Report from the Natural Environment Team

North-East Norwich Growth Triangle: Green infrastructure Delivery Plan

April 2016

Natural Environment Team

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Norfolk County Council

Green Infrastructure in the North-East Norwich Growth Triangle: Delivery Plan

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April 2016 (Revised final version)

1. Background: Context of Study

1.1 Introduction

1.1.1 Appointment and brief

Norfolk County Council Natural Environment Team has been appointed by Broadland District Council to undertake a project to provide greater specificity of Green Infrastructure (GI) provision for the North-East Norwich Growth Triangle (NEGT).

The officers who undertook the study were

> Dr David White; Senior Green Infrastructure Officer, Natural Environment Team, and
> Zoe Tebbutt, Green Infrastructure and Landscape Officer, Natural Environment Team,

With additional contributions from Tim Foo (Year-in-Industry Student, Natural Environment Team), Rachel Harold (Ecological Assistant, NBIS), and Lizzy Oddy (Assistant Biodiversity Officer, NBIS).

A brief for the study was agreed in spring 2015 (*GI P1.1: GI connections - Blue Boar Lane to NE Rackheath;* GNGB Green Infrastructure programme Team 14th Feb 2015). The brief is provided in Appendix 1.

A draft version of this report was issued to Broadland District Council in January 2016. This final version was issued in April 2016.

1.1.2 The North-east Norwich Area Action Plan

Development to the north east of Norwich will be guided by the Old Catton, Sprowston, Rackheath & Thorpe St Andrew - or North East Norwich Growth Triangle (NEGT) - Area Action Plan (AAP). The Joint Core Strategy (GNDP, 2011 & 2014) and subsequent AAP plans for approximately 13,500 homes to be built in the area. This includes the 2008 baseline commitments in the NEGT of approximately 1,500 homes. The AAP was subjected to public examination in July 2015 and a schedule of main modifications and additional modifications was published in February 2016.

The growth within the AAP will be supported by the construction of the Norwich Northern Distributor Road (NDR), a new 20km road linking the A1067 Fakenham Road near Attlebridge to the A47 Trunk Road at Postwick. This received consent from the Planning Inspectorate in autumn 2015 and construction started in December 2015.

1.1.3 Scope and Objectives of the current project

The proposed GI Strategy for the North East Norwich Growth Triangle as described in the brief seeks to address four main issues, namely

- the landscape setting of development,
- ecological connectivity,
- the recreational needs of residents, and
- walking and cycling connectivity.

A *Draft Growth Triangle Green Infrastructure Strategy* (BDC, November 2013) was produced for consultation to help inform the Area Action Plan policies. This draft GI Strategy was itself based on a number of studies of which perhaps the most relevant are the *GNGB Green Infrastructure Strategy* (GNGB 2007), *Ecological Corridors Plan for NE Norwich* (Natural Environment Team, NCC; June 2015) and *Green Infrastructure Project Opportunity Plan for NE Norwich* (NCC, Nov 2010).

The *Draft Growth Triangle GI Strategy* describes landscape setting, ecology, recreation and cycling opportunities and provides a list of 27 projects that could be delivered within the NEGT area, many of which are incorporated into policies within the emerging AAP. The projects are described in Section 3 of this report and the *Key Diagram* is reproduced as Figure 1.

This *NEGT GI Delivery Plan* forms part of the wider ambition of delivering the Primary GI Corridor from Mousehold Heath to the northern Broads at Wroxham that was identified by the GNGB GI Strategy (GNGB, 2007) in which it was referred to as Primary GI Corridor 01: *Mousehold Heath to the Broads* (shown as a bold green dashed line on Figure 1). The section of the corridor covered by this study, specifically the section from Blue Boar Lane to NE Rackheath, lies on the alignment of the Salhouse Road from Blue Boar Lane to Rackheath and then heads northwards parallel to the railway (on the western side).[1]

1.1.4 The relationship of GI delivery in the NEGT with mitigation for the NDR

The NDR will be delivered with a comprehensive landscaping and ecological management scheme (*Norwich Northern Distributor Road – Landscape and Ecological Management Plan*; NCC/Mott MacDonald, July 2015), and a number of additions and enhancements to walking and cycling opportunities.

The *Draft Growth Triangle GI Strategy* was produced concurrently with the landscaping and ecological management plans for the NDR. As such, there is a degree of continuity between the two documents. For example, it has been possible to ensure that proposed GI within the NEGT connects with the location of mitigation for bats over the NDR such as gantries, culverts and green/brown bridges. Similarly, the proposed pedestrian and cycle links with the NEGT have been aligned to the most suitable crossing points over the NDR, for example at Newman Road and adjacent to the railway line south of Rackheath.

1.1.5 The relationship of GI provision with the Habitat Directive

As required by the Conservation of Habitats and Species Regulations 2010, local authorities must make an appropriate assessment of the implication of any plan on the Natura 2000 network. The *Habitats Regulation Assessment (HRA) of the North-East Norwich Growth Triangle Area Action Plan* (Natural Environment Team, NCC, November 2014; with addendum, Nov 2015) concluded that there was a potential small adverse impact from the effects of cumulative growth as a result of increased recreation pressure on Broadland Natura 2000 sites. The location of the Natura 2000 sites in relation to the NEGT is shown in Figure 2.

As such mitigation is necessary. The AAP will deliver this mitigation in the form of new and enhanced GI (Policy GT2 and supporting text paragraph 7.17). The principle being that if attractive and accessible local opportunities for everyday recreational uses such as for dog-walking are made available in, or adjacent to, the housing allocations, then there will be a reduced need for residents to visit Natura 2000 Sites. Additional impacts on those ecologically-sensitive sites therefore will be negligible.

[1] Note: A second primary GI corridor, Primary Corridor 02: *Thorpe (Wooded) Ridge* is also shown on Figure 1. This corridor is not specifically covered by the current work but it links with Primary GI Corridor 01 at Thorpe Woodlands (see Section 3.3.7.).

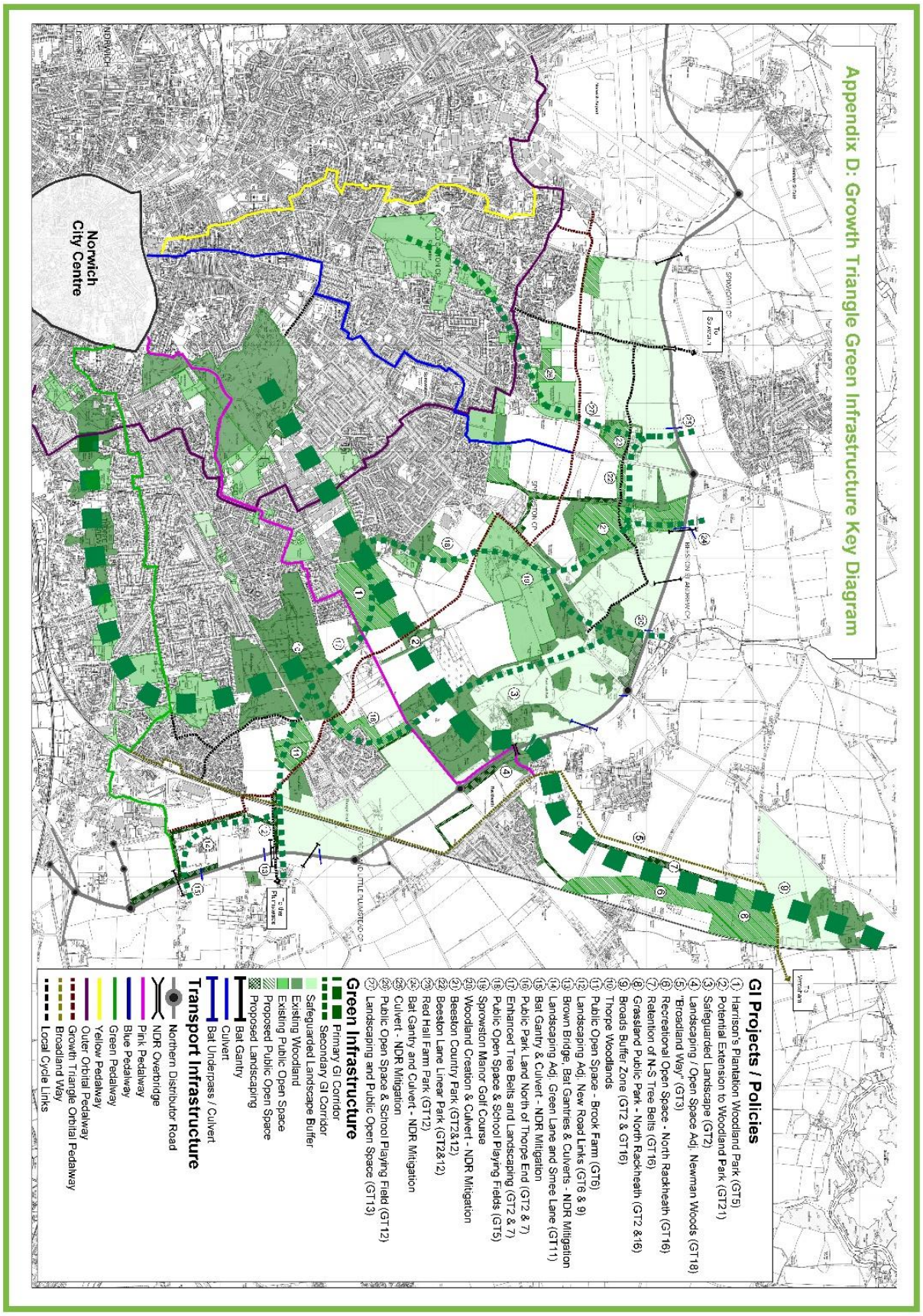


Figure 1: NEGT Green Infrastructure Key Diagram reproduced from the Draft Growth Triangle GI Strategy (BDC, 2014)

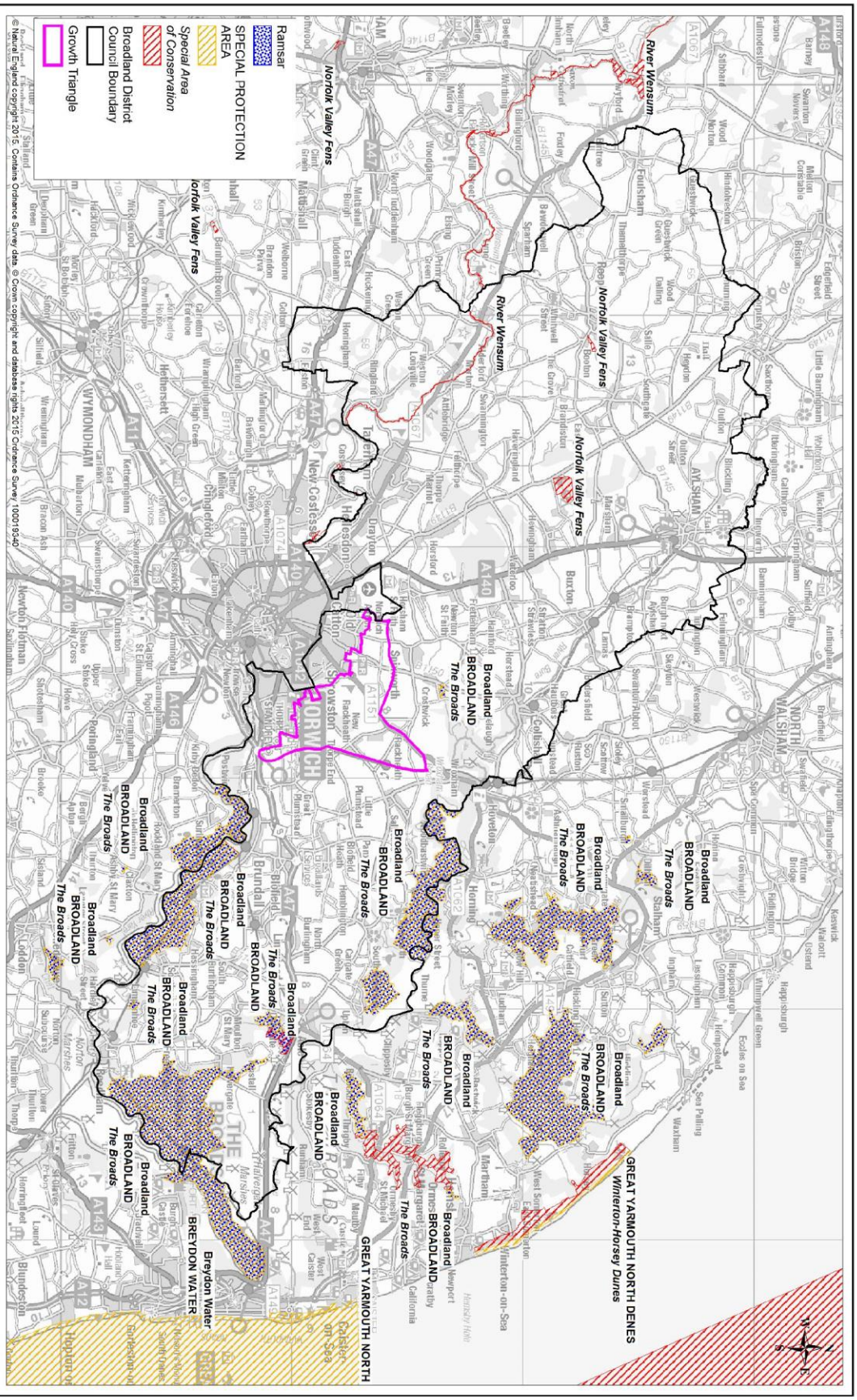


Figure 2: Location of Natura 2000 sites in relation to the NEGT

1.1.6 Aims of the current study

As described in the project brief, this study will **identify, prioritise and develop GI connections**. This will be achieved in the context of the HRA mitigation requirements and in combination with mitigation for the NDR. Specifically, it will:

- identify the specific strategic requirements of GI within the north-east in the context of the emerging Area Action Plan and the areas covered by particular policies;
- identify potential GI linkages and assess their deliverability;
- identify most appropriate delivery and funding mechanisms;
- identify projects for consideration by the GNGB Green Infrastructure Programme Team to recommend for inclusion in the annual business plan.

2 Green Infrastructure Requirements

2.1 Multi-functional GI

Many GI assets can provide multiple functions, for example they can provide both ecological connectivity and opportunities for recreation. However, the proposed GI projects within the NEGT can be divided into their four main functions that they aim to fulfil: landscape, ecology, recreation, and walking and cycling.

2.1.1 Landscape

The landscape element of the *Draft Growth Triangle GI Strategy* describes two specific requirements that the GI strategy should deliver which have been incorporated into policy GT2 and GT6 of the AAP, namely

- to maintain a landscape setting to the urban fringe of Norwich south of the NDR, and
- to maintain a 'landscape cushion' around Thorpe End Garden village.

The Landscape character type of the area is defined as 'Wooded Estatelands' in the *Broadland District Landscape Character Assessment*, specifically within *E3: Spixworth* and *E4: Salhouse* character areas. There are a number of historic parklands mainly dating from the 18th century, which are super-imposed on to an 'ancient' landscape of wooded heaths or 'wastes' that once stretched from Mousehold Heath to Wroxham. The NDR will pass to the north of the historic parks of Beeston, Sprowston and Rackheath and passes close to a number of 'ancient' - or at least old - woodlands.

Thorpe End is predominantly a 1930s development south of Plumstead Road. The character of the village is based on the form of the buildings and their relationship to one another, but also to the physical separation of the village from the Norwich urban fringe (*Thorpe End Village Conservation Area Character Statement*).

Key message - Landscape: Green Infrastructure should maintain a landscape setting to the urban edge of Norwich. GI provision should provide separation between new development and Thorpe End, thereby retaining a sense of physical separation from the urban edge of Norwich.

2.1.2 Ecology

The landscape of the NEGT is an ancient one, which indicates that it is important for biodiversity as older landscapes generally support greater biodiversity than younger ones. The 18th century parkland estates were created within an ancient landscape of 'wastes' that once stretched from Mousehold Heath to Wroxham. There are a number of old woodlands which remain from the medieval landscape, some of which are on the Natural England Ancient Woodland Inventory[2] (Sprowston Wood, Tollshill Wood, Bulmer Coppice and Weldon Wood), and other modern plantations on land that was once grassy heaths. Some of these woodlands were incorporated into 18th century parkland tree belts, for example at Beeston. In addition, there are a number of local wildlife sites or County Wildlife Sites (CWS)[3]. These include Paine's Yard Wood, The Owlery & March Covert CWS (CWS1392) and Thorpe Woodlands (Racecourse Plantation, Belmore Plantation and Brown's Plantation (CWS 2041, 2042). The wildlife value of these sites is largely due to the fact that they retain elements of the historic landscape, albeit modified by modern usage.

[2] Natural England's Ancient Woodland Inventory: http://publications.naturalengland.org.uk/category/552039
[3] Norfolk's County Wildlife Site database: http://www.norfolkbiodiversity.org/countywildlife/

This landscape history means that the proportion of the NEGT area that retains deciduous and mixed woodland is high relative to other areas of Broadland District, and there are a large number of veteran trees. Consequently the area is an important refuge for a number of species that rely on old deciduous woodland and veteran trees, notably ground flora, bats and saproxylic invertebrates. The AAP aims to buffer and protect major ecological habitats within NEGT. **GI provision must seek to increase ecological connectivity between these habitats to ensure viable populations continue to exist alongside the development.**

2.1.2.1 GI ecological corridors

The GNGB GI Strategy (GNGB, 2007) identified a number of primary and secondary GI corridors, based on the Econet work undertaken by Norfolk Wildlife Trust and partners. The primary links are:

- GI Primary Corridor no. 1: *Mousehold Heath to the Broads*; and
- GI Primary Corridor no. 2: *Thorpe Ridge.*

The secondary links are:

- Catton Park to Spixworth;
- Beeston Country Park to Spixworth Park;
- Thorpe Woodlands to Broadwalk Plantation/Fir Covert;
- Thorpe Woodlands to Dobbs Beck (via Harrisons Plantation);
- Thorpe Woodlands to Dobbs Beck (via Rackheath Park);
- Thorpe Woodlands to Witton Run; and
- Thorpe Woodlands to Apple Tree Farm, Plumstead.

These links are shown as smaller dashed green lines on Figure 1.

The AAP, specifically policy GT2, seeks to deliver ecological connectivity using a combination of interventions including landscape and habitat protection, the provision of multi-functional open space, street planting, green roofs and walls.

2.1.2.2 Bats and the NEGT

The work to inform the Development Consent Order Application for the NDR involved considerable fieldwork in establishing how bats use the road corridor. Through radio-tracking, static monitoring, tree-climbing and transects, a total of over 115 individual bat roosts were identified. Of these, 52 were roosts of the nationally-rare barbastelle bat *Barbastella barbastellus.* The Environmental Statement of the NDR states that the area supports a population of this species of "*at least national importance*". The UK population of barbastelle bats is thought to be around 5000 individuals (Bat Conservation Trust, 2015) and the barbastelle bat is listed as Near Threatened on the global IUCN Red List of mammals as the worldwide population is recorded as decreasing. As such, barbastelle roosts and feeding areas are a significant consideration in the NEGT.

Barbastelle bats mostly use trees for summertime and maternity roosting. Roosts are often clustered, with males frequently roosting alone or in small single-sex groups whilst females can form large roosts with up to 50 individuals recorded in a single tree in the NEGT area. Our current understanding is there are two main clusters of barbastelle roosts associated with the NEGT, one cluster between Rackheath and Sprowston and a second cluster east of the railway line south of Thorpe End. The use of radio-tracking allowed identification of where the bats fed and their

commuting routes[4]. Barbastelles in the study tended to feed over and along edges woodland blocks and along linear features - feeding directly over open farmland was uncommon – with the mean foraging distance being just over 5km from their roosts[5]. This extensive data has been used to inform the ecological connectivity requirements and delivery of AAP Policy GT2.

Almost all European bat species utilise woodland and a recent peer-reviewed study [6] shows that in UK, roost location of several species was positively associated with both the extent and proximity of broadleaved woodland, with the greatest effect of increasing woodland extent seen between 0% and 20% woodland cover. The authors of the study further identify that the bat species assessed will benefit from the creation of an extensive network of linked woodland patches across landscapes. For the long-term viability of the bat populations – especially the local barbastelle population - priority must be given to protecting and linking existing woodland areas within the NEGT.

Key message - Ecology: Given the significance of the location for bats, particularly barbastelles, the focus of protecting and enhancing ecological connectivity within the NEGT should be directed at these species, with emphasis on linking woodland blocks and protecting and enhancing commuting routes. Whilst aimed primarily at bats, this form of ecological connectivity will benefit a range of species from a number of other taxa, and reduce the overall impact of the development on biodiversity.

A barbastelle bat *Barbastella barbastellus*

(Photo credit: Lotty Packman)

[4] 'Commuting routes' are the flight lines used by bats to reach their feeding locations from their roosts. Bats regularly use the same routes which often follow linear features, although the particular routes used on a given day may vary with the time of year or in different weather conditions.

[5] This mean foraging distance from roost is shorter than in other studies which have shown barbastelles often average 10km and sometimes up to 30km.

[6] Katherine L. Boughey, Iain R. Lake, Karen A. Haysomb, Paul M. Dolman (2011); "*Effects of landscape-scale broadleaved woodland configuration and extent on roost location for six bat species across the UK*"; Biological Conservation; Volume 144, Issue 9, Pages 2300–2310

2.1.3 Recreation

Broadland District Council has requirements for formal open space, such as sports pitches and children's play space, and allotments that will operate within the NEGT. However, it is the amount and attractiveness of accessible open space within the NEGT that will be critical if it is to function effectively in drawing local recreation pressure away from the Broadland Natura 2000 sites as required by the HRA mitigation. A number of big 'set-piece' open recreational spaces will be delivered through planning conditions, some of which have received consent. These are discussed brief below and then considered in further detail in the main body of the report.

2.1.3.1 Consented development at North Sprowston and Old Catton (Planning Application 20121516); AAP Policy GT12

Mitigation measures have been consented in the form of the creation of a country park, Beeston Country Park, as an integral part of the application. This will be a recreational resource for future residents living within the proposed development and is specifically intended to limit the number of residents from using the Broads International Sites for 'general' or daily recreation. The HRA of the application (NCC August 2013) concluded that when enhanced as proposed, the scale of the country park, its location and its attractiveness will enable it to fulfil its intended function to reduce disturbance impacts on the Broads International Sites from residents of the development to negligible levels. The site will also support significant biodiversity and contribute to the ecological network, specifically the Secondary GI corridors Catton Park to Spixworth, Beeston Country Park to Spixworth Park and Thorpe Woodlands to Broadwalk Plantation/Fir Covert.

Detail is provided in Section 3.3.13. of this report.

2.1.3.2 Consented Development at White House Farm (Planning Application 20080367); AAP Policy GT5

This consent brings in to public access 31.5 hectares of woodland. The Woodlands to be transferred are Harrison's Plantation & The Breck and Boar Plantation. The Section 106 agreement requires that a Woodland Management Plan is agreed before no more than 450 homes are occupied. Broadland District Council have worked to bring the public access element of this scheme forward; working with Norfolk County Council and Sprowston Town Council, the eventual owners of the woodland, a management plan has been produced (NCC, June 2015). The Woodlands are already accessible from existing residential areas, and close to potential development schemes in the vicinity of Salhouse Road. The White House Farm permission requires cycleways to be constructed parallel to Salhouse Road and Blue Boar Lane, which are currently expected to be delivered in 2016/17. In addition, the City Cycle Ambition programme has already delivered improved pedestrian and cycle access to areas south of Salhouse Road. This development was not subjected to a specific HRA but the open space provision exceeds the district average by some margin.

Detail is provided in Section 3.3.1., 3.3.2. and 3.3.18. of this report.

2.1.3.3 Consented development at Brook Farm (Planning Application 20090886); AAP Policy GT6

The total site area of the consented development is 56 hectares, of which a significant proportion is given over to publically accessible open space. There are areas of public open space proposed including *Brook Farm Meadows*, an area between the new housing development and Thorpe End and Plumstead Road East, and a linear park running through the north-south valley leading to Dussindale Park.

Detail is provided in Section 3.3.8. of this report.

2.1.3.4 *North Rackheath Buffer/grassland public park; Policy GT16 (currently subject to Main Modification consultation)*

Policy GT16 (subject to a proposed Main Modification) requires at least 30ha of Public Open Space including the establishment of a "*large public parkland within the identified North Rackheath Buffer Zone*". its location, being situated between the NEGT housing and the northern Broads, should ensure a reduced temptation for residents of the new households to head towards the Broadland Natura 2000 Sites for their 'everyday' recreational activities such as dog walking. The Policy requires the public open space to include "*acid grassland or a suitable alternative*".

Currently, the majority of the location is farmland under arable production, although there is some adjoining woodland, and the site will need to be made attractive to users if it is to fulfil its function. Broadland District Council is currently working in partnership with the Landowner, Manor Farms, and Barratt Homes to bring forward a refreshed masterplan in 2016.

Detail is provided in Section 3.3.6. of this report.

Key message - Recreation: A number of set-piece open recreational areas will be provided through planning consents but an integrated and accessible network of open space will also need to be delivered alongside these to ensure the requirements of the HRA mitigation are fulfilled.

2.1.4 *Walking and cycling*

The AAP aims to ensure that there are good walking and cycling links between new and existing settlements and providing excellent accessibility to jobs, services and facilities. There should be links and enhancement to the existing Norwich Cycle network, with sections of the network within allocations delivered by policy through planning conditions. The proposed orbital road between Norwich airport and Broadland Business Park should provide opportunities for safe cycling.

The AAP seeks to deliver Broadland Way. This should be a GI corridor which will allow non-motorised users to cross the NDR from Norwich and head north, bypassing Thorpe End, through Rackheath and on to Wroxham and the northern Broads. It should link with existing cycleways through Dussindale and the Broadland Business Park. As such, it should provide leisure opportunities and commuting opportunities. Feasibility has already been undertaken considering how Broadland Way can best be delivered. If delivered as planned, the *Broadland Way* will link to the wider broads via the 'Three Rivers Cycleway' of which phase 1 is planned for delivery in 2016/17 and supported by DfT National Parks funding.

The NDR will be delivered with a number of additions and enhancements to walking and cycling network. Safe crossing points for non-motorised users will be delivered at the Newman Road overbridge (see Sections 3.3.4 and 3.3.5.). The NDR non-motorised user strategy will deliver bridleway links between BBP and Rackheath, albeit that these are somewhat circuitous.

Key message – Walking and cycling: Through development consents and synergies with other schemes, links and enhancement to the existing Norwich cycling and walking network should be delivered. The walking and cycling routes should deliver excellent links to jobs, services and facilities, and allow for recreation and leisure opportunities.

3 Green Infrastructure Delivery

3.1 Approach

The approach of this study is to consider each of the proposed GI projects from the *Draft Growth Triangle GI Strategy* and to provide some detail as to how they can meet their intended specific requirements. The list of GI projects from the *Draft Growth Triangle GI Strategy* is shown in Table 1.

3.2 Projects

In this report, the proposed GI projects will be considered in the order that they appear in the *Draft Growth Triangle GI Strategy.* Table 1 indicates the relevant AAP policies and a reference to the section in which they are considered within this report. Where projects have similarities, they are considered together, for example Project 21: Beeston Country Park (GT2 & 12), Project 22: Beeston Lane linear park (GT2 & 12) and Project 23: Red Hall Farm Park (GT12) are covered in a single section. Where additional work has already been undertaken, reference will be made to that work and additional detail will only be provided where necessary.

No.	Project name	AAP policy No. (where applicable)	Section of report where discussed
1.	Harrison's Plantation Woodland	GT5	3.3.1.
2.	Potential extension to Woodland Park	GT21	3.3.2
3.	Safeguard landscape	GT2	3.3.3.
4.	Landscaping/open space adj. to Newman Woods	GT18	3.3.4.
5.	The *Broadland Way*	GT3	3.3.5
6.	Recreational open space – North Rackheath	GT16	3.3.6.
7.	Retention of N-S tree belts	GT16	3.3.6.
8.	Grassland public park – North Rackheath	GT2 & 16	3.3.6.
9.	Broads buffer zone	GT2 & 16	3.3.6.
10.	Thorpe Woodlands		3.3.7.
11.	Public open space – Brook Farm	GT6	3.3.8.
12.	Landscaping adj. to New Road link	GT6 & 9	3.3.9.
13.	Brown bridge, gantries and culverts – NDR mitigation		3.3.9.
14.	Landscaping adj. to Green Lane and Smee Lane	GT11	3.3.9.
15.	Bat gantry and culvert – NDR Mitigation		3.3.9.
16.	Public park land north of Thorpe End	GT2 & 7	3.3.10.
17.	Enhanced tree belts and landscaping	GT2 & 7	3.3.10.
18.	Public open space and school playing fields	GT5	3.3.11.
19.	Sprowston Manor Golf Course		3.3.12.
20.	Woodland creation and culvert – NDR mitigation		3.3.9.
21.	Beeston Country Park	GT2 & 12	3.3.13.
22.	Beeston Lane linear park	GT2 & 12	3.3.13.
23.	Red Hall Farm Park	GT12	3.3.13.
24.	Bat Gantry and culvert – NDR mitigation		3.3.9.
25.	Culvert – NDR mitigation		3.3.9.
26.	Public open space and school playing field	GT12	3.3.14.
27.	Landscaping and public open space	GT13	3.3.15.

3.3 Specific GI Projects

3.3.1 Project no.1: Harrison's Wood

Project 1: Harrison's Plantation Woodland	**AAP Policy GT5** **AAP GT2**
Primary GI function requirement: Recreation Provision	
Additional GI function requirements: To contribute to Primary GI Corridor No 1: *Mousehold Heath to the northern Broads*	

Background:

The woodland is part of Primary GI Corridor 01. Barbastelle bats are known to feed above the woodland. The Woodland will become open for public access under planning consent 20080367.

Broadland District Council commissioned The Natural Environment Team at Norfolk County Council to produce a Management Plan for this site, now called Harrison's Wood. This report was produced on 29th June 2015 and lays out proposals for site management including phasing plans and a management schedule. The intention is for Sprowston Town Council to manage the site in future.

Required work:

The Management Plan provides the detail to undertake the necessary GI work both for public access and ecology and, as such, no further information is provided here. The recommendations for health and safety work should be carried out prior to the opening of the woodland for public access.

Ecological connectivity should be sought through adjoining sites on the Primary GI corridor, particularly for use by bats. See Sections 3.3.2., 3.3.10 and 3.3.11. If lighting along the cycleways within the woodland is deemed necessary, it should be bat-friendly with minimal light spill.

Delivery mechanisms:

The works and on-going management to the woodland will be delivered through a section 106 agreement with the developer.

Cycle improvements along Salhouse Road will be delivered through the same section 106 agreement, with the exception of the Salhouse Road crossing which will be delivered by the Push-the-Pedalways improvement program (PtP). Currently it is the expectation that the shared pedestrian-cycleways adjacent to Blue Boar Lane and Salhouse Road will be delivered in 2016/17. In future, this will form part of the improved pedestrian/cycleway links back to Mousehold Heath.

3.3.2 Project no.2: Woodland Connections between Harrison's Wood and Bulmer Coppice

Project 2: Potential extension to Woodland Park	**AAP Policy GT21 AAP GT2**
Primary GI function requirement: To contribute to Primary GI Corridor No 1: *Mousehold Heath to the northern Broads*	
Additional GI function requirements: To increase connectivity between woodland areas, especially for barbastelle bats; Potential to provide additional recreation provision	

Background:

The area is part of the Primary GI Corridor No. 01. To the south is Harrison's Wood, which will become an area for informal recreation and which is an important area for wildlife. To the north-east lies the Rackheath estate including Bulmer's Coppice, an area of replanted ancient woodland, and County Wildlife Site no. 1392: Paine's Yard Wood, The Owlery & March Covert, with White House Farm – currently a fruit farm - in between. A number of bat roosts of several species are known to be present in buildings and trees within the Rackheath estate (refer to Section 3.3.9. for further details of roosts).

The areas to the north-west covered by AAP policies GT4 and GT5 have consented permissions. The protected route for the Orbital Link Road passes between Harrison's Wood and the woodland south of White House Farm. Further to the north-west lies Sprowston Manor Golf Course which is an important feeding area for bats and which also has several barbastelle bat roosts on its perimeter.

Required work:

There is a need to retain and enhance ecological connectivity from Harrison's Wood to Rackheath estate. Importantly this should provide opportunities for use by commuting bats that are known to feed over the two areas previously mentioned. Bats commute from their roosts to feeding areas along dark linear features and thus opportunities should be sought to create ecological corridors of this nature. Suitable ecological corridors would be in the form of a tree belt, or a wide hedge with standard trees, fringed with a grassland strip. The grass area could be sown as wildflower meadow[7]. The landscaped zone should be as wide as possible, ideally a minimum of 25m in width. The hedges and tree-lines should be of a variety of native species to increase resilience against pests and diseases. The ecological corridors should not be directly lit.

The orbital road is likely to break this ecological connectivity. Where the wildlife corridor is breached by roads, the gaps should be kept to a minimum and adjoining landscaping should be designed to retain/create height to encourage bats to cross the roads at a height above the traffic. The ecological corridor should not be directly lit where the road crosses. If lighting is deemed necessary, it should be bat-friendly and minimise light spill onto the habitat used by bats.

Sections of the Primary GI Corridor are not included in any allocation and as such it may be difficult to protect and enhance the corridor for biodiversity in these sections through policy. In areas outside of allocations other approaches will be necessary. Opportunities may arise to incorporate biodiversity enhancements with other infrastructure projects. For example, improvements for cycle-

[7] In this context, a suitable wildflower meadow mix would be based on a mix of 80% meadow grass and 20% wildflower mix, but the specific composition of the mix will depend on the nature of the soil and its current nutrient status. Useful information can be found at http://wildseed.co.uk/mixtures/category/meadow-mixtures-for-different-soil-types

ways along the Salhouse Road north of Harrison's Wood may allow for suitable landscaping that would provide habitats suitable for commuting bats as described above.

Delivery mechanism(s):

- Where the necessary GI is in or close to allocated sites, it will be provided by the developer through planning conditions or planning obligations;
- Opportunities should be sought to incorporate ecological connectivity as part of other schemes, e.g. cycleway improvements;
- Where connectivity is needed outside allocations, projects to provide ecological connectivity could be considered for inclusion in the GNGB Infrastructure Program. Approaches to the relevant landowners should be considered at an early opportunity once detailed GI plans for the area covered by AAP policy GT21 are available. A project to enhance ecological connectivity outside of allocations could be scoped to be considered for inclusion in the GNGB Infrastructure Program at an appropriate time as adjoining development proceeds.

Looking from the north of Harrison's Wood, to the woodland beyond. Connectivity between the woodlands will be necessary.

3.3.3 Project no.3: Providing a landscape buffer south of the NDR

Project 3: Safeguard landscape	**AAP Policy GT2**
Primary GI function requirement: To maintain a landscape setting to the urban fringe of Norwich	
Additional GI function requirements: Potential to provide additional recreation provision Potential to increase connectivity, especially for barbastelle bats	

Background:
The policies within the AAP aim to preserve a landscape setting to the future built edge of Norwich (Policy GT2). The landscaping buffer is shown on the AAP Policies maps.

To the east of Norwich International Airport the airport safety zone will remain free of development. This stretches east of the airport through the NEGT almost to Red Hall Farm Park, forming part of the landscape buffer.

NDR landscaping:
The AAP policy supporting text clearly defines the buffer zone as being "*south of the NDR*" and, as such, the landscaping delivered with the NDR construction will be important in defining the buffer zone.

The NDR will be delivered with a comprehensive ecological and landscape plan with the stated aim of "*integrating the road into the surrounding landscape as far as possible*". It will involve mounding and grading out of steep slopes to blend the road into the surrounding topography, together with linking the roadside planting with adjoining existing vegetation and habitats using similar species and creating similar communities.

Some of the specific landscaping undertaken as part of the NDR scheme in the NEGT area is detailed below:

- In the vicinity of the airport, the NDR route is largely unplanted, with localised mounding to provide screening. Approximately 2km either side of Horsham St. Faith, where planting is provided, species mixes have been chosen to reduce the risk of bird strike hazards to aircraft. Shrub planting will be maintained at 2m in height and trees to 4m, and the proportion of large trees to shrubs is lower than elsewhere in the scheme. In addition, the proportion of berry-producing shrubs has been reduced to avoid attracting large flocks of birds which could prove hazardous to aircraft.
- Where the NDR crosses the former parkland north of Beeston Hall, there will be an area of earth mounding south of the road. Here, planting will be restricted to clumps of specimen tress to reinforce the parkland character. These will be planted to replicate the historic location of planting illustrated in the first edition Ordnance Survey Map (1879- 1886). See Figure 3 below.
- West of Beeston Lane, the route will be screened by mounding and tree and shrub planting, whilst at the A1151 Wroxham Road roundabout, dense woodland planting will be used to provide a habitat link between existing woodland and to reflect the woodland block planting in the vicinity of Rackheath Park (see also Section 3.3.9.).

- West of Salhouse Road, the NDR route rises to cross the Norwich to Sheringham railway line and extensive dense woodland planting on the lower embankment slopes are intended to reduce the impact of the road in the flat landscape.
- South of where the NDR crosses the Plumstead Road, the landscape is fairly open arable land with isolated farms and houses. Localised mounding and some dense planting will be used to screen properties as appropriate.

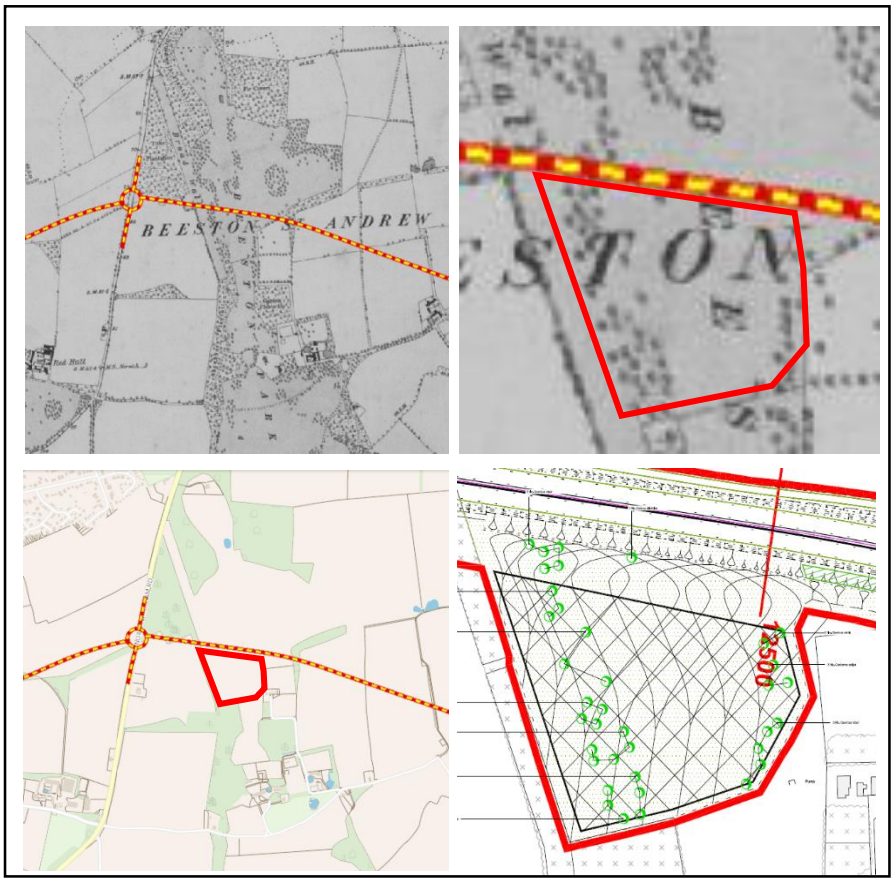


Figure 3: The area of landscaping north of Beeston Hall that will be planted to replicate the planting shown on the First Edition Ordnance Survey Map. The yellow-and-red line is the centre line of the NDR and the area marked in red is where the landscaping will be delivered. The green circles on the drawing bottom right indicate where trees will be planted and it can be seen that these correspond with the locations of trees shown on the First Edition OS map. (Planting map from the NDR Landscape and Ecological Management Plan; *Mott MacDonald, 2015).*

Required work:

In its simplest form, the buffer will be an area of predominantly undeveloped land south of the NDR with existing uses - primarily agricultural - maintained. However there is a possibility that the area could be enhanced; the 'landscape buffer zone' could potentially be used for other functions such as enhancing ecological connectivity and/or recreational use.

Ecological enhancement: Enhancement of bat feeding and commuting corridors south of the NDR could be encouraged[8]. Suitable ecological enhancements would include widening and thickening-up of hedges, and creating new hedgerow links where they have been lost. The First Edition OS Map and old aerial photos[9] can be used to identify where old hedgerows have been grubbed out. Some recommendations for planting to enhance bat corridors is provided in Section 3.3.9.

Recreational enhancements: Connections to existing and proposed cycleways and the Public Right of Way (PRoW) network would be particularly beneficial (Figure 4). Opportunities exist where pedestrian access across the NDR is possible. The two main crossing points for NMU within the NEGT are:

- Newman's Road pedestrian/cyclist bridge, which will form an extension of the Pink Pedalway (see AAP policy GT18; Section 3.3.4.). A new section of bridleway will be delivered as part of the NDR scheme between Salhouse Road and Newman Road to mitigate for where existing PRoW has been severed.
- In association with *Broadland Way* where a section of bridleway will be provided south of Rackheath, as mitigation for severed PRoW. The bridleway will pass under the NDR alongside the railway track and link up with Green Lane East (see AAP policy GT3; Section 3.3.5.).

In addition there are cycling improvements:

- Along Green Lane East and Green Lane West where cycleway improvements are proposed (see AAP Policy GT16; Section 3.3.6.).

And proposed local cycle links:

- Local cycle links are intended from Wroxham Road to North Walsham Road along Beeston Lane through Beeston Country Park, Beeston Lane Linear Park and Red Hall Farm Park.

[8] The Natural Environment Team of Norfolk County Council is already working to enhance bat corridors *north* of the NDR route, working in partnership with Norfolk FWAG and local land owners.

[9] After the Second World War the RAF photographed almost all of the United Kingdom as part of a National Air Survey. The Norfolk Historical Map Explorer includes around 8,300 aerial photographs of Norfolk taken between 1945-6. http://www.historic-maps.norfolk.gov.uk/home

Delivery mechanism(s):

- The landscape buffer zone is delivered through policy at no cost.
- Landscaping associated with the delivery of the NDR will be funded through that scheme.
- Enhancements to bat commuting corridors could be delivered with landowner agreement using the *Connecting Nature Fund*[10] or a similar scheme.
- The cycling improvements described above will be delivered through the planning conditions or planning obligations, informed by AAP policies.

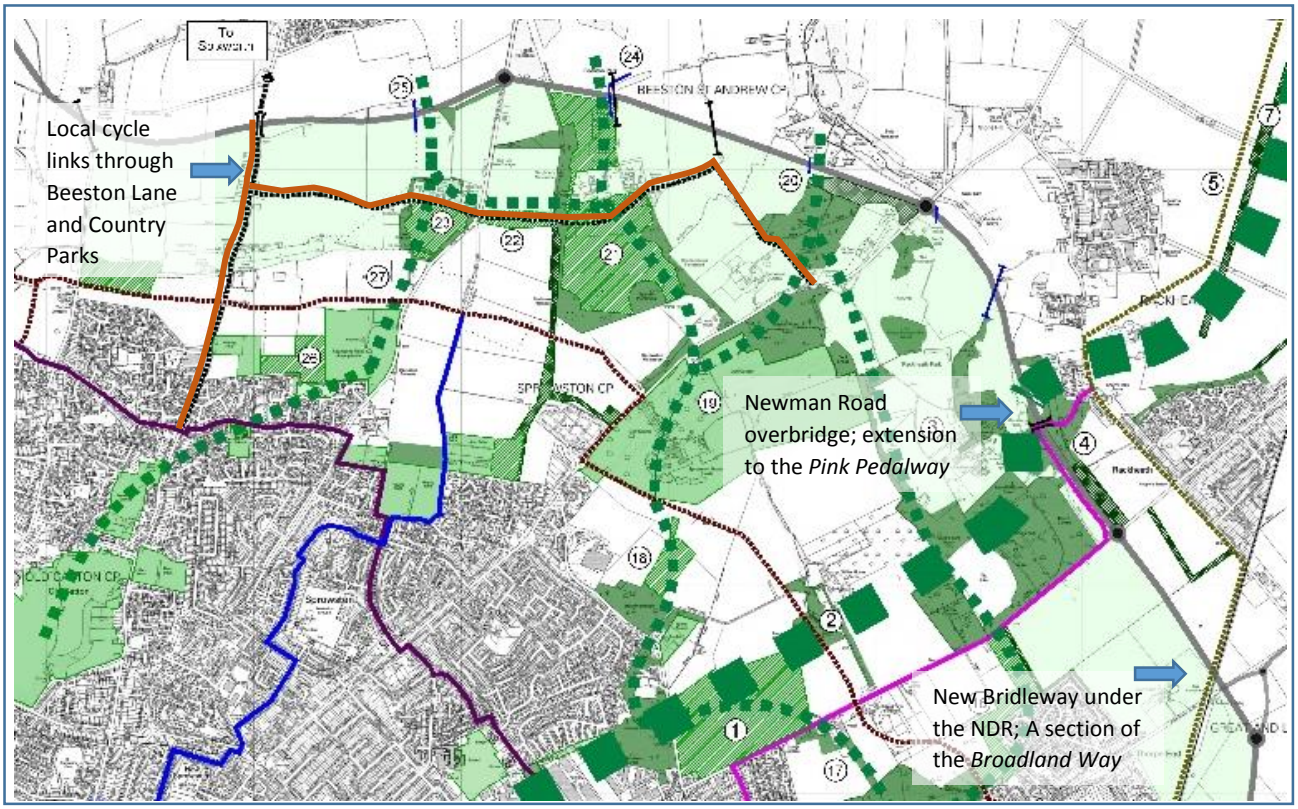


Figure 4: Cycling enhancements within the landscape Buffer Zone south of the NDR. The two primary crossing points for pedestrians and NMU are marked. The coloured lines are the existing or proposed Pedalways of the Norwich Cycling Network.

[10] The *Connecting Nature Fund* is an independently-manged tool for use by developers and local authorities, based on the principles of biodiversity offsetting. It can be used to channel money captured through development for ecological mitigation for use in the wider landscape, following the principles of the Lawton Report "*Making Space for Nature*" 2010. The *Connecting Nature Fund* is managed by Norfolk FWAG http://www.norfolkfwag.co.uk/

3.3.4 Project no.4: Landscaping/open space adj. to Newman Woods

Project 4: Open space provision adj. to Newman Woods	**AAP Policy GT18 AAP GT2**
Primary GI function requirement: To contribute to Primary GI Corridor No 1: *Mousehold Heath to the Broads*	
Additional GI function requirements: To increase connectivity between woodland areas, including for *Myotis* spp. and Brown-long eared bats Potential to provide additional recreation provision	

Background:

AAP policy site GT18, referred to as 'Land South of Green Lane West' is located between Rackheath and the route of the NDR. Some landscaping will be delivered as part of the construction of the NDR in the form of tree and shrub planting on a slight bank (Figure 5), and to the south of that is woodland associated with Rackheath Hall. The site proposed for residential development consists of two arable fields south of Green Lane West, which are separated by an access track with grass margins and a mature hedgerow.

To the west of the allocation is one of the two crossing points for pedestrians and NMU over NDR at Newman Road. This will form part of the Pink Pedalway in due course, and will link to a section of path for NMU alongside the south side of the NDR from Salhouse Road roundabout to Wroxham Road Roundabout. Policy GT18 requires cycle links at the frontage of the allocation site linking to the Pink Pedalway and along Green Lane which could form part of the *Broadland Way* (see Section 3.3.5.).

Woodland on either side of Newman Road (referred to as 'Newman Woods' or 'Newman Road Woods') has developed on the site of the former WWII USA airbase is owned by Broadland District Council and is intended as a community wood. It was surveyed by Norfolk Wildlife Trust in 2011 and was found not to meet County Wildlife Site designation criteria. However, its value for biodiversity has probably increased since 2011 due to management undertaken by BDC and volunteers and works to maintain some of the airbase features has progressed.

Required work:

Allocation GT18 will requires recreational areas and public open space provision in accordance with the standard policies and "*extensive landscaping along the western edge of the site adjacent to the route of the…NDR*". The obvious approach would be for the development to provide a landscaping plan that links Newman Woods and the NDR woodland and shrub planting, with the required landscaping along the western edge of the development. The new woodland block could also provide recreational opportunities.

In creating and managing new woodland, the following biodiversity aims should be delivered. The wood should

- be created in sympathy with adjacent and nearby woodland,
- maintain a mix of species relevant to the local area,
- aim to achieve a layered structure over time (canopy, shrub and field layers),
- provide shrub planting along the edge to encourage a herb layer and habitat for invertebrates,

- incorporate dead wood where feasible to provide for saproxylic invertebrates,
- trees should be protected during establishment period following usual means.

Community involvement in the management of the woodland and open space seems more readily deliverable in this location than in many others. Consideration should be given to potential mechanism that would help establish a community group, provide tools, training and initial insurance etc.

Delivery mechanism(s):

The GI will be provided by the developer through planning conditions or planning obligations.

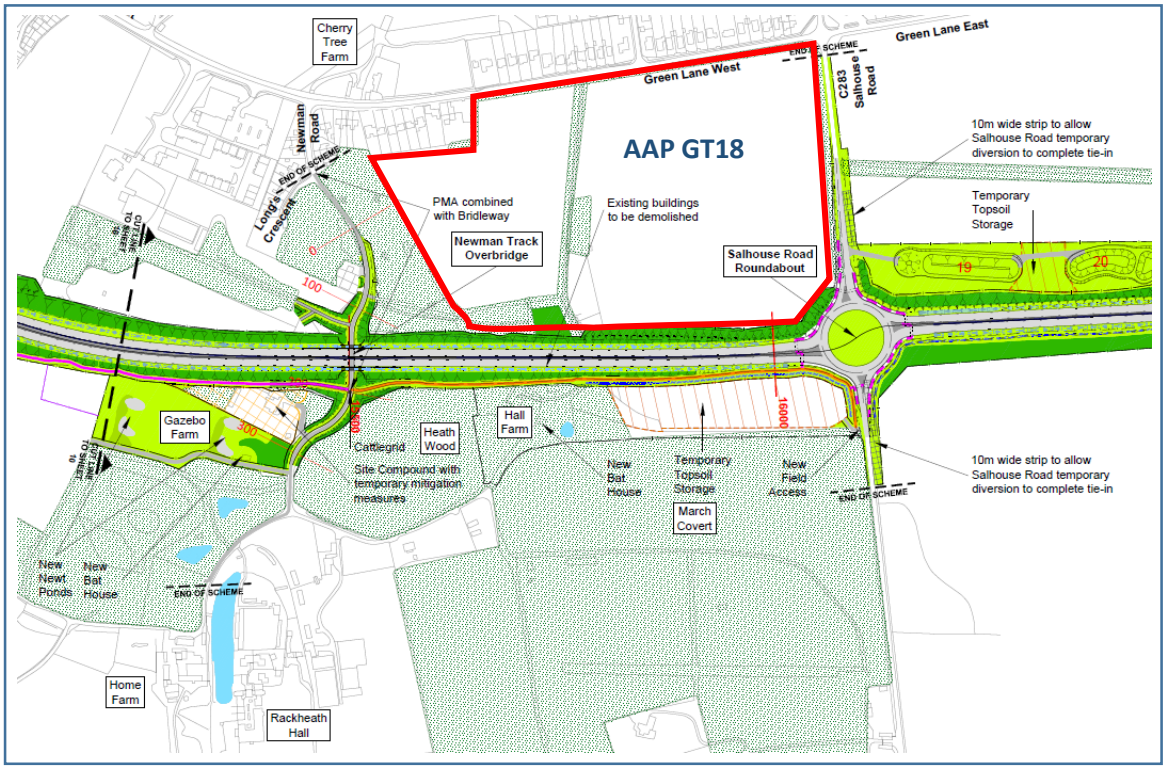


Figure 5: Section of the NDR showing the intended landscaping associated with delivery of the road in the area adjacent to the Newman Road Woods. The approximate section of AAP policy GT18 area is outlined in red..

3.3.5 Project no.5: The Broadland Way – a route for non-motorised users

Project 5: The Broadland Way	**AAP Policy GT3** **AAP GT2**
Primary GI function requirement: To improve the cycling and walking network	
Additional GI function requirements: To increase ecological connectivity, especially for barbastelle bats and other wildlife	

Background:

The *Broadland Way* is being promoted as a Green Infrastructure corridor which will allow non-motorised users (NMUs) to cross the NDR from Norwich and head north, bypassing Thorpe End, through Rackheath and on to Wroxham. The full *Broadland Way* route would stretch from Norwich to Wroxham and would contribute to, and provide a missing link, in the Norfolk Trails network; *Broadland Way*, together with the Bure Valley Way and Marriott's Way, would provide a recreational trail that will form a loop of approximately 50 miles that includes Norwich and its cycleway network. It will also link the Norwich cycleway network with the *Three Rivers Way Phase 1- Hoveton to Horning* cycle scheme for which DfT funding has been secured for delivery in 2016/17.

A feasibility study was commissioned by Broadland District Council and the GNGB that focused on 3 sections:

- The section from Green Lane North to Plumstead Road, south of Thorpe End;
- The section from Broad Lane to the growth allocation at North Rackheath;
- The section from the growth allocation at North Rackheath to Wroxham.

The scheme will require land acquisition, as described in the feasibility study, but sections may be delivered through development. A section of the route will be delivered as mitigation for the NDR. The section constructed as part of the NDR scheme will run from Plumstead Road to Broad Lane under the new bridge adjacent to the railway line.

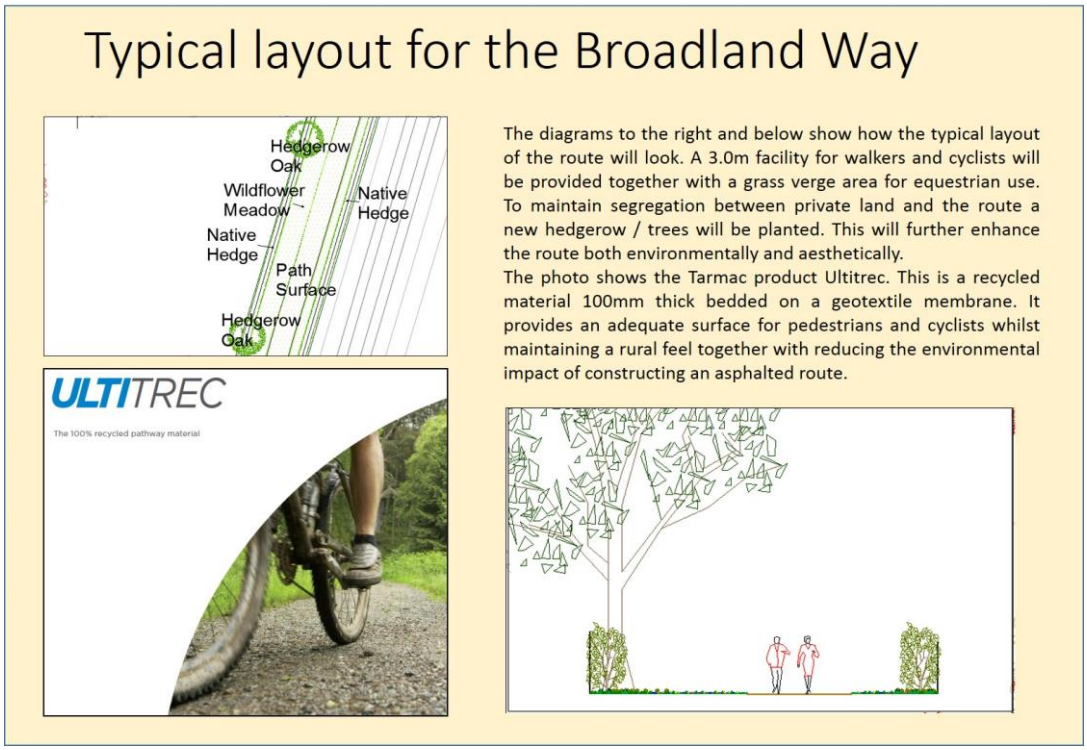
Required work:

The feasibility work (NCC, Dec 2015) describes how, wherever possible, the *Broadland Way* should consist of a 10.0m wide strip to be built in existing farmland. Of this

- A 3.0m strip will be dedicated as a hardened surface for use by cyclists and walkers;
- Approximately 2.0m strip will be set aside as a grass area for equestrian use; and
- The remaining 5.0m will be utilised for wildflower meadow and hedgerow / tree planting to provide a scenic route throughout for users and to provide ecological connectivity.

New hedgerows should be planted on each side of the route in double staggered rows at a 5 per metre density, interspersed at regular intervals with tree planting and will be made up of 55% Hawthorn *Crataegus monogyna*, 15% Field Maple *Acer campestre*, 12.5% Hazel *Corylus avellana*, 5% Guelder Rose *Viburnum opulus*, 5% Dogwood *Cornus* sp., 2.5% Crab Apple *Malus sylvestris* and 2.5% Wild Cherry *Prunus avium*. Oaks *Quercus robur* will be planted as standards at approximately 30m intervals throughout the new hedgerows on the route. Within larger rest areas further native trees and shrubbery such as Bird Cherry *Prunus padus*, Rowan *Sorbus aucuparia*, Silver Birch *Betula pendula*, Whitebeam *Sorbus aria* and Goat Willow *Salix caprea* could be planted. The grass area between the 3.0m facility and the landowner side hedgerow should be sown as wildflower meadow

(e.g. on a mix of 80% meadow grass / 20% wildflower mix) to further enhance the route as shown in the example layouts shown in Figure 6.



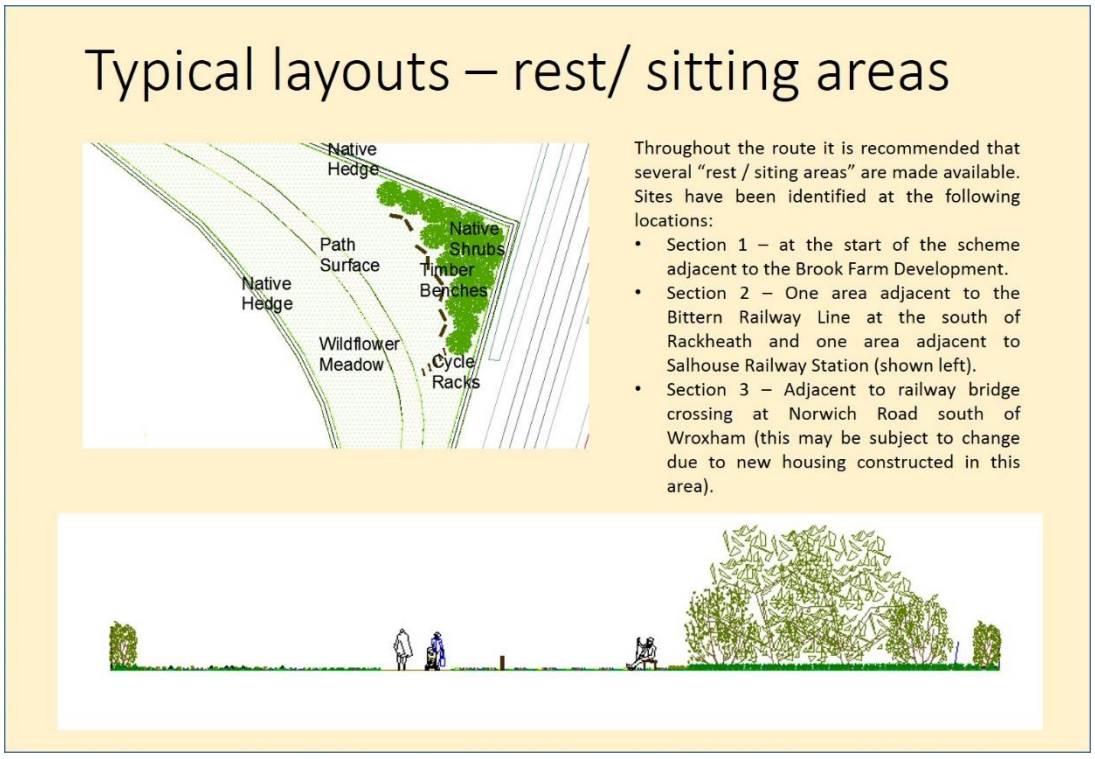


Figure 6: Typical layouts proposed for the Broadland Way from the feasibility study (NCC, Dec 2015)

The route will require four road crossings namely 1. Plumstead Road north east of Thorpe End adjacent to the level crossing, 2. In Rackheath at the mini roundabout on Green Lane East, 3. In Rackheath adjacent to the level crossing on Salhouse Road and 4. At Muck lane near Salhouse Railway Station (Figure 7).

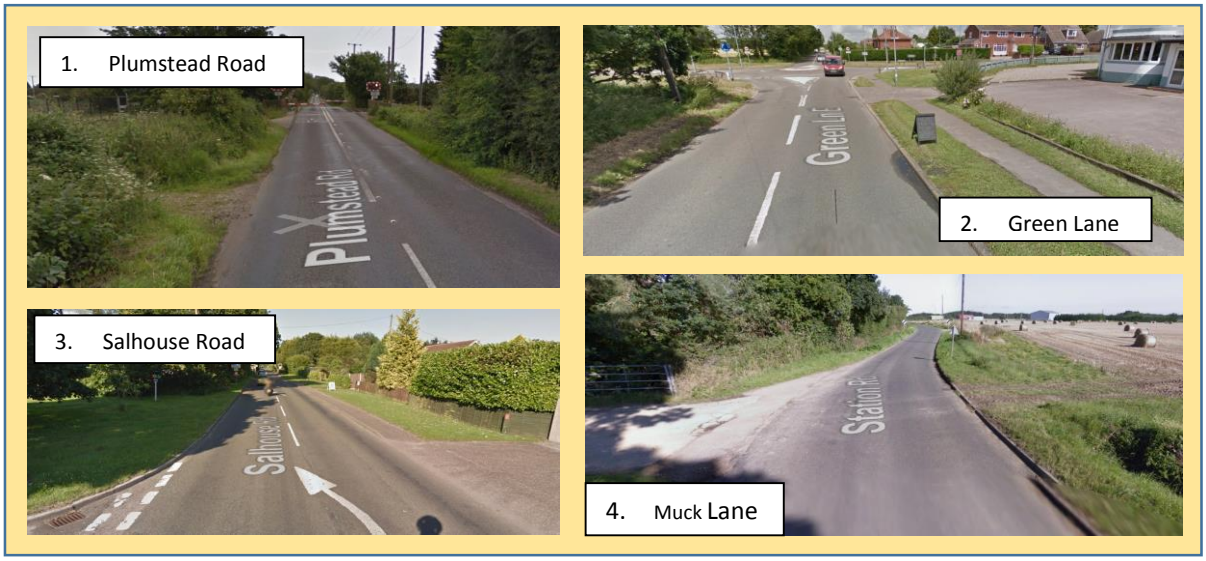


Figure 7: Google Street View screen-shots of the locations where the Broadland way will cross existing highways.

The crossings located in Rackheath are both on sections of the highway network which have high flows of traffic. As such a dedicated crossing point such as toucan crossings should be provide to give pedestrians and cyclists a safe suitable method of crossing these roads. Alternatively a "tiger" dual crossing can be installed. Of relevance, AAP Policy GT16 requires the developer to provide

- Improved cycle crossing facilities between Green Lane East and Green Lane West at the junction with Salhouse Road, and
- Improved cycle crossing facilities of Green Lane West providing connections to the NDR Newman Road overbridge.

The road crossing for Muck Lane near Salhouse Railway Station is a relatively quiet rural road currently with low traffic flows. However traffic may increase with development and so consideration should be given to the need for a formalised crossing point in this area.

The crossing point for Plumstead Road is located on a section of the network with high traffic flows however, due to the close proximity of the level crossing, a toucan crossing (which could cause queuing back on to the level crossing) could potentially be unsafe. Therefore the creation of a suitably wide vision splay to enable users to cross safely in this location may be necessary. This might involve some significant coppicing of trees and hedgerows, which in turn may require mitigation with replacement hedges and trees planted nearby.

Delivery mechanism(s):

The cost of delivering the scheme was calculated in the feasibility work. The total cost including 30% contingency was £1.15million. This excludes the section of the route that will be carried out as part of the NDR delivery. It also does not consider where sections could be delivered as part of development. The *Broadland Way* has been identified by the GNGB Green Infrastructure Delivery Team as one of the three top GI priorities within Greater Norwich area to support growth.

3.3.6 *North Rackheath - Project no.6: Recreational open space, no.7: Retention of N-S tree belts, and no.8: Grassland Public Park, and no. 9: Broads buffer zone (AAP Policy GT2 & 16)*

Project 6: Recreation Open Space - in North Rackheath	**AAP Policy GT16 AAP GT2**
Primary GI function requirement: Broads buffer zone Recreation Provision Protection of landscape features To contribute to Primary GI Corridor No 1: *Mousehold Heath to the Broads*, especially ecological connectivity for barbastelle bats	
Additional GI function requirements: Potential to contribute to Project 5: Broadland Way (GT3)	

Background:

AAP allocation site GT16 lies north of Rackheath village and is broadly similar to the area previously referred to as the Eco-town. Policy GT16 is subject to proposed Main Modifications. It is understood that the Masterplanning process for this site has recently resumed.

The site lies on the Primary GI Corridor no. 01: *Mousehold Heath to the Broads* and development must contribute to enhancing this corridor. The JCS identified the need to provide an undeveloped buffer zone (GI project 9) between development north of Rackheath village and the northern Broads at Wroxham which have international designations[11]. AAP policy GT16 identifies that a significant area of "*at least 30ha*" of publically-accessible "*acid grassland, or a suitable alternative*" should be provided (GI project 8). This is necessary to mitigate additional recreational impact on Natura 2000 sites in the northern Broads. The policy maps show an area that could fulfil this function (and which is marked in blue on Figure 8 below).

The policy contains an additional requirement for further "*recreational open space*" (GI project 6). A high pressure gas main runs through the east of the site which limits what development can occur in this zone. Policy GT16 (as per proposed main modifications) states that it should be used to provide '*recreational open space*'.

There are a number of tree belts within the site, which are aligned with features from the previous use of this land as an airfield during WWII. Policy GT16 requires the "*retention and enhancement of the north-south linkages created by the existing tree belts*" (GI project no. 7).

Cycling connections through the site and beyond are necessary. The supporting text for GT16 states:

> "*Off-carriageway cycling facilities should be provided between Green Lane west and Stonehouse Lane. These could be located with the GI links provided along the route of the gas pipeline. This will ensure residents…have fast and direct connections to the public open space at the north of the site and form part of the wider cycling links between Thorpe St Andrew and Wroxham.*"

[11] Part of the Natura 2000 network

The policy also requires improved cycle crossing facilities of Green Lane West providing connections to the NDR Newman Road overbridge. There are links to GI projects 5: Broadland Way and GI project 4: Landscaping/open space adjacent to Newman Woods.

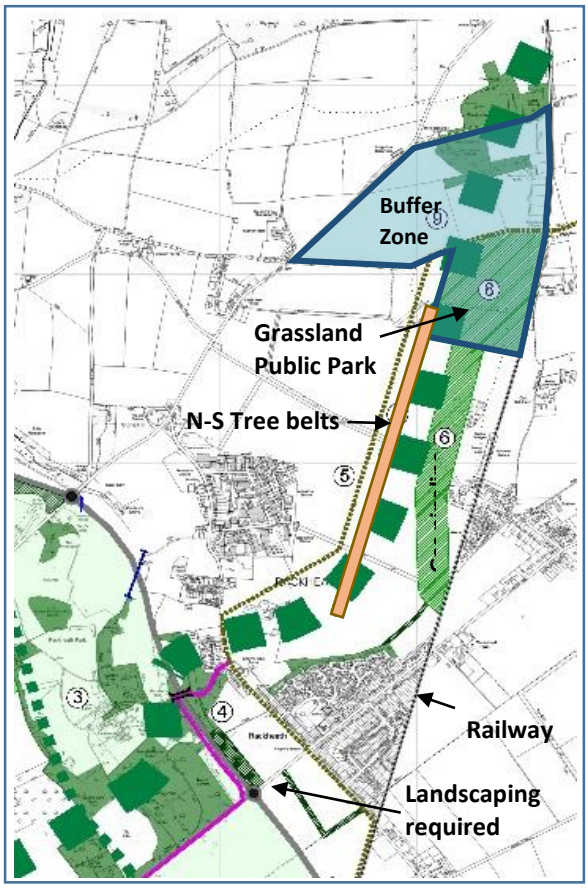


Figure 8: Green infrastructure connections in the GT16 area. The large dashed green line marks the location of Primary GI Corridor No. 1: Mousehold Heath to the northern Broads*. Existing woodland is marked in solid green with the North-south tree belts referred to with policy GT16 marked in brown. The gas pipeline route is marked in light green. The dotted brown line indicates a possible route of the* Broadland Way *(NMU) and the pink line indicates the* Pink Pedalway*. The area coloured blue is the location shown as public open space in the AAP policy map.*

Required work:

3.3.6.1 Broads Buffer Zone

At a basic level, the Broads buffer zone could simply be seen as an area of undeveloped land between the northernmost houses of the NEGT and the settlement of Wroxham to the north. However the AAP recognises that there is clearly potential for informal recreational use in this area. This is considered in the section below.

3.3.6.2 Grassland public park

The Policy requires at least 30ha of publically accessible acid grassland or a suitable alternative to be created. It specifically states that this will be to contribute to the mitigation required under the HRA of the JCS and subsequent planning documents. As such, its role will be to attract local residents to meet their daily recreational needs, including dog-walking, so they have no need to use nearby Natura 2000 sites. To attract local use, evidence shows that the recreation area must be a

significant size and be 'attractive'; an un-landscaped field is unlikely to act as a sufficient draw. As such, it is recommended that a variety of habitats/landscape features are created in addition to the grassland. Suitable features could include hedgerows, individual trees, clumps of trees and water features. These features would also contribute to the biodiversity value of the site and contribute to ecological connectivity within GI Primary corridor 1.

It is suggested that a management plan is produced as part of any masterplanning or planning application. It should consider the establishment and the long-term management of the public park and be informed by ecological surveys[12]. Aspects that should be covered by such a document are:

- **Management of existing landscape features:** Existing landscape features, such as hedges, woodland blocks and large trees should be retained. These should be manged in an appropriate manner to ensure they thrive in the long-term. The existing woodland blocks in, or adjacent to, the north of the buffer zone could be incorporated in to the recreation area.

  Management of the woodland could include the removal of non-native conifers with a conversion to a more deciduous woodland over the long-term. Open glades could be created, with felled timber used to create new dead wood habitat of various types, including the creation of log piles in shaded and sunny situations. Felled timber should be retained in the longest lengths possible.

  Paths could be created or improved through the wood. Path surfaces may need to be improved to cope with footfall, but the country 'feel' should be retained; crushed aggregate or similar may be appropriate. Arboriculture and flora surveys will be required to determine the most appropriate route for paths through the woodland.

- **Creation of grassland habitat.** The aim of the grassland creation should be to create acid grassland or a flower-rich sward with acid grassland components appropriate to the site. Formal amenity grassland is not a suitable alternative[13]. The prescription for grassland creation will depend on a more detailed assessment of current soil conditions, particularly pH and nutrients levels. Soils of arable fields often contain high levels of nutrients as result of repeated fertilizer application over many years. High nutrient status is not ideal for creating a flower-rich acid grassland as coarse grasses tend to dominate in these conditions. A number of techniques are available for creating appropriate soil conditions including the use of agricultural crops such as barley or linseed for 'nutrient stripping', but the process could take several years to achieve. It is likely that the seedbank is depleted and an appropriate seed mix will be required to create the sward. Appropriate commercially-sourced mixes are available[14].

[12] Surveys and management plans should conform to BS 42020:2013: *Biodiversity – Code of Practice for Planning and Development*. Bat use surveys are likely to be necessary as existing data in this area is incomplete.

[13] 'Formal amenity grassland' is a term generally used to refer to mown lawns or recreational/sports fields which tend to be planted with hard-wearing, but species-poor grass mixes, more suitable for heavy recreational use. This type of grassland would not be suitable in this context as it is of limited value for biodiversity.

[14] A suitable commercially available mix may be EM7AF: *Wild flower seed mix for acid soils* by Emorsgate Seeds http://wildseed.co.uk/home, a Norfolk-based company.

Long-term management of the grassland could involve grazing by stock, most probably sheep. If it is the intention that the grassland will be grazed, fencing will be necessary. This should be of a type appropriate to the setting; temporary electric fencing is not ideal where public access is encouraged. If grazing is not used, the floral diversity will need to be maintained by mowing and the removal of arisings from site. Mowing should take place after the meadow plants have set seed. A spring cut may also be necessary to reduce 'thatch'.

- **Tree planting:** To increase habitat diversity and to provide additional visual interest, individual trees or groups of trees could be planted within the grassland area. Planted trees should be of native provenance and should be of more than species to increase resilience in the context of climate change and pests and diseases. The trees will need to be protected during establishment and an approach suitable to the area will be necessary, perhaps with rustic post-and-rail fencing. If grazing stock is used, the fencing must preclude access by animals. The 1946 aerial photos of the area[15] show the presence of some large trees that no longer exist. Consideration could be given to replicating the historical situation with planting.

  Shrub planting would add interest. Along the existing woodland edge, and as appropriate within the wider area, some flowering-shrubs could also be planted to provide nectar resources particularly in spring, such as willows *Salix* species, hawthorn *Crataegus monogyna*, gorse *Ulex europea* and elder *Sambucus nigra*.

- **Hedgerow planting:** Hedgerows can used to provide structure to the landscape, to add to the visual interest of the site and provide habitat for wildlife. They could be used to link woodland blocks or clumps of planted trees. Hedgerows should be planted in double staggered rows at a 4-5 whips per metre. Some trees to grow on as standards should be planted at a distance of 10-20m. The hedges should be maintained in a manner that ensures their ecological integrity; they should be allowed to grow wide and tall and cut in a sympathetic manner. Species used should be similar to the composition of the existing or nearby hedges and include species that provide nectar and berries for wildlife.

- **Pond:** Opportunities should be sought to see if it is feasible to create a water feature. Ground conditions would need to be suitable. Field surveys should include searches for 'ghost' ponds[16] that could be recreated. The provision of any water feature would be subject to agreement with Norwich Airport.

- **Elements of more formal recreation**: These could be incorporated sensitively in to the grassland public park, such as a children's play area or public and/or community art. A small car park may be considered appropriate.

[15] After the Second World War the RAF photographed almost all of the United Kingdom as part of a National Air Survey. *The Norfolk Historical Map Explorer* includes around 8,300 aerial photographs of Norfolk taken between 1945-6. http://www.historic-maps.norfolk.gov.uk/home

[16] With pressure to increase food production and a decline in the number of uses for ponds, many ponds in open farmland have now been lost**,** often filled in during agricultural improvements. However, many remain visible as damp, circular crop marks, or bowl shaped depressions in the fields. These are called 'ghost ponds'. A project to restore them in underway in Norfolk. https://ghostponds.wordpress.com/

3.3.6.3 Protection of the North-South Tree belts

The policy requires for the North-South tree-belts (actually aligned North-east to South-west) to be retained within development. It should be noted that there are other tree belts aligned perpendicular to those described above, but the retention of these is not required by the policy. The Masterplanning process should ensure the tree belts are fully integrated into proposals and that they help inform the structure and layout of development. The tree belts should be managed in an appropriate manner in the long-term.

The integrity of the tree belts should be retained with no or very few breaks to retain their landscape and ecological value. Although data is incomplete, it is likely that the edges of the tree belts are used as commuting routes by bat species; in 2009 the tree belts were in the home range[17] of a radio-tracked barbastelle bat[18]. They should not be lit to allow their continued use by bats. Increased ecological connectivity should be delivered through the wider development, with the aim of linking the tree belts to other green areas, especially the open space on the line of the gas main. This could be achieved through street trees on the roads aligned east-west and green roofs.

New cycleway links are required running north to south through the allocation site, forming part of the *Broadland Way*. These could be developed adjacent to the tree belts (although potentially they could also be delivered along the route of the gas main). Consideration should be given to including a strip of grassland adjacent to the edges of the woodland, forming a linear open space, through which the cycleway could run. If this is the chosen option, it is recommended that the houses front the linear open space.

Management of the tree belts in the long-term could include the removal of non-native conifers with a conversion to a more deciduous woodland.

3.3.6.4 Additional recreation areas

The route of the gas pipeline could be used for informal or formal recreation, perhaps sports pitches. It could potentially be used to take the *Broadland Way* or cycle links through the development. It is recommended that the houses front the linear open space.

Increased ecological connectivity should be delivered through the wider development; the open space on the line of the gas main should be linked to other green areas including the tree belts. This could be achieved through street trees on the roads aligned east-west and green roofs. Areas of informal recreation space within the pipeline route could be seed with a wildflower mix. See Section 3.3.6.2 for details.

Delivery mechanism(s):

The GI works should be delivered by the developer through planning condition or planning obligation.

It will be necessary to ensure appropriate measures are put in place, including sufficient funds are secured, to manage the new and enhanced GI in the long-term.

[17] In this context, a 'home range' is defined as the restricted area within which a bat moves when performing its normal activities. The home range in question was derived from radio-tracking data of a male barbastelle bat that was roosting in March Covert on the Rackheath estate.

[18] The presence of one bat using a given location for feeding (in this case identified through radio-tracking) implies other individuals from the same 'population' may use a similar area.

3.3.7 *Project no.10: Thorpe Woodlands (Racecourse, Belmore and Brown's Plantations) – protection of ecological connectivity*

Project 10: Thorpe Woodlands	**AAP Policy: none AAP GT2**
Primary GI function requirement: Protection of Primary GI corridors. The Woodlands are an important element of two GI Primary Corridors: • GI Primary Corridor no. 1: *Mousehold Heath to the Broads*; and • GI Primary Corridor no. 2: *Thorpe Ridge*	
Additional GI function requirements: The woodlands act as an 'ecological hub', connecting the Primary GI corridors with a number of secondary corridors: • Thorpe Woodlands to Broadwalk Plantation/Fir Covert; • Thorpe Woodlands to Dobbs Beck (via Harrisons Plantation); • Thorpe Woodlands to Dobbs Beck (via Rackheath Park); • Thorpe Woodlands to Witton Run; and • Thorpe Woodlands to Apple Tree Farm, Plumstead. The woodlands could be used for informal public recreation and could contribute to the mitigation for impacts identified through the HRA process*. (*Although public access to Thorpe Woodlands is <u>not</u> a necessity within the mitigation package required by HRA)	

Background:

'Thorpe Woodlands' is a name given to a group of adjoining woodlands either side of Plumstead Road, namely Belmore's and Brown Plantation on the south side of the road, and Racecourse Plantation to the north. The majority of the woodland blocks are in the Parish of Thorpe St Andrew's. The northern edge of Racecourse Plantation forms the parish boundary between Thorpe and Sprowston, whilst the north-eastern edge forms the parish boundary between Thorpe and Great Plumstead with a very small part of Racecourse Plantation in the latter Parish.

The woodlands have been managed commercially for timber production. They are currently in a woodland grant scheme which allows for normal forestry practices to be undertaken, with an extant Forest Plan covering the period 2001 to 2020 (Forest Plan ref: 017014). Some recreational activities currently take place within the woodland, including archery and paintballing. Formal access to parts of the woodland was permitted in the relatively recent past when the woodlands were entered in to an environmental scheme that made payments for access, and the current Forest Plan includes a management objective to "*…provide for informal and formal recreational use*" with a stated aim of "*Maintaining permissive access in Belmore Plantation*".

Various proposals for developing houses within the woodland have been promoted over the years. A development company is currently promoting the partial development of the site, and they made representations regarding this site at the public examination of the AAP.

History:

The history of the location is very interesting and better understood than many areas due to unusually extensive historical records[19]. Domesday Book records Thorpe as belonging to the King, and implies that there were about 1500 acres of wood pasture present, part of a mosaic of woodland, heath and grassland of the former Mousehold Heath. This was one of the largest heaths in Norfolk until it was destroyed by piecemeal loss following the Enclosure Act of 1881[20]. The area known today as Racecourse Plantation, apparently named after a 17th century short-lived racecourse, is located in this area. As described above, the woodlands are located on the parish boundaries and the meeting point of the parishes was once marked by a notably feature, shown on various maps, called 'Whyght Stake'. To the south of this was an area of 'waste' called Gydding Heathe, which most likely covered the area where the woodlands are today[21]. Various landscape features can still be seen in the current woodlands including part of the western boundary of Gydding Heath and the former Walsham Way, a road or track depicted on the 1589 map. Extant ditches, some quite deep, follow the alignment of the parish boundaries.

Ecology:

The woodlands have been considered as ancient woodland[22] by some, and appeared briefly on Natural England's Ancient Woodland Inventory. Current thinking is that they are not. Having said that, they retain features from the former 'heathy' or waste-type landscape (e.g. old boundary banks, old trackways) and they support a varied flora. A recent assessment by an independent landscape historian, Oliver Rackham, commissioned by Socially Conscious Capital in 2012, identified 20 species that are considered "ancient woodland indicators", species whose presence is usually correlated with the locations of ancient woods. The accompanying report notes that this is 'an unusually large list for a wood of this size'. The tentative explanation suggested for this concentration of indicator species is the plants are later introductions that have inadvertently arrived via forestry vehicles. This seems a particularly unsatisfactory explanation; if this is the reason, why have similar concentrations of ancient woodland indicators not occurred in the many other woods in the county that are also subjected to similar forestry management? The woodlands also support an unusually large number of heathland plant species, including some scarce ones, and it is generally agreed that these are relics from when the site was heathland, itself 'ancient' in origin.

In any event, whether ancient or not, the current flora is rich and varied (confirmed by Rackham's work, Applied Ecology's reports and other private surveys) and includes the notable plants chaffweed *Centunculus minimus* and allseed *Radiola linoides*. As such the woods have been designated as County Wildlife Sites: Racecourse Plantation CWS 2041 and Belmore's and Brown Plantation CWS 2042. The woods also act as an 'ecological hub', a situation reflected in the number of secondary GI corridors that intersect with the two primary GI corridors at this location. These corridors were identified in the Greater Norwich Green Infrastructure Strategy (2009), informed by

[19] Mousehold Heath was an asset of the Bishop of Norwich, and much information of the site is included in the considerable archives of the Dean and Chapter. Oliver Rackham, the illustrious Landscape Historian, has written extensively about Mousehold Heath in several books and articles, drawing extensively on the Cathedral records, and provided a report for consultants promoting the development of Racecourse Plantation in November 2012.

[20] Leaving the small remnant that is called "Mousehold Heath" and that was given to the City Council (then the City Corporation) in 1884.

[21] As depicted on the spectacular Mousehold Map of 1589; Norfolk Records Office MS 4547.

[22] Ancient Woodland is defined as woodland that has been in existence since 1600AD. It is usually identified through historical evidence and the presence of physical features and plant indicator species.

the Eco-net ecological mapping undertaken by Norfolk Wildlife Trust, and refined by subsequent work by NBIS/Norfolk County Council.

Barbastelle bats are known to feed over the woodland (see Sections 2.1.2.2.; 3.3.9., and 3.3.9.3.), coming from two different groups of roosts that appear to have a degree of separation (perhaps best considered as 'sub-populations' in this context). These roost clusters are centred on Rackheath Park estate and an area near Great Plumstead. There are several probable reasons why the Thorpe Woodlands are used by barbastelles:

- In the UK, un-farmed and undeveloped is of great importance to this species as the use of fertilisers and pesticides on arable land has significantly reduced insect abundance, the prey items of bats, in the wider landscape. Deciduous woodland fits in to this category, and is therefore of importance for barbastelles[23].
- Modern forestry practices often provide conditions suitable for bats. The value of plantations is that they are undeveloped, unlit and herbicides and pesticides use it limited. They are also undisturbed at night when bats are feeding. Vehicle movements create ruts which hold water.
- Damp areas are favoured for feeding by barbastelle bats, as their diet includes tiny diptera that thrive in damp soils. The Thorpe Woodlands are particularly damp (reports previously supplied by Socially Conscious Capital indicate this is why forestry operations have not been particularly successful at the site).
- The extent and connectedness of broadleaved woodland is closely linked to roost location for bat species in the UK[24]. Thorpe Woodlands are large and sit in a landscape with many woodland patches, both large and small, that are connected with hedges or lines of mature trees. The 18th century parklands that are prevalent in the area contain a number of veteran trees which provide roost opportunities.

Given these reasons, it is hardly surprising that Thorpe Woodlands formed a large part of the home ranges of at least three radio-tracked barbastelles. It is probably safe to assume that they also form part of the home ranges of other individuals from the same roost clusters, and are therefore of importance for barbastelles at a population level.

The woodlands are also home to other priority (scarce, rare, notable) protected fauna, including great crested newts *Triturus cristatus.* The large size of the woodland probably means it is important for woodland specialists. Studies show that both the number of woodland specialist species and their abundance is closely related to woodland area[25]; larger blocks of woodland support more species and greater abundance than smaller woods. The size of the Thorpe woodland probably also

[23] The loss of woodland habitat is considered a main reason for the decline of this species in Europe. The UK population of barbastelle bats is thought to be around 5000 individuals (Bat Conservation Trust, 2015). The barbastelle bat is listed is listed as Near Threatened on the global IUCN Red List of mammals, and the worldwide population is recorded as decreasing.

[24] Katherine L. Boughey, Iain R. Lake, Karen A. Haysomb, Paul M. Dolman (2011); "*Effects of landscape-scale broadleaved woodland configuration and extent on roost location for six bat species across the UK*"; Biological Conservation; Volume 144, Issue 9, Pages 2300–2310.

[25] E.g. Bellamy et al. (1996); "*Factors influencing bird species numbers in small woods in South-east England*"; Journal of Applied Ecology; 33, 249-262. Note that the area of woodland accounted for 70% of the variation i.e. far more important than various measures of 'quality' of the woodland habitats. Similar results have been reported across a range of taxa including *carabid* beetles, fungi and small mammals.

means that a greater proportion of the woodland is less affected by domestic cats than other smaller woods, as impacts from cats reduce with distance from their home[26].

Required work:

The protection of the ecological value of these woodlands is necessary within the development proposed for the north-east of Norwich. In particular, the value of their role as an 'ecological hub' in delivering ecological connectivity must be retained, and this connectivity should be secured through adjoining allocated sites.

If recreation use is considered appropriate, this must be carefully managed to ensure the value for biodiversity will not be adversely impacted. It should be noted that the HRA for the NEGT AAP concluded that potential impacts on the Natura 2000 sites would be successfully mitigated without the need for informal recreational access in Thorpe Woods.

If other uses of the wood are proposed, the impact on the barbastelle population must be considered.

Delivery mechanism(s):

The land is under a woodland grant scheme at present which allows for forestry practices to be undertaken. Opportunities to enhance the area for biodiversity are encouraged, through the grant scheme or other means.

No cost implications at present.

[26] Woods M et al (2003); "*Predation of wildlife by domestic cats* Felis catus *in Great Britain*"; Mammal Review 33; pp 174 - 188

3.3.8 Project no.11: Public open space and landscaping at Brook Farm

Project 11: Public Open Space - Brook Farm	**AAP Policy GT6 AAP GT2**
Primary GI function requirement: • To provide a Landscape cushion south of Thorpe End Village • To provide informal recreational to contribute to the mitigation required by the HRA	

Additional GI function requirements:
• To provide ecological connectivity, especially for bats, along secondary GI corridors:
  ○ Thorpe Woodlands To Witton Run, and
  ○ Thorpe Woodlands to Smee Lane	

Background:

An allocated site of approximately 38ha south of Thorpe End, referred to as Brook Farm, is anticipated to be completed as per consented permission 20090886. The AAP (para 8.19) states "*the sense of separation between Thorpe End and the built up edge of Thorpe St Andrew is an important part of the area's heritage and local distinctiveness….The maintenance of a 'landscape cushion' at the edge of Thorpe End is key to retraining separation*".

A large area of open space to the north of the development site will effectively maintain the separation and will provide 16.5ha of land for informal recreation to contribute to the mitigation required by the HRA. The orbital link road will pass through the allocation, probably to the south of the west and south of the open space, whilst Green Lane North will become a cycleway forming part of the Outer Orbital Pedalway. A possible landscape plan from the 2009 application is included below (Figure 9).

Barbastelle bats from a cluster of roosts in an area near Great Plumstead are known to feed over the area south of Thorpe End, particularly over Triangle Wood, as well as commuting through it to feed over Thorpe Woodlands immediately to the west (see Section 3.3.7.). The area is defined as a secondary GI Corridor for this reason and probably is a crucial part of the home ranges of bats from more than one roost[27]. The area is also important for brown long-eared bats, *Myotis* spp. and pipistrelles spp.

Required work:

In an ideal world, the landscape form created by the historic use of the area should be used to inform the character of the landscaping buffer to Thorpe End. The area was probably once part of the 'Lumners Foldcourse' (Or 'Great Lumners'), a long-standing block of land enclosed from Mousehold Heath (i.e. separate from the heath) on which the cathedral Dean and Chapter used as pasture for sheep[28]. The area is now largely under arable farming but the current field boundaries appear to be very similar to those shown on both the OS First Edition Map and the 1946 aerial photos. Speculatively, these boundaries may have their origins on internal boundaries of the

[27] In this context, a 'home range' is defined as the restricted area within which a bat moves when performing its normal activities. The home ranges in question were derived from radio-tracking data of three separate barbastelle bats that were roosting near Great Plumstead. Two of the bats were identified as spending significant time feeding over Triangle Wood. It is likely that other bats from the same cluster of roosts use similar feeding areas and commuting routes.

[28] Depicted on a map dated 1718 showing the cathedral lands (NNR: CHC 1193)

foldcourse, but in practice there is little detailed information to inform to inform the design of the open space.

Habitats within the open space:

- Given the lack of detailed historical information to inform the design of the open space, it is suggested that the open space could be a mosaic of dry and wet grassland and tree planting in the form of copses and scattered trees. The aim of the grassland creation should be to create a flower-rich sward with species appropriate to the site. The prescription for doing so will depend on a more detailed assessment of current soil conditions, particularly pH, water content and nutrients levels. The illustrative landscaping plan shows an area of wet meadows and this may be achievable. It is likely that the recent use of the site for arable farming means that nutrient levels are likely to be elevated due to repeated fertiliser use. Therefore nutrient removal may be necessary to stop coarse grasses dominating in the new sward. Similarly, the seedbank is likely to be depleted and an appropriate seed mix will be required to create the sward. Appropriate commercially-sourced mixes are available[29].
- Planted trees should be of native provenance and should be of several species to increase resilience in the context of climate change and pests and diseases. The trees will need to be protected during establishment and an approach suitable to the area will be necessary, perhaps using rustic post-and-rail fencing. Along the existing boundaries and as appropriate within the wider open space, some flowering-shrubs could also be planted to provide nectar resources particularly in spring, such as willows *Salix* species, cherries *Prunus* species, hawthorn *Crataegus monogyna* and elder *Sambucus nigra*.
- To maintain the use of the area by bats (from the known roosts to the east and feeding over the woodlands to the west), it will be necessary to retain linear features. These could be incorporated adjacent to the orbital road or cycleway/Green Lane North in the form of landscaped planting. For further details see section 3.3.9.3.
- It is likely that the open space will include features for sustainable drainage and these should be consistent with informal recreational use and have value for biodiversity.

The potential of the adjacent Triangle Wood to be used for informal recreation and biodiversity enhancement should be explored with land owners – particularly it is associated with other proposed development.

Delivery mechanism(s):

The GI works should be delivered by the developer through planning condition. A management plan for the creation and management of the open space is recommended. It will be necessary to ensure measures are put in place to ensure the long-term maintenance of the GI.

[29] Suitable mixes are commercially available e.g. from Emorsgate Seeds http://wildseed.co.uk/home, a Norfolk-based company.

Figure 9: An illustrative landscape Plan submitted by the applicant of consented permission 20090886 in 2009, covering allocation GT6 and showing a possible design for the area of public open space.

Triangle Wood at Thorpe End; photo taken from the Middle Road bridge over the railway line (DW).

3.3.9 *NDR Mitigation - Project no.13: Brown bridge, bat gantries and culverts, no.15: Bat gantry and culvert, no. 20: Woodland creation and culvert, no.24: Bat Gantry and culvert, and no.25: Culvert. Associated mitigation - Project no.12: Landscaping adj. to New Road link (GT6 & 9) and Project no.14: Landscaping adj. to Green Lane and Smee Lane (GT11)*

Projects 12, 13, 14, 15, 20, 24, 25 – NDR ecological mitigation	**AAP Policy GT2; GT 6; GT 9; GT 11**
Primary GI function requirement: Ecological mitigation for adverse impacts from the NDR on local bat populations, particularly barbastelle bats.	
Additional GI function requirements: Landscaping enhancements for amenity	

Background:

The Development Consent Order (DCO) for the NDR was granted in July 2015. Ecological work to inform the DCO identified significant use of the road corridor by bats including by a population of Barbastelle bats of at least national importance. Over 50 roosts of at least 8 species were identified in, and close to, the NEGT area. The main roosts are depicted in Figure 10. Specific mitigation for where roosts are impacted will be completed under a European Protected Species licence. In addition, mitigation will be undertaken at the 10 most significant locations where bats currently cross the route. Of these, 7 are within the growth triangle.

Within the NEGT area, mitigation comprises of:

- 5 wire gantries (NDR bat gantry no.3: *Quaker Lane*, NDR BG no. 4: *Beeston Park - North of Hall buildings*, NDR BG no. 5: *Beeston Park – track off Beeston Lane*, NDR BG no. 6: *west of Toad Lane*, NDR BG no. 7: *Smee Lane*);
- A culvert under the NDR suitable for use by brown long-eared bats south of the Wroxham Road on the Rackheath estate; and
- A 'Brown' bridge at Middle Road that incorporates an integral hedge across the span of the road.

Bat gantries:

The idea of wire gantries is to encourage bats to cross the road at a height above that of lorries so as to reduce the potential for collisions. Although the evidence to date of the successfulness of such features is limited[30], the design of those proposed for the NDR is different to that used previously, and the integration of the gantries into the existing landscaping features has been carefully considered in the design of the wider mitigation scheme. Planting leading up to the bat gantries will include semi-established shrubs and trees to a minimum height of 1.5m to provide some tangible height and structure along which bats could commute as soon as it is planted.

[30] See Berthinussen & Altringham, 2015, for a summary of mitigation for bats crossing linear transport infrastructure.

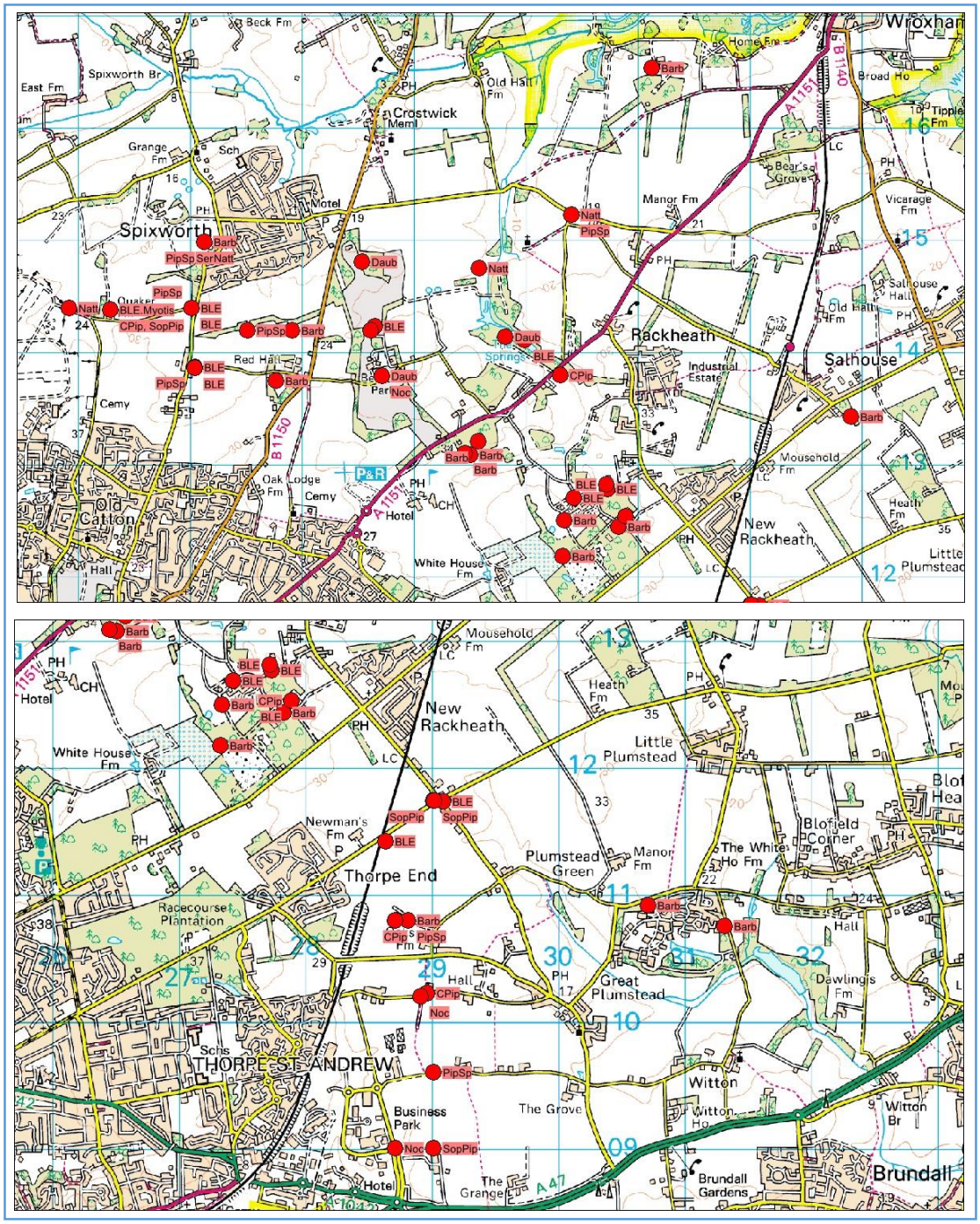


Figure 10: The locations of the main bat roosts identified through the preparatory work to inform the NDR Development Consent Order. Hibernation, maternity and summer roosts are shown. Species codes: Barbastelle (Barb), Noctule (Noc), Brown Long-eared (BLE), Natterer's (Natt), Daubenton's (Daub), unidentified Myotis (Myotis), Common Pipistrelle (CPip), Soprano Pipistrelle (SopPip), unidentified Pipistrelle (PipSp). Data was collected between 2009 and 2015. Map redrawn from the NDR Environmental Statement Vol 2: Chapter 8: Appendix D.

Culvert for use by bats (GI project no. 13):

Several studies have shown that a number of bat species use underpasses to cross beneath roads[31]. Brown-long-eared bats in particular seem to take to them. The location of the culvert intended to act as a bat underpass is in an area heavily used by brown long-eared bats. Immediately to the south is an extensive area of woodland associated with Rackheath Park where a number of roosts of this species have been identified. There are also woodland connections to Gazebo Farm where further roosts occur. The design of the culvert is shown in cross section in Figure 11. The underpass will be 2.5m in width and 2m in height[32].

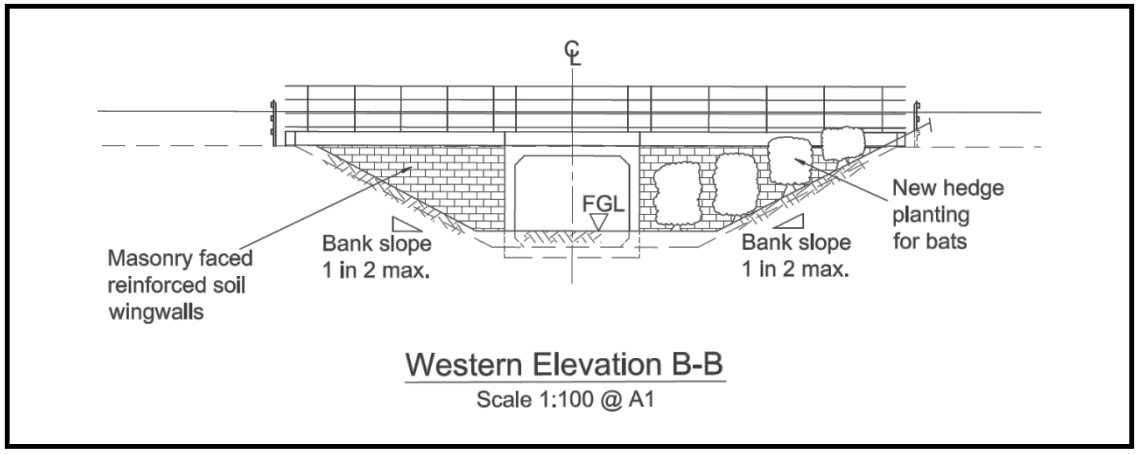


Figure 11: Cross section of the culvert that is intended for use by Brown long-eared bats

"Brown" bridge (GI project no. 13):

Bridges with vegetation, either land bridges or green bridges that are covered by semi-natural vegetation, or brown bridges that carry some vegetation such as hedges, are likely to be effective for bat usage given their similarities to natural bat commuting features. However they are largely untested in this respect[33]. An example of an existing bridge of this type is shown in Figure 12, where the hedge-lined bridge should allow bats to commute across the bypass in a safe manner.

A brown bridge will be completed to take Middle Road over the NDR. This will have a hedge along one side that should allow bats to cross the NDR safely. The design of the bridge is shown in Figure 13. There are some significant roosts of barbastelles bats located to the east of the bridge and bats from these roosts are known to feed over Thorpe Woodlands to the west commuting across the area between Dussindale and Thorpe End (AAP policy area GT6). There is also a large maternity roost of common pipistrelle and a noctule maternity roost.

A suitable planting scheme within the NDR route footprint will complement the brown bridge. Planting on the bridge and leading up to it will include semi-established shrubs and trees to a minimum height of 1.5m to provide some tangible height and structure along which bats could commute as soon as it is planted. In addition, west of the A1151 Wroxham Road roundabout, dense

[31] See Berthinussen & Altringham, 2015, for a summary of mitigation for bats crossing linear transport infrastructure.

[32] Note **GI project 25** refers to a culvert south of Spixworth. Whilst this may be used by wildlife, it is not specifically intended to be part of the ecological mitigation scheme.

[33] Berthinussen & Altringham, 2015

woodland planting will be used to provide a habitat link between existing woodland in the vicinity of Rackheath Park adjacent to a culvert under the NDR **(GI project no 20)**.

Figure 12: An example of an existing bridge with similarities to that proposed at Middle Lane: Scotney Castle Green Bridge over the A21 at Lamberhurst Bypass in Kent, built in 2005. Located in an AONB and surrounded by the Scotney Estate, known to support significant populations of several species of bats. Left: view from the south-east, and right: the view over the bridge.

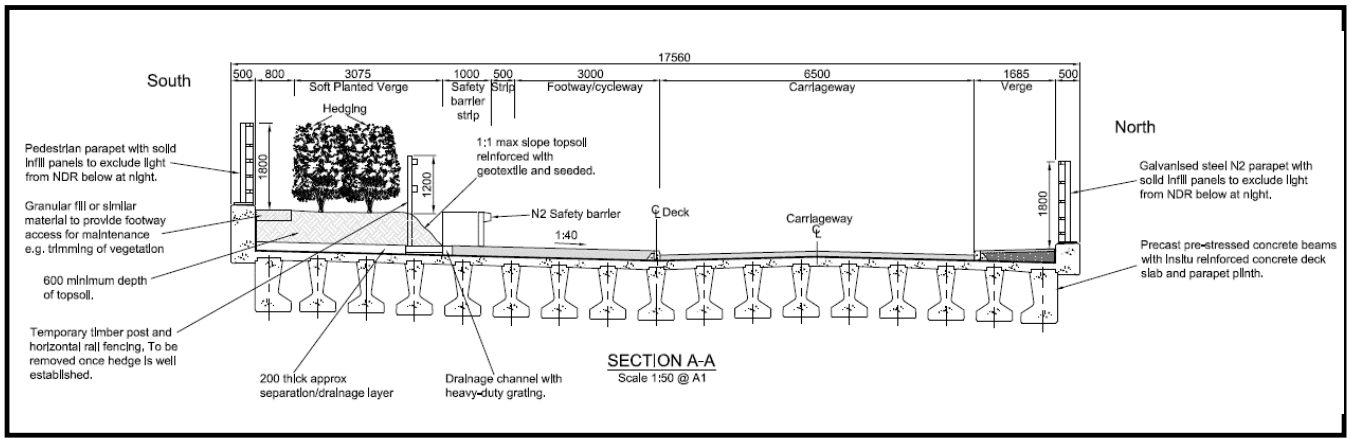


Figure 13: Cross section of the brown bridge that is intended for use by barbastelle bats

Required work:

The footprint of the NDR is relatively narrow. For the mitigation to be successful, wider landscape enhancements outside of the footprint will be necessary. In particular, the maintenance and enhancements of features used by bats leading towards the crossing points will be necessary to ensure the long-term viability of the local populations. Particular areas where this is necessary are described below.

3.3.9.1 *GI Project 24: Landscaping adjacent to the bat gantries at Beeston Park, BG no. 4: Beeston Park - North of Hall buildings, and BG no. 5: Beeston Park – track off Beeston Lane.*

The eastern side of Beeston Park and the track heading north from Beeston Lane are commuting and feeding areas for barbastelle bats that roost to the south (see Section 3.3.14), and important for *Myotis* species - mainly Daubenton's and Natterer's – and brown long-eared bats. Wire bat gantries will be delivered at these two locations. The footprint of the NDR scheme is relatively narrow here and landscaping as part of the scheme is primarily limited to the southern side. The exception to this is where the NDR crosses the former parkland north-west of Beeston Hall. Here there will be an area of earth mounding south of the road with planting restricted to clumps of specimen tress to reinforce the parkland character (shown in blue on Figure 14). These will be planted to replicate the historic location of planting illustrated in the first edition Ordnance Survey Map (1879- 1886) (refer to Section 3.3.3.).

To maximise the chances of the wire bat gantries to function as intended, it will be necessary to provide some additional landscaping outside of the NDR footprint. Existing hedgerows should be enhanced by 'gapping-up' with additional planting as necessary. The hedges should be maintained in a manner that ensures their ecological integrity; they should be allowed to grow wide and tall and cut in a sympathetic manner. Species used should be as in the composition of the existing or nearby hedges. Where gaps are large, or new hedges are required, planting should be in double staggered rows at a 4-5 whips per metre.

The developer delivering outline consent 20121516 included this enhancement as part of their mitigation for hedges lost in their wider application site. They must be held to the commitment to deliver this hedge planting.

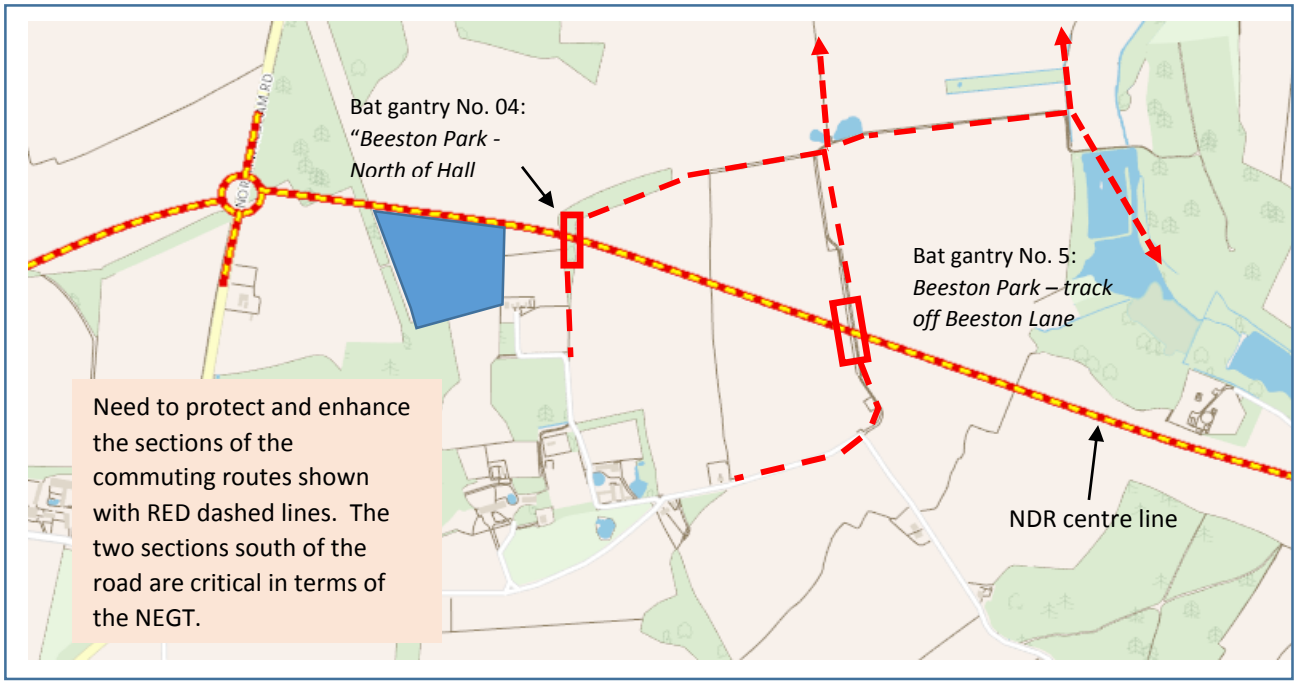


Figure 14: Location of areas where additional landscaping is necessary to permit the appropriate functioning of the wire gantries over the NDR. The area shaded in blue is where mounding and parkland planting will be delivered as mitigation for the NDR.

3.3.9.2 GI Project 13: Landscaping adjacent to the wire bat gantry at BG no. 6: West of Toad Lane

The track running west from Toad Lane has a very incomplete hedge with a number of standard trees (see Figure 16 and photo below). It has been identified as a commuting feature for barbastelle bats from roost a very nearby. It is also used by brown long-eared bats, *Myotis* species, and as a feeding feature for pipistrelle bats from roosts within the trees along the track. The NDR will pass through the section of the track where there are most trees. This will be 'bridged' with a wire gantry to encourage bats to cross at a height above the lorries. The width of the footprint of the NDR scheme is relatively narrow at this section and so planting delivered as part of the NDR adjacent to the gantry will be limited. It is therefore important that the enhancements to the hedgerows are delivered through policies within the AAP.

The hedges along the track either side of the gantry should be enhanced by 'gapping-up' with additional planting of native species. Where gaps are large, and where new hedges are required, planting should be in double staggered rows at a 4-5 whips per metre. Some trees to grow on as standards should be planted at a distance of 10-20m. Ideally the hedges should be maintained in a manner that ensures their ecological integrity; they should be allowed to grow wide and tall and cut in a sympathetic manner. Species used should be similar to those of the existing or nearby hedges.

This location is within the Landscape Buffer zone and is not part of any current allocation. Therefore an approach to the landowner will be necessary and a funding source may need to be found. However, should an application come forward in this vicinity, perhaps related to area covered by Policy GT22, this landscaping could be delivered as part of that permission.

3.3.9.3 GI Project 12 and 13: Landscaping adjacent to the Middle Road 'Brown' overbridge and new Orbital Link Road

Middle Road is an important commuting route for barbastelle bats that roost just to the north and to the west, and that feed over Thorpe Woodlands and along the railway line. The area is also important for brown long-eared, *Myotis* species, noctule and Leisler's bats. To take Middle Road over the NDR, some embanking is necessary. Thus adjacent to the Middle Road 'Brown' overbridge, the footprint of the scheme is broader and some landscaping will be provided (Figure 15 and the shaded blue area in the aerial photo in Figure 16). Outside of the NDR footprint, additional landscaping links should be provided along Middle Road to the west of the bridge (shown by red dashed lines in Figure 16).

The Orbital Link Road is likely to be delivered along the western section of Middle Road and then south through AAP policy area GT9. This link road should be landscaped in such a manner to enable it to act as a features bats can use.

Where landscaping is required, hedgerow planting should be in double staggered rows at a 4-5 whips per metre. Some trees to grow on as standards should be planted at a distance of 10-20m. Ideally the hedges should be maintained in a manner that ensures their ecological integrity; they should be allowed to grow wide and tall and cut in a sympathetic manner. Species used should be similar to the composition of the existing or nearby hedges. Adjacent to the hedges bordering the link road, consideration should be given to providing a grass strip of 5m in width.

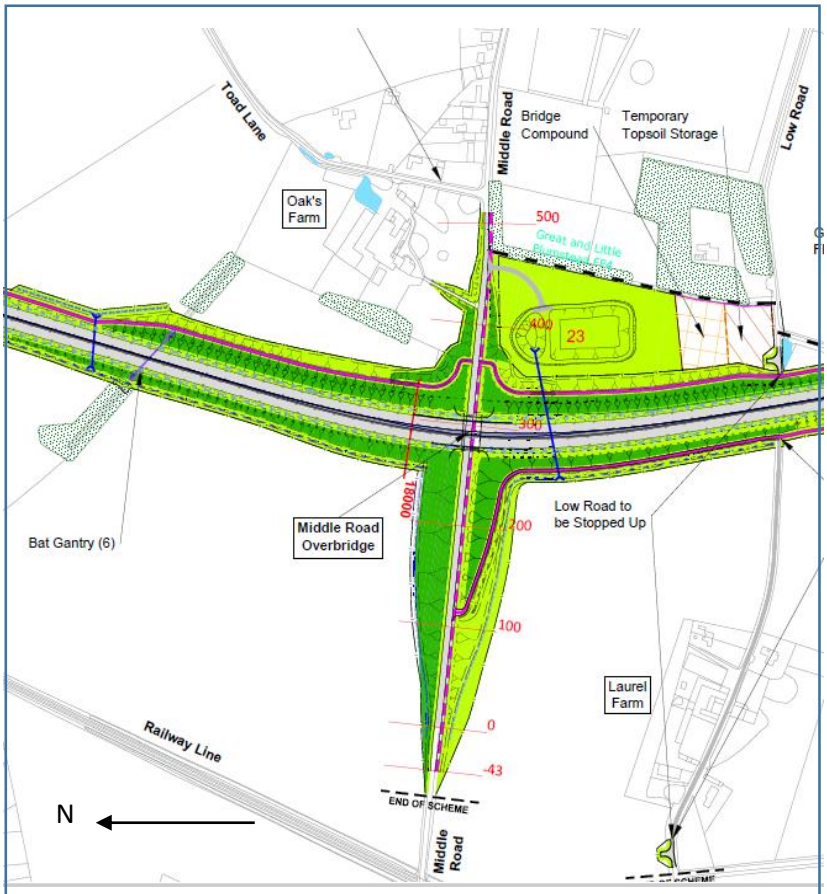


Figure 15: Extract from NDR landscaping plans showing planting areas at the Middle Road overbridge.

Middle Road; photo taken from the Railway bridge looking east (DW).

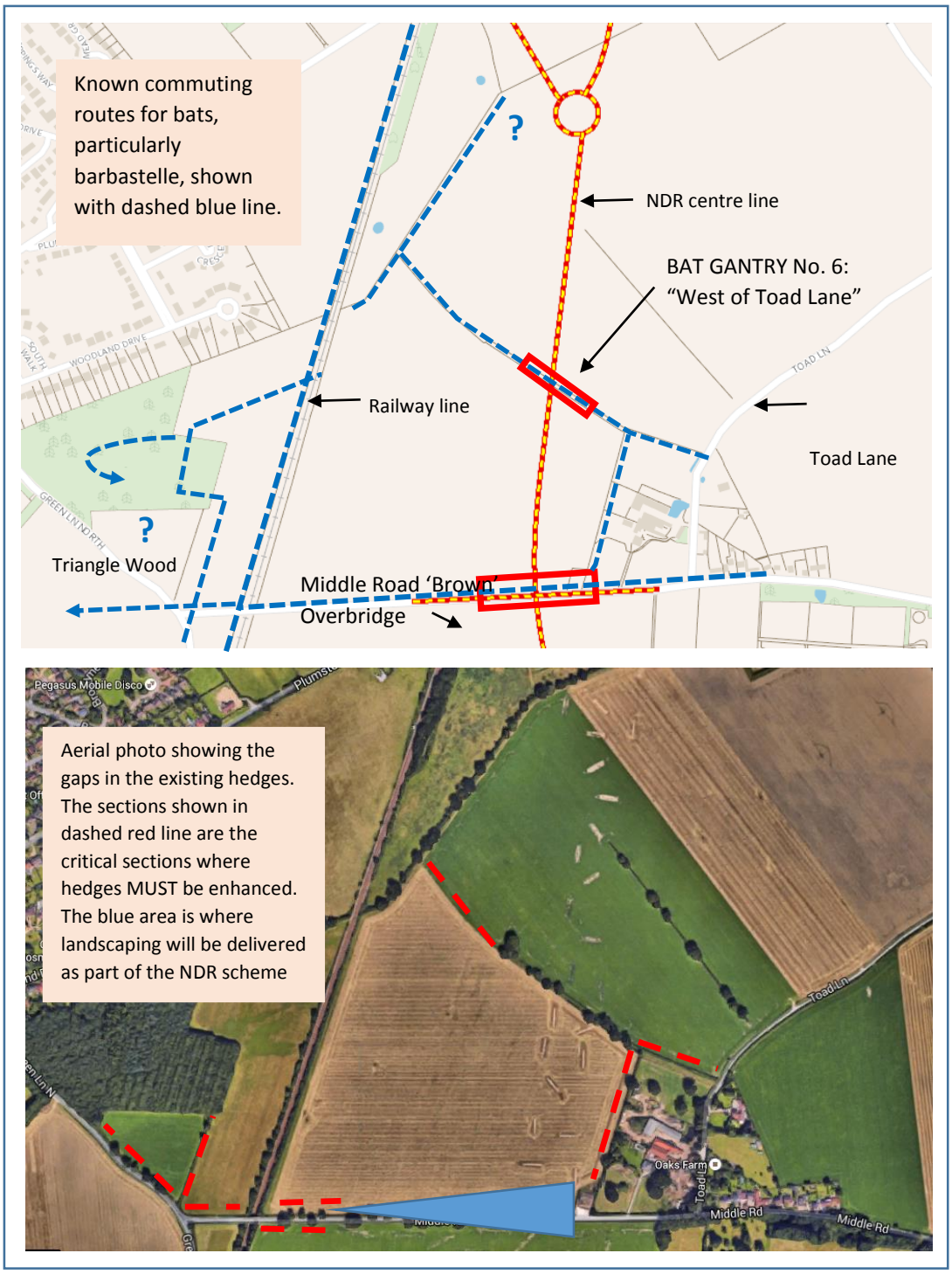


Figure 16: Location of bat commuting routes and areas where additional landscaping is necessary (shown by dashed red lines) to permit the appropriate functioning of the wire gantry and the Middle Road overbridge across the NDR. The area shaded in blue is where landscaping will be delivered as part of the NDR scheme.

3.3.9.4 GI Project 14 and 15: Landscaping adjacent to Green Lane and Smee Lane (GT 11) and landscaping associated with Bat Gantry no. 7: Smee Lane

The tree-lined fields and tracks in this area are extensively used by several species of bats. Smee Lane is a route used by barbastelles and pipistrelle bats from nearby maternity roosts to the east heading to their feeding areas. It is also used *Myotis* species, serotine, noctule and Leisler's bats. The double-hedged/tree-lined track from Low Road to Smee Lane is an important foraging area for probably all of these species.

Left: Track linking Smee Lane to Low Road. This is used by barbastelles, brown-long-eared, pipistrelles and serotines. Above the tree-lined field edges by Smee Lane used by several bat species (DW).

Smee Lane will be closed as part of the NDR scheme although a wire bat gantry will be installed to retain the bat corridor (Figure 17). Very limited landscaping is associated with this gantry and some enhancement of the existing hedgerow and tree-line to the west to the roundabout at Cranley Road is recommended (shown by red dashed line in Figure 17).

The Orbital Link Road is likely to be delivered south from Middle Road and through AAP policy area GT9 to the Cranley Road roundabout. This link road should be landscaped in such a manner to enable it to act as a features bats can use. Green Lane would also benefit from some landscaping. A hedgerow/tree-line on both sides of the road is recommended if space permits (GT 9 to the west and GT 11 to the east).

Where landscaping is required, hedgerow planting should be in double staggered rows at a 4-5 whips per metre. Some trees to grow on as standards should be planted at a distance of 10-20m. Ideally the hedges should be maintained in a manner that ensures their ecological integrity; they should be allowed to grow wide and tall and cut in a sympathetic manner. Species used should be similar to the composition of the existing or nearby hedges. Along the hedges bordering the link road and Green Lane, consideration should be given to providing a grass strip of 5m in width.

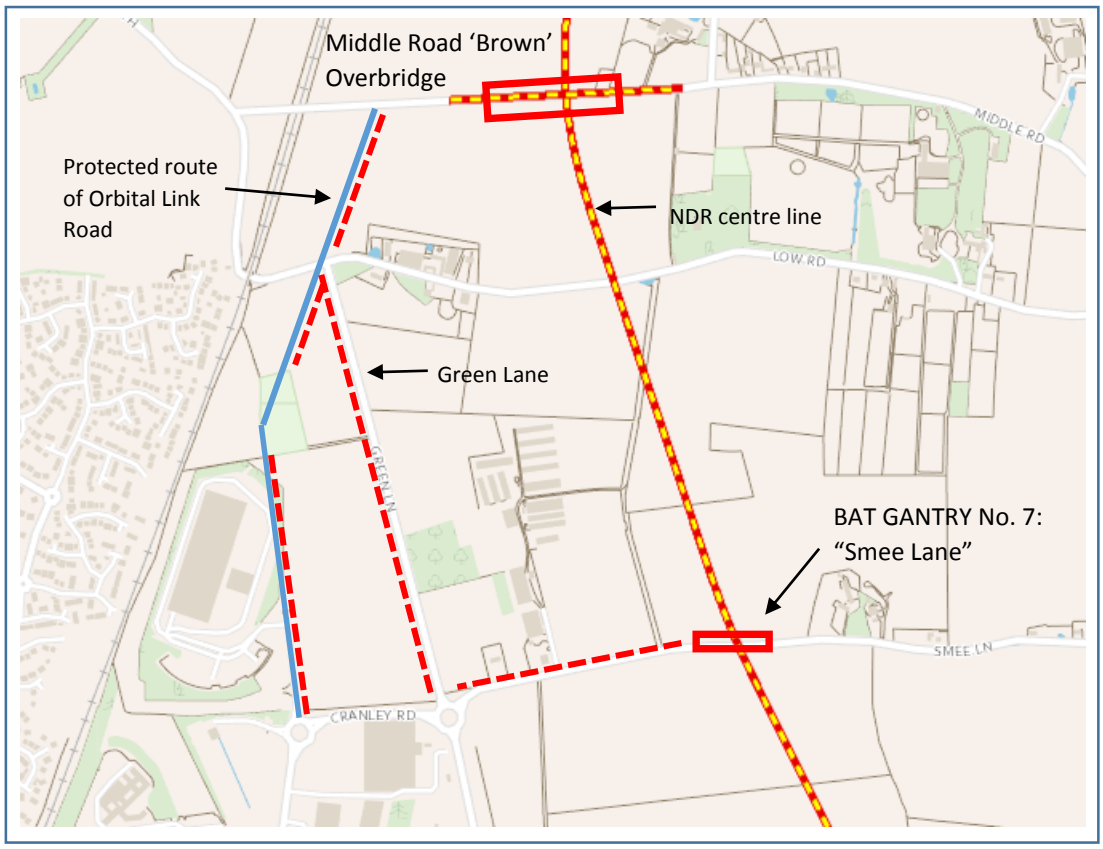


Figure 17: Location of bat gantry No 7 and the Middle Road overbridge across the NDR. The approximate Protected route of the Orbital Link Road is shown in blue. Red dashed lines indicate areas where landscaping is required. The double tree-lined track linking Smee Lane to Low Road is clearly visible.

3.3.10 Project no.16: Public parkland north of Thorpe End and Project no.17: Enhanced tree belts and landscaping

Project 16: Public Parkland North of Thorpe End **Project 17: Enhanced Tree Belts and Landscaping**	**AAP Policy 7** **AAP GT2**
Primary GI function requirement: To provide ecological connectivity along secondary GI Corridors • Thorpe Woodlands to Dobbs Beck via Harrison's Wood • Thorpe Woodlands to Dobbs Beck via Rackheath Park To provide a landscape cushion between Thorpe End village and new housing within Allocation GT7	
Additional GI function requirements:	

Background:

The site known as 'Land South of Salhouse Road' is situated between Salhouse Road and Thorpe End village. Thorpe Woodlands (Racecourse Plantation) borders the allocation site to the south, whilst Harrison's Wood, White House Farm and the Rackheath estate are immediately to the north of Salhouse Road. The protected route of the Orbital Link Road passes through the allocation.

The text supporting for AAP Policy GT7 states:

"*The location and orientation of children's play space, sports pitches and parklands and the provision of landscaping, green roofs and walls, street trees and reinforcement of tree belts should be designed to deliver* (the required) *green infrastructure links. In addition, informal open space in the form of a landscaped parkland should be provided between the development on the site and Thorpe End, an indicative suitable area for this parkland is identified on the policies map. The parkland to the edge of Thorpe End is especially important as it is a key bat commuting corridor … Such a feature will also help maintain the sense of separation between Thorpe End and Norwich Urban Fringe.*"

The area around Thorpe End is important for barbastelle bats. Barbastelle bats from a cluster of roosts in an area near Great Plumstead are known to feed over the area south of Thorpe End, whilst bats from roosts near Rackheath estate are known to commute along the western boundary of the village to feed over Thorpe Woodlands immediately to the south-west (see Section 3.3.7. and Section 3.3.8.). In addition, bats currently fly between Thorpe Woodlands and Harrisons Wood, using the tree belt between Racecourse Plantation and the Salhouse Road adjacent to the public house. The whole area is probably a crucial part of the home ranges of bats from more than one roost[34].

Required work:

[34] In this context, a 'home range' is defined as the restricted area within which a bat moves when performing its normal activities. The home range in question was derived from radio-tracking data of two male barbastelle bats that were roosting on the edge of the Rackheath estate. It is likely that other bats roosting in the same area use similar feeding areas and commuting routes.

3.3.10.1 Parkland Open Space:

To maintain the use of the area by bats, it will be necessary to maintain an open, undeveloped corridor around the north-west of Thorpe end village to the Salhouse Road. This is the area that the policy requires as open-space of a parkland-type.

As described in Section 3.3.8. little information is available on the historical use of this land. Given the lack of detailed historical information to inform the design of the open space, it is suggested that it could be a mosaic of species-rich grassland and tree planting in the form of scattered trees to create a parkland feel. It is likely that the recent use of the site for arable farming means that nutrient levels are likely to be elevated due to repeated fertiliser use. Therefore nutrient removal may be necessary to stop coarse grasses dominating in the new sward at the expense of less competitive meadow species. Similarly, the seedbank is likely to be depleted and an appropriate seed mix will be required to create the sward.

Planted trees should be of native provenance and should be of several species to increase resilience in the context of climate change and pests and diseases. The trees will need to be protected during establishment and an approach suitable to the area will be necessary, perhaps using rustic post-and-rail fencing. Some flowering-shrubs could also be planted to provide visual interest and to act as nectar resources particularly in spring, such as willows *Salix* species, cherries *Prunus* species, hawthorn *Crataegus monogyna* and elder *Sambucus nigra*.

3.3.10.2 Enhanced Tree belts and landscaping:

The tree belts should be protected and enhanced to provide the ecological connectivity between Racecourse Plantation and Harrison's Wood. The Masterplanning process should ensure the tree belts are fully integrated into proposals and that they help inform the structure and layout of development. The tree belts should be managed in an appropriate manner in the long-term.

The integrity of the tree belts should be retained with no or very few breaks to retain their landscape and ecological value. They should not be directly lit to allow their continued use by bats. Ideally there should be a strip of species-rich grassland alongside the tree belts. The grassland strip could be sown as wildflower meadow (e.g. a mix of 80% meadow grass and 20% wildflower mix). If it is necessary for the wildlife corridor to be breached by roads, the gaps should be kept to a minimum and adjoining landscaping should be designed to retain/create height to encourage bats to cross the roads at a height above the traffic. The ecological corridor should not be directly lit where a road crosses. Increased ecological connectivity should be delivered through the wider development, with the aim of linking the tree belts to other green areas, especially other open space and sports pitches. This could also be achieved through street trees and green roofs and walls.

Delivery mechanism(s):

The GI works should be delivered by the developer through planning condition. A management plan for the creation and management of the open space is recommended. It will be necessary to ensure measures are put in place to ensure the long-term maintenance of the GI.

3.3.11 Project no.18: Recreation provision associated with White House Farm and other development

Project 18: Public Open Space and School Playing Fields	**AAP Policy GT5 AAP GT2**
Primary GI function requirement: To contribute to GI Secondary Corridor linking Harrison's Woodland to Sprowston Park	
Additional GI function requirements: Recreation provision	

Background:
Existing planning permission exists in this area (White House Farm - South West) to the east of Blue Boar Lane, and it is anticipated that it will be completed as per the existing planning permission. The application requires an agreed masterplan that supports the delivery of GI corridors. Harrisons Wood will become publically accessible as part of the same permission (see Section 3.3.1). Other public open space is required in line with Broadland Council's adopted standards. The site lies on the Secondary GI Corridor linking Thorpe Woodlands and Sprowston Park, a route that bats are likely to use between the two known feeding areas.

Required work:
Ecological connectivity in the form of the secondary GI corridor should be retained. A corridor of non-developed land through the allocation site could meet this need. Potentially this could incorporate the sports pitches, public open space and SUDS features that are required by AAP policy GT5. Illustrative masterplans for the site seem to indicate that this is possible but it will be important to ensure a coherent corridor is created and maintained if the housing is delivered in multiple phases.

Delivery mechanism(s):
The GI works will be delivered by the developer as part of reserved matters.

3.3.12 Project no.19: Sprowston Manor Golf Course – fulfilling ecological connectivity

Project 19: Sprowston Manor Golf Course	**AAP Policy AAP GT2**
Primary GI function requirement: Landscape protection Biodiversity protection Contributing to the secondary GI corridor network	
Additional GI function requirements: Formal recreation (Golf)	

Background:

No development is intended in this area under the current plan; the area will act as a large 'green space' between areas of future developments. It is an important link in the network of secondary GI corridors. Around the area there are a number of veteran trees that are likely to support roosts of barbastelle bats. Several individual barbastelles from roosts within Tollshill Wood[35], immediately adjacent to Sprowston Manor Golf Course to the north, were recorded feeding over the golf course. Bats from these roosts were also tracked feeding over Beeston Park, the Rackheath estate, and further afield.

Required work:

The retention of ecological connectivity it important. Connectivity must be secured through adjoining allocated sites.

The management of the veteran trees must be undertaken sensitively given the presence of barbastelle bats.

Management advice could be offered to the owners of land where barbastelle bat roosts occur. The Norwich Bat Group[36] could be approached to offer such advice.

Delivery mechanism(s):

No funding required. Ecological connectivity must be secured through appropriate conditions secured in adjoining allocated sites.

[35] Identified through radio-tracking as part of the NDR ecological fieldwork.

[36] The Norwich Bat Group was formed in 2007 and works to help protect, conserve and raise the awareness of bats in Norwich and the surrounding area http://www.norwichbatgroup.co.uk/. The group is affiliated to the Bat Conservation Trust, the national voice for bats in Britain.

3.3.13 *Project no.21, 22 and 23: Country Park associated with North Sprowston and Old Catton development ('Beyond Green') (AAP Policies GT2 & 12)*

Projects 21: Beeston Country Park **Project 22: Beeston Lane Linear Park** **Project 23: Red Hall Farm Park**	**AAP Policy GT12** **AAP GT2**
Primary GI function requirement: Recreation Provision To protect and enhance biodiversity	
Additional GI function requirements: To increase connectivity between woodland areas, especially for barbastelle bats	

Background:

Consented outline permission for up to 3,520 dwellings at North Sprowston and Old Catton (Planning Application 20121516) requires the delivery of a multi-functional GI network. Of key significance is the development of informal recreation provision and the protection and enhancement of biodiversity features.

The application was supported by a GI Statement (Beyond Green 2012) and the Environmental Statement (ES) provided some recommendations for biodiversity enhancements of the parkland.

The recreation provision must meet the requirements of the **Habitats Regulation Assessment** for the development produced by Broadland District Council[37]. The proposed Beeston Country Park, including the nearby Red Hall Farm Park and Beeston Lane Linear Park (Figure 18), is in the north-east section of the development. In other words, it is adjacent to the eastern edge of the residential/commercial areas and situated between the proposed new houses and the northern Broads. The former 18th Century parkland is a substantial size, being more than 35ha, and currently consists of a conifer tree belt surrounding arable land. This will be a recreational resource for future residents living within the proposed development and is specifically intended to limit the number of residents from using the Broads International Sites for 'general' day-to-day recreation. The HRA of the application concluded that when enhanced as proposed, the scale of the country park, its location and its attractiveness will enable it to fulfil its intended function to reduce disturbance impacts on the Broads Natura 2000 Sites from residents of the development to negligible levels.

Figure 18: Drawing from the GI Statement supporting the outline planning consent 20121516, showing the relationship between Beeston Country Park and Red Hall Farm Park with Beeston Lane Linear Park in between.

[37] Acting as the 'Competent Authority' as defined by the Conservation of Habitats and Species Regulations 2010.

The Country Park will also have the potential to support significant biodiversity and contribute to the ecological network, specifically the Secondary GI corridors Catton Park to Spixworth, Beeston Country Park to Spixworth Park and Thorpe Woodlands to Broadwalk Plantation/Fir Covert. Of crucial importance will be the protection and enhancement of bat roosts, feeding areas and commuting corridors. The crossing points for bats over the NDR need to be incorporated in to the wider landscaping scheme (See Section 3.3.9.). The main bat roosts and commuting routes are shown on Figure 19. (Note the culvert labelled as project 25, is not part of the ecological mitigation scheme of the NDR but it may be used by some wildlife.)

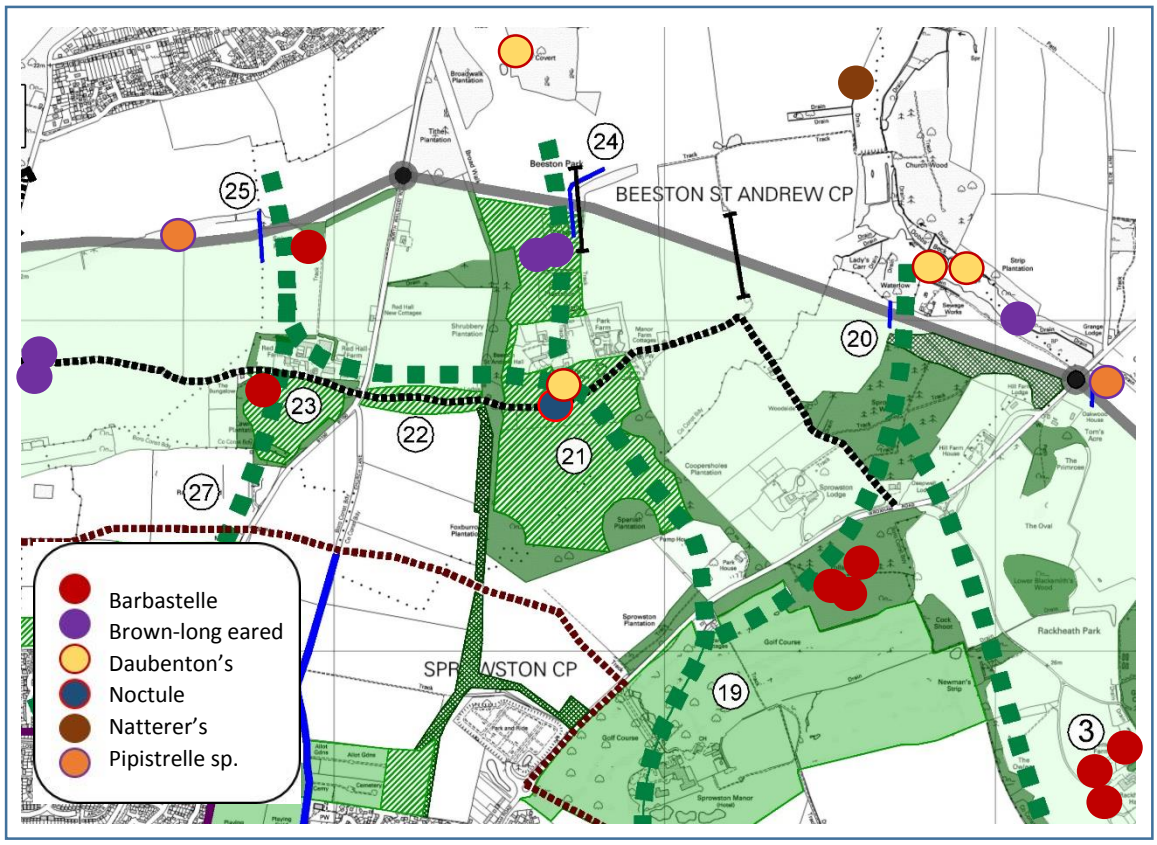


Figure 19: The location of main bat roosts in the vicinity of Beeston Country Park as identified through the preparatory work to inform the NDR Development Consent Order, and other surveys. The thick dashed lines are the secondary GI corridors and incorporate the main commuting routes for larger bat species. The dark green hashing shows areas where new landscaping for ecological connectivity will be required (see text).

Required work:

In terms of recreation, the restored parkland will be an attractive resource for future residents. Beeston Park currently retains a feeling of the former parkland landscape with an exterior belt of pine woodland and a number of veteran trees facing the existing hall. The land has been used for arable production but the proposal is to return the open land to grassland.

According to the ES supporting the outline permission, within Beeston Park 21.5ha of arable fields will be reverted to parkland habitat with additional management in the existing woodlands. The key actions will comprise grassland creation, new tree planting and enhanced management. To maximise the recreation and biodiversity value, a **management plan** for the delivery of Beeston

Country Park and Red-Hall Park will be necessary. The management plan should cover the following aspects.

- **Recreate grassland habitat within the pine belt of Beeston Park**. The grassland must not be created or maintained as a formal amenity type. The aim of the grassland (re-)creation should be to create acid grassland or a more flower-rich sward with acid grassland components appropriate to the site. The prescription for doing so will depend on a more detailed assessment of current soil conditions, particularly pH and nutrients levels. A number of techniques are available for creating appropriate soil conditions including intensive mowing or the use of agricultural crops such as barley or linseed for 'nutrient stripping', the use of sulphur-based fertilisers. The process could take several years to achieve. It is likely that the seedbank is depleted and an appropriate seed mix will be required to create the sward. This could be sourced locally from the existing parkland grassland and arable verges or a commercially sourced mix could be used[38].

- **Long-term management of grassland**. Long-term management of the grassland could involve grazing by stock, probably sheep. If it is the intention that the grassland will be grazed, fencing will be necessary. This should be of a type appropriate to the parkland setting. If grazing is not used, the floral diversity will need to be maintained by mowing and the removal of arisings from site. Mowing should take place after the meadow plants have set seed. A spring cut may also be necessary to reduce 'thatch'.

- **Parkland-type Tree Planting**. The ES recommends that individual trees or groups of trees could be planted within the grassland area. The planting of new parkland trees will ensure a continuity of open growth parkland trees and standing deadwood in the long-term. However numbers of new trees should be limited to ensure the open 'feel' is retained and so views are enhanced rather than obscured. Planted trees should be of native provenance and should be of more than species to increase resilience in the context of climate change and pests and diseases. The trees will need to be protected during establishment and an approach suitable to the area will be necessary, perhaps with rustic post-and-rail fencing.

  Along the existing woodland edges and as appropriate within the wider parkland, some flowering-shrubs could also be planted to provide nectar resources particularly in spring, including willows *Salix* species, hawthorn *Crataegus monogyna* and elder *Sambucus nigra*.

- **Retention of Parkland Tree Belt**. The enclosed 'feeling' provided by the woodland should be retained, by minimising any breaks in the woodland belt. The number of paths through the woodland opening in to the grassland area should be limited and path entrances should be kept narrow.

  Path surfaces through the woodland may need to be improved to cope with footfall, but the country 'feel' should be retained so tarmac surfacing should be avoided. Crushed aggregate or similar may be appropriate. Arboriculture and flora surveys will be required to determine the most appropriate route for paths through the woodland.

- **Management of existing woodland/tree belt.** Enhanced management should include the removal of non-native conifers from the existing woodlands and also halo-ing [39] around

[38] A suitable commercially available mix would be EM7AF: *Wild flower seed mix for acid soils* by Emorsgate Seeds http://wildseed.co.uk/home, a Norfolk-based company.

[39] 'Halo-ing' is a process by which secondary tree or scrub growth that is encroaching into the natural canopy of a veteran tree is removed to promote the long-term health of the veteran.

veteran trees. Works should enhance the habitat for bats, creating new foraging areas within any new open glades, but also mindful of the potential presence of roosts even behind minor features such as flaking bark – feature known to be used by roosting barbastelle bats in the area. Felled timber from the development should be placed in the park to create new dead wood habitat of various types, including the creation of log piles in shaded and sunny situations. Felled timber should be retained in the longest lengths possible.

- **Linear features for bats.** The outside edges of the woodland, especially the eastern edge of Beeston Park, are linear features used extensively by bats. It will be necessary to retain wildlife corridors adjacent to the woodland edges. These corridors should be as wide as possible and development must not be allowed to encroach on them. The ES states that

  > "*A buffer between the street and the existing edge of the woodlands will comprise 20 metres of landscaped area incorporating formal and informal play space, areas of wetland and small ponds as part of the SuDS network, forest garden and planting to complement the woodland habitat*."

  The corridors could be grass areas sown as wildflower meadow (e.g. a mix of 80% meadow grass and 20% wildflower mix, either commercially sourced or sourced locally from the existing parkland grassland and arable verges). In addition the external woodland edges must be retained as dark corridors so bats are still able to use them. Any lighting schemes must take this in to account.

- **Water features.** The intention is that a water feature may be created within the open parkland as part of a SUDS. If delivered in an appropriate manner, this could enhance the landscape and provide wildlife habitat. The location of such a feature is likely to be determined by topography, but it should be designed to have sloping sides and emergent vegetation so as to have high value for wildlife. It should not be stocked with fish.

- **Beeston Linear Park.** The ES provides very little detail on this. The Beeston Linear Park should be as wide as possible and should be appropriately landscaped with open species-rich grassland, perhaps sown as wildflower meadow. Wide hedges with standard trees will be necessary on both the northern and southern boundaries of the linear park, forming features that can be used by bats for feeding and commuting. The hedges and tree-lines should be of a variety of native species to increase resilience against pests and diseases. Some nectar-rich shrubs could be incorporated into the landscaping scheme. The orbital cycleway passes through the linear park and it is recommended that there should be a separate cycle lane if sufficient space is available.

- **Red Hall Park.** The ES provides little information regarding how this will be developed. Like Beeston Country Park, the retention and enhancements of the tree belts and the re-creation of grassland will be necessary. The outside edges of the woodland, especially the western edge, is known to be used extensively by bats and this corridor must be retained and kept as a dark zone.

- **Countryside furniture**. Gates, seats etc should be appropriate to the parkland setting. If a formal play area is delivered within the parkland, its location must be carefully selected so as not to damage views or disturb biodiversity. The most suitable location for such a facility may be near to the hall.

- **Connecting landscaping.** The development should incorporate new landscaping to connect Beeston Park to the existing landscaping around the Park and Ride facility and to the allotments and cemetery adjacent to the church (as shown on the GI Key Diagram). This is shown on Figure 14 (above) in dark green hatching.

  The new landscaping should be in the form of a tree belt or a wide hedge with standard trees fringed with a grassland strip on either side perhaps sown as wildflower meadow (e.g. a mix of 80% meadow grass and 20% wildflower mix). In total the landscaped zone should be as wide as possible (25m in width would be ideal). The hedges and tree-lines should be of a variety of native species to increase resilience against pests and diseases and should be protected during establishment as appropriate.

Delivery mechanism(s):

The GI works will be delivered by the developer as part of forthcoming planning applications. A management plan for all areas of GI is recommended. It is likely the development will proceed in several phases and it will be very necessary to ensure GI is delivered in a coherent manner through all phases.

It will be necessary to ensure funds are secured to manage the new and enhanced GI in the long-term.

Beeston Park in 2013, looking west down Beeston Lane with parkland trees to the left and the tree belts behind (DW).

3.3.14 Project no.26: Recreation opportunities east of Buxton Road

Project 26: Public Open Space and Playing Fields	**AAP Policy GT12 AAP GT2**
Primary GI function requirement: Recreation provision	
Additional GI function requirements: To provide ecological connectivity to the secondary GI corridor, Catton Park to Spixworth.	

Background:

The area is part of existing committed development. The public open space/playing field will be south of the protected route for the proposed orbital link road. North-east of the orbital road is the area covered by AAP Policies GT13 (Norwich RFU) and GT14 (Land East of Buxton Road).

Required work:

Landscaping should connect to adjoining already committed development and allocations GT13 and GT14 (see Section 3.3.16). Whilst not directly part of the secondary GI corridor, areas suitable for biodiversity will connect with the corridor. As such, existing boundary hedges and trees should be retained where possible and opportunities sought to create coherent wildlife corridors. These could take the form of wide hedges of native species with standard trees. Within the development, highway trees and green roofs or walls could be used to increase opportunities for biodiversity.

Landscaping opportunities along the orbital road should be sought including the use of appropriate highways trees. There may be opportunities to create a separate space for cyclists alongside the orbital route. Cycling routes should connect with those in adjoining developments.

Delivery mechanism(s):

The GI works will be delivered by the developer as part of forthcoming planning applications.

3.3.15 Project no.27: Landscaping and public open space

Project 27: Landscaping and Public Open Space	**AAP Policy GT13 AAP GT2**
Primary GI function requirement: Contributing to Secondary GI Corridor, Catton Park to Spixworth; open space provision and ecological connectivity.	
Additional GI function requirements:	

Background:

This site is on the Secondary GI corridor Catton Park to Spixworth. To the north, it adjoins the Red Hall Farm Park, whilst to the south is the protected route of the Orbital Link Road.

Required work:

It is necessary to ensure GI on this site is coherent with that on adjacent sites. A barbastelle roost is known to the north of the site and so it is considered highly likely that bats currently feed over the sports pitches and along the existing hedgerows. Therefore, it will be important to ensure ecological connectivity through the development to the retained school playing field to the south and the open space within the already committed development (GI project no 26). One suitable approach to achieve this would be the retention and enhancement of existing hedges alongside the boundaries of the site with an adjoining grassland strip to form a landscaped corridor. The grassland could be sown as wildflower meadow (e.g. a mix of 80% meadow grass and 20% wildflower mix). In total the landscaped zone should be a minimum of 25m in width. The hedges and tree-lines should be of a variety of native species to increase resilience against pests and diseases. Where treelines are breached by roads, the gaps should be kept to a minimum and adjoining landscaping should be designed to retain height to encourage bats to cross the roads at a height above the traffic. The ecological corridors should not be directly lit.

Cycling routes should be coherent with those in adjoining development. A link to Red Hall Farm Park would seem sensible and there may be opportunities to deliver this in association with the ecological connectivity.

Delivery mechanism(s):

The GI works will be delivered by the developer as part of forthcoming planning applications.

4 Summary of actions and delivery mechanisms

No.	Project name	AAP policy No.	Delivery Mechanisms	Section of report
1.	Harrison's Plantation Woodland	GT5	The works and on-going management will be delivered through a section 106 agreement with the developer. Cycle improvements along Salhouse Road should be delivered through the Push the Pedalway improvement program	3.3.1.
2.	Potential extension to Woodland Park	GT20	Where the required GI is in or close to allocated sites, it should be provided by the developer through appropriate planning conditions or planning obligations. Opportunities should be sought to incorporate ecological connectivity as part of other schemes, e.g. cycleway improvements. Where connectivity is needed outside allocations, projects to provide ecological connectivity could be considered for inclusion in the GNGB Infrastructure Program. Approaches to the relevant landowners should be considered at an early opportunity once detailed GI plans for the area covered by AAP policy GT21 are available. A project to enhance ecological connectivity outside of allocations could be scoped to be considered for inclusion in the GNGB Infrastructure Program at an appropriate time as adjoining development proceeds.	3.3.2
3.	Safeguard landscape south of the NDR	GT2	In its simplest form, the buffer will be an area of undeveloped land south of the NDR with existing uses - primarily agricultural - maintained. The landscape buffer zone is delivered through policy at no cost. Landscaping associated with the delivery of the NDR will be funded through that scheme. Enhancements to bat commuting corridors could be delivered with landowner agreement using the *Connecting Nature Fund* or a similar scheme. The cycling improvements will be delivered through appropriate planning conditions or planning obligations.	3.3.3.
4.	Landscaping/open space adj. to Newman Woods	GT18	The GI will be provided by the developer through planning conditions. The obvious approach would be for the development to provide a landscaping plan that links Newman Woods and the NDR woodland and shrub planting, with the required landscaping along the western edge of the development. The new GI could also provide recreational opportunities.	3.3.4.

5.	The *Broadland Way*	GT3	A feasibility study was undertaken by NCC Highways. It has identified that the cost of delivering the scheme, including 30% contingency, is £1.15million. This excludes the section of the route that will be carried out as part of the NDR delivery. It also does not consider where sections could be delivered as part of development. Several sections will pass through or close to allocation sites and the required cycling improvements could be delivered through appropriate planning conditions or planning obligations.	3.3.5
6.	Recreational open space – North Rackheath	GT16	It is suggested that a management plan is produced as part of any masterplanning or planning application. It should consider the establishment and the long-term management of the recreational open space.	3.3.6.
7.	Retention of N-S tree belts	GT16	The GI will be provided by the developer through planning conditions, or through the Masterplanning process. It should ensure the tree belts are fully integrated into proposals and that they help inform the structure and layout of development. The tree belts should be managed in an appropriate manner in the long-term.	3.3.6.
8.	Grassland public park – North Rackheath	GT2 & 16	It is suggested that a management plan is produced as part of any masterplanning or planning application. It should consider the establishment and the long-term management of the public park and be informed by ecological surveys.	3.3.6.
9.	Broads buffer zone	GT2 & 16	This will be delivered by policy and could simply be a strategic gap between development and the Wroxham. Opportunities to use the area for recreation and biodiversity enhancements should be encouraged.	3.3.6.
10.	Thorpe Woodlands		The land is under a woodland grant scheme at present which allows for forestry practices to be undertaken. Opportunities to enhance the area for biodiversity are encouraged, through the grant scheme or other processes.	3.3.7.
11.	Public open space – Brook Farm	GT6	The GI works will be delivered by the developer as part through planning condition. A management plan for the creation and management of the open space is recommended. It will be necessary to ensure measures are put in place to ensure the long-term maintenance of the GI.	3.3.8.
12.	Landscaping adj. to New Road link	GT6 & 9	This is necessary to maintain connectivity in line with mitigation for bats and the NDR. For the NDR mitigation to be successful, wider landscape enhancements outside of the footprint will be necessary. In particular, the maintenance and enhancements of features used by bats leading towards the crossing points will be necessary to ensure the long-term viability of the local populations. These enhancements should be delivered through appropriate delivery of development within the allocation.	3.3.9.
13.	Brown bridge, gantries and culverts – NDR mitigation		The footprint of the NDR is relatively narrow. For the mitigation to be successful, wider landscape enhancements outside of the footprint will be necessary. In particular, the maintenance and enhancements of features used by bats leading towards the crossing points will be necessary to ensure the long-term viability of the local populations. These enhancements should be delivered through appropriate delivery of development within allocations.	3.3.9.

14.	Landscaping adj. to Green Lane and Smee Lane	GT11	The footprint of the NDR is relatively narrow. For the mitigation to be successful, wider landscape enhancements outside of the footprint will be necessary. In particular, the maintenance and enhancements of features used by bats leading towards the crossing points will be necessary to ensure the long-term viability of the local populations. These enhancements should be delivered through appropriate delivery of development within allocations.	3.3.9.
15.	Bat gantry and culvert – NDR Mitigation		The footprint of the NDR is relatively narrow. For the mitigation to be successful, wider landscape enhancements outside of the footprint will be necessary. In particular, the maintenance and enhancements of features used by bats leading towards the crossing points will be necessary to ensure the long-term viability of the local populations. These enhancements should be delivered through appropriate delivery of development within allocations through planning conditions..	3.3.9.
16.	Public park land north of Thorpe End	GT2 & 7	The GI works should be delivered by the developer through planning condition. A management plan for the creation and management of the open space is recommended. It will be necessary to ensure measures are put in place to ensure the long-term maintenance of the GI.	3.3.10.
17.	Enhanced tree belts and landscaping	GT2 & 7	The GI works should be delivered by the developer through planning condition. A management plan for the creation and management of the open space is recommended. It will be necessary to ensure measures are put in place to ensure the long-term maintenance of the GI.	3.3.10.
18.	Public open space and school playing fields	GT5	The GI works will be delivered by the developer as part of reserved matters.	3.3.11.
19.	Sprowston Manor Golf Course		The retention of ecological connectivity it important with connectivity secured through adjoining allocated sites with the use of appropriate planning conditions. The management of the veteran trees must be undertaken sensitively given the presence of barbastelle bats. Management advice could be offered to the owners of land where barbastelle bat roosts occur. The Norwich Bat Group could be approached to offer such advice.	3.3.12.
20.	Woodland creation and culvert – NDR mitigation		The footprint of the NDR is relatively narrow. For the mitigation to be successful, wider landscape enhancements outside of the footprint will be necessary. In particular, the maintenance and enhancements of features used by bats leading towards the crossing points will be necessary to ensure the long-term viability of the local populations. These enhancements should be delivered through appropriate delivery of development within allocations through planning conditions.	3.3.9.
21.	Beeston Country Park	GT2 & 12	The GI works will be delivered by the developer as part of forthcoming planning applications. It is likely the development will proceed in several phases and it will be very necessary to ensure GI is delivered in a coherent manner through all phases. A management plan for all areas of GI is recommended. It will be necessary to ensure funds are secured to manage the new and enhanced GI in the long-term.	3.3.13.
22.	Beeston Lane linear park	GT2 & 12	The GI works will be delivered by the developer as part of forthcoming planning applications. It is likely the development will proceed in several phases and it will be very necessary to ensure GI is delivered in a coherent manner through all phases. A management plan for all areas of GI is recommended. It will be necessary to ensure funds are secured to manage the new and enhanced GI in the long-term.	3.3.13.

23.	Red Hall Farm Park	GT12	The GI works will be delivered by the developer as part of forthcoming planning applications. It is likely the development will proceed in several phases and it will be very necessary to ensure GI is delivered in a coherent manner through all phases. A management plan for all areas of GI is recommended. It will be necessary to ensure funds are secured to manage the new and enhanced GI in the long-term.	3.3.13.
24.	Bat Gantry and culvert – NDR mitigation		The footprint of the NDR is relatively narrow. For the mitigation to be successful, wider landscape enhancements outside of the footprint will be necessary. In particular, the maintenance and enhancements of features used by bats leading towards the crossing points will be necessary to ensure the long-term viability of the local populations. These enhancements should be delivered through appropriate delivery of development within allocations through planning conditions.	3.3.9.
25.	Culvert – NDR mitigation		The footprint of the NDR is relatively narrow. For the mitigation to be successful, wider landscape enhancements outside of the footprint will be necessary. In particular, the maintenance and enhancements of features used by bats leading towards the crossing points will be necessary to ensure the long-term viability of the local populations. These enhancements should be delivered through appropriate delivery of development within allocations through planning conditions.	3.3.9.
26.	Public open space and school playing field	GT12	These enhancements should be delivered through appropriate delivery of development within allocation through planning conditions.	3.3.14.
27.	Landscaping and public open space	GT13	These enhancements should be delivered through appropriate delivery of development within allocation through planning conditions.	3.3.15.

5 References

5.1 Reports:

The following documents are referred to in the text. They have been grouped by organisation.

5.1.1 Broadland District Council:

- Growth Triangle Area Action Plan (Submission Document with Track Changes), November 2015;
- Revised Habitats Regulation Assessment of the North-east Norwich Growth Triangle Area Action Plan (November 2014 - version 9 with revisions);
- Addendum – Revised Habitats Regulation Assessment of the North-East Growth Triangle Area Action Plan (Nov 2015);
- Draft North East Growth Triangle Green Infrastructure Strategy (November 2013 revision);
- Thorpe End Village Conservation Area Character Statement

5.1.2 Greater Norwich Growth Board:

- The Joint Core Strategy for Broadland, Norwich and South Norfolk (2011);
- The Joint Core Strategy: Broadland part of the Norwich Policy Area Local Plan (2014);
- Greater Norwich Green Infrastructure Strategy (2007);
- Greater Norwich Growth Board Green Infrastructure Delivery Plan (2009);
- Feasibility Study Brief: GI connections - Blue Boar Lane to NE Rackheath GI P1.1 (GNGB Green Infrastructure programme Team 14th Feb 2015);

5.1.3 Northern Distributor Road (Norfolk County Council)

- NDR Environmental Statement: Vol II: Chapter 8 Ecology and Nature Conservation (Mott MacDonald, version 8th Jan 2014);
- Norwich Northern Distributor Road – Landscape and Ecological Management Plan (Mott MacDonald; July 2015 with subsequent amendments);
- Appraisal and Summary report on Technical Appendix 8: Bat Reports of NDR Environmental Statement: Vol II (Rachel Harold, NBIS; December 2015);

5.1.4 Norfolk County Council Natural Environment Team:

- Harrison's Wood Management Plan (Natural Environment Team, June 2015);
- GTB54: Possible Ecological Corridors Plan for NE Norwich (Natural Environment Team, June 2015);
- Green Infrastructure Project Opportunities Plan for NE Norwich (Countryside and Biodiversity Team, Nov 2010);

5.2 Other references:

Anna Berthinussen & John Altringham (2015); "*Development of a cost-effective methods for monitoring the effectiveness of mitigation for bats crossing linear transport infrastructure"*; Natural England report.

Katherine L. Boughey, Iain R. Lake, Karen A. Haysomb, Paul M. Dolman (2011); "*Effects of landscape-scale broadleaved woodland configuration and extent on roost location for six bat species across the UK*"; Biological Conservation; Volume 144, Issue 9, Pages 2300–2310.

Bellamy et al. (1996); "*Factors influencing bird species numbers in small woods in South-east England*"; Journal of Applied Ecology; 33, 249-262.

Woods M et al (2003); "*Predation of wildlife by domestic cats* Felis catus *in Great Britain*"; Mammal Review 33; pp 174 - 188

BS42020: 2013 *Biodiversity – Code of Practice for Planning and Development*

5.3 Web pages referenced in the text:

5.3.1 Norfolk-specific webpages

Details of Norfolk County Wildlife Sites (County Wildlife Site database):
http://www.nbis.org.uk/CWS

Historic maps for Norfolk (Norfolk Map Explorer):
http://www.historic-maps.norfolk.gov.uk/home

Norfolk FWAG/ Connecting Nature Fund:
http://www.norfolkfwag.co.uk/

Norfolk's Ghost Ponds:
https://ghostponds.wordpress.com/

Norwich Bat Group:
http://www.norwichbatgroup.co.uk/

Three Rivers Way Association:
http://www.threeriversway.org.uk/

5.3.2 National webpages

National Ancient Woodland Inventory (Natural England):
http://publications.naturalengland.org.uk/category/552039

Bat Conservation Trust
http://www.bats.org.uk/

Grassland seed information (Emorsgate Seeds):
http://wildseed.co.uk/home

6 Appendix 1 – The Project Brief

Project title	Feasibility Study: GI connections - Blue Boar Lane to NE Rackheath	Ref	GI P1.1

Investment category	Transport ☐ Green ☒ Education & Libraries ☐ Economic Development ☐ Community ☒

Location	Broadland ☒ Norwich ☐ South Norfolk ☐
Spatial Package	**GNGB-wide** ☐ North East ☒ City Centre ☐ South West ☐ Long Stratton ☐ Elsewhere ☐

Description

This is a project which forms part of the wider ambition of delivering the Primary GI Corridor from Mousehold Heath to the northern Broads at Wroxham (GI Primary Corridor 01; GI Strategy, 2007).

The section of the corridor covered by this pro-forma, specifically the section from Blue Boar Lane to NE Rackheath, lies on the alignment of the Salhouse Road from Blue Boar lane to Rackheath and then heads northwards parallel to the railway (on the western side).

AIM: This project will identify, prioritise and develop GI connections, primarily for access with a secondary function for ecological connectivity.

Feasibility work is necessary to

- **understand the specific strategic requirements of GI within the corridor in the context of timing of development**
- **identify potential GI linkages and assess their deliverability**
- **identify cost for projects and identify most appropriate funding mechanisms**
- **prioritise projects for consideration by the GNGB Green Infrastructure Programme Team to recommend for inclusion in the annual business plan**

<u>Baseline data and information sources:</u>

1. There are a number of developments in the area, some with permission and others likely to come forward in the short and medium terms including: White House Farm (Planning Application 20080367, commencement expected 2015/16), Proposed AAP allocation GT7: Land South of Salhouse Rd (commencement expected 2017/18); Proposed AAP allocations GT18&19 for Land South of Green Lane (commencement expected 2016/17) and the proposed New Settlement North of Rackheath Village, Proposed AAP allocation GT16 (/commencement expected 2019/20).

GI provided through these developments to be delivered on-site or through S106 developer contributions to off-site projects.

2. The corridor encompasses a number of woodlands and areas of semi-natural habitat. Some of these have some existing public access. From south to north, these areas include:

- Cottage Plantation
- Harrison's Plantation (where GI issues are being addressed in a separate study in the GNIP: *"Early delivery of Public Access and Woodland Management*")
- Paine's Yard Wood, The Owlery & March Covert CWS (CWS1392)
- Toll's Hill Wood CWS and Ancient Woodland (CWS 2021)
- Historic Estate Parkland Connected to Rackheath Hall
- Thorpe Woodlands (Racecorse Plantation, Belmore Plantation and Brown's Plantation (CWS 2041, 2042)
- Bulmer Coppice (Ancient Woodland)
- Newman Woods
- Weldon Wood (Ancient Woodland)

3. The emerging Growth Triangle AAP includes a GI Key Diagram (Appendix D) which lays outs 27 potential GI Projects and policies, of which numbers 1 – 9 are located in the section of the GI corridor covered by this pro-forma. Other projects in the AAP that are relevant include nos. 10. 17, 11, 18 and 19. Several of the projects aim to enhance secondary/local GI corridors linked to the Primary Corridor e.g. links Beeston Park (Beyond Green), bat corridors etc.

4. Existing and new cycle links: The Pedalways cycling improvements include works to the Pink Pedalway which link Mousehold Heath to Salhouse Road and Harrison's Plantation, it is planned that the Pink Pedalway will eventually link to Rackheath via the Newman Rd NDR overbridge. There are planned opportunities to link with the proposed 'Broadland Way' – an off-carriageway cycle and pedestrian route link linking Broadland Business Park with Wroxham through the creation of cycle links through proposed AAP allocation GT7: Land South of Salhouse Rd that will connect Salhouse Road to Green Lane North. Broadland Way will link to the wider broads via the 'Three Rivers Cycleway' which is planned for delivery in 2015/16 and supported by DfT National Parks funding.

5. NATS aims to deliver a Bus Rapid Transport route along the Salhouse Road. A scheme development project brief has been agreed for the Salhouse Rd BRT route which will be undertaken in 2015/16.

6. Gt & Lt Plumstead Parish Council wish for a pedestrian path/pavement adjacent to the Plumstead by Belmore plantation between Thorpe End and South Hill Rd.

Total estimated project costs	**£** £5,000
Total funding *obtained/secured*	**£5,000 included in the GNGB Growth Programme for 2014/15 to be provided by BDC**
Total funding yet to be *obtained/secured* *Please provide details of potential sources*	**£0**

High level outputs and outcomes
Outputs (houses and jobs) – **Improved connections for GI, primarily public access measures, to meet the requirements of the <u>Habitat Regulation Assessment of BDC local plans</u> which requires the delivery of high quality Green Infrastructure as mitigation for potential impacts on N2K sites** *Outcomes/wider benefits (if known) –* • Improved pedestrian and cycle links contributing to the wider cycling network; • Modal shift from cars to walking/cycling for commuting, leisure, daily journeys (e.g. from homes to schools); including linking Norwich to the Northern Broads • Health and well-being benefits; • Landscape enhancements to minimise impacts on visual amenity • Enhancing biodiversity/ecological networks

Start date	**Feasibility 2014/15**
End date	On-going
Timescale	Short term (1-3 years) ☒ Medium term (3-5 years) ☒ Long term (5 years+) ☐ **Feasibility short-term; delivery of individual projects in the short and medium term**
Status/stage of project Feasibility ☒ Agreed scheme ☐ Consents secured ☐ Funding secured ☐ On site ☐	

What technical work, design and business case development has already taken place?

NEGT AAP has identified potential projects but little work has been undertaken on their deliverability or costs

What are we currently doing to progress the project?

Other anticipated milestones?

Strategic fit

How does the project fit with wider objectives and strategies?

Clearly linked to imminent growth, clearly linked to meeting HRA requirements

Is the project part of a bigger scheme and what are the other projects which deliver the overall scheme and have any already been completed?

This is linked to the GI Strategy for the NEGT; some projects within the strategy are likely to be delivered soon (e.g. Beyond Green, Public Access to Harrisons Plantation & Salhouse Rd Cycleway)

When it this project needed in relation to the other projects in the bigger scheme?

This feasibility study needs to be completed urgently in order to identify projects that can be delivered along the Mousehold to Broads Primary Corridor

Other dependent infrastructure/triggers?

What dependent infrastructure is required before this project can commence?

None

Are there any other projects which have a related dependency? Please give details

Links with other projects but this feasibility is need to understand strategic need of other work

Project hold ups

What (if anything) is holding up the project?

Staff resource to undertake feasibility work need to be addressed

Key risks and steps taken to mitigate against risks

- **Time and Cost:** Staff Resource not available to complete feasibility study in a timely manner – BDC to liaise with NCC Natural Environment Team and if no likelihood of timely state consideration will be given to letting the contract externally, which could be more expensive.
- **Quality and Cost:** Untimely completion of feasibility might undermine securing off-site S106 contributions to appropriate GI schemes on early delivery schemes. This could increase the overall cost of the programme, as preferred projects might need to find alternative funding, or decrease quality because less beneficial projects are funded through S106 because preferred projects had not been identified - BDC to liaise with NCC Natural Environment Team and if no likelihood of timely state consideration will be given to letting the contract externally.

Project lead and contact details (email and phone no.)

Phil Courtier, Head of Planning , BDC (phil.courtier@broadland.gov.uk (01603) 430XXX)

Partner organisations involved

What stakeholder support does the project have?

Completed by	David White	**Date**	02.02.15

7 Appendix 2 – Additional note regarding the boundary of the County Wildlife Site of Racecourse Plantation.

Relating to Project 10: Thorpe Woodlands (Section 3.3.7) and Project no.16: Public parkland north of Thorpe End and Project no.17: Enhanced tree belts and landscaping (Section 3.3.10).

It has already been noted that CWS 2041 Racecourse Plantation includes a small section in the Parish of Great Plumstead. This section differs significantly in character from the rest of the site, with a proportion of it being used for arable production. In the 1980s, some agricultural buildings used for rearing pigs were constructed within the CWS boundary (visible in Figure 20C) and four associated slurry ponds were dug, of which three are visible on the current OS map (Figure 20A). The foundations/concrete pads of the agricultural buildings can still be seen today, with remnants of other parts of the structures (March 2016). At least three ponds are extant, all highly eutrophic and with very steep sides, including one on the CWS boundary which does not appear on the OS map.

The area under long-term arable production probably should not be included in the County Wildlife Site boundary and it is likely that this area would be excluded if/when the CWS is resurveyed. Arguably the same might be true of the area where the remains of pig buildings are located (subject to survey). It is likely that the other areas within the parish of Great Plumstead which are more wooded would continue to meet the CWS designation criteria and would remain part of the CWS.

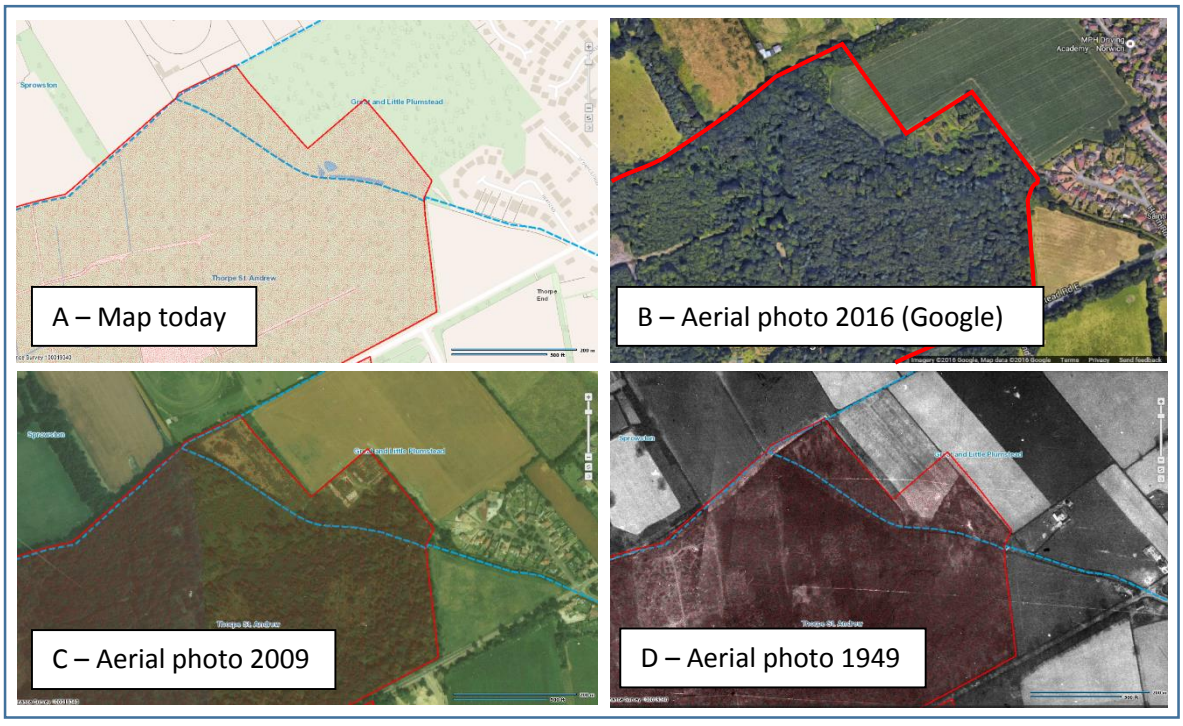


Figure 20: The North-east section of Racecourse Plantation CWS (CWS no. 2041) over time. The boundary of the CWS is shown in red and the parish boundaries in blue. The current OS map (A), the 'current' aerial photo (B), an aerial photo taken in 2010 (C) and the 1949 aerial photo (D).