



West Winch Housing Access Road Design and Access Statement

Author: WSP UK Ltd on behalf of Norfolk County Council

Document Reference: 1.02.00

Version Number: V1

Date: December 2023



Contents

Glossary of Abbreviations and Acronyms	5
1 Introduction	6
1.1 Purpose of this document.....	6
1.2 Planning application	7
1.3 Scheme objectives	8
1.4 The importance of good design	8
1.5 Design development.....	9
2 Policy context for good design	10
2.1 Introduction.....	10
2.2 National plans, policy, and strategies	10
2.3 Regional plans, policy, and strategies	12
2.4 Local plans, policy, and strategies	14
2.5 Design guidance and standards	20
3 Landscape context.....	21
3.1 Introduction.....	21
3.2 Biodiversity net gain	22
3.3 Landscape design	24
4 The Design.....	26
4.1 Introduction.....	26
4.2 Overview of the Scheme Design	26
4.3 Key factors	28
4.4 Environmental constraints	29
4.5 Proposed Scheme Design.....	29
4.6 Complimentary works.....	58
5 Design evolution.....	59
5.1 Introduction.....	59
5.2 Route alignment	59
5.3 Highways.....	63
5.4 Structures.....	77
5.5 Side roads.....	82
6 Proposed Scheme design response to policy	85



7 Conclusion 87

Tables

Table 6-1 – Policy GA04 design of a ‘relief road’ North Runcton and West Winch Neighbourhood Plan (2017)..... 85

Figures

Figure 2-1 - Strategic concept map of the area as presented in the SADMP with the Proposed Scheme highlighted 15

Figure 2-2 - West Winch Growth Area Masterplan 19

Figure 4-1 - Scheme location 28

Figure 4-2: Scheme design overview plan 31

Figure 4-3: Overview plan of Hardwick Interchange..... 34

Figure 4-4: Photo of existing underpass: western end 37

Figure 4-5: Photo of existing underpass: eastern end..... 37

Figure 4-6: Cross section view of the proposed underpass extension 38

Figure 4-7: Overview plan of the A47 dualling..... 41

Figure 4-8: Overview plan of the A47/WWHAR to Metacre Roundabout..... 45

Figure 4-9: Extract from Hopkins Homes' Access Plan 47

Figure 4-10: Cross section of WWHAR south of Hopkins Homes Roundabout..... 47

Figure 4-11: Overview plan of Metacre roundabout to the A10 tie in..... 49

Figure 4-12: Extract from the Metacre Ltd DAS showing the 2011 Framework Masterplan and roundabout connection..... 52

Figure 4-13: Extract from Highways General Arrangement Plan..... 54

Figure 4-14: Overview plan of the A10 tie in..... 56

Figure 5-1: Ideas for the position of a housing access road from 2012 consultation 61

Figure 5-2: Three scenarios for housing development: Do minimum, reduced option, and full option 62

Figure 5-3: Extracts from OBC Appendix B showing the shortlisted options for the Hardwick Interchange and A47 options 2, 3 and 6..... 66

Figure 5-4: Extract from Hopkins Homes Hardwick Green Masterplan 67

Figure 5-5: Options 1-5 (left to right) for the northern extent of WWHAR 69



Figure 5-6: Adopted solution for the northern extent of WWHAR 70

Figure 5-7: Extract from Hopkins Homes 'Illustrative Masterplan' 71

Figure 5-8: Options for the southern extent of WWHAR..... 73

Figure 5-9: Section view of the portal frame option where it joins the existing pipe . 79

Figure 5-10: Section view of the concrete arch option where it joins the existing pipe
..... 79

Figure 5-11: Images of the box girder bridge model..... 82



Glossary of Abbreviations and Acronyms

Acronym	Definition
AONB	Area of Outstanding Natural Beauty
BCKLWN	Borough Council of King's Lynn and West Norfolk
BNG	Biodiversity Net Gain
DAS	Design and Access Statement
DEFRA	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
DfT	Department for Transport
ES	Environmental Statement
GI	Green Infrastructure
NCC	Norfolk County Council
NIC	National Infrastructure Commission
NPPF	National Planning Policy Framework
PRoW	Public Right of Way
OAR	Options Appraisal Report
OBC	Outline Business Case
SADMP	Site Allocations & Development Management Policies Plan
SOBC	Strategic Outline Business Case
SSSI	Site of Special Scientific Interest
STS	Sustainable Transport Strategy
WWHAR	West Winch Housing Access Road



1 Introduction

1.1 Purpose of this document

- 1.1.1 This Design and Access Statement (DAS) supports the planning application for the West Winch Housing Access Road (WWHAR) (the 'Proposed Scheme') promoted by Norfolk County Council (NCC) as the applicant.
- 1.1.2 The DAS presents the design for the Proposed Scheme submitted for planning permission, proving rationale for how the design and its development was informed by key factors, and how has responded to these as design principles.
- 1.1.3 The DAS is required by Article 9 of the Town and Country Planning (Development Management Procedure) (England) Order 2015, which sets out the requirements of a DAS. Article 9(3) states:

"A design and access statement must—

- (a) explain the design principles and concepts that have been applied to the development;
- (b) demonstrate the steps taken to appraise the context of the development and how the design of the development takes that context into account;
- (c) explain the policy adopted as to access, and how policies relating to access in relevant local development documents have been taken into account;
- (d) state what, if any, consultation has been undertaken on issues relating to access to the development and what account has been taken of the outcome of any such consultation; and
- (e) explain how any specific issues which might affect access to the development have been addressed."



1.2 Planning application

1.2.1 This Design and Access Statement is part of a suite of documents and drawings prepared as part of the planning application for the Proposed Scheme. The DAS should be read in conjunction with the other planning application documents and drawings.

1.2.2 The Proposed Scheme provides crucial transport infrastructure required for adjacent development, for which the following Outline Planning Applications have been submitted to Borough Council of King's Lynn and West Norfolk (BCKLWN):

- Referred to as the Hopkins Homes development in this document:
13/01615/OM – Outline application: Land West of Constitution Hill, North Runcton comprising change of use from agricultural / undeveloped land to housing and associated facilities. This includes a mix of up to 1110 residential units, a primary school, local centre, public open space, landscaping and highway access.
- Referred to as the Metacre Ltd development in this document:
18/02289/OM – Outline application: Land at West Winch comprising up to 500 homes with a neighbourhood centre, associated landscaping, parking and supporting infrastructure.

1.2.3 The South-East King's Lynn Strategic Growth Area has been identified in the King's Lynn and West Norfolk Local Plan as the primary site for substantial housing development. This development would comprise 4,000 new dwellings on land between the A10 and A47.

1.2.4 The site has been selected as the only location available in the area for such levels of growth due to flooding constraints elsewhere, and its proximity and links to King's Lynn. The housing development cannot come forward without new highway infrastructure to mitigate the impacts of the additional traffic demand.



1.3 Scheme objectives

1.3.1 The project objectives have been developed in response to the current national, regional, and local policy, and to address identified problems that the Proposed Scheme aims to address. The Scheme Objectives are as follows:

- To drive economic growth by supporting housing delivery, employment growth and Levelling Up in King's Lynn
- To enhance the A10's role as a strategic link supporting the wider King's Lynn economy
- To provide a more resilient road network to improve journey time reliability and safety for all users
- To improve the quality of life for residents of West Winch by reducing the volume of non-local journeys through the village
- To provide better conditions in West Winch and along the A10 for travel by non-motorised modes
- To increase active mode connectivity with the wider public transport network
- To reduce carbon emissions and improve local air quality by alleviating congestion, supporting the decarbonisation agenda.

1.4 The importance of good design

1.4.1 The applicant is committed to delivering good design for the Proposed Scheme, to ensure that it responds to its setting, is long-lasting, and that wider benefits are realised beyond the primary function as a new link road.

1.4.2 Good design is not just about how something looks as an aesthetically pleasing architectural form, but about the process taken to developing the solution and the benefits it can offer for the environment, placemaking for people, and whole life value.

1.4.3 An important part of design development is engagement of appropriate focus groups, and consultation with the public, to inform the design. An overview of



the consultation and engagement activities is set out the Pre-application Consultation Report (document reference: 5.01.00).

1.5 Design development

- 1.5.1 The Proposed Scheme design has developed since its first inception to support local growth, developed through consultation with local parishes, and included in local policy. A preferred route and approach to each junction connection has been established through traffic modelling, stakeholder engagement, and appraisal processes.
- 1.5.2 The Outline Business Case (OBC) presents the optioneering process undertaken (including the Options Appraisal Report (OAR)) for the Proposed Scheme (document reference 70100518-OBC).
- 1.5.3 As part of the OBC, the scope of the Proposed Scheme has been extended to include a package of sustainable transport measures to complement the WWHAR and encourage mode shift away from private car use for those travelling shorter distances within the study area. This addition reflects increased policy emphasis on carbon savings, climate change, and increased requirements for Biodiversity Net Gain.
- 1.5.4 Further design development has taken place in response to further consultation, stakeholder engagement, and surveys/assessments.



2 Policy context for good design

2.1 Introduction

2.1.1 The following plans, policies, strategies, and guidance documents are specifically relevant to design and access. A comprehensive review of the policies that the Proposed Scheme adhere to, is included in the Planning Statement (document reference: 1.01.00).

2.2 National plans, policy, and strategies

National Infrastructure Strategy (HM Treasury, November 2020)

2.2.1 This strategy sets out the government's plans to deliver ambitions for improvement in the quality of the UK's infrastructure to level up the country and put the UK on the path to net zero emissions by 2050.

2.2.2 The strategy describes 'designing high-performing and beautiful infrastructure':

"The government wants the planning process to stimulate proposals that are well-designed and will enhance the environment, health and character of local areas. As outlined in 'Planning for the Future' White Paper (August 2020), the government wants to better incentivise good design and high-quality homes and infrastructure, which should be a central tenet of the planning system and planning decisions.

Good design is also an essential element in securing high performance of infrastructure from the start. In line with the design principles set out by the National Infrastructure Commission (NIC), the government is committed to embedding good design in all infrastructure projects."

National Planning Policy Framework (Department for Levelling up, Housing and Communities, December 2023)

2.2.3 The need for good design in development is prevalent in the National Planning Policy Framework (NPPF). In Chapter 12 'Achieving well-designed places', Paragraph 131 explains:



“...Good design is a key aspect of sustainable development, creates better places in which to live and work and helps make development acceptable to communities.”

- 2.2.4 The NPPF goes on to explain the importance of design quality, stakeholder engagement as part of the process and the value of design review panels to achieve well-designed places.

National Policy Statement for National Networks (Department for Transport (DfT), December 2014) and Draft published March 2023

- 2.2.5 Whilst this policy is applicable to Nationally Significant Infrastructure Projects (NSIPs) through the Planning Act 2008, it is of relevance for the design of roads.

- 2.2.6 It sets out a ‘*Criteria for ‘good design’ for national network infrastructure*’ in paragraphs 4.28-4.35 (4.24-4.29 in the Draft version) which explains:

“Applying “good design” to national network projects should therefore produce sustainable infrastructure sensitive to place, efficient in the use of natural resources and energy used in their construction, matched by an appearance that demonstrates good aesthetics as far as possible.”

Gear Change (DfT, July 2021)

- 2.2.7 This document presents a bold vision for cycling and walking intended to drive a ‘step-change’ in the policy and thinking around walking and change in England. It states a vision which is for ‘England will be a great walking and cycling nation’.

- 2.2.8 The aim of the document is:

“Places will be truly walkable. A travel revolution in our streets, towns and communities will have made cycling a mass form of transit. Cycling and walking will be the natural first choice for many journeys with half of all journeys in towns and cities being cycled or walked by 2030.”

- 2.2.9 This future vision is centred around four areas:



- Healthier, happier, and greener communities
- Safer streets
- Convenient and accessible travel
- At the heart of transport decision-making

2.2.10 The Sustainable Transport Strategy (STS) (document reference: 4.02.00) aligns with the aims of the Gear Change policy by presenting opportunities for walking and cycling improvements in the local area.

2.3 Regional plans, policy, and strategies

Norfolk County Council - Transport for Norwich Strategy (NCC, 2021)

2.3.1 This sets out the transportation strategy for the Norwich area, Chapter 11 states:

‘Places: New schemes, enforcement and maintenance activities on the transport network will seek to enhance the character and quality of places with historic, architectural or natural landscape character and ecological value.’

2.3.2 A ‘Key Action’ following this policy includes:

‘Transport schemes developed in places of historical, landscape or architectural importance, including conservation areas, will be designed to ensure that they maintain or enhance the area and improve public realm.’

2.3.3 The Proposed Scheme considers its future interface with public realm in an urban context, the networks and experiences of non-motorised users in the locality, providing access and connectivity.

2.3.4 A Sustainable Transport Strategy (STS) (document reference: 4.02.00) has been developed as part of the Proposed Scheme as a wider package of complementary measures that the Proposed Scheme will facilitate. This will support sustainable modes of transport and the non-motorised user network, maintaining accessibility and routes in anticipation of the adjacent future development.



Norfolk County Council – Local Transport Plan (NCC, 2022)

2.3.5 This policy comprises a Strategy and Implementation plan, it covers the period 2021-2036. Policy 10 states:

‘We will seek to improve connectivity between rural areas and services in urban centres.’

2.3.6 To achieve this, actions include:

‘...extending sustainable walking and cycling networks in the urban areas to connect with longer-distance facilities...and – recognising the significant role that car travel will continue to play in the future – improving some of the road links and connections.’

2.3.7 It goes on to explain:

‘Good design will be important to make sure that local walking and cycling facilities are attractive to encourage all users.’

2.3.8 The STS also supports this policy and application of good design to encourage use of the facilities on the network.

Norfolk County Council - Environmental Policy (NCC, 2019)

2.3.9 This policy embodies the Government’s 25-year plan published in 2018 to champion resource efficiency and implement environmental targets.

2.3.10 The key policy aims describe goals relevant to the Proposed Scheme design which have been considered throughout its development. This policy describes the need for biodiversity net gain to be achieved in development and working towards carbon neutrality by 2030.



2.4 Local plans, policy, and strategies

Borough Council of King's Lynn and West Norfolk - Local Development Framework Core Strategy (2011)

2.4.1 The Borough Council of King's Lynn and West Norfolk's (BCKLWN) Core Strategy sets out the spatial planning framework and guidance for the development of the Borough up to 2026 including:

- **Policies for places** – including CS03 King's Lynn area, defining the strategy for growth in the West Winch area
- **Area wide policies** – including CS11 Transport, setting out the need for a bypass in West Winch

Borough Council of King's Lynn and West Norfolk - Local Plan (2016)

2.4.2 The Local Plan - King's Lynn and West Norfolk Local Plan - Site Allocations & Development Management Policies (SADMP) Plan sets out land allocations and development management policies. It will guide development and change in the borough until 31st March 2026.

2.4.3 The SADMP (including the main modifications) forms the King's Lynn and West Norfolk Local Plan, together with:

- the Core Strategy (adopted 2011)
- any neighbourhood plans that have been made, including the North Runcton and West Winch Neighbourhood Plan (2017)

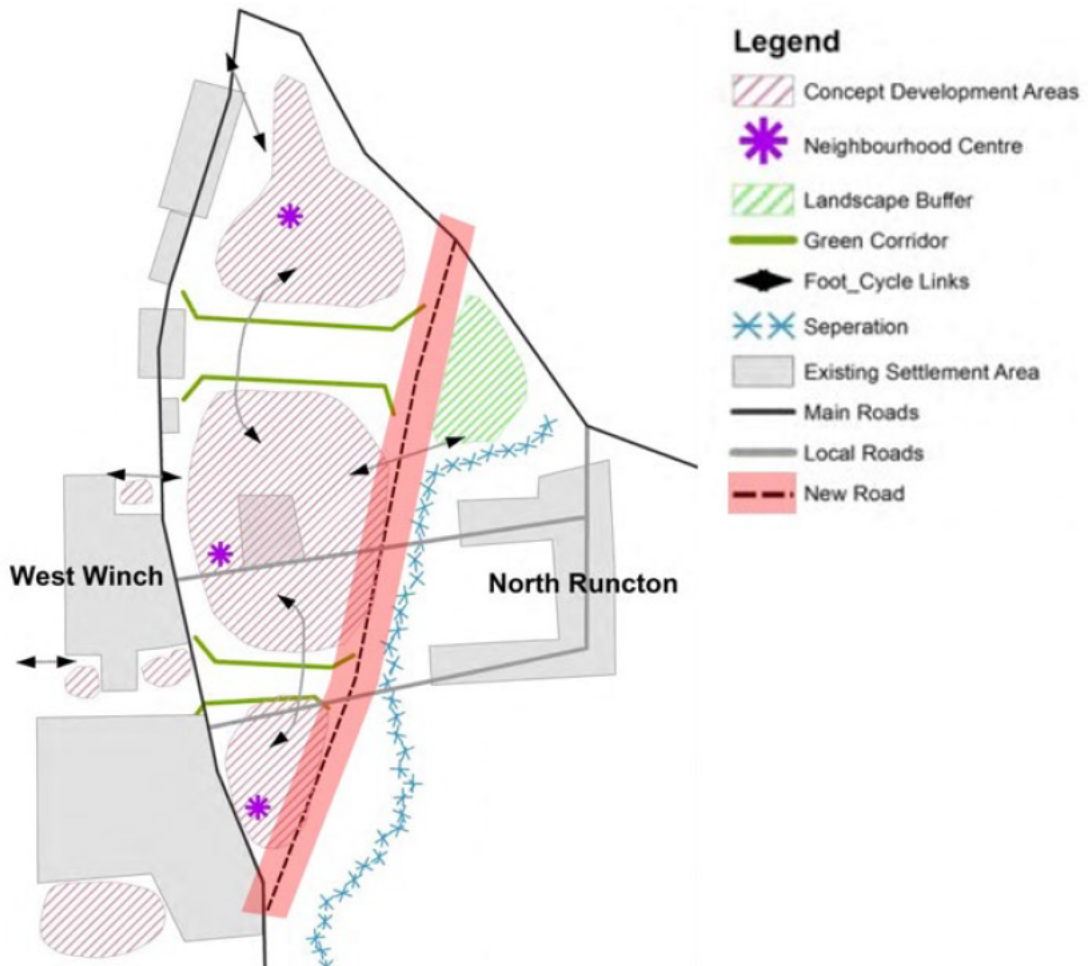
2.4.4 Relating to the 'Distributor road linking A10 to A47' (the Proposed Scheme) the SADMP sets out the principle of its function in supporting growth in E2.52 to E2.55.

2.4.5 Figure 2-1 illustrates the three neighbourhoods presented in the SADMP: near the A47 at Constitution Hill at the north, an extension of 'old' West Winch, and south of Chequers Lane. The southernmost area may form a later phase, while the other two are anticipated to provide adequate area to achieve



objectives identified for delivery by 2026. The areas are to be separated by green corridors which align with the gas main corridors.

Figure 2-1 - Strategic concept map of the area as presented in the SADMP with the Proposed Scheme highlighted



Borough Council of King's Lynn and West Norfolk - Green Infrastructure Study (2010)

2.4.6 This study presents an audit of Green Infrastructure (GI) in the borough as Stage One, followed by Stage Two which provides a structure for the future development of GI and priorities for delivery.

2.4.7 Chapter 4 of the study presents GI policies including:



“The planning system will be used to protect identified GI sites. This will be achieved through a requirement for all new development to incorporate and enhance existing GI where appropriate. Developer contributions may be necessary to increase the quality of protected and existing sites.”

- 2.4.8 The Proposed Scheme integrates with the networks proposed across the adjoining housing developments for GI and walking/cycling routes.

**North Runcton & West Winch Neighbourhood Plan 2016 - 2026
(BCKLWN, 2017)**

- 2.4.9 This document sets out a vision for North Runcton and West Winch, supported by planning policies to help ‘shape’ development for the period until 2026 and beyond. It aims to “nurture a vibrant, integrated community, an attractive, healthy environment and a thriving local economy”.

- 2.4.10 It sets out Aims and Objectives for the environment, social, economy, transport and sustainability. Relating to the Proposed Scheme design, the ‘transport’ aim is as follows:

“To enable local people to go about their business in a timely manner. To reduce the domination of through-traffic on residents’ day-to-day lives. To provide an excellent network of road, cycle and footpaths that allow genuine choice in future transport options and mitigate against excessive road traffic and car dependency.”

- 2.4.11 The transport objective states:

“The Plan seeks to mitigate traffic and environmental problems on the A10 and A47, encouraging a future road hierarchy that will reduce the impact of proposed development. Policies encourage and support traffic calming measures. High standards of public transport, cycle path and footpath infrastructure are encouraged.”

- 2.4.12 Policy GA04 concerns the ‘Design of a relief road’ which states:

“In designing the proposed relief road, the following design elements should be included where possible:



- *A roundabout or similar 'free flow' junction at Gravelhill Lane to eradicate congestion and queues and to provide safe local access to the A10/relief road.*
- *Rectory Lane and Chequers Lane to remain as through roads and incorporate safe cycle and pedestrian crossings.*
- *Cycle and/or pedestrian paths to be provided on both sides of the relief road corridor and these should be generally separated from the road carriageway by a sustainable soft landscape strip (grass verge, hedge, tree planting – or preferably a mix of all three).*
- *Appropriate safe cycle and pedestrian crossing points to be provided at regular intervals along the road – and specially to link desire lines between local centres, recreational facilities and public transport nodes. Safe wildlife crossings should also be considered.*
- *The design should fully integrate environmental impact mitigation features – especially ensuring that existing and proposed settlement is mitigated from traffic noise and night lighting impacts. Night lighting should be minimised, especially in sections adjacent to an agricultural backdrop. The road surface should be designed to minimise tyre noise.*
- *A maximum speed of 40 mph for the relief road – but a 30mph limit may be appropriate and desirable in some sections. The carriageway design should discourage speeding.”*

2.4.13 Further consideration of this policy is presented in Section 6 of this document.

**King's Lynn Local Cycling and Walking Infrastructure Plan (LCWIP)
(NCC and BCKLWN, 2022)**

2.4.14 This LCWIP is part of a series produced by NCC and local authorities to improve walking and cycling infrastructure and promote sustainable travel modes in Norfolk.

2.4.15 The plan supports the Government's ambition for cycling and walking to be the natural first choice for many journeys, with half of all journeys in towns and



cities being cycled or walked by 2030. It has been produced with the latest policy and guidance in mind including but not limited to:

- Norfolk Local Cycling and Walking Infrastructure Plan Summary (Travel Norfolk, 2023)
- Gear Change - a Bold Vision for Cycling and Walking' (Department for Transport, 2020)
- Cycle Infrastructure Design guidance: Local Transport Note 1/20 (Department for Transport, 2020)

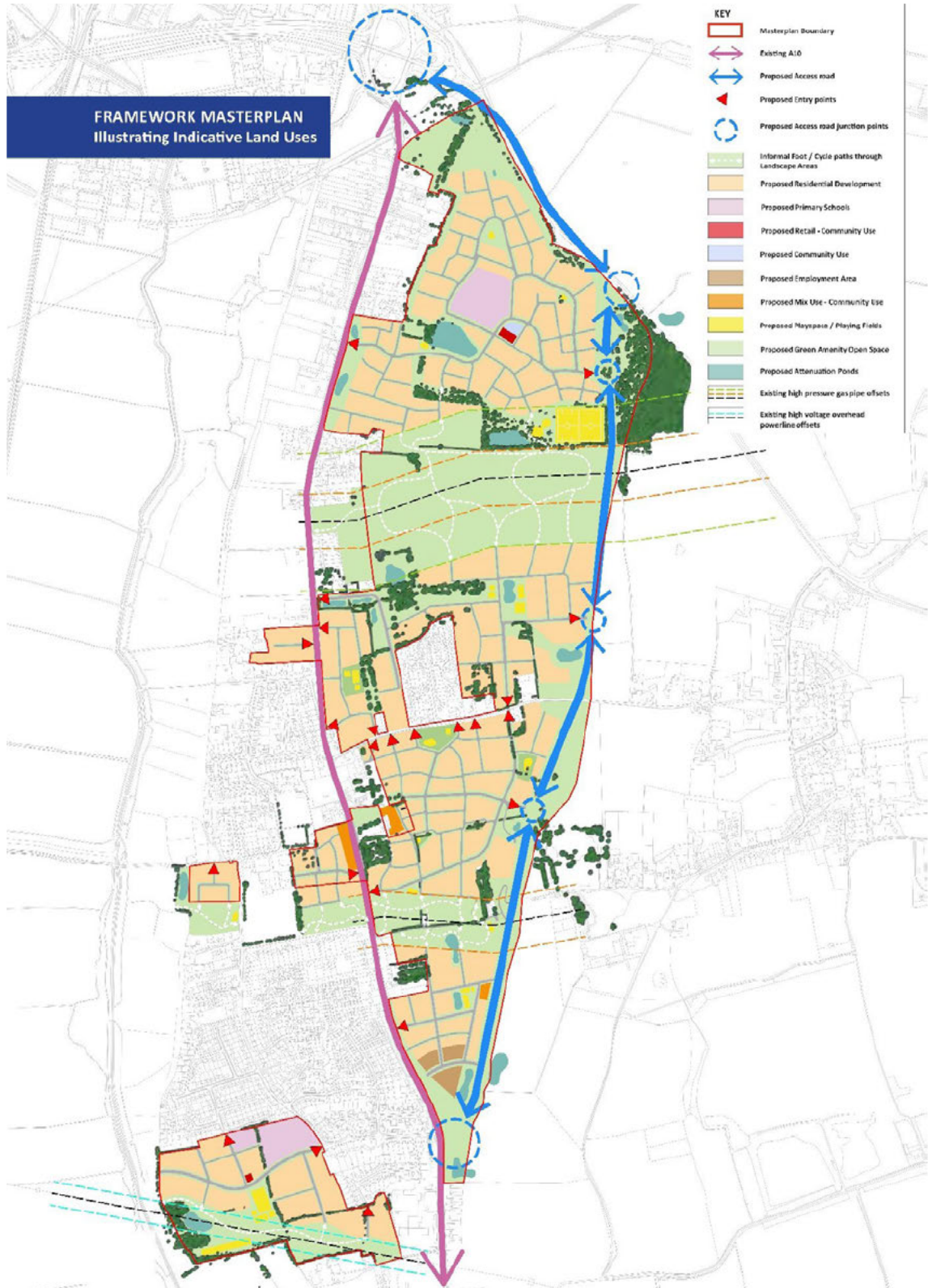
West Winch Growth Area – Framework Masterplan (BCKLWN, 2023)

2.4.16 This document was produced to provide clarity to developers for the West Winch growth area in response to the allocations and guidance made by the SADMP (2016), Neighbourhood Plan (2016), and Infrastructure Delivery Plan (2018) described above.

2.4.17 It is intended to provide focus for practical implementation and a design framework, informed by public consultation. Figure 2-2 illustrated the Masterplan for the growth area.



Figure 2-2 - West Winch Growth Area Masterplan





2.5 Design guidance and standards

2.5.1 The following are some of the design standards and guidance applicable to the design, though the list is not exhaustive:

Design Manual for Roads and Bridges

2.5.2 The Design Manual for Roads and Bridges (DMRB) provides standards and advice for the design, assessment and operation of trunk roads and motorways in the United Kingdom. It contains a number of volumes which cover topics such as drainage, pavement design, road geometry, signage, lighting and so on.

2.5.3 The highway authorities retain the right to influence the design, and advise on any relaxations or departures required from the standards as part of the technical approvals process.

2.5.4 Situations may arise which require a relaxation or departure from standard to work with the site conditions, or accommodate necessary features of the Scheme. These are explained in Appendix 1 of this document 'Departure from Standards Report' (document reference: 1.02.01)

2.5.5 The design for the Proposed Scheme has generally been produced in accordance with the guidance and standards set out in the DMRB.

Manual for Streets (2007) and Manual for Streets 2 (2010)

2.5.6 The guidance set out in Manual for Streets and Manual for Street 2, is for the design of roads not classified as trunk roads. The guidance advises how to enhance streets to create better places, mindful of distinctiveness and identity.

2.5.7 It is relevant to the Proposed Scheme's connections with existing roads and the standards likely used for the growth area.

Design Principles for National Infrastructure

2.5.8 The National Infrastructure Commission (NIC) present four principles – climate, people, places and value. These aim to guide the planning and delivery of future major infrastructure projects in the UK.



Cycle Infrastructure Design: Local Transport Note 1/20 (DfT 2020)

2.5.9 This Local Transport Note provides guidance and good practice for the design of cycle infrastructure, it describes key design principles to be applied to ensure inclusive and accessible design of networks and routes which should be: Coherent; Direct; Safe; Comfortable and Attractive. The application of this is described further in the Sustainable Transport Strategy (STS) (document reference: 4.02.00).

Sustrans Design Guidance

2.5.10 Sustrans is a charity organisation who provide advice and collaborate with designers, to improve the safety and quality of pedestrian and cycle environments.

2.5.11 They provide a catalogue of design guidance documents which deal with good practice in design for walking and cycling which is applicable to the STS component of the design.

Norfolk County Council (website): Highway guidance for development

2.5.12 Norfolk County Council's website provides guidance for highway developments including residential areas, highways, and details on drainage and lighting.

3 Landscape context

3.1 Introduction

3.1.1 The site of the Proposed Scheme is located in the Parishes of North Runcton and West Winch, south-east of King's Lynn. It is located within the following National Character Areas (produced by National England to provide classification of landscape character at a national scale):

- NCA 46 – The Fens
- NCA 76 – North West Norfolk



3.1.2 The site falls within the following Local Character Areas as defined by the BCKLWN's Landscape Character Assessment (2007):

- D – The Fens – Settles Inland Marshes
- E – The Fens – Open Inland Marshes
- G – Farmland with woodland and wetland

3.1.3 BCKLWN's Landscape Character Assessment (2007) describes the area as Farmland with Woodland and Wetland, a 'medium-scale mixed farming landscape, flat to gently undulating with some woodland and open water'. This description is most appropriate for the landscape around North Runcton and the landscapes towards Middleton and Bawsey to the north-east. However, the west and south of West Winch parish falls within the flat, open 'fenland' character type and West Winch can be said to be a 'fen edge' settlement – having grown on the higher ground adjacent to the rich, low lying fenland associated with the River Nar valley and the Great Ouse further to the west.

3.1.4 Key characteristics of these character areas are set out in the Landscape and Visual Impact Chapter of the Environmental Statement (document reference: 3.09.00)

3.2 Biodiversity net gain

3.2.1 Biodiversity Net Gain (BNG) is an approach to development which aims to leave biodiversity in a better condition than it was in before the development. It facilitates an increase in appropriate natural habitat and ecological features over and above that being affected by the proposed development.

3.2.2 Whilst BNG is not yet a legal requirement through the planning system at the time of writing (the relevant provisions of the Environmental Act 2021 are not yet in force), NCC have committed to achieving at least 10% net gain for applicable habitats, as part of the Proposed Scheme to ensure a responsible approach to development is taken. This approach is reinforced by the NPPF and NCC's Environmental Policy.



- 3.2.3 The Department for Environment, Food and Rural Affairs (DEFRA) has developed a metric for quantifying biodiversity as units, through a calculator which establishes a baseline score based on habitat distinctiveness, condition and area. The calculator enables an assessment to be made of the existing (pre-development) conditions of the site, to enable understanding of the impact which would be incurred by development, and the area and type of habitat enhancement required to offset that.
- 3.2.4 A BNG Assessment has been undertaken using the Biodiversity Metric 4.0 and associated guidance material published by Natural England. The BNG Assessment also assesses the Proposed Scheme against best practice guidance.
- 3.2.5 Baseline habitat data collected through habitat surveys have been used to inform the habitat calculations for the BNG assessment.
- 3.2.6 Biodiversity offsetting by replacing habitat is ideally a last resort, the following mitigation hierarchy should be used to minimise impact: Avoidance, Minimisation, Restoration/rehabilitation, and lastly Offset.
- 3.2.7 The Proposed Scheme has been developed iteratively with specialists to minimise impacts and known ecological features as much as practicable.
- 3.2.8 Initial BNG calculations were obtained at early stages of the design to provide a high-level understanding of the likely land requirements to offset impacts. This has been revisited as the Proposed Scheme was developed to ensure accuracy and robustness in the approach to net gain and is reflected in the Landscape Design.
- 3.2.9 Habitats of principal importance (HPI) and Norfolk Habitat Action Plan (HAP) are an important focus for the scheme proposals and habitat creation to achieve net gain. The HPis / Norfolk HAPs present where the Proposed Scheme is situated include:
- Lowland mixed deciduous woodland;
 - Wet Woodland;



- Ponds Priority Habitat; and
- Hedgerows Priority Habitat.

3.2.10 All of the hedgerow recorded within the Scheme Boundary qualify as HPI as they contain more than 80% native species. Almost all of these are considered important hedgerows due to the presence of red and amber listed bird species listed as Birds of Conservation Concern.

3.2.11 The Environmental Statement chapters describe the mitigation requirements which have been identified through assessments and engagement with relevant statutory bodies. This mitigation includes requirements for protected species mitigation, to achieve BNG, and to compensate for tree loss which are required as part of the Proposed Scheme.

3.2.12 The Biodiversity Net Gain assessment and conclusions are presented in Chapter 8 'Biodiversity' of the ES (document reference: 3.08.00) and its appendices.

3.3 Landscape design

3.3.1 The proposed landscape design has been developed with ecologists to deliver greater structural and species diversity than is currently provided by the largely intensive agricultural area adjacent to the Proposed Scheme.

3.3.2 The following specific landscape mitigation measures are embedded within the Proposed Scheme:

- Retention, protection and enhancement of existing trees, hedgerows and woodland where possible, to maintain the existing landscape character of the local area;
- Provision of new native tree belts to provide visual enclosure and to screen views from sensitive receptors in close proximity to the Proposed Scheme;
- Provision of new lengths of native hedgerow, some with native trees, surrounding the proposed development, to provide visual enclosure



and enhance the setting of nearby residential properties and public rights of way within or in close proximity to the Proposed Scheme;

- Provision of scattered native tree planting to break up the massing of the proposed development; and
- Enhancement of site boundary margins, through proposed species rich grassland in line with ecological requirements.

3.3.3 Planting is positioned to provide screening and visual interest for nearby receptors, as well as function on a landscape scale for species such as bats and birds.

3.3.4 Compensatory planting has been included in the landscape design including woodland planting within which rides, glades, ponds and other features will be incorporated at detailed design stage to create areas with ecological complexity.

3.3.5 The woodland planting will maintain connectivity for bats through the landscape and reduce lighting impacts from lighting at the Chequers Lane crossing in particular. The retention existing habitat would also mitigate the effect of habitat loss upon protected and notable species, including birds, bats and reptiles.

3.3.6 Hedgerow planting along the perimeter of the Proposed scheme acts as an edge boundary, and may align with boundary fencing, which is to be determined at detailed design.

3.3.7 Each roundabout includes tree planting at its centres for which specimen tree species include: Field Maple, Downy Birch, Beech, Sessile Oak, English Oak, Mountain Ash. Native woodland planting also includes: Silver Birch, Hazel, Hawthorn, Crab Apple, Sweet Cherry, Wayfaring Tree.



4 The Design

4.1 Introduction

4.1.1 This section presents the scheme design for which planning consent is sought. It provides an overview of the design for the Proposed Scheme, then describes the design principles for each component of the design, and how these have been applied.

4.1.2 Explanation of the design evolution and alternatives discounted are provided in Section 5 and in the Alternatives Chapter of the ES (document reference: 3.04.00).

4.2 Overview of the Scheme Design

4.2.1 The WWHAR scheme will deliver a number of highway interventions within the vicinity of the proposed housing development ensuring the site is connected and that the highway network can manage the increase in demand.

4.2.2 The main elements of the WWHAR scheme include:

- A 3.5km long carriageway to the east of West Winch connecting the A47 with the existing A10, providing access to proposed housing development;
- Modifications to the existing Hardwick Interchange and dualling of the existing A47 between Hardwick Interchange and the housing access road;
- The housing access road will be predominantly single carriageway, with a short section of dual carriageway on the approach to the A47 and feature a total of five roundabouts including;
- A partially signalised roundabout junction where the housing access road meets the A47;
- A roundabout on the housing access road providing access to the Hardwick Green (i.e. Hopkins Homes) planned development, plus two



roundabout junctions to accommodate connections to further housing development;

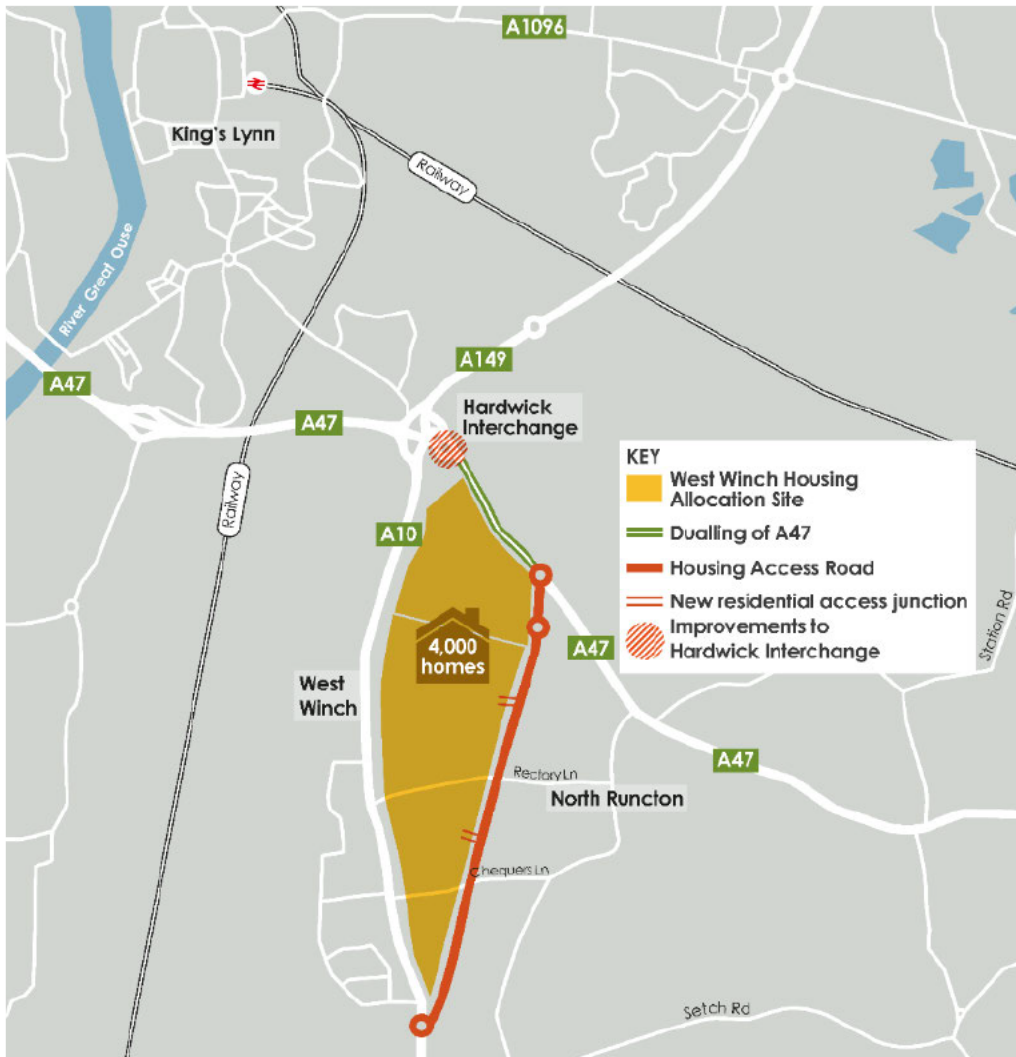
- A roundabout at the southern end of the housing access road, providing a connection to the existing A10 with new signalised crossings nearby;
- Treatment of local roads severed by the housing access road including an overbridge at Rectory Lane to accommodate road and bridleway users, and closure of Chequers Lane where it crosses the scheme with an at-grade signalised crossing, to maintain east to west access;
- Modifications to the existing A10 to improve safety and support its repurposing as a local traffic route;
- Construction of drainage features, including basins, and associated maintenance access tracks;
- Landscaping, and connections for non-motorised users;
- Utility diversions, including National Grid gas mains;
- Demolition of Hill Cottages on A47 Constitution Hill; and
- Temporary use of land during construction for working areas, haul routes, site compounds, and storage.

4.2.3 A comprehensive description is provided in Chapter 3 of the Environmental Statement 'Description of the Proposed Scheme' (document reference: 3.03.00).

4.2.4 Figure 4-1 shows location of the WWHAR scheme at the eastern edge of the land allocation for housing development to be brought forward in phases in the fullness of time.



Figure 4-1 - Scheme location



4.3 Key factors

4.3.1 The following key factors influence the design of the Proposed Scheme:

- Site topography;
- Design standards set out in DMRB;
- Significant utilities crossing the scheme area, including gas mains and overhead power lines;
- Environmental constraints including woodland, habitats, and drainage;
- Land ownership and designation, including Common Land;
- Interface with proposed housing development(s);



- Indicative layouts of proposed housing developments; and
- Related policy e.g. Neighbourhood plans.

4.4 Environmental constraints

4.4.1 The design responds to the outcomes of environmental surveys and assessments undertaken, and environmental constraints – of particular importance for the design solution include:

- The area supports protected species such as bats, [REDACTED] otters, water voles, breeding and wintering birds, reptiles and amphibians.
- The scheme is not located within any statutory or non-statutory designated sites; however the River Nar Site of Special Scientific Interest (SSSI) is located approximately 700m west of the scheme and the Setchey SSSI is located approximately 750m to the south of the scheme.
- There are no Areas of Outstanding Natural Beauty (AONB), National Parks or Country Parks within 2km of the scheme. There are several Public Rights of Way (PRoW) in close proximity to the scheme.
- Proximity to Flood Zone 3 near Hardwick Interchange, north of the A47.

4.4.2 The species identified in proximity to the Proposed Scheme through surveys / assessments, and mitigation proposals are presented in ES Chapter 8 – Biodiversity (document reference: 3.08.00).

4.5 Proposed Scheme Design

4.5.1 This section describes the design for the Proposed Scheme, explaining the design principles that apply and how the design has responded to them. For ease of understanding, the design is presented from North to South, in the following areas as shown in Figure 4-2.

Area 1: Hardwick Interchange

Area 2: Dualling of the A47



Area 3: WWHAR: A47 to Metacre Roundabout

Area 4: WWHAR: Metacre Roundabout to the A10

Area 5: A10 tie in and works

4.5.2 The WWHAR is to be unlit, with street lighting only featured on the A47, and at the signalised crossing on the WWHAR, near the Chequers Lane closure.



Figure 4-2: Scheme design overview plan





Area 1: Hardwick Interchange

4.5.3 The Hardwick Interchange at the northernmost point of the Proposed Scheme (comprising both the over-sailing A47 and the underlying circulatory carriageway) forms part of the A47 and is under the jurisdiction of National Highways.

4.5.4 Alterations are required on five of its six arms to accommodate the housing access road and respond to desire lines for future residents to provide connectivity as shown in Figure 4-3. The design in this location proposes:

- Removal of the Constitution Hill satellite roundabout, replacing it with on and off slips to the main circulatory on the east side;
- Improvements to the crossing facilities for Beveridge Way and A10 West Winch Road;
- Optimisation of the southern side of the main circulatory of Hardwick Interchange through localised re-alignment and widening;
- A left in, left out arrangement for access to Hardwick Farm;
- Traffic signal optimisation of Hardwick Interchange; and
- A drainage basin between the A10 and A47 with associated maintenance access track from the A10.

4.5.5 An existing underpass beneath Constitution Hill will be extended as part of the design due to the carriageway widening. The underpass accommodates an existing permissive route which is not currently a Public Right of Way, but is used for private farm access. It cannot be lit for pedestrians as this would interfere with bats that use the structure.

4.5.6 Landscape planting in this area will provide native deciduous woodland, wet woodland, wildflower grassland and individual tree groupings.

Design principles:

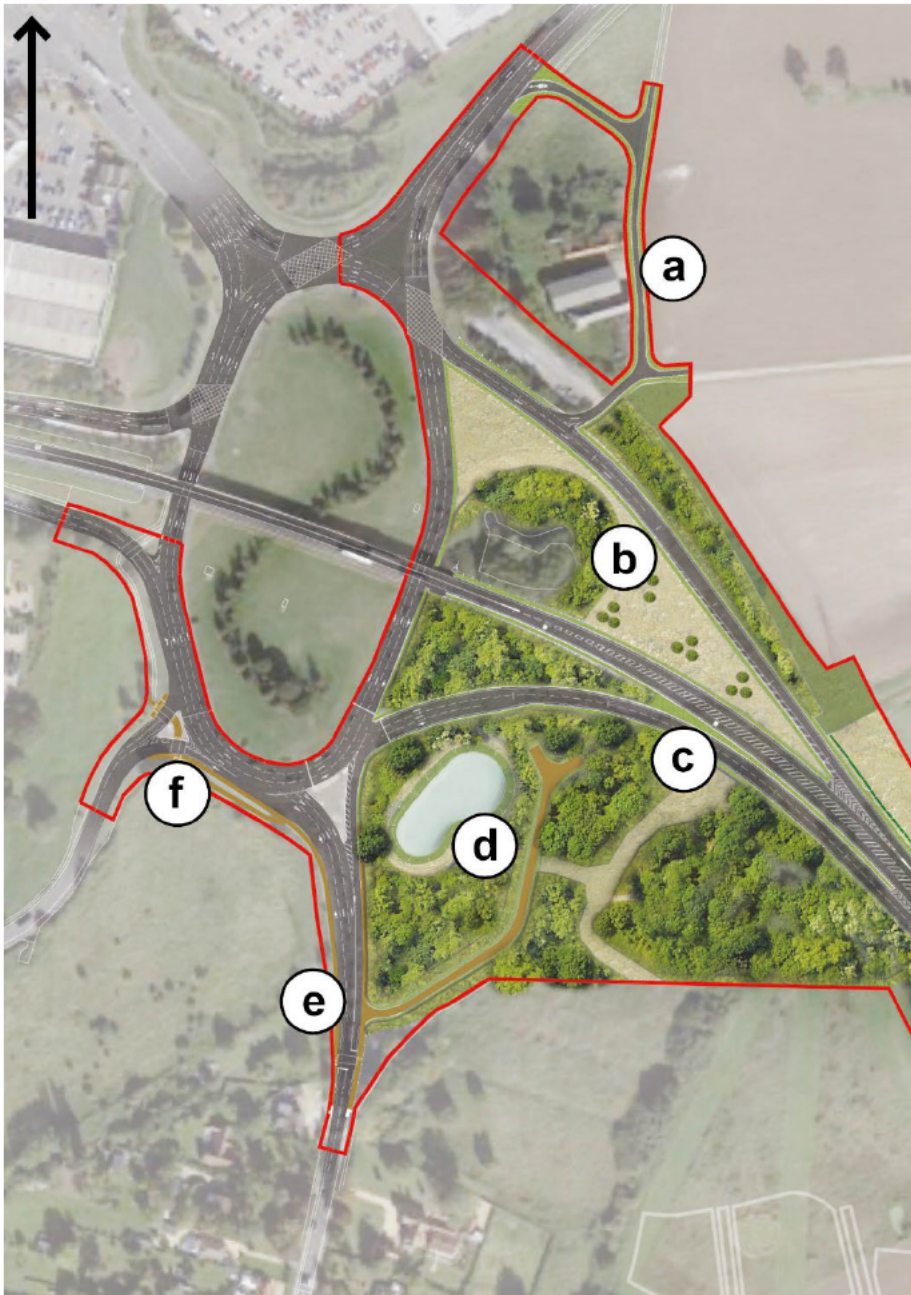
4.5.7 The Proposed Scheme has been designed to:



- Provide resilience to the infrastructure adjoining the WWHAR, to optimise capacity and connectivity;
- Not preclude network improvements made by National Highways;
- Minimise land take required;
- Improve facilities and crossings for walking and cycling; and
- Minimise impact on existing woodland and habitats.



Figure 4-3: Overview plan of Hardwick Interchange



4.5.8 Figure 4-3 presents the following design features at Hardwick Interchange:

- Access for Hardwick Farm
- Removal of satellite roundabout
- Constitution Hill underpass
- Drainage basin and maintenance access track
- Relocation and signalisation of crossing on A10



- Signalised crossing on Beveridge way

Access for Hardwick Farm

4.5.9 The highway design proposed at the Hardwick Interchange has influenced the access arrangement for Hardwick Farm, requiring a solution to be developed with the landowner which maintains access to and from their property.

4.5.10 The design maintains the entrance as a left in via the westbound A47 arm of the junction, and introduces a left out via the A149 Queen Elizabeth Way arm, to maintain access to this property.

Removal of satellite roundabout

4.5.11 This roundabout currently allows traffic movement between the A47 and the Hardwick Interchange circulatory junction. As part of the Proposed Scheme, this roundabout will be removed to facilitate the on and off slip road design.

Constitution Hill Underpass

4.5.12 The existing underpass, owned and maintained by National Highways, carries the A47 over a disused railway line that is now used as a private farm access track. It is a permissive route which does not currently feature a Public Right of Way. It comprises a 35m long corrugated steel pipe buried structure sleeved through a previous structure (prior to Hardwick Interchange works in 2003) with partial retention of the original reinforced concrete abutment and wingwalls at its eastern extent as shown in Figure 4-5.

4.5.13 An extension of the existing corrugated pipe of approximately 40m (52m including the bevelled end which integrates with the sloped embankment) is proposed to the south-west of the existing underpass, to accommodate the highways design. The design for this structure must minimise maintenance requirements and limit risk of settlement between the existing and new structure.



- 4.5.14 Current use by agricultural vehicles will be extinguished as part of the Proposed Scheme, however the structure is required for ecological purposes to maintain an observed bat flight path. This required retention of the height and width of the existing structure must broadly be retained to maintain use, with planting proposed around the structure.
- 4.5.15 The design accommodates any future walking/cycling route delivered separately which may utilise the structure – dictating a minimum desirable headroom of 2.7m according to CD195. Due to the presence of bats, this structure remains unlit. Its cross section is illustrated in Figure 4-6.
- 4.5.16 Utility diversion or mitigation is required to manage the existing assets in proximity to the underpass. This includes a surface water drainage pipe approximately 750mm deep, which carries surface water from the A47 to a drain east of the underpass. A manhole cover located west of the underpass will be relocated further west, as part of the design.
- 4.5.17 Whilst the Proposed Scheme is in an area of low flood risk, Flood Zone 3 on the northeastern side of the A47 is in close proximity to the underpass and therefore considered at risk of flooding.
- 4.5.18 Due to the alignment of the highway above and make up of the pavement design required, the headroom within the underpass may have a minor variation between 3.7m at its lowest point and 4.1m to align with the existing structure at the western extent, flaring to maintain functionality for use by bats.
- 4.5.19 This variation in height is not suited to all structural types, the alternative designs discounted due to constructability and maintenance are discussed further in 5.4.
- 4.5.20 The western extent of the underpass extension will take a similar visual appearance to the current situation with integration of the sloped earth embankments, as shown in Figure 4-4.



Figure 4-4: Photo of existing underpass: western end

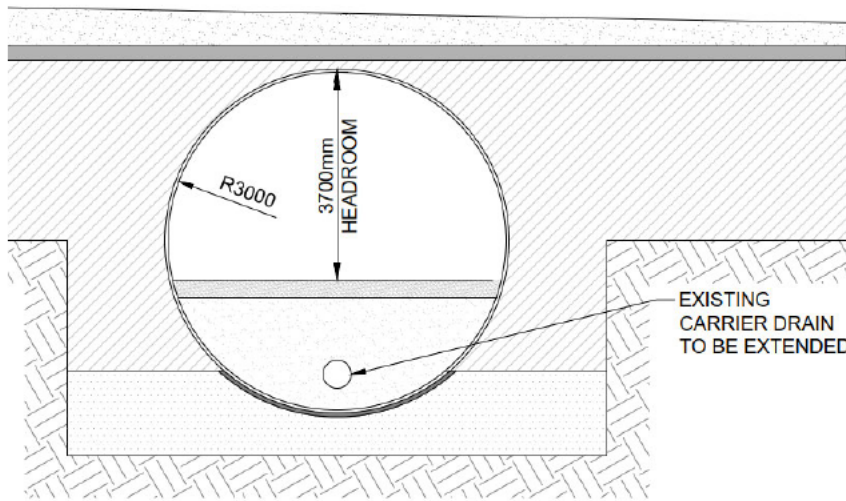


Figure 4-5: Photo of existing underpass: eastern end





Figure 4-6: Cross section view of the proposed underpass extension



Drainage basin and maintenance track

4.5.21 A drainage basin is positioned south of Hardwick Interchange between the A10 and A47 westbound arms, which manages surface water run off from the carriageway. A maintenance access track is required from the A10 to access the basin, which wraps around the eastern side of the basin with turning heads for maintenance vehicles.

4.5.22 The Surface Water Drainage Strategy (document reference: 3.11.02) and Drainage Plans present further detail (document reference: 2.08.00).

4.5.23 This basin has been relocated during design development to minimise land take and environmental impact.



Relocation and signalisation of crossing on the A10

4.5.24 As part of enhancements to the northern extent of the A10, an existing southbound layby will be removed – where the signalised crossing provision will be relocated.

4.5.25 Relocation of the crossing from the Hardwick Interchange junction approximately 150m south to its proposed location aligns with the existing and proposed shared use paths, and reduced the width required to cross.

Signalised crossing on Beveridge Way

4.5.26 Beveridge Way is the only vehicular entrance/exit to the industrial area and employment located south-west of the Hardwick Interchange. A signalised crossing is proposed as part of the design to improve safety in this location for walking and cycling. It utilises the existing central island to provide a two stage toucan crossing. The signal sequencing for the circulatory junction will be adjusted to accommodate this addition, and to support the A10 arm as a priority junction, This is discussed in the Traffic Signal Strategy (document reference: 2.18.00).

Area 2: Dualling of the A47

4.5.27 This section of the Proposed Scheme is immediately east of Hardwick Interchange as shown in Figure 4-7. To facilitate the connection between the new WWHAR and the A47, dualling of the A47 is required, designed to the north of the existing alignment between Hardwick Interchange and the roundabout junction with the WWHAR.

4.5.28 National Highways are delivering improvements across their network and on the A47, the design requires delivery of anticipated dualling as this would not be feasible to implement at a later phase once the WWHAR is in place.

4.5.29 Two residential properties and associated accesses will be removed to facilitate the dualling. Informal laybys will be removed.



4.5.30 The scheme boundary in this location allows flexibility to refine the design during detailed design.

Design principles:

4.5.31 The Proposed Scheme has been designed to:

- Provide resilience to the infrastructure adjoining the WWHAR, to optimise capacity and connectivity;
- Not preclude network improvements made by National Highways; and
- Minimise impact on existing woodland and habitats.



Figure 4-7: Overview plan of the A47 dualling





4.5.32 Figure 4-7 presents the following design features as part of the A47 dualling:

- Dualling of the A47 carriageway
- Demolition of properties and accesses
- Drainage basins and maintenance access track
- Westbound layby
- Dualling of the A47 carriageway

4.5.33 To facilitate the Proposed Scheme, alterations to approximately 1.5km of the A47 are required between Hardwick Interchange and the WWHAR junctions. National Highways are delivering improvements across their network in the area including dualling of the A47 in the Norfolk region, which the Proposed Scheme cannot preclude. For this reason it is necessary to dual the affected section of highway to futureproof this stretch of the trunk road.

4.5.34 The dualling is being delivered to the north of the existing single carriageway, returning to single carriageway east of the WWHAR/A47 roundabout.

4.5.35 North of the carriageway an area of native woodland mix is proposed, with woodland edge species and grasses to provide stratum and diversity in habitats.

Demolition of residential properties and accesses

4.5.36 Due to the alignment of the A47 dualling, it is necessary to demolish two residential properties 'Hill Cottages' and their accesses, located north of the existing carriageway. These properties will be acquired to enable delivery of the Proposed Scheme.

Drainage basins and maintenance access track

4.5.37 Two drainage basins are positioned north-east of the A47/WWHAR roundabout, which manage surface water run-off from the A47 and WWHAR carriageways separately.



4.5.38 A maintenance access track is required from the roundabout junction to access the basin, which provides a dual-purpose as a private means of access, with turning heads provided for maintenance vehicles.

4.5.39 The Surface Water Drainage Strategy (document reference: 3.11.02) and Drainage Plans present further detail (document reference: 2.08.00).

4.5.40 These basins have been relocated during design development to minimise land take and enable efficiency in maintenance by positioning them in proximity to each other. Previously the proposed basin serving the WWHAR was located south of the A47.

Westbound layby

4.5.41 A layby will be introduced on the westbound lane of the single carriageway A47, east of the WWHAR roundabout to replace an existing informal layby that will be removed. An informal existing layby on the eastbound carriageway will also be removed to accommodate the design.

4.5.42 The layby has been positioned to avoid departures from design standards, and to minimise land take requirements.

Area 3: WWHAR: A47 to Metacre Roundabout

4.5.43 This section of the Proposed Scheme comprises a partially-signalised roundabout connection between the A47 and the WWHAR, a dualled section of WWHAR to a roundabout junction with the anticipated housing development. South of the 'Hopkins Homes' Roundabout the WWHAR remains single carriageway.

4.5.44 The dualled section between the two roundabouts will provide adequate capacity for the anticipated growth. Traffic modelling has not demonstrated the need for the full WWHAR to be a dual carriageway with the full housing allocation in place.

4.5.45 A maintenance access track forms an arm off the roundabout to the north to access proposed drainage basins. This also accommodates a private means of access.



4.5.46 It is understood that the housing development brought forward by Hopkins Homes will provide a shared walking/cycling route along the northern perimeter alongside the A47 to Hardwick Interchange. For this reason, it is not included in the Proposed Scheme though the design provides connectivity to this route.

4.5.47 The landscape design in this area provides a tree line effect alongside the new access road surrounded by species rich wildflower. The roundabouts feature specimen tree groupings in the centre.

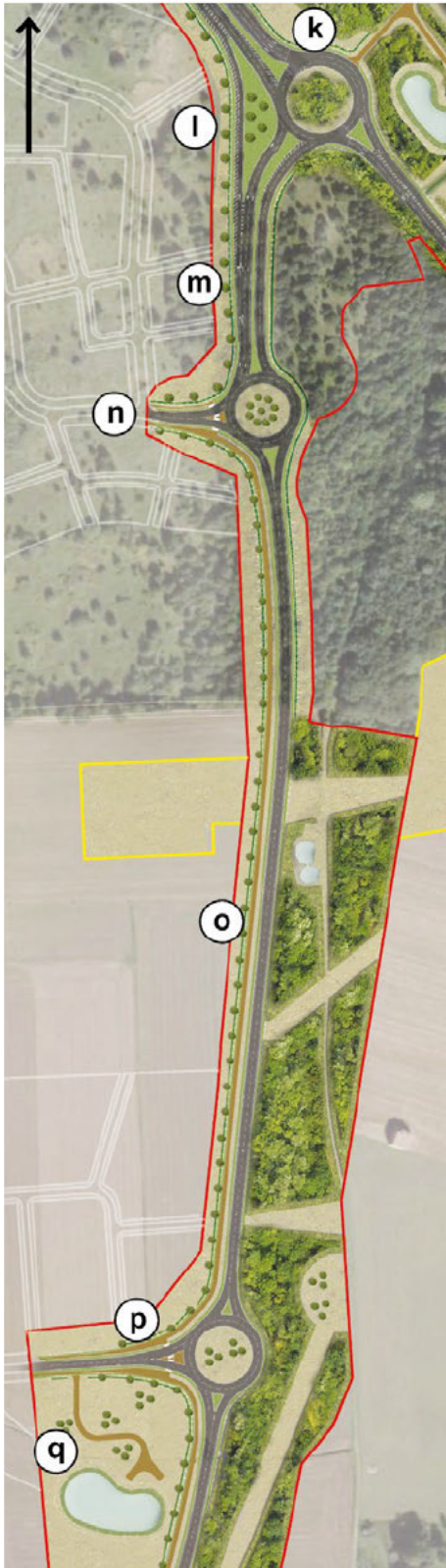
Design principles:

4.5.48 The Proposed Scheme has been designed to:

- Integrate with adjacent housing development and walking/cycling networks proposed
- Provide continuity in walking/cycling provision parallel to the road
- Minimise impact on existing woodland and habitats
- Introduce diverse native planting and habitats to the east



Figure 4-8: Overview plan of the A47/WWHAR to Metacre Roundabout





4.5.49 Figure 4-8 presents the following design features between the A47/WWHAR roundabout to the Metacre Roundabout:

- A47/WWHAR Roundabout
- Left turn slip lane
- Dualled section of WWHAR
- Hopkins Homes roundabout
- Shared walking and cycling route
- Metacre roundabout
- Drainage basin and maintenance access track

A47/WWHAR roundabout and, l) left turn slip lane

4.5.50 A partially signalised roundabout junction connects the proposed WWHAR with the A47. This roundabout is where the proposed dualling ends, and the A47 continues as a single carriageway to the east.

4.5.51 A native woodland mix is proposed in the centre of the roundabout.

4.5.52 A segregated left turn lane enables westbound traffic from WWHAR onto the A47 conveniently without having to negotiate the roundabout.

4.5.53 The central island separating the left turn lane and the roundabout provides an opportunity for tree planting and grass.

Dualled section of the WWHAR

4.5.54 The carriageway, of approximately 200m between the A47/WWHAR and the Hopkins Homes roundabout is to be dualled to accommodate future growth.

4.5.55 Whilst the remainder of the WWHAR proposed a segregated shared walking/cycling route along the western side of the carriageway, the Hopkins Homes development will provide the facility in this location and connectivity with the proposed housing area.

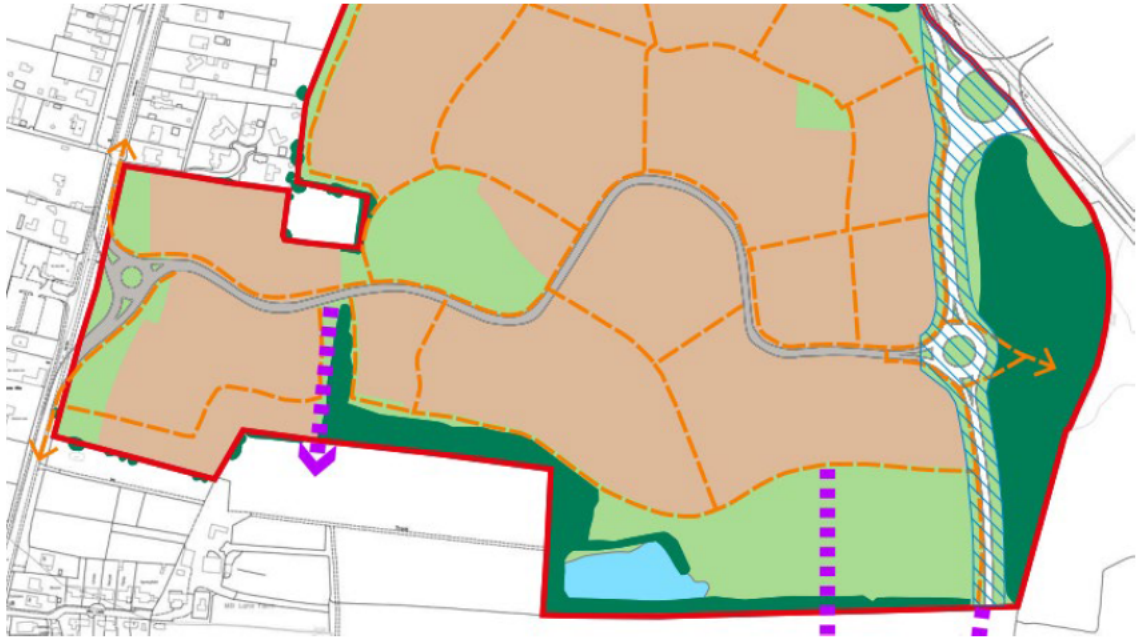
Hopkins Homes roundabout

4.5.56 A roundabout junction will provide access to the proposed Hopkins Homes development, connecting with their main 'feeder road' as presented in their



planning application, which provides the main east to west road through the development connecting with the A10 by another roundabout as part of their scheme as shown in Figure 4-9.

Figure 4-9: Extract from Hopkins Homes' Access Plan

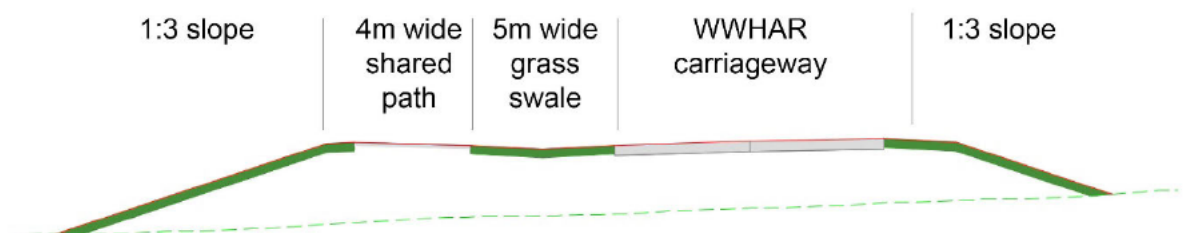


4.5.57 The landscape design in this area provides a tree line and hedgerow effect alongside the new access road surrounded by species rich wildflower. The roundabout features specimen tree groupings in the centre.

Shared walking and cycling route

4.5.58 A segregated 4m wide shared path positioned west of the mainline carriageway as shown in Figure 4-10. It is separated from the mainline carriageway by the 5m wide grass verge swale.

Figure 4-10: Cross section of WWHAR south of Hopkins Homes Roundabout





Metacre Roundabout

4.5.59 This roundabout is the second of the three housing access junctions proposed between the A47 and A10 along the WWHAR, in anticipation of development being delivered on adjacent land in due course.

4.5.60 An informal crossing utilising a central island, aligns with the shared walking/cycling route alongside the carriageway.

4.5.61 The landscape design in this area provides a hedgerow boundary effect alongside the new access road surrounded by species rich wildflower. The roundabout features specimen tree groupings in the centre.

Drainage basin and maintenance access track

4.5.62 South-west of the Metacre roundabout is a drainage basin to manage surface water run-off from the WWHAR carriageway.

4.5.63 A maintenance access track is required to access the basin, with turning heads provided for maintenance vehicles. The track is positioned south of the Metacre Roundabout housing access arm.

The Surface Water Drainage Strategy (document reference: 3.11.02) and Drainage Plans present further detail (document reference: 2.08.00).

Area 4: Metacre Roundabout to A10 tie in

4.5.64 This area of the WWHAR is where the single carriageway angles in a south-westerly alignment to connect to its proposed roundabout junction with the A10. This section of the proposed comprises the Rectory Lane overbridge, Zurich Roundabout, closure of Chequers Lane and a private access.

4.5.65 There are also extensive areas of native woodland planting with glades and grasses to provide habitat along the corridor.

Design principles:

4.5.66 The Proposed Scheme has been designed to:

- To manage east to west movements on existing rural roads



- Integrate with adjacent housing development and walking/cycling networks proposed
- Provide continuity in walking/cycling provision parallel to the road
- Minimise impact on existing woodland and habitats
- Introduce diverse native planting and habitats

Figure 4-11: Overview plan of Metacre roundabout to the A10 tie in





4.5.67 Figure 4-11 presents the following design features between the Metacre roundabout to the A10 tie in:

- Rectory Lane Overbridge
- Zurich roundabout
- Chequers Lane closure and signalised crossing
- Access for Manor Farm

Rectory Lane Overbridge

4.5.68 A road bridge is required to maintain east to west accessibility over the Proposed Scheme. The vertical alignment of this side road was a key factor in the design development of the bridge structure, informing the options considered.

Design principles:

- Limiting the depth of cutting on WWHAR to enable positive drainage outfalls.
- Achieving suitable headroom to the proposed over bridge on Rectory Lane for the WWHAR beneath.
- Achieving NMU accessible gradients on the approaches to the bridge.
- Limiting the height and footprint of the approach embankments to minimise land take requirements.
- Minimising environmental impact, including embodied carbon.

4.5.69 The span of the bridge over WWHAR is approximately 20.7m long with abutments positioned behind verges to minimise the span length. A minimum 5.5m headroom is provided.

4.5.70 An options appraisal was undertaken to consider the most appropriate solution for this structure. Due to the need for further investigations at detailed design stage, two integral options remain for this structure:



- **Option 1** – Single-span integral precast concrete beam and reinforced concrete infill deck, with flexible discrete support columns in front of reinforced earth retaining wall.
- **Option 2** – Single-span integral precast concrete beam and reinforced concrete infill deck, with full-height abutments and reinforced-soil wing-walls.

4.5.71 For each of the options, the construction methodologies vary slightly, with further options available for modular elements to be utilised.

4.5.72 Discounted design alternatives for this structure are presented in 5.4.

4.5.73 The two options are similar in principle and have the same footprint, but provide flexibility for the detailed designer to pursue the option best suited to the site when further investigations have been undertaken. Each offer advantages and disadvantages in cost, construction programme, construction sequencing / methodology, maintenance requirements, and visual appearance.

4.5.74 The parapets included in the design are 1.5m in line with guidance for use of the structure by cyclists, however this may need to increase to 1.8m during detailed design should it be found that equestrians are likely to use the route.

4.5.75 The visual appearance of the structure (including the potential for curved wingwalls) has drawn influence from other structures present on the major road network within Norfolk to provide visual continuity.

Zurich Roundabout

4.5.76 This is the third roundabout to facilitate access to residential development along the WWHAR route. Much like the Metacre roundabout, an informal crossing utilising a central island, aligns with the shared walking/cycling route alongside the carriageway.

4.5.77 The roundabout design aligns with the proposals included within the Metacre Ltd planning application as shown in Figure 4-12.



4.5.78 The landscape design in this area provides a tree lined effect alongside the new access road with woodland, surrounded by species rich wildflower. The roundabout features specimen tree groupings in the centre.

Figure 4-12: Extract from the Metacre Ltd DAS showing the 2011 Framework Masterplan and roundabout connection



Chequers Lane closure and signalised crossing

4.5.79 Chequers Lane is to be stopped up as part of the Proposed Scheme with turning heads provided for general traffic. Access is provided for walking/cycling to provide a connection to the route running alongside the WWHAR.

4.5.80 A signalised at-grade crossing is proposed in this location to maintain east to west connectivity for walking and cycling. A small number of lighting columns are required in this location for safety.



4.5.81 A multi-criteria assessment framework process considered the options against the following criteria to score and enable the most appropriate solution to be included in the design and compliance with standards and guidance. The criteria were derived from the LTN1/20 core principles, including: coherent, direct, safe, comfortable and attractive. The alternative designs that were discounted for Chequers Lane are presented in 5.5.

4.5.82 The proposed solution scored the highest of all options for its compliance with the core principles as it minimises diversion distance, providing a comfortable and convenient solution.

4.5.83 Further considerations will be addressed during the detailed design stage to maximise safety of the crossing including but not limited to: anti-skid surfacing on the carriageway, a number of street lights to ensure visibility of users to approaching vehicles, enforcement of 40mph speed limit.

4.5.84 Due to the use of Chequers Lane by commuting bat species observed during surveys, the landscape design and planting has been developed to support this flight path and encourage its continued use.

Access to Manor Farm

4.5.85 An existing access to Manor Farm severed by the Proposed Scheme, is to be provided as a new left in / left out junction directly off the WWHAR, designed to accommodate HGV traffic.

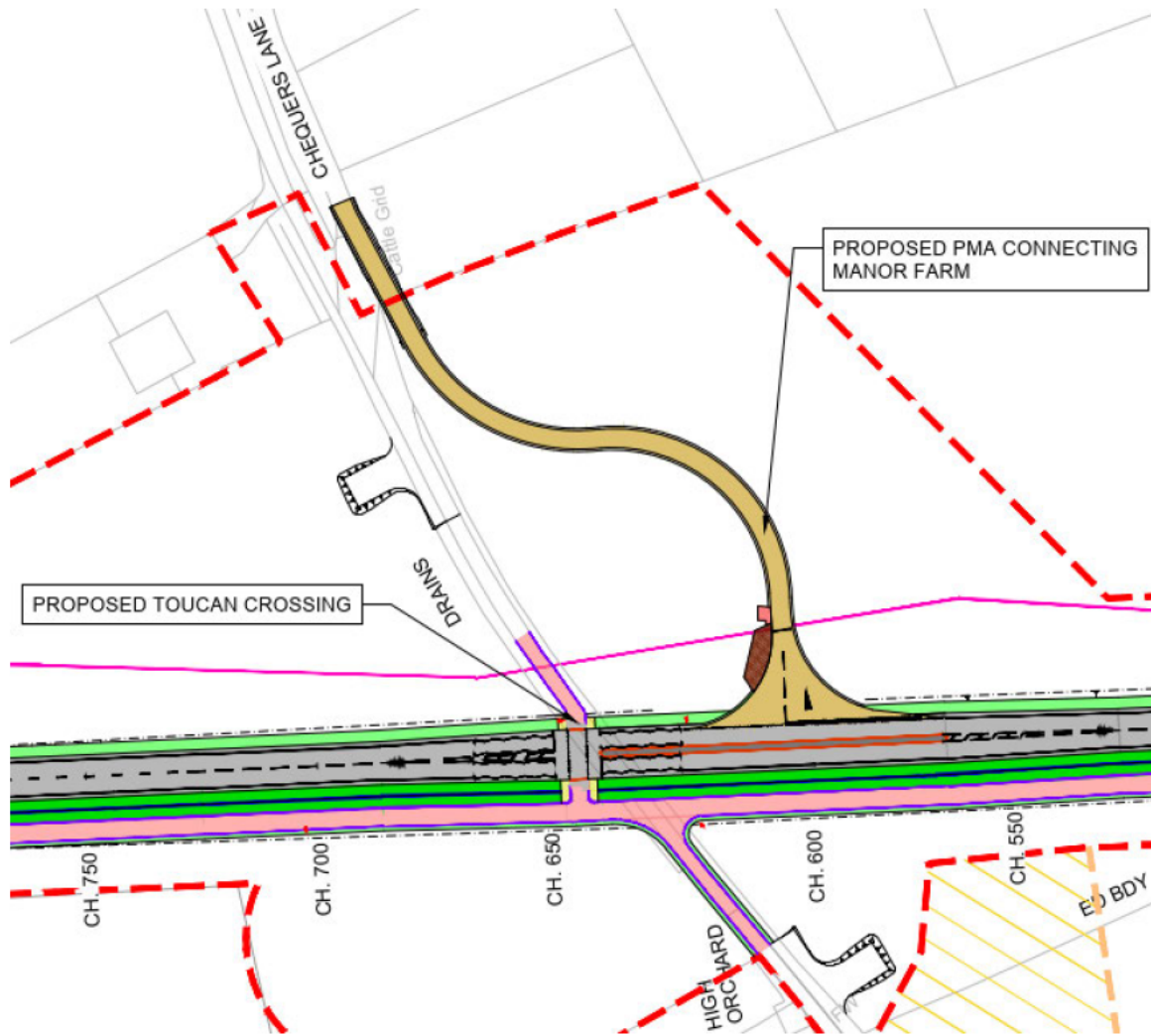
4.5.86 The route of HGVs and vehicles to the farm and nearby agricultural businesses has been considered to maintain a suitable connection for them, to minimise HGVs through North Runcton.

4.5.87 As part of the design development for Chequers Lane, the impacts on a private access to Manor Farm were considered due to its close proximity. Options were developed for treatment of the Manor Farm access, which are discussed in 5-3.



4.5.88 Figure 4-13 is an extract from Highways General Arrangement Plan Sheet 3 (70100518-WSP-HML-HAR-DR-CH-003) (document reference: 2.04.00) it illustrates the proposed design for Chequers Lane and Manor Farm Access.

Figure 4-13: Extract from Highways General Arrangement Plan





Area 5: A10 tie in

4.5.89 This area of the Proposed Scheme is at the southern extent at a new roundabout junction connection with the A10 as shown in Figure 4-14.

4.5.90 The shared walking/cycling route provided alongside the length of the WWHAR continues around to the A10 to tie in with the existing facilities.

4.5.91 A native woodland mix is proposed around the roundabout to provide habitats and visual screening for local residents.

Design principles:

4.5.92 The Proposed Scheme has been designed to:

- To provide a suitable connection with the A10 and Gravellhill Lane
- Improve safety and connectivity for walking and cycling
- Facilitate the repurposing of the A10 as a local route, to provide improved crossing facilities and encourage general traffic to use the WWHAR
- Integrate with the surrounding context and walking/cycling networks
- Provide continuity in walking/cycling provision parallel to the road
- Minimise land take required
- Minimise impact on existing woodland and habitats
- Introduce diverse native planting and habitats



Figure 4-14: Overview plan of the A10 tie in



4.5.93 Figure 4-14 presents the following design features at the A10 and its tie in with WWHAR:

- Drainage basins and maintenance access tracks
- WWHAR/A10 roundabout
- Gravelhill Lane tie in and crossing



Drainage basins and maintenance access tracks

- 4.5.94 A drainage basin is proposed north and south of the A10/WWHAR roundabout on the eastern side of the carriageway to manage surface water run-off from the carriageways.
- 4.5.95 A maintenance access track is required to access the basin, as an arm on the eastern side of the roundabout. A culvert will carry the track over an existing drain in this location.
- 4.5.96 A native woodland area is proposed either side of the maintenance access track, and wildflower grassland around the basins.
- 4.5.97 The Surface Water Drainage Strategy (document reference: 3.11.02) and Drainage Plans present further detail (document reference: 2.08.00).

WWHAR/A10 roundabout

- 4.5.98 This roundabout features four arms, two that draw the A10 westwards to tie in with the WWHAR arm, and the drainage basin access track.
- 4.5.99 The landscape design in this area provides a tree line effect alongside the new access road with woodland blocks, surrounded by species rich wildflower. The roundabout features specimen tree groupings in the centre.
- 4.5.100 An alternative roundabout location south of the proposed location beyond a row of houses was considered and discounted, this is discussed in 5.3.

Gravelhill Lane tie in and signalised crossing

- 4.5.101 Gravelhill Lane forms a main entry from the A10, into an existing residential area south of West Winch village. Its tie in with the repositioned A10 north-west of the WWHAR/A10 roundabout which provides a suitable junction off the repurposed A10 to separate it from the WWHAR junction and traffic.
- 4.5.102 Crossings will be provided north and south of the proposed roundabout to improve safety for walking and cycling, and to provide access to the shared route nearby.



4.6 Complimentary works

- 4.6.1 The Sustainable Transport Strategy (STS) (document reference 4.02.00) introduces measures to repurpose the A10 facilitated by the introduction of the WWHAR, to improve safety for pedestrians and cyclists. The STS aligns with aspirations presented for the area in local policy such as the North Runcton and West Winch Neighbourhood Plan (2017).
- 4.6.2 To ensure the A10 does not remain as an attractive route for through-travelling traffic and becomes used principally by local traffic, it is proposed to introduce a traffic calming scheme onto the A10.
- 4.6.3 Traffic calming measures would be designed in accordance the principles outlined in Manual for Streets 2 which is appropriate for local roads, rather than the guidance of DMRB applicable to trunk road. The proposed measures could include:
- new 30mph and 20mph limits,
 - weight restriction signage,
 - bus stops on carriageway (instead of in laybys),
 - a feature in the centre of the village,
 - a mobility hub, and
 - pedestrian crossings
- 4.6.4 The strategy aligns with proposals presented in the Metacre Ltd Housing Development planning application to provide enhancements on the A10 including crossings and traffic calming measures.
- 4.6.5 It is intended that the A10 measures be brought forward once the WWHAR is in place.



5 Design evolution

5.1 Introduction

5.1.1 This section presents the design evolution of the Proposed Scheme, summarising key design decisions that were made following testing of options – with the original scheme objectives in mind.

5.1.2 The design evolution is described by the following components:

- Route alignment;
- Highways;
- Structures,
- Side roads; and
- Drainage.

5.2 Route alignment

5.2.1 The alignment of the WWHAR is largely dictated by the proposed growth area designation as set out in the local plan, which includes the WWHAR to the east of the proposed new housing. There are no significant alternative highway solutions that would be effective in enabling the housing growth and providing relief to the existing A10 through the village of West Winch.

5.2.2 In 2012, a West Winch Community Planning Workshop hosted by the Borough Council, was held with the purpose of understanding the local views, and to consider options for growth in the area to inform the Neighbourhood Plan.

5.2.3 Through the workshop it was agreed that the design and delivery of a new relief road for West Winch was important both to existing residents but also to facilitate the delivery of new housing.

5.2.4 Therefore, planning work was developed further to determine the most appropriate road infrastructure to support the growth area. Through engagement between the Parish Councils and Norfolk County Council, broad options for the housing access road were identified, as shown in Figure 5-1.



- 5.2.5 It was determined that a route to the eastern extent of the growth area had local support and was more suited to proposals put forward by the two main developers.
- 5.2.6 This alignment was then embodied in the Local Plan, Site Allocations and Development Management Policies (SADMP) (adopted in 2016). These policies set out that the housing allocation could not come forward in its full extent without transport infrastructure in place to mitigate the impacts of the development on existing and future users. This road and settlement concept, with a new route from the A10 south of West Winch to a new junction on the A47 east of Hardwick junctions, was then reflected in the North Runcton and West Winch Neighbourhood Plan which was published in October 2017.
- 5.2.7 With the need for a Housing Access Road established and supported by policy options for the scale of the road were considered in terms of delivery of the overall objectives including:
- **Do Minimum:** 350 homes proposed with no housing access road provided;
 - **Reduced Option:** 1,100 homes proposed with an access road provided from the A47 solely to the site; and
 - **Full Option:** 4,000 homes proposed with the full WWHAR, which will also provide access to the site.
- 5.2.8 The three scenarios are presented in Figure 5-2.
- 5.2.9 This study concluded the full option of a housing access road from the A47 to A10 is the only way to achieve the objectives and support future growth, including up to 4000 homes.



Figure 5-1: Ideas for the position of a housing access road from 2012 consultation

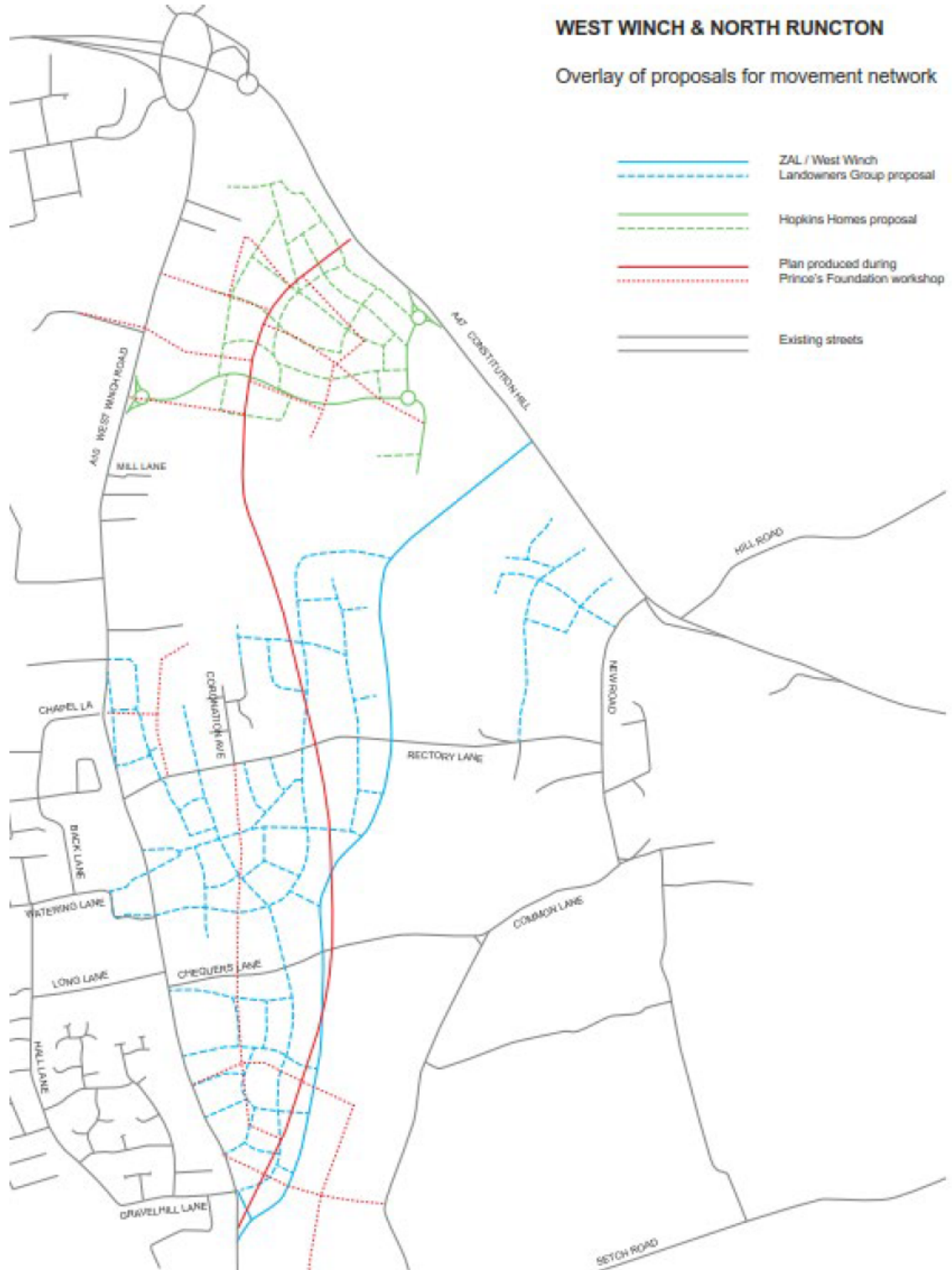
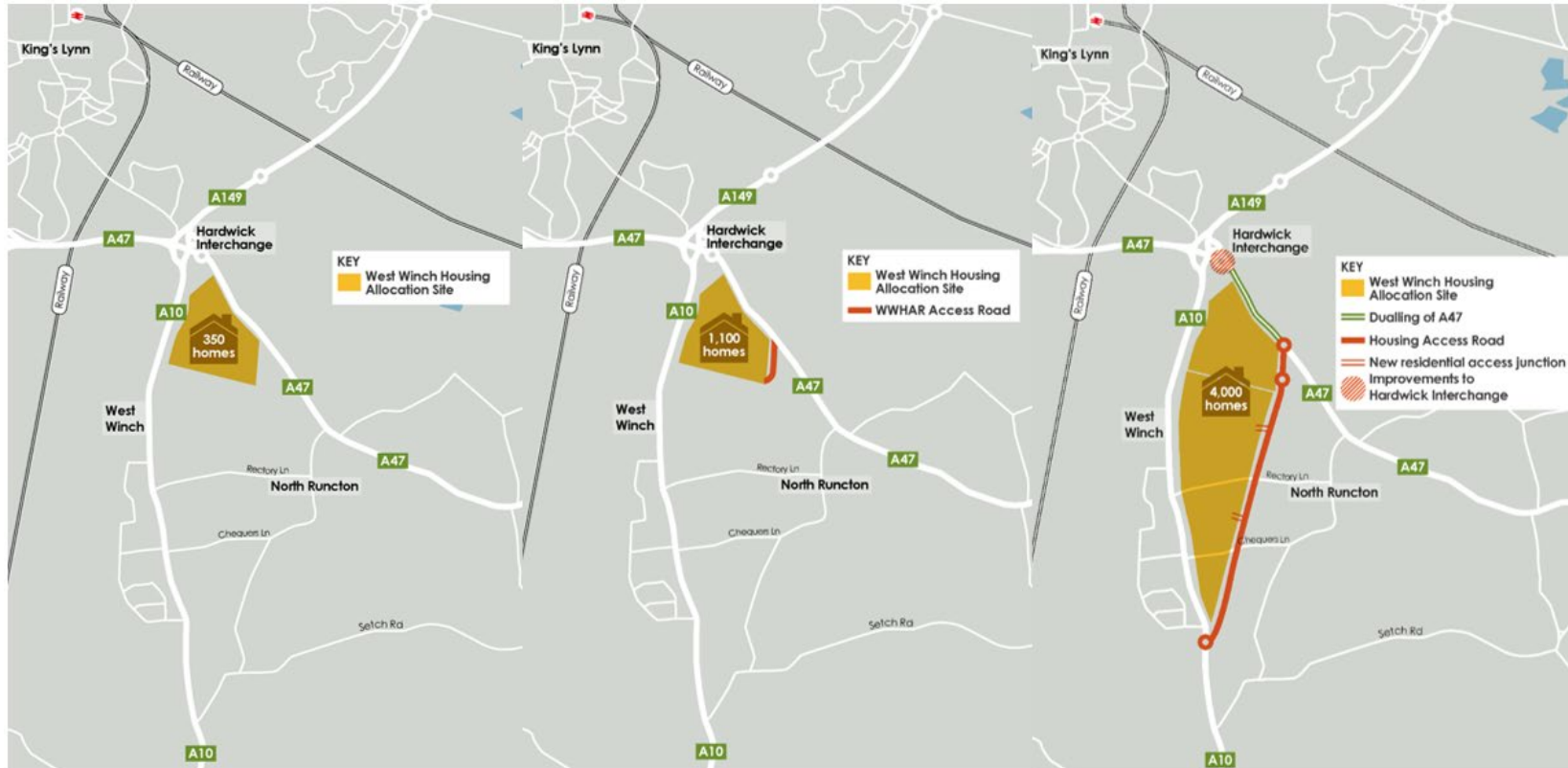




Figure 5-2: Three scenarios for housing development: Do minimum, reduced option, and full option





5.3 Highways

5.3.1 Following the adoption of the full option providing an access road from A47 to A10, options were considered for the highways alignment and junctions at the northern and southern extents.

5.3.2 For ease of explanation and in line with the design development undertaken, this is presented in the following sections:

- Hardwick interchange and A47
- WWHAR Northern extent
- WWHAR Southern extent

Hardwick Interchange and A47

5.3.3 An options study was undertaken in 2019 (Appendix B of the OBC (document reference 70100518-OBC-B) to consider the Hardwick Interchange and A47 alterations required to facilitate the delivery of the WWHAR and futureproofing of the network in this location.

5.3.4 The following options were considered:

- **Option 1:** This includes a new signalised roundabout with a south-west left turn bypass at the intersection of the WWHAR and the A47. This will tie in a dualled A47 between the new roundabout and the existing Constitution Hill roundabout. The Constitution Hill roundabout will remain as priority controlled but the diameter will be increased with the aim of avoiding the need for additional traffic signals. The A47 dualling would be undertaken offline to the north to minimise construction impact. This option requires online works at Constitution Hill. Optimisation of the main Hardwick Interchange circulatory will be needed to accommodate additional traffic flows.
- **Option 2:** this option is identical to Option 1 except at Constitution Hill where the satellite roundabout at Hardwick Interchange is replaced by a signalised T-Junction with a north to east left turn bypass.



- **Option 3:** this removes the Constitution Hill node of Hardwick Interchange and replaces it with on and off slips on the eastern side. To accommodate the change in traffic flow movements at Hardwick Interchange associated with the new on-slip, the circulatory has been expanded to the south and traffic signal timings and phasing changed. As with the previous two options, Option 3 includes a dualling to the north of the A47 between Hardwick Interchange and the WWHAR roundabout. The roundabout will need to be signalised with a south to west left turn bypass once all 4,000 are built out and occupied.
- **Option 4:** This option intends to keep both strategic east-west A47 traffic and north-south A10 traffic separate from each other to remove any potential issues which could arise from lane switch in a short length of road. The Option includes a parallel road arrangement between the WWHAR and Hardwick Interchange, the removal of the Constitution Hill roundabout and a new four-arm priority-controlled roundabout at the intersection of the A10 and A47. This option does not require the A47 to be dualled.
- **Option 5:** This option bypasses the A47 and Hardwick Interchange, limiting the impact of the design on the strategic road network and potentially providing wider traffic relief. The option includes a new single carriageway link road between a four-arm priority-controlled roundabout at the WWHAR and A47 intersection and the existing roundabout on the A149 immediately to the north. This option does not include dualling of the A47 or any other change to Hardwick Interchange.
- **Option 6:** This is similar to Option 3 as it also provides eastern on and off slip lanes for Hardwick Interchange. However, this option retains the Constitution Hill as a priority-controlled roundabout to allow for more flexible route choices, particularly from Hardwick Road to the A47 west. As with Option 3, the A47 would be dualled to the north and a signalised roundabout would be placed at the WWHAR intersection with the A47.



- **Option 7:** this is the second parallel road option. In this proposal the existing A47 would become a continuation of the WWHAR (new A10) and would join Hardwick interchange at a new node, providing an uninterrupted journey between Hardwick and a new priority-controlled roundabout. The A47 would take the form of a new single carriageway road north of the new A10 which would be uninterrupted within the study area with all accesses taking the form of merges and diverges. This option would remove the possibility of turning south to east from the WWHAR to the A47 and traffic wishing to make this movement would need to use the old A10 and turn east at Hardwick Interchange.

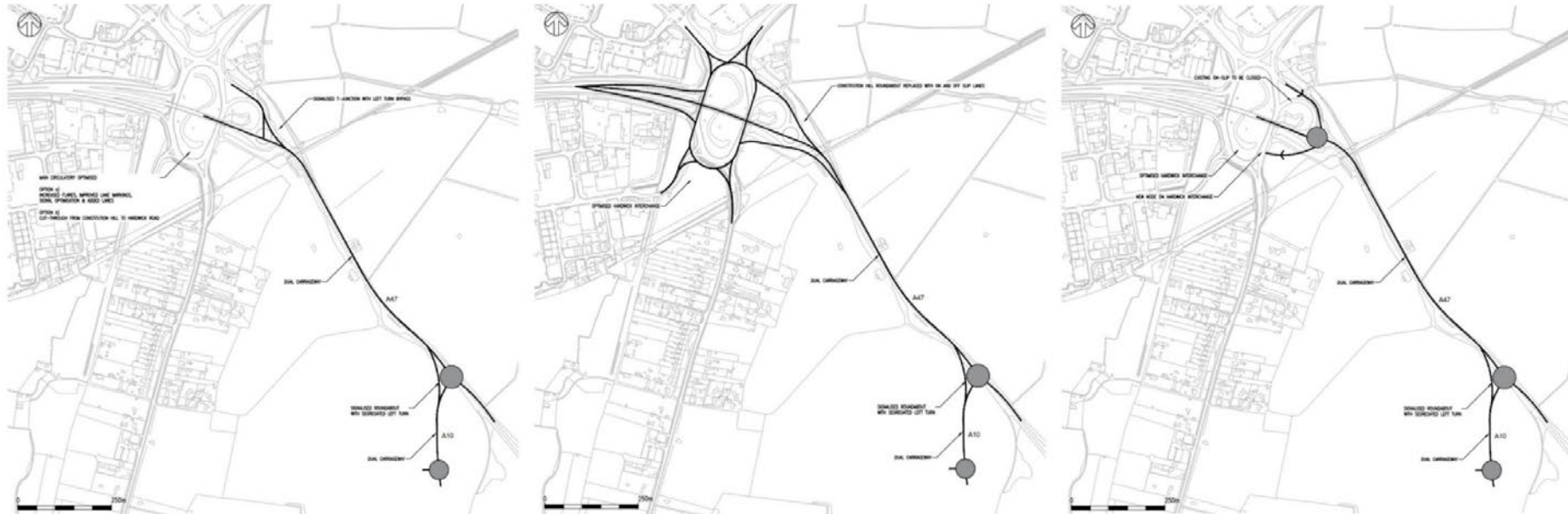
5.3.5 Journey time modelling and sifting of the options concluded a shortlist of Options 2, 3 and 6 (as shown in Figure 5-3) for further consideration against the following criteria:

- Ability to facilitate new housing
- Vehicle speeds on network
- Impact on existing traffic movements
- Affordability
- Constructability
- Flexibility

5.3.6 Preliminary highway designs were produced for Options 2, 3 and 6 to further consider and compare the feasibility of them. The three options proposed similar optimisation of Hardwick Interchange circulatory junction and the same roundabout junction between the A47 and WWHAR.

5.3.7 This study concluded that Option 3 was the preferred option for futureproofing the network and achieving the objectives of the Proposed Scheme, and was therefore adopted within the design.

Figure 5-3: Extracts from OBC Appendix B showing the shortlisted options for the Hardwick Interchange and A47 options 2, 3 and 6





WWHAR Northern extent options

5.3.8 The Hopkins Homes planning application design at the northern portion of the growth area designation, included a proposal for the northern section of Housing Access Road where it interfaces with the housing development and access to it as shown in Figure 5-4.

Figure 5-4: Extract from Hopkins Homes Hardwick Green Masterplan



5.3.9 The following summarises the findings of the 'Route Alignment Option (Northern Section) Technical Note (2018) appended to the Outline Business Case (2023) (document reference: 70100518-OBC-B) presenting the options considered for the northern WWHAR tie in with the A47.

5.3.10 As it is anticipated that the housing access road could become the new A10, the link geometry presented is not considered to be consistent with the



requirements of the strategic road network. More appropriate alignment options were considered and appraised.

5.3.11 Five options considered for the A47 connection, and Hopkins Homes development are presented in Figure 5-5. The main differences between the options are the position in relation to Sheeps Course Wood, with Options 1, 2 and 3 to the west of the woods creating a barrier between the housing development amenity space and the woods. However, Options 4 and 5 west of the woods would be located in third party land which would required acquisition, and a greater length of A47 dualling.

- **Option 1:** This option is a simple re-alignment of the link between the two roundabouts proposed by the Hardwick Green development, with a tie-in to the remainder of the WWHAR to the south.
- **Option 2:** As with option 1, but with the access to the development access roundabout positioned further east.
- **Option 3:** This option is the same as Option 2 but positions the A47 roundabout further east.
- **Option 4:** This route alignment option is positioned to the east of Sheeps Course Wood, but close to the property boundary and in third party land.
- **Option 5:** The final route option is the same as option 4 but is positioned further east to tie-in to an alternative WWHAR alignment to the south.



Figure 5-5: Options 1-5 (left to right) for the northern extent of WWHAR



5.3.12 Option 2 was selected as the preferred option with further modifications in agreement with Hopkins Homes providing the adopted solution for the design as shown in Figure 5-6.



5.3.15 During detailed design, further design integration will need to occur to ensure that the WWHAR and Hopkins Homes developments align. The principle of a shared walking/cycling route around the eastern perimeter of the housing development has enabled the removal of this section from the WWHAR to avoid duplication. Landscape planting, fencing and other details will need to be refined collaboratively during the detailed design phases.

Figure 5-7: Extract from Hopkins Homes ‘Illustrative Masterplan’



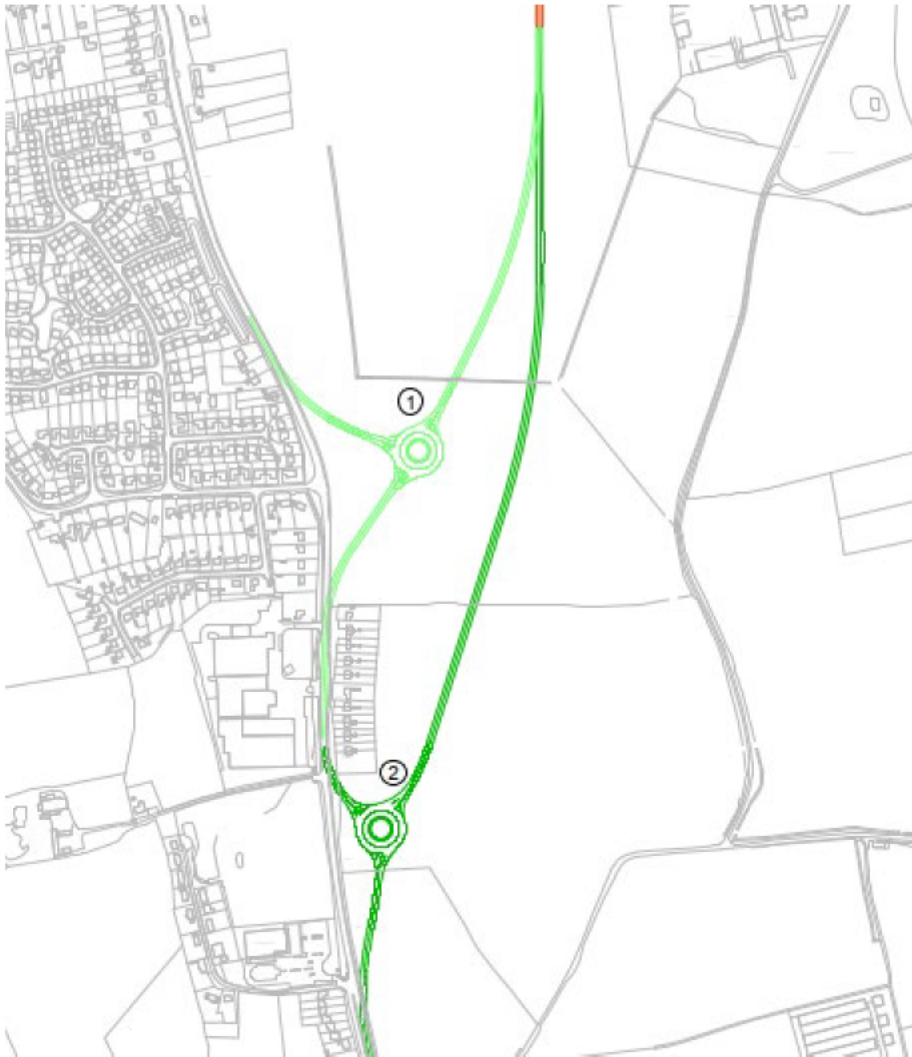


WWHAR Southern Extent Options

- 5.3.16 A roundabout junction will be provided at the tie-in of the A10 with the WWHAR, to the south of West Winch. Traffic modelling showed that the predicted turning traffic movements would have made it difficult for traffic to turn right and exit onto the WWHAR from the A10 if a priority junction were used instead.
- 5.3.17 Two key options were explored for the roundabout junction of WWHAR and the A10 at the southern extent of the Proposed Scheme as shown in Figure 5-8.
- 5.3.18 The following summarises the 'Route Alignment Options (Central and Southern Sections) (2018) report appended to the Outline Business Case (2023) (document reference: 70100518-OBC-B) presenting options for the WWHAR tie in with the A10.



Figure 5-8: Options for the southern extent of WWHAR



5.3.19 The roundabout would be located on land to the east of the existing A10 junction with Gravelhill Lane (ie land within the King's Lynn Strategic Growth Area). The two options considered are as follows:

- **Option 1:** This option ties into the existing A10 at the earliest opportunity south of West Winch, but north of a row of 19 residential properties and a significant commercial unit. Access to the old A10 and existing property currently fronting the A10 close to the tie-in point will be via a new link(s) to an off-line roundabout



- **Option 2:** Tying in further south than Option 1, thereby bypassing the 19 residential properties and single commercial unit and linking back to the old A10 via new link(s) to an off-line roundabout.

5.3.20 These options were considered in terms of:

- Tie-in / impact on existing A10;
- Quality of new A10 highway alignment;
- Integration with existing roads;
- Land ownership;
- Relative costs;
- Relative benefits; and
- Strategic Planning considerations.

5.3.21 It was concluded that Option 1 with the roundabout positioned to the north of the row of houses would be more achievable, particularly noting its position within the allocated growth area rather than third party requiring acquisition. This option also shortens the length of the WWHAR to be delivered.

Access to housing development

5.3.22 The preliminary design for WWHAR at the Strategic Outline Business Case (SOBC) stage included two ghost island priority junctions to provide access to housing development. This junction was assumed to prioritise uninterrupted movement between the A47 and the A10, providing a convenient route for vehicles and assumed speed of 60mph. Following a design review in 2019 to consider safety and traffic modelling, alternative options were considered.

5.3.23 Alternatives were considered to maximise housing development land, minimise noise impacts and to align with requirements of a major road network. The options included the following scenarios:

- **Scenario 1:** the current housing access road's design (based on 60 mph speed limit) is amended to include two roundabout junctions as



replacements for the current housing accesses on the new access road;

- **Scenario 2:** the current housing access road's design (60 mph speed limit) is amended to include a single roundabout junction on the new access road – this scenario assumes the masterplan will provide a junction which will connect Rectory Lane and the internal masterplan access road;
- **Scenario 3:** the current housing access road's design is amended to retain two priority access junctions but with changes to the road's speed limit (now based on 40 mph speed limit) and alignment to produce a road alignment that gets closer to the housing allocation boundary;
- **Scenario 4:** the current housing access road's design is amended to replace the two priority access junctions with roundabouts and with changes to the road's speed limit (40 mph speed limit) to enable a road alignment that gets closer to the housing allocation boundary;
- **Scenario 5:** the current housing access road's design is amended to replace the priority access junctions with a single roundabout and with changes to the road's speed limit (40 mph speed limit) to enable a road alignment that gets closer to the housing allocation boundary – this scenario assumes the masterplan will provide a junction which will connect Rectory Lane and the internal masterplan access road;
- **Scenario 6:** the current housing access road's design is amended to retain two priority access junctions but with changes to the road's speed limit (40 mph speed limit) to enable a road alignment that remains within the housing allocation area;
- **Scenario 7:** the current housing access road's design is amended to replace priority access junctions with roundabouts and with changes to the road's speed limit (40 mph speed limit) to enable a road alignment that remains within the housing allocation area;
- **Scenario 8:** the current housing access road's design is amended to replace the priority access junctions with a single roundabout and with



changes to the road's speed limit (40 mph speed limit) to enable a road alignment that remains within the housing allocation area - this scenario assumes the masterplan will provide a junction which will connect Rectory Lane and the internal masterplan access road.

5.3.24 The scenarios were modelled and tested for their network performance, journey times and traffic flows. Scenarios 1, 4, and 5 were taken forward for consideration, with the remainder of the options discounted due to safety concerns or inability to achieve the objectives of the Proposed Scheme.

5.3.25 Scenarios 1 and 4 are similar in that they replace the two access junctions proposed by the SOBC design with two roundabout access junctions. These scenarios do not provide additional land for housing growth. They reduce traffic speeds on the housing access road which might reduce the impact of traffic noise thereby freeing up land within the housing allocation area for housing.

5.3.26 Scenario 5 complicates delivery of housing in the area south of Rectory Lane. It also presents a highway alignment that may have implications for road safety. The highway alignments presented by scenario 5 may not be deemed suitable for a part of the Major Road Network.

5.3.27 Scenario 4 was adopted as it provided the best balance in achieving the objectives, and is included in the design for the Proposed Scheme.

Manor Farm Access

5.3.28 As part of the design development for Chequers Lane, the impacts on a private access to Manor Farm were considered due to its close proximity. Options were developed for treatment of the Manor Farm access, including:

- A direct access to WWHAR allowing all movements
- Direct access to WWHAR with left in / left out only
- Direct access to WWHAR with left in / left out dedicated lanes
- Diversion to Setch Road
- Diversion to access via southern roundabout



5.3.29 The options were compared against the following criteria: connectivity, geometry and safety, cost and maintenance, land requirement.

5.4 Structures

5.4.1 The following structures have been considered during the design development of the Proposed Scheme:

- Constitution Hill underpass – at the A47, east of Hardwick Interchange
- Rectory Lane overbridge – a side road which crosses the WWHAR at ch1250
- Chequers Lane overbridge – a side road which crosses the WWHAR at ch 625, and later discounted as described in 5.5.

Constitution Hill Underpass

5.4.2 The vertical and horizontal highway alignment of the A47 above the underpass dictate the extension required to the structure, whilst managing constraints including utilities, ecology, and drainage / flooding. This also impacts the depth of cover between the highway and the structure, which in turn informs the feasibility of structural options to ensure sufficient cover is achieved.

5.4.3 The extension must be cost effective, maintainable, and compatible with the existing underpass structure.

5.4.4 Alternatives considered included:

- Precast concrete joined portal frame
- Precast concrete arch
- Traditional bridge
- Large diameter twin wall plastic pipe
- Precast reinforced concrete box

5.4.5 The precast concrete joined portal frame option (as shown in Figure 5-9) would have required sections of the underpass to be brought to site with



precast reinforced concrete headwalls and wingwalls at the western extent.

Due to the varied height of the underpass, the rectangular units would have to be individually fabricated which is not efficient. The joints and particularly at the lowest point in the underpass, maintenance liabilities would be present where water could accumulate and cause leakage. Alternatives within this option to achieve a continuous height would compromise the cover above the structure, or increase the flooding risk by lowering the ground level. This option also presents a risk of differential settlement, particularly with the weight of the earthworks acting upon the structure.

- 5.4.6 The precast concrete arch option (as shown in Figure 5-10) is similar to the portal frame option as it would be constructed in sections, but provides a rounded arch solution. This faces similar issues with inconsistent height sections causing inefficiencies and risks to the longevity and maintenance of the structure.
- 5.4.7 A traditional bridge structure with reinforced concrete beams and abutments would be more complex to design and construct than other options. It also requires longer programme and greater cost to build.
- 5.4.8 A large diameter twin-wall plastic pipe option may incur capacity issues for provision for abnormal loads and is not available in the sizes required (the largest available is 3.5m).
- 5.4.9 A precast reinforced single concrete box has similar constraints to the precast portals with the added complexity of constructing the interface connection with the existing structure.
- 5.4.10 There is a risk with these options that the lack of continuity with the existing structure could compromise its use by bats.
- 5.4.11 These alternative options were not deemed viable for the Proposed Scheme and were therefore discounted. The chosen solution was an extension of the existing corrugated steel structure.



Figure 5-9: Section view of the portal frame option where it joins the existing pipe

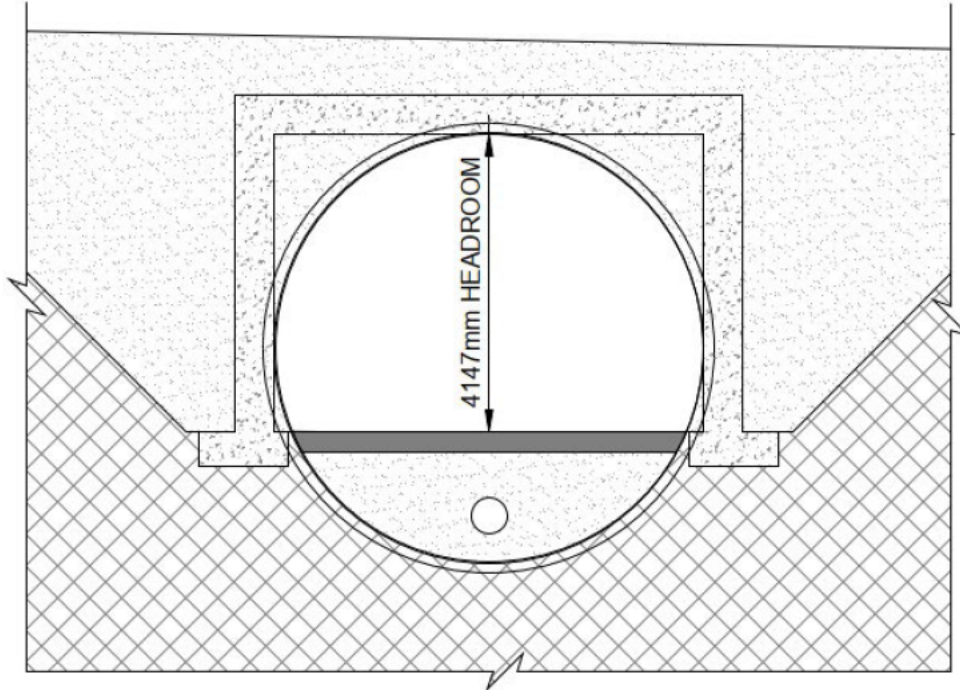
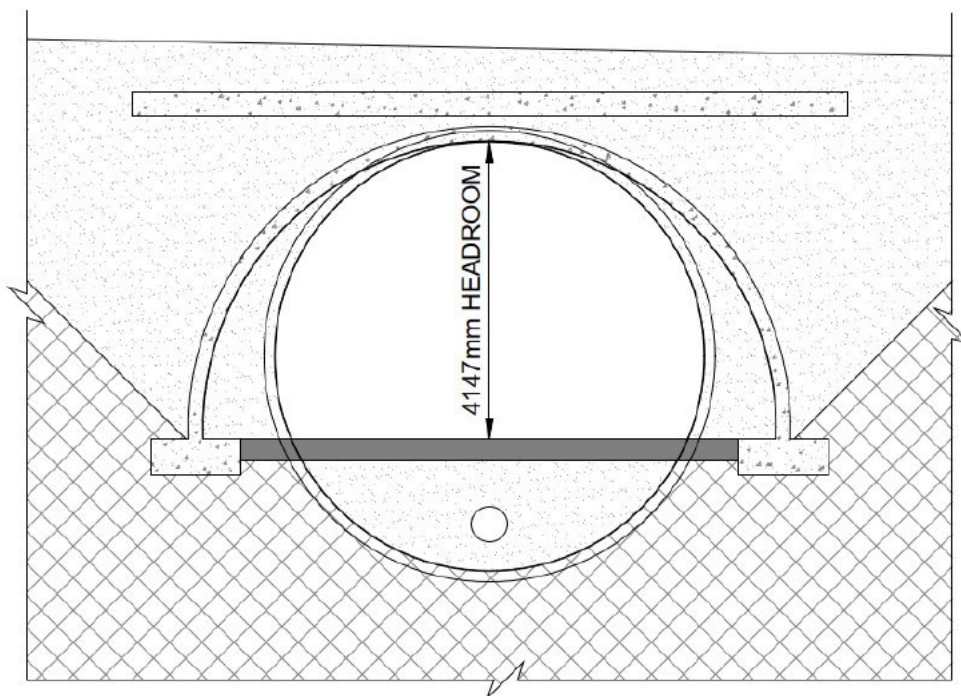


Figure 5-10: Section view of the concrete arch option where it joins the existing pipe





Rectory Lane Overbridge

5.4.12 From the review of the site-specific considerations and the preferred vertical alignment for the re-aligned Rectory Lane, the following two options have been identified as the most appropriate for further consideration and appraisal:

- Option 1 – Single-span integral precast concrete beam and reinforced concrete (RC) infill deck, with flexible discrete support columns in front of reinforced earth retaining wall.
- Option 2 – Single-span integral precast concrete beam and reinforced concrete (RC) infill deck, with full-height abutments and reinforced-soil wing-walls.

5.4.13 Due to the need for further investigation to inform this design decision at detailed design stage, the two options remain within the planning application.

5.4.14 Consideration was given to the possibility of designing the structure offline to minimise impact on local residents caused to headlights, and provide efficiencies during construction however this option was ruled out.

5.4.15 The following options were considered but were discounted at an early stage as they were not deemed to merit further examination.

- A substructure option comprising a flexible abutment within reinforced-soil wall – this option was discounted as it would require a longer span length, subsequently increasing the construction depth in comparison with the chosen option.
- Steel composite 'I' girders deck – this form of structure would be more costly than the precast prestressed beams alternatives.
- In-situ reinforced concrete slab deck – this form of construction requires greater construction depth in comparison with the other options considered. It also requires a greater amount of falsework to construct the deck which would be more complex than alternative options.



- Precast prestressed beam and slab deck (including 'TY', 'Y' and 'U' beams) – these options require less concrete than a slab and beam with concrete infill slab deck. However, they were discounted on the basis of the increased construction depth in comparison with the preferred slab option. The beam and slab options would also require the installation of permanent formwork panels which adds to the risk of working at height.

Chequers Lane overbridge

5.4.16 A pedestrian/cycle overbridge was considered as one of the possible options to maintain east to west connectivity across the Proposed Scheme for non-motorised users at Chequers Lane.

5.4.17 The bridge option was discounted as the 2nd best scoring option in favour of an at-grade signalised crossing, see 5.5. The bridge design featured a 3.5m width structure with 1.4m high parapets, spanning a minimum of 28m over the WWHAR.

5.4.18 To provide comfortable gradients (shallower than 1:20) on the approach slopes, and adequate headroom of 5.5m minimum below the structure, ramps of a minimum 115m long would be required.

5.4.19 To prevent fast speeds by cyclists down the ramps, a curved alignment with earthworks and planting was considered, to create a solution sympathetic to its environment and appealing to its users.

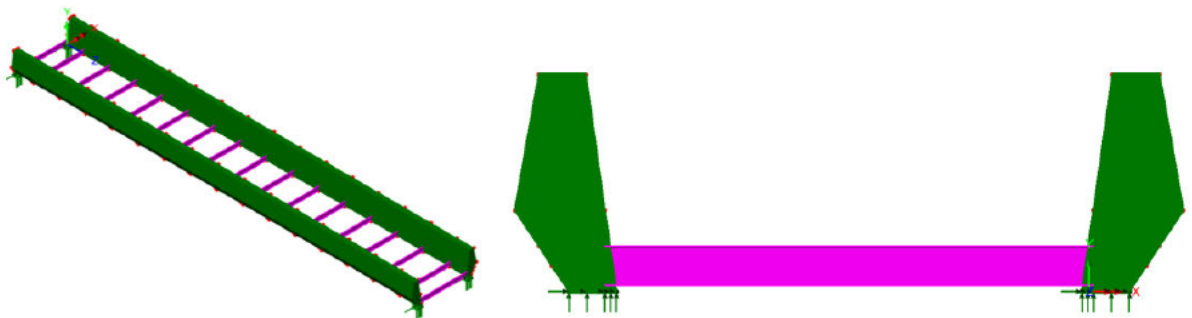
5.4.20 One structural option considered for the bridge was a half-through plate girder, comprising a pair of girders with bracing between them and the deck on top. This was considered as it allows architectural flexibility to propose chosen materials for the walkway and as cladding on the girders, though the use of weathered steel would minimise maintenance requirements.

5.4.21 The preferred structural option (as shown in Figure 5-11) was a box girder bridge with a similar concept, whilst it offers less architectural freedom, it was

considered more efficient, with lower maintenance requirements, and a sleek elevation achievable to aid its integration with the landscape.

5.4.22 Whilst the overbridge would have provided separation from the main carriageway for non-motorised users, the ramp lengths and gradients make this option less comfortable and convenient for users than alternative options.

Figure 5-11: Images of the box girder bridge model



5.5 Side roads

5.5.1 In 2019 a study was undertaken to consider the options for Rectory Lane, Chequers Lane, and the A10 connection, which cross the Proposed Scheme. The primary considerations included:

- Provide a high level of connectivity between the West Winch and North Runcton communities;
- Discouraging rat-running through North Runcton;
- Minimise delay on the WWHAR;
- Preserve amenity for existing properties; and
- Integrate Rectory Lane and Chequers Lane into an access strategy for the West Winch housing allocation.

5.5.2 The options included:

- **Option A (the chosen option):** Rectory Lane as the primary east to west link – an overbridge for all users at Rectory Lane, closure of Chequers Lane where it meets the WWHAR, diversion of the A10 to converge with WWHAR at an at-grade junction;



- **Option B:** Chequers Lane as the primary east to west link – with an at-grade junction of the western side of Rectory Lane with WWHAR, closure of the eastern side of Rectory Lane where it meets the WWHAR, and overbridge for Chequers Lane and diversion of the A10 to converge with WWHAR at an at-grade junction;
- **Option C:** Rectory Lane as the primary east to west link – an overbridge for all users at Rectory Lane, and at-grade junction of the western side of Chequers Lane with WWHAR, closure of the eastern side of Chequers Lane where it meets the WWHAR, and closure of the A10 where it converges with the WWHAR;
- **Option D:** Portions of Rectory Lane and Chequers Lane used to maintain east to west link - with an at-grade junction of the western side of Rectory Lane with WWHAR, closure of the eastern side of Rectory Lane where it meets the WWHAR, an at-grade junction of the eastern side of Chequers Lane with WWHAR, closure of the western side where it meets the WWHAR. Also, diversion of the A10 to converge with WWHAR at an at-grade junction;
- **Option E:** Rectory Lane and Chequers Lane provide east to west links for particular users – Rectory Lane to be closed to traffic where it meets the WWHAR with a pedestrian/cycle bridge crossing provided, and at-grade junction of Chequers Lane and WWHAR, closure of the A10 where it converges with the WWHAR;

5.5.3 The options were scored against the following criteria:

- Vehicular connectivity
- Pedestrian connectivity
- Rat-running detraction
- Potential delay for WWHAR
- Physical constraints

5.5.4 The scoring confirmed that Option A was the most effective option, this option was agreed with West Winch and North Runcton Parish councils in April 2019.



Chequers Lane

5.5.5 A further study investigating the treatment of Chequers Lane was undertaken in 2023. Rectory Lane is the main east to west route crossing the Proposed Scheme, allowing options to be considered for the treatment of Chequers Lane including its potential closure to general traffic. This principle was supported by responses received during public consultation in early 2023.

5.5.6 The options for treatment of the Chequers Lane closure for non-motorised users, considered during the design development included:

- Grade separated bridge (overbridge)
- At-grade crossing (non-signalised)
- At-grade crossing (signalised) – **the chosen option**
- Diversion to northern roundabout
- Diversion to Rectory Lane Bridge

5.5.7 Options for Chequers Lane were appraised using a multi-criteria assessment framework to test the options against the core principles of LTN1/20 for compliance including:

- Coherent – junctions should enable and facilitate cycle movements in all permitted directions. These should be made in a legible manner, without requiring people to deviate from their overall desire lines.
- Direct – the distance and time required for cyclists to travel through a junction should be minimised. Cycle crossing at junctions and across links should not be staggered.
- Safe – junctions should be designed to remove or manage conflicts between cyclists, motor traffic, and pedestrians
- Comfortable – the occasions when cyclists need to stop or to give way should be minimised. Routes through junctions should ease the passage of cyclists by providing a smooth surface of adequate width, with flush surfaces at transitions, and avoid street clutter



- Attractive – junctions are often important places where people gather and should be designed to suit and enhance their context

5.5.8 The at-grade signalised crossing option scored the highest in the assessment and has been included in the design for which planning consent is sought.

5.5.9 Considerations for this component of the design in the next stage of the design include:

- Approach Speeds of Vehicles: speeds of vehicles along the WWHAR would need to be enforced so that they do not exceed the proposed 40mph limit;
- Safety: adequate visibility to pedestrians on approach and for drivers to see the crossing;
- Street lighting would be needed to comply with Chapter 6 of the Traffic Signs manual, so that drivers can see users on approach;
- Provision of skid-resistant surfacing on the carriageway; and
- A Road Safety Audit (RSA) would need to be conducted.

6 Proposed Scheme design response to policy

6.1.1 The following table considers how the design for the Proposed Scheme has responded to the relevant policy relating to design.

Table 6-1 – Policy GA04 design of a ‘relief road’ North Runcton and West Winch Neighbourhood Plan (2017)

Policy	How the design has responded
A roundabout or similar ‘free flow’ junction at Gravelhill Lane to eradicate congestion and queues and to provide safe local access to the A10/relief road.	A roundabout has been provided at the junction of the WWHAR and the A10, with a combination and signalised crossing points introduced to enhance safety for pedestrians and cyclists, while responding to desire lines. The design provides connectivity and continuity with existing shared walking/cycling routes.



Policy	How the design has responded
<p>Rectory Lane and Chequers Lane to remain as through roads and incorporate safe cycle and pedestrian crossings.</p>	<p>Rectory Lane features an overbridge to maintain connectivity for all users.</p> <p>Consultation demonstrated local support for the closure of Chequers Lane to general traffic, but a signalised crossing facility is provided in this location for walking/cycling connectivity.</p>
<p>Cycle and/or pedestrian paths to be provided on both sides of the relief road corridor and these should be generally separated from the road carriageway by a sustainable soft landscape strip (grass verge, hedge, tree planting – or preferably a mix of all three).</p>	<p>A shared walking/cycling route is provided along the length of the WWHAR along the western side to sit alongside the proposed development and provide safe connectivity to those areas. The shared route is separated by a 5m grass verge swale which forms part of the surface water drainage system.</p>
<p>Appropriate safe cycle and pedestrian crossing points to be provided at regular intervals along the road – and specially to link desire lines between local centres, recreational facilities and public transport nodes. Safe wildlife crossings should also be considered.</p>	<p>Due to the nature of the WWHAR as part of the major road network, the need for continuous flow of traffic to encourage its use (instead of the A10) and the traffic speed of 40mph proposed mean that regular crossings along the WWHAR would be unsafe and compromise journey times and convenience of the new road. Noting the location of the WWHAR along the eastern edge of the development (not through the centre of it), it is considered that the Rectory Lane and Chequers Lane crossing options maintain adequate accessibility east to west between destinations without the need for additional crossings.</p> <p>Environmental mitigation proposals respond to the survey findings and assessments undertaken to ensure suitable provision and habitat creation for species affected by the Proposed Scheme.</p>



Policy	How the design has responded
<p>The design should fully integrate environmental impact mitigation features – especially ensuring that existing and proposed settlement is mitigated from traffic noise and night lighting impacts. Night lighting should be minimised, especially in sections adjacent to an agricultural backdrop. The road surface should be designed to minimise tyre noise.</p>	<p>The Landscape Design provides a level of screening of the new road to local receptors which providing habitat. Due to the flat nature of the landscape and topography in this area, significant earthworks were considered inappropriate as mitigation in this location.</p> <p>The WWHAR is proposed to be unlit, without highway lighting, this is only required on the A47.</p> <p>The pavement design aligns with that used elsewhere on the network to simplify maintenance. Due to the anticipated speed limit, the benefits of a low noise road surface would be limited, therefore making the additional cost difficult to justify.</p>
<p>A maximum speed of 40 mph for the relief road – but a 30 mph limit may be appropriate and desirable in some sections. The carriageway design should discourage speeding.”</p>	<p>The proposed speed limit for the WWHAR is 40mph which is considered appropriate for this type of road.</p>

7 Conclusion

7.1.1 This DAS has been prepared to support the planning application for the West Winch Housing Access Road. It presents the design for the Proposed Scheme, proving rationale for how the design and its development was informed by key factors applying design principles to respond to them.

7.1.2 The approach to the design of the Proposed Scheme has been based on the principles described. The principles were adopted to deliver appropriate design outcomes, responding to the local context and planned growth.

7.1.3 Design decision making has been influenced by the principles, and stakeholder feedback throughout the design development process. The



design has sought to avoid or minimise impacts, whilst realising opportunities for environmental enhancement.

- 7.1.4 The design responds to policy and guidance relating to design and access for infrastructure projects, with the specific strategies within the planning application for environmental, accessibility and user needs to be delivered as part of the Proposed Scheme.