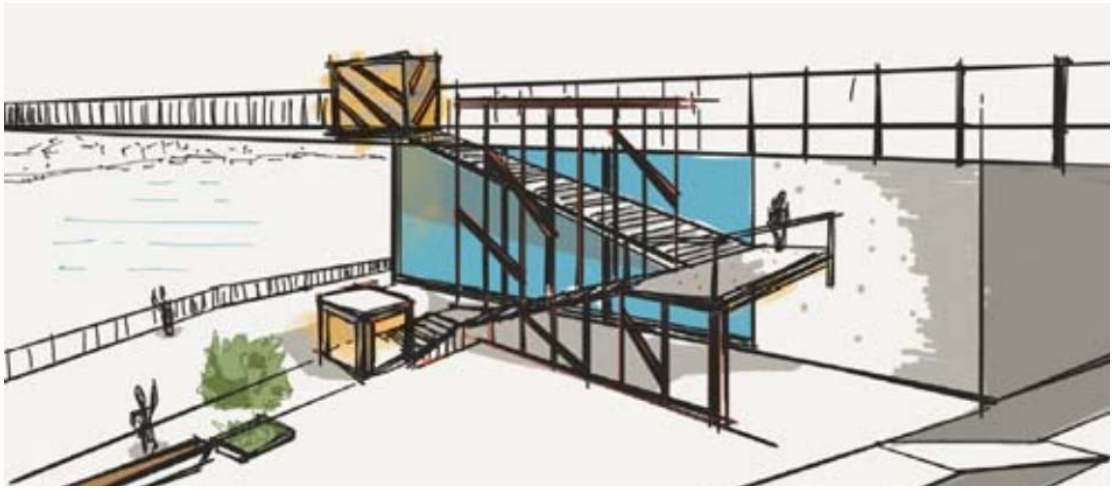


Figure 2-41 Possible design for viewing and waiting areas

There is a need to provide safe waiting spaces for cyclists and pedestrians for peak activity hours when the bridge is lifted. As a significant high point in the town and a new public structure, the views will be new and so the design capitalises on the opportunities to frame them. Cycle and pedestrian waiting areas have been designed to extend from the footway at the 'bascule' hinge.

Further information is set out in the Urban Design and Landscape Report (Supporting document 15)

2.15 Impacts of the proposed scheme and achievement of objectives

The Great Yarmouth Third River Crossing will have a significant and beneficial impact on traffic in the town, and this will give rise to a range of benefits, helping to deliver the scheme's objectives.

Traffic levels will be reduced on key links. Figure 2-42 shows the forecast changes in traffic flow in the local road network – comparing "Do Something" (DS) and "Do Minimum" (DM) flows on key links in the opening year 2023 (pm peak).

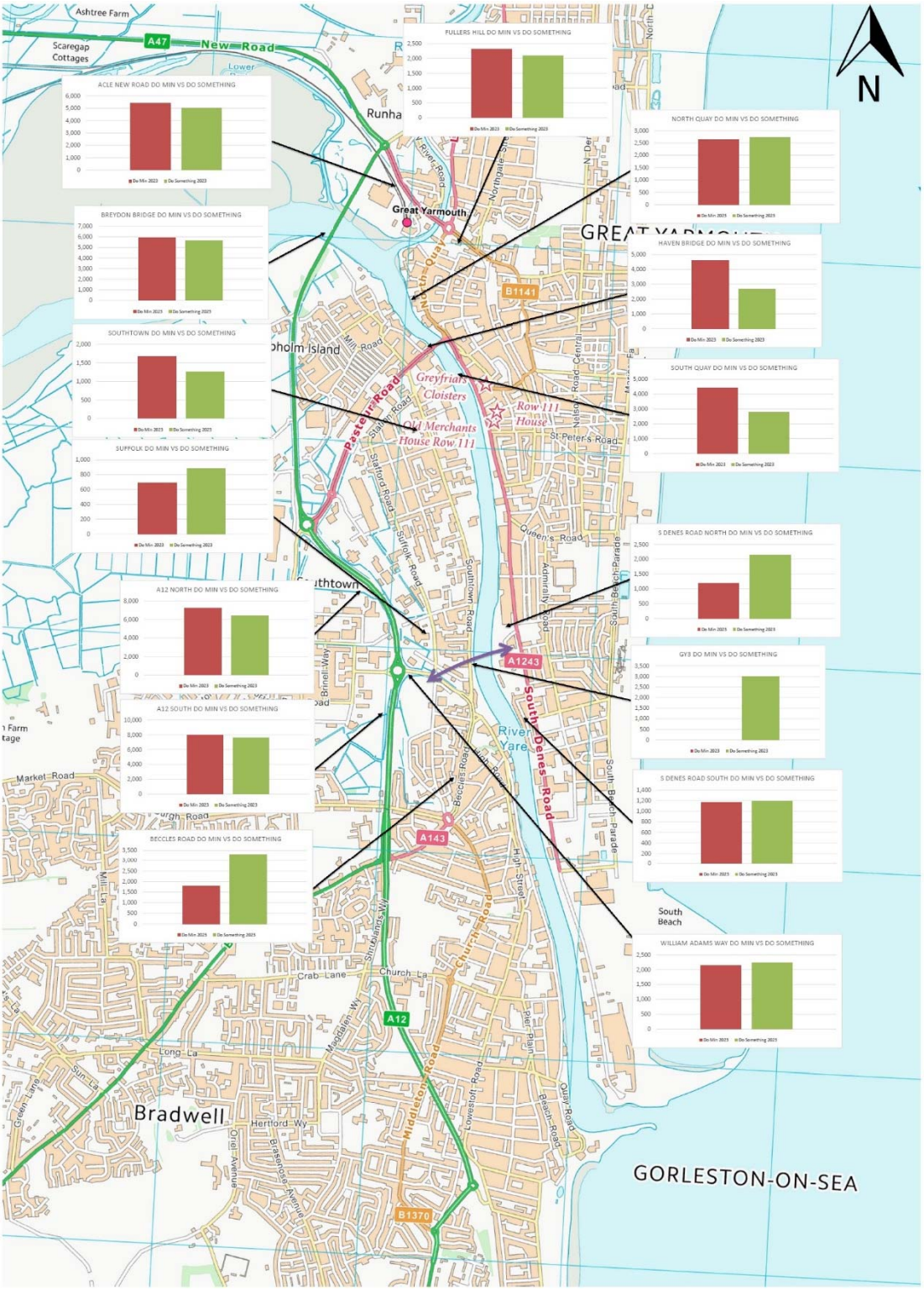


Figure 2-42 Traffic flow changes due to the scheme 2023 pm peak

Whilst there are some increases on the approaches to the new bridge, the general effect is to redistribute traffic between three, instead of two, river crossings, reducing the pressure of traffic in sensitive areas. This will contribute to the achievement of the schemes objectives.

The existing bridges will both experience a reduction in traffic – one of the key objectives of the scheme. Table 2-16 shows the impact of the scheme on bridge crossing flows in 2023.

Traffic flow (2 way) AADT	2023 DM	2023 DS	Difference %
A47 Breydon Bridge	34,846	32,208	-8%
A4123 Haven Bridge	26,186	13,458	-49%
Third River Crossing	-	20,114	-

Table 2-16 Forecast traffic changes on all bridges Bridge AADT (from SATURN model)

The most dramatic reduction is in the traffic on Haven Bridge, where there will be a **49% reduction** upon the opening of the Third River Crossing – a large beneficial impact which will be felt immediately by people in the town. Of the three bridges, Haven Bridge will in future be the least busy by a significant margin.

Congestion will reduce. Figure 2-43 shows visual representations (heat maps) of predicted congestion in 2038 (PM peak), showing the reduced intensity of congestion hotspots as a result of the Third River Crossing.

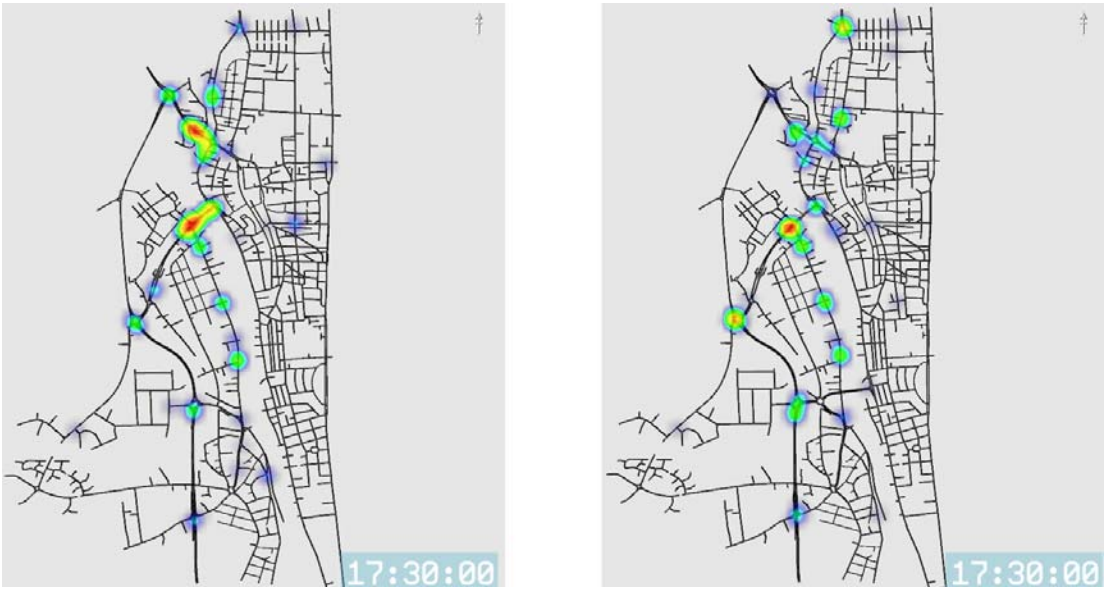


Figure 2-43 Congestion hotspots 2038 PM peak in DM (left) and DS (right)

Journey times on key routes will be reduced. Table 2-17 and Table 2-18 show the dramatic impact that the Great Yarmouth Third River Crossing will have on the times for journeys into the South Denes peninsula.

	Without scheme 2023 PM	With scheme 2023 PM	Time saving (minutes)
Gorleston to South Denes	16.00	8.06	7.54
South Denes to Gorleston	10.56	8.30	2.26

Table 2-17 Forecast journey time savings (Gorleston to South Denes peninsula) 2023 AM peak

	Without scheme 2023 PM	With scheme 2023 PM	Time saving (minutes)
Gorleston to South Denes	15.27	8.01	7.26
South Denes to Gorleston	11.31	8.32	2.59

Table 2-18 Forecast journey time savings (Gorleston to South Denes peninsula) 2023 PM peak

Journey time reliability will also be improved, as demonstrated in the Economic Case, as a result of these changes in traffic flow.

Historic areas of the town will experience less traffic. Forecast changes in traffic on Haven Bridge and North and South Quay are set out in Table 2-19. Traffic will reduce significantly on the historic South Quay.

Traffic flow (2 way) PM peak	2023 DM	2023 DS	Difference %
North Quay	12,748	13,612	+7%
Haven Bridge	26,186	13,458	-49%
South Quay	26,610	15,332	-42%

Table 2-19 Forecast traffic changes near Haven Bridge PM peak (from SATURN model)

Vehicular access to South Denes and the Outer Harbour will be greatly improved, as the Third River Crossing will provide a much shorter route into the South Denes area for traffic from the SRN (A47).

Access for pedestrians and cyclists will be improved. The Third Crossing will provide a much more direct route for many trips. It will also be provided with excellent facilities for non-motorised modes, as illustrated in Figure 2-44.

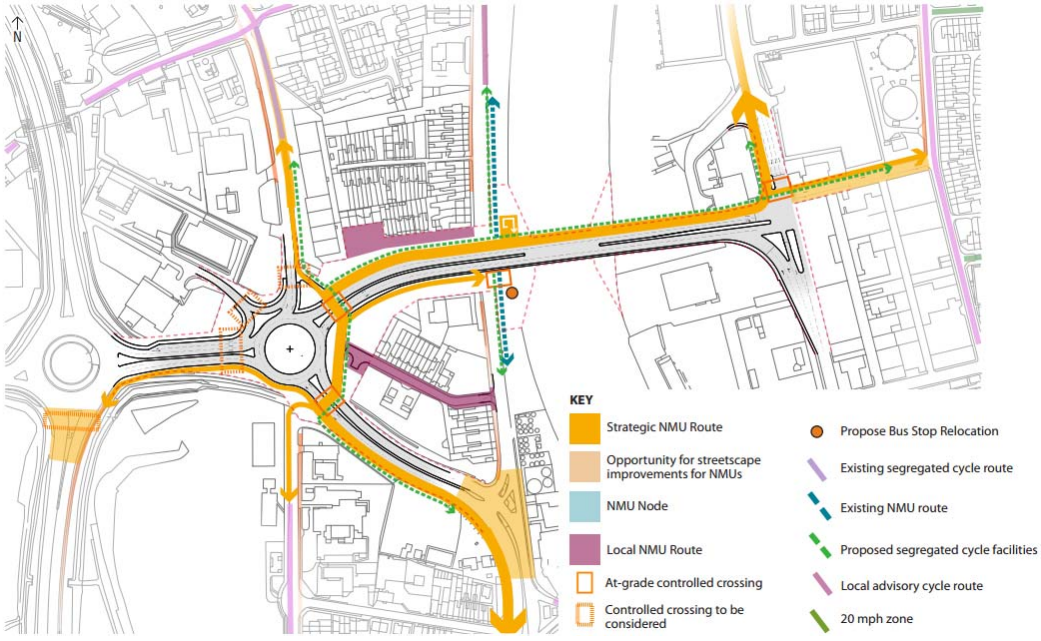


Figure 2-44 Facilities for pedestrians and cyclists (from Landscape and Urban Design Report)

Accessibility plots (Figure 2-45 and 2-46) show the significant improvement in accessibility for pedestrians and cyclists respectively.

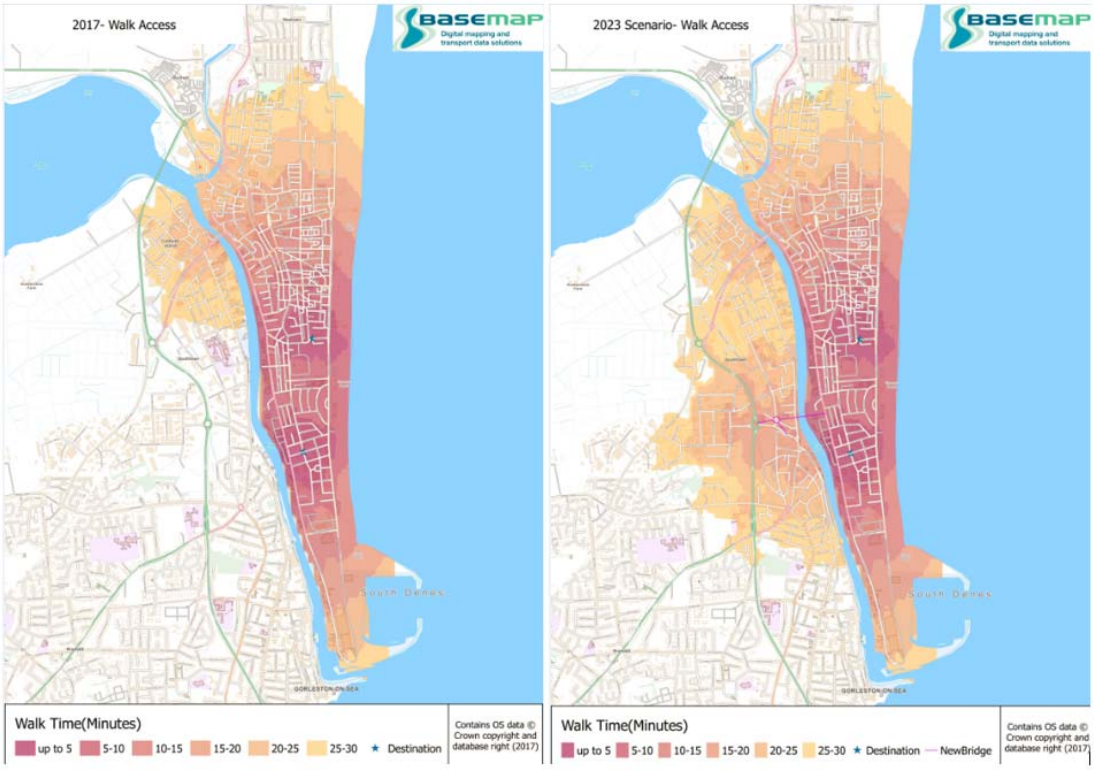


Figure 2-45 Accessibility for pedestrians 2023 DM (left) and DS (right)

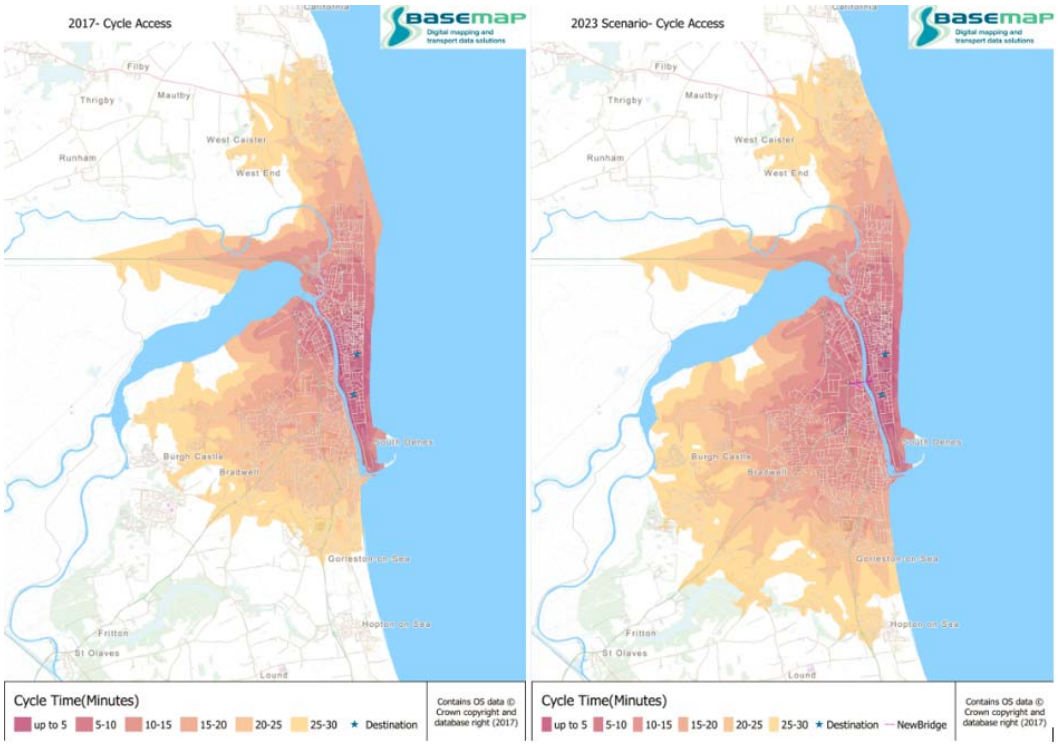


Figure 2-46 Accessibility for cyclists 2023, DM (left), DS (right)

More information on benefits for users of active modes are set out in the Economic Case and in the Active Modes Appraisal Report (Supporting document 10).

Bus users will benefit from:

- Less congestion on existing routes
- New waiting facilities near the Third River Crossing
- The opportunity to introduce new, more direct routes into the South Denes area

Road accidents will be reduced, as detailed in the Economic Case, and demonstrated using the DfT assessment tool, COBALT.

Greenhouse gas emissions will be reduced, as detailed in the Economic Case.

The resilience of the local road network will be enhanced by the provision of additional capacity overall, reduced congestion and additional route options (for example when roads are closed due to incidents), meeting the criteria set out in Paragraph 2.5.10 above.

In summary, **the Great Yarmouth Third River Crossing is expected to deliver on all of the specific objectives** set out in Paragraph 2.7 above – in some cases with very large positive impacts.

The improvements to accessibility and connectivity, and the reductions in travel times, will reduce transport costs and help to deliver the high level, strategic outcomes also set out in Paragraph 2.7 above:

- Support the creation of new jobs (see the Regeneration and Wider Impacts Report, (Supporting document 11)
- Support Great Yarmouth as a centre for Offshore Energy, and as a port
- Support the regeneration of Great Yarmouth, including the town centre and the seafront, helping the visitor and retail economy
- Improve strategic connectivity and reduce severance
- Protect and improve the environment

3 The Economic Case

3.1 Introduction

The Economic Case identifies and assesses all the impacts of the scheme to determine its overall value for money. It takes account of the costs of developing, building, operating and maintaining the scheme, and a full range of its impacts, including those impacts which can be monetised.

The results of the assessment are set out in detail in the Appraisal Summary Table (Appendix L) and summarised in the Value for Money Statement (Paragraph 3.16).

These demonstrate that the benefits of the scheme will outweigh its costs, offering **high** value for money.

This Economic Case covers:

- Options appraised;
- Overview of methodology and assumptions;
- Scheme costs;
- Transport economic efficiency (TEE);
- Safety impacts;
- Active mode impacts;
- Reliability benefits;
- Wider impacts;
- Social and distributional impacts;
- Environmental impacts;
- Value for money statement;
- Sensitivity testing;
- Appraisal summary table (AST); and
- Summary and conclusion.

3.2 Options appraised

The proposed scheme has been identified after consideration of a full range of options. These included:

- Non-road options
- Different types of crossing (bridge or tunnel)
- Different corridors and locations for a crossing
- Different types of bridge or tunnel structure
- Different bridge heights (high or low)
- Different carriageway standards (single, dual or three-lane)
- Different ways of connecting to the existing highway network

The assessment of these options, and the refinement of the preferred option, is described in detail in the 2016 and 2017 Option Assessment Reports, and is summarised in the Strategic Case. At each stage of the assessment, use has been

made of the analytical tools available at that time. The models used to determine scheme impacts have been progressively improved, giving increasing confidence in the results.

The 2016 Option Assessment Report (included as Supporting document 1) which builds on earlier work in 2007 and 2009, identified, sifted and assessed a very broad range of options. It led to the identification of a preferred type of crossing (a bascule bridge) and a preferred corridor.

Figure 3-1 Preferred route corridor (2016)

The 2017 Final Option Assessment Report (included as Supporting document 2) considered 40 options for a road crossing within the preferred corridor. These were sifted and assessed against the scheme objectives to produce a short list of nine options:

Option	Western tie -in	Bridge height	Carriageway standard
4	Existing Harfrey's roundabout	High (7m)	2 lane single carriageway
5	Existing Harfrey's roundabout	High (7m)	Dual carriageway
6	Existing Harfrey's roundabout	High (7m)	Three lane carriageway
31	New roundabout at Suffolk Road	High (7m)	2 lane single carriageway
32	New roundabout at Suffolk Road	High (7m)	Dual carriageway
33	New roundabout at Suffolk Road	High (7m)	Three lane carriageway
37	At-grade junction with Southtown Road	Low (3m)	2 lane single carriageway
38	At-grade junction with Southtown Road	Low (3m)	Dual carriageway
39	At-grade junction with Southtown Road	Low (3m)	Three lane carriageway

Table 3-1 Shortlisted options (2017)

All of the short-listed options involved a signalised T-junction with South Denes Road as the eastern tie-in to the existing road network.

The nine options were then assessed in more detail using the DfT's Early Assessment and Sifting Tool (EAST). This considered the high level economic, environmental and social impacts of the scheme, in line with the five case model. The EAST sifting process is intended to inform a decision, not to make one.

The final stage of assessment led to the identification of a single preferred option which was then refined and optimised as part of the scheme design process.

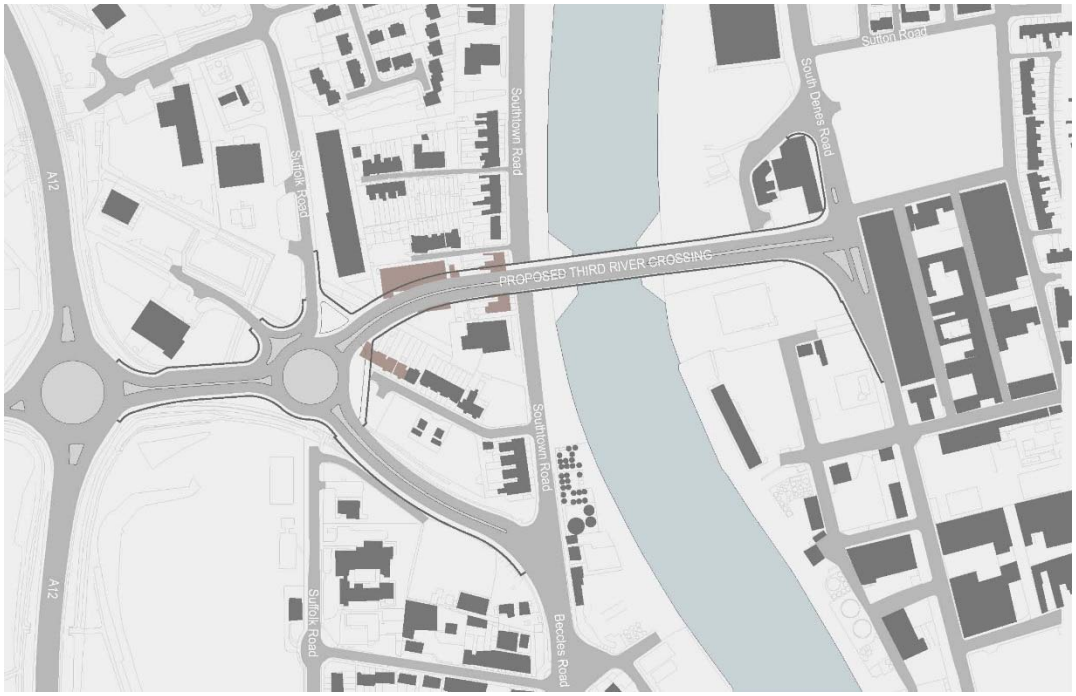


Figure 3-2 Preferred scheme

The scheme will provide a third crossing over the River Yare, creating a new, more direct link between the western and eastern parts of the Great Yarmouth. Specifically it will provide a connection between the Strategic Road Network (A47) and the South Denes Business Park, Enterprise Zone, Great Yarmouth Energy Park and the Outer Harbour, all of which are located on the South Denes peninsula.

A new lifting bridge will carry a dual carriageway road across the river, opening when required to allow shipping to pass through. Traffic will be controlled by lifting barriers at either end of the bridge, and queueing space will be provided.

On the western side of the river, a new roundabout will be constructed on William Adams Way, at the site of the existing junction with Suffolk Road, to the east of the A47 Harfrey's Roundabout. Suffolk Road (north) will connect directly into the roundabout. William Adams Way will be realigned and widened between Harfrey's Roundabout and the new roundabout, and between the new roundabout and Beccles Road / Southtown Road.

From the new roundabout, a new dual carriageway road will run eastwards towards the river, crossing Southtown Road on a flyover, and continuing over the new bridge. On the eastern side of the river, the new dual carriageway will connect to the A1243 South Denes Road at a new signal controlled junction.

The Economic Case sets out the results of assessing this scheme in more detail, using the most up-to-date information and analytical tools available.

3.3 Overview of traffic modelling methodology and assumptions

The economic assessment is based on the detailed modelling of traffic in Great Yarmouth, both with and without the proposed scheme. The modelling methodology was agreed by a peer group of representatives from NCC, DfT and Mouchel.

The Great Yarmouth Traffic Model (GYTM) is based on a SATURN model originally built by Mott MacDonald in 2008. This has been recalibrated to create a new 2016 base model.

The development, validation and use of the new SATURN model are described in the following reports, provided as Supporting documents to the OBC.

Supporting document	Title
3	Data collection report
5	Local Model Validation Report (LMVR) (SATURN)
6	Demand Model Report
8	Forecasting Report (SATURN)

Table 3-2 Modelling reports

A very brief summary of the approach to modelling is set out below.

3.3.1 Updating the 2008 model

The model update included:

- Reviewing the network structure, taking account of changes to the highway infrastructure
- Refining the zone structure and zone connectors, especially close to the proposed scheme
- Updating traffic signal timings
- Adding development sites introduced between 2008 and 2016
- Updating demand matrices using new RSI survey and traffic count data

3.3.2 Features of the model

The SATURN software employs an iterative process of assigning flows and simulating delay. Within the simulated model area, capacity is restrained at junctions.

In line with TAG Unit M2, variable demand modelling (VDM) has been used.

3.3.3 *Model study area*

The simulation model area covers the whole of the Great Yarmouth conurbation, as shown in Figure 3-3 below.

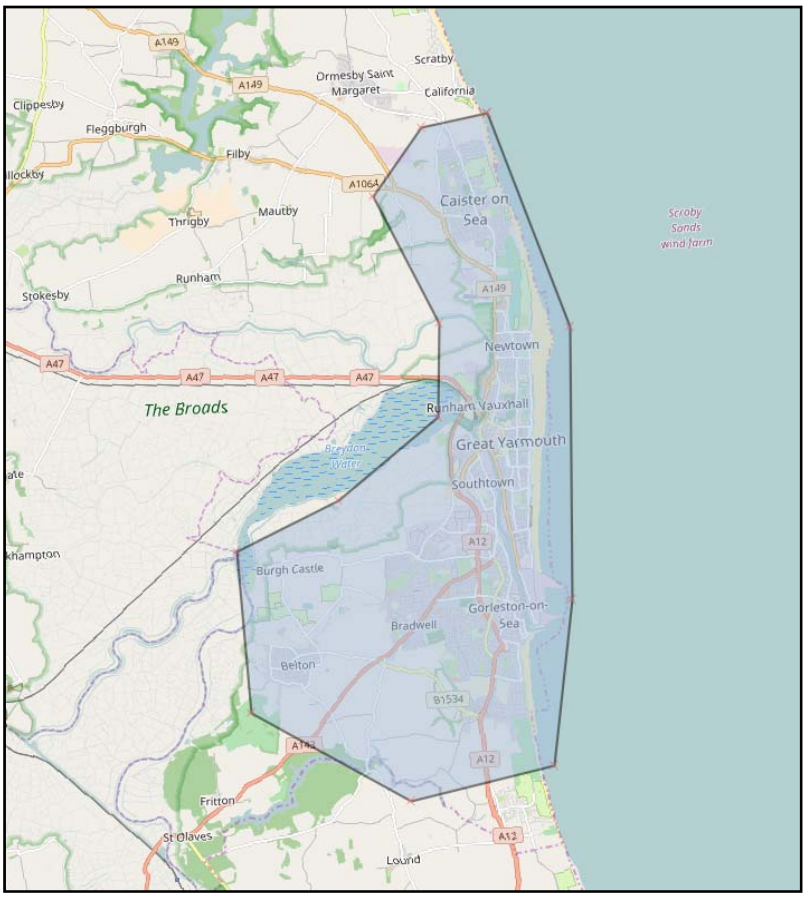


Figure 3-3 SATURN model - extent of detailed simulation area

The simulation area is considered large enough to capture the biggest impacts expected due to the scheme and also includes an area where impacts are quite likely but are expected to be relatively small.

3.3.4 *Zoning*

The model comprises 240 zones, with the greatest level of detail being in the town centre and close to the proposed scheme. The zoning structure is illustrated in Figure 3-4 and is described in more detail in the LMVR.

3.3.5 *Highway network*

The simulation area of the model network is also shown in Figure 3-4 and described in more detail in the LMVR. All roads outside the core model area are coded as buffer links.

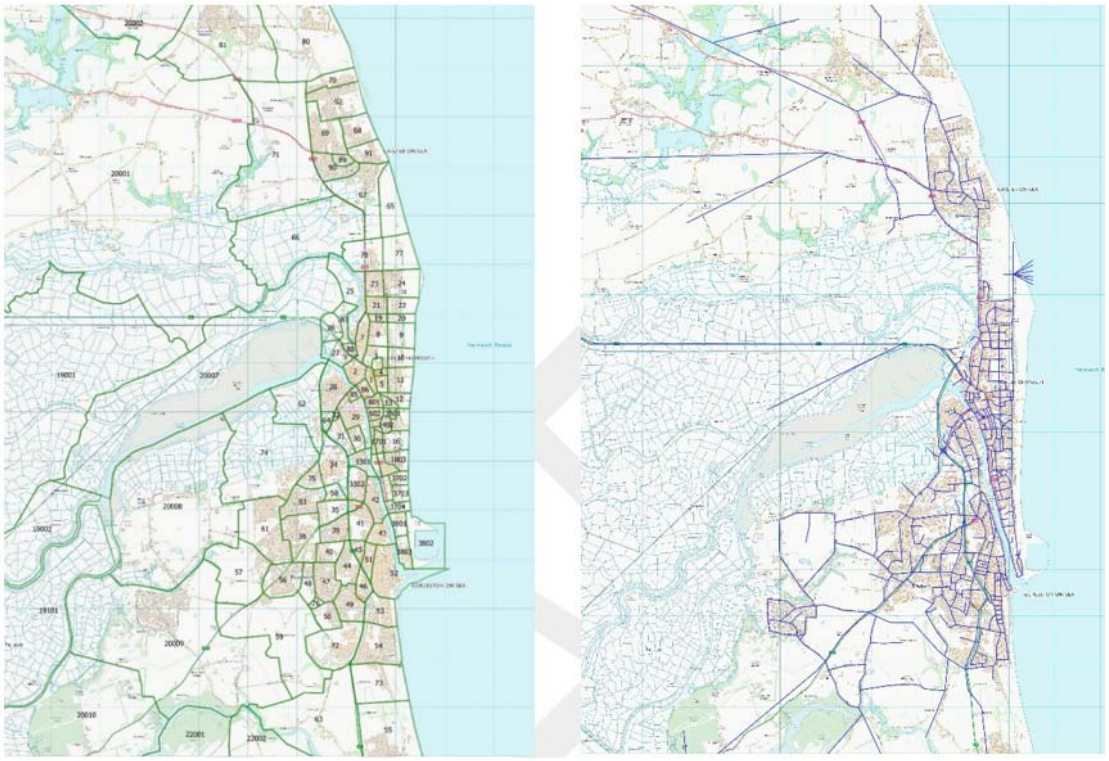


Figure 3-4 SATURN zoning and highway network

3.3.6 Traffic data

Traffic data was obtained from:

- Existing data, including: ANPR, MCC, ATC, queue surveys, Trafficmaster.
- Roadside interview surveys in 2016
- Manual classified counts at over 40 locations in 2016
- Automatic traffic counts at 30 locations in 2016
- Journey time surveys on 8 routes in 2016

The collection and processing of this data is detailed in the Data Collection Report (Supporting document 3).

3.3.7 Junction modelling

In order to represent the effects of traffic delay and queues at junctions, junction operation has been modelled in detail within the study (simulation) area.

3.3.8 Matrix development

Base year trip matrices were developed for 2016. Three time periods were modelled in order to replicate trip patterns over a typical weekday:

- AM Peak hour (08:00 – 09:00);
- PM Peak hour (16:30 – 17:30); and
- Average Inter-Peak hour (10:00 – 15:30).

Five user classes have been modelled:

- Cars – employer business ;
- Cars – commute;
- Cars – other
- Light Goods Vehicles;
- Heavy Goods Vehicles (OGV1, OGV2 and Coaches).

The development of the base year (2016) traffic model and its validation against observed traffic flows and journey times is fully documented in the LMVR.

3.3.9 Forecasting

The modelled assessment years are:

- Base Year (2016)
- Opening Year (2023)
- Design Year (2038)
- Horizon Year (2051)

The forecasting process comprised the following stages:

- define future year travel scenarios
- define future year intervention strategies
- undertake fixed matrix DM and DS forecasting
- undertake variable matrix DM and DS forecasting
- report model outputs

The future year travel scenarios include the planned developments described in the Strategic Case, and other individual developments. The Forecasting Report includes the ‘uncertainty log’ detailing these developments, and describes the development of the future year trip matrices.

In accordance with TAG Unit M4, three growth scenarios were considered:

- Core
- Low demand
- High demand

The following future networks were developed:

- Do Minimum (DM) – validated 2016 network plus do-minimum schemes
- Do something (DS) – DM network plus the proposed scheme

The variable demand modelling (VDM) allows demand model matrices to change in response to changes in travel cost as predicted by the highway supply model. VDM has only been applied to car trips. The process is described in the Demand Model Report (Supporting document 6).

3.4 Overview of economic appraisal methodology and assumptions

The economic assessment 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; and
- TAG Unit A5-1 Active Mode Appraisal.

The methodology is based on the DfT Value for Money Note (December, 2013 and is illustrated in Figure 3-5.

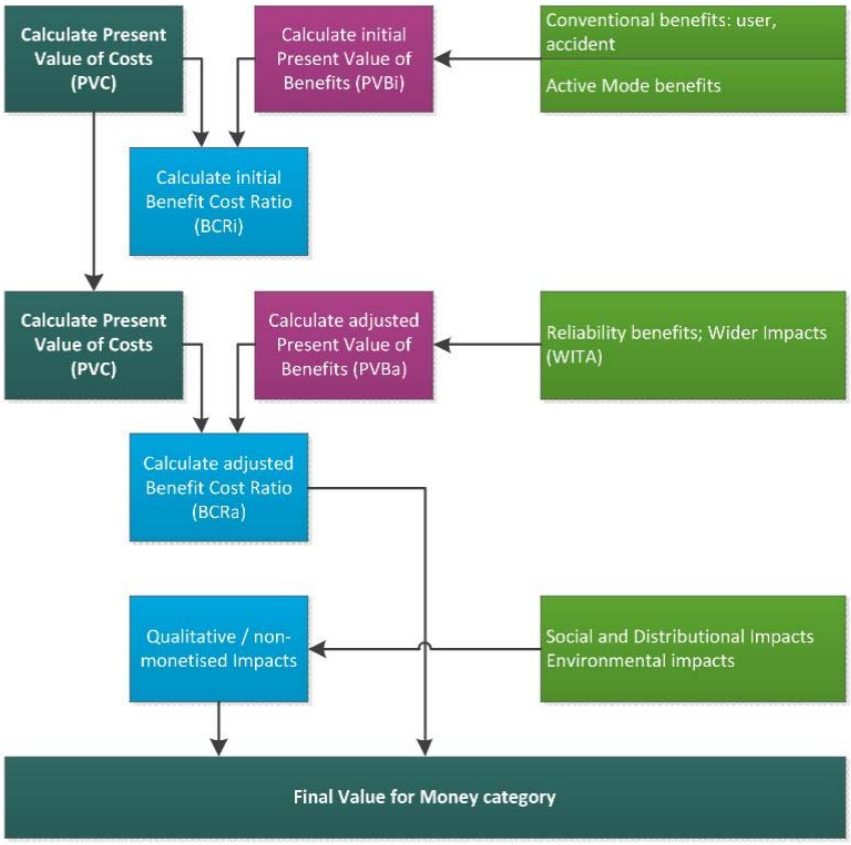


Figure 3-5 Calculation of BCR and VfM score - methodology

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.

- COBALT (Cost and Benefit to Accidents – Light Touch) is used to assess benefits arising from savings in **accidents**.
- An active mode appraisal is undertaken to determine the economic benefits of increases in **active travel**.
- 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 a final **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.

3.5 Economic appraisal reports

The development, validation and use of the new SATURN model are described in the following reports, which are provided as Supporting documents to the OBC.

Supporting document	Title
9	Economic Appraisal Report (EAR)
10	Active Modes Appraisal Report
11	Regeneration and Wider Impacts Report
12	Environmental Options Assessment Report and worksheets

Table 3-3 Economic appraisal reports

3.6 Costs

Costs have been estimated under three broad headings:

- Investment costs (scheme preparation and construction)
- Operating costs
- Maintenance and renewal cost

3.6.1 Scheme preparation and construction cost

The risk adjusted scheme preparation costs have been estimated following the principles set out in WebTAG Unit A1.2 ‘Scheme Costs’.

All costs were estimated at 2016 (Q3) prices, as set out in detail in Chapter 4, The Financial Case. The costs include an adjustment for quantified risk (QRA).

The estimated risk-adjusted cost of scheme preparation and construction is **£111,651,306** at 2016 Q3 prices.

3.6.2 Operating cost

The estimated operating cost of the proposed bridge to provide 24/7 staffing is **£102,523** per year at 2016 Q3 prices.

3.6.3 Maintenance and renewal costs

The estimated costs of maintenance and renewal, expressed as an average annual cost, are:

- Bridge: **£94,712** per year at 2016 Q3 prices.
- Roads: **£64,450** per year at 2016 Q3 prices.

3.6.4 Optimism Bias

In line with the guidance in TAG Unit A1.2, an adjustment for optimism bias has been applied to all costs in the economic assessment[38].

The allowance is designed to compensate for the systematic tendency for appraisers to be overly optimistic about key parameters. The Green Book (HMT, 2003) suggests that appraisers should make explicit, empirically based adjustments to the estimates of costs, and TAG provides recommended adjustment factors based on the project category and stage of development.

Project category

The relevant project types identified in guidance are:

- Fixed link (bridges and tunnels)
- Roads (motorways, trunk and local roads, cycle and pedestrian facilities etc.)

The scheme comprises a bascule bridge and the approach roads (with cycle and pedestrian facilities) connecting the bridge to the local highway network.

Examination of the cost estimates shows that the proportion of total scheme cost attributable to each part of the scheme is:

- Bascule bridge 70% of total scheme cost
- Roads 30% of total scheme cost

These proportions (70:30) were used to calculate the overall allowance for optimism bias.

[38] The purpose of OB is to ensure that the cost-benefit analysis is robust. Optimism bias is only applied to costs in the economic assessment and is not included in the forecast out-turn costs in the Financial Case.

Stage of development

As a project develops, the scheme cost estimate is expected to be refined, based on better quality data. As project-specific risks become better understood, quantified and valued, the factors that contribute to optimism bias are better captured within the risk management process. Therefore, as risk analysis improves it is expected that the risk-adjusted scheme cost estimate will become more certain, whilst the applicable level of optimism bias will decrease.

TAG Unit A1-2 states clearly that the allowance for optimism bias should be largest at the initial stage of the life of a transport project (Strategic Outline Business Case), should decrease in a more detailed business case (Outline Business Case), and be smallest in the presence of a fully detailed business case (e.g. Full Business Case).

The recommended optimism bias uplifts for each stage of a transport project are set out in Table 3-4.

Stage Category	Stage 1 "Programme entry"	Stage 2 "Conditional approval"	Stage 3 "Full approval"
Fixed link (bridge)	66*	23%	6%
Road	44%	15%	3%
Weighted average (70:30)	59%	21%	5%

Table 3-4 Recommended optimism bias uplifts

The guidance in TAG Unit A1-2 does not give an exact equivalence between the above stages and the three levels of business case approval. However the DfT guidance "The Transport Business Cases" identifies three phases of scheme development as illustrated below:

Figure 3-6 Stages of business case development (Source DfT)

This document is the Outline Business Case, and has been prepared in support of a bid for DfT investment in the scheme. The next and final stage will be the submission of a Full Business Case.

This outline business case develops the scheme which was first identified in the successful 2016 Application for Scheme Development Funds (Local Majors Bid). This, together with a detailed Options Appraisal Report, included most of the material normally provided for a Strategic Outline Business Case, and was based on outline

scheme designs and cost estimates. The optimism bias used was 65%, reflecting the level of uncertainty at that initial stage of scheme development.

For the preparation of this outline business case:

- The option assessment process was developed further, to identify a single preferred option.
- The bridge and highways elements of the scheme have been subject to a significantly more detailed level of design.
- A detailed estimate of costs has been prepared, as set out in Appendix E (Detailed cost breakdown).
- A full quantified risk assessment (QRA) has been undertaken, including a risk identification workshop and statistical calculations of volume and cost risks for individual project components, as summarised in the Financial Case and detailed in Appendix F.

This detailed 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 at **£25,714,218** at 2016 Q3 prices, which adds **30%** to the base cost of the scheme. The base costs themselves include allowances for estimating uncertainty.

Determining an appropriate allowance for optimism bias

This robust approach to scheme design, cost estimation and quantified risk assessment gives a high degree of confidence in the risk-adjusted cost estimates and for this reason the allowances for optimism have been reduced to the Stage 2 levels: **23%** for the fixed link and **15%** for the road elements. For simplicity, a weighted average has been calculated, based on the proportions of bridge and road costs (70:30) giving an overall optimism bias allowance of **21%.**

This approach is supported by advice in DfT guidance “Procedures for dealing with Optimism Bias in Transport Planning” (June 2004) which, whilst urging caution, states that:

“individual projects may exist where the claims to improved risk mitigation are so strong that a downward adjustment to uplifts is warranted in order to avoid double counting. This may be the case if advanced risk analysis (e.g. risk identification workshop and statistical calculations of volume and cost risks for individual project components) has been applied and their results adequately reflected in the established budget.”

For the economic assessment an overall allowance for optimism bias of **21%** has therefore been applied to the total risk-adjusted costs.

A sensitivity test has also been undertaken with a higher allowance for optimism bias of **40%**. This represents a mid-point between the Stage 1 and Stage 2 values.

3.6.5 Present Value of Costs

Finally, the costs are projected over the whole life of the scheme (assumed to be 60 years) and discounted to a 2010 base year at an annual rate of 3.5% for the first 30 years after opening and 3% for years 31 to 60. Discounting represents the assumption that costs (and benefits) incurred at a future date are less valuable now than those incurred earlier. All costs and benefits in the Economic Case are expressed at 2010 prices, discounted to 2010.

£ ,000	Risk adjusted scheme preparation and construction cost	Maintenance, renewal and operation (60 yrs)	Total
Estimated cost at current prices	111,651	15,347	126,998
Cost at 2010 prices, including inflation, discounted to 2010 with market price adjustment.	88,753	4,172	92,925
Optimism bias (21%)	18,638	0	18,638
Present Value of Costs (PVC)	**107,391**	**4,172**	**111,563**

Table 3-5 - Present Value of Costs

Further detail on the costs are set out within Appendix H (Note on Scheme Costs).

The total discounted Present Value of Costs (PVC) is **£111.563 million.**

3.6.6 Public Accounts Table

The full Public Accounts (PA) Table in the format required by DfT is set out in Appendix K. The apportionment of costs between local and central government is discussed in the Financial Case.

3.7 Benefits

The expected economic impacts of the scheme have been established through various transport studies, following methods set out in the Department's modelling and appraisal guidance (WebTAG).

The benefits assessed are:

- Transport Economic Efficiency (user benefits)

- Safety benefits
- Physical Activity (Active Modes) benefits
- Environmental benefits (greenhouse gases)
- Wider public finances (indirect taxation revenues)

The assessment assumes that the opening year for the scheme will be 2023 with an appraisal period spanning 60 years from opening. The choice of appraisal period is informed by HM Treasury's Green Book and WebTAG which stipulates a 60 year appraisal for projects that are deemed to have an "indefinite life", including some major infrastructure schemes such as tunnels and bridges.

Annualisation factors for the three modelled time periods were based on values obtained from local traffic survey data, and are discussed in more detail in Appendix G (TUBA methodology) and in the Economic Appraisal Report (Supporting document 9)

3.7.1 Transport Economic Efficiency

The Transport Economic Efficiency (TEE) benefits are derived from travel time and vehicle operating cost benefits as a result of the scheme. The benefits or disbenefits related to construction and maintenance will be assessed and included in the Full Business Case.

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. The standard TUBA 1.9.8 economics file was used. The TUBA methodology is described in more detail in Appendix G.

The full Transport Economic Efficiency (TEE) Table is included at Appendix I in the format required by DfT, and summarised in Table 3-6 below.

Transport Economic Efficiency (TEE) Benefits		**£,000s 2010 prices, discounted to 2010**
Consumer – commuting user benefits	Travel Time	60,952
	Vehicle operating costs	1,418
	Subtotal	**62,370**
Consumer – other user benefits	Travel Time	139,275
	Vehicle operating costs	4,765
	Subtotal	**144,040**
Business benefits	Travel Time	107,065
	Vehicle operating costs	15,567
	Subtotal	**122,632**
Total TEE benefit		**329,042**

Table 3-6 - Transport User Benefits

The benefits by time period are summarised in Table 3-7 below.

Time Period	PV Benefits £,000
AM Peak	61,517
PM Peak	80,040
Inter Peak	143,543
Off Peak	-
Weekend	36,457

Table 3-7 - TUBA benefits by time period

3.7.2 Safety benefits

The assessment of safety benefits and costs was undertaken using COBALT Cost Benefit Analysis Light Touch), the DfT's cost-benefit analysis software for accident savings, in line with the guidance set out in WebTAG Unit A4.1.

Five year accident data was obtained for Great Yarmouth between 1st January 2011 and 30th December 2015. Default accident rates were used across the COBALT network, except for links within Great Yarmouth for which the actual observed accidents were applied.

The safety benefits were assessed for a 60 year period (2023 to 2082) with an opening year of 2023, a design year of 2038 and a horizon year of 2051.

The latest COBALT economic parameter file (included in the Economic Appraisal Report) was used to calculate accident impacts in line with WebTAG guidance. The data tables provide the inputs required to calculate accident and casualty numbers and costs for each year of the appraisal period.

COBALT uses "Do Minimum" and "Do Something" outputs from the SATURN traffic model to forecast changes in the number of accidents as a result of the scheme, using details of link and junction characteristics, relevant accident rates and costs and forecast traffic volumes by link.

Separate links and junctions were assessed. As COBALT does not accept links with a 20mph speed limit, a speed of 30mph was assigned to any links in both the Do Minimum and Do Something networks which were below this threshold.

The COBA-LT analysis indicates that 22 accidents will be saved by 2082 as a result of the scheme, as shown in Table 3-8 below:

Accidents in 60 years		
Do minimum	**Do something**	**Reduction in Accidents**
7,698	7,615	83

Table 3-8 - Accident Savings over 60 years

COBALT also provides a summary of the number of casualties saved as a result of the scheme, as shown in Table 3-9 below:

Casualty reduction over 60 years	Do minimum	Do something	Reduction in Casualties
Slight	10,460	10,241	220
Serious	1,019	975	43
Fatal	115	109	6
Total	**11,594**	**11,325**	**269**

Table 3-9- Casualty reduction over 60 years

The economic value of the accident savings is set out in Table 3-10 below.

Accident savings over 60 years	Do minimum cost	Do something cost	Accident Savings
Accident costs (£,000)	**428,918**	**416,379**	**12,539**

Table 3-10 Present value of accident savings over 60 years (2010 prices, discounted to 2010)

Overall, the Great Yarmouth Third River Crossing is expected to generate accident benefits with a present value of **£12.539 million** (2010 prices, discounted to 2010).

3.7.3 Active Modes Benefits

As a result of the scheme pedestrians and cyclists will have better access to the Great Yarmouth peninsula and a more pleasant environment. Dedicated facilities on the new bridge will improve journey quality and make encourage more people to walk or cycle. These impacts are expected to produce economic benefits due to:

- Increased physical activity leading to lower healthcare costs.
- Less absenteeism and fewer working days lost.
- The value placed on improved journey quality and ambience.
- Time savings for cyclists and pedestrians.

To quantity these benefits, an active mode appraisal has been conducted over a 30 year appraisal period, in line with WebTAG guidance. The benefits have been discounted and reported in present values using the schedule of discount rates provided in the TAG Databook. As the appraisal has taken place in 2017, a discount rate of 3.50% per year has been applied until 2047, with a rate of 3.00% thereafter. Again, in line with TAG, the values have included real growth in line with forecast GDP/capita.

A full report on the calculation of active modes benefits is contained in the Active Modes Appraisal Report (Supporting document 10).

The present value of benefits for each active mode impact are summarised in Table 3-11.

Impact	Pedestrian £,000	Cycle user £,000	Total £,000
Physical Activity (Health)	2,536	915	3,451
Absenteeism	143	59	203
Journey Quality/Ambience	1,014	810	1,825
Journey Time	3,642	232	3,875
Total	**7,336**	**2,017**	**9,353**

Table 3-11 – Present Value of Active Mode Impacts over 30Yr Appraisal Period (2010 prices and value)

It is calculated that the present value of the active modes benefits for the Great Yarmouth Third River Crossing over a 30 year assessment period is **£9.353 million** (2010 prices discounted to 2010).

3.7.4 Greenhouse gases

Emissions of greenhouse gases are dependent on traffic composition, speed and flow, which is determined by the traffic model. An economic value can be assigned to reductions in greenhouse gases. The reduction in greenhouse gases as a result of the scheme, and the resulting economic benefit is calculated directly by TUBA.

The present value of benefits associated with greenhouse gas reductions for the Great Yarmouth Third River Crossing over a 60 year assessment period is **£1.827 million** (2010 prices discounted to 2010).

3.8 Initial Benefit –cost ratio (BCR)

The Benefit-Cost Ratio (BCR) is defined by dividing the Present Value of Benefits (PVB) by the Present Value of Costs (PVC).

According to WebTAG, Value for Money categories are defined as follows:

- Poor VfM if BCR is below 1.0;
- Low VfM if the BCR is between 1.0 and 1.5;
- Medium VfM if the BCR is between 1.5 and 2;
- High VfM if the BCR is between 2.0 and 4.0; and
- Very High VfM if the BCR is greater than 4.0.

Based on the AMCB (Appendix J), the total monetised benefits exceed the costs by **£237.713 million**. The initial BCR of the scheme is **3.1**. This means that the initial value for money category is **high**.

The initial value of BCR includes monetised benefits of accident savings, greenhouse gas reductions) and indirect taxation impacts, but does not include benefits accruing from reliability or wider impacts. The calculation of initial BCR is set out below.

Analysis of monetised costs and benefits (Initial BCR)	2010 prices discounted to 2010 £,000
Greenhouse Gases	1,827
Physical Activity (Active Mode Appraisal)	9,353
Accidents	12,539
Economic Efficiency: Consumer Users (Commuting)	62,370
Economic Efficiency: Consumer Users (Other)	144,040
Economic Efficiency: Business Users and Providers	122,632
Wider Public Finances (Indirect Taxation Revenues)	-3,485
Present Value of Benefits (PVB)	**349,276**
Cost to Broad Transport Budget	
Investment cost	107,391
Operating costs	4,172
Present Value of Costs (PVC)	**111,563**
Net Present Value (NPV)	**237,713**
Initial BCR	**3.1**

Table 3-12 - Analysis of Monetised Costs and Benefits (AMCB)

3.9 Additional benefits

Given an initial BCR of more than 2.0, it is not necessary to demonstrate further economic benefits from a formal assessment of reliability or wider economic impacts. However, as improved reliability and benefits to the local economy are important objectives of the scheme, these impacts have been considered and used to produce an adjusted BCR.

3.9.1 Reliability Benefits

Reliability has been assessed in line with WebTAG Unit A1.3, Section 6.3 (Reliability – urban roads) using the following relationships, based on calculation of the standard deviation of journey times from journey time and distance for each O-D (origin-destination) pair:

$$\textit{Reliability benefit} = -\sum \Delta\sigma_{ij} \left(\frac{T_{ij}^2 + T_{ij}^1}{2}\right) \times 0.8 \times VOT$$

Where: $\Delta\sigma_{ij} = 0.0018 \left(\left(t_{ij}^2\right)^{2.02} - \left(t_{ij}^1\right)^{2.02} \right) d_{ij}^{-1.41}$

VOT = value of time (£/sec)

T = number of trips (1 = before improvement, 2 = after improvement)

t = journey time (s) (1 = before improvement, 2 = after improvement)

d = distance (km)

i,j = subscript denoting quantity from zone I to zone j

A full report on the calculation of reliability benefits is included in the Economic Appraisal Report (Supporting document 9).

It is calculated that the present value of the reliability benefits for the Great Yarmouth Third River Crossing over the 60 year assessment period is **£33.925 million** (2010 prices discounted to 2010).

3.9.2 Wider Economic Impacts

Wider impacts, as defined in DfT guidance, are the economic impacts of transport that are additional to transport user benefits. In perfectly competitive markets, these impacts would be fully captured by a properly specified appraisal. But in practice, most markets are not perfectly competitive and as a result, wider impacts may result as direct user impacts are amplified through the economy. It has been demonstrated that these impacts can be large, and can therefore be an important part of the overall appraisal of a transport scheme.

The types of wider impacts that need to be considered are:

- WI1 – Agglomeration
- WI2 – Output change in perfectly competitive markets
- WI3 – Tax revenues arising from labour market impacts
  (from labour supply impacts and from moves to more or less productive jobs)

The quantitative assessment of these impacts can be undertaken using the DfT's WITA software (Wider Impacts in Transport Appraisal). In its absence, and in the initial stages of the Outline Business Case submission appropriate uplifts may also provide some understanding of the magnitude of such benefits.

An indicative measure of the value of increased output in imperfectly competitive markets can be estimated using a 10% uplift to the business user benefits abstracted from the TUBA outputs for the Core Scheme. This represents the additional consumer surplus associated with increased output.

On this basis, it is calculated that the present value of these wider benefits for the Great Yarmouth Third River Crossing over the 60 year assessment period is **£12.263 million** (2010 prices discounted to 2010).

In order to validate these assumptions the likely impact of regeneration in Great Yarmouth has been reported by consultant Regeneris in the Regeneration and Wider Impacts Report (Supporting document 11). Their 2017 assessment of benefits and impacts is largely qualitative but quantification is also outlined with the focus of the assessment being on the impacts on employment land and existing sites and premises, as well as on town centre regeneration and the visitor economy. There is also a commentary on demographic change and the how increased investment and development activity in Great Yarmouth will lead to requirements for, and supply of, a skilled labour market.

The non-monetised impacts on regeneration are discussed further in paragraph 3.12.2 below.

3.10 Adjusted Benefit Cost Ratio (BCR)

The adjusted BCR has been calculated as set out below:

Adjusted BCR	(2010 prices discounted to 2010) £,000
Initial Present Value of Benefits (PVB)	349,276
Wider Impacts – Reliability	33,925
Wider Impacts - Economic	12,263
Adjusted Present Value of Benefits (PVB)	**395,464**
Cost to Broad Transport Budget	
Investment Cost	107,391
Operating Costs	4,172
Present Value of Costs (PVC)	**111,563**
Net Present Value (NPV)	**283,901**
Adjusted BCR	**3.5**

Table 3-13 - Adjusted BCR Calculation

Following this adjustment, the BCR increases to **3.5** and is within the **high** value for money category.

3.11 Non-monetised impacts

Where impacts cannot be monetised they are assessed in qualitative terms and, where appropriate, quantified.

3.11.1 Environmental impacts

This section summarises the expected impacts of the proposed scheme on the environment. The assessed environmental impacts are:

- Noise;
- Air quality;
- Greenhouse gases;
- Townscape;
- Historic environment;
- Biodiversity; and
- Water environment.

Greenhouse gas emissions benefits have been monetised and included in the BCR calculation. Other impacts have not been monetised, but have been quantified where appropriate and described in the Environmental Options Assessment Report (Supporting document 12).

The Environmental Appraisal of the proposed scheme will be updated for the full business case, and will include fully quantified and monetarised assessments where required by WebTAG.

3.11.2 Regeneration impacts

The DfT Value for Money note (2013) permits the use of regeneration benefits in the calculation of the adjusted BCR. Regeneration benefits (as defined by DfT) are not included in the calculation of the adjusted BCR here, and are reported here as qualitative benefits. This is because there is no “dependent development” associated with the scheme, and therefore no direct land value uplift (planning gain) that is directly attributable. The benefits captured in the other assessments above are considered to include regeneration benefits already. Inclusion of additional regeneration benefits would therefore “double-count” these benefits. This is considered a conservative approach to the calculation of scheme benefits.

Potential regeneration impacts have been considered by consultant Regeneris and reported in the Regeneration and Wider Impacts Report (Supporting document 11). As noted above, their 2017 assessment of benefits and impacts is largely qualitative but quantification is also outlined, with the focus of the assessment being on the impacts on employment land and existing sites and premises, as well as on town centre regeneration and the visitor economy.

Regeneris estimate that the potential for employment and gross value added (GVA) growth is derived from employment and development sites in the Borough. The sites are consistent with those used in the transport assessment for the third crossing and it is concluded that if these sites were developed and occupied by 2030, the net employment impact would be in the order of 3,300 full-time equivalent (FTE) jobs, with a total GVA contribution of around £240m. The gross average annual employment and GVA associated with these occupiers over this period would be in the order of 280 FTE jobs and £20m of GVA.

The Third River Crossing alone will not address all of Great Yarmouth’s congestion issues, nor is it expected that all of the employment and GVA benefits at these sites can be attributable to the proposed scheme’s investment. Therefore for the purpose

of assessing the potential scale of employment and GVA impacts attributable to the proposed scheme, a low level of dependency has been assumed, at just 10%. This is a conservative assumption, allowing for a modest employment and GVA uplift.

The impacts attributable to the proposed scheme would therefore be expected to be of the order of **330 FTE jobs** and **£24m of GVA** by 2030.

This aspect alone is greater than the initial conservative estimates derived from transport user benefits. As the scheme evolves further quantitative assessments of the wider impacts will be completed to add to the quantification of benefits.

3.12 Social and Distributional Impact analysis

Of the Social and Distributional Impact analysis that can be undertaken, as set out in TAG Unit A4-1 and A4-2, only User Benefits and Accident analysis have been done at this Outline Business Case stage. This is partly because quantitative assessment of noise and air quality impacts will not be available until production of the Full Business Case.

3.12.1 Distributional analysis of user benefits

Income is unevenly distributed in Great Yarmouth, with the most deprived areas being on the peninsula to the east of the town, including the town centre, the seafront and the Peel Ports. Higher incomes are found in other areas to the north and west of the River Yare. As a result, different income groups may experience the benefits of the scheme differently.

The distribution of income between the modelled zones, using data from the Index of Multiple Deprivation is illustrated in Figure 3-7 below:

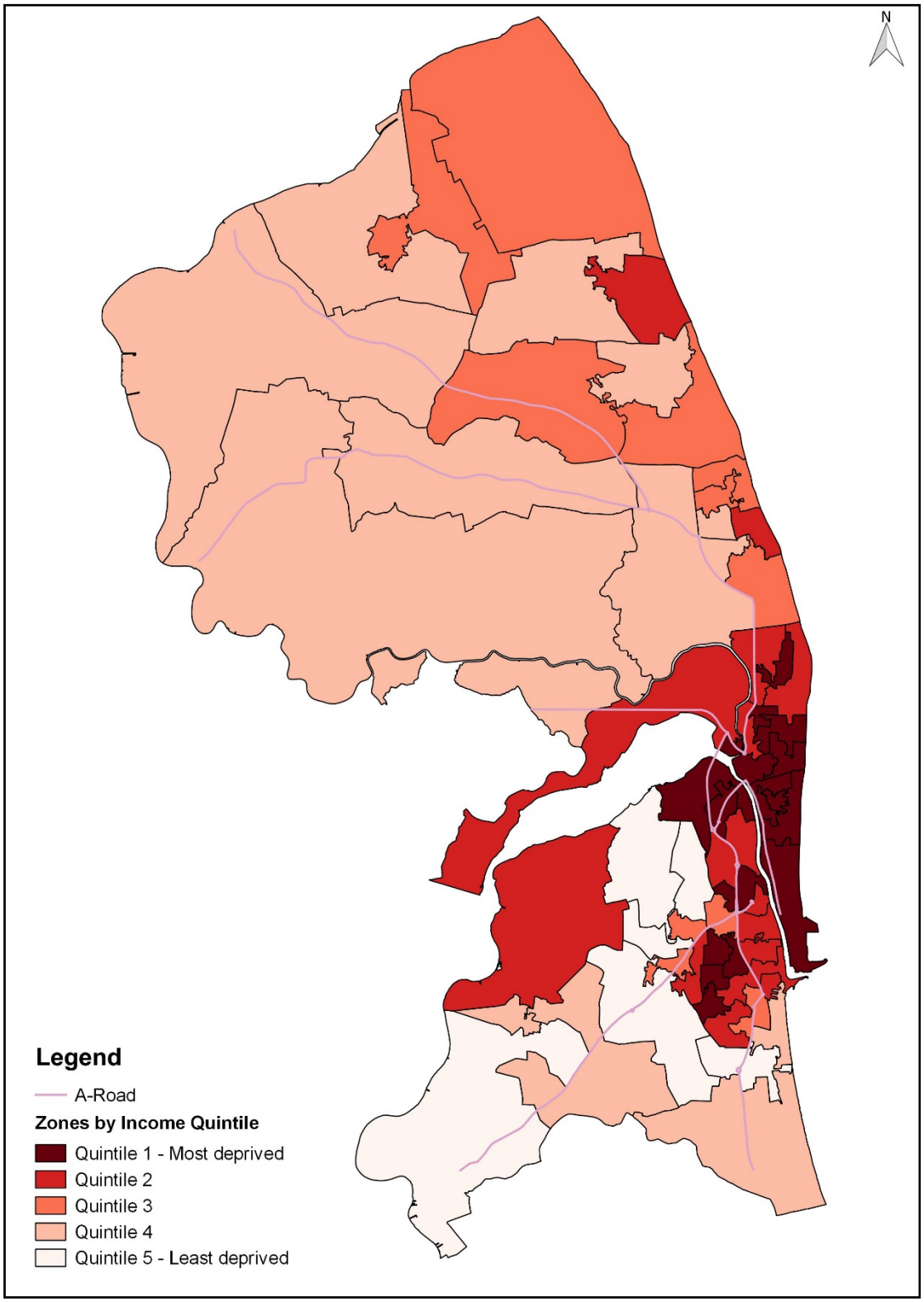


Figure 3-7 Model zones categorised by income quintiles

The distribution of user benefits between different income groups is analysed in Table 3-14.

	IMD Income Domains £m						Total
	0<20%	20<40%	40<60%	60<80%	80<100%	Rest of England and Wales	
Total benefits of LSOA's within Impact Area (£m)	74.996	30.213	23.021	6.457	8.408	25.457	168.5
Proportion of benefits within Impact Area	52%	21%	16%	5%	6%	-	100%
Proportion of benefits within whole of Modelled Area (rest of England & Wales)	44%	18%	14%	4%	5%	15%	100%
Population	33,301	28,401	23,436	8,453	3,686	55.98m	56.07m
Share of population in the impact area	34%	29%	24%	9%	4%	-	
Assessment	✓✓✓	✓✓	✓	✓	✓	✓	

Table 3-14 - Distributional Analysis for Users Benefits

As may be seen, most of the benefits of the scheme accrue to lower income areas.

3.12.2 Distributional analysis of accident benefits

The distribution of accident benefits was also investigated using the guidance set out within TAG Unit 4-2.

As shown in Table 3-15, only one of the links identified in the analysis area has more than 50 casualties in a period of 5 years (2011-2015). Therefore, a detailed analysis is not required by WebTAG. A summary of existing data by age and mode of transport is provided below.

Description	No of Casualties
A12	66
A1243	33
A143	16
A149	21
A47	16
B-Roads	32
Local Roads	198
Total	382

Table 3-15 - Description of Screened Great Yarmouth links and number of casualties

The distribution of road accident casualties by age group and mode of transport is shown in the tables below:

Group	Total	% in Great Yarmouth analysis area (2011-2015)	% in accidents (2015 national average)
Children (under 16 years old)	47	12%	9%
Young People (16-25)	127	33%	25%
Older People (66+)	29	8%	9%
Other ages	179	47%	58%
Total	382	100%	100%

Table 3-16 - Casualties by age group

Group	Total	% in Great Yarmouth analysis area (2011-2015)	% in accidents (2015 national average)
Pedestrian	82	12%	13%
Cyclist	40	10%	11%
Motorcycle	52	14%	10%
Other (Inc. car drivers, passengers)	208	54%	66%
Total	382	100%	100%

Table 3-17 - Casualties by mode

These values are based on existing road data, and show that the proportion of the vulnerable group casualties on the affected links is higher in comparison with the national average for some categories.

3.13 Sensitivity testing

In order to understand how sensitive the benefits described above are to a range of alternative parameters, a number of tests have been performed.

- Alternative growth scenarios
- Alternative levels of Optimism Bias allowance
- Active Modes Appraisal (alternative growth scenarios)

The results of these tests are summarised below, and set out in more detail in the Economic Appraisal Report (Supporting document 9).

3.13.1 Alternative growth scenarios sensitivity test

The first sensitivity test undertaken was a standard high and low growth scenario sensitivity test. These sensitivity tests are provided in the table below:

Benefits		Low Growth	Core	High Growth
TUBA	Consumer – commuting user benefits	45,730	62,370	81,221
	Consumer – other user benefits	104,352	144,040	191,105
	Business benefits	88,885	122,632	164,526
	Indirect Tax Revenue	-3,049	-3,485	-3,940
	Greenhouse Gases	1,443	1,827	2,115
COBA-LT	Accident benefits	16,843	12,539	11,494
Active Mode Appraisal		7,477	9,353	10,720
Total TEE benefit		**254,204**	**349,276**	**446,521**
Additional benefits	Reliability Benefits	20,567	33,925	53,162
	Wider Impacts	8,889	12,263	16,453
Total benefits		**283,660**	**395,464**	**516,136**
BCR		**2.5**	**3.5**	**4.6**
VfM		**High**	**High**	**Very High**

Table 3-18 - High, Core and Low Growth scenario TUBA benefits sensitivity tests (£,000s, 2010 prices, discounted to 2010)

Although the alternative growth scenarios (low and high) have a significant impact on the total benefits forecast, these remain well above the costs even for the low growth forecast, indicating that the value for money is very robust.

3.13.2 Alternative Optimism Bias Sensitivity Testing

As noted in Paragraph 3.6.4 above, an allowance of 21% for optimism bias (OB) is considered appropriate for this scheme, given the level of development and scope of the Quantified Risk Assessment (QRA). The effect on PVC, BCR and value for money for the core scenario of increasing this to 40% and 59% is set out below:

Allowance for Optimism Bias	Adjusted PVB (£,000)	PVC (£,000)	BCR	VfM category
21%	395,464	111,563	3.5	High
40%	395,464	128,426	3.1	High
59%	395,464	145,289	2.7	High

Table 3-19 Alternative optimism bias sensitivity tests

As may be seen, whilst a higher allowance for optimism bias reduces the scheme BCR, the value for money category remains robustly high, even with the highest uplift of 59%.

3.13.3 Active Mode Appraisal Sensitivity Testing

As recommended in TAG Unit A5.1, the potential differences in uplift for pedestrians and cycle users as a result of the scheme has been considered, and this has been reflected in a high and low growth sensitivity test, which is provided alongside the core scenario presented above. The table below summarises the proportions of forecast pedestrian and cycling demand used in the sensitivity tests to generate Active Mode benefits.

Assumptions and Results	Low Growth		
	Low	Core	High
Pedestrians Benefits	6,081	7,336	8,082
Cycle users benefits	1,396	2,017	2,638
Total Benefits	**7,447**	**9,353**	**10,720**

Table 3-20 – Active Modes, low and high uplift sensitivity test results (£, 000)

3.14 Alternative scenario test

The proposed scheme does not require alterations to the A47 Trunk Road. Highways England (HE) are currently investigating and consulting on possible improvements to junctions on the A47 as part of RIS 1, but are not currently progressing a scheme to improve Harfrey's roundabout, the junction closest to the Great Yarmouth Third River Crossing. However, because of the possibility that an improvement scheme could be re-introduced by HE, an alternative DS scenario has been tested which includes the signalisation of this roundabout. Using broad assumptions about the cost of an improvement, the impact on costs and benefits was found to be beneficial, with an increased adjusted PVB of **£445.301 million** and an increased PVC of **£119.264**

million giving a slightly increased BCR of **3.7** (with the value for money category remaining high**)**. As noted elsewhere in the business case, NCC will continue to work closely with HE as a mutual stakeholders, and this could include sharing information to enable HE to appraise their package of schemes in more detail.

3.15 Appraisal Summary Table (AST)

The AST presents in a single table of all the evidence from the economic appraisal. It records all the impacts which have been assessed and described above – economic, fiscal, social distributional and environmental impacts – assessed using monetised, quantitative or qualitative information as appropriate. The AST for the scheme, in line with WebTAG requirements, is included in Appendix L.

3.16 Value for Money Statement

3.16.1 Value for money category

An analysis of the monetised benefits of the proposed scheme demonstrates that it offers **high** value for money

3.16.2 Present value of costs and benefits assessed

The monetised costs and benefits assessed are set out in Table 3-21.

3.16.3 Benefit Cost Ratio

The value for money category is based on the Benefit Cost Ratio (BCR). The initial BCR is **3.1**. Inclusion of reliability benefits and wider economic impacts gives an adjusted BCR of **3.5**.

Business will benefit from reduced congestion, faster journeys and improved journey time reliability, with reduced costs and better access to markets, whilst commuters will similarly benefit from shorter, more reliable, journeys to work. These benefits, which are included in the BCR calculations will support local development and the regeneration of Great Yarmouth's economy.

The scheme is expected to lead to a reduction in greenhouse gas emissions; these have been monetised and included in the BCR.

3.16.4 Non-monetised impacts assessed

Other impacts on the environment have been assessed. These will be reviewed for the Full Business Case in the light of more detailed assessment and consideration of measures to mitigate, manage or compensate for the impacts.

Analysis of monetised costs and benefits	£,000 (2010 prices discounted to 2010)
Greenhouse Gases	1,827
Physical Activity (Active Mode Appraisal)	9,353
Accidents	12,539
Economic Efficiency: Consumer Users (Commuting)	62,370
Economic Efficiency: Consumer Users (Other)	144,040
Economic Efficiency: Business Users and Providers	122,632
Wider Public Finances (Indirect Taxation Revenues)	-3,485
Present Value of Benefits (PVB)	**349,276**
Cost to Broad Transport Budget	
Investment cost	107,391
Operating costs	4,172
Present Value of Costs (PVC)	**111,563**
Net Present Value of Costs (NPV)	**237,713**
Initial BCR	**3.1**
Reliability – business	2,483
Reliability – non-business	31,442
Wider impacts - Economic	12,263
Adjusted Present Value of Benefits (PVB)	**395,464**
Adjusted Net Present Value (NPV)	**283,901**
Adjusted BCR	**3.5**

Table 3-21 Present value of costs and benefits assessed

3.16.5 Identification of risks, sensitivities and uncertainties

The risk register is set out in Appendix F. The financial impact of a range of risks has been considered in a Quantified Risk Assessment (QRA) and the costs included in the calculation of PVC have been adjusted for risk.

Further sensitivity testing with a range of growth scenarios shows that the scheme would still offer **high** value for money in a low growth scenario.

Sensitivity tests show that the value for money category remains high, even with low growth assumptions. A sensitivity test on higher levels of Optimism Bias allowance similarly did not affect the value for money category, which remains robustly high.

3.16.6 Social and distributional impacts

Analysis of social and distributional impacts shows that areas of Great Yarmouth with lower average incomes will benefit most from the scheme.

4 The Financial Case

4.1 Introduction

The cost of delivering the Great Yarmouth Third River Crossing will be **£119.910 million** at out-turn prices from 2017/18 onwards. After completion, there will be further costs for operation, maintenance and renewal. This chapter sets out the financial case for the scheme, and shows that the scheme is affordable. It explains:

- How much the scheme will cost, and how this has been calculated
- The risks that may affect the cost, and how they are being managed
- The anticipated profile of expenditure (whole life costs)
- How the scheme will be paid for, and by whom
- The accounting implications for the scheme's funders.

The Financial Case deals with cost and accounting issues. The question of value for money is dealt with separately in the Economic Case.

4.2 Base Costs

4.2.1 Base cost of scheme development and construction

The estimated base cost of the scheme[39], at 2016 Q3 prices, adjusted for risk but excluding future inflation and non-recoverable VAT, is **£85.937 million**. The base costs are detailed in Appendix E and are summarised in Table 4-1 below:

Scheme element	Estimated cost 2016 Q3 prices £
Western section and bridge approach	11,464,865
Bascule Bridge	40,012,609
Eastern section and bridge approach	5,909,159
Sub-total: Construction costs	**57,386,633**
Utilities: Works by statutory undertakers and others	3,040,454
Land[40]	14,110,000
Fees[41]: Design, investigations, surveys, procurement, supervision etc.	11,400,000
Base cost at 2016 Q3 prices	**85,937,088**

Table 4-1 Costs of scheme development and construction (2016 prices)

[39] Based on Drawing No. 1076653-MOU-HGN-OPT32-DR-D-0001_Option32 alt plan (P1,S2)

[40] Includes the current value (£2,700,000) of land acquired for the scheme before 2017/18

[41] From 2017/18 onwards

The above costs are for the whole scheme, including alterations to the existing road network to accommodate the new bridge and its approaches.

The allowance for fees includes all costs which will be incurred for preliminary design, up to and including submission to DCO, all costs associated with the DCO process, and all future detailed design costs.

Cost estimates have been prepared by an experienced Principal Quantity Surveyor in Mouchel's Highways Team and reviewed by NCC. Independent advice has been sought from specialists in those aspects of cost which are higher risk, especially the mechanical and electrical aspects of the bridge, and land values. A full independent check will be undertaken for the Full Business Case.

4.2.2 Estimating uncertainty

The final cost of delivering the scheme will not be known until after completion of detailed design, land purchase, and the receipt of tenders. There are many things that could affect the cost. For this reason, the scheme cost estimate includes allowances for both estimating uncertainty and events-driven uncertainty, or risk[42].

An allowance for estimating uncertainty is included in the base costs for each element of the scheme, based on experience with similar schemes at this stage of development.

The treatment of risk, and the calculation of quantified risk (QRA) is described below.

4.3 Managing Risk

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*".

The process of managing and reviewing a wide range of project risks, and ensuring an appropriate transfer of risk to the contractor, is described more fully in the Management and Commercial Cases.

A four stage risk management process has been followed, as illustrated in Figure 4-1 below:

[42] Risk allowance is a factor applied to project costs to act as a contingency for unforeseen circumstances. At the concept stage, the risks of being able to accurately assess cost is deemed high, and this reduces throughout the scheme's lifecycle

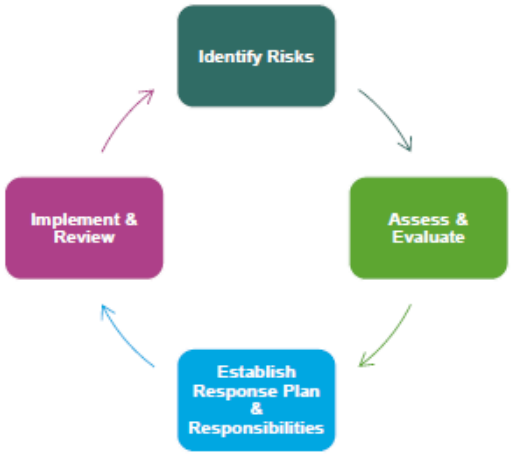


Figure 4-1 The 4-stage risk management process

4.3.1 Identifying risks

Risks have been identified by specialists from all relevant disciplines, including highways and structural engineering, geotechnics, marine engineering, navigation and harbour operation, mechanical and electrical, transport planning, quantity surveying and the environmental disciplines. A Risk Management Workshop was held on 30 January 2017 to consider risks associated with the preferred scheme, 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.

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:

The workshop completed Project and Design Assumption testing using a mind mapping tool.

Risks were categorised as:

- Strategic and programme
- Statutory process and planning
- Design
- Ecology and archaeology
- Organisational and human factors
- Financial and commercial
- Land
- Construction
- Statutory undertakers and third parties
- Operational (both highways and port/harbour) and maintenance.

These are catalogued in the Risk Register, which is included within Appendix F.

4.3.2 *Quantified risk*

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.

The range of possible costs associated with each risk was estimated, and each risk was 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.

Commercial software programme, @RISK 6.3 was used to undertake a Monte Carlo simulation with 1,000 iterations per run, each representing a different risk occurrence scenario, in order to determine the probability distribution of the total risk cost for the scheme. From this distribution, the 85th percentile value was used as an overall estimate of the quantified risk for the scheme.

Using this methodology, the 85th percentile value of quantified risk was calculated to be **£25.714 million**, at 2016 Q3 prices. This represents 30% of the non-adjusted base cost[43] .

The assessment and quantification of risk is described in more detail in Appendix F.

4.3.3 *Risk adjusted cost*

The risk adjusted total cost at 2016 prices is set out in Table 4-2 below:

	Capital cost 2016 Q3 prices £
Base cost at 2016 Q3 prices	85,937,088
Quantified Risk (P85 value)	25,714,218
Risk-adjusted base cost at 2016 Q3 prices	**111,651,306**

Table 4-2 Risk adjusted total cost (2016 prices)

4.3.4 *Managing risk (Response plans and mitigation)*

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:

[43] Including estimating uncertainty

- **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; and
- **Terminating the activity** that gives rise to the risk.

Response plans to manage risks will be developed only where the likelihood of occurrence or the impact of risks can be managed cost effectively.

4.3.5 Implementation of response plans, and review of risk

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.

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.

4.4 Spend profile

Subject to funding, construction of the scheme will start in October 2020 and the new bridge will open to traffic in January 2023. The expected profile of expenditure is set out in Table 4-3 below.

Scheme element	TOTAL %	Pre-2017-2018	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
Construction	**100%**	0%	0%	18%	3%	32%	40%	8%
Utilities	**100%**	0%	0%	15%	45%	40%	0%	0%
Land	**100%**	19%	2%	3%	30%	35%	7%	4%
Fees	**100%**	0%	10%	20%	23%	27%	18%	4%

Table 4-3 Spending profile (%)

Some of the land acquisition costs were incurred prior to 2017-18.

The risk-adjusted forecast spend in each year, still at 2016 Q3 prices, is set out in Table 4-4 below:

Scheme element	TOTAL £,000	Pre-17-18 £,000	2017-2018 £,000	2018-2019 £,000	2019-2020 £,000	2020-2021 £,000	2021-2022 £,000	2022-2023 £,000
Construction	57,387	-	-	10,048	1,773	18,226	22,783	4,557
Utilities	3,040	-	-	456	1,368	1,216	-	-
Land	14,110	2,700	282	423	4,233	4,939	988	545
Fees	11,400	-	1,112	2,223	2,594	3,078	1,995	399
Base cost	**85,937**	**2,700**	**1,394**	**13,150**	**9,968**	**27,459**	**25,765**	**5,501**
QRA	25,714	-	1,286	5,143	3,857	7,714	6,429	1,286
Risk-adjusted base cost	**111,651**	**2,700**	**2,679**	**18,293**	**13,825**	**35,173**	**32,194**	**6,787**

Table 4-4 Risk adjusted forecast expenditure (2016 Q3 prices)

The QRA has been apportioned across the future scheme years only.

4.5 Out-turn price adjustment (inflation)

Inflation will mean that the actual amount of money to be spent on the scheme will differ from the 2016 Q3 estimates. An allowance for inflation has therefore been calculated for each future year.

The 2016 prices will be inflated through the delivery and construction period based on the Bank of England CPI latest forecasts of general inflation as set out in Table 4-5 below.

Factors applied to 2016 Q3 to give out-turn prices	Pre-2017-2018	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
General inflation rate		2.44%	2.69%	2.48%	2.36%	2.36%	2.36%
Inflation factors		1.024	1.052	1.078	1.103	1.129	1.156

Table 4-5 Inflation (based on Bank of England CPI forecasts of general inflation)

Construction inflation has previously been assessed and agreed by the Highway Authority, based on an examination of local contractors' rates, and set at 2% per year for 2013 to 2018. The Building Cost Information Service (BCIS) and other construction inflation indices show forecast construction inflation to be at a lower level than forecast inflation from RPI over the short term and therefore the Bank of England inflation rates are considered both realistic and reliable in the context of setting out robust scheme costs for this Outline Business Case.

4.6 Scheme cost

The "scheme cost" as defined by DfT, is the out-turn capital cost of the scheme excluding costs incurred prior to completion of the OBC. Therefore, the forecast scheme cost is **£119.910 million** as set out in Table 4-6 below.

Costs £,000	Preparation costs (between OBC and start of construction)	Land purchase	Construction costs	TOTAL
Base cost	7,752	11,410	64,075	**83,237**
Risk	2,395	3,525	19,794	**25,714**
Inflation	1,021	1,502	8,436	**10,959**
TOTAL	**11,168**	**16,437**	**92,305**	**119,910**

Table 4-6 Scheme costs (£000)

This is the amount of money actually needed to deliver the scheme, and is the basis for the funding bid and future local contributions.

4.7 Expenditure prior to financial year 2017-2018

Table 4-7 shows that an additional **£4.9 million** was spent on the scheme prior to and including 2016/17, of which **£3.7 million** has been funded directly by the County Council.

Scheme element	TOTAL Pre-2017-2018	2006-2010 £,000	2010-2011 £,000	2011-2012 £,000	2012-2013 £,000	2013-2014 £,000	2014-2015 £,000	2015-2016 £,000	2016-2017 £,000
Fees	**887**	866	10	10	1				
Land	**2,812**		1,873	449	480	20	4	-14	
Total NCC	**3,699**	866	1,883	458	481	20	4	-14	
OBC prep	**1,200**								1,200
TOTAL	**4,899**	**866**	**1,883**	**458**	**481**	**20**	**4**	**-14**	**1,200**

Table 4-7 Expenditure before 2017/18

Prior to 2016/17, the County Council had invested **£0.9 million** in scheme preparation and **£2.8[44] million** on advance land acquisition. The preparation of the Outline Business Case in 2016/17, was supported by DfT with **£1.080 million** from the Local Major Scheme Fund, with a further **£0.12** million from NCC.

4.8 Whole life costs

Although the funding bid 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 the bascule bridge, costs of maintaining the bridge and the highway, and the longer term costs of infrastructure renewal.

4.8.1 Operating costs

The annual cost of operating the Bascule Bridge, at current (2016) prices, will be **£102,523**.

[44] Estimated current market value £2,700,000

4.8.2 Maintenance and renewals

Bridge maintenance and renewals

An estimated annual average over the 60 year period of **£94,712** at current (2016) prices will be required to meet:

- annual bridge maintenance liabilities, both for the new bascule bridge, and for the new bridge over Southtown Road:
- periodic bridge repair and rehabilitation, including treatment to avoid corrosion, painting the structure and structural repairs (included in the annual average cost).

Highways maintenance and renewals

An estimated annual average over the 60 year period of **£64,450** at current (2017) prices will be required annually for highways maintenance and renewals:

- highways maintenance liabilities including communications 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 new bridge approaches and bridge surface (included in the annual average cost)

The whole life cost impact on budgets, and the funding cover required to meet liabilities, is dealt with in paragraph 4.9.4 below. Whole life costs are also needed for the calculation of the present value of costs in the Economic Case.

4.8.3 Summary of whole life costs

The above whole life costs are summarised in Table 4-8 below. The average annual cost of operating, maintaining and renewing the roads and bridges is estimated at **£261,685**.

Whole-life costs 2016 prices	Bridges		Highways	TOTAL
	Operating costs	Maintenance and renewal	Maintenance and renewal	Operating, maintenance and renewal
Annual average (2016 Q3 prices)	102,523	94,712	64,450	**261,685**

Table 4-8 Whole life costs as annual average at current (2016) prices

The annual costs are used in the economic appraisal, which is described in the Economic Case.

4.9 Budgets and funding cover

4.9.1 Funding strategy

It is anticipated that the Great Yarmouth Third River Crossing will be funded entirely from public finances.

4.9.2 Funding request and profiling

Table 4-9 sets out the funding required from 2017/18 onwards to deliver the Great Yarmouth Third River Crossing.

A contribution of **£98.088 million** of government funding is being sought from the Department for Transport, as detailed in Table 4-9 below. This does not include expenditure incurred prior to completion of the OBC.

Norfolk County Council will make a further local contribution from 2017/18 onwards of **£21.822 million.**

£,000	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	Total £,000
DfT funding requested	1,745	18,242	13,903	29,811	27,362	7,024	**98,088**
LA (NCC) contribution	1,000	1,000	1,000	9,000	9,000	822	**21,822**
Third party contribution	0	0	0	0	0	0	**0**
Total	**2,745**	**19,242**	**14,903**	**38,811**	**36,362**	**7,846**	**119,910**

Table 4-9 Funding request and profiling (£, 000)

4.9.3 Local authority contribution

The total financial investment by Norfolk County Council in developing and delivering the Great Yarmouth Third River Crossing, including expenditure already incurred, will be **£25.641 million** as set out in Table 4-10 below.

Expenditure by NCC	Date	Amount £,000
Scheme preparation	Before 2016/17	887
Advance land acquisition	Before 2016/17	2,812
Preparation of OBC	During 2016/17	120
Local contribution to scheme (post OBC)	From 2017/18	21,822
Total		**25,641**

Table 4-10 Norfolk County Council's financial contributions

The total contribution by Norfolk County Council is **20%** of the total scheme cost, including expenditure prior to 2017/18.

The exact composition of the local authority contribution from 2017/18 has not yet been finalised, but is expected to come from a combination of the following:

- Rates retention from the Lowestoft and Great Yarmouth Enterprise Zone
- 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 Growth Deal funding through the New Anglia LEP

The details of the local funding mechanism will be clarified as the scheme is developed. In view of the uncertainty about the sources of local funding, Norfolk County Council will underwrite these costs. The local contribution is confirmed in the signed declaration by Norfolk County Council's Section 151 officer, which is included in the Bid Cover Sheet. The declaration also confirms that the Council will underwrite any increase in costs above those set out in the Business Case.

The Council is also prepared to enter into credit arrangements under the prudential borrowing powers from the Local Government Act 2003.

4.9.4 Funding cover for whole life costs

The whole life costs, summarised in Paragraph 4.8 above, 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.

The scheme is not expected to generate any direct income.

4.10 Summary of the Financial Case

The cost of delivering the Great Yarmouth Third River Crossing, including allowances for risk and inflation will be **£119.910 million**.

A total of **£4.9 million** has been spent prior to submission of the OBC, including **£3.8 million** by the County Council.

A robust risk management strategy is in place to identify, quantify, manage and review risks, including financial risks.

The scheme will also give rise to costs for annual operation and maintenance, and for the long term renewal of the infrastructure, averaging **£261,685** per year.

Norfolk County Council is seeking a contribution of **£98.088 million** from the Government's Department for Transport towards the capital costs of the scheme, and the Council will support this with a further local contribution of **£21.822 million**.

Including expenditure on scheme preparation prior to and including 2016/17 and advance land acquisition, the County Council's contribution is **£25.641 million** which is **20%** of the complete cost of delivering the OBC.

The Council will also meet the ongoing costs of operation, maintenance and renewal.

The scheme will be developed and delivered over the period 2017/18 to 2022/23 and is expected to open in January 2023.

The risk adjusted base costs and spend profile set out in the financial case are also used to calculate the present value of costs (PVC) in the economic analysis, which is set out in the Economic Case.

5 The Commercial Case

5.1 Introduction

The Commercial Case provides evidence of the commercial viability of the proposed scheme, and describes the procurement strategy that will be used to engage the market and deliver the scheme. It provides evidence on the approach to risk allocation and transfer, contract and implementation timescales, and the approach to managing of the contract.

Following scheme approval, the Council's main aim will be to ensure that the Great Yarmouth Third River Crossing is delivered to time and on budget, with a robust contracting and procurement strategy in place.

5.2 Output based specification

The Commercial Case is based on strategic outcomes and outputs, against which alternative procurement and contractual options are assessed.

The outcomes which the preferred procurement strategy and contract must deliver are to:

- Achieve cost certainty, or certainty that the scheme can be delivered within the available funding constraints;
- Minimise further preparation costs with respect to scheme design by ensuring best value, and appropriate quality;
- Obtain contractor experience and input to the construction programme to ensure the implementation programme is robust and achievable; and
- Obtain contractor input to risk management and appraisals, including mitigation measures, to capitalise at an early stage on opportunities to reduce construction risk and improve out-turn certainty thereby reducing risks to a level that is 'As Low as Reasonably Practicable'

5.3 Procurement strategy

The proposed Third River Crossing is a relatively straightforward highway scheme, together with a Bascule bridge. A high proportion of the cost and risk is associated with provision of the bridge. An appropriate procurement strategy is one which manages these risks and reduce cost uncertainty.

The Official Journal of the European Union (OJEU) is the publication in which all public sector tenders valued above £4,104,394 (for infrastructure projects) must be

advertised[45]. There are four main procurement procedures available for schemes to which the OJEU values apply, as illustrated and described below:

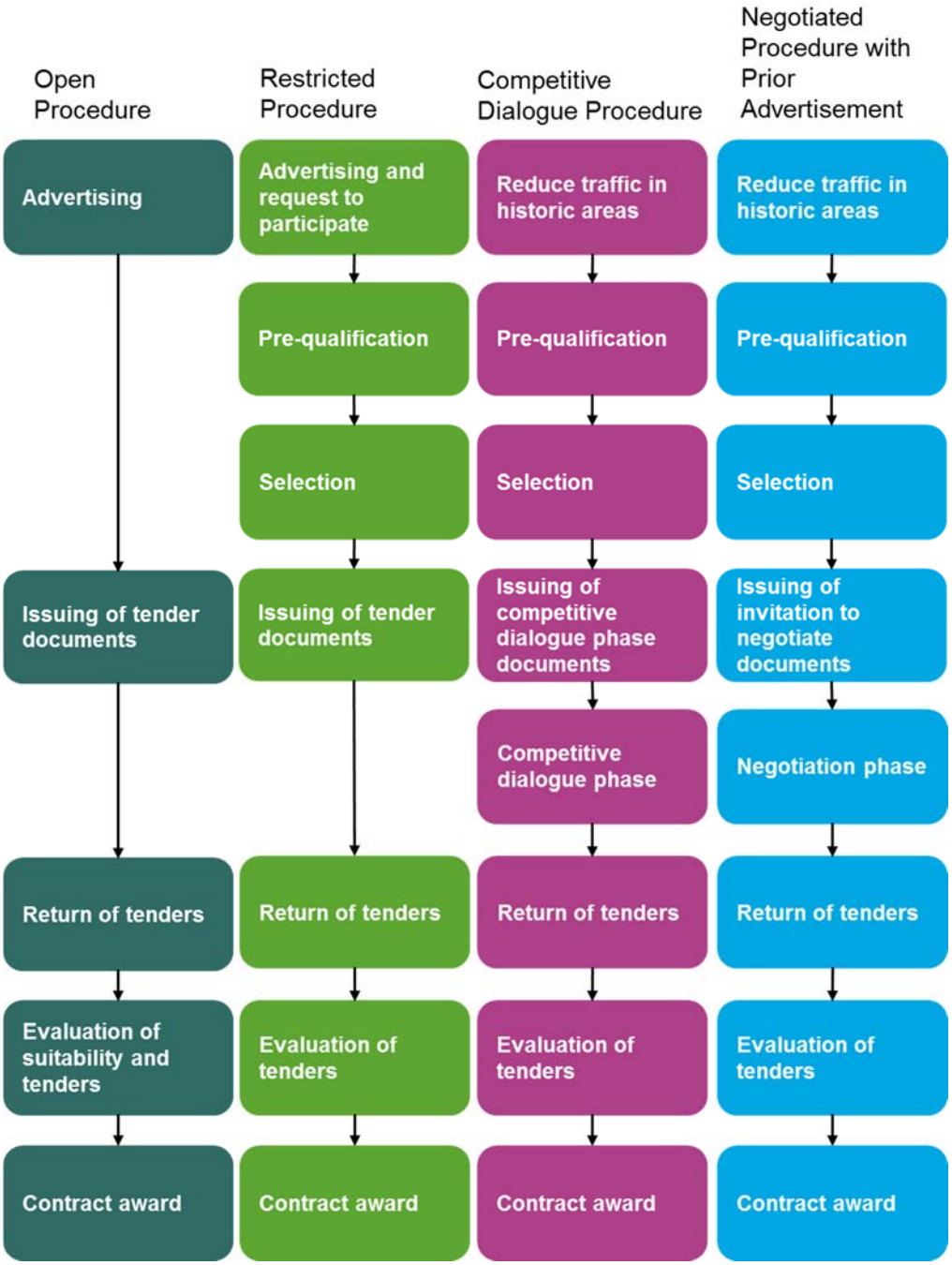


Figure 5-1 Procurement options

[45] OJEU thresholds are reviewed annually. Level quoted applies to end 2017.

5.3.1 Open Procedure

This procedure allows an unlimited number of interested parties to tender against defined parameters. There are no restrictions (e.g. pre-qualification) on the parties who are permitted to tender, meaning that some parties may not be suitable to carry out the work. This procedure is straightforward and transparent but can attract a large number of potential bidders (which will require a greater degree of assessment and resource requirements).

- This route is not usually recommended for construction projects due to the high number of tenders that could be expected and the particular skills and experience that may be required of potential bidders.

5.3.2 Restricted Procedure

This is a two-stage procedure. The first stage allows the contracting authority to set the minimum criteria relating to technical, economic and financial capabilities that the potential bidders have to satisfy. Following evaluation of the responses to the first stage a minimum of five bidders (unless fewer qualify) are invited to tender in the second stage.

- This process is typically used to appoint consultants or contractors on traditionally procured projects, and would therefore be suitable for the Third River Crossing scheme.

5.3.3 Accelerated Restricted Procedure

This procedure is only intended for use where, for reasons of urgency, the contracting authority must procure the contract in a reduced time frame. Any contracting authority wishing to use this procedure must be able to demonstrate the reasons of urgency that necessitate its use. It is identical to the Restricted Procedure except that the timescales for each stage are reduced.

- The time frame for the Third River Crossing can be accommodated with the Restricted Procedure

5.3.4 Competitive Dialogue

This procedure is appropriate for complex contracts where contracting authorities:

- are not objectively able to define the technical means capable of satisfying their needs or objectives; and/or
- are not objectively able to specify the legal and/or financial make-up of a project.

This is a multi-stage procedure. The first stage is a pre-qualification to select the potential bidders to participate in the dialogue. In the second stage the contracting authority enters into a dialogue with the potential bidders to identify and define the means best suited to satisfying their needs.

Any aspect of the contract may be discussed, including technical requirements for the works to be delivered and the commercial/contractual arrangements to be used. The dialogue may be conducted in successive phases with the remaining bidders being invited to tender. By the end of the dialogue phase the contracting authority's requirements will have been determined such that the scheme can be tendered. In the final stage, the remaining bidders from the dialogue phase are invited to tender for the scheme.

- Competitive dialogue is not considered appropriate for the Third Crossing scheme and would not fit with the anticipated time frame.

5.3.5 Competitive Procedure with Negotiation

This relatively new procedure is intended to be used where minimum requirements are able to be specified but negotiations with bidders may be needed to improve the initial tenders. The grounds for using this procedure are as follows:

- Where needs cannot be met without adaptation of readily available solutions;
- Where the contract includes design or innovative solutions;
- Where the requirement is complex in nature, in its legal and financial make-up or because of its risks;
- Where the technical specifications cannot be established with sufficient precision;
- In the case of unacceptable/irregular tenders.

Within this procedure, bidders initially submit tenders based on the information issued by the contracting authority. The contracting authority is then able to review the tenders it has received and negotiate with the bidders, following which the tenders will be resubmitted. This procedure may therefore be useful where the requirements are well developed initially and full tender documents can be produced but it is felt that there may be advantage in retaining the ability to hold negotiations if there are certain aspects which bidders raise.

- The Competitive Procedure with Negotiation is considered unlikely to fit with the time frame for the Third Crossing scheme.

5.4 Preferred procurement strategy

Having considered the above options, it is likely that the scheme will use an OJEU 'restricted procedure' procurement tendering process. This is appropriate for a large scale infrastructure project as it provides for the "pre-qualification" of suppliers based on their financial standing and technical or professional capability, so as to narrow the number permitted to submit bids.

The restricted procedure has defined timescales for each stage which will allow the Council to ensure that the tenders can be received by the dates required by the overall project programme.

There is a well-developed market for the proposed procurement approach, and it is anticipated that there will be a high demand and strong competition amongst engineering contractors to secure the contract for the construction of this scheme.

The selected procedure will be confirmed in the Full Business Case.

5.5 Type of contract

The proposed scheme is a relatively straightforward highway scheme with a high proportion of the cost and risk associated with the provision of the bascule bridge. An appropriate type of contract is one which manages these risks and reduce cost uncertainty.

A number of options were considered:

- Private-public partnership
- Traditional contract
- Partnering contract
- Design and build contract

The advantages and disadvantages of each, and the likely contract form, are summarised below:

5.5.1 Private-public partnership: Design, build, finance and operate (DBFO) or Public Finance Initiative (PFI)

It is envisaged that funding will be secured from the DfT Local Majors fund with a local funding contribution. There would be no particular benefit for this project in the DBFO or PFI types of contract, and they have not been considered further.

5.5.2 Traditional contract

Advantages

- Principles developed over many years and widely understood
- Client develops the specification
- Risk managed by the Client
- Client retains control and flexibility to change specification
- Award of contract on lowest price basis demonstrates Value for Money

Disadvantages

- Client retains risk of delivery on time and to budget
- No incentive for contractor to innovate
- No link between design and construction
- Nature of all risks are not fully realised at the point of award resulting in the potential for an increase in outturn cost and delays with completion.

5.5.3 Partnering contract with early contractor involvement (ECI)

Advantages

- Collaboration between parties
- Risks are better defined than more traditional
- Opportunities to link design and construction

Disadvantages

- Many of the disadvantages of traditional procurement can remain
- Difficult to get the right people involved at an early stage in the development of the project

5.5.4 Design and build contract

Advantages

- Integration of design and construction leads to efficiencies in cost and time
- Single point of responsibility for the Client
- Risks clearly identified and allocated during the procurement phase
- Stimulates innovation, reducing cost
- Allows the contractor to review the buildability of the design

Disadvantages

- Reduced competition with fewer companies interested
- Contractor takes on greater risk and prices accordingly
- Lack of flexibility to change the specification
- Quality may be overridden by cost efficiency

5.6 Preferred contract type

Although the highways elements of the project are relatively straightforward, the lifting bridge Mechanical and Electrical (M&E) elements are complex. A traditional contract would not provide an active link between design and construction. Risks would not be fully known at the point of award, resulting in the potential for increased out-turn costs and delays.

A partnering contract with early contractor involvement (ECI) would provide a link between design and construction, though it may not result in full integration of design and construction disciplines. It would however provide a better definition of risks than a conventional contract. It would add value by enabling some input into construction methodology or impacts at the anticipated Examination process. However the procurement process would take longer than with a design and build contract if substantial contractor involvement, such as detailed design work, was required prior to DCO submission, and this would lengthen the overall timescale for delivery.

With a Design and Build contract the Contractor would take on the responsibility and risk related to the detailed design and construction of complex elements. This reduces risk to the client, whilst the integration of detailed design with construction could bring about efficiencies. Ensuring affordability and reducing the risk of cost increases are key considerations, because the funding from DfT is likely to be capped at a level which cannot be increased.

For these reasons, it is concluded that a Two Stage Design and Build form of contract would be the most appropriate for this project. Stage 1 would be procured using the NEC 3 Professional Services Contract and Stage 2 would be procured using the NEC 3 Engineering and Construction contract.

This will involve the Contractor at an early stage to develop the design, and help ensure that a buildable and affordable scheme is available. Inherent to the design-and-build approach is that the appointment of the Contractor occurs before detail design has been carried out. The contract will be evaluated on a price / quality split, with specific questions for the quality mark. To ensure that the Council receives value for money, a Priced Model will be developed and incorporated into the Commercial Schedules to be completed by bidders.

5.7 Proposed form of contract

5.7.1 Stage 1

The Council will use the NEC3 Professional Services Contract (PSC) form of contract for stage 1 which is the standard form of contract for construction works in the UK.

The NEC3 PSC consists of a set of Core Clauses to which may be added one of the following Options

- Option A: Priced with activity schedule;
- Option C: Target cost with activity schedule;
- Option E: Time based contract; and
- Option G: Term contract.

The proposed form of contract is NEC3 PSC, using one of the following options:

- Option A (Priced with activity schedule)
- Option E(Time based contract)

5.7.2 Stage 2

The Council will use the NEC3 Engineering and Construction (ECC) form of contract which is the standard form of contract used for construction works in the UK. The NEC3 ECC consists of a set of Core Clauses to which may be added one of the following Options:

- Option A: Priced with activity schedule;

- Option B: Priced with bill of quantities;
- Option C: Target cost with activity schedule;
- Option D: Target cost with bill of quantities;
- Option E: Cost reimbursable; and
- Option F: Management contract.

The proposed form of contract is NEC3 ECC, using one of the following options:

- NEC3 Option A (Priced with activity schedule)
- NEC3 Option C (Target cost with activity schedule)

5.8 Sourcing options

As described above, the scheme will be sourced through advertisement in the Official Journal of the European Union (OJEU) due to its value. This will allow companies from across the EU to bid for the work.

5.9 Payment mechanisms

It is anticipated that payment will be made to the contractor by monthly valuation with a BACS payment within 30 days after the due date for payment.

5.10 Pricing framework and charging mechanisms

Contractors would be invited to bid on a pricing model, based on the illustrative design material available.

The purpose of the pricing model is to provide:

i) A basis for comparison of tenders.

ii) A basis for building up the Stage 2 Prices, tied to the Contractor's tendered rates

The model would include all the major quantities, allowing the client to compare the bids against each other. Greater detail would be requested on those elements of work where it is envisaged that significant design changes may occur.

Because of the early stage of the design it will not be possible to make the commercial schedules fully inclusive. Many elements will excluded on the basis that inclusion would require bidders to make assumptions which might lead to disparity between each bidders' submissions.

Most of the design will be carried out by the Contractor. The Contractor's solutions may differ from the concept designs in many instances. Because of the anticipated progress of the design, the pricing model is likely to incorporate approximately half of the items that will constitute the overall Main Works Budget.

The contract documents will inform contractors that the pricing model will form the basis for the build-up of the target price (if option C is used) or the cost for each item

on the Activity Schedule (if option A is used). This would be agreed with the employer during the first few months of the contract.

The contractor would then work with the design delivery team to develop the Target or Lump Sum Price over a number of months as the design is finalised (Stage 1).

The contractor and the design delivery team would hold regular risk and opportunities workshops (possibly on a monthly basis) to develop and manage the avoidance of risk, develop mitigation strategies and review the risk pot. The contractor would use this information, and the ongoing detail design to produce a monthly indicative Target Price / Lump Sum Price which would be reviewed by the delivery team.

Once the client is satisfied with the Target Price / Lump Sum Price the contractor would be given the go-ahead to start construction (Stage 2). If the client is not satisfied with the Target Price / Lump Sum Price the client has the option of cancelling the contract and going out to tender on the full design

The Contract could also include a number of conditions:-

- ECI input could be costed and agreed in advance;
- Savings on the risk pot could be shared between the client and the contractor

If Option C (Target Price) is used:

- The contract could include a pain / gain mechanism;
- The contract could include a target cap, say 115% of the target

5.11 Risk allocation and transfer

The procurement concept has been developed on the basis that risk is allocated to the party best placed to manage or mitigate that risk, or to manage the consequences if a risk event occurs.

The contractor will be asked to produce a priced risk register and decisions will be made on the risk share mechanism between the contractor and the County Council to ensure that the proposed allocation provides value for money to the council.

The design risk will be retained by the County Council in principle. The only design risk the contractor will carry is that of his own specialist suppliers or other minor elements of design carried out in support of main client design teams.

The delivery and programme risk will substantially rest with the contractor. However the following are examples of some of the risks that the County Council will need to take a view on as part of the review of the priced risk register during the process of target setting:

- Unforeseen ground conditions
- Exceptional Weather
- Flooding
- Cost Inflation
- Vandalism/ Theft

- Protestors (delay)
- Environmental (delay)
- Archaeology
- Surveys (adequacy/ suitability)

5.12 Contract length

Key stages in the procurement process are set out in Table 5-1 below:

Event	Duration	Earliest Date
PIN Notice	-	3/4/17
Industry Day	10 weeks	12/6/17
Develop PQQ	6 weeks	24/7/17
NCC Procurement/legal process	4 weeks	21/8/17
List through OJEU	1 week	28/8/17
PQQ Return Period	12 weeks	20/11/17
PQQ Evaluation (Mouchel)	4 weeks	18/12/17
NCC Moderation	1 week	8/1/18
NCC Approval process	2 weeks	22/1/18
Tender documents prepared for issue (assumes ongoing work on tender docs through PQQ stage)	4 weeks	19/2/18
Contractor Return period	16 weeks	11/6/18
Assessment of tenders	4 weeks	9/7/18
Moderation Period	2 weeks	23/7/18
NCC review/comment/legal processes to appoint	4 weeks	20/8/18
Stand Still period	2 weeks	3/9/18
Contractor appointed	-	3/9/18

Table 5-1 Procurement process - key stages and timetable

The timetable for implementation of the scheme is summarised in the Management Case and in Appendix M (Project Plan).

More detail on contract timetable will be provided in the Full Business Case.

5.13 Human resource issues

No significant human resources issues have been identified that could affect the deliverability of the scheme. No TUPE issues are expected. The Council will provide personnel to perform the role of Project Manager and create a small site supervision team.

More information on the governance and management of the project, including details of the people involved, is set out in the Management Case.

5.14 Contract management

The form of contract selected provides the Council with a suitable contract at construction to minimise risk, but with increased ability to bring forward the detailed design process in the programme.

More detail on contract management will be provided in the Full Business Case.

5.15 Commercial viability

The information above provides evidence that the scheme is commercially viable, with a robust contracting and procurement strategy. The Council has confidence that the contractual and commercial arrangements are appropriate and workable. Specifically:

- The OJEU “restricted procedure” procurement strategy has been successfully used by the Council on a number of large-scale transport infrastructure schemes. The proposed approach is in full accordance with the Council’s procurement systems and processes.
- The procurement route includes risk management as a core principle, using strategies of risk allocation and transfer to the contractor. It includes the use of disincentives, such as penalties for programme overruns or missing key milestones, in order to achieve delivery on time and to the required quality.
- There is a well-developed market for the proposed procurement approach, and it is anticipated, on the basis of the previous procurement of large scale infrastructure works in Norfolk, that there will be high demand and competition amongst contractors for the design and construction of this scheme.

5.16 Summary of the Commercial Case

It is likely that the scheme will use an **OJEU ‘restricted procedure’** procurement tendering process. This is appropriate for a large scale infrastructure project as it provides for the "pre-qualification" of suppliers based on their financial standing and technical or professional capability. It has defined timescales for each stage which will allow the Council to ensure that the tenders can be received by the dates required by the overall project programme.

A **Two Stage Design and Build** form of contract is considered to be the most appropriate for this project. It will involve the Contractor at an early stage to develop the design, and help ensure that a buildable and affordable scheme is available.

The proposed form of contract for Stage 1 is **NEC3 PSC**, using one of the following options:

- NEC3 Option A (Priced with activity schedule)
- NEC3 Option E (Time-based contract)

The proposed form of contract for Stage 2 is **NEC3 ECC**, using one of the following options:

- NEC3 Option A (Priced with activity schedule)
- NEC3 Option C (Target cost with activity schedule)

The Commercial Case demonstrates that the scheme is commercially viable, with a robust contracting and procurement strategy.

6 The Management Case

6.1 Introduction

The Management Case demonstrates that the Great Yarmouth Third River Crossing scheme is capable of being delivered successfully in line with recognised best practice. It describes the processes that are being put in place to ensure that the project is effectively delivered, and properly evaluated.

Specifically this chapter sets out:

- examples of other large scale projects that have been successfully delivered by Norfolk County Council
- 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

Norfolk County Council 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
- Stow Bridge Reconstruction
- Guist Bridge
- Marine Parade Great Yarmouth Phases 1, 2 & 3
- 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

- Kings Lynn South Lynn Transport Major
- Kings Lyn Major Developments (including new development link road)
- Kings Lynn Transport Interchange
- A47/A1042 Postwick Hub Junction
- A12/A143 Link Road
- Norwich Northern Distributor Road (NNDR)

Table 6-1 sets out the scope of the works, costs, timescale and procurement strategy followed for the three most recent schemes.

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. The proposed form of contract for the Great Yarmouth Third River Crossing scheme would be a two stage NEC3 Engineering and Construction Contract, as described in the Commercial Case.

A Delivery Team and Contract Administration team has been used successfully on major infrastructure schemes and this approach will again be followed for the Great Yarmouth Third River Crossing.

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 NNDR NSIP process to assist with the development of the NSIP 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/ECI 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/ECI stage.

Scheme name	Description	Contract	Form of contract	Approximate total project value	Construction date
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 exiting Park and Ride site.	NEC3 Engineering and Construction Contract	Option C, with a Target Price developed from first principles and an incentivised approach which aims 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	Norfolk County Council Term Service Contract - NEC3 Engineering and Construction Contract	Option C, with a Target Price developed from first principles and an incentivised approach which aims 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 aims to deliver the construction works below the target figure.	£151m	Under construction at present

Table 6-1 Examples of similar projects delivered by NCC

- 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.

6.2.1 Consultant experience

Norfolk County Council is being advised by Mouchel Ltd, the Council's term consultant, and a major provider of highway consultancy services to local authorities.

Mouchel 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, and the Lowestoft Third Crossing for Suffolk County Council. Mouchel 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. Recent key projects include High Speed 2, Tideway, Crossrail and Thameslink.

6.2.2 Contractor experience

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.

6.3 Programme and project dependencies

The Great Yarmouth Third River Crossing 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.

The County Council is aware that Highways England is consulting on possible improvements to junctions on the A47 Trunk Road (formerly the A47/A12 junction enhancements scheme) as part of the government's Road Investment Strategy for 2015-2020 (RIS 1). Two locations in Great Yarmouth (Illustrated in Figure 6-1) are being considered:

A47 Vauxhall Roundabout and station approach.

- Enlarged roundabout
- Widening and realignment of approaches
- Possible improvements for non-motorised users
- Minor improvements to existing layout and signals, and reinstated right turn at Station Approach

A47 Gapton Roundabout

- Signalisation of roundabout
- Possible improvements for non-motorised users

Figure 6-1 Planned RIS - 2 junction improvements

Subject to the consultation and further work to determine whether there is a compelling case for improvement, HE could announce a preferred route for these improvements in late 2017 and start the pre-application stage of the development consent process, leading to a start of construction in 2020.

Although there is no inter-dependence between these RIS 1 schemes and the proposed Third River Crossing, the County Council will liaise very closely with HE as their respective projects are developed and taken forward.

A47 Harfrey's roundabout

Highways England had also been considering improvements to Harfrey's, Bridge Road and James Paget junctions on the A47, but their assessments have not identified improvements at these locations that would offer good value for money.

HE have therefore removed these junctions from the current consultations but is keeping them under review[46].

Traffic using the Third River Crossing will join the A47 at Harfrey's Roundabout - the proposed western approach road to the new bridge will start from a new roundabout east of Harfrey's.

Operational assessments undertaken for the Third Crossing scheme show that it is not dependent upon any improvement at Harfrey's Roundabout. However the potential for such an improvement to generate additional benefits has been examined as an alternative scenario test, as described in the Economic Case.

The County Council will liaise very closely with the HE as the Third Crossing Scheme is taken forward and will actively co-operate with any further appraisal or design work that HE may decide to undertake in relation to Harfrey's.

No other project dependencies have been identified.

6.4 Project governance, organisation structure and roles

To ensure successful delivery of the scheme, Norfolk County Council has established and will continue to resource the following bodies:

- Project Board
- Project Delivery Team
- Stakeholder Group

The organisational and governance structure is illustrated in Figure 6-2 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 Norfolk County Council, and 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.

6.4.1 Project Sponsor

The Project Sponsor is Norfolk County Council, represented by Tracy Jessop, the Council's Assistant Director of Community and Environmental Services.

[46] Improving the A47 – Great Yarmouth junction improvements: Public consultation. (Highways England, March 2017)

6.4.2 *Senior Responsible Officer*

The Senior Responsible Officer will be **David Allfrey** who is currently Major Projects Manager, Highways and Transport, Communities and Environmental Services at Norfolk County Council.

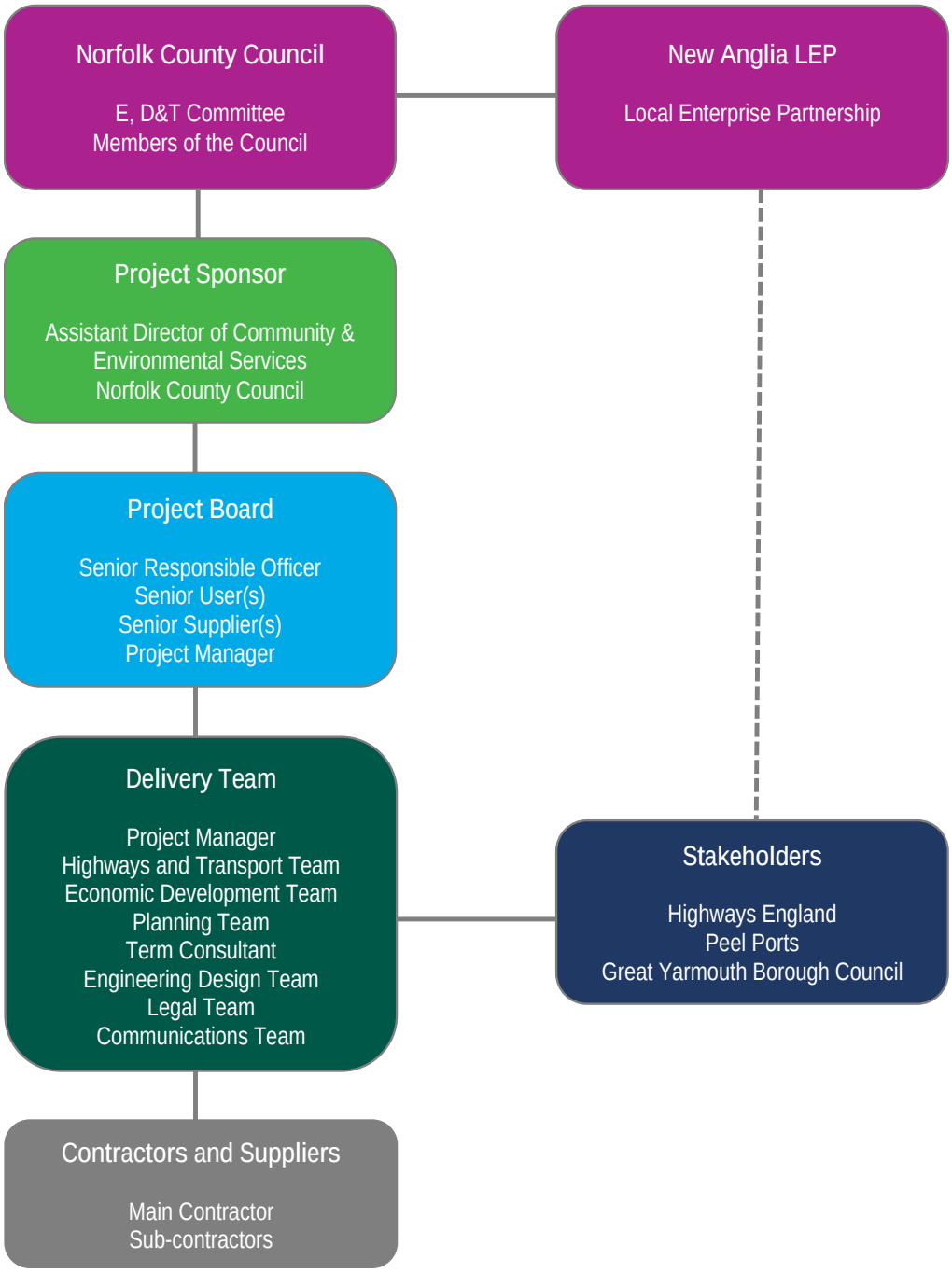


Figure 6-2 Governance diagram

David Allfrey is the Major Projects Manager in the Highways and Transport Group of the Community and Environmental Services Department of Norfolk County Council. David Allfrey 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 Norfolk County Council 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

6.4.3 Project Board

Norfolk County Council 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.

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.

The Project Board will consist of people in the following roles:

Role	Responsibilities	Name	Position
Project Sponsor	Chair of Project Board.	Tracy Jessop	Assistant Director of Community and Environmental Services (NCC)
Project Owner and Senior Responsible Owner (SRO) 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.	David Allfrey	Major Projects Manager, Highways and Transport (NCC)
Senior User	Represents the interests of all those who will use the scheme. Monitors and manages user-related risks.	David Glason	Group Manager for Growth (GYBC)
Senior Supplier	Represents those who are designing, developing, facilitating, procuring and implementing the scheme. Verifies the quality of products delivered by suppliers, resolves supplier conflicts, and monitors and manages supplier-related risks.	David Wildman	Client Liaison Manager (Mouchel)

Project Director/Executive	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	Vince Muspratt and Tig Armstrong	Assistant Director Economic Development and Strategy and Infrastructure and Economic Growth Manager (NCC)
Project Assurance	Considering the end product of each work package against the plan and specification, and confirming that it is fit for purpose.	Ian Parkes	Principal Infrastructure and Economic Growth Planner (NCC)
Project Manager	Managing the project to ensure that it delivers the required products within the agreed constraints. Co-ordinating the work of the delivery team. Role split between Mouchel and NCC	Mark Kemp (NCC) & Joanna Lyon (Mouchel)	Project Team Manager, Highways and Transport (NCC) & Senior Project Manager (Mouchel)

Table 6-2 Project Board membership and roles

6.4.4 Delivery Team

Norfolk County Council 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 co-ordination of activities and is a forum for discussing issues/problems as they arise.

The main responsibilities of the delivery team are to:

- co-ordinate 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.

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.

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

The Delivery Team will comprise the following:

Person / team represented	Role / remit	Name
Senior Responsible Officer/ Project Owner (NCC)	Chair of Delivery Team Provides reports to Project Board	David Allfrey *(Major Projects Manager)*
Project Manager (NCC)		Mark Kemp *(Project Team Manager)*
Highways and Transport Team (NCC)		Matt Tracey *(Network Manager)* Gavin Broad *(Project Engineer)*
Economic Development Team (NCC)		Ian Parkes David Cumming
Planning Team (NCC)		To be confirmed
Finance Team (NCC)	Financial monitoring and reporting	Andrew Skiggs *(Finance Business Partner)*
Legal team (NCC)	Specialist legal advice	NPLaw
Communications team (NCC)	Develop communications plan Public consultation. Stakeholder management. Press liaison.	Claire Sullivan
Inquiry Team	Co-ordinate inputs to DCO	To be confirmed
Project Manager: Term consultant (Mouchel)	Develop Full Business Case. Co-ordinate design and delivery. Monitoring and evaluation.	Joanna Lyon

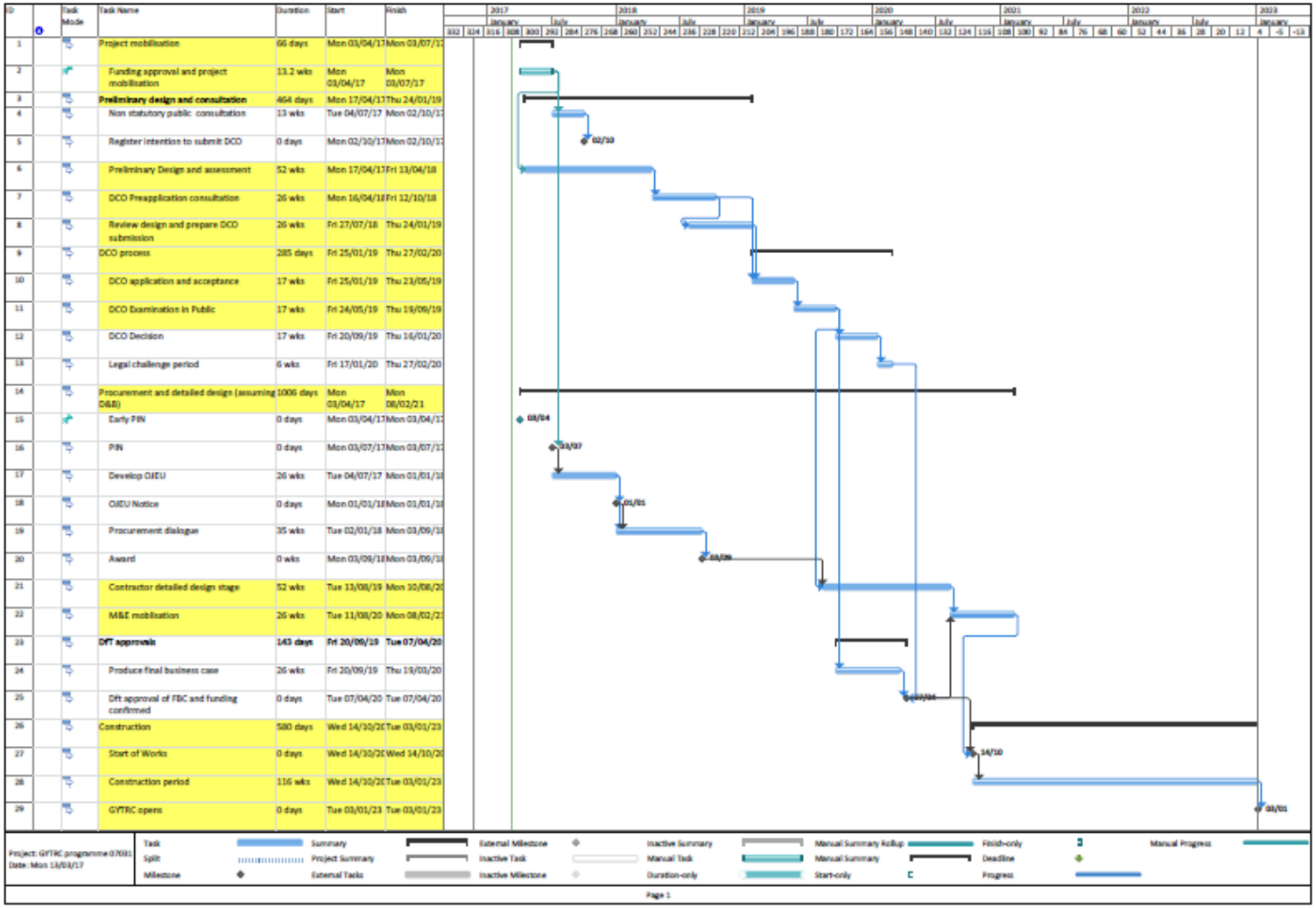
Specialist teams (Mouchel)	Highways engineering. Traffic engineering. Transport Planning. Drainage engineering. Lighting engineering. Structural engineering. Maritime engineering. Environmental specialists. Quantity Surveyors. CDM Consultation and stakeholder management specialists.	-
Administrative support (NCC)	Support to project manager and delivery team.	To be confirmed

Table 6-3 Delivery Team members and roles

Consider adding organisation diagram of delivery team

6.5 Programme and project plan

The project programme is set out in Table 6-4 and in Appendix M.



	Task Mode	Task Name	Duration	Start	Finish
1		Project mobilisation	66 days	Mon 03/04/17	Mon 03/07/17
2		Funding approval and project mobilisation	13.2 wks	Mon 03/04/17	Mon 03/07/17
3		**Preliminary design and consultation**	464 days	Mon 17/04/17	Thu 24/01/19
4		Non statutory public consultation	13 wks	Tue 04/07/17	Mon 02/10/17
5		Register intention to submit DCO	0 days	Mon 02/10/17	Mon 02/10/17
6		Preliminary Design and assessment	52 wks	Mon 17/04/17	Fri 13/04/18
7		DCO Preapplication consultation	26 wks	Mon 16/04/18	Fri 12/10/18
8		Review design and prepare DCO submission	26 wks	Fri 27/07/18	Thu 24/01/19
9		DCO process	285 days	Fri 25/01/19	Thu 27/02/20
10		DCO application and acceptance	17 wks	Fri 25/01/19	Thu 23/05/19
11		DCO Examination in Public	17 wks	Fri 24/05/19	Thu 19/09/19
12		DCO Decision	17 wks	Fri 20/09/19	Thu 16/01/20
13		Legal challenge period	6 wks	Fri 17/01/20	Thu 27/02/20
14		Procurement and detailed design (assuming D&B)	1006 days	Mon 03/04/17	Mon 08/02/21
15		Early PIN	0 days	Mon 03/04/17	Mon 03/04/17
16		PIN	0 days	Mon 03/07/17	Mon 03/07/17
17		Develop OJEU	26 wks	Tue 04/07/17	Mon 01/01/18
18		OJEU Notice	0 days	Mon 01/01/18	Mon 01/01/18
19		Procurement dialogue	35 wks	Tue 02/01/18	Mon 03/09/18
20		Award	0 wks	Mon 03/09/18	Mon 03/09/18
21		Contractor detailed design stage	52 wks	Tue 13/08/19	Mon 10/08/20
22		M&E mobilisation	26 wks	Tue 11/08/20	Mon 08/02/21
23		**DfT approvals**	**143 days**	**Fri 20/09/19**	**Tue 07/04/20**
24		Produce final business case	26 wks	Fri 20/09/19	Thu 19/03/20
25		Dft approval of FBC and funding confirmed	0 days	Tue 07/04/20	Tue 07/04/20
26		Construction	580 days	Wed 14/10/20	Tue 03/01/23
27		Start of Works	0 days	Wed 14/10/20	Wed 14/10/20
28		Construction period	116 wks	Wed 14/10/20	Tue 03/01/23
29		GYTRC opens	0 days	Tue 03/01/23	Tue 03/01/23

Table 6-4 Project programme

6.6 Assurance and approvals plan

6.6.1 Approvals

Responsibility for the assurance and approval of the Outline and Full Business Cases rests with the DfT, who will assess the technical content of the business cases against appropriate business case and transport appraisal guidance in order to confirm that the scheme represents value for money to the taxpayer. The DfT will then advise Transport Ministers to approve (or decline) the Business Case and scheme.

The DfT typically follow a three-staged gateway process of funding approval:

- **Programme Entry**. The Government's acceptance of the County Councils application for scheme development costs from the DfT's Local Majors Fund, enabling the Council to prepare an Outline Business Case acted as the programme entry agreement.

- **Conditional Approval** will occur following the DfT's acceptance / approval of the Outline Business Case (including its assessment of value for money). It is the gateway to proceed to the development of the Full Business Case but does not guarantee full funding or commitment to the scheme. It does provide the mandate for Norfolk County Council to begin the process of obtaining the requisite statutory powers to construct the scheme (including the NSIP / DCO / planning consents / compulsory purchase etc.).

- **Full Approval** occurs after the selection of a preferred contractor following the procurement process, which will achieve a fixed scheme cost and increased scheme cost certainty. The Full Business Case will be submitted at this point and if approved, Norfolk County Council will be able to start drawing down funding and begin construction.

The local funding contribution is discussed within the Financial Case. However, to confirm, Norfolk County Council's Section 151 Officer has underwritten the local contribution and will approve the release of local funding, when satisfied and appropriate to do so.

6.6.2 Assurance – Gateway reviews

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 and is owned and administered by the Office of Government and Commerce (OGC).

Gateway reviews will be undertaken in line with the principles set out in the Project Control Handbook[47]

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.

A Gateway review provides assurance and support to the senior responsible owner 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.

Gateway reviews are a mandated assurance process for all publicly funded major projects, although not all reviews will apply to all projects. The SROs and project manager will engage early with the Centre of Excellence to agree which gateways are required and when.

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

Gateway		Major project phase/stage
1	**Business justification**	Entry to the options phase (undertaken on behalf of DfT) (option identification stage)
2	**Delivery strategy**	Entry to the development phase (preliminary design stage)
3a	**Investment decision**	Entry to the statutory procedures and powers stage
3b	**Investment decision**	End of the construction preparation stage
4	**Readiness for service**	Prior to open for traffic or consent to operate
5a	**Operational review and benefits realisation**	Following handover into operations and before the end of the defects period
5b	**Operational review and benefits realisation**	A further operational benefits review may need to be undertaken. The timing is at the discretion of the SRO

Table 6-5 Gateway review stages

The next stage for the Great Yarmouth Third Crossing scheme is Stage 3a.

[47] Highways Agency, April 2013

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 Full Business Case.

6.7 Communications and Stakeholder Management

The Council has engaged with local stakeholders as part of the preparation of the Outline Business Case, and the results are set out in the Stakeholder Engagement Report (Supporting document 13).

6.7.1 Communication and Engagement Strategy

Norfolk County Council, in liaison with Great Yarmouth Borough Council as a key stakeholder, will develop a robust Communication and Engagement Strategy for the scheme.

This will make it clear how and when information will be placed in the public domain, and how the Council will communicate with stakeholders throughout the development and delivery of the scheme. It will include well established protocols to ensure that enquiries from the press, members of the public, elected councillors, stakeholders and other interested parties are dealt with in the right way. It is essential that the information provided is accurate, timely and informative.

As the design for the Third River Crossing is developed in more detail, it will be shared with stakeholders, together with information about the wider infrastructure improvements and investment being planned for Great Yarmouth.

6.7.2 Stakeholder Management Plan

Stakeholders have a crucial role in the successful delivery of the scheme. Engagement and consultation gives all stakeholder groups a voice that is heard, and allows concerns to be addressed at an early stage to ensure a successful outcome.

The stakeholder engagement process will provide further evidence of the strong local and political support for a Third River Crossing.

NCC will build upon the extensive stakeholder engagement undertaken for the Outline Business Case, and on the relationships developed with businesses, port users, residents and all other interested parties. Stakeholders will continue to be involved throughout the development of the Full Business Case, and the delivery phase. A Stakeholder Management Plan will be developed as part of the wider Communication and Engagement strategy for the scheme.

6.7.3 Key stakeholder groups

All stakeholders are important to the scheme's success, and communications with each group of stakeholders will be tailored to their specific needs and interests. The Project Owner, with support from the NCC Communications Team and the Council's consultants, will make use of a wide range of communications tools, including a project website, mailings, face-to-face meetings, social media and workshops to engage with stakeholders.

The key stakeholder groups with very specific interests in the delivery and successful outcome of the scheme are identified in Table 6-6, together with the approach to be taken with each group.

Key group	Approach to stakeholder communication and engagement
Political	• Continue to set out a clear case with key information sharing with District and County politicians as to why the Third River Crossing is essential to the growth of the area and how we can accelerate financial investment. • Reassurance to political members that processes are inclusive. Continued high level engagement with local MPs to update on the Full Business Case and scheme delivery.
Businesses	• Reassurance that the Third River Crossing is sensitive to the needs of local businesses, with economic growth not only bringing new business to the area but working for the benefit of those already there. • Regular information to key businesses on the progress of the scheme • Close liaison with the businesses directly and indirectly affected by the bridge • Specially targeted consultation events and one to one meetings with key businesses
Residents	• Reassurance that NCC are working on the Third River Crossing to ensure growth works in the best interests of local people. • A number of high profile engagement and stakeholder events throughout the development of the Full Business Case engaging residents on the progress, design and delivery.
Peel Ports and port users	• Ongoing one to one meetings with Peel Ports and port users on the scheme and its delivery • Engagement with land owners directly affected by the bridge in the form of one to one meetings • Engagement with land owners indirectly affected by the bridge
Great Yarmouth Borough Council	• Ongoing one to one meetings with Great Yarmouth Borough Council Chief Executive and Economic Growth Team (also represented on the Project Board) • A number of high profile engagement and stakeholder events delivered in partnership • Liaison with GYBC throughout all stages of business case development and scheme delivery
Highways England	• Ongoing one to one meetings with Highways England on the Full Business Case and the wider infrastructure impacts, in particular Harfrey's Roundabout.

Table 6-6 Engagement with key stakeholder groups

The Council will continue to build on the relationships established with these audiences, through regular liaison, information sharing, technical workshops, face to

face meetings and presentations. A detailed timetable of events will be set out in the Stakeholder Management Plan and shared with stakeholders. The Council will also take advantage of other opportunities that may arise to ensure that audiences are fully engaged in the scheme. The NCC website and social media sites will be key portals for dissemination of information to stakeholders.

6.7.4 Stakeholder interests

A list of stakeholders and their most likely specific interests is set out in Table 6-7.

Stakeholders	Summary of interests
Department for Transport	Interest in the detailed engineering layout, development of the full business case and submission, funding and planning.
Directly affected landowners	Interest in detailed engineering aspects of the Third River Crossing and how this will impact upon them.
Great Yarmouth Borough Council	Formal planning processes, stakeholder engagement, political engagement, design and
Emergency services	Mainly how the scheme will impact on their services (improvement in response times)
English Heritage	Interest in issues relating to pollution control, protection of natural environments in and around the site of the TRC and the enhancement of areas in the masterplan where traffic will be removed due to the TRC.
Environment Agency	Works in, over, under or adjacent to river, port, environmental legislation relevant to construction, air quality and noise issues
Public and residents	Interested in issues surrounding all aspects of the scheme, such as noise pollution, traffic implications, and traffic management, construction issues, planning issues and procedures and environmental issues, environmental enhancement and design.
Highway England	Access to the strategic road network and the improvements to the surrounding junctions; Gapton Roundabout, Vauxhall Roundabout and Harfrey's Roundabout.
Indirectly affected landowners	Interest in engineering aspects of the TRC and the impact on businesses not directly affected.
Local Access Forum (PROW interest groups)	Focus on issues surrounding Public Rights of Way including reducing severance and enhancing the network for public right of way users.
Magistrates Court	Power to authorise stopping up or diversion of highway
Media Groups	All issues relating to the Third River Crossing that may be of public interest.
National Grid	Gas and Overhead power lines if affected
Natural England	General Protected Species

Norfolk Association for the Disabled	Interested in creating a more accessible environment through scheme development and design.
Norfolk County Councillors	Interest in all aspects of the scheme that will have an impact on their constituents.
Great Yarmouth Borough Council Councillors	Interest in all aspects of the scheme that will have an impact on their constituents.
Norwich Geological Society	Regional Important Geological Sites. RIGS
Parish councils	Interest in how the TRC directly or indirectly affect the parish and its residents.
Public Utilities	Affected Utilities
Residents of directly affected parishes	Impact on their property through issues such as noise pollution and traffic implications through construction and impact of traffic movements using TRC.
Transport groups (bus companies, freight associations)	Interest in issues surrounding transport companies such as route changes.
Anglian Water/Environment Agency	Disposal of effluent to sewer/surface water drain/watercourse
Countryside Agency	Interest in issues relating to pollution control, protection of natural environments.
DEFRA	Interest in issues relating to protection of natural environments.
Great Yarmouth Port Authority (Peel Ports)	Impact on port activities directly and indirectly including construction phase. Design and alignment, business impact, construction impact.
Port Users	Impact on port activities directly and indirectly including construction phase. Design and alignment, business impact, construction impact.
Great Yarmouth Tourism and BID	Impact on Great Yarmouth Tourism businesses
GY Cycle Forum	Impact on cycle routes
Federation of small businesses	Interest in how the TRC directly or indirectly affect the businesses in Great Yarmouth and Gorleston
Chamber of Commerce – Great Yarmouth Council	Interest in how the TRC directly or indirectly affect the businesses in Great Yarmouth and Gorleston
Great Yarmouth Community Trust	Interest in how the TRC directly or indirectly affect the local community interests
Great Yarmouth & Waveney Mind – Community ROOTS project	Interest in how the TRC directly or indirectly affect the community ROOTS garden project close to the TRC

Table 6-7 Stakeholders and interests

6.7.5 *New Anglia Local Enterprise Partnership and Local Transport Body*

The LEP and the LTB are more than just stakeholders; the LEP is responsible for the Strategic Economic Plan of which the Great Yarmouth Third River Crossing is an important component. The LTB is responsible for delivery of transport infrastructure projects funded in the Growth Deal. The Body is chaired by the LEP and includes a Councillor from each of Suffolk County Council and Norfolk County Council. Regular reports on the scheme are made to the LEP through regular formal and informal meetings and to the LTB through regular quarterly meetings. The views of the LEP and LTB are communicated to the Project Board in the same way.

The Local Transport Body brings together transport stakeholders across the region including the Department for Transport, Highways England, Abellio Greater Anglia, Port of Felixstowe, Norwich International and Stansted Airports, First group, innovative transport providers such as Liftshare, CBI, Federation of Small Businesses as well as the counties' Local Authorities and Chambers of Commerce. The LTB provides a forum for discussing strategic issues and is currently developing an integrated transport strategy which will set out the key transport requirements for Norfolk and Suffolk.

The Managing Director of New Anglia LEP, Chris Starkie has confirmed the LEP's full support for the scheme, saying that it will boost productivity, attract inward investment and retain local talent. A Third River Crossing in Great Yarmouth will help create thousands of jobs, improved links across the town and the region.

6.7.6 *Public consultation*

Communication and engagement with local people is equally important. The key methods of public consultation are set out in Table 6-8.

Communication method	Action	Timescale
Exhibitions	Non statutory and pre application consultation	• Summer 2017 • Summer 2018
Newsletter	Draft, publish and distribute newsletter.	• As required update via social media NCC account • Bi- weekly updates to Port Users • Monthly updates to residents • Monthly updates to business community (continue in construction phase)

Website	Update, refresh and publish latest news on website.	• Refresh website to include statutory processes and newsletter updates. • Weekly check on content
Your Norfolk	Draft and publish news for Your Norfolk magazine for the March edition.	• Quarterly update • Publish through social media
Telephone Hotline	Deal with formal and informal requests for information.	• As and when required
Email Hotline	Deal with formal and informal requests for information.	• As and when required
Letters and personal visits	Deal with formal and informal requests for information.	• As and when required
Press releases	Draft and publish appropriate press releases	• As and when required. A timetable will be drawn up in liaison with GYBC.
Other publications	Draft, publish and distribute information to appropriate publications	• As and when required. A timetable will be drawn up in liaison with GYBC.
Formal reports	Draft and publish reports for Committee	• As and when required
Informal reports	Draft and publish progress reports	• As and when required
Internal Meetings	Co-ordinate and facilitate internal meetings.	• Weekly
External Meetings	Co-ordinate and facilitate external meetings.	• As and when required.
Correspondence	This includes general correspondence received through letters, phone calls, emails and visitors.	• As and when required

Table 6-8 Public engagement - communication methods

6.8 Project reporting

Progress will be reported to the County Council's Environment, Development and Transport (EDT) 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 Environment, Transport and Development Committee. This ensures appropriate involvement of the elected members in this important project.

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

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

6.9 Contract Management

The Full Business Case will include details of the management of contractors and suppliers. It will confirm arrangements for continuity between those involved in developing the contract and those who will subsequently manage it.

6.10 Risk Management Strategy

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*".

A four stage risk management process has been followed, as illustrated in Figure 6-3

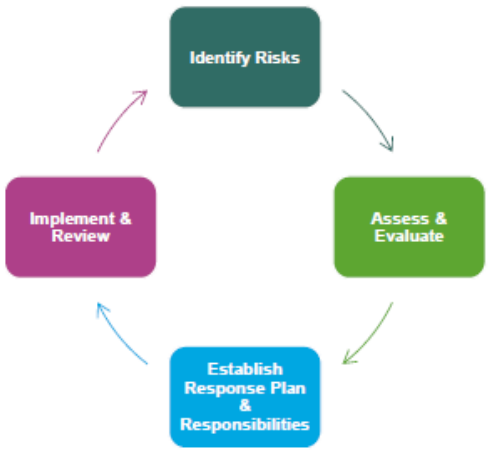


Figure 6-3 Risk management process

Identifying risks

Risks have been identified by specialists in highways and structural engineering, geotechnics, transport planning, quantity surveying and the environmental disciplines. A Risk Management Workshop was held on 30 January 2017 to consider risks associated with the preferred scheme, 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.

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:

These are catalogued in a Risk Register, which is included as Appendix F.

Quantified risk

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.

The methodology used to quantify and monetise risk is described in the Financial Case (Chapter 4).

Risk response plans and mitigation

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; and
- **Terminating the activity** that gives rise to the risk.

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

Transfer of risk to the contractor

The Commercial 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.

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 include, for example:

- Unforeseen ground conditions
- Exceptional Weather
- Flooding
- Cost Inflation
- Vandalism/ Theft
- Protestors (delay)
- Environmental (delay)
- Archaeology
- Surveys (adequacy/ suitability)

A pain-gain share mechanism will be negotiated and agreed with the contractor and used to provide incentive for value engineering and robust cost and programme management.

Implementation of response plans, and review of risk

The effectiveness of the response plans will depend on:

- proper implementation of the plans
- review of the residual risk, including any secondary risk associated with implementation, at key decision points in the life of the scheme.

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. The Risk Register will be reviewed at Project Board meetings and at meetings of the Project Delivery Team. All key risks and opportunities will be formally reviewed at key decision points in the scheme's lifecycle.

All project issues will be registered in an Issue Log. An issue management and escalation strategy will be implemented, ensuring that issues are dealt with at an appropriate level. The Project Manager will be responsible for the regular analysis of the Issue Log, and will escalate issues where necessary to the Project Board if they are likely to have a significant impact on the project programme, budget, outputs or outcomes.

6.11 Benefits realisation plan (outline)

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 Full Business Case.

A Benefits Realisation Plan will be prepared for the Great Yarmouth Third River Crossing 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".

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 scheme objectives, together with the desired outputs and outcomes are summarised in Table 6-9.

Strategic objectives	Desired outputs	Desired outcomes
To support the creation of new jobs, especially in the South Denes Local Development Order area and the Enterprise Zone, by being a catalyst for investment	A scheme that improves the traffic issues currently experienced by business users and commuters by creating a new, more direct road link into the southern part of the peninsula and the South Denes Local Development Order area and Enterprise Zone, including the port, outer harbour, and under-developed employment areas.	Economic growth More businesses locating in the Enterprise Zone Reduced unemployment
To support Great Yarmouth as a Centre for Offshore Renewable Engineering, and as a port	A scheme which provides improved road access to the port and outer harbour, and to businesses associated with the offshore energy industry.	Reduced journey times for traffic accessing the port, the outer harbour and businesses located on the peninsula. Increased employment related to offshore energy
To support the regeneration of Great Yarmouth, including the town centre and the seafront, helping the visitor and retail economy	A scheme which makes it easier for people to access the town centre and seafront, and which reduces traffic and congestion in these areas	A town centre which is perceived to be more attractive. Easier access to the town centre, seafront and visitor attractions, with more visitors and increased visitor spend in these areas

To improve strategic connectivity, and reduce community severance	A scheme which provides a direct road link between the eastern peninsula and the strategic road network (A47), and which reduces journey time and distance for people moving between the east and west parts of Great Yarmouth.	Reduced journey time and distance between the peninsula and the A47. A more integrated town and community. Easier, quicker, access between eastern and western parts of the town, for employment, education, social and recreational trips.
To protect and improve the environment	A scheme which reduces traffic in environmentally sensitive areas, and which reduces total emissions of greenhouse gases and pollutants. A scheme which has been designed to minimise its own impact on the local built and natural environment.	Contribution towards carbon reduction targets. Improved health and well-being. Environmental assets protected and adverse impacts minimised or mitigated.
Scheme specific objectives	**Desired outputs**	**Desired outcomes**
To provide traffic relief to Breydon Bridge and Haven Bridge	A third river crossing which offers an attractive alternative for some of the traffic which at present uses the existing bridges	Less traffic on Breydon Bridge. Less traffic on Haven Bridge. More efficient road network
To reduce congestion and delay in the town centre	A scheme which reduces traffic on town centre roads which experience congestion at present	Less traffic and reduced journey times on town centre roads. A more attractive town centre, and a more efficient road network
To improve journey time reliability	A scheme which reduces traffic, or improves traffic flow, on routes where journey times can currently be unpredictable due to congestion.	A more efficient road network

To reduce traffic in historic areas	A scheme which provides a more attractive route for some of the traffic which presently uses the historic quays	Less traffic on historic quays. Protection and enhancement of the historic built environment
To improve vehicular access to South Denes and the outer harbour, especially from the A47	A scheme which provides a more direct road link between the eastern peninsula and the strategic road network (A47).	Reduced journey time and distance between South Denes and the outer harbour and the A47.
To improve access to the Great Yarmouth peninsula for buses	A scheme which allows more direct bus routes into the peninsula, and which reduces bus journey times and improves reliability on existing routes into the peninsula	Buses re-routed to use the new bridge. A better bus service with potential to attract more users. Better access to jobs and services for people without access to a car
To improve access to the Great Yarmouth peninsula for cyclists	A third crossing which is available to cyclists, providing safe and convenient cycle routes into the peninsula linked to the existing cycle network	Use of the bridge by pedestrians and cyclists. Increased use of active travel modes, leading to health and productivity benefits, and reduced carbon emissions Better access to jobs and services for people without access to a car. Improves the leisure offer of Great Yarmouth as a resort
To improve access to the Great Yarmouth peninsula for pedestrians	A third crossing which is available to pedestrians, providing safe and convenient pedestrian routes into the peninsula, linked to existing footways and pedestrian routes	
To reduce road accident casualties	A scheme which reduces traffic (and hence the risk of collisions) on routes with high accident rates. A scheme which has been designed to minimise the risk of road accidents.	Fewer deaths and injuries due to road accidents.

To reduce emissions of greenhouse gases	A scheme which provides shorter, less congested routes for traffic, resulting in less fuel consumption and lower emissions of greenhouse gases.	Contribution towards a reduction in the rate of global warming
To improve the resilience of the local road network	A third river crossing which provides additional capacity to cope with situations when one of the other bridges is unavailable, and which reduces the impact of routine bridge closures on local congestion and delay	A more efficient road network. Improved perceptions of accessibility of Great Yarmouth for business.
Operational objectives	**Desired outputs**	**Desired outcomes**
To provide an additional crossing of the River Yare for vehicles, cyclists and pedestrians	A third river crossing with proper provision for non-motorised users, as well as sufficient capacity for expected road traffic, including future demand for commercial access to the port	Increased choice of mode of travel. More direct routes for pedestrians and cyclists More travel by sustainable modes
To reduce overall journey times and vehicle kilometres in Great Yarmouth	A third river crossing which provides a shorter, more attractive route for some of the trips currently being made in Great Yarmouth	Shorter routes for road vehicles. Reduced fuel consumption and emissions. Time savings benefiting individuals and the local economy.
To minimise environmental impact, compulsory purchase and demolition of residential and commercial property	A new bridge and approach roads which use, as far as possible, land which NCC already owns, or is undeveloped.	Minimises scheme cost and impact on the built and natural environment. Reduces risk of delay in delivering scheme.
To achieve a balance between the needs of road and river traffic	A new bridge located and designed to optimise its role as a part of the road network, whilst also minimising its impact on the operation of the port and the passage of shipping	A more efficient road network and an efficient port and navigable waterway, leading to support for the scheme from road and river users

Table 6-9 Objectives, outputs and outcomes

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

6.12 Monitoring and evaluation plan

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.

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

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.

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

- Standard monitoring
- Enhanced monitoring
- Fuller evaluation

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 Great Yarmouth Third Crossing scheme will cost more than £50 million, the DfT’s enhanced monitoring guidance will be in addition to the standard measures.

The measures that fall into the ‘enhanced monitoring’ category are summarised in Table 6-10

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

Table 6-10 Enhanced monitoring

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

6.12.1 Data requirements

The proposed measurements, data required and frequency of data collection are set out in Table 6-11:

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 Great Yarmouth Borough Councils review and assessment of Local Air Quality (statutory duty)
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	Motor traffic, cyclist and pedestrian counts on the new bridge.
Accident and casualty rates	Pre and post construction, Years 1 and 5 post opening	Annual monitoring of collisions (STATS 19)
Average annual CO_2 emissions	Pre and post construction, Years 1 and 5 post opening	DfT's Local Authority Carbon Toolkit

Table 6-11 Data requirements (outline)

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

6.12.2 Data sources

The monitoring and evaluation for the Great Yarmouth Third River Crossing project will be undertaken by Norfolk County Council. The following surveys will be undertaken:

- Journey times
- Automatic Traffic Counts
- Turning counts

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), retail sales and Great Yarmouth footfall figures.

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

6.12.3 Timescale for evaluation

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.

Data will be collected one year and five years after opening and will be compared against the baseline. Evaluation reports 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.

6.12.4 Setting targets

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.

6.12.5 Summary of analysis

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?

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; and
- Measure the levels of accidents on the existing and improved network.

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 5 year assessment will look at longer term benefits including accidents, travel patterns and jobs / additional investment.

6.12.6 Linking indicators to outcomes

It is important to demonstrate how the proposed indicators relate to the desired outcomes.

Figure 6-4 Causal chain diagram is a Logic Map or Causal Chain Diagram which shows the expected relationship between the outputs of the scheme, the achievement of objectives, and the delivery of the strategic outcomes.

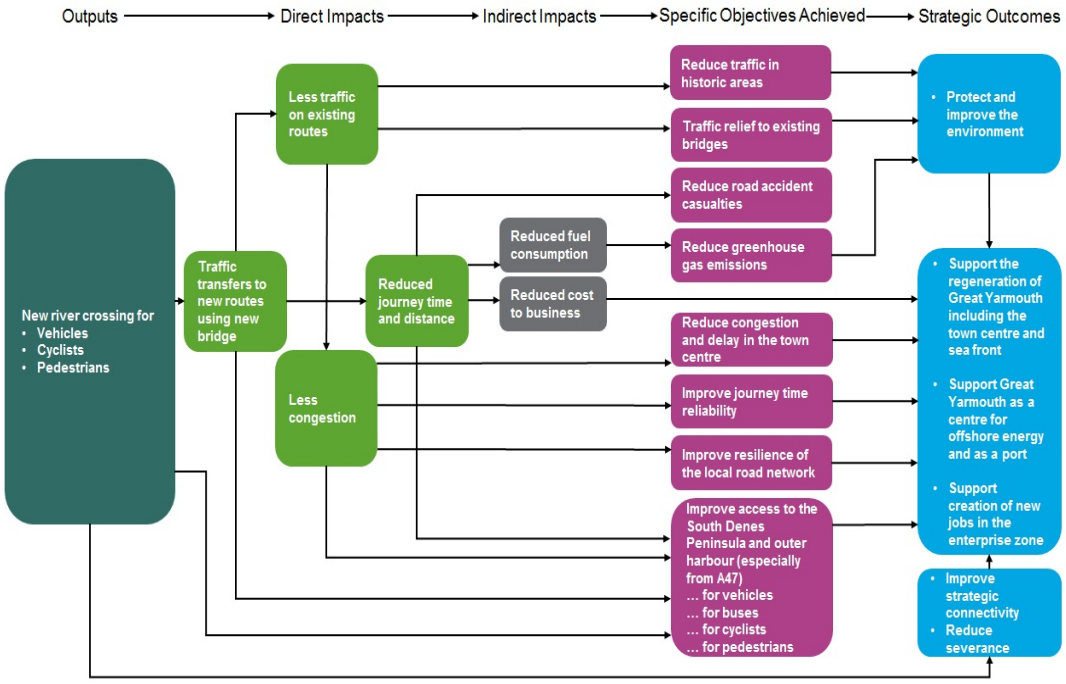


Figure 6-4 Causal chain diagram

In general it is easier to measure achievement of the objectives (e.g. changes in traffic volume or journey time) than the strategic outcomes (e.g. support regeneration) because the latter often take time to achieve and can be influenced by factors other than the proposed river crossing.

In most cases, achievement of the specific objectives will be measured directly by means of:

- Traffic counts
- Journey time surveys
- Accident statistics

Greenhouse gas emissions and improved reliability are difficult to measure directly but are predictable consequences of reduced traffic, congestion and delay and the availability of shorter routes.

Strategic outcomes are not so easy to measure directly, but can be seen to be logical consequences of achieving the specific objectives. However longer term monitoring of local development, business growth and relocations, tourist numbers

and revenue, employment, air quality and deprivation will continue to take place, and will contribute to an understanding of the success of the scheme. Anecdotal information, especially in relation to perceptions of congestion and resilience also has a supporting role in evidencing the success of the scheme.

A full Monitoring and Evaluation plan will be developed and updated in the Full Business Case. It will consider attribution of outcomes to the intervention and whether a clear link between the delivery of the scheme and the wider economic benefits can be achieved. As such, Norfolk County Council's partners will work with the LEP and DfT to consider any additional longer term evaluation work to undertake case studies or meta-analysis in order to further understand the economic benefits arising from the Third Crossing project, subject to availability of resources.