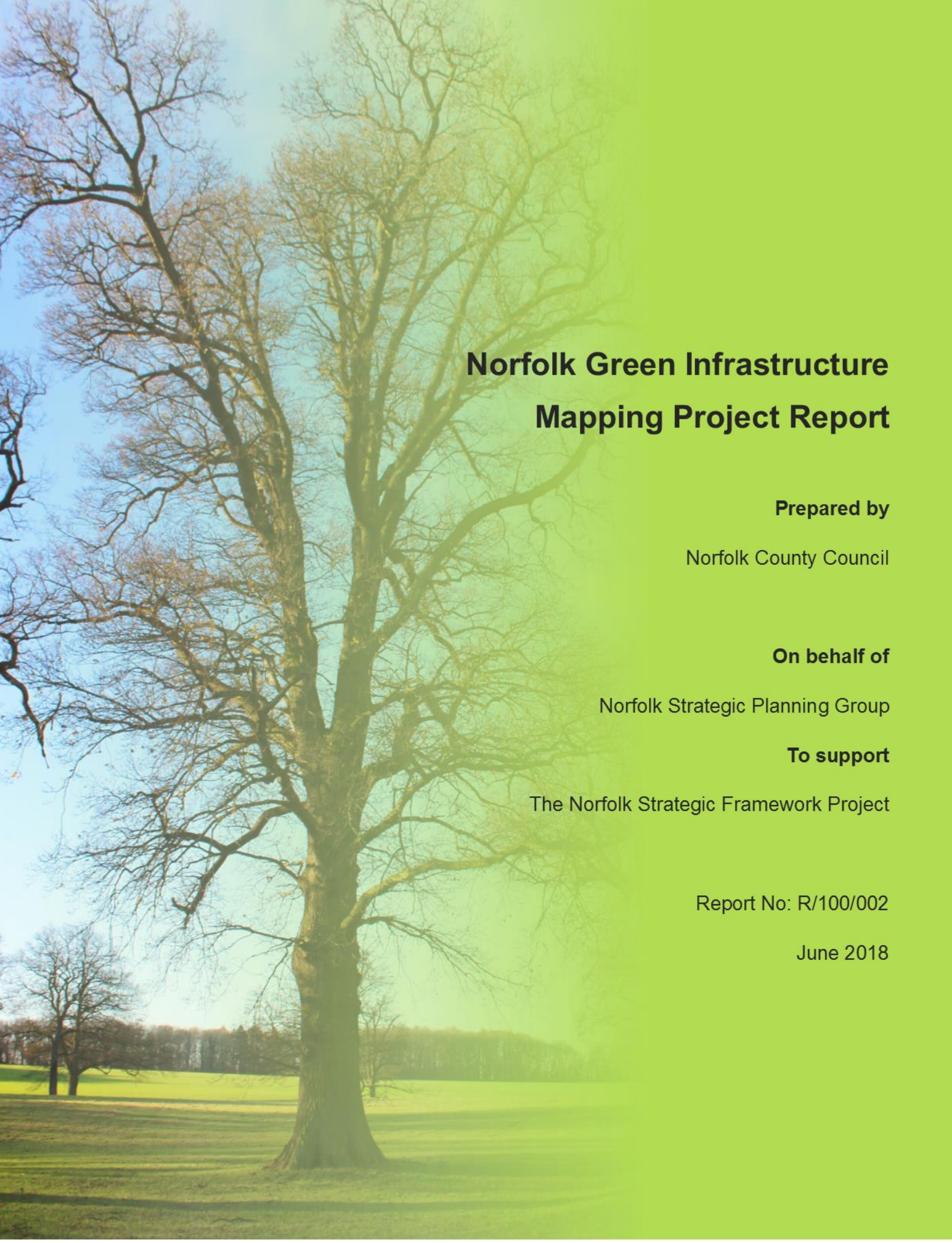

Norfolk Green Infrastructure Mapping Project Report

Prepared by

Norfolk County Council

On behalf of

Norfolk Strategic Planning Group

To support

The Norfolk Strategic Framework Project

Report No: R/100/002

June 2018

IN TRAN
communication for all

www.norfolk.gov.uk

Norfolk County Council

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The data has been prepared and provided in accordance with the CIEEM's Code of Professional Conduct. We confirm that any opinions expressed are our best and professional bona fide opinions.

Date	Revision	Prepared by	Approved by	Comments
05.06.18		DW		
25.06.18	v.2	MH		
03.07.18	v.3	DW		

Contents

Green-winged Orchids *Anacamptis morio* at New Buckenham Common (photo credit: David White)

1. The background to the Norfolk GIMP

Introduction

1.1 In December 2016, the Norfolk Strategic Planning Officer Group (NSPG) commissioned Norfolk County Council Environment Team to undertake a piece of work to consider matters relating to Green Infrastructure (GI) within the local plan context to support the Norfolk Strategic Framework project.

1.2 The project became known as the Norfolk Green Infrastructure Mapping Project (Norfolk GIMP).

1.3 A project brief was agreed in April 2017 (Appendix 1). The aims of the project were:

- To make the 'connections' between GI and growth, providing LPAs with a deliverable approach to addressing Green Infrastructure matters to enable and support growth.
- To map the Green Infrastructure Network of Norfolk, maximising the benefits it brings to the communities of Norfolk.
- To identify deficiency in GI provision.
- To identify opportunities for enhancement.

1.4 It was also recognised that Strategic GI planning will help address issues identified in the Habitat Regulation Assessments (Appropriate Assessments) of local plans, in particular with regards to accessible public open space and recreation.

1.5 The work was intended to complement the Study of Recreation Pressure on Natura 2000 sites (NCC/Footprint Ecology; 2016).

Project management

1.6 The commissioning group was the Norfolk Strategic Framework (NSF) Officer Group with Trevor Wiggett acting as project sponsor.

1.7 The project leads were Martin Horlock and David White, NCC Environment Team.

1.8 A steering group was formed comprising of Phil Mileham (Breckland District Council), Alan Gomm (KLWNBC), Stuart Rickards (EA), Natalie Beale (BA), Emily Smith (GYBC), and Martha Moore (NNDC), although there was no meeting when all steering group members were present.

1.9 There was no chair of the group and this role defaulted to David White. Lydia Tabron (Norwich City) provided administrative support.

1.10 The project was funded by the NSF with additional financial support for particular matters from the Norfolk Wildlife Trust.

1.11 David White and Martin Horlock provided updates to the Norfolk Strategic Planners Group at various times during the project. At the conclusion of the project in December 2017, David White gave a presentation to the Norfolk Strategic Framework Officers Group and gave a similar Presentation to the Members Group in March 2018 (a requirement of the brief).

The project need

1.12 The project was aimed to help address specific requirements of the NPPF.

1.13 NPPF paragraph 114 states that:

- "*Local planning authorities should set out a strategic approach in their local plans, planning positively for the creation, protection, enhancement and management of networks of green infrastructure*."

1.14 NPPF paragraph 114 states that:

- "*To minimise impacts on biodiversity and geodiversity, planning policies should…plan for biodiversity at a landscape-scale across local authority boundaries*" and to
- "*identify and map components of the local ecological networks, including the hierarchy of international, national and locally designated sites, wildlife corridors and stepping stones that connect them, and areas for habitat restoration or creation*".

1.15 The NPPF also encourages planning to deliver improvements for public access to the natural environment. Paragraph 75 states

- "*Planning Policies should protect and enhance public rights of way and countryside access….*" and
- "*LPA should seek opportunities to provide better facilities for users, for example by adding links to existing rights of way network including national trails*".

1.16 Given the requirements of the NPPF, it was agreed to focus on two elements of GI, specifically connectivity of public access and ecological connectivity. In addition maps were produced that assessed opportunities for delivering GI that could also have a surface water flooding mitigation impact.

BOX 1: The definition of GI as described on the Gov.uk website[1] is

"*Green infrastructure is a network of multifunctional green space, urban and rural, which is capable of delivering a wide range of environmental and quality of life benefits for local communities.*

Green infrastructure is not simply an alternative description for conventional open space. As a network it includes parks, open spaces, playing fields, woodlands, but also street trees, allotments and private gardens. It can also include streams, canals and other water bodies and features such as green roofs and walls."

[1] https://www.gov.uk/guidance/natural-environment#local-ecological-networks

What are local ecological networks and what evidence should be taken into account in identifying and mapping them?

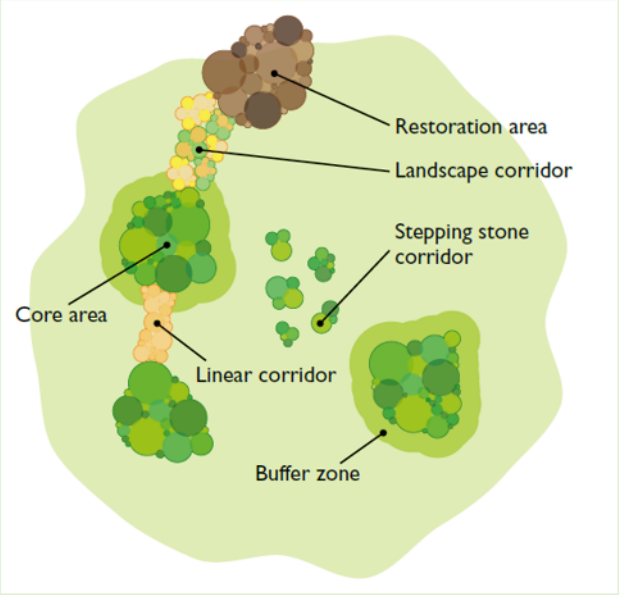
1.17 The current government advice on identifying and mapping ecological networks is described on the Gov.uk website[1].

Relevant evidence in identifying and mapping local ecological networks includes:

- the broad geological, geomorphological and bio-geographical character of the area, creating its main landscapes types;
- the location and extent of internationally, nationally and locally designated sites;
- the distribution of protected and priority habitats and species;
- main landscape features which, due to their linear or continuous nature, are important for the migration, dispersal and genetic exchanges of plants and animals, including any potential for new habitat corridors to link any isolated sites that hold nature conservation value, and therefore improve species dispersal;
- areas with potential for habitat enhancement or restoration, including those necessary to help biodiversity adapt to climate change or which could assist with the habitats shifts and species migrations arising from climate change;
- an audit of green space where new development is proposed.

1.18 The various components of ecological networks are explained in the Natural Environment White Paper[2]. The main elements are summarized in Box 2.

BOX 2: Components of an ecological network



The Natural Environment White Paper summarises the information regarding ecological networks that was described in the 2010 review of England's wildlife sites: *Making Space for Nature* (also known as the Lawson Report).

It talks of "*enhancing connections between wildlife sites, either through physical corridors, or through stepping stones*".

The main elements of an ecological network are shown in this diagram, reproduced from the Lawton Report.

[2] https://www.gov.uk/government/publications/the-natural-choice-securing-the-value-of-nature

2 Objectives and outputs

The project objectives

2.1 As outlined in the project brief, the objectives were to identify and map GI on a county-wide basis, to include (i) formal and informal accessible green space, (ii) walking and cycling networks, and (iii) ecological networks. The relatedness of these elements of GI is described in Box 3.

2.2 To identify deficiencies in GI provision, it was agreed to map settlements deficient in accessible green space (based on national standards tailored to local need) and settlements deficient in Public Rights of Way or isolated from access to the countryside.

2.3 To make the 'connections' between GI and growth, it was agreed to provide information to help

- Identify and map local GI that has been or will be delivered through recently consented planning permissions.
- Identify where GI is necessary to support already planned growth in existing local plans;
- Help identify strategic growth locations and the requirements for GI to enable these locations to be delivered;
- Identify where development has the potential to enhance ecological networks or countryside access;
- Identify if there are any areas where GI constraints may provide significant barriers to growth;
- Identify where existing GI requires adaptation for a change in need as a result of development.

Project output

2.4. It was agreed that the outputs of the project would be:

- A map, or series of maps, showing existing GI provision throughout the county, including
  - Mapped accessible public open space and countryside access (formal and informal),
  - Mapped cycle networks
  - An ecological network map

- A map showing settlements with an indication of their GI provision (adequate, deficient, or with capacity). The work will reflect the hierarchy of settlements and those with committed development and those where current understanding indicates growth in subsequent iterations of local plans.

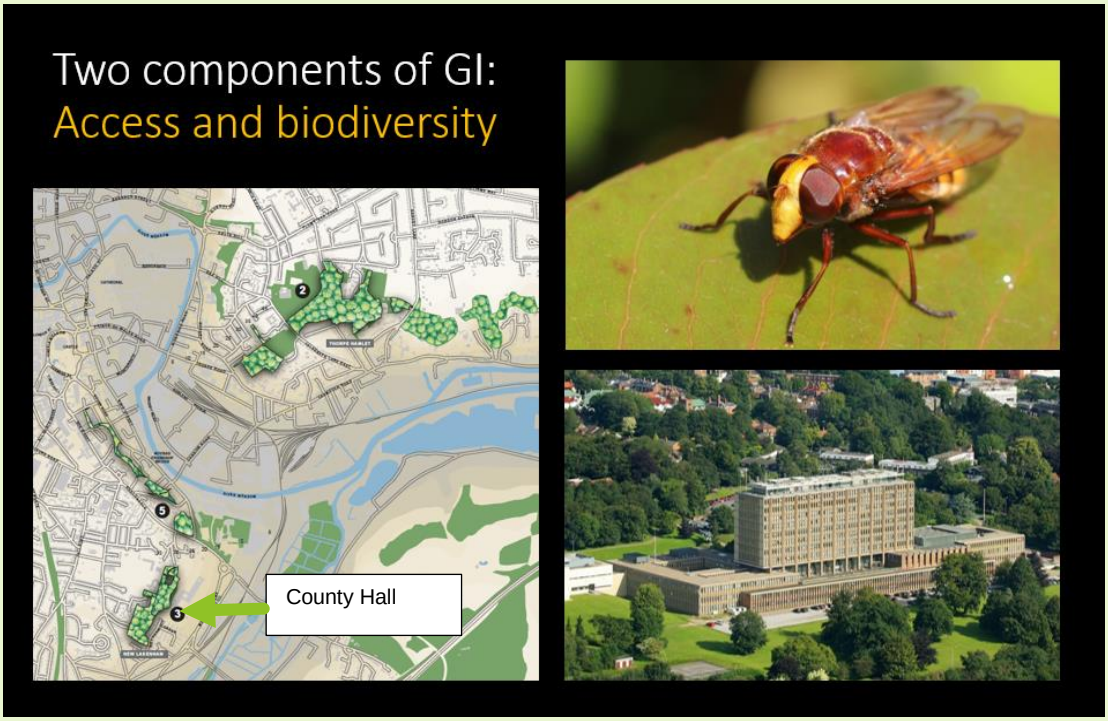
- Identification of primary and secondary Green Infrastructure Corridors throughout the county (the 'GI network'), following a similar methodology to that used in the Greater Norwich Green Infrastructure Strategy (2007).

- A map, or maps, identifying GI gaps, deficiencies and opportunities, along with a prioritisation of opportunities (using ecological network modelling and the identified GI corridors).

BOX 3: Access and biodiversity – separate but related aspects of GI corridors

GI should always be seen as multi-functional, and the Norfolk GIMP focuses on two elements of GI connectivity: Public access to the natural environment ("connectivity for people"), and biodiversity ("ecological connectivity"). When mapping GI networks, a given location can deliver both functions but not necessarily to the same degree. For example, a formal public park might provide high quality public access but have only a relatively small value for biodiversity. Conversely a nature reserve may have high biodiversity value, but limited public access. So when mapping GI corridors, the focus is identifying the over-lap between the delivery of both functions.

It is also important to recognise that GI corridors need not necessarily be "continuous" to still function effectively, as demonstrated in the example of County Hall (below). County Hall grounds are publically accessible and people use them to walk their dogs, for jogging, and to walk to other accessible open spaces such at Whitlingham Country Park. Therefore they form a part of the "connectivity for people" element of the local GI network. County Hall Woods are also a County Wildlife Site. Natural Environment Team officers have found a scarce large hoverfly, *Volucella zonaria* in the woods. Unsurprisingly, this species has also been found in the publically-accessible woods on the Thorpe Ridge on the north side of the River Wensum. This implies that, although there is not continuous woodland in the intervening land between the woods, the sites are ecologically connected and the species can move between them. Therefore County Hall Woods also contributes to the ecological connectivity element of the local GI network.



3 Methodology and mapping

GI Access Asset Mapping

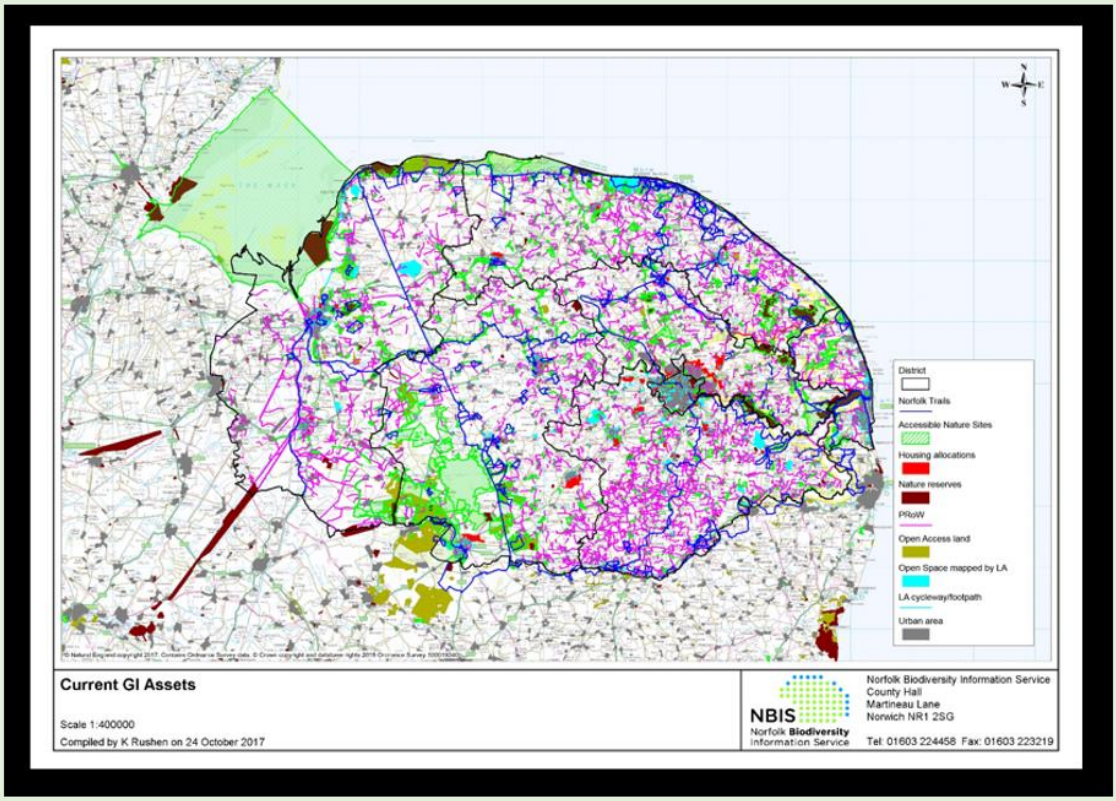
4.1 The project identified and mapped a range of formal and informal access sites across the county. This included the Norfolk Trails network, Public Rights of Way (PRoW), open access land (as identified under the CRoW Act), accessible and partially accessible nature reserves, and coastal access land. A summary of the asset mapping is shown in **Box 4**, with a larger-scale map included in **Appendix 1: Map 1.**

4.2 The district and borough authorities provided details of open space in their ownership or control, and details of accessible land that has been delivered through planning. This list is not considered comprehensive.

4.3. The mapping is a "living data set" and will be updated as new access land is delivered through planning. The LPAs will need to provide this data as appropriate.

BOX 4: The GI Access Asset Mapping:

The Access Asset Mapping covers a range of access sites, from those that are fully accessible and free, to others that are partially accessible, or for which there is a charge. The 'mapping' consists of a number of GIS layers that can be interpreted in a variety of ways for a range of uses. The map below is a summary of the combined layers. Whilst the scale that the data is presented means detail cannot be seen, it does allow certain broad-scale interpretation. For example, the large area of accessible land that is Thetford Forest (light green) stands out, as does the large concentration of PRoW in South Norfolk relative to other parts of the county (pink lines). Importantly, because the 'map' consists of many layers, the data can be interrogated in a number of ways for different purposes.



Green Infrastructure Network mapping

3.1 The approach taken was based on the mapping undertaken for the Greater Norwich GI delivery plan, which was designed to provide links between protected sites, semi-natural habitats, development sites and provide linkages between key features. The identification of the GI target areas or corridors was also designed to help the delivery of green transport links into the city of Norwich from the surrounding towns, villages and proposed development sites. The resulting corridor network was used to inform the Greater Norwich JCS and was used in the key diagram.

3.2 The method used was to assess the potential links between existing semi-natural habitats and protected sites, and to assess the opportunity for land outside of these to provide sites for habitat or GI creation. Arable and plantation land within the area was considered as potential opportunity and the vicinity to existing habitat was assessed in a variety of ways. The addition of proposed development areas to this network then allowed a set of potential GI corridors to be designed.

3.3 For the County level mapping the same approach was used but, because NBIS now holds additional finer scale habitat and land-use data through the Norfolk Living Map[3], it was possible to undertake more detailed and sophisticated modelling of the networks. NCC worked with the consultants Environment Systems to undertake this. A detailed description of this work using the SENCE (Spatial Evidence for Natural Capital Evaluation) is given in Norfolk Green Infrastructure – Ecosystem Service Mapping: Resilient Ecological Networks and Natural Flood Management Opportunity Analysis (Parker 2017).

3.4 This work was then used with the previously developed approach to produce a series of proposed GI corridors. In addition existing corridors designed by NBIS for use in the Norfolk and Suffolk iteration of the Buglife B-Lines project were also included[4].

Ecological Network mapping

3.5 The habitat data from The Norfolk Living Map was used to identify ecological connectivity maps, namely

- Habitat core areas map
- Ecological network and opportunity maps for Grassland/Heathland habitats
- Ecological network and opportunity maps for woodland
- Ecological network and opportunity maps for wetland habitats
- Combined networks and opportunity maps.

These habitats and ecological network maps are reproduced in this report in **Appendix 1: Maps 2- 12**

[3] The Norfolk Living Map was generated by remote sensing as part of the Defra-funded project Making Earth Observation Work (MEOW). The Living Map identifies the semi-natural habitats at a field-by-field scale.

[4] https://www.buglife.org.uk/b-lines-hub/norfolk-and-suffolk-b-lines

Identifying GI deficiency

3.6 The production of the current GI asset map allowed an initial assessment of any potential GI deficiency across the county. In order to do this, all the urban areas within the county were assessed against the Natural England Accessible Natural Greenspace Standards (ANGSt) guidelines[5] and also the Woodland Trust Woodland Access Standard[6] (though in the latter case all GI was assessed not just woodlands). This allowed the production of maps that indicate urban areas and settlements that appear to be deficient in GI and could be targeted for work as part of any GI planning.

3.7 In terms of the ANGSt, urban areas were assessed against three levels of accessibility, namely

- Urban areas within 2km of 20ha or greater greenspace
- Urban areas within 5km of a 100ha or greater greenspace
- Urban areas within 10km of a 500ha or greater greenspace

These maps showing GI deficiency are reproduced in this report in **Appendix 1: Maps 13 – 15**

3.8 In terms of the Woodland Trust Woodland Access Standards, the urban areas were assessed against two levels of accessibility

- Urban areas within 500m of a 20ha or greater greenspace
- Urban Areas within 4km of a 20ha or greater greenspace

These maps showing GI deficiency are reproduced in this report in **Appendix 1: Maps 16 – 17**

Natural Surface Water Flood Management

3.9 In addition, this element of the project produced two maps relating to natural flood management:

- Natural flood management Ecosystem Services map
- Natural flood management Ecosystem services opportunity map

These flood management maps are reproduced in this report in **Appendix 1: Maps 19 and 20**

5 http://webarchive.nationalarchives.gov.uk/20140605111422/http://www.naturalengland.org.uk/regions/east_of_england/ourwork/gi/accessiblenaturalgreenspacestandardangst.aspx

6 https://www.woodlandtrust.org.uk/mediafile/100083906/space-for-people.pdf

4 Using the data

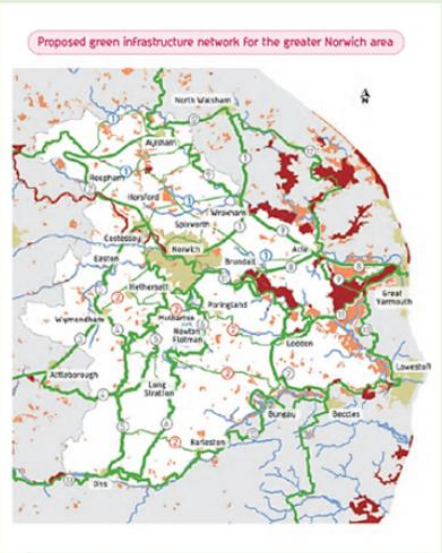
4.1 The data behind the maps can be shared by NBIS with partners in its current form. But it would be desirable to make the mapping data more widely available on-line, so it can be readily used to support Local Authority plans and projects. Finding a suitable funding source would be necessary for this to happen.

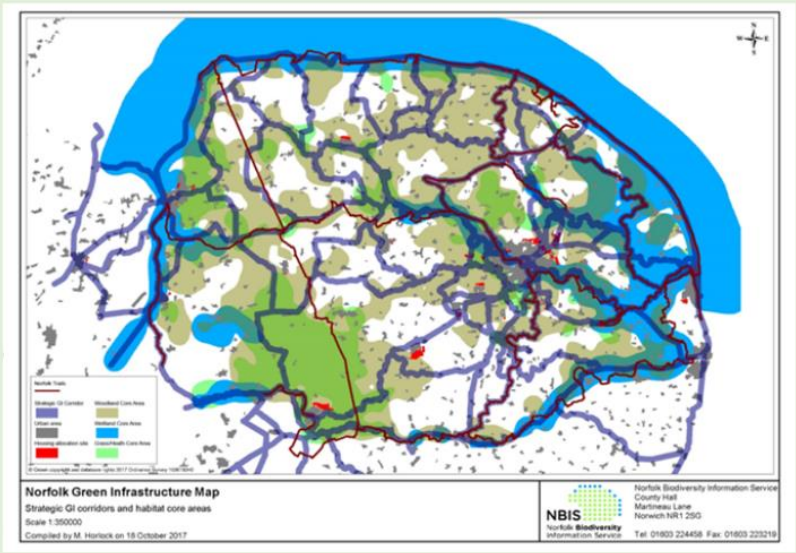
4.2 The data presented in these GI maps can be used in a number of ways. Whilst not intended to be comprehensive, some ideas are suggested below.

4.3 The intention was that the GI Corridor Map (**Map 18**), or a version of it, could be included in Local Plans. It might be recalled that a similar map was presented in the Joint Core Strategy for the Greater Norwich Local Plan (see **Box 5**).

BOX 5: Using the GI Corridor maps — An example from the JCS of Greater Norwich

The Joint Core Strategy for Greater Norwich (2011, 2014) included a map showing the GI corridors that were produced as part of the Greater Norwich Green Infrastructure Strategy 2009 (the map from the JCS is reproduced on the left below). The map produced by the current study for the whole of the county is shown on the right. Given the same approach was used in each case, it is unsurprising that the GI corridors in the Greater Norwich Area are extremely similar on both maps.



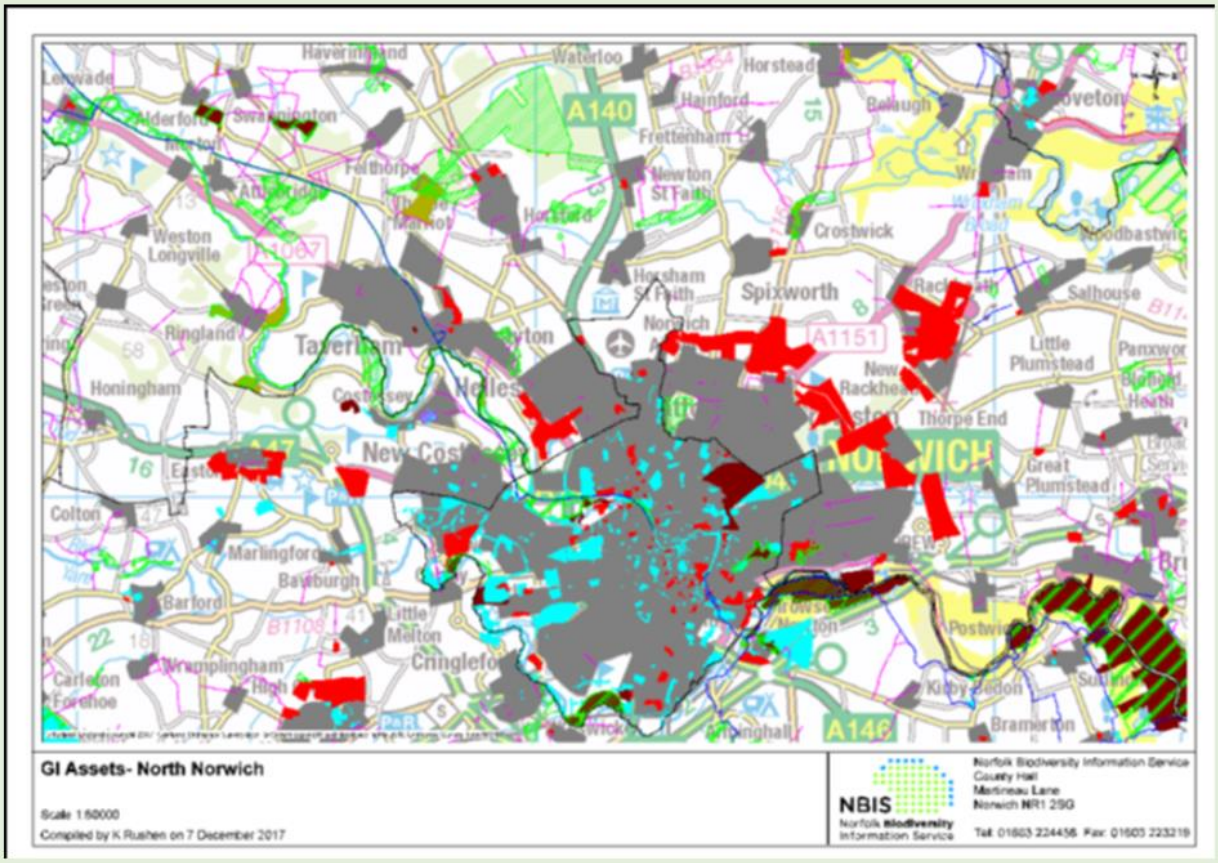


4.4 The mapped Current GI Asset data (**Map 1**) could be used informal spatial planning. Where there are locations for proposed growth where it is recognised that there are deficiencies in greenspace, it may be considered desirable to develop planning policies to address this (see example in **Box 6**). The data can also be used as part of the evidence to help inform Habitat Regulation Assessments (of plans or projects), demonstrating where there is already good countryside access.

BOX 6: Using the Access Asset Mapping to inform spatial planning

This extraction from the Access Asset Mapping, shows the accessible public space (in light blue and maroon), and the allocated sites from within the current Greater Norwich Local Plan (in red). The existing urban area is shown in grey. It is immediately apparent that there is currently little publically accessible green space in the vicinity of the allocated sites in the North-east Norwich Growth Triangle.

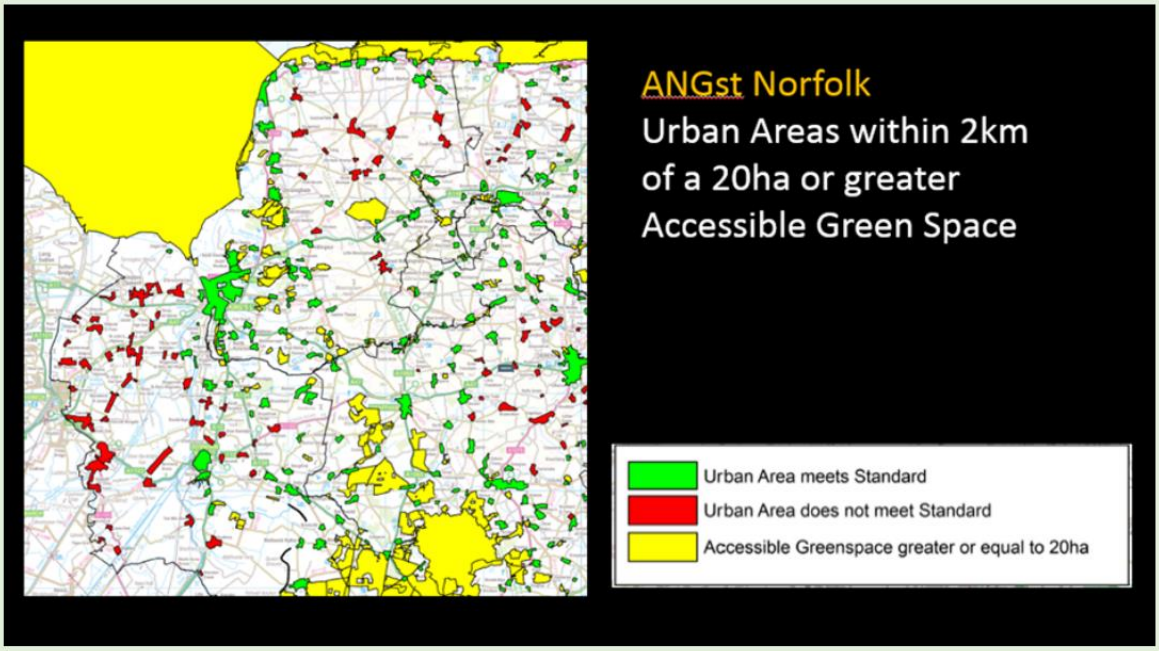
The Area Action Plan for the North East Norwich Growth Triangle (BDC 2016) recognised this deficiency and included a comprehensive GI Strategy to address the issue of accessible open space.



4.5 In a similar vein, the GI deficiency maps (**Maps 13- 17**) could be used to inform specific greenspace policies for certain settlements, or as evidence to support funding bids. This might be particularly applicable in relatively rural settlements (see example **Box 7**).

BOX 7: Using the data to address rural deficiencies in public access

This extract from the ANGst Mapping shows that there are a number of settlements in the west of the county, which despite being in rural locations, do not provide for access to the countryside. Note the cluster of red-coloured settlements to the west of Kings Lynn and around the village of Docking. This information could be used as evidence in funding bids for GI projects, or to help inform specific open space policies for new developments in these locations.



5 Future work: A county-wide Green Infrastructure Strategy

5.1 A logical next step would be to develop a county-wide Green Infrastructure Strategy based on the data and mapping completed as part of the Norfolk GIMP. The benefits of such a cross-LPA boundary strategy are obvious; people of Norfolk do not necessarily undertake their recreation in the district in which they are resident, and wildlife clearly does not recognises district boundaries.

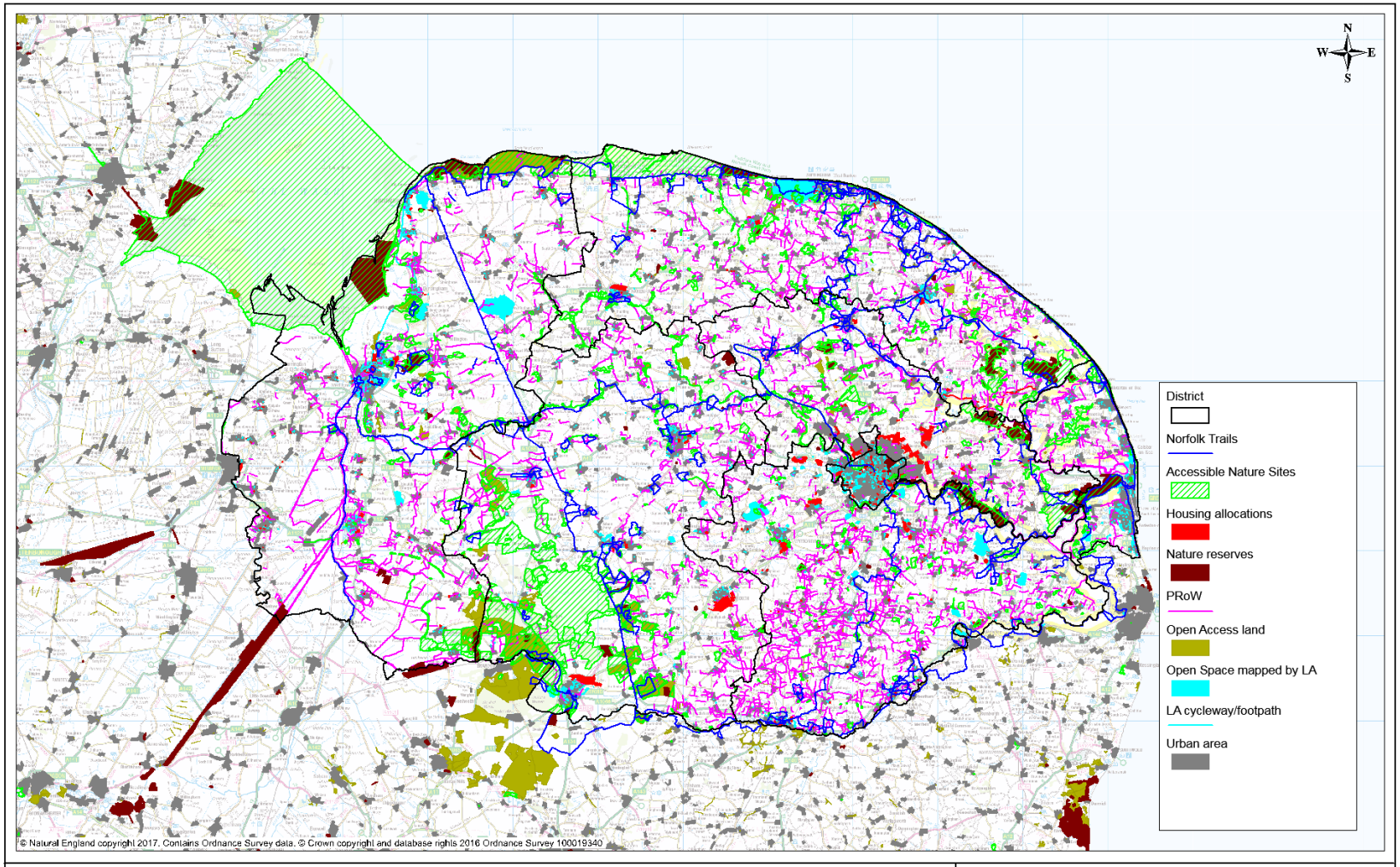
5.2 Strategic GI planning at a county scale will also help address issues identified in the Habitat Regulation Assessments (Appropriate Assessments) of local plans, in particular with regards to accessible public open space and recreation.

5.3 Funding would be needed to develop a county-wide GI strategy. The Greater Norwich Development Partnership recently has indicated some funds may be available to support such a strategy in the Greater Norwich Area, and this could form an approach for the whole county. It is thought that a project of this nature could be complete in-house.

5.4 It is recommended that the partners consider the desirability of developing a Green Infrastructure for Norfolk, and indicate their ambitions and objectives of such a project.

Catfield Fen (Photo credit: David White)

Appendix A: The Maps



Map 1: Current Green Infrastructure Assets

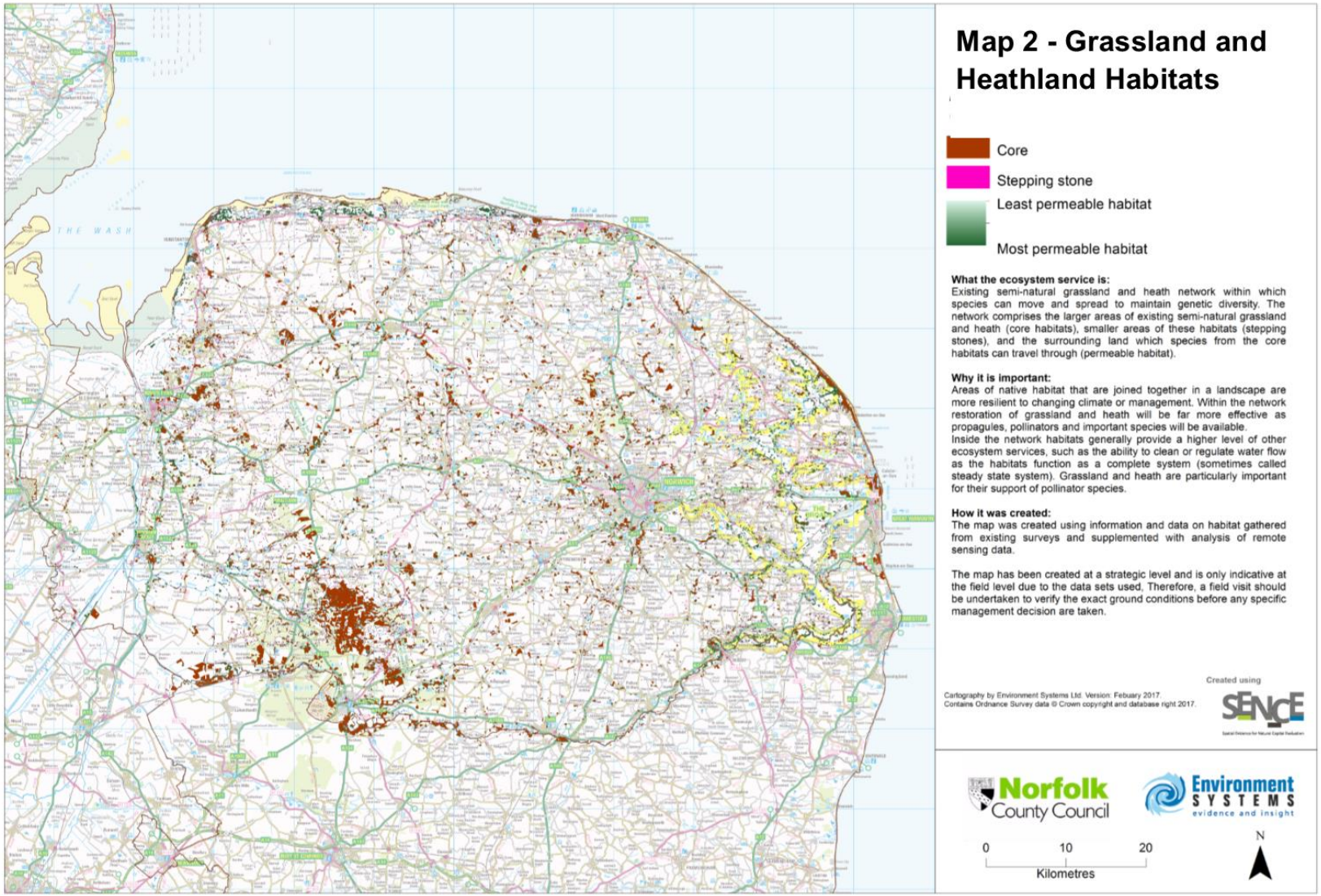
Scale 1:400000

Compiled by K Rushen on 2 July 2018

NBIS Norfolk Biodiversity Information Service

Norfolk Biodiversity Information Service
County Hall
Martineau Lane
Norwich NR1 2SG

Tel: 01603 224458 Fax: 01603 223219


Map 2 - Grassland and Heathland Habitats
Core
Stepping stone
Least permeable habitat
Most permeable habitat
What the ecosystem service is:
Existing semi-natural grassland and heath network within which species can move and spread to maintain genetic diversity. The network comprises the larger areas of existing semi-natural grassland and heath (core habitats), smaller areas of these habitats (stepping stones), and the surrounding land which species from the core habitats can travel through (permeable habitat).
Why it is important:
Areas of native habitat that are joined together in a landscape are more resilient to changing climate or management. Within the network restoration of grassland and heath will be far more effective as propagules, pollinators and important species will be available.
Inside the network habitats generally provide a higher level of other ecosystem services, such as the ability to clean or regulate water flow as the habitats function as a complete system (sometimes called steady state system). Grassland and heath are particularly important for their support of pollinator species.
How it was created:
The map was created using information and data on habitat gathered from existing surveys and supplemented with analysis of remote sensing data.
The map has been created at a strategic level and is only indicative at the field level due to the data sets used, Therefore, a field visit should be undertaken to verify the exact ground conditions before any specific management decision are taken.
Cartography by Environment Systems Ltd. Version: Febuary 2017.
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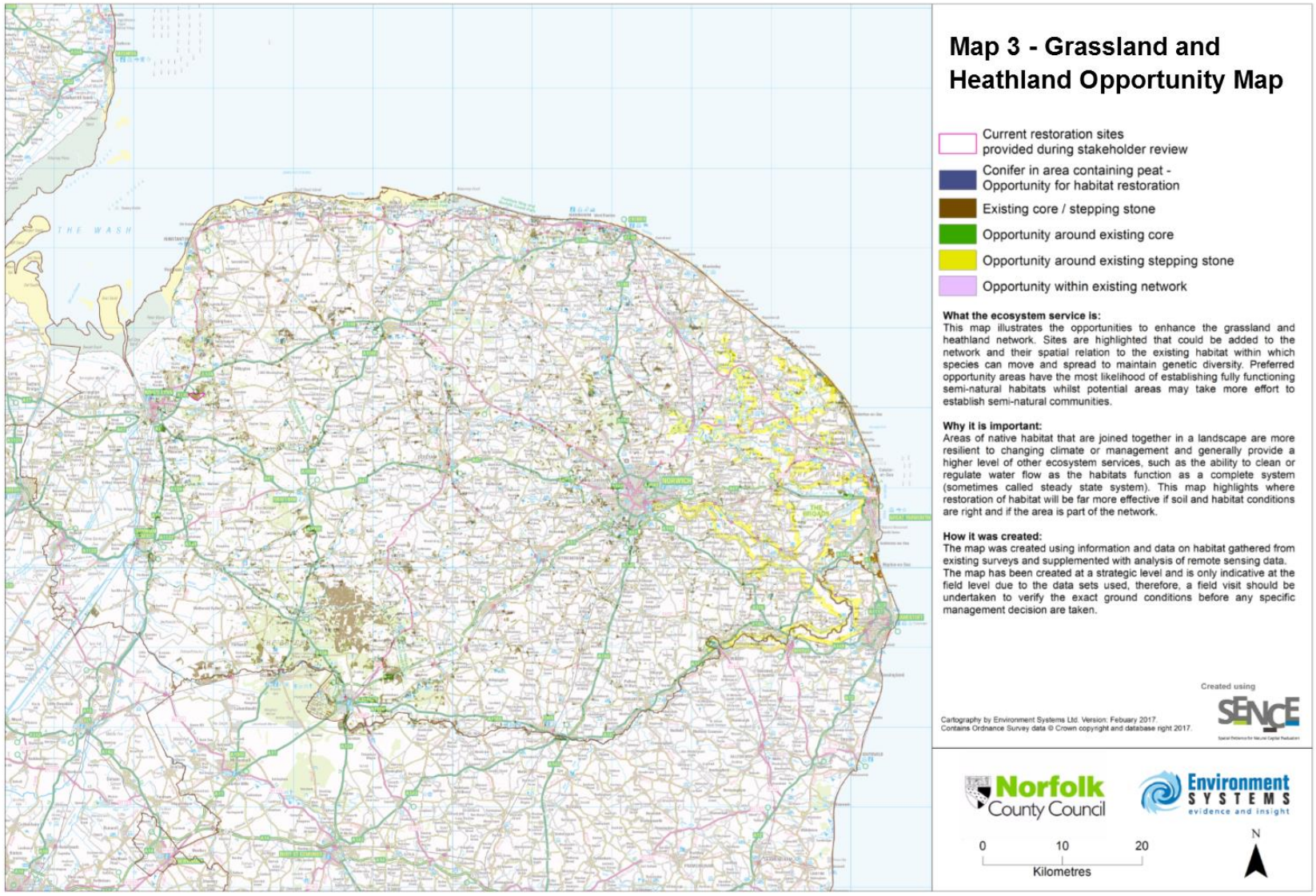
Map 3 - Grassland and Heathland Opportunity Map
Current restoration sites provided during stakeholder review
Conifer in area containing peat - Opportunity for habitat restoration
Existing core / stepping stone
Opportunity around existing core
Opportunity around existing stepping stone
Opportunity within existing network
What the ecosystem service is:
This map illustrates the opportunities to enhance the grassland and heathland network. Sites are highlighted that could be added to the network and their spatial relation to the existing habitat within which species can move and spread to maintain genetic diversity. Preferred opportunity areas have the most likelihood of establishing fully functioning semi-natural habitats whilst potential areas may take more effort to establish semi-natural communities.
Why it is important:
Areas of native habitat that are joined together in a landscape are more resilient to changing climate or management and generally provide a higher level of other ecosystem services, such as the ability to clean or regulate water flow as the habitats function as a complete system (sometimes called steady state system). This map highlights where restoration of habitat will be far more effective if soil and habitat conditions are right and if the area is part of the network.
How it was created:
The map was created using information and data on habitat gathered from existing surveys and supplemented with analysis of remote sensing data. The map has been created at a strategic level and is only indicative at the field level due to the data sets used, therefore, a field visit should be undertaken to verify the exact ground conditions before any specific management decision are taken.
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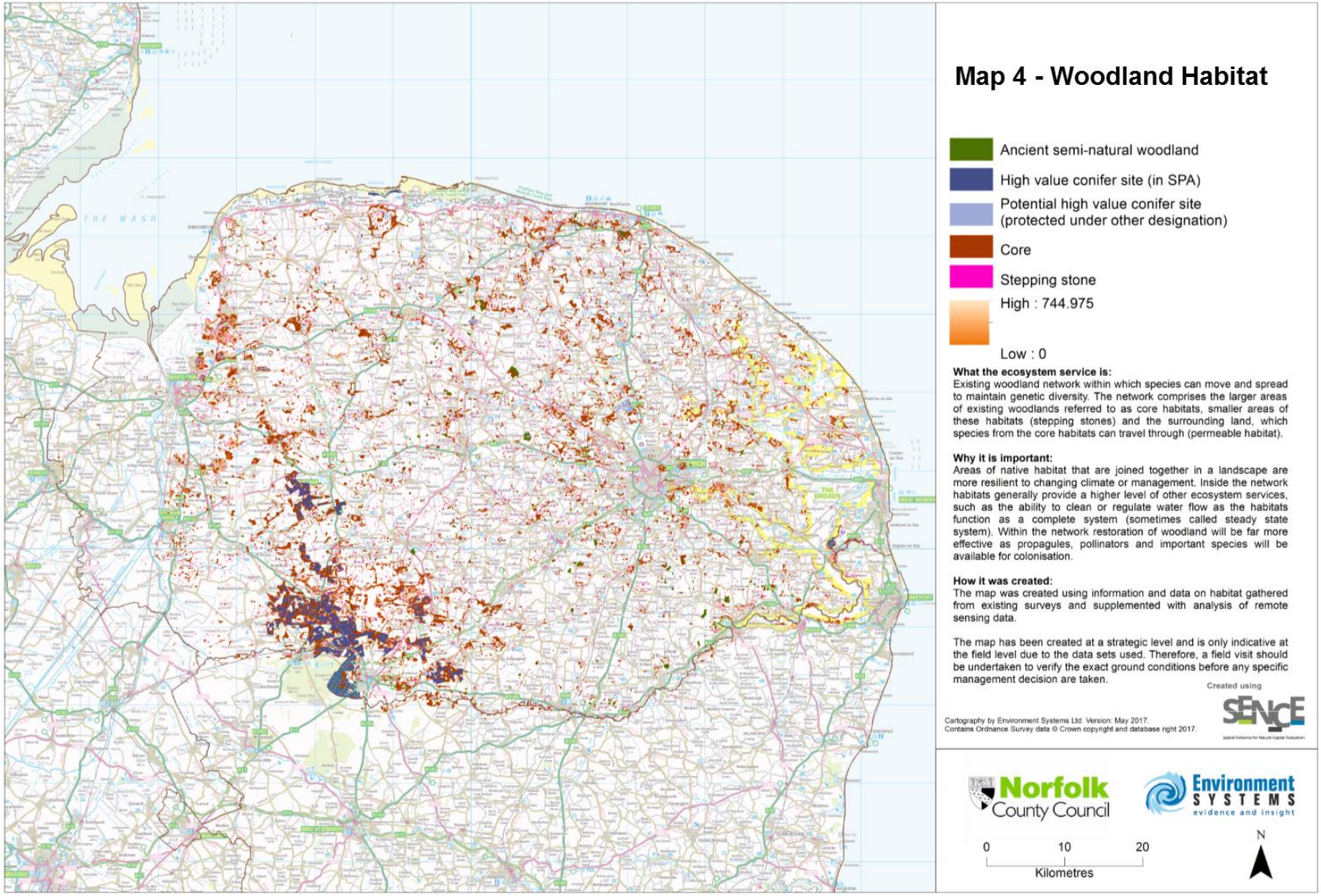
Map 4 - Woodland Habitat
Ancient semi-natural woodland
High value conifer site (in SPA)
Potential high value conifer site (protected under other designation)
Core
Stepping stone
High : 744.975
Low : 0
What the ecosystem service is:
Existing woodland network within which species can move and spread to maintain genetic diversity. The network comprises the larger areas of existing woodlands referred to as core habitats, smaller areas of these habitats (stepping stones) and the surrounding land, which species from the core habitats can travel through (permeable habitat).
Why it is important:
Areas of native habitat that are joined together in a landscape are more resilient to changing climate or management. Inside the network habitats generally provide a higher level of other ecosystem services, such as the ability to clean or regulate water flow as the habitats function as a complete system (sometimes called steady state system). Within the network restoration of woodland will be far more effective as propagules, pollinators and important species will be available for colonisation.
How it was created:
The map was created using information and data on habitat gathered from existing surveys and supplemented with analysis of remote sensing data.
The map has been created at a strategic level and is only indicative at the field level due to the data sets used. Therefore, a field visit should be undertaken to verify the exact ground conditions before any specific management decision are taken.
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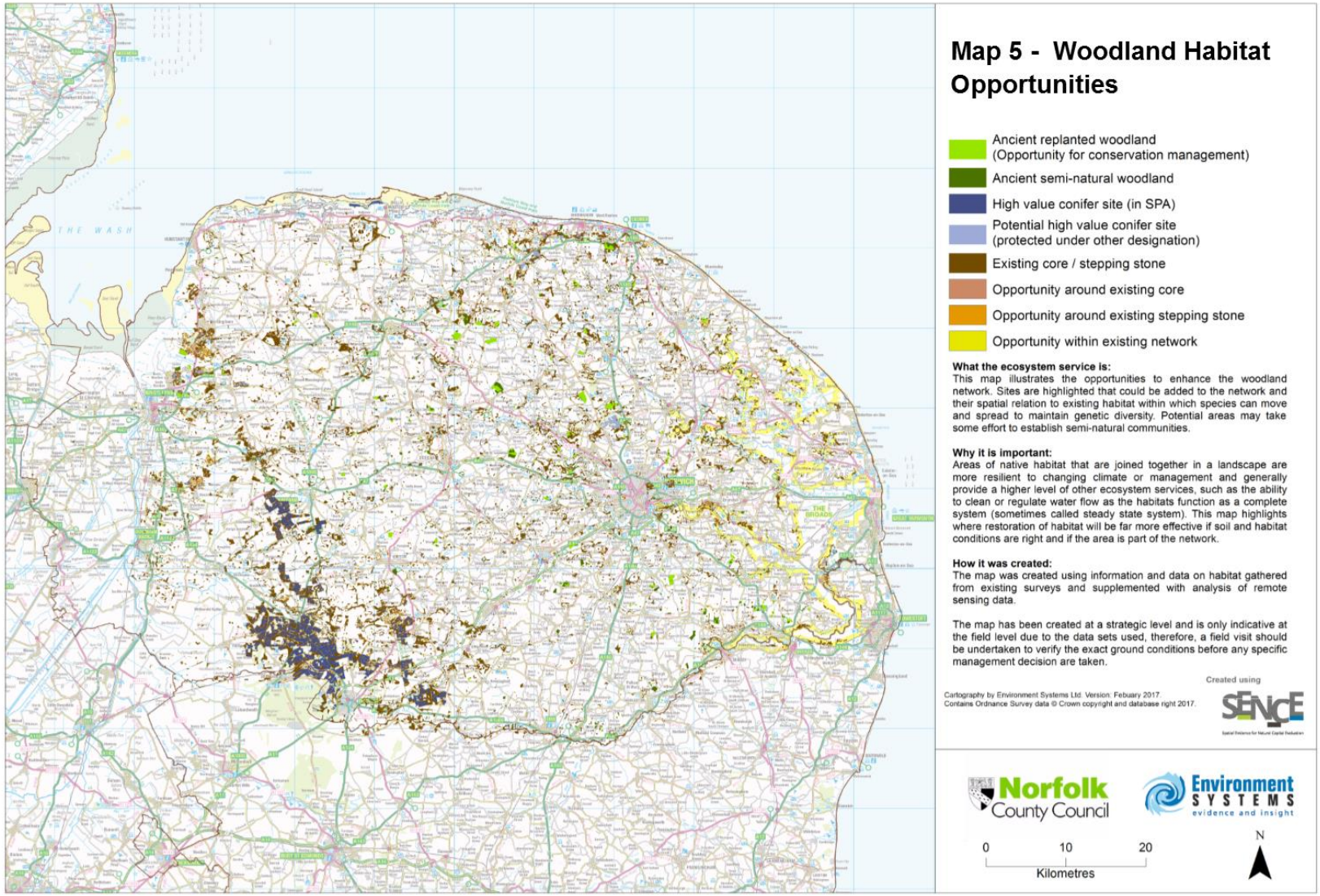
Map 5 - Woodland Habitat Opportunities
Ancient replanted woodland (Opportunity for conservation management)
Ancient semi-natural woodland
High value conifer site (in SPA)
Potential high value conifer site (protected under other designation)
Existing core / stepping stone
Opportunity around existing core
Opportunity around existing stepping stone
Opportunity within existing network
What the ecosystem service is:
This map illustrates the opportunities to enhance the woodland network. Sites are highlighted that could be added to the network and their spatial relation to existing habitat within which species can move and spread to maintain genetic diversity. Potential areas may take some effort to establish semi-natural communities.
Why it is important:
Areas of native habitat that are joined together in a landscape are more resilient to changing climate or management and generally provide a higher level of other ecosystem services, such as the ability to clean or regulate water flow as the habitats function as a complete system (sometimes called steady state system). This map highlights where restoration of habitat will be far more effective if soil and habitat conditions are right and if the area is part of the network.
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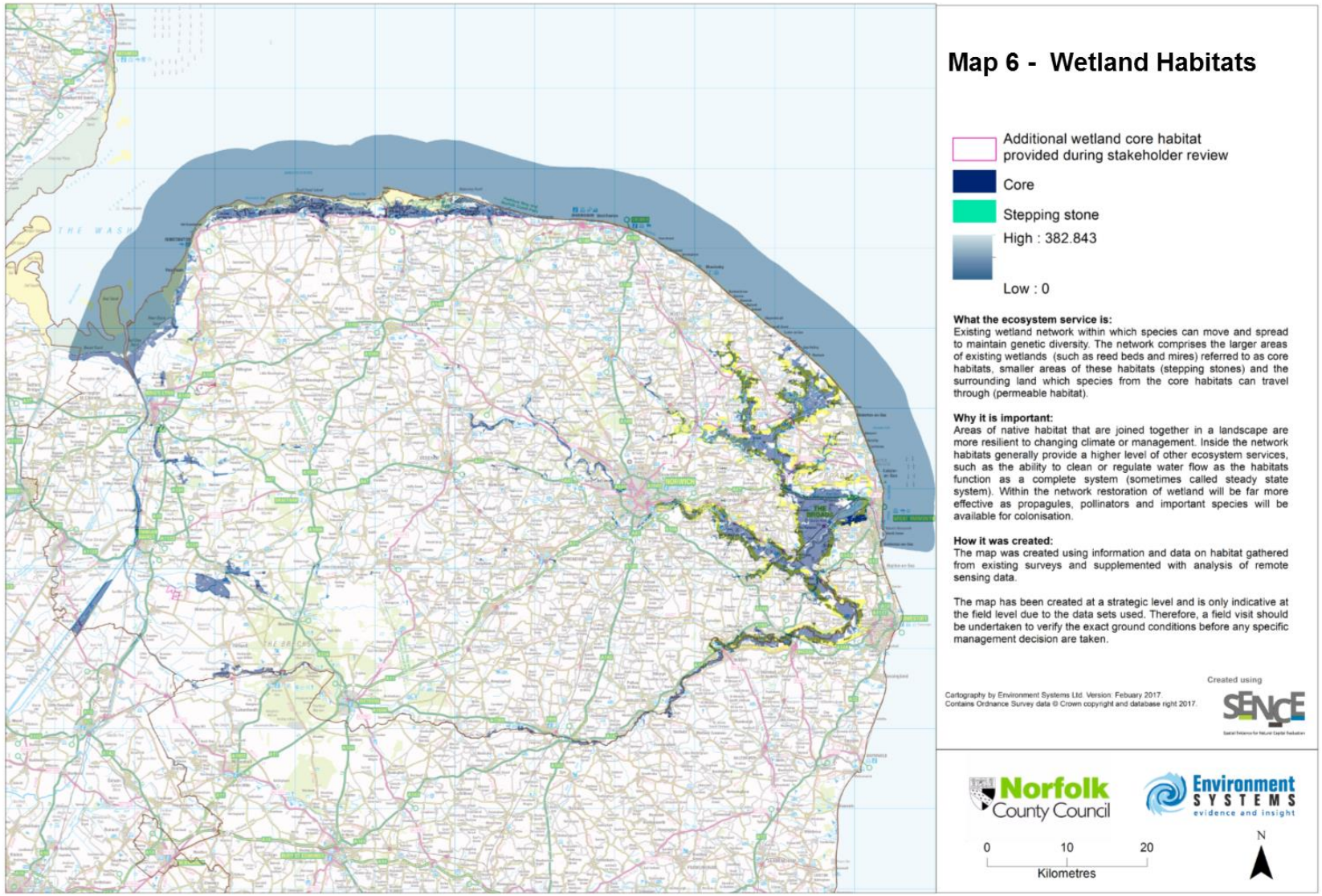
Map 6 - Wetland Habitats
Additional wetland core habitat provided during stakeholder review
Core
Stepping stone
High : 382.843
Low : 0
What the ecosystem service is:
Existing wetland network within which species can move and spread to maintain genetic diversity. The network comprises the larger areas of existing wetlands (such as reed beds and mires) referred to as core habitats, smaller areas of these habitats (stepping stones) and the surrounding land which species from the core habitats can travel through (permeable habitat).
Why it is important:
Areas of native habitat that are joined together in a landscape are more resilient to changing climate or management. Inside the network habitats generally provide a higher level of other ecosystem services, such as the ability to clean or regulate water flow as the habitats function as a complete system (sometimes called steady state system). Within the network restoration of wetland will be far more effective as propagules, pollinators and important species will be available for colonisation.
How it was created:
The map was created using information and data on habitat gathered from existing surveys and supplemented with analysis of remote sensing data.
The map has been created at a strategic level and is only indicative at the field level due to the data sets used. Therefore, a field visit should be undertaken to verify the exact ground conditions before any specific management decision are taken.
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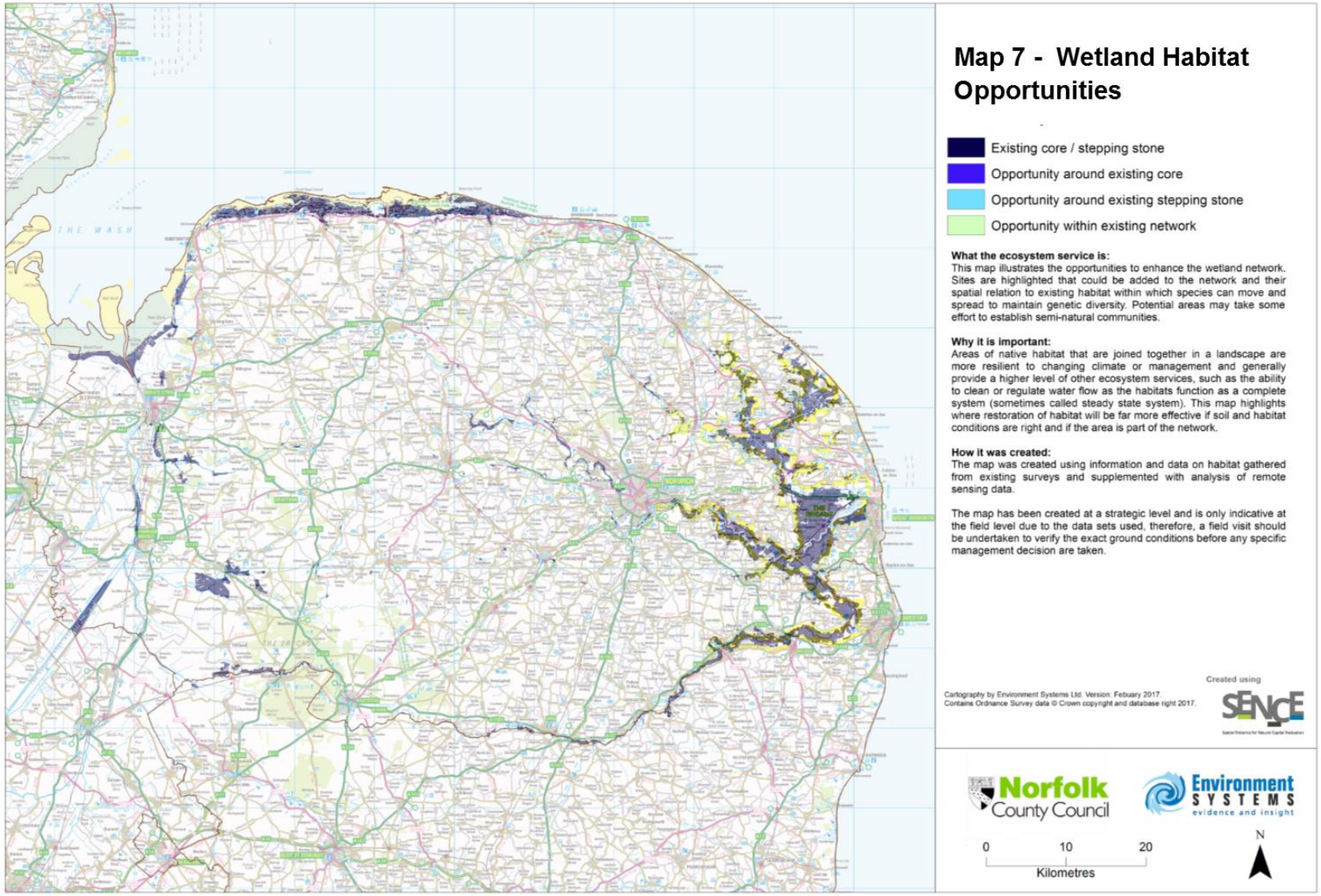
Map 7 - Wetland Habitat Opportunities
Existing core / stepping stone
Opportunity around existing core
Opportunity around existing stepping stone
Opportunity within existing network
What the ecosystem service is:
This map illustrates the opportunities to enhance the wetland network. Sites are highlighted that could be added to the network and their spatial relation to existing habitat within which species can move and spread to maintain genetic diversity. Potential areas may take some effort to establish semi-natural communities.
Why it is important:
Areas of native habitat that are joined together in a landscape are more resilient to changing climate or management and generally provide a higher level of other ecosystem services, such as the ability to clean or regulate water flow as the habitats function as a complete system (sometimes called steady state system). This map highlights where restoration of habitat will be far more effective if soil and habitat conditions are right and if the area is part of the network.
How it was created:
The map was created using information and data on habitat gathered from existing surveys and supplemented with analysis of remote sensing data.
The map has been created at a strategic level and is only indicative at the field level due to the data sets used, therefore, a field visit should be undertaken to verify the exact ground conditions before any specific management decision are taken.
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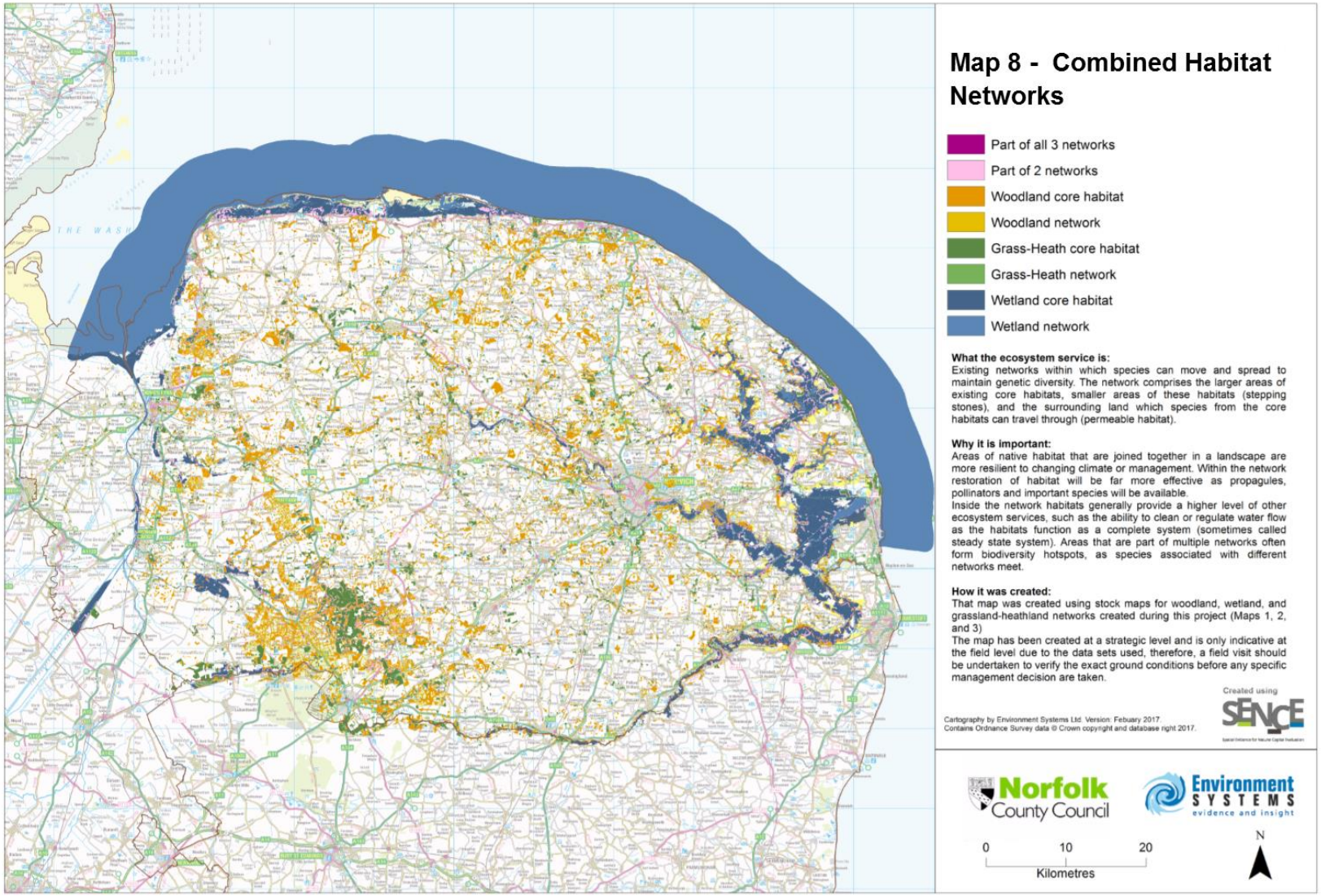
Map 8 - Combined Habitat Networks
Part of all 3 networks
Part of 2 networks
Woodland core habitat
Woodland network
Grass-Heath core habitat
Grass-Heath network
Wetland core habitat
Wetland network
What the ecosystem service is:
Existing networks within which species can move and spread to maintain genetic diversity. The network comprises the larger areas of existing core habitats, smaller areas of these habitats (stepping stones), and the surrounding land which species from the core habitats can travel through (permeable habitat).
Why it is important:
Areas of native habitat that are joined together in a landscape are more resilient to changing climate or management. Within the network restoration of habitat will be far more effective as propagules, pollinators and important species will be available.
Inside the network habitats generally provide a higher level of other ecosystem services, such as the ability to clean or regulate water flow as the habitats function as a complete system (sometimes called steady state system). Areas that are part of multiple networks often form biodiversity hotspots, as species associated with different networks meet.
How it was created:
That map was created using stock maps for woodland, wetland, and grassland-heathland networks created during this project (Maps 1, 2, and 3)
The map has been created at a strategic level and is only indicative at the field level due to the data sets used, therefore, a field visit should be undertaken to verify the exact ground conditions before any specific management decision are taken.
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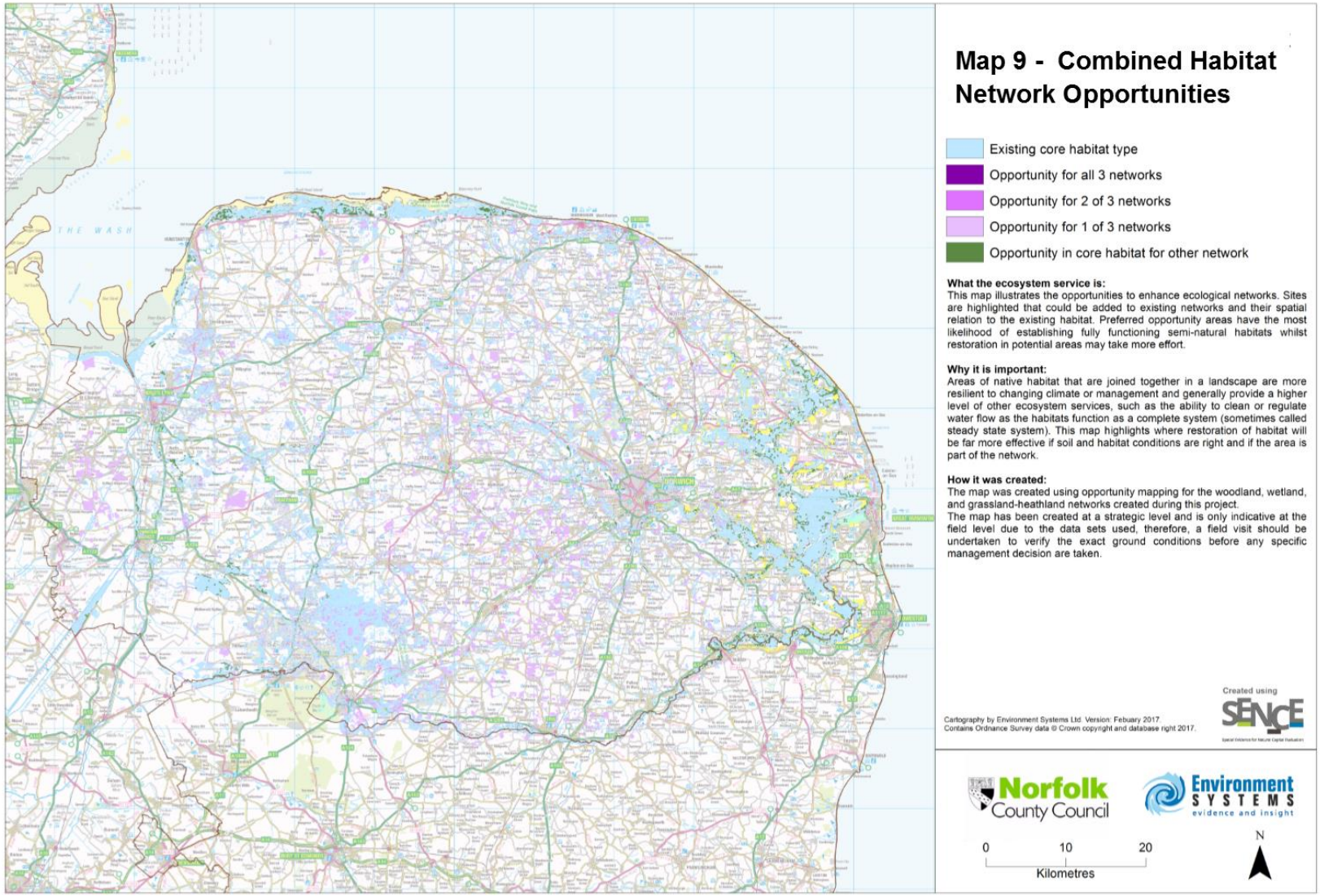
THE WASH
Map 9 - Combined Habitat Network Opportunities
Existing core habitat type
Opportunity for all 3 networks
Opportunity for 2 of 3 networks
Opportunity for 1 of 3 networks
Opportunity in core habitat for other network
What the ecosystem service is:
This map illustrates the opportunities to enhance ecological networks. Sites are highlighted that could be added to existing networks and their spatial relation to the existing habitat. Preferred opportunity areas have the most likelihood of establishing fully functioning semi-natural habitats whilst restoration in potential areas may take more effort.
Why it is important:
Areas of native habitat that are joined together in a landscape are more resilient to changing climate or management and generally provide a higher level of other ecosystem services, such as the ability to clean or regulate water flow as the habitats function as a complete system (sometimes called steady state system). This map highlights where restoration of habitat will be far more effective if soil and habitat conditions are right and if the area is part of the network.
How it was created:
The map was created using opportunity mapping for the woodland, wetland, and grassland-heathland networks created during this project.
The map has been created at a strategic level and is only indicative at the field level due to the data sets used, therefore, a field visit should be undertaken to verify the exact ground conditions before any specific management decision are taken.
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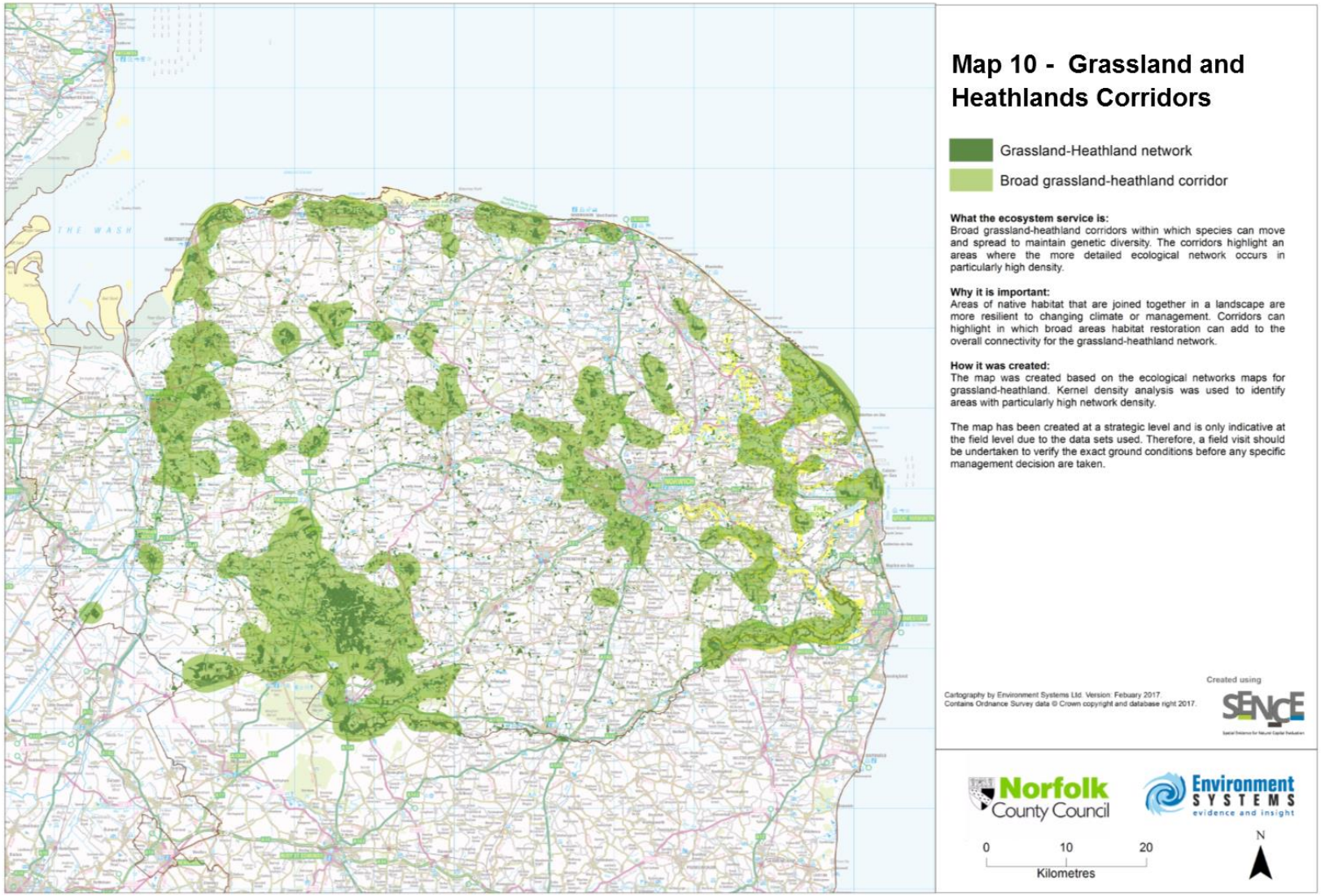
Map 10 - Grassland and Heathlands Corridors
Grassland-Heathland network
Broad grassland-heathland corridor
What the ecosystem service is:
Broad grassland-heathland corridors within which species can move and spread to maintain genetic diversity. The corridors highlight an areas where the more detailed ecological network occurs in particularly high density.
Why it is important:
Areas of native habitat that are joined together in a landscape are more resilient to changing climate or management. Corridors can highlight in which broad areas habitat restoration can add to the overall connectivity for the grassland-heathland network.
How it was created:
The map was created based on the ecological networks maps for grassland-heathland. Kernel density analysis was used to identify areas with particularly high network density.
The map has been created at a strategic level and is only indicative at the field level due to the data sets used. Therefore, a field visit should be undertaken to verify the exact ground conditions before any specific management decision are taken.
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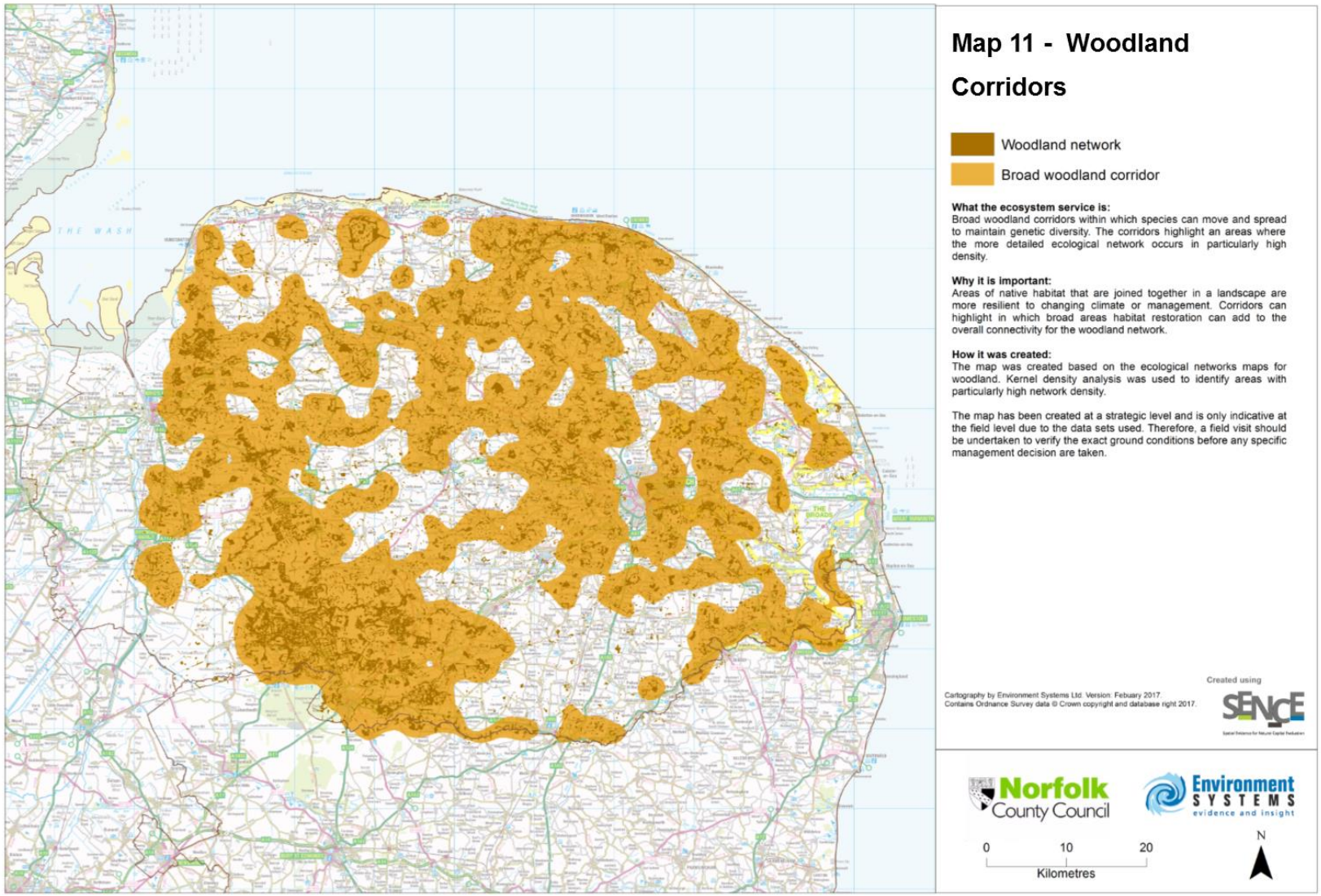
Map 11 - Woodland Corridors
Woodland network
Broad woodland corridor
What the ecosystem service is:
Broad woodland corridors within which species can move and spread to maintain genetic diversity. The corridors highlight an areas where the more detailed ecological network occurs in particularly high density.
Why it is important:
Areas of native habitat that are joined together in a landscape are more resilient to changing climate or management. Corridors can highlight in which broad areas habitat restoration can add to the overall connectivity for the woodland network.
How it was created:
The map was created based on the ecological networks maps for woodland. Kernel density analysis was used to identify areas with particularly high network density.
The map has been created at a strategic level and is only indicative at the field level due to the data sets used. Therefore, a field visit should be undertaken to verify the exact ground conditions before any specific management decision are taken.
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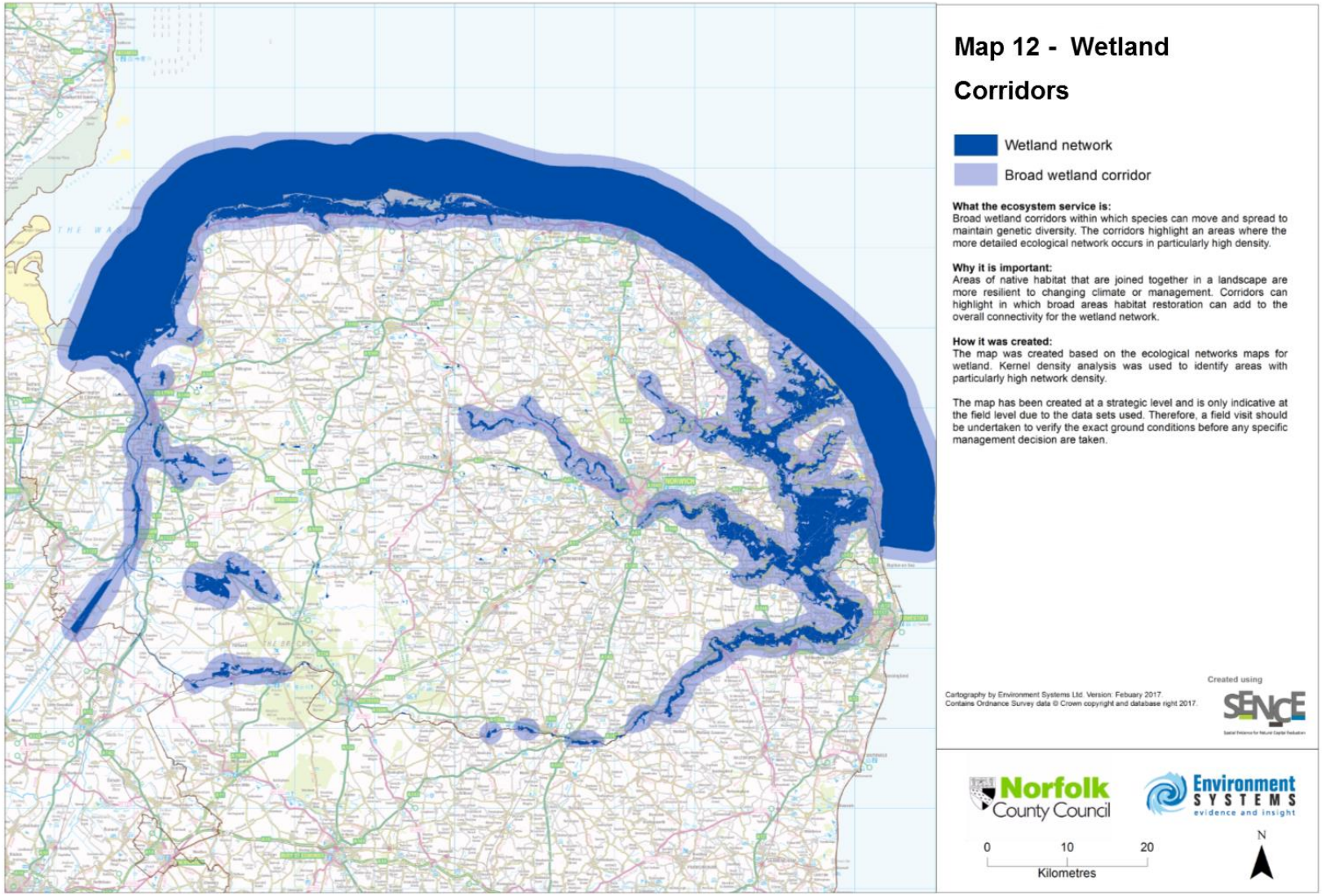
Map 12 - Wetland Corridors
Wetland network
Broad wetland corridor
What the ecosystem service is:
Broad wetland corridors within which species can move and spread to maintain genetic diversity. The corridors highlight an areas where the more detailed ecological network occurs in particularly high density.
Why it is important:
Areas of native habitat that are joined together in a landscape are more resilient to changing climate or management. Corridors can highlight in which broad areas habitat restoration can add to the overall connectivity for the wetland network.
How it was created:
The map was created based on the ecological networks maps for wetland. Kernel density analysis was used to identify areas with particularly high network density.
The map has been created at a strategic level and is only indicative at the field level due to the data sets used. Therefore, a field visit should be undertaken to verify the exact ground conditions before any specific management decision are taken.
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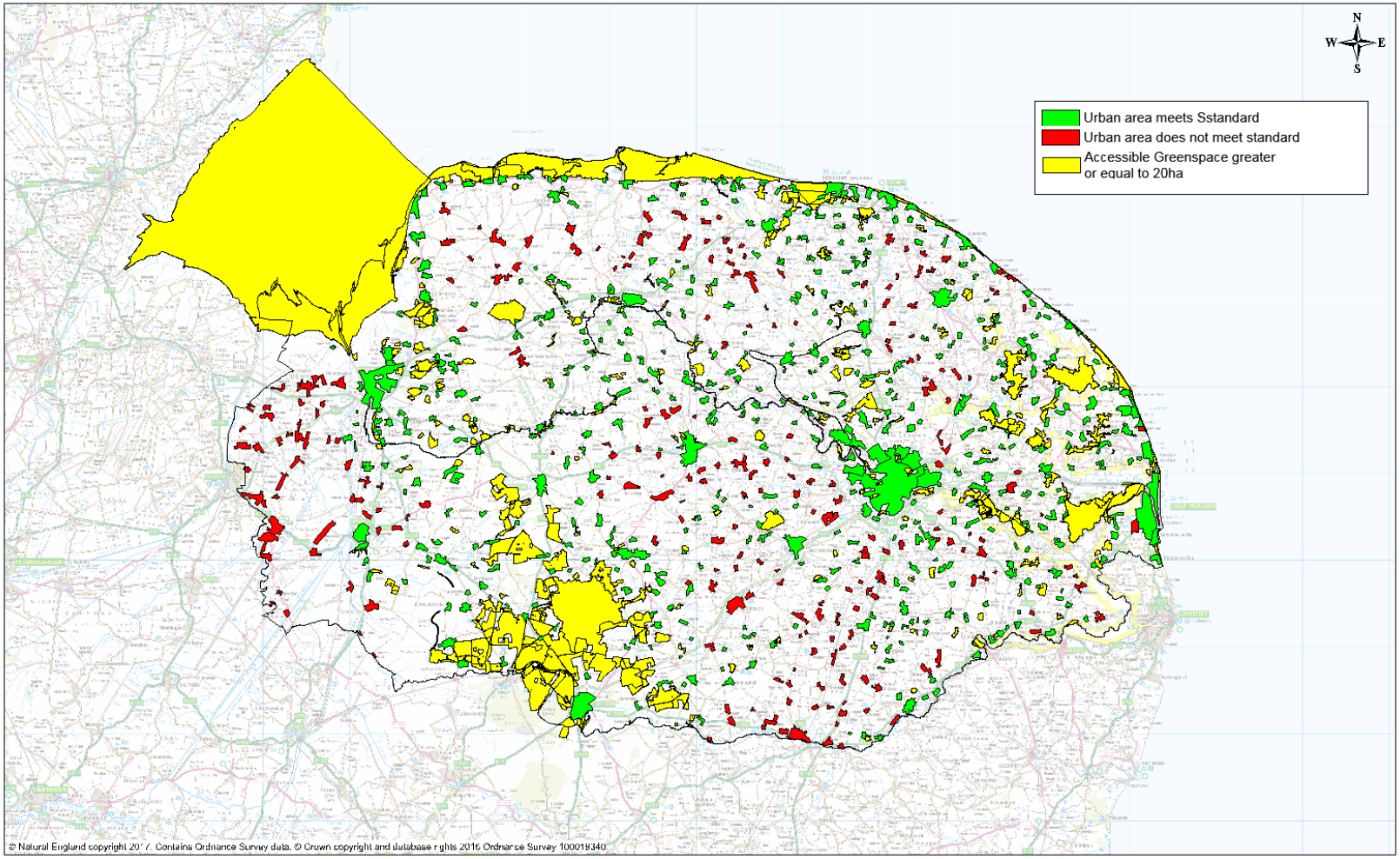


Map 13: Accessible Natural Greenspace Standard (ANGSt)

Urban areas within 2km of a 20ha or greater greenspace

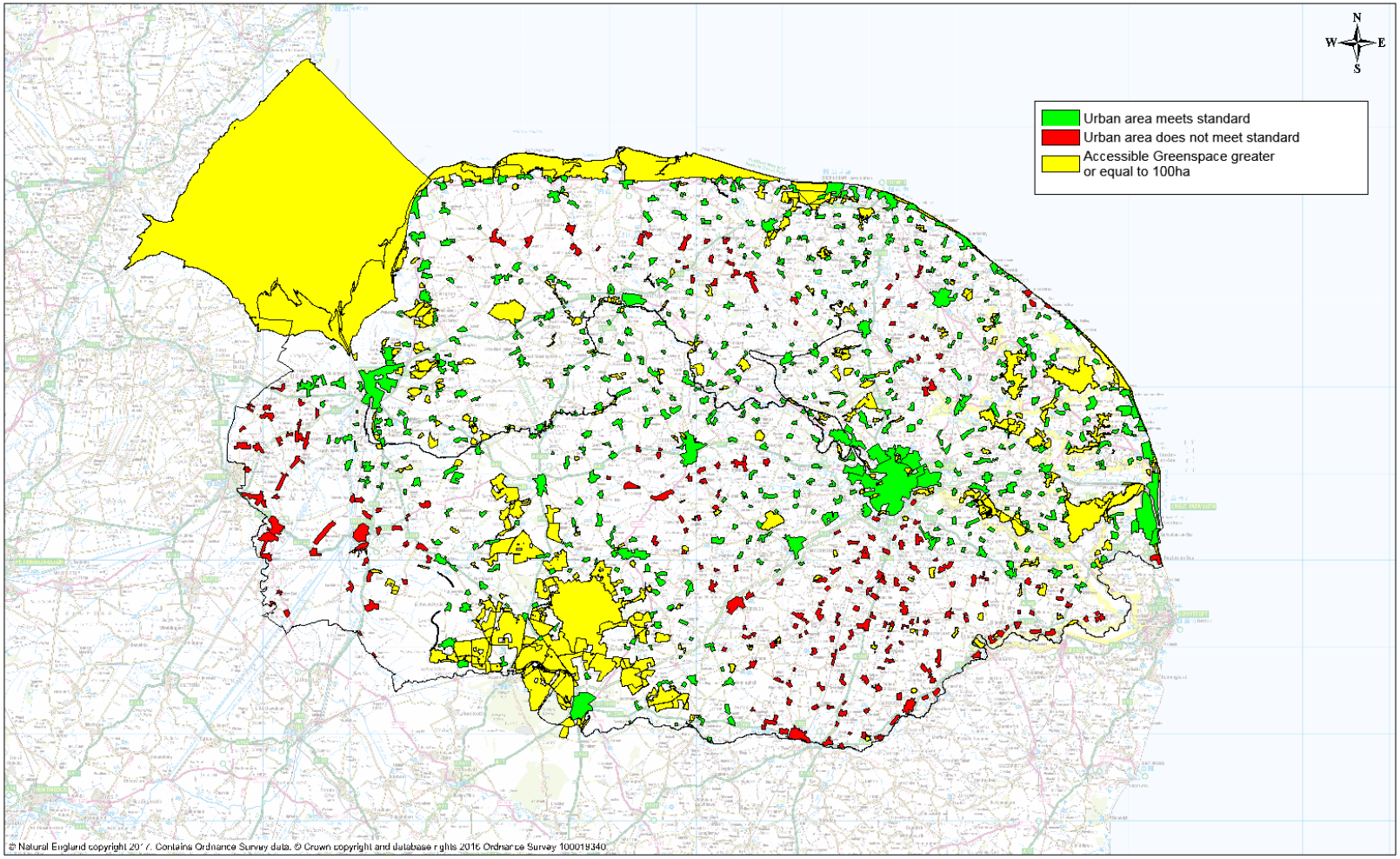
Scale 1:400000

Compiled by K Rushen on 02 July 2018

NBIS Norfolk Biodiversity Information Service

Norfolk Biodiversity Information Service
County Hall
Martineau Lane
Norwich NR1 2SG

Tel: 01603 224458 Fax: 01603 223219



Map 14: Accessible Natural Greenspace Standard (ANGSt)

Urban areas within 5km of a 100ha or greater greenspace

Scale 1:400000

Compiled by K Rushen on 02 July 2018

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Norwich NR1 2SG

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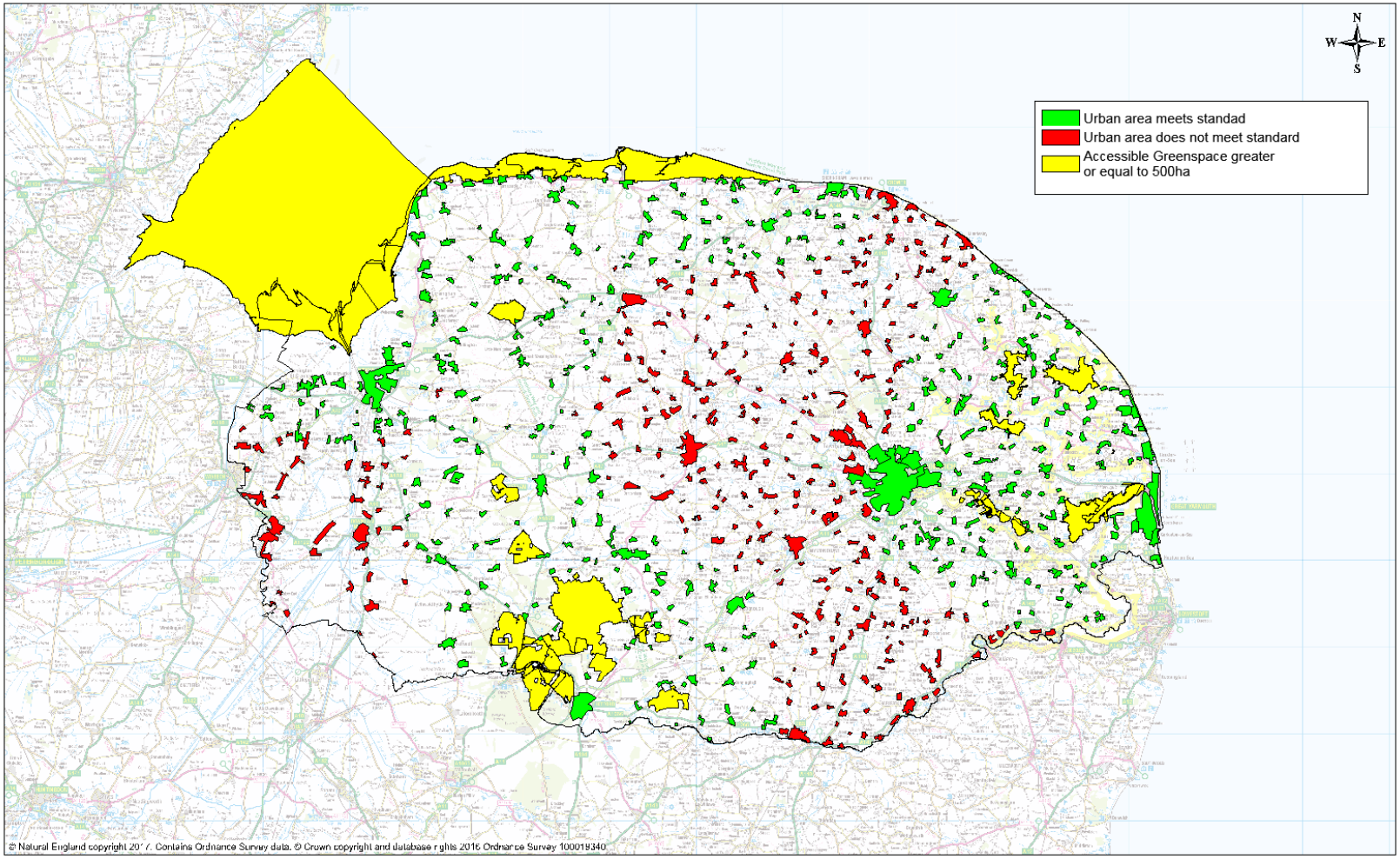

Map 15: Accessible Natural Greenspace Standard (ANGSt)

Urban areas within 10km of a 500ha or greater greenspace

Scale 1:400000

Compiled by K Rushen on 02 July 2018

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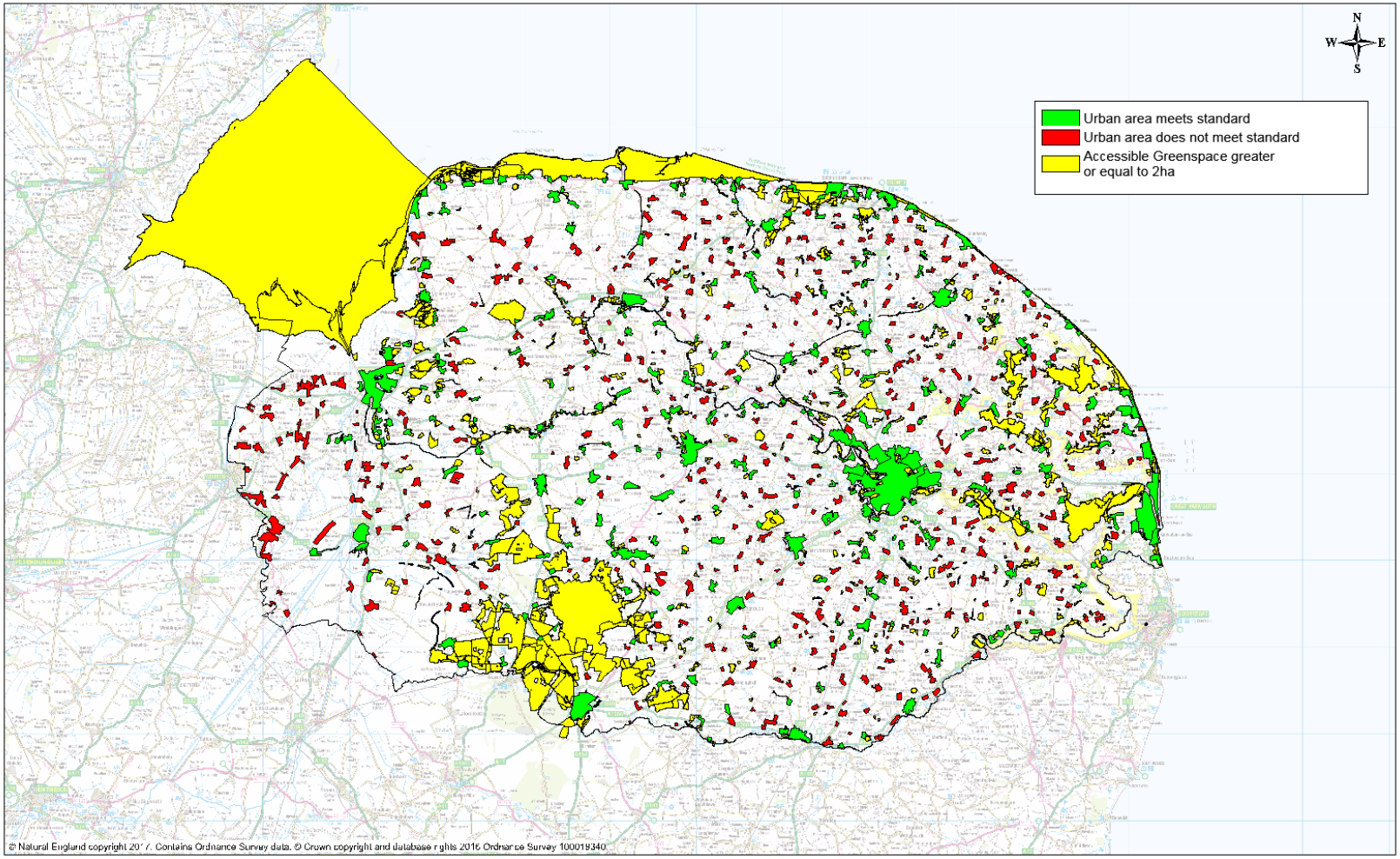

Map 16: Woodland Trust Woodland Access Standards

Urban areas within 500m of a 2ha or greater greenspace

Scale 1:400000

Compiled by K Rushen on 02 July 2018

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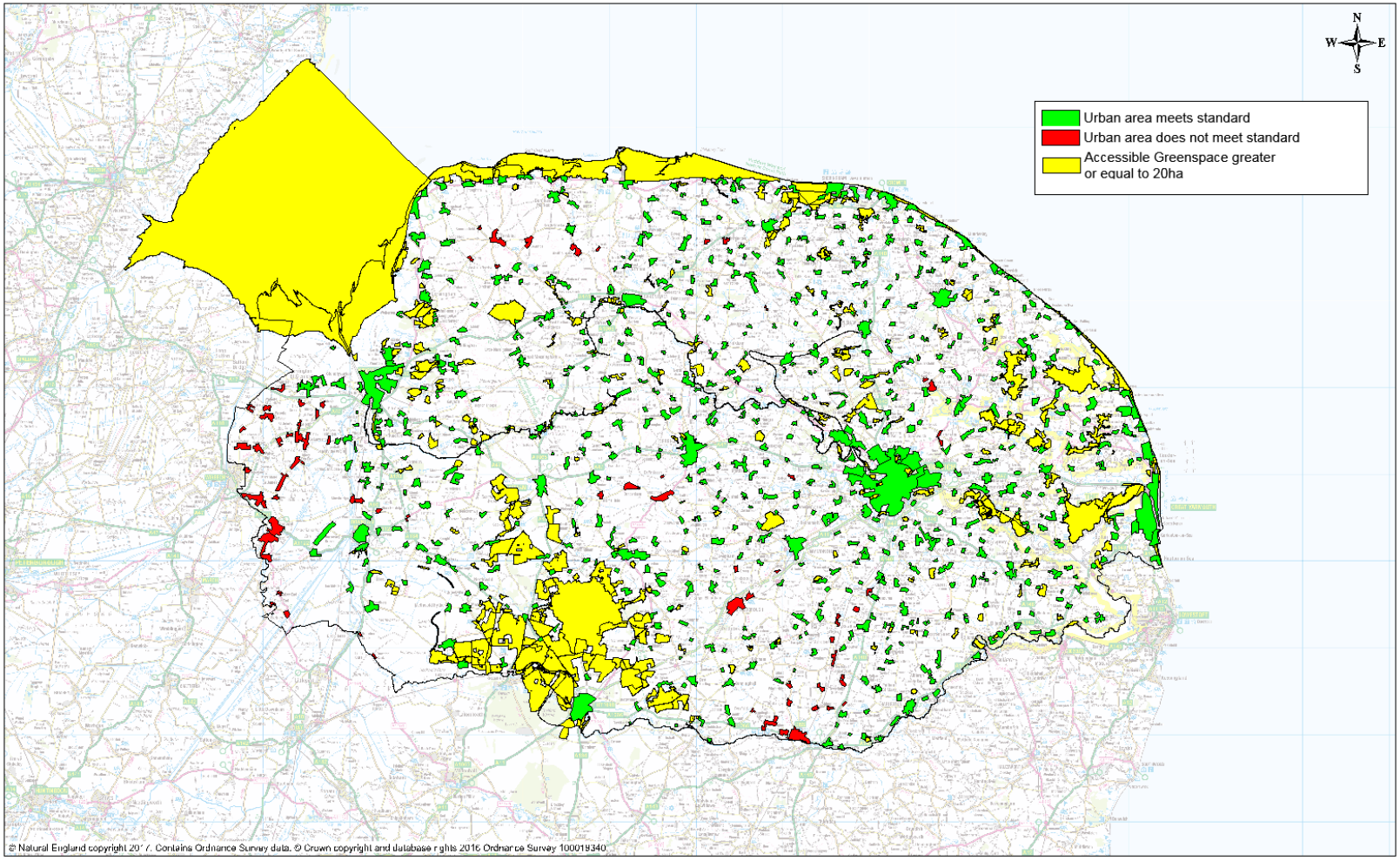

Map 17: Woodland Trust Woodland Access Standards

Urban areas within 4km of a 20ha or greater greenspace

Scale 1:400000

Compiled by K Rushen on 02 July 2018

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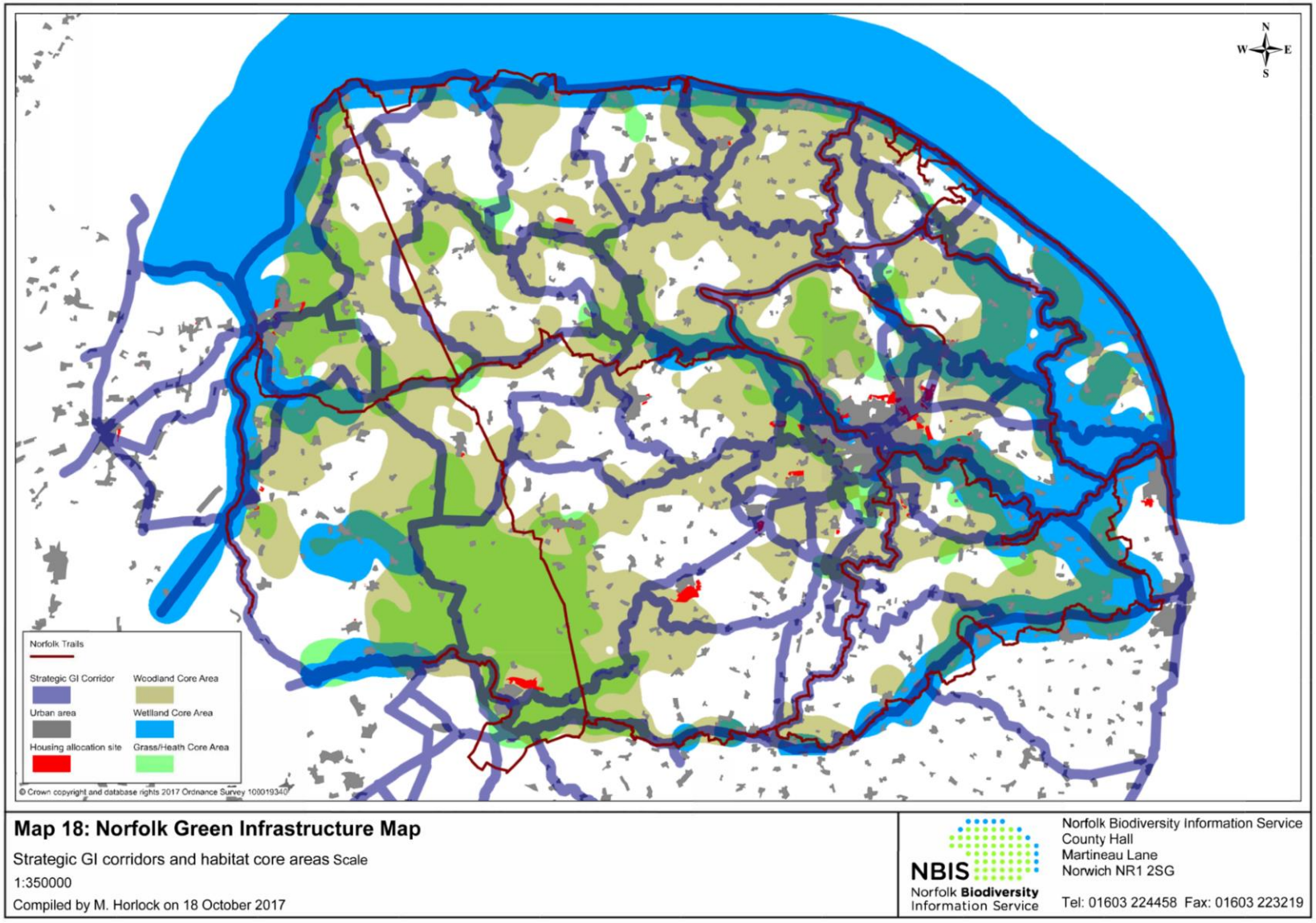

Map 18: Norfolk Green Infrastructure Map

Strategic GI corridors and habitat core areas Scale

1:350000

Compiled by M. Horlock on 18 October 2017

NBIS Norfolk Biodiversity Information Service

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Martineau Lane
Norwich NR1 2SG

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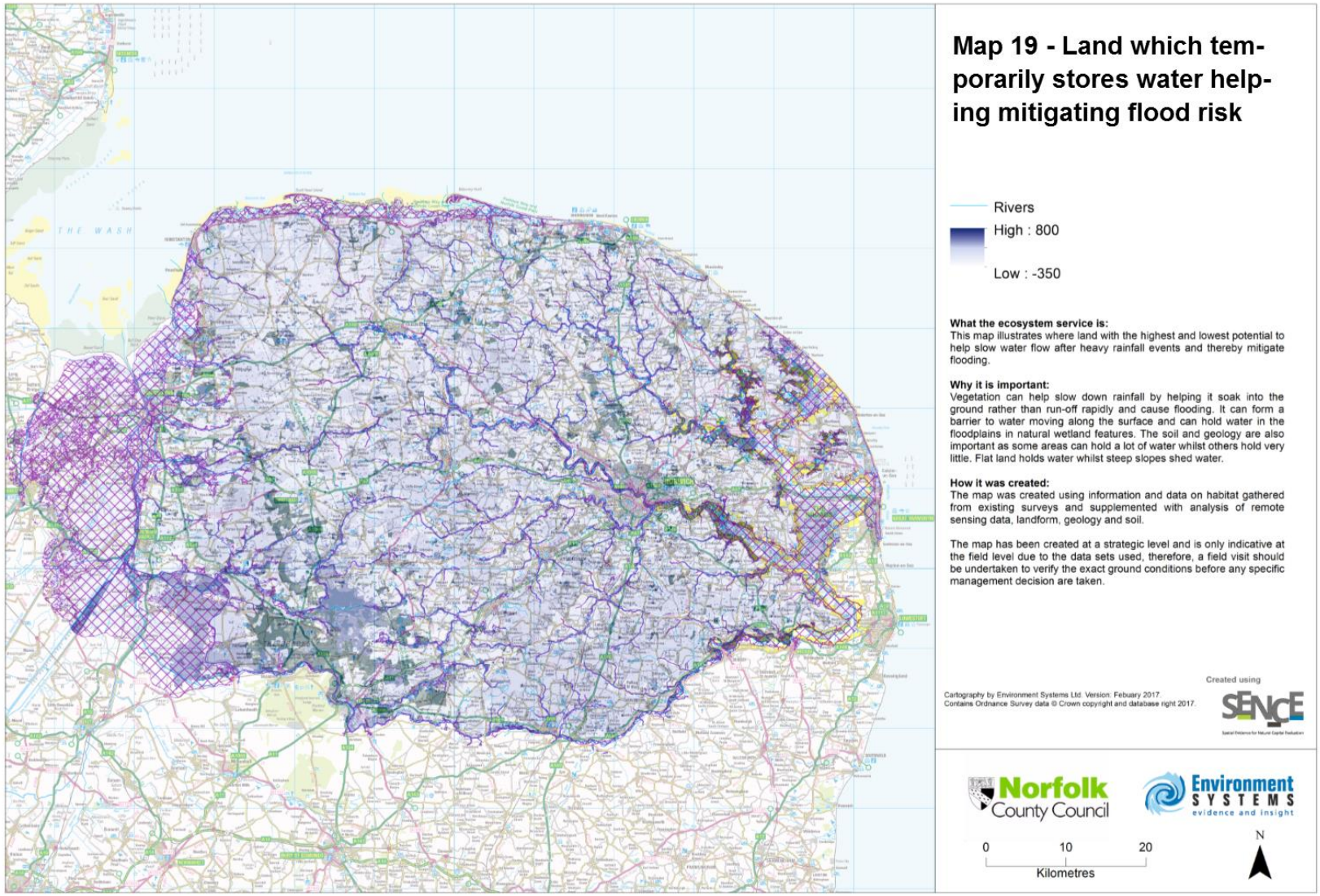
THE WASH
Map 19 - Land which temporarily stores water helping mitigating flood risk
Rivers
High : 800
Low : -350
What the ecosystem service is:
This map illustrates where land with the highest and lowest potential to help slow water flow after heavy rainfall events and thereby mitigate flooding.
Why it is important:
Vegetation can help slow down rainfall by helping it soak into the ground rather than run-off rapidly and cause flooding. It can form a barrier to water moving along the surface and can hold water in the floodplains in natural wetland features. The soil and geology are also important as some areas can hold a lot of water whilst others hold very little. Flat land holds water whilst steep slopes shed water.
How it was created:
The map was created using information and data on habitat gathered from existing surveys and supplemented with analysis of remote sensing data, landform, geology and soil.
The map has been created at a strategic level and is only indicative at the field level due to the data sets used, therefore, a field visit should be undertaken to verify the exact ground conditions before any specific management decision are taken.
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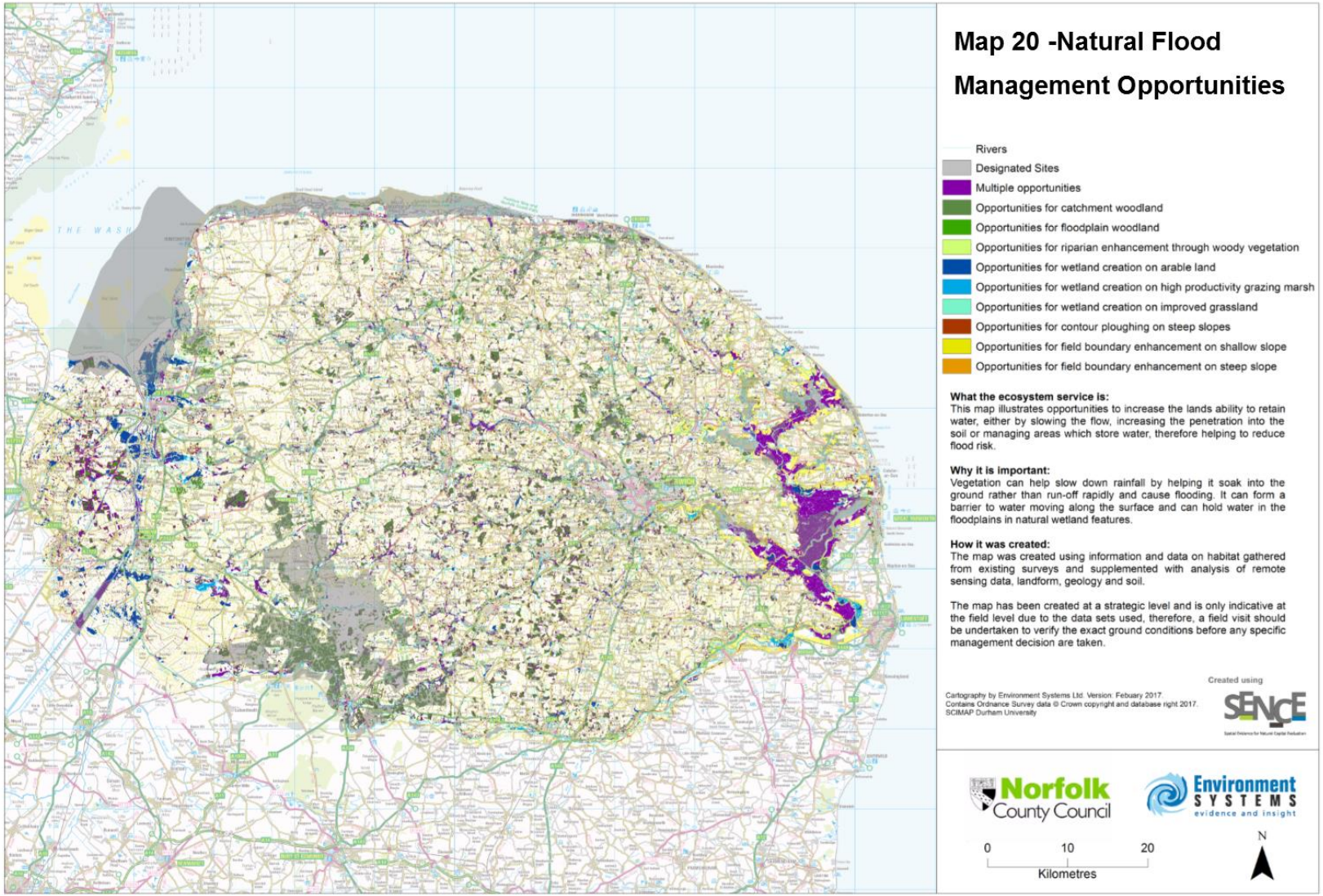
Map 20 -Natural Flood Management Opportunities
Rivers
Designated Sites
Multiple opportunities
Opportunities for catchment woodland
Opportunities for floodplain woodland
Opportunities for riparian enhancement through woody vegetation
Opportunities for wetland creation on arable land
Opportunities for wetland creation on high productivity grazing marsh
Opportunities for wetland creation on improved grassland
Opportunities for contour ploughing on steep slopes
Opportunities for field boundary enhancement on shallow slope
Opportunities for field boundary enhancement on steep slope
What the ecosystem service is:
This map illustrates opportunities to increase the lands ability to retain water, either by slowing the flow, increasing the penetration into the soil or managing areas which store water, therefore helping to reduce flood risk.
Why it is important:
Vegetation can help slow down rainfall by helping it soak into the ground rather than run-off rapidly and cause flooding. It can form a barrier to water moving along the surface and can hold water in the floodplains in natural wetland features.
How it was created:
The map was created using information and data on habitat gathered from existing surveys and supplemented with analysis of remote sensing data, landform, geology and soil.
The map has been created at a strategic level and is only indicative at the field level due to the data sets used, therefore, a field visit should be undertaken to verify the exact ground conditions before any specific management decision are taken.
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Appendix B: The Project Brief

Project Title	**Norfolk Green Infrastructure Mapping Project**
Project lead	Martin Horlock and David White, NCC Environment Team
Project commissioning group	NSF Group Trevor Wiggett to act as project sponsor for NSF
Project steering group	Phil Mileham (Breckland) (Chair), Alan Gomm (KLWNBC), Stuart Rickards (EA), Natalie Beale (BA), Emily Smith (GYBC), Martha Moore (NNDC); Lydia Tabron (Norwich City) (Meeting organiser and minutes).
The context of the work	This work will demonstrate compliance with the NPPF. NPPF requires that LPAs should • "….*set out a strategic approach in their Local Plans, planning positively for the creation, protection, enhancement and management of networks of biodiversity and green infrastructure…."* (Paragraph 114), • *"Should plan for biodiversity at a landscape-scale across local authority boundaries…*" and *"…identify and map components of the local ecological networks, including the hierarchy of international, national and locally designated sites…, wildlife corridors and stepping stones that connect them, and areas for habitat restoration or creation*" (paragraph 118), and • "*seek opportunities to provide better facilities for users* (of public rights of way)*, for example by adding links to existing rights of way network including national trails*" (Paragraph 75). This strategic cross-boundary work will also demonstrate the Duty to Cooperate required by the Localism Act (2011).
Aims	The aims of the project are • To make the 'connections' between GI and growth, providing LPAs with a deliverable approach to addressing Green Infrastructure matters to enable and support growth. • To map the Green Infrastructure Network of Norfolk, maximising the benefits it brings to the communities of Norfolk. • To identify deficiency in GI provision • To identify opportunities for enhancement

	Strategic GI planning will help address issues identified in the Habitat Regulation Assessments (Appropriate Assessments) of local plans, in particular with regards to accessible public open space and recreation. The work will complement the Study of Recreation Pressure on Natura 2000 sites (NCC/Footprint Ecology; 2016).

Objectives	• To identify and map GI on a county-wide basis, to include
	  ○ Formal and informal accessible green space
	  ○ Walking and cycling networks
	  ○ Ecological networks – the mapping will provide for a number of networks e.g. woodland, dry terrestrial, wetland etc.
	
	• To identify deficiencies in GI Provision, to include
	  ○ Settlements deficient in accessible green space (based on national standards tailored to local need)
	  ○ Settlements deficient in Public Rights of Way or isolated from access to the countryside
	  ○ Nature conservation sites where potential impacts from recreation could threaten the designated features
	  ○ Gaps in ecological networks
	  ○ Green infrastructure features threatened by current development
	  ○ Isolated habitat and habitat features
	
	• To identify opportunities for enhancements, to include
	  ○ New areas of publically-accessible open space;
	  ○ Links to National and County long-distance trails, including the expanding England Coast Path;
	  ○ New PRoW and/or links to existing Public Rights of Way (ensuring consistency with The Norfolk Countryside Access/Public Rights of Way Improvement plan (2014 – 19 and emerging re-iteration)
	  ○ Enhancements and adaptions of cycleways and Sustran routes;
	  ○ Buffering of sites for nature conservation;
	  ○ Increasing ecosystem services through GI provision e.g. surface water flooding mitigation/prevention.
	
	• To make the ‘connections’ between GI and growth, including
	  ○ Identifying and mapping local GI that has been or will be delivered through recently consented planning permissions; data needed from the district authorities.
	  ○ Identifying where GI is necessary to support already planned growth in existing local plans;
	  ○ Helping identify strategic growth locations and the requirements for GI to enable these locations to be delivered;

	○ Identifying where development has the potential to enhance ecological networks or countryside access; ○ Identifying if there are any areas where GI constraints may provide significant barriers to growth; ○ Identifying where existing GI requires adaptation for a change in need as a result of development.
Outputs:	**Elements of output:** • A map, or series of maps, showing existing GI provision throughout the county, including ○ Mapped accessible public open space and countryside access (formal and informal), ○ Mapped cycle networks ○ An ecological network map • A map showing settlements with an indication of their GI provision (adequate, deficient, or with capacity). The work will reflect the hierarchy of settlements and those with committed development and those where current understanding indicates growth in subsequent iterations of local plans. • Identification of primary and secondary Green Infrastructure Corridors throughout the county (the 'GI network'), following a similar methodology to that used in the Greater Norwich Green Infrastructure Strategy (2007). • A map, or maps, identifying GI gaps, deficiencies and opportunities, along with a prioritisation of opportunities (using ecological network modelling and the identified GI corridors). • A report, summarising methodologies used and highlighting issues, priorities and identifying future work requirements. The report will include details of a deliverable approach to addressing Green Infrastructure to enable and support growth. It is anticipated that the mapping will form the major body of the project, and the report will largely provide explanations of the process of producing the maps. It is expected that a draft report will be circulated to the steering group. Comments from the steering group will be considered and a final draft issued. • If the steering group feel it is appropriate, a presentation/talk to NSF or NSPG can be provided at a suitable agreed time.

Timeframe:	**The timeframe of the project is outlined below, although the steering group have requested that the deadlines 2 and 3 are brought forward by a month.** **1. By Jan 31st 2017:** NOW 28th FEB 2017 (as at 16th Jan 2017) • Accessible public open space and Countryside Access map (1st iteration) • Ecological Network Map (1st iteration) • A map showing settlements with an initial indication of their GI provision (1st iteration) **2. By July 30th 2017:** • Identification of primary and secondary Green Infrastructure Corridors throughout the county (the 'GI network'); (1st iteration). • Accessible public open space and Countryside Access map (2nd iteration) • Ecological Network Map (2nd iteration) • A map showing settlements with an initial indication of their GI provision (2nd iteration) **3. By Sept 30th 2017:** • A map, or maps, identifying GI gaps, deficiencies and opportunities, along with a prioritisation of opportunities (using ecological network modelling and the identified GI corridors). • A draft report, summarising methodologies used and highlighting issues, priorities and identifying future work requirements **4. By Dec 31st 2017:** • Final iterations of maps • Final Report

Costs:	• NCC mapping:
	  ○ 50% of Year-In-Industry-Student Post (at cost) = £5,000
	  ○ 20 days Senior Biodiversity Officer time (Martin Horlock) @ £300/day = £6,000
	  ○ 10 days Biodiversity Officer @ £300/day =£3,000
	• Cost of producing the ecological network map (Contractors: Environment Systems): £8,275 (Quote attached)
	• Cost of purchasing additional data sets (rainfall and soil data) = £3,200 (approx.).
	• NCC Green Infrastructure Officers' time (Dr David White, Ms Zoe Tebbutt) = no charge

	Expenditure: £25,475 • Less £5,000 contribution from Norfolk Wildlife Trust **Net Expenditure: £20,475**
Data/information sources:	• Natural England ANGST (Accessible Natural Green Space Standards) • The Countryside Access/Public Rights of Way Improvement Plan (2014 – 19); (note the emerging re-iteration may be called the 'Norfolk Access Improvement Plan'); • Norfolk Habitat Map generated by the MEOW ("Making Earth Observation Work") project (NBIS/Defra/Environment Systems; 2015); • Emerging Norfolk County Council's Cycling and Walking Strategy (2016); • The Norfolk Trails' Handbook (2016); • Study of Recreation Pressure on Natura 2000 sites (NCC/Footprint Ecology; 2016) and HRAs for existing and emerging local plans; • The Broads Plan, the Norfolk Coast AONB Management Plan (2014-19); • Existing GI studies and strategies, including Greater Norwich Green Infrastructure Strategy (GNGB, 2007), North-east Norwich Green Infrastructure Strategy (NCC/BDC; 2015), the North-East Norwich GI Delivery Plan (NCC, BDC; 2016), the emerging River Wensum Strategy (City, NCC et al; 2016), The Yare Valley GI study (NCC, 2015), The East Broadland GI Plan (NCC/BDC 2016), Kings Lynn GI Strategy, Dereham GI Strategy, Swaffham GI Study (2009); • Local GI that has been or will be delivered through recently consented planning permissions; (data will be needed from the district authorities). **Useful groups and other sources of information:** • The Norfolk Local Access Forum (a group required to be established under the CROW Act, 2000) and the Broads Local Access Forum • The Kings Lynn and West Norfolk HRAMMIC group (established as a requirement of their Local Plan examination to address issues relating to mitigating impacts from recreation on Internationally-designated sites in West Norfolk). • The Greater Norwich Green Infrastructure Group and the GI projects in the rolling 5year GNGB business plan. • Landscape-scale nature conservation initiatives, including Norfolk Wildlife Trust's Living Landscape Projects and the RSPB's Futurescapes projects.

	• Bug Life's *B-Line* project (a Norfolk Map has been produced in 2016, supporting the Government's *National Pollinator Strategy*, 2014, which sets out a 10 year plan to help pollinating insects survive and thrive across England.) • People counters at various recreation sites, including on Norfolk Trails network; • Access and Nature Conservation policies in Neighbourhood Development Plans; • Breckland Ecological Corridors Project (Brecks Biodiversity Delivery Group).