



# Hastings Borough Green and Blue Infrastructure and Biodiversity Net Gain Strategy

Hastings Borough Council

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## Acronyms

Acronym	Definition
ANGst	Access to Natural Green Space Standards
APGB	Aerial Photography for Great Britain
ASNW	Ancient Semi-Natural Woodland
BCT	Bat Conservation Trust
BNG	Biodiversity Net Gain
BOAs	Biodiversity Opportunity Areas
BUGS	Biodiversity in Urban Gardens
BwN	Building with Nature
CEH	Centre for Ecology and Hydrology
CIEEM	Chartered Institute of Ecology and Environmental Management
CIL	Community Infrastructure Levy
CIRIA	Construction Industry Research and Information Association
DEFRA	Department for Environment, Food and Rural Affairs
EBN	Environmental Benefits from Nature
EIA	Environmental Impact Assessment
ELMS	Environment Land Management Scheme
EU	European Union
ExGI	Excess Green Index
G7	Group of Seven
GBI	Green and Blue Infrastructure
GIS	Geographic Information System
GP	General Practitioner
HLS	Higher Level Stewardship
HPI	Habitats of Principal Importance
IEMA	Institute of Environmental Management and Assessment
ILP	Institute for Lighting Professionals
IPCC	Intergovernmental Panel on Climate Change
IRZs	Impact Risk Zones
IUCN	International Union of Conservation of Nature

<b>Acronym</b>	<b>Definition</b>
LGS	Local Geological Sites
LNR	Local Nature Reserve
LPAs	Local Planning Authorities
LWS	Local Wildlife Sites
MCZ	Marine Conservation Zone
NERC	Natural Environment and Rural Communities
NHS	National Health Service
NPPF	National Planning Policy Framework
NVC	National Vegetation Classification
OECD	Organisation for Economic Co-operation and Development
OMH	Open Mosaic Habitats
OS	Ordnance Survey
OSMM	Ordnance Survey Master Map
PSGA	Public Sector Geospatial Agreement
RGB	Red, Green and Blue Bands
SAC	Special Areas of Conservation
SLNP	Sussex Local Nature Partnership
SNCI	Site of Nature Conservation Interest
SNP	Surrey Nature Partnership
SPA	Special Protection Areas
SPI	Species of Principal Importance
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
UN	United Nations
WCA	Wildlife and Countryside Act

## 1 Non-technical summary

- 1.1.1 Hastings Borough Council (hereafter referred to as the Council) is preparing a new local plan. The draft new local plan will cover a 20-year period from 2019 to 2039. As part of the evidence base to inform the plan, the Council commissioned SWT Ecology Services to prepare a Green and Blue Infrastructure (GBI) and Biodiversity Net Gain strategy to maximise biodiversity across Hastings and deliver sustainable development. By using a strategy and landscape-scale approach, the Council will also ensure resources are allocated strategically.
- 1.1.2 The vision for this GBI and Biodiversity Net Gain Strategy is to:
- Protect, develop and enhance a network of multi-functional, highly connected green and blue infrastructure across Hastings Borough, designed to incorporate climate adaptation, is financially sustainable, benefits wildlife and Hastings Borough's diverse local community.*
- 1.1.3 GBI is defined as a “*network of multi-functional green and blue spaces and other natural features, urban and rural, which is capable of delivering a wide range of environmental, economic, health and well-being benefits for nature, climate, local and wider communities and prosperity* (Ministry of Housing, Communities and Local Government, 2021)”.
- 1.1.4 GBI provide us with multiple benefits, including enhance connectivity for wildlife and people; climate change resilience and mitigation, sustainable drainage and mental and physical health support for the local community.
- 1.1.5 Biodiversity Net Gain is an approach to development that leaves biodiversity in a better state than before. Through the Environment Act 2021, all developments will need to demonstrate a 10% biodiversity net gain, demonstrating:
- How impacts were avoided through careful project design
  - Minimised where these could not be avoided
  - Restoring habitats on site and as a last resort
  - Compensating for losses on or offsite
- 1.1.6 Developing a strategic approach to the delivery of Biodiversity Net Gain is critical for the Council in the Local Plan preparation to ensure funds are prioritised in areas where these can most benefit biodiversity (i.e., have the largest impact), and deliver GBI equitably across the borough.
- 1.1.7 Hastings comprises habitats within an urban landscape, with statutory and non-statutory designated sites forming a backbone across the centre of the borough. Whilst some connectivity is present, habitats are often isolated, which makes them more susceptible to impacts from development and climate change. Furthermore, south-western areas within the borough are deficient in open spaces, as evidenced in the Natural England Green Infrastructure Mapping Tool (Natural England, 2021). The Hastings Strategic Open and Play Space Assessment (Hastings Borough Council, 2020d) specifically identifies the need for the planning process to undertake site assessments of its open spaces assessing the quality of these and prioritise those that

fall below the threshold; promote environmental qualities through delivering appropriate management practices; manage the parks and open spaces to support communities in responding to the challenges of the Climate Emergency and maintain and enhance landscape character and nature conservation value of open spaces, whilst ensuring contemporary uses. Further information is provided in Appendix 6 with regards to this.

- 1.1.8 The habitats within Hastings support a range of common and widespread species, in addition to protected species and species of conservation concern. The strategy aims to promote movement of species across the landscape to ensure the common and widespread species do not become threatened, but also increase opportunities for species more susceptible to climate change and development impacts.
- 1.1.9 The GBI network was developed through creating a Circuitscape® model that incorporated baseline information on protected sites and habitats and identified barriers to species movement across the landscape. A specialised tool was then used to find the least-cost<sup>1</sup> pathway with the least amount of barriers. The GBI network was then established based on:
- Least-cost pathway analysis
  - Review of information from the Natural England GI tool to identify areas deficient in GI
  - A 50m buffer either side of the least-cost pathway and included statutory and non-statutory designated sites, and open space intersecting with the buffer. The GBI network is presented in Figure 5.
- 1.1.10 Key ecological threats and possible mitigation measures are detailed in Table 1 of the report, with climate change and unconstrained development posing the most significant threat to the GBI network. The threats were reviewed to develop objectives to deliver sustainable development across Hastings. These are presented in Chapter 6, and summarised as:
- Objective 1: protect, restore and enhance the GBI network
  - Objective 2: Create high-quality multi-functional GBI
  - Objective 3: Provide and encourage community growing spaces
  - Objective 4: Increase connectivity of green and blue infrastructure for people and wildlife
  - Objective 5: Maximise tree protection and encourage planting the right tree in the right location
  - Objective 6: Deliver an ambitious biodiversity net gain target
  - Objective 7: Minimise urban heating
  - Objective 8: Incorporate measures to enhance biodiversity opportunities across all developments.
  - Objective 9: Provide benefits to the community through inclusive designs for all users, irrespective of social group or abilities and promote health and well-being across the GBI network

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<sup>1</sup> GIS based method of determining the shortest route whilst minimizing fiscal cost

- Objective 10: Work with partners to build and secure funding, effective governance and stewardship for new and existing green and blue infrastructure to ensure their long-term sustainability
- 1.1.11 With respect to funding the restoration of the GBI network, the Council could consider reviewing its landholding and identify priority areas within the GBI network for habitat restoration. Funding generated from offsite offset contributions would then be strategically invested in these areas, increasing habitat resilience across the GBI network. The process would involve:
- Establishing baseline conditions
  - Identifying priority areas within the GBI network (habitats of poor and moderate condition should be favoured)
  - Develop management plans and strategies to deliver biodiversity net gain within these
  - Calculate the cost of securing and managing these sites for a period of 30 years
  - Liaise with applicant and offer suitable offsite compensation within GBI network.
- 1.1.12 Chapter 7 presents policy recommendations, along with considerations as to how the objectives can be met. These can be summarised into three key elements:
- **Build landscape connectivity and improve habitat resilience** through the protection, enhancement and creation of GBI; improving habitat connectivity within developments and across the GBI network, ensuring designs deliver accessibility and active travel; deliver a 20% biodiversity net gain, maximising tree protection and develop a Supplementary Planning Document that includes quality standards for GBI
  - **Integrate water management systems** to include nature-based solutions to flood management, protecting and enhancing existing watercourses and waterbodies and integrate SUDS to reduce water run-off and store water
  - **Plan for future growth** by ensuring equitable access to green spaces across the borough, specifically in western areas where this is deficient, require delivery of offsite offset compensations within the GBI network, support the use of land and buildings as new community growing spaces, include the temporary use of vacant or derelict land for community growing spaces, developments should contribute to urban greening and reduce urban heating and secure provisions of the future management and maintenance of habitats within the GBI network via planning obligations, where appropriate
- 1.1.13 A glossary of terms is provided in Appendix 1.

## 2 Introduction

### 2.1 Background

2.1.1 Hastings Borough Council is preparing a new local plan. The draft new local plan will cover a 20-year period from 2019 to 2039. As part of the evidence base to inform the plan, the Council commissioned SWT Ecology Services to prepare a Green and Blue Infrastructure (GBI) and Biodiversity Net Gain strategy to maximise biodiversity across Hastings and deliver sustainable development. By using a strategy and landscape-scale approach, the Council will also ensure resources are allocated strategically and areas prioritised for biodiversity where this will deliver the highest biodiversity gains within the local context.

### Vision

2.1.2 The vision for this GBI and Biodiversity Net Gain Strategy is to:

*Protect, develop and enhance a network of multi-functional, highly connected green and blue infrastructure across Hastings Borough, designed to incorporate climate adaptation, is financially sustainable, benefits wildlife and Hastings Borough's diverse local community.*

### Aims

2.1.3 The GBI and Biodiversity Net Gain strategy aims are to:

- Identify a robust GBI network across Hastings that reflects current GBI assets, and key priorities to increase their resilience
- Develop policy objectives that can be incorporated into the local plan, along with recommendations for local plan policy considerations

### 2.2 What is Green and Blue Infrastructure?

2.2.1 GBI is defined as a “*network of multi-functional green and blue spaces and other natural features, urban and rural, which is capable of delivering a wide range of environmental, economic, health and well-being benefits for nature, climate, local and wider communities and prosperity* (Ministry of Housing, Communities and Local Government, 2021)”.

2.2.2 GBI is not simply an alternative description for conventional open space. As well as natural habitats, parks, open spaces, playing fields and woodlands, it also includes street trees, allotments, private gardens, green roofs and walls, sustainable drainage systems (SUDs) and soils, along with blue infrastructure that include coastal habitats, rivers, streams, canals and other water bodies.

2.2.3 GBI provide us with multiple benefits (referred to as ecosystem services), including:

- Enhanced connectivity for wildlife and people
- Climate change resilience and mitigation
- Sustainable drainage
- Support for people’s mental and physical health

2.2.4 Further information on these is provided below.

## **Connectivity**

- 2.2.5 Connectivity can be defined as corridors that allow species and genes to move across the landscape, and ecological processes to function uncompromised (United Nations Environment Programme, 2019). This facilitates climate adaptation at a landscape (or ecosystem) scale. Generalist species adapt readily to their surroundings, whilst specialists require very specific habitat conditions to facilitate movement across the landscape. Therefore, delivering good connectivity requires a mosaic of habitats that can be used by both generalist and specialist species, with wide-ranging comparative mobility.
- 2.2.6 Connectivity does not have to be continuous, but can include 'stepping-stones' habitats, that reduce extensive areas of built-up areas without opportunities for wildlife (Lawton, 2010).

## **Climate change resilience and mitigation**

- 2.2.7 Tackling climate change is a key priority for the Council who declared a climate emergency in February 2019. The Climate Emergency Strategy and Action Plan includes a vision to make Hastings carbon neutral by 2030 (Hastings Borough Council, 2020). The strategy was updated in 2022, placing a greater importance on climate change adaptation and the role of the natural environment to achieve this. GBI can help to both mitigate the impacts as well increase resilience to change. Furthermore, GBI can make a significant contribution to this through following:
- Contributions to carbon sequestration,
  - Greenways for active and low carbon travel
  - Reducing the heat island effect

## **Water Management**

- 2.2.8 The likelihood of more intense periods of rainfall during the summer months in the UK, and a wetter winter season, may have effects on water quality in Hastings. Increased surface water run off can cause erosion, sewer overflow, carry various pollutants into watercourses and result in increased sedimentation.
- 2.2.9 Blue infrastructure comprises swales and wetlands that provide excellent opportunities for flood management and biodiversity enhancement. Developed in areas of damp or standing water where soil and ground water conditions allow, swales (shallow, broad and vegetated channel), and wetlands can be used to store and/or convey run-off and remove pollutants. These are a form of nature-based solutions (i.e. using natural system to solve an engineering problem). Swales can be used as conveyance structures to pass the run-off into the next stage of treatment and can be managed to intercept rainfall and surface water run-off, incorporating vegetation and trees. Plant root systems can promote infiltration and water storage in the soil as well as reducing sedimentation. They are particularly good at reducing run-off rates and volumes and remove urban pollutants. Swales can also be easily incorporated into the landscape.
- 2.2.10 As well as natural flood management and pollution control, blue infrastructure can also be used to provide aquatic habitats and blue-green corridors for walking, cycling and contribute to habitat connectivity.

## Health and Wellbeing

2.2.11 The GBI network can create space for communities to play, rest and recuperate ‘on their doorstep’.

2.2.12 There is a growing body of evidence that GBI is key to maintaining and improving the health and wellbeing of communities. A higher likelihood and rate of physical activity has been linked to better quality natural environments (Natural England, 2016). The Fields in Trust organisation estimate the wellbeing value of local parks and green space for the adult population of the UK to be £34.2 billion per year, saving the National Health Service around £111 million per year (Fields in Trust, 2018).

## 2.3 What is Biodiversity Net Gain?

2.3.1 Biodiversity net gain is an approach to development that leaves biodiversity in a better state than before (CIEEM, CIRIA, IEMA, 2019). The Environment Act 2021 is the UK Government’s key piece of environmental legislation post-Brexit. The Environment Act 2021 will require new development to deliver a minimum 10% biodiversity net gain. Provisions for the act will be made through secondary legislation and at the time of writing, these were undergoing a consultation process.

2.3.2 Biodiversity net gain is assessed using a metric developed by the Department of Food, Environment, Rural Communities and Agriculture (DEFRA) which uses habitats as a proxy for biodiversity (Panks, et al., 2022b). The assumption is that habitats in good condition provide more opportunities for biodiversity. Guidance has been developed in the assessment and delivery of Biodiversity Net Gain with the key principles being to implement the mitigation hierarchy throughout a project life cycle that includes:

- Avoiding impacts where possible through careful project design.
- Minimising impacts where these cannot be avoided.
- Restoring habitats that are retained or could be impacted by the development.
- **As a last resort**, compensating for the loss of or damage to habitats, which can either be compensated for onsite, or offset where this cannot be delivered onsite.

2.3.3 Developing a strategic approach to the delivery of Biodiversity Net Gain is critical for the Council in the Local Plan preparation to ensure funds are prioritised in areas where these can most benefit biodiversity (i.e., have the largest impact), and deliver GBI equitably across the borough.

## 2.4 Consultation

2.4.1 This GBI and Biodiversity Net Gain Strategy has been developed using a collaborative approach across a number of stakeholders, and review of existing information. Two stakeholder meetings were held (28<sup>th</sup> January 2022 and 19<sup>th</sup> May 2022). Appendix 2 presents the list of attendees and outcomes of the stakeholder engagement meetings, and responses to queries raised.

## 3 Legislative and planning policy context

3.1.1 Relevant planning policy and legislation is presented in Appendix 5. In the preparation of this study, relevant legislation and planning policy was reviewed and recommendations made in line with these.

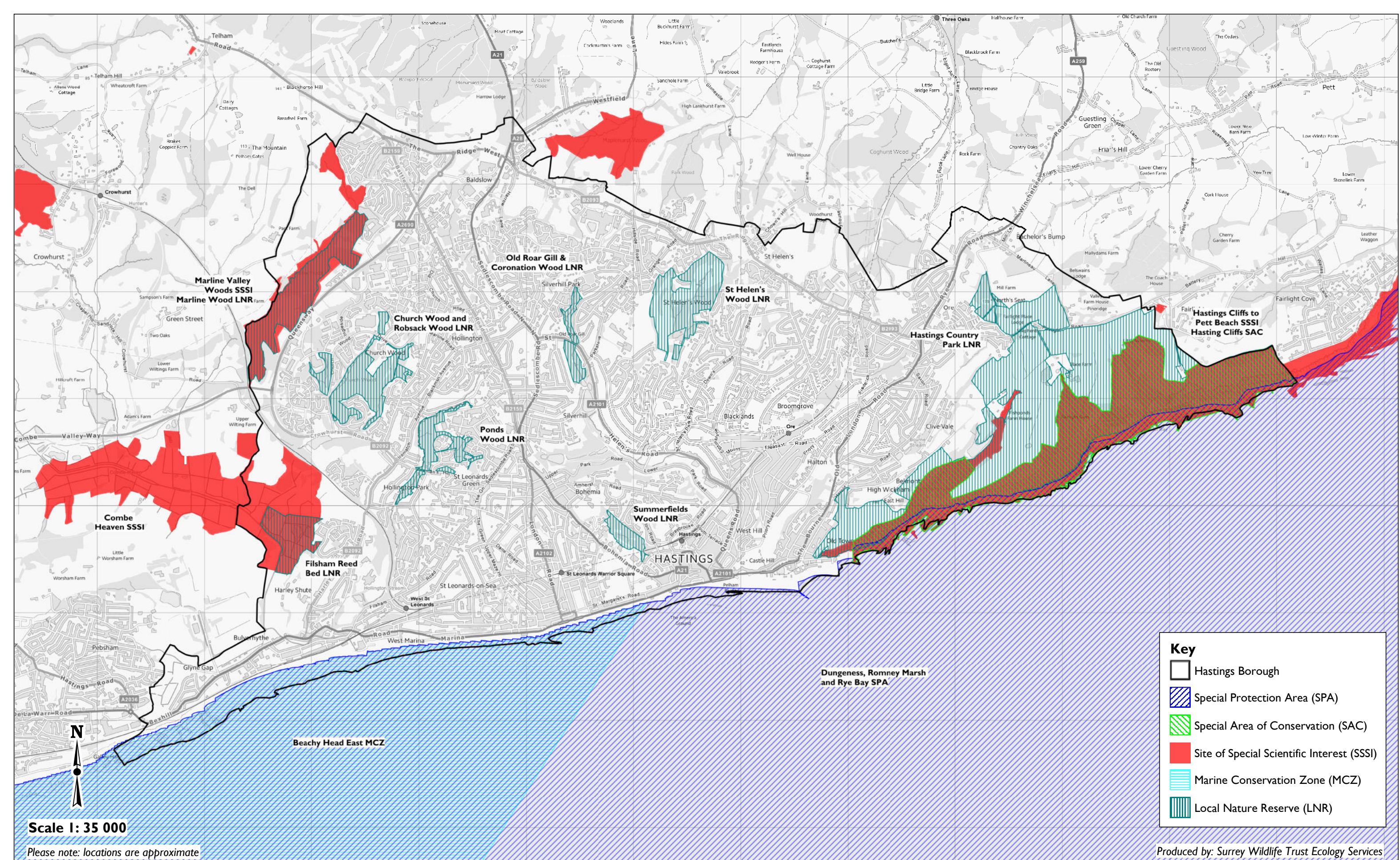
## **4 The GBI Network**

### **4.1 Existing GBI assets**

- 4.1.1 The existing GBI assets comprise a network of habitats across an urban landscape, with statutory (protected by law) and non-statutory (protected through local policies) designated sites forming the backbone of the network.
- 4.1.2 Understanding the current GBI assets is critical in the formation of a network. A desk-based exercise, combined with a site visit to ground-truth the outcomes of the desk study was undertaken between December 2021 and February 2022 to identify the current GBI assets across Hastings. The outcomes of the assessment are detailed below.

#### **Designated sites**

- 4.1.3 Fourteen statutory designated sites were recorded within Hastings, including one Special Protection Areas (SPA), one Special Areas of Conservation (SAC), three Sites of Special Scientific Interest (SSSI), eight of Local Nature Reserves (LNR) and one Marine Conservation Zone (MCZ).
- 4.1.4 Thirty non-statutory designated sites, comprising three Local Geological Sites (LGS) and 25 Local Wildlife Sites (LWS) are present in Hastings.
- 4.1.5 Figure 1 presents the location of the statutory designated sites within Hastings and Figure 2 presents the location of non-statutory designated sites, including country parks and Biodiversity Opportunity Areas. Descriptions of these sites and areas are provided in Appendix 3.

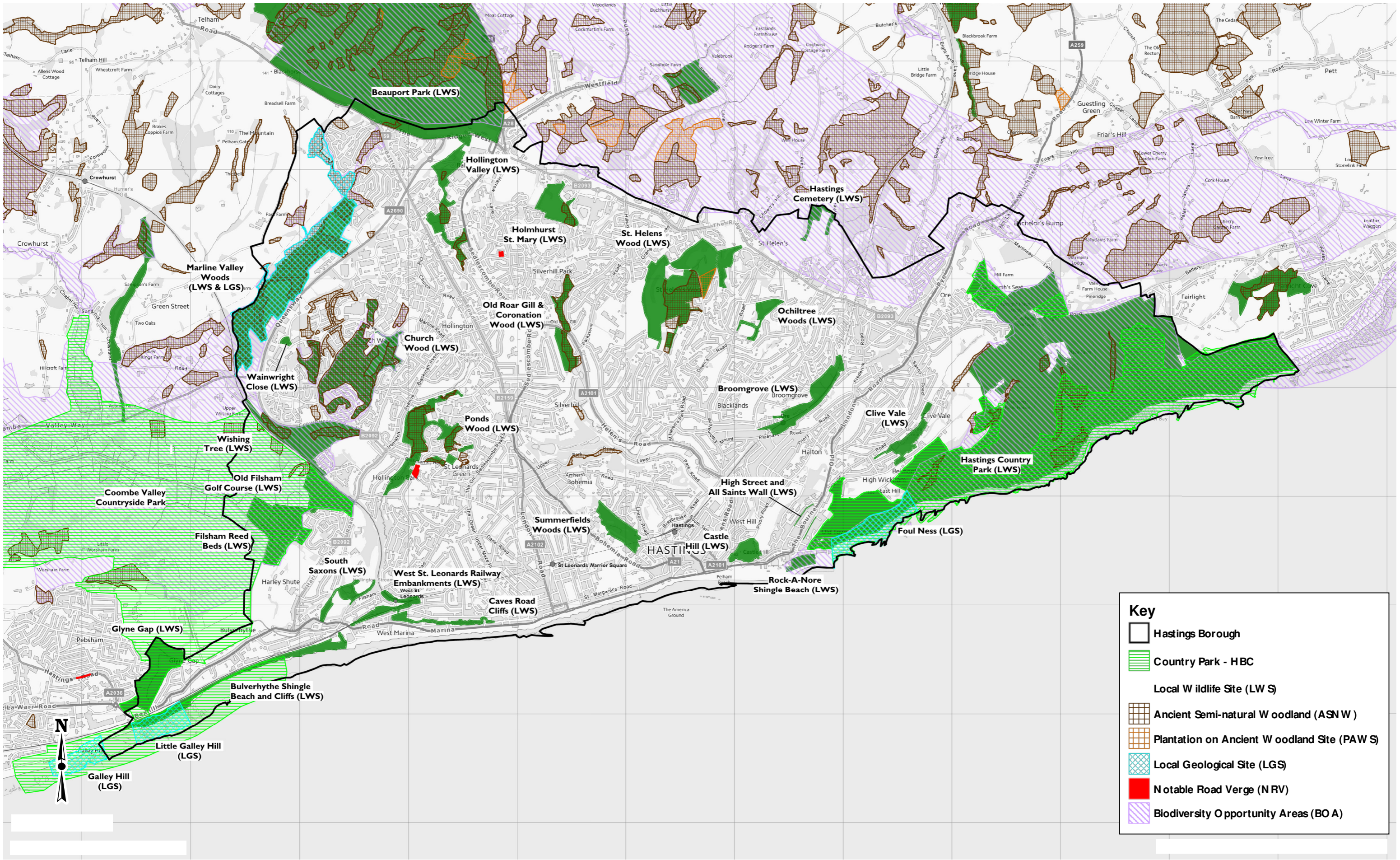


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4420-1, March 2022

**Figure 1: Hastings Borough Council Statutory Designated Sites for Nature Conservation**





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Figure 2: Hastings Borough Council Non-Statutory Designated Sites for Nature Conservation



Surrey Wildlife Trust Ecology Services

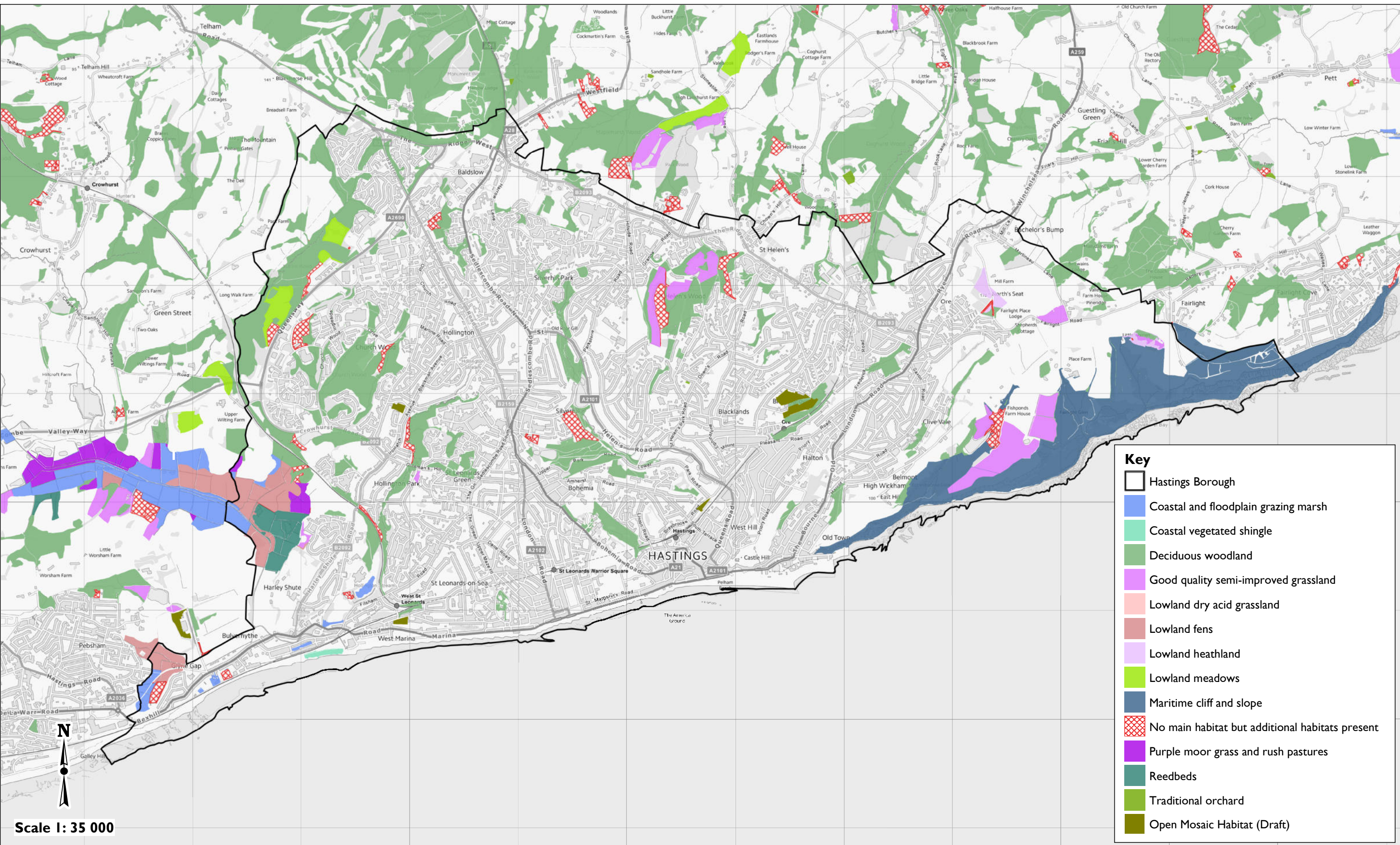
## Habitats

4.1.6 Hastings is an urban environment, supporting multiple habitat types typical of urban environments, along with several Habitats of Principle Importance (HPI), as defined under the Natural Environment and Rural Communities (NERC) Act 2006. Habitats are generally common and widespread, however where these HPI occur, they add significant biodiversity value, and provide multiple ecosystem services, and also represent nationally rare and important habitats that are critical for wildlife in an urban environment. The location of the HPI (as mapped by Natural England) is provided in Figure 3. Additional information on the HPI is provided in the Habitat Action Plan (Hastings Borough Council, 2007).

4.1.7 Habitats within Hastings include:

- Urban:
  - Buildings
  - Infrastructure (roads and rail)
  - Open space (as defined by OS MasterMap) such as parks, allotments, amenity spaces, recreational grounds etc (full list detailed in Table 6 in Appendix 6)
- Coastal:
  - Amenity shingle beach (with sandy intertidal zone)
  - Coastal and floodplain grazing marsh (HPI)
  - Coastal vegetated shingle
- Woodland:
  - Deciduous woodland, including lowland beech and yew woodland (HPI) and ancient semi-natural woodland
  - Other woodland habitat
  - Lowland wood pasture and Parkland (HPI)
  - Wet woods (HPI)
- Grassland:
  - Amenity grassland
  - Semi-improved grassland
  - Lowland meadow (HPI) a
  - Other grassland habitats
- Wetland
  - Lowland fens (HPI)
  - Purple moor grass and rush pastures
  - Reedbeds (HPI)
- Heathland
  - Lowland heathland (HPI)
- Marine:
  - Coastline
  - Maritime cliff and slope (HPI)
- Aquatic
  - Standing water
  - Running water

- Agricultural
    - Cereal field margins (HPI)
- 4.1.8 Further information on these habitats detailed in Appendix 4.
- 4.1.9 In addition to the above HPI Natural England has recorded possible Open Mosaic Habitats (OMH) on Previously Developed Land HPI within Hastings (Natural England, 2020). This is a draft register which used desk-based mapping to allocate HPI boundaries across England, and as such, there is lower confidence in these allocations. Where this is recorded, an NVC survey would be required to confirm if the HPI is present. Based on previous land use, and the date at which many of these sites became unused, it is highly likely that this habitat exists within Hastings.



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4420-1, October 2022

**Figure 3: Hastings Borough Council Priority Habitat Inventory (including Open Habitat Mosaic Draft Inventory)**



## Species

4.1.10 Hastings supports a suite of common and protected species. The protection afforded to some of these species can pose a constraint to development. However, it is critical to ensure the populations of common and widespread species are maintained to ensure they do not become threatened within Hastings, and for habitats within Hastings to be protected and enhanced to prevent threats to rare and notable species.

## Fauna

### *Invertebrates*

4.1.11 The data search returned records of 538 invertebrate species within the 1 km search area. Hastings supports suitable habitat for invertebrates, such as standing open water, river, ditch, grassland, scrub, line of trees, scattered trees, woodland. Records of several species listed under Schedule 5 of Wildlife and Countryside Act 1981, as amended, were returned as results of the desk study. These included the stag beetle and Roman snail as well as various butterflies including white-letter hairstreak, Adonis blue, chalk hill blue, swallowtail, large tortoiseshell, pearl-bordered fritillary and small blue. Records of grayling, a nationally rare butterfly listed under Schedule 4 of the Conservation of Habitats and Species Regulations 2017, as amended, was also returned.

4.1.12 In reviewing species records, Hymenoptera (bees and ants for example) seem mainly restricted to gill lines although there are more recent records in some of the urban areas. Only one record of stag beetle was returned as part of the desk study, in Hollington, however this may reflect under-recording. Furthermore, St Leonards and Hollington hold very few records of invertebrates, contrary to other surrounding areas.

### *Amphibians*

4.1.13 The data search returned records of great crested newt, palmate newt, smooth newt, common frog and common toad within the 1 km search area. Great crested newt and common toad are Species of Principal Importance (SPIs).

4.1.14 Hastings supports aquatic and terrestrial habitat suitable for great crested newt, as confirmed by existing populations. Although Alexandra Park supports numerous waterbodies, no records of great crested newt were returned as part of the desk study. It is possible that this is due to the urban nature of Hastings and a fragmented landscape.

4.1.15 Records of other amphibians, such as common toads, occur within areas already designated (statutory and non-statutory).

### *Reptiles*

4.1.16 The data search returned records of common lizard, adder, slow worm, grass snake smooth snake and sand lizard within the 1 km search area. All UK reptile species are SPI. The borough supports multiple habitats suitability for reptiles.

4.1.17 Due to the nature of the parks and recreational areas, supporting rare reptiles is considered unlikely in Hastings. Smooth snake and sand lizard were once present in

Hollington Park but are no longer present due to habitat loss. Last known records of these species were in 1901. Hastings Country Park supports adder.

- 4.1.18 Common lizard, slow-worm and grass snake all tend to be found in the same habitats and have similar distributions across the borough. These are clustered either in the east or west areas, where it is more rural, but there are urban and suburban records to. This includes records in areas which are now being developed. Generally, the habitat for reptiles is fragmented, however opportunities exist to restore some of the habitats, whilst delivering the recreational objectives of these areas.

### **Birds**

- 4.1.19 The data search returned records of 207 bird species, including 79 that are listed as Schedule 1 species under the Wildlife and Countryside Act 1981, as amended. The survey area supports suitable breeding bird habitat within woodland, scattered trees, dense scrub, scattered scrub, bracken, introduced shrub, longer grassland, buildings, standing open water, river and coastal habitats. Several birds of Conservation Concern included in the Red list were recorded within the project area e.g. purple sandpiper, common goldeneye, yellowhammer, puffin, hen harrier, common swift, skylark, aquatic warbler, marsh warbler and many more.
- 4.1.20 Within urban areas passerines are well-distributed throughout the borough.

### **Mammals**

#### **Badger**

- 4.1.21 The desk study does not include badger records and the local Badger Group (Badger Trust Sussex) was not consulted as part of the desk study. It is understood that Hastings supports an important badger population across the urban environment. Evidence of badger activity was recorded during the surveys.

#### **Bats**

- 4.1.22 Records of nine species of bat and records of four genera were returned as part of the desk study. Noctule, soprano pipistrelle and brown long-eared bat are all SPIs.
- 4.1.23 Hastings supports diverse habitats suitable for bats. Waterbodies provide an ideal foraging environment for the species and the presence of SSSIs and LNRs in the outskirts as well as Alexandra Park gill within Hastings urban area provides good connectivity in the landscape and a good suitability for roosting, foraging and commuting bats. Roosting opportunities exist within trees and buildings, as well as railway tunnels.
- 4.1.24 The distribution of bat records reflects this habitat diversity and species records are dominated by common pipistrelle and Nathusius' pipistrelle. Brown long-eared records are mainly within the outskirts, and several occur within the Bannatyne grounds. Silverhill appears to be important for *Myotis* species (e.g. Daubenton's, Natterer's etc).

#### **Hazel dormouse**

- 4.1.25 Hastings supports suitable hazel dormouse habitat in the form of woodland, scrub and hedgerows. Historical records of hazel dormouse were returned as part of the desk study.

- 4.1.26 Hazel dormouse is a SPI.
- 4.1.27 The most recent records of hazel dormouse within Hastings are in Church Wood and Robsack Wood LNR (records date from 2016). A second record from 2019 falls just to the west of the borough boundary, around Upper Wilting Farm.
- 4.1.28 The species is not considered very common in the borough. Previous records include St. Helen's Wood LNR (1910); Church Wood and Robsack Wood LNR (2010), Wishing Tree LWS (2016). Four records are within or adjacent to Wishing Tree LWS. These are situated either side of the railway embankment.
- 4.1.29 Most of the western records fall within the Marline Valley Woods SSSI and Marline Wood LNR (and bounding woodland) and date from 2015.
- 4.1.30 Hazel dormouse records to the east are associated with woodland around Hastings Country Park.
- 4.1.31 Further north, there are two records in the Mallydams Wood area (within Rother) which lies next to Fairlight Hall – 2005 and 2006, and there are probably many more under-recorded here due to the rural nature of the wood and its lack of development.
- 4.1.32 Overall, the borough does not appear to readily support this species in its interior, despite the significant woodland coverage. This may be due to the fragmented nature of the woodland in the borough – while a lot of the gills converge, due to urban centres having been constructed over time a lot of this convergence is carried out through underground pipework and so this does not connect the woodland areas up. It could be possible that due to a lack of development within woodland in Hastings, this species has not been frequently encountered and so is under-recorded. It may be a combination of the two.

#### *Otter*

- 4.1.33 The survey area supports suitable otter habitat in the form of river. Otter is a SPI. No historical records of otter were returned as part of the desk study. The most recent mammal distribution study suggests that otter is unlikely to occur within Hastings, or from Eastbourne to most of Kent (Mathews, et al., 2018).

#### *Water vole*

- 4.1.34 The survey area supports suitable water vole habitat in the form of river, stream. Water vole is a SPI. Historical records of water vole were returned as part of the desk study.
- 4.1.35 There are only a handful of records within and adjacent to the borough. One was recorded in St Helen's Wood in 1997. More recent records just outside of Filsham, along Combe Haven in 2007.
- 4.1.36 Based on the data search although habitat does occur the species appears to be absent from the borough. However, with gills being extremely important to Hasting's character, and with these being unlikely to be developed, and with the presence of the Coombe Haven running through west of the borough, there is opportunity for this species to make a return.

### *Other mammals*

- 4.1.37 Historical records of hedgehog, polecat, common porpoise, harvest mouse, brown hare and red squirrel were returned with the desk study. Suitable habitat does occur within Hastings for these species. In addition, records of harbour seal, bottle-nosed dolphin returned within the data search results.
- 4.1.38 Hedgehog, brown hare, mountain hare, pine marten, harvest mouse, polecat, common seal, and red squirrel are all SPIs.
- 4.1.39 Harvest mouse is present in the west of the borough, restricted apparently to Filsham Reed Beds and Glyne Gap, with records being recent. Whilst these locations are close to each other, but there is limited connectivity considering the presence of Hastings Household Waste Recycling Site and Bulverhythe Recreation Ground. It's possible that this species is under recorded as it is small and cryptic.
- 4.1.40 There are relatively few hedgehog records. These are concentrated mainly north borough, but there are a handful south of the railway line. The railway appears to be a big obstacle to migration, but also appears to offer good habitat. Note that this species is probably under-recorded as people tend to view it as a 'common' species despite this not being the case. The urban records within the town centre are moderately recent (2005) which does not pre-date this area being built up, and there are more recent records from 2015 and 2017 within the northern suburb section of the town. There is also a single 2012 record in St Leonards.
- 4.1.41 Otherwise, suburban records mainly focus around Silverhill and Hollington. There is a notable absence around St Helen's Wood.

### *Fish*

- 4.1.42 Three fish species returned as part of the desk study and suitable habitat is present within the project site area. These are most likely unrecorded however European eel records within Alexandra Park from 2001 occur. Eel is also present within Hastings Country Park and Combe Haven.

### **Flora**

- 4.1.43 Nineteen bryophytes, fifteen fungi, 40 lichen and one algae species returned as part of the desk study. Records of 154 vascular plants returned as part of the desk study.
- 4.1.44 Fifty-five species listed under Schedule 9 of the Wildlife and Countryside Act 1981 (non-native and invasive) returned as part of the desk study.
- 4.1.45 Considering the specialised nature of lower plant identification it is likely that these are under recorded. Several rare or protected species were returned as part of the desk study including bearded tooth (Schedule 8, Wildlife and Countryside Act 1981, as amended), within the Old Roar Gill. Church Wood was also found to support fungi of conservation interest.
- 4.1.46 Castle Hill supports Royal Fern, which is rare in Sussex. Other rare ferns occur within the Marline Valley Area, as well as Hastings Country Park.
- 4.1.47 Bluebell, species listed on Schedule 8 of the Wildlife and Countryside Act 1981, as amended, is well distributed within the woodlands.

4.1.48 The shingle habitats within the LWS also support coastal species of conservation interest.

## 4.2 Developing the GBI network

4.2.1 The GBI network was developed through a series of stages, detailed in Plate 1. A full methodology is presented in Appendix 6.

4.2.2 In summary, the GBI network was established by reviewing baseline information (protected sites, habitats, species and threats) and assigning resistance values to habitat layers and open space layers to represent barriers to the movement of species across the landscape. The model output is presented in Figure 4 and shows resistance values across Hastings. The spectrum ranges from high resistance (i.e. a high number of barriers to species movements) in the reds, and lower resistance in the greens.

4.2.3 Using a specialised mapping tool that analyses the resistance across the landscape, it was possible to identify the least-cost pathways, where barriers across the landscape are lowest and movement opportunities for species are highest. The least-cost pathway is presented in Figure 4.

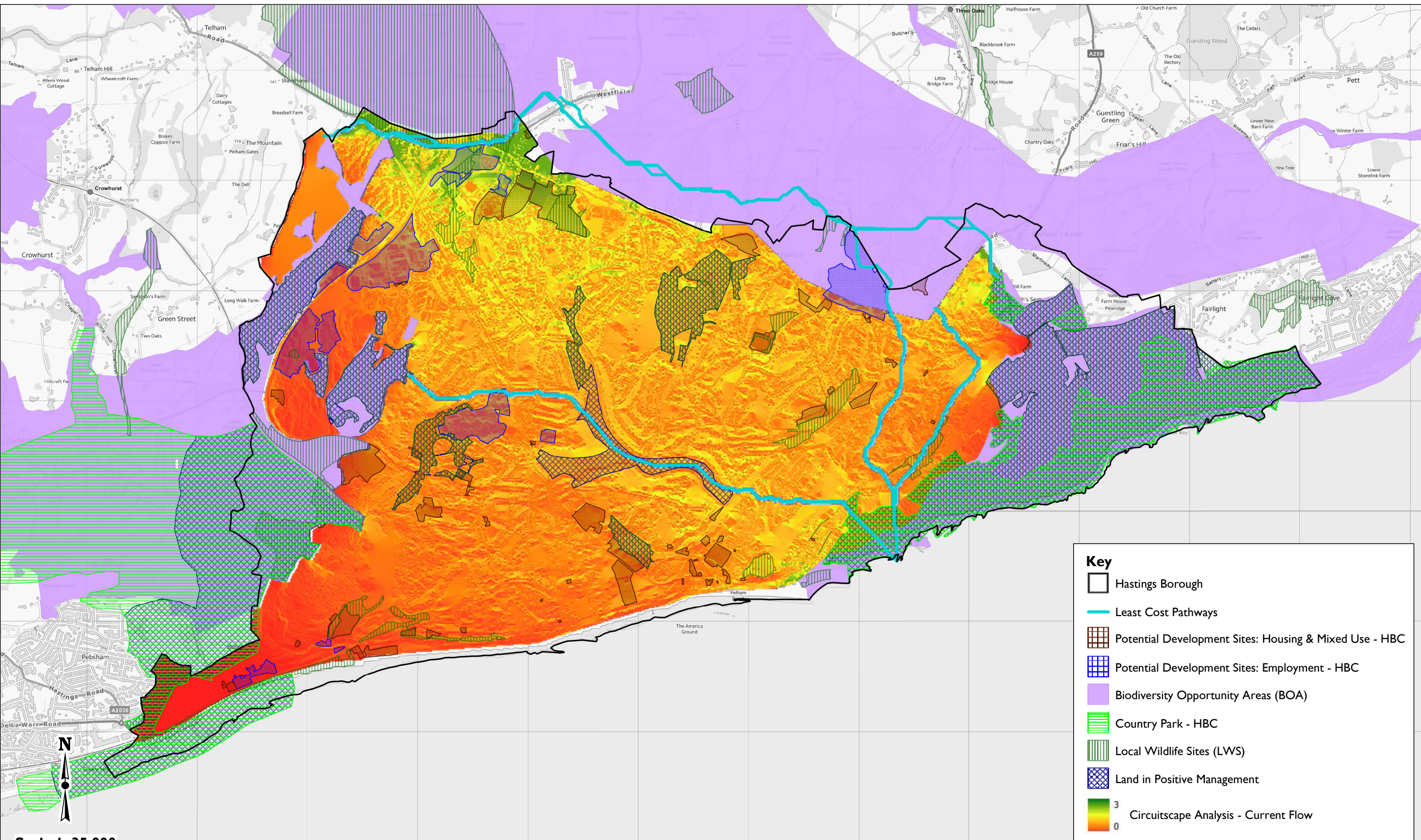
**Plate 1: Circuitscape® Model summary**

Stage	Activity		
1. Establish model baseline	Species	Habitats (including quality and diversity)	Threats
2. Identify barrier to movement of species (landscape permeability)	Identify features in the landscape that would prevent a species from moving across it (e.g. extensive urban areas, roads, lighting etc)		
3. Identify least-cost pathway	Use the information generated by the model to identify optimal route for a species to move across the landscape		
4. Determine GBI network	Establish the network based on: <ul style="list-style-type: none"> <li>• Least-cost pathway analysis</li> <li>• Review information from Natural England GI mapping tool specifically in relation to areas deficient in GBI across Hastings Borough</li> <li>• Form 50m buffer either side of least-cost pathway and include designated and non-designated sites, ancient woodland, open spaces intersecting with buffer</li> </ul>		

4.2.4 In December 2021, Natural England published their green infrastructure mapping tool that details (Natural England, 2021):

- Green and blue infrastructure assets across England
- Access to Natural Green Space Standards (ANGSt)
- Linear access network
- Designated and defined areas
- Access to Nature Close2Home
- Accessible Natural Greenspace Inequalities

- Socio-economic statistics
- 4.2.5 Given the least-cost pathway was predominately located in the east of the borough, and the GI tool developed by Natural England (Natural England, 2021) indicated areas to the south west experienced the highest deficiency in access to green space, environmental issues (e.g. flooding and coastal erosion, and association with poor health, mental health and areas requiring economic development) it was deemed important to connect the habitats to the west, creating a connectivity throughout these. The railway line was identified as a good route within these areas as where overground it provided a continuous line of connectivity throughout approximately the centre of areas of low permeability, and where underground several parks could provide the key stepping-stones that species require to move across the landscape.
  - 4.2.6 A 50m buffer was then established either side of the least-cost pathway and railway line and the GBI network was established by overlaying the buffer to the existing GBI assets and including all of those that intersected with the buffer, along with all statutory and non-statutory designated sites. Where statutory and non-statutory designated sites did not intersect with the buffer, these were included in the network as stepping-stones within the GBI network.
  - 4.2.7 The GBI network is presented in Figure 5 and covers 1,475 ha.



**Scale 1: 35 000**  
 Please note: locations are approximate

**Key**

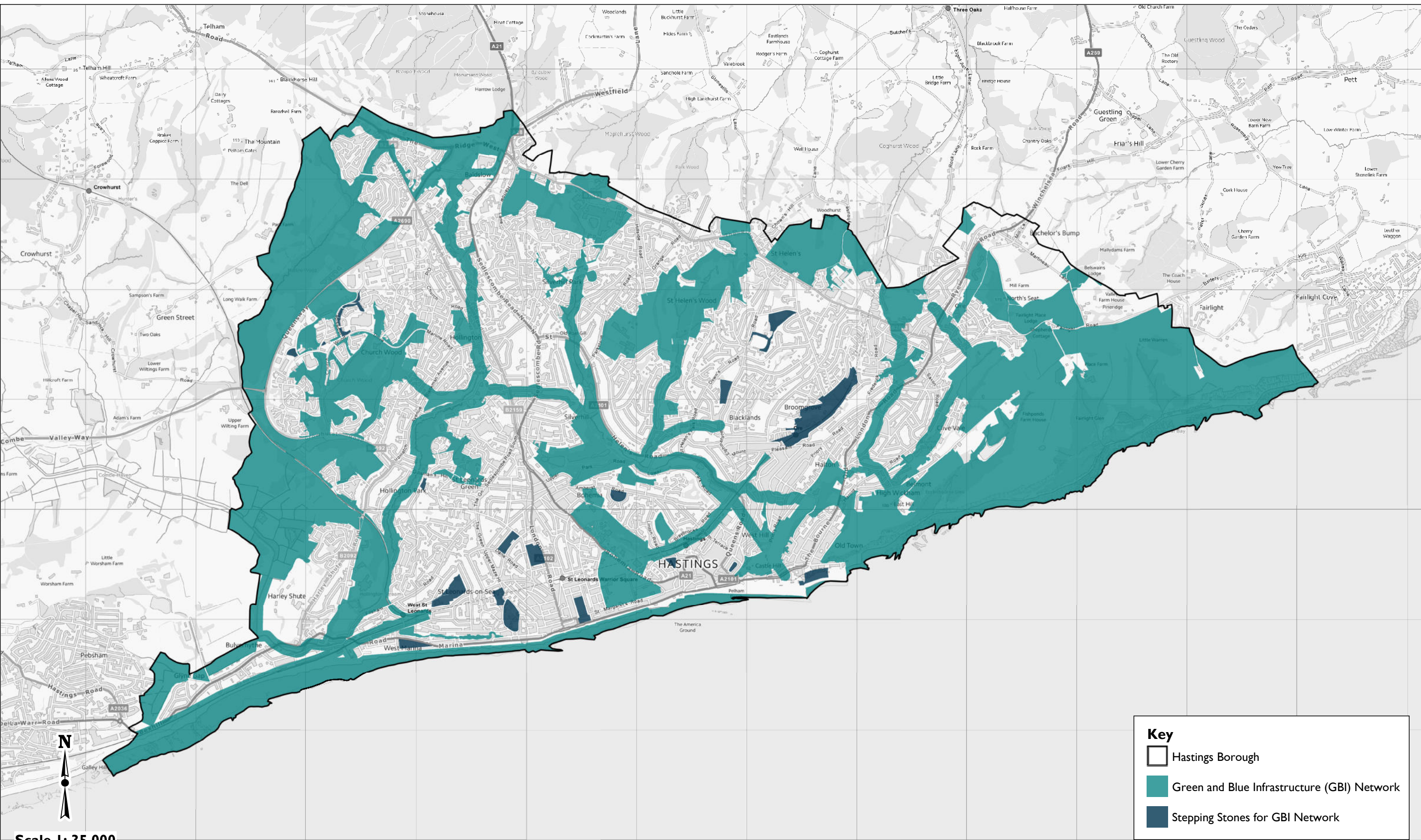
- Hastings Borough
- Least Cost Pathways
- Potential Development Sites: Housing & Mixed Use - HBC
- Potential Development Sites: Employment - HBC
- Biodiversity Opportunity Areas (BOA)
- Country Park - HBC
- Local Wildlife Sites (LWS)
- Land in Positive Management
- Circuitscape Analysis - Current Flow

Produced by: Surrey Wildlife Trust Ecology Services

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**Figure 4: Hastings Borough Council  
 Circuitscape Analysis and Least Cost Pathway**





Scale 1: 35 000  
 Please note: locations are approximate

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**Figure 5: Hastings Borough Council Green and Blue Infrastructure (GBI) Network**



## 5 Ecological threats and challenges

5.1.1 Table 1 details the existing threats to GBI and biodiversity. The table also includes mitigation measures that have been considered in developing this strategy

**Table 1: Ecological threats and challenges and mitigation measures**

Ecological Threat and Challenge	Source	Impact on biodiversity	Proposed mitigation relevant to GBI and Biodiversity Net Gain strategy
Climate change	Increased carbon emissions	Loss in biodiversity Increased invasive non-native species Change in habitat structure and composition, affecting its suitability for some species currently adapted to the habitat, therefore reducing its suitability for these Significant changes to weather patterns including increased drought, flooding, fire risk, coastal erosion, impacting the suitability for habitats for some more specialised species	<ul style="list-style-type: none"> <li>• Future development to review impact on ecosystem services and delivering environmental net gain in addition to biodiversity net gain</li> <li>• Increase habitat resilience through habitat enhancements and appropriate buffering of vulnerable habitats and ecosystems</li> <li>• Habitat management to improve condition and diversity of habitat types and structure within publically owned open spaces</li> <li>• Increase habitat connectivity and creation of stepping-stones across urban areas within the GBI corridors</li> <li>• Raise awareness of activities that Hastings residents can implement to deliver this GBI and Biodiversity Net Gain strategy</li> <li>• Increase collaboration across the Council departments and link with local communities and local community groups</li> <li>• Liaison with the Council to ensure development activities affecting GBI have appropriately considered impacts to biodiversity and delivery of ecosystem services and develop measures to mitigate these and to increase resilience of GBI within Hastings</li> <li>• Selection of tree species to maximise carbon sequestration and delivery of ecosystem services for all landscaping plans for future development, and other tree planting (e.g. by the Council) across the borough.</li> <li>• Future development and green infrastructure designed to promote low carbon behaviours such as walking and cycling and using public transport</li> <li>• Future development to demonstrate low carbon approaches to design, construction and long-term management".</li> </ul>
Pollution	Pesticides, dog fouling, litter, unauthorised motor vehicles on open space, untreated storm-water runoff, light	Habitat degradation Habitat loss	<ul style="list-style-type: none"> <li>• Increase habitat resilience through habitat enhancements, and appropriate buffering of vulnerable habitats and ecosystems.</li> <li>• Encourage development to incorporate Nature Based Solutions for storm-water run-off treatment (e.g. swales, wetlands)</li> <li>• Review water management across Hastings, and incorporate swales, SUDs and wetlands where appropriate</li> <li>• Development plans to include wildlife-sensitive lighting plans, clearly demonstrating the location of dark corridors and ensuring these connect across the landscape.</li> <li>• Increase collaboration across the Council departments and link with local communities and local community groups</li> <li>• Develop a pesticide strategy with the aim to ceasing the use of pesticides across all council activities.</li> <li>• Future development and green infrastructure designed to promote low carbon behaviours such as walking and cycling and using public transport</li> <li>• Future development to demonstrate low carbon approaches to design, construction and long-term management".</li> </ul>
Disturbance	Free roaming dogs, Increased visitor use	Disturbance to breeding birds adversely impacting nest success rates	<ul style="list-style-type: none"> <li>• Working with the local community to identify measures to minimise disturbance in vulnerable habitats.</li> </ul>
Habitat loss	Development	Habitat loss and degradation Habitat fragmentation	<ul style="list-style-type: none"> <li>• Encourage development of swales, wetlands and SUDs for storm-water run-off treatment</li> <li>• Development plans that impact nocturnal species (e.g. bats) to include wildlife-sensitive lighting plans, clearly demonstrating the location of dark corridors and ensuring these connect across the landscape, where bats will be impacted.</li> <li>• Appropriate and documented implementation of biodiversity net gain hierarchy: avoid, minimise, realise a minimum 20% net gain. Maximise gains on site and compensate offsite habitat losses as a last resort.</li> <li>• Appropriate selection of species in landscape plans so that all species selected benefit biodiversity, with a specific reference to pollination and delivery of other ecosystem services.</li> <li>• Presumption against the removal of trees unless there are sound arboricultural reasons for these to be removed.</li> </ul>
Management of open spaces just for recreational purposes	Poorly designed management plan Poorly implemented management plan Lack of management plan High frequency mowing	Habitat degradation Habitat loss	<ul style="list-style-type: none"> <li>• Appropriate and documented implementation of biodiversity net gain hierarchy: avoid, minimise, realise a minimum 20% net gain. Maximise gains on site and compensate offsite habitats losses as a last resort.</li> <li>• Development of management plans or strategies for open spaces within developments, and areas managed by the Council to ensure these deliver a diversification of habitats and incorporate measures to maximise connectivity across the landscape and improve habitat condition.</li> <li>• Increase collaboration across council departments and link with local communities and local community groups to identify how open spaces can be managed to encourage habitat connectivity, improve diversity of habitats particularly within stepping-stones and utilise margins</li> </ul>
Invasive non-native species	Introduction of invasive non-native species through poor biosecurity measures when working between sites. Landscape plans for proposed developments and planting in public open spaces lacking focus on species that	Habitat degradation Habitat loss	<ul style="list-style-type: none"> <li>• Development of best practice measures to be shared across council departments, contractors and partners across to ensure biosecurity is appropriately implemented during habitat management works</li> <li>• Strengthening resilience of habitats being improved for biodiversity, including preparation and implementation of management plan and/or strategies.</li> <li>• Appropriate selection of species in landscape plans so that all species selected benefit biodiversity, with a specific reference to pollination and delivery of other ecosystem services.</li> </ul>

Ecological Threat and Challenge	Source	Impact on biodiversity	Proposed mitigation relevant to GBI and Biodiversity Net Gain strategy
	provide biodiversity benefits Climate change resulting in habitat conditions no longer being suitable for native species and new species from the south colonising habitats		
Resource and investment	Budgetary restrictions	Lack of funding and staff resource to implement management and monitoring strategy.	<ul style="list-style-type: none"> <li>• Increase collaboration across council departments and link with local communities and local community groups to encourage volunteer opportunities to implement habitat management measures</li> <li>• Work with primary and secondary care departments within the Council, and local NHS trusts to deliver social prescription</li> <li>• Undertake a cost-benefit analysis of the implementation of Nature Based Solutions for flood and coastal erosion management, versus traditional methods and spend on flood and erosion remediation measures.</li> </ul>

## 6 Objectives

### 6.1 Background

6.1.1 The 2030 Agenda for Sustainable development outlines the principles for peace and prosperity for people and the planet (United Nations, 2015). Seventeen sustainability goals have been developed and are broadly characterised into the following areas of critical importance for humanity and the planet:

- People
- Planet
- Prosperity
- Peace
- Partnership

6.1.2 The development of this GBI and Biodiversity Net Gain Strategy has been developed as part of this strategy delivering GBI for people, planet, prosperity and partnership. This is further reflected by the Building with Nature standards (Building with Nature, 2021). These have been developed to ensure high quality GBI is central to placemaking at the development and policy levels. The key principals are to deliver GBI:

- Holistically, by implementing a framework throughout all stages of a development or policy development
- Reflecting a site's potential, regardless of its size
- Proportionally to the type of site and incorporate all features that can benefit wildlife and people at a local scale
- Delivering long-term outcomes.

6.1.3 Building with Nature Standards are presented in Table 2.

**Table 2: Building with Nature Standards<sup>2</sup>**

Standard number	Description
1	Optimises multifunctionality and connectivity
2	Positively responds to the climate emergency
3	Maximises environmental net gains
4	Champions a context driven approach
5	Creates distinctive places
6	Secures effective place-keeping
7	Brings nature closer to people
8	Supports equitable and inclusive places

<sup>2</sup> Orange reflects core standards, purple well-being standards, blue water standards and green wildlife standards

Standard number	Description
9	Delivers climate-resilient water management
10	Brings water closer to people
11	Delivers wildlife enhancement
12	Underpins nature's recovery

- 6.1.4 Building with Nature provides a framework not just to confidently improve GBI access for people and wildlife, but also for other environmental benefits. The Building with Nature Award is an accreditation that demonstrates that a development project has been designed following all 12 of the standards. The accreditation is a two-step process, with an initial assessment undertaken by a BwN Approved Assessor, followed by an Audit undertaken by a member of the BwN Audit Team. A project is therefore evaluated by two separate third-party assessors. It can be awarded for full or outline planning applications and awards can provide the Local Planning Authority with the confidence that a development project has maximised its GBI opportunities and has been designed to positively influence other environmental factors, considering long-term outcomes. Consideration should be made to encouraging projects that have been awarded Building with Nature accreditation.
- 6.1.5 The objectives for the local plan policies are detailed in Table 3, with supporting information in the following sections

**Table 3: GBI and biodiversity net gain local plan policy objectives**

Number	Objective	Areas of critical importance	Relevant Building with Nature Standard
1	<b>Protect, restore and enhance</b> the GBI network	People, planet and prosperity	1, 2,5, 6, 7, 11, 12
2	<b>Create</b> high-quality multi-functional GBI	Planet, people and prosperity	1 - 12
3	Provide and encourage <b>community</b> growing spaces.	People and Planet	1, 3, 4, 5, 6, 7, 8, 11, 12
4	Increase <b>connectivity</b> of green and blue infrastructure for people and wildlife	Planet and people	1, 2, 3, 5, 7, 11, 12
5	Maximise <b>tree protection</b> and encourage planting the <b>right tree in the right location</b>	Planet, people	1, 2, 3, 4, 5, 6, 7, 8, 11, 12
6	Deliver an ambitious biodiversity net gain target	Planet	2, 7, 11
7	Minimise urban heating	Planet	2, 7, 9 11
8	Incorporate measures to enhance biodiversity opportunities across all developments.	Planet	11, 12
9	Provide benefits to the community through inclusive designs for all users, irrespective of social group or abilities and promote health and well-being across the GBI network	People and Partnership	4, 5, 6, 7, 8, 10
10	Work with partners to build and secure funding, effective governance and stewardship for new and existing green and blue infrastructure to ensure their long-term <b>sustainability</b>	Prosperity	6

## 6.2 Objective 1: Protect, enhance and restore the GBI network

### 6.2.1 The Council will:

- Test identified sites to determine the likely biodiversity net gain requirements.
- Review its existing landholding, including baseline habitat condition and identify priority areas within the GBI network to restore and enhance existing habitats.
- Prepare management plans and strategies to reflect the biodiversity and ecosystem services objectives.
- Discuss with the applicant the appropriate location for delivery of the offsite compensation, such that this enhances the GBI network, improves connectivity and resilience, and meets local biodiversity objectives.

### Protect the GBI network

6.2.2 Within the existing local plan, green infrastructure includes open spaces, woodlands, wildlife habitats, parks, recreational areas and other areas that deliver social, economic and environmental benefits. Such areas include:

- Non-statutory protected sites, such as Local Nature Reserves and Local Wildlife Sites
- Parks and open spaces

6.2.3 Policy EN3 of the current plan indicates that priority is given to the protection, management and enhancement of Local Nature Reserves and Local Wildlife Sites and the integrity and biodiversity of the Green Infrastructure network will be improved.

6.2.4 Through this study, the GBI network has been expanded to reflect the diversity of habitats within Hastings and maximise habitat connectivity across the landscape.

6.2.5 Considering the urban nature of Hastings, net loss of GBI within the network will adversely impact the network's resilience to climate change and development pressures.

6.2.6 Sites that should be tested to identify net gain potential for the emerging plan are presented in Figure 6. These include sites that are already in development, sites that have been allocated for development in the existing adopted Local Plan but not yet built out, and sites identified through the Strategic Housing and Employment Land Availability Assessment (SHELAA). In developing the GBI network, discussions were had with regards to incorporating sites that were already in development. These are detailed in Table 4, which also includes the Council's assessment of whether these sites need to be removed from the GBI network

**Table 4: Sites in development:**

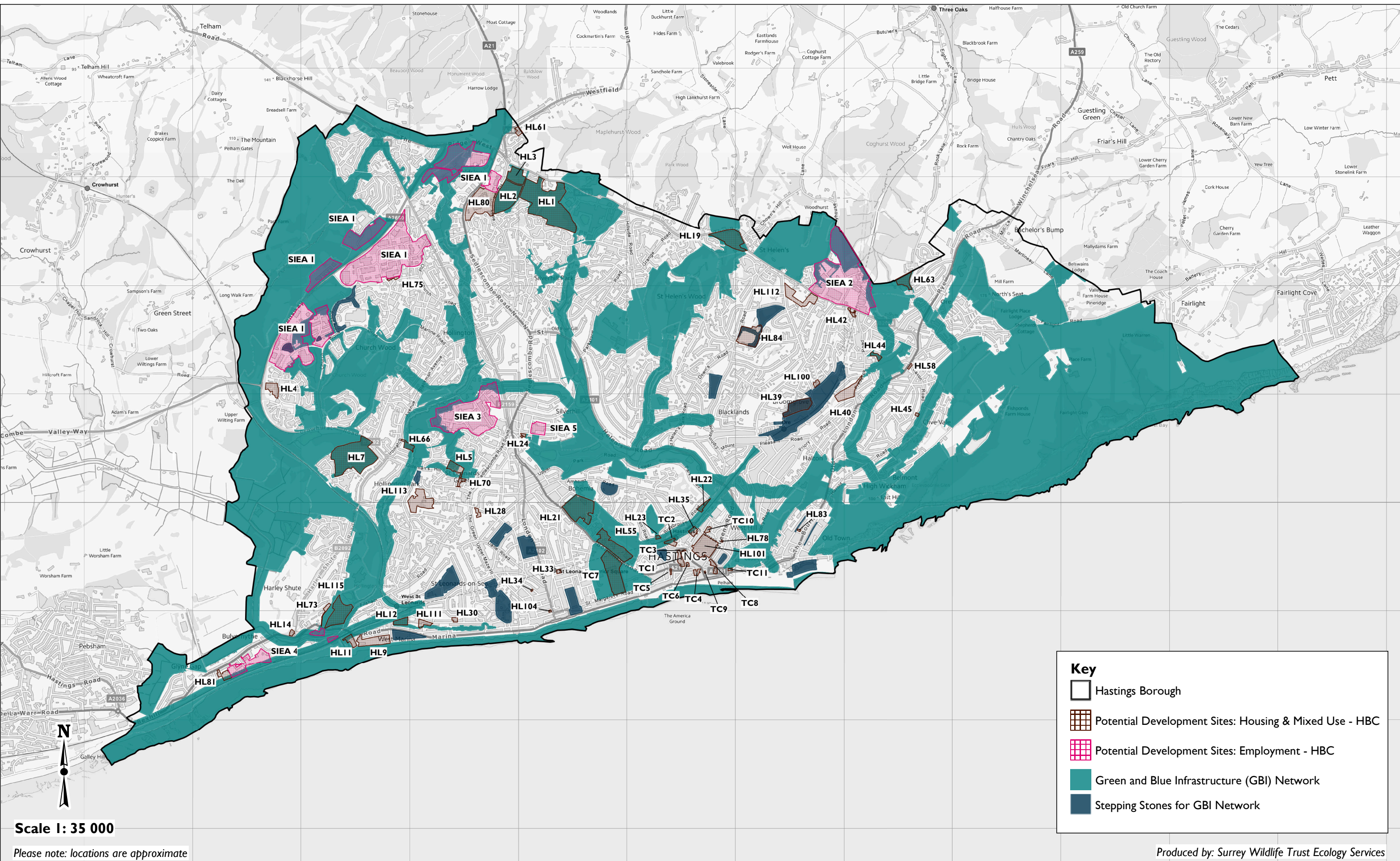
Site	Comment	The Council's suggested outcome
HL2 Harrow Lane	Approved scheme includes new green space & boundary landscaping	Retain
HL1 Holmhurst St Mary	Development is under construction but not completed. There are natural green spaces to be retained and other green features in the development.	Retain
HL7 Grove Sch/Darwell Cl	Permission contains areas of green open space and ecology features and protected species.	Retain
HL66 Ironlatch Ave	Development has not commenced; therefore the site retains a positive contribution to the GI network. It is adjacent to ancient woodland and will include buffers etc.	Retain
HL5 former Spyways school	The development retains significant trees around it and as part of the development and is within a very wooded area.	Retain
HL2 Harrow Lane	Approved scheme includes new green space & boundary landscaping	Retain

6.2.7 These sites have therefore been retained in the network as the current permissions may be amended or discarded offering future opportunities to deliver these schemes in line with this GBI and Biodiversity Net Gain Strategy. Furthermore, some of these are well-connected to the landscape and it is critical to retain their contribution.

6.2.8 For remaining sites within the GBI network, should these come forward, an Ecological Impact Assessment, proportionate to the impact, will be submitted to the Council and Biodiversity Net Gain assessment prepared (see below for further detail). Demonstration of how the project meets the Biodiversity Net Gain principles to avoid impacts, minimise these, restore existing habitats and as a last resort compensate these. Offsite compensation will be delivered within the GBI network to strengthen its resilience.

#### **Restore and enhance existing GBI**

6.2.9 Enhancing habitat resilience within the GBI network is a key measure to deliver climate change adaptation within Hastings. This can be achieved by restoring and enhancing the GBI network. The Environment Act 2021 will require all developments to deliver biodiversity net gains, which must be met either on site or as suitable offsite compensations. The Council has an opportunity to adopt a strategic landscape-scale approach for offsite compensation such that this is delivered within the network.



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**Figure 6: Tested Sites**



### 6.3 Objective 2: Create high quality, multi-functional GBI

#### 6.3.1 The Council will:

- Request major developments demonstrate how they deliver ecosystem services impacted by the development.
- Demonstrate how their proposed GBI meets with Building with Nature standards

6.3.2 High quality and multi-functional GBI are critical to delivering the vision. It is recommended that a supplementary planning document is developed to include quality standards for GBI.

6.3.3 While Hastings supports many pockets of semi-natural habitat, these areas are often isolated within a built-up urban environment with little to no GBI, providing a significant barrier to the movement of wildlife as demonstrated in the resistance analysis. There are some instances of connectivity between larger habitat parcels, but these connecting habitats are frequently in poorer condition which limits their suitability for wildlife.

6.3.4 Development projects bring an opportunity to introduce GBI to areas where this is currently limited, and to enhance existing GBI such that it can facilitate the movement of biodiversity more effectively, as well as bring nature closer to people in areas where this is limited. Well-designed developments can have a cumulative effect across the Borough, enhancing existing stepping-stones and creating new stepping-stones where opportunities arise.

6.3.5 GBI creation should be prioritised onsite. However, in some instances, it may not be practicable for a development project to create new GBI e.g. development restricted to specific floors of a high-rise building, or a site which already has significant, high-quality GBI present with no space to create any additional GBI.

6.3.6 In these scenarios, the development still can contribute to the borough's GBI network through financial compensation within the GBI network to create new habitats within the network that will increase the network's resilience.

#### Delivering environmental benefits

6.3.7 Ecosystems provide numerous services which benefit people and wildlife. This includes (but is not limited to) biodiversity, carbon sequestration, air purification, water purification, flood mitigation, recreation, and well-being.

6.3.8 Ecosystem services, due to their complex nature, can be very difficult to measure in a standardised manner. This means it can be hard to determine whether a development design will deliver benefits through ecosystem services, and the extent of this delivery. It can be very difficult to ascertain the overall net contribution a development has: while it may obviously deliver gains in one factor, this may be offset significantly by losses in another, and the interplay between these factors must be considered. A surface level assessment of a development design can therefore sometimes give false assurance that the project will deliver a greater benefit than is actually feasible.

6.3.9 Consideration should be made to requiring major developments to submit a full assessment of environmental gains, breaking down elements of the design and

evaluating the feasibility of deliverables to ecosystem services, taking an evidence-based approach.

- 6.3.10 Recently, there has been a push to create natural capital metrics which standardise this assessment and makes it even clearer how a development's effects on different environmental factors overall come together as a collated loss or gain. These include the Environmental Benefits from Nature (EBN) tool, and the NATURE tool.
- 6.3.11 Therefore, where a development project has made use of these tools, following correct procedure, the Council can have more confidence in the feasibility of a project to deliver gains in ecosystem services.

## **6.4 Objective 3: Provide and encourage community growing spaces**

6.4.1 The Council will:

- Review how community growing spaces can be incorporated into the GBI network
- Encourage major development to incorporate growing spaces in the development plans or into the GBI network where this is not possible.
- Consider where appropriate growing spaces may be incorporated, whilst bearing in mind that systemic under-reporting of contaminated land and waste dumps within the borough may limit the availability of suitable growing space beyond what is presently known.

6.4.2 Community growing spaces are very important for strengthening local communities and improving health and well-being. Community gardening provides people with increased physical activity, improved nutrition through fresh produce, and decreased stress levels, all of which reduce the likelihood of chronic health issues, including mental health issues (Lovell, Husk, Bethel, & Garside, 2014). These gardens have the secondary benefit of increasing GBI within a community, particularly when they are created within urban areas.

6.4.3 Existing restrictions which prevent people from accessing growing spaces include primarily lack of access to spaces, and lack of skills/knowledge.

6.4.4 Specific thresholds can be developed with the aim of providing an accessible growing space within a ~15 minute walk of residents, which is important as it ensures accessibility for members of the community who do not have access to private vehicles (Food Matters as part of Harvest Brighton & Hove, 2011) (JPC Strategic Planning & Leisure Ltd., 2011).

6.4.5 The requirement for creation of community growing spaces on all new development of 0.5 ha or more will result in an increase of these spaces within areas which currently have reduced or no easy access to green spaces. Community growing spaces, if poorly designed, can also be exclusionary to people with disabilities if the growing space does not include disabled access or means for those with differing mobility to interact with the growing space.

6.4.6 Growing spaces should therefore be designed considering the specific requirements of the community it lies within, to ensure that it is accessible to people with disabilities, for example by including raised beds or growing walls with wheelchair access. This is particularly pertinent for sites such as care homes, schools, and community centres.

## 6.5 Objective 4: Increase connectivity of GBI for people and wildlife

### 6.5.1 The Council will:

- Require development proposals demonstrate how they increase connectivity for people and wildlife.
- Encourage development to incorporate species-rich hedgerows that connect well to the wider landscape.

6.5.2 Connectivity can be defined as corridors that allow species and their genes to move freely across the landscape and ecological processes to function unimpeded (United Nations Environment Programme, 2019). This facilitates climate adaptation using an ecosystem approach. Generalist species adapt readily to their surroundings, whilst specialists require very specific habitat conditions to facilitate movement across the landscape. Therefore, delivering good connectivity requires an understanding of the habitats and species present in the GBI network, the degree to which they can move across the landscape along with what measures are required to facilitate this movement. Connectivity therefore requires a mosaic of habitats that can be used by both generalist and specialist species.

6.5.3 Artificial boundary features such as close-board fencing serve an effective means of dividing land parcels in a secure manner cost-effectively. However, aside from this primary function, these boundary features offer very few to no secondary benefits. They significantly restrict movement of wildlife and inhibit GBI connectivity, contributing to the overall decline in biodiversity and habitat connectivity within Hastings, as they act as impermeable barriers. They can be designed to allow for the movement of wildlife through the creation of specified gates and tunnels, however this still creates limitation of movement by restricting wildlife to specific locations.

6.5.4 Traditional boundary features such as treelines, ditches and most significantly traditionally laid hedgerow can serve the primary function of dividing land parcels whilst delivering a wealth of secondary benefits such as habitat provision and connectivity between larger habitat parcels, flood mitigation and drainage solutions, carbon sequestration, air purification, and even food provision if they comprise fruit-bearing species. These types of boundary features also tend to have permeability for wildlife to directly move through the barrier at multiple points. This is the case even for densely laid hedges.

6.5.5 Hedgerows provide the most benefit to biodiversity when they comprise a variety of different species, where they have been laid to generate dense growth, and where a buffer of semi-natural ground flora habitat is permitted to develop at its base. On this basis, species-rich hedgerows will be encouraged to maximise connectivity across the landscape.

## 6.6 Objective 5: Maximise tree protection and encourage planting the right tree in the right location

### 6.6.1 The Council will:

- Encourage the retention of trees

- Require the replacement of trees that cannot be retained for arboricultural reasons at a ratio of 3:1 for small trees, and 13:1 for large trees.
  - Required offsite compensation for tree replacement to be delivered within the GBI network appropriate for tree planting, increasing local habitat resilience.
- 6.6.2 A mature tree supports a wide range of organisms within its structure, from symbiotic fungi at its roots through to bat roosts and bird nests within its trunk, as well as supporting solitary wasps and leaf-mining flies within its leaves. Each native tree species has evolved alongside numerous specialist organisms specific to that tree, as well as being hugely important for generalist species.
- 6.6.3 As well as being biodiversity hubs, trees are an excellent means of sequestering carbon, due to their growth patterns and photosynthesis, which is important when considering the necessity of reversing the effects of climate change. In urban environments, certain species of trees can filter out air pollutants which can improve air quality, potentially relieving some of the strain on healthcare systems by reducing the instances of respiratory conditions relating to air pollution, such as elder, silver birch and yew (Wang, Maher, Ahmed, & Davison, 2019).
- 6.6.4 As most native hardwood tree species tend to be slow growing, the felling of a mature tree results in the loss of an ecosystem that cannot be instantly replaced, and the release of a large quantity of stored carbon. In the natural cycle, tree death is compensated for by a cycle of regeneration over the years, with surrounding trees all being at different stages of their life cycle. Felling to facilitate development does not mimic this natural process very well, particularly when the trees being felled are isolated outside of a woodland habitat.
- 6.6.5 The local plan policies should aim to retain trees wherever possible and where these require removal for arboricultural reasons, an appropriate replacement ratio will be required, if biodiversity net gain principles do not apply to the circumstance. This approach would also contribute to a national need to increase the rate of tree planting to 50,000 ha per year as part of efforts to halt climate change (Committee on Climate Change, 2019).

#### **Encourage planting the right tree in the right location**

- 6.6.6 Trees form an important asset across the landscape and, given the long period of time it takes for this asset to be realised, and to mitigate risk of tree loss, small trees lost should be compensated for at a ratio of 3:1 to account for mortality and life-span, and large trees compensated for at a ratio of 13:1 (Nowak & Aevermann, 2019).
- 6.6.7 Forest Research conducted an extensive study on the ecosystem services provided by large (Hand & Doick, Ecosystem services delivery by large stature urban trees, 2019) and small and medium (Hand & Doick, Ecosystem services delivery by small and medium stature trees, 2019b) stature trees. The recommendations below are made based on the results of these assessments.
- 6.6.8 In the first instance, any new tree planting should consider the localised ecology to determine whether it is appropriate to plant trees in this location. Guidance on selecting species for Green Infrastructure is available and should be followed to ensure

the species is appropriate to the conditions. Factors to consider are the species (including existing constraints, ecophysiology, delivery of ecosystem services and aesthetics), rooting environment, plant quality and arboricultural practice (Hirons & Sjomán, 2018)

6.6.9 Tree planting be considered in areas with high sediment run off and/or poor biodiversity. Tree lines along riverbanks assist in the interception of soil runoff from agricultural land and secure riverbanks via their root systems, preventing bank collapse. Additionally tree roots, dead wood and leaf litter provides nursery habitats for numerous fish and invertebrate species, adding structure to the river ecosystem and improving biodiversity.

6.6.10 Consideration should be made in selecting planting location to ensure the presence of trees will not disrupt access to buried services including:

- Gas mains
- Water works
- Electricity lines
- Oil pipelines

6.6.11 Where services are identified, tree planting will be relocated to a more appropriate location.

6.6.12 Where new tree planting opportunities have been identified the following should be considered:

- The species selected should be of local provenance and a native species, or species that is known to provide biodiversity benefits.
- Species that should be considered for planting include:
  - Standing mature trees:
    - Pedunculate oak
    - Beech
    - Sycamore
    - Holm oak
    - Lime species
    - Sweet cherry
    - Rowan
    - Bird cherry
    - Silver birch
  - Hedgerow
    - Yew
    - Hornbeam
    - Field maple
    - Rowan
    - Holly
    - Bird cherry
    - Hawthorn
    - Hazel
    - Elder

- Blackthorn

6.6.13 Species should be strategically diverse to enhance resilience of tree populations for future biotic and abiotic threats. Larger species that have the greatest benefit across a range of ecosystem services should be selected (Hirons & Sjoman, 2018).

6.6.14 Where hedgerows are planted there should be a minimum of five species per 30m, such that these can be native species-rich hedgerows, enhancing the local biodiversity.

6.6.15 Tree management should be undertaken by qualified arborists. It is advised that grassland under the tree drip line is not mown to promote biodiversity. Biodegradable tree guards should be used when planting to minimise plastic waste.

6.6.16 Hedgerows should be managed on a five-year rotation whereby 20% of the hedgerows are cut in any one year. Where possible a minimum of 1m either side of the hedgerows should be left unmown to promote biodiversity

## 6.7 Objective 6: Deliver ambitious biodiversity net gain target

6.7.1 The Environment Act 2021 will mandate the delivery of a minimum 10% Biodiversity Net Gain through secondary legislation, expected in autumn 2023. The Council will deliver an ambitious target with regards to biodiversity net gain within its local plan, reflecting the climate emergency by building climate change resilience into the GBI network.

6.7.2 The Council will require development delivers a 20% biodiversity net gain.

### Climate change and the biodiversity crisis

6.7.3 In August 2021 the Intergovernmental Panel on Climate Change (IPCC) confirmed that human influence has warmed the atmosphere, ocean and land, resulting in widespread and rapid changes across the globe (Inter-governmental Panel on Climate Change, 2021). In its sixth assessment report on impacts, adaptation and vulnerability, the key messages in the IPCC's assessment are:

- Impacts of climate changes are being felt across the globe with increased heatwaves, droughts and floods already exceeding plants' and animals' tolerance thresholds, driving mass mortalities in certain species and ecosystems.
- **Ambitious, accelerated action** is required to adapt to climate change, whilst making rapid **deep cuts to greenhouse gas emissions**.
- The window of opportunity to effect change is closing and **adequate funding, technology transfer, political commitment** and **partnership lead** are required to deliver a more effective increase in climate change adaptation and reduction in emissions.
- Nature plays an important role to minimise climate risks and improve people's lives. The key is to have **healthy ecosystems** (Inter-governmental Panel on Climate Change, 2022)

6.7.4 The Council declared a climate emergency in 2019, committing to reduce carbon emissions and working towards being carbon zero by 2030 (Hastings Borough Council, 2020a). Nature and ecosystem services it delivers play a significant role in mitigating climate change impacts, but also sequestering carbon.

- 6.7.5 One of the key priorities of the Council's climate strategy is reviewing opportunities to sequester carbon within land management. Ensuring a strategic approach and synergy between the climate change strategy and the GBI and biodiversity net gain strategy is critical for the success of both and reflects inextricable link between biodiversity and climate change.
- 6.7.6 The UK has half of its biodiversity left, meaning it is the least diverse in the G7 countries and is within the bottom 10% of all countries globally (Davis, 2020). The latest UK State of Nature Report 2019 found that around 15% of UK species are now listed as threatened, with 2% already considered extinct, and that 41% of UK species have shown significant decreases in abundance since 1970 (Hayhow, et al., 2019).
- 6.7.7 This pressure on biodiversity adversely impacts the ecosystem services that these deliver which are the services that biodiversity provides to humans such as provision of natural resources (e.g. food, primary materials), regulating services (such as air quality, noise, pollution control, crop pollination) and cultural services, such as recreation and a sense of place (IUCN, 2016).
- 6.7.8 Given the urbanised nature of Hastings, the resilience of its existing habitats must be increased through improved connectivity and improved conditions, such that it contributes towards climate change mitigation.

### Why a 20% net gain

- 6.7.9 Surrey Nature Partnership (SNP) is a Local Nature Partnership that is formally recognised by the Department of Environment, Food and Rural Affairs (DEFRA) and has the purpose of championing the value of the natural environment in decision-making at all levels. In November 2020, SNP produced a position statement recommending that Surrey's planning authorities adopt a 20% minimum biodiversity net gain for all development (Surrey Nature Partnership, 2020).
- 6.7.10 In reviewing the appropriate level of gain, SNP assessed:
- Evidence from the national cost/benefit analysis (DEFRA, 2018)
  - Surrey's rate of biodiversity loss (Surrey Nature Partnership, 2019)
  - Natural capital approach (Surrey Nature Partnership, 2015b)
- 6.7.11 The 20% was selected as there is a continued threat to biodiversity at a local level and ambitious targets are set to halt, and where possible reverse, biodiversity declines.
- 6.7.12 This is further supported by the OECD 2019 report that indicates:
- The annual value of the natural environment's benefits to physical and mental health as £2 billion in the UK (OECD, 2019). This is through alleviating the pressure on the NHS, as increased access to the natural world improves physical fitness which reduces likelihood of injury and low-fitness related illnesses such as heart disease. It also reduces the amount of resources the NHS needs to spend on stress-related illnesses and can aid in management of chronic mental health conditions. A secondary benefit to this is that the number of people out of work for health-related reasons is reduced, resulting in more people in the workforce (contributing to the economy).

- A biodiverse population of pollinators can relieve pressures on the farming industry, as more pollinators with varying specialities mean that less time and resources are spent artificially pollinating crops. A diverse population of natural enemies to plant pests (e.g. parasitic wasps specific to different species of scale insect) reduce the effect of pest damage to crops, meaning less money is spent supplying chemical pesticides, and more profit can be made from a higher yield.
- In the UK, agriculture and fisheries are reliant on biodiversity for their long-term survival.
- Protecting and enhancing existing wetlands, and creating new wetlands, can have a beneficial effect on the water supply chain in addition to supporting biodiversity gain.

### Viability of delivering 20% biodiversity net gain

#### Nationally

- 6.7.13 At a national level, multiple local authorities and neighbourhood groups are reviewing their local, and neighbourhood plans, reflecting changes in the NPPF (2021). In line with this and simultaneous to councils declaring climate change and biodiversity emergencies, targets reflecting significant losses in biodiversity at a national and local level are being reviewed. Appendix 7 presents some examples of these and in summary, several local authorities and neighbourhood groups are proposing higher biodiversity gain targets than the minimum 10% that the Environment Act (2021) will mandate.
- 6.7.14 In setting the appropriate target the key elements are balancing developmental needs and housing targets with climate change and biodiversity loss resilience, along with costs to households.
- 6.7.15 The principals behind biodiversity net gain are to avoid impacts, where these cannot be avoided, minimise these, restore existing habitats and finally compensate when other options have been exhausted. When reviewing these net gain targets it is critical to keep these principals in mind, as the key aim is to retain and enhance the best habitats throughout project life-cycles and compensate for these as a last resort.
- 6.7.16 In 2018, DEFRA produced an impact assessment on biodiversity net gain, which contained a cost/benefit analysis discussing how biodiversity decline can be reversed while still being achievable from an economic perspective.
- 6.7.17 DEFRA indicates in its cost benefit analysis that 10% is the **lowest level** of net gain that is required to deliver a genuine net gain or a no net loss; whilst the Natural Capital Committee *“indicates that a net gain of 10% or above is necessary to give reasonable confidence in halting biodiversity loss (Natural Capital Committee, 2019).”* However, the same report also states that *“the analysis undertaken ... indicates that the level of requirement makes relatively little difference to the costs of mitigating and compensating for impacts.”*
- 6.7.18 This is supported by a recent viability assessment commissioned by Kent County Council that reviewed the viability of delivering a 10, 15 or 20% biodiversity net gain. This study also found most of the financial impact was the mandatory 10%, with little difference between 15 and 20% (SQW and Temple Group, 2022).

- 6.7.19 These results are also consistent with a viability assessment of delivering a 20% biodiversity net gain was undertaken by Swale Borough Council in 2020 (personal communication). The report identified two key points:
- Costs of delivering a 20% net gain versus a 10% were marginal, with most of the costs required to meet the mandatory 10% biodiversity net gain
  - Larger developers welcomed ambitious targets for biodiversity net gain delivery, whilst small and medium sized developers found this more challenging.
- 6.7.20 The latter point is more reflective of improving the identification and delivery of offsite compensation where this cannot be met onsite.
- 6.7.21 The Sussex Local Nature Partnership has published a Natural Capital Investment Strategy, which is to be used in part to guide policy decisions by Authorities within Sussex with respect to natural capital and development, including biodiversity net gain (Sussex Local Nature Partnership, 2019). The Strategy provides several objectives, with proposed actions to achieve desired outcomes.
- 6.7.22 A key part of the strategy is the 'Promotion of a commitment to biodiversity within the natural capital approach', with the aim for natural capital to become a valuable and trusted means of delivering 'nature recovery'. By ensuring that biodiversity is formally considered for all natural capital approaches (including those primarily aimed at non-biodiversity related services), indirect negative impacts on biodiversity are avoided.
- 6.7.23 Sussex Nature Partnership has not yet released a statement recommending a minimum biodiversity net gain threshold for the region; however a Biodiversity Net Gain Working Group has been formed, and guidance may be released in future, which the Council may find informative.

### **Within Hastings**

- 6.7.24 Due to the comparatively small size of the borough, its already highly developed urban centres, development opportunities are focused on brownfield land, infill and change of use. Based on the tested sites, 11 will not need to deliver any biodiversity net gains, as these areas do not support existing biodiversity baseline units, although there is a possibility that some urban trees may be present. Alternative measures to deliver benefits for biodiversity and specifically urban heating will need to be considered for these and are discussed separately, below.
- 6.7.25 Due to the urbanised nature of Hastings, setting a 20% target will ensure the best of the remaining habitats will be retained and enhanced, thus increasing the GBI network resilience across the borough, deliver more ecosystem services and contribute towards the Council's climate change strategy ambitions.
- 6.7.26 Approximately half of the tested sites that will need to deliver biodiversity net gain are under 1ha. Therefore, the difference in real terms between 10% and 20% net gain contributions is not significant and will likely identify net gain contributions in the low hundreds of pounds. Where sites greater than 1h are identified, the net gain contributions will be correspondingly larger, and the differences between 10%and 20% net gain contributions will increase, the larger the development. However, each development will need to demonstrate how it has applied the mitigation hierarchy in its

development designs and prioritise delivering gains on site, which will significantly reduce the financial burden.

6.7.27 Notwithstanding the above, there is a significant need for resources to ensure continued management and protection of the Borough's unique semi-natural habitats, including Local Nature Reserves (LNRs) and Local Wildlife Sites (LWS). Therefore, one means of achieving net gain is by using land owned by the Council to deliver biodiversity net gain compensation required by developments that cannot deliver these on site.

6.7.28 The Council should consider setting a 20% threshold for Biodiversity Net Gain provision, that would ensure a larger provision of resources to achieve the objective of nature recovery across the borough, thus increasing the resilience of the GBI network.

#### ***Capacity to deliver 20% biodiversity net gain within the GBI network***

6.7.29 The project comprised a desktop exercise to establish the GBI network and assess the likely gains that would be required for existing site allocations, and those arising from the SHELAA process. Based on a review of aerial imagery the likely biodiversity net gain units to deliver a 20% gain across all tested sites is 1350 units.

6.7.30 To determine whether habitats in the GBI network could deliver these gains a high-level biodiversity net gain assessment was undertaken using the DEFRA 3.1 biodiversity net gain metric (Panks, et al., 2022b). The following assumptions were made:

- Habitats within SSSIs, SACs or SPAs were excluded from the analysis given existing statutory obligations
- All HPI habitats were assessed as being of high distinctiveness of moderate condition
- All habitats in LWS and LNS not identified as HPI and 3% of the habitat within the parks and gardens is identified as being of medium distinctiveness of moderate condition
- 7% of the habitat in Parks and Gardens is of low distinctiveness in poor condition
- Remaining habitats within Parks and Gardens would be unsuitable for biodiversity net gain
- All moderate condition habitats can be improved to good condition
- All poor condition habitats can be improved to good condition

6.7.31 With these precautionary principals in place, up to 4400 biodiversity units could be delivered within the GBI network, improving it by 24%. Accurate calculations would need to be completed, however based on this high level analysis, the GBI network does have capacity to deliver a 20% gain across tested sites, and also improving the total biodiversity units across the network by 20%.

#### **Conclusion**

6.7.32 Given the severity of the climate change and biodiversity emergency, the capacity for delivering biodiversity units across the GBI network, and limited financial impact of delivering 20% versus 10% biodiversity net gain, it is highly advised the Council requests developments deliver a 20% biodiversity net gain within the GBI network.

## 6.8 Objective 7: Minimise urban heating

6.8.1 The Council will require development minimises urban heating by:

- Redevelopment and re-use should incorporate one green roof designed in line with Building with Nature standards, with a minimum depth of settled substrate of 150mm supporting semi-natural diverse habitats of moderate condition.
- Where trees are planted, these will be selected to maximise carbon sequestration and deliver additional ecosystem services, in line with objective 5.
- Deliver high quality green infrastructure in line with Building with Nature, and specifically addressing measures to reduce urban heating.

6.8.2 Recent climatic predictions in the UK can be summarised as (DEFRA, DBEIS, Met Office and Environment Agency, 2022):

- Increased temperatures in summer (range between 1.3°C and 5.1°C and winter (ranging between 0.6°C and 3.8°C), with summer temperatures rising more significantly, by the end of the 21<sup>st</sup> century
- Summer heatwaves will become more prevalent, hotter and lasting longer
- Rainfall will vary across the seasons with increased droughts which will become more prevalent and lasting longer periods.
- Within urban environments, the intensity of summer rainfall will increase, which will impact the frequency and severity of surface water flooding

6.8.3 Incorporating measures into the local plan to mitigate these impacts is critical both in the Council's commitment to delivering its climate change strategy, but also limit the adverse impact of localised heating associated with climate change, which will impact the local health boards, and the population of Hastings.

6.8.4 Scientific studies have demonstrated the benefits of urban greening in mitigating the impacts of climate change and more specifically reducing urban heating, in addition to delivering other ecosystem services such as reducing surface water runoff, improving water quality (Bush, Ashley, Foster, & Hall, 2021).

6.8.5 Green factor tools have been developed world-wide, including in Seattle, Helsinki, Malmö and Singapore with the aim of greening across cities.

6.8.6 In 2021, the London Plan introduced Urban Greening Factor (UGF) to meet Policy G5 Urban Greening (Greater London Authority, 2021). UGF was developed based on several international approaches and allows the quality and quantity of urban greening to be assessed and inform a development proposal. This is calculated by assigning a score from one to zero to all the surface cover types in a proposed development. Scores indicate their quality and are based on their potential for rainwater infiltration. The better-quality surface cover type is semi-natural vegetation, as it provides the higher benefits for biodiversity, and it receives the highest UGF score. The lowest score is given to impermeable sealed surfaces.

6.8.7 Measures to minimise urban heating will be required of developments, including incorporating green roofs, selecting species and habitats that target carbon sequestration and deliver GBI in line with Building with Nature standards.

## 6.9 Objective 8: Incorporate measures to enhance biodiversity opportunities across all developments

6.9.1 The Council will require development incorporate:

- Installation of integrated bird and bat boxes (e.g. in line with the new British Standard BS 42021:2021 Integral nest boxes – Selection and installation for new developments (in publication). This provides specifications and appropriate numbers of boxes, commensurate with the size of development.
- Including holes under fences to minimise barriers to species movement.
- Incorporating integrated invertebrate boxes
- Including reptile and amphibian hibernacula in secluded garden areas (where available).

6.9.2 Landscaping plans that specifically include address how the selected species are appropriate for the habitat type, deliver climate change resilience and benefit biodiversity. Secondary benefits such as food production or air purification will be encouraged.

## 6.10 Objective 9: Providing benefits to the community

6.10.1 The Council will:

- Require developments deliver high quality, multi-functional GBI in line with Building with Nature Standards
- Encourage partnership between departments to identify and deliver suitable opportunities for green social prescribing and prioritise areas within the GBI network

6.10.2 Delivering inclusive designs is key to delivering high quality multi-functional GBI. The Landscape Institute has developed guidance with regards to this which recommends the following (Landscape Institute, 2019):

- Prioritising people and cyclists over vehicles that make up the majority of people's journeys
- Providing seating opportunities for resting (this could be achieved using recycled materials where available)
- Creating more interesting streetscapes to make the journeys more memorable
- Providing a choice of routes whilst minimising unnecessary segregation
- Providing accessible wayfinding and signage
- Taking care with colours and contrasts to avoid confusing people with poor sight to dementia
- Mitigating the effects of topography
- Ensure natural surveillance
- Protecting users from hazards
- Ensure good lighting where appropriate
- Providing well-signed access to drinking water and toilet facilities
- Providing a refuge of calm within busy areas for mental as well as physical, rest and recover.

6.10.3 The benefits of countryside volunteering extend beyond physical improvements to Hastings' greenspaces. The considerable health benefits of outdoor exercise, both mental and physical, are widely accepted. Residents contributing to habitat management within Hastings have the opportunity to meet people and socialise whilst learning new skills, discovering new places, and making a positive difference to their local environment. In a recent study published by Public Health England, 10% of medication prescribed to individuals has no or a harmful effect on the individual (Ridge, 2021).

6.10.4 Furthermore, the Covid-19 pandemic has highlighted the importance of being outdoors for people's physical and mental health and the inequality of access to green spaces. Ridge's review and the NHS Long-term Plan (NHS, 2019) recognises the need to increase social prescribing in tackling the over-prescription of medication and better linkages across the community to ensure individual needs are met. In relation to enhancing and managing the GBI network, The Council has an opportunity to develop and enhance programmes that deliver social prescription using nature-based interventions and activities such as community gardening, green gyms and food-growing projects. To inform the design of these programmes a working group should be developed in partnership between Council departments including primary and secondary care givers, community support and greenspaces management to identify suitable opportunities for green social prescribing and prioritise areas within the GBI network where this could be undertaken.

## **6.11 Objective 10: Delivering economic sustainability for the GBI network**

6.11.1 The Council will:

- Identify key sites for biodiversity net gain offsite compensation within its landholding where funding would have the most impact on benefits to biodiversity. Efforts should be focused on sites with poorer conditions.
- Undertake habitat condition assessments of these sites to establish baseline conditions
- Agree management objectives for these sites and determine the Biodiversity Net Gain units that could be generated.
- Determine a suitable cost per biodiversity units to manage the land for a minimum period of 30 years, including setting up the legal agreements, and monitoring the outcomes to adapt management measures where required.
- Liaise with developers to identify how offsite offset opportunities can be delivered within the GBI network.
- Promote awareness within its departments to ensure the successful delivery of this strategy.

### **Develop natural capital funding strategy**

6.11.2 The main source of funding for sites within Hastings is as follows:

- Hastings Country Park LNR (and overlapping designated sites): management of the Country Park is funded through an existing Higher-Level Stewardship (HLS) Agreement which is in place until 2023. The Council also works with Groundwork South

to deliver specific improvements and activities within the Country Park as part of the Hidden Hastings Heritage Project, which is funded by the Heritage Lottery Fund and other organisations. The costs of managing Hastings Country Park LNR covered by the HLS grant will gradually be transferred to the Environmental Land Management (ELM) scheme in the future. This scheme should be supplemented by Council budgets to fully meet all management objectives.

- St. Helen's Wood LNR & LWS: This designated site is managed by the St. Helen's Park Preservation Society, funded by donations.
  - Marline Wood LNR and Filsham Reed Bed LNR: These designated sites are managed by Sussex Wildlife Trust, funded by donations.
- 6.11.3 Natural Capital funding opportunities refers to financial investments to conserve the value of the natural environment for the long term (Natural Capital Coalition, 2016). Opportunities to attract Natural Capital funding should be explored by the Council to contribute towards the funding of managing open spaces.
- 6.11.4 Considering the above, several developers will be seeking offsite biodiversity compensation to deliver their Biodiversity Net Gain obligations. The funding associated with this should be used by the Council to deliver habitat management within the GBI network. To determine the potential income that could be generated, the Council will need to understand the potential biodiversity units that could be delivered within its landholding. Where offsite compensation is required for a project, developers should discuss requirements with the Council to determine whether this could be delivered within Council owned land in the GBI network. A biodiversity net gain assessment will be required to determine whether the compensation is appropriate and once confirmed, the developer would pay the Council to deliver the required gains.
- 6.11.5 Of note, the income generated through the Biodiversity Net Gain scheme can only be used for habitat improvements to generate biodiversity net gains and cannot be used for other purposes. The Council would need to do a cost-benefit analysis looking at different funding opportunities to determine the most economically viable options.

### **Promote awareness**

- 6.11.6 Education is critical for promoting climate action such that people can understand and address the impacts of the climate and biodiversity crises. Whilst the Council can be a leader in taking action, the successful delivery of this GBI and Biodiversity Net Gain Strategy is to ensure that all employees and residents develop and enhance their knowledge, skills, values and attitudes required to improve habitats within Hastings.
- 6.11.7 This will be achieved by promoting awareness across:
- The Council such that the GBI and Biodiversity Net Gain Strategy can be embedded within the organisation
  - Local communities to ensure they are supported in delivering biodiversity initiatives consistently throughout the borough and following the latest best-practice guidance and also reflecting the Council's vision and aims in this GBI and Biodiversity Net Gain Strategy

- For residents to inspire and guide these so that they better connect with biodiversity and open spaces, and their physical and mental health can benefit
- Provision of workshops for stakeholders (landowners, tenants, local community groups etc) within the Borough with a particular emphasis on protected areas, connectivity corridors and stepping-stones, along with opportunity areas. These would allow landowners to understand how their activities can impact biodiversity and ecosystem services and provide them with an opportunity for them to engage with the Council. Workshops would also provide guidance where opportunities for habitats and nature-based solutions should be focused and prioritised.

### Within the Council

6.11.8 A communication strategy will need to be developed for the Council to promote activities to raise awareness of GBI and its benefits across all social, demographic, ethnic and diversity groups. The communication strategy will need to identify existing uses of GBI across the organisation and local communities.

6.11.9 Whilst effective communication on climate change and the biodiversity crisis are essential in taking action, evidence suggests engaging on climate change can be challenging (Corner & Shaw, 2018). The uncertainty of climate change modelling and its impact on biodiversity, distant impacts that do not affect day to day life and the absence of public and political discourse are key issues in communicating climate change and the biodiversity crisis to the public. It is key to ensure the communication strategy is developed to maintain and enhance this engagement. In preparing the communication strategy, the Council will embed the following principles for effective communication on climate change and biodiversity crisis:

- Being sensitive to public opinion
- Relating information to areas that matter to residents, such as health and well-being
- Outline clear objectives for new initiatives and report on the outcome so that residents can see the achievements within their own communities
- Collating and sharing positive stories across the community.

6.11.10 The Council could also explore training needs within the organisation and also share knowledge with stakeholders. This would be specifically developed such that individuals understand the relevance of their actions in relation to the GBI and Biodiversity Net Gain Strategy. This can be achieved by supporting well-resourced, knowledgeable, and well-trained specialist staff who consult with the relevant departments within the Council and develop a bespoke training programme. Key biodiversity champions across different sectors of the organisation can also be identified that inspire others to act.

6.11.11 Through this process, employees and contractors will be made aware of relevant legislation and policies so they understand their responsibilities and can make informed decisions that ensure the protection and enhancement of the GBI network throughout the borough. For some employees and contractors their actions can directly impact biodiversity, for example where they undertake habitat management, whilst for others such as office-based staff, the link between their actions and biodiversity may

be less obvious. It is therefore essential to consult with the staff before training is provided to understand the training needs.

6.11.12 Identifying measures of improving and enhancing engagement with local communities will also need to be explored.

### **Local communities**

6.11.13 Several community groups exist within Hastings. Volunteers can get involved with nature conservation within Hastings by participating in friends groups (e.g. Friends of Hastings Country Park), Sussex Wildlife Trust and other community groups (e.g. Summerfields Wood and St Helens Wood). Through these work parties, volunteers make improvements to sites, and undertake projects for which there would otherwise be staff or budgetary constraints. Volunteering also enables residents to have a direct role in the management of their local greenspace, thus gaining a greater appreciation and understanding of the special interest of the site in question.

6.11.14 Opportunities occur for the to arrange work parties for the sites they manage. This involvement would develop communication channels between the Council and local communities, and results in greater levels of trust and co-operation. It can also lead to an increased awareness and more responsible behaviour from site visitors.

6.11.15 Training workshops on the GBI and Biodiversity Net Gain Strategy will also help stakeholders understand how best to maximise the delivery of the vision across all activities in the borough.

### **Residents**

6.11.16 The Council can support residents in promoting biodiversity by:

- Increasing its engagement with volunteers
- Promoting community involvement with Greenspaces and their management
- Identifying measures that businesses, residents and landowners can implement to benefit biodiversity. Some of these measures are detailed in Chapter 12 and can be used by residents to enhance the GBI within their local environment.

## **7 Policy recommendations**

7.1.1 Below are a series of considerations that could inform the Local Plan policies and to guide how the objectives of the strategy could be met. It is recommended that the GBI and Biodiversity Net Gain measures should be incorporated throughout the local plan, rather than under a single policy.

7.1.2 To facilitate the delivery of recommendations a checklist of requirements has been prepared in is presented in Appendix 8.

### **Build landscape connectivity and improve habitat resilience**

7.1.3 This can be achieved by:

- Protecting, restoring and enhancing the GBI networks, along with the creation of high quality, multi-functional GBI.
- Opportunities should be sought to improve the connectivity across the GBI network and links to the neighbouring Biodiversity Opportunity Areas.

- All major schemes should demonstrate how the proposed designs deliver connectivity across the development and link to the GBI network analysis and link to the wider network.
- Ensure the GBI network is accessible to all users
- Encourage sustainable modes of transport, where possible.
- Support opportunities to create new habitat that specifically deliver ecosystem services such as reduction of urban heating, carbon sequestration and natural flood management within the GBI network
- Safeguard existing designated sites and species
- Do not support development that have an adverse impact on the integrity of statutory or non-statutory designated sites.
- Develop a Supplementary Planning Document that includes quality standards for GBI
- Encourage projects that have been awarded Building with Nature accreditation
- Require the inclusion of integrated biodiversity enhancements for all new buildings.
- Require the delivery of a 20% biodiversity net gain, evidenced by the inclusion of the latest DEFRA-recognised Biodiversity Metric version current at the time of submission.
- Maximise opportunities to protect existing and increase tree cover, and introduce or extend new hedgerows, setting it within the context of a plan for biodiversity net gain and having regard for the prevalent tree species and landscape character
- Have regard for the changing climate and prevalent tree diseases when selecting species which should preferentially be of native provenance and sourced in accordance with the national strategy for biosecurity.

### **Integrate water management systems**

- Include measures to promote sustainability including energy and water efficiency and flood mitigation measures, such as SUDS
- Ensure flooding downstream is anticipated and aligned with natural flood management systems such as woodland planting and habitat enhancement
- Encourage the enhancement and naturalisation of the shoreline and waterbodies where opportunities arise
- Enhance the existing blue infrastructure network, restoring natural processes, where possible.
- Protect and enhance existing watercourses and open bodies of water
- Promote new open bodies of water as part of new developments
- Require developments to include innovative nature-based designs in response to flood risk, maximising the benefits of natural flood management
- Consider the availability of water and water infrastructure over the life-time of the development
- Require all major development proposals and masterplans to demonstrate a landscape-scale approach to water management.
- Ensure surface water is managed at source to improve water quality, reduce flood risk and enhance biodiversity
- SUDS to be considered for all development and as part of an integrated GBI to reduce run-off and store water

- Ensure a balance is maintained between the protection of the GBI network and provision for urban growth
- Ensure mitigation measures are identified where adverse impacts are unavoidable

### **Plan for future growth**

- Ensure adequate access to natural spaces, particularly in western areas where access to green spaces is limited.
- Require delivery of Biodiversity Net Gain offsite compensation provisions within the GBI network, or a financial contribution, as appropriate
- Ensure the protection and enhancement of existing urban open spaces
- Support the use of land and buildings as new allotments, orchards or community gardens for local food production and growing spaces
- Include the temporary use of vacant or derelict land for community growing spaces
- Development should contribute to the urban greening as a fundamental element of the site and building design
- Measures should include high quality landscape, green roof, green walls and nature based SUDS
- Incorporate measures into development that minimise urban heating
- Major development proposals should demonstrate how communities could be engaged in the management of GBI with long-term stewardship and community ownership models encouraged.
- Require management plans for green spaces to look at multi-functional opportunities, including a focus on biodiversity enhancements
- Financial contributions should include the need to support maintenance of new GBI onsite
- Secure provisions for the future management and maintenance of habitats within the GBI network via planning obligations, where appropriate.

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## Appendix 1: Glossary

Term	Definition
Ancient semi-natural woodland	A parcel of woodland that has existed continuously within the United Kingdom (excluding Scotland) since 1600 at the latest. These woodlands are considered to have developed naturally due to woodland planting being an uncommon practice prior to this date.
Autecology	This is a branch of ecological study which focuses on how an individual organism or single species interacts with its environment, including both biological factors (e.g. other species) and non-biological factors (e.g. climate).
Biodiversity	An umbrella term for the variety of biological life on earth (i.e. living organisms). This term accounts for the abundance, relative frequency and distribution of different species.
Biodiversity net gain	A means of measuring biodiversity as a type of natural capital. This is carried out using a metric which uses proxy measurements to establish baseline biodiversity values (measured as units), which can be compared to projected biodiversity values of a development design to determine if the net difference in units results in a loss or gain.
Brownfield	A site which has been developed on previously. In some instances such sites may not currently hold any permanent structures however they will have done in the recent past.
Carbon sequestration	A process where atmospheric carbon dioxide is captured and stored as another form of carbon or carbon-based chemical compound, thus removing carbon dioxide from the atmosphere. Examples include photosynthesis, where the carbon dioxide is stored as glucose within a plant.
Circuit theory	Circuit theory was developed to describe the flow of electric currents, where the flow of electricity is inhibited by resistance within the circuit. It has found use within ecological modelling, where the movement of organisms across a landscape can be treated as analogous to electrical currents, with flow of movement restricted by factors that cause different degrees of resistance to the movement.
Community (biological)	Two or more populations of different species occupying a defined habitat. Communities can be large scale (e.g. a landmass) or small scale (e.g. microbes living on the surface of a plant root).
Dark corridor	A wildlife corridor which is unexposed to artificial light sources, such that lux levels at night are influenced only by moonlight and starlight. Lux levels therefore tend to be less than one lux (BCT and Institute of Lighting Professionals, 2018). This means that movement of nocturnal animals is not restricted by bright light levels.
Ecosystem	The overall system comprising communities of organisms, their habitats and other non-living influences such as climate.

Term	Definition
Ecosystem service	Natural systems which provide people with benefits such as: water purification, air pollution filtration, carbon sequestration, food sources, and benefits to health and wellbeing.
Environmental net gain	A natural capital concept which uses proxy measurements of ecosystem services to determine an overall baseline value measured in units, which can be compared to projected unit values of a development design to determine if the net difference in units results in a loss or gain. The aim of this concept is to ensure that development results in an improvement to the environment through the creation and enhancement of different ecosystem services.
Generalist species	A species which tolerates a wide range of habitats as it can make use of a wide variety of different resources to thrive.
Green and blue infrastructure	This is defined as a “ <i>network of multi-functional green and blue spaces and other natural features, urban and rural, which is capable of delivering a wide range of environmental, economic, health and well-being benefits for nature, climate, local and wider communities and prosperity.</i> ” (Ministry of Housing, Communities and Local Government, 2021). In terms of ecological connectivity, GBI provide functional networks of spatially distributed habitat to maintain biodiversity and to optimise ecological functions and ecosystem services.
Greenfield	A site which has not been developed on in the past.
Greenway	A path through undeveloped land which provides access to the undeveloped habitat. They are used as a means of connecting people and places through natural spaces.
Habitat of Principal Importance	A habitat type designated by Natural England to be of “ <i>principal importance for the purpose of conserving biodiversity.</i> ” These habitats have been selected due to being under threat or in decline, or if they tend to hold a significant proportion of species of conservation concern. Habitats of Principal Importance are listed under Section 41 of the Natural Environment and Rural Communities Act 2004.
Habitat fragmentation	A process where, either through natural or artificial means, a habitat parcel is separated into smaller, disconnected parcels, such that it is very difficult for species to move between these parcels. In large natural systems, this tends to be offset by habitat succession which restores connectivity, however in the UK habitat fragmentation tends to result in permanent isolation of small habitat parcels, and this can result in declining species numbers and loss of habitat types.
Heat island effect	Describes how urban areas tend to be notably warmer than surrounding rural areas due to a concentration of human activity, buildings and infrastructure.

Term	Definition
Indicator species	A species which can be used to measure ecological conditions due to the species needing specific biological requirements to exist in a location. Examples of this include indicators for habitat types, water quality and air pollution.
Invasive (non-native) species	A non-native species is one which is outside of its natural range (which can be a result of natural and anthropogenic reasons). An invasive species is a non-native species which is known to pose a threat to the native wildlife present.
Irreplaceable habitat	A habitat which would be very difficult, or take a significant amount of time, to replace once it is destroyed. This is due to factors such as unique and rare species, and species compositions resulting from an establishment of conditions and communities over time. Examples include ancient semi-natural woodland, blanket bog, limestone pavement, salt marsh and lowland fen (not exhaustive).
Lower plants	Also referred to as non-vascular plants. A collective term for a group of plants which do not have a vascular system. This includes mosses, liverworts, hornworts, and algae. Lichen also tends to be included within this category although these species also comprise a fungus as well as an alga.
Microhabitat	Used to describe small areas within a larger habitat which differ very slightly to neighbouring habitat due to factors including light and shade levels, small temperature differences, and shifts in humidity. These differences can result in each microhabitat supporting a different communities of specialist species (typically invertebrates, fungi and microbes) in a relatively small area.
Natural capital	Factors within the natural environment which can provide goods and services and as such have economic value.
Nature-based solutions	Using a natural system to solve a societal problem (e.g. health, engineering, economic). An example is the use of 'green gyms' to improve the fitness of a population.
Niche	A specific environmental condition, or combination of conditions, which supports a viable population of a specific species. This includes presence of other species as well as abiotic factors such as climate.
Semi-natural habitat	A type of habitat which has been altered in some way by human activity but is able to support species biodiversity and ecosystem services at a level close to similar habitats which have not been altered by human activity.
Specialist species	Species which have highly specific requirements to thrive. If these requirements are not met, this species will not survive.

Term	Definition
Species of conservation concern	A species which has some element of need for conservation e.g. declining numbers, threat of habitat loss.
Species of Principal Importance	A species listed on Section 41 of the Natural Environment and Rural Communities Act 2006, identified as having importance for conserving biodiversity within England.
Species richness	A measurement of species diversity which counts the number of different species residing within a defined habitat.
Stepping-stone habitats	Habitat parcels which can support several different species, that can provide refuge which allows a species to move between areas of larger habitats.
Successional community	A biological community which readily establish after disturbance of a habitat. This is usually split into early successional communities which establish very quickly within the area of disturbance, and late successional communities which take more time. These communities are transitional and are gradually replaced by more permanent ones. As such they form dynamic habitats across space.
Sustainable drainage systems	Drainage systems designed to mimic natural drainage processes within a development, as opposed to directly channelling surface water through pipes. They are an important means of delivering nature-based solutions with regards to flood management and can increase biodiversity within a development.
Swale (including bioswale)	A swale is a linear depression within the ground and can be natural or artificial. They tend to have shallow sloped sides and often hold water seasonally or at times of heavy rainfall. Bioswale uses vegetation to retain water and so is considered a type of sustainable drainage system.
Vascular plants	Also known as high plants, these are species which have a vascular system of stems, leaves and roots.
Vegetation index	A means of analysing geospatial imagery using the electromagnetic spectrum to determine vegetation density.
Wildlife corridor	An area of habitat (typically linear) which connects wildlife populations between larger habitat parcels, which would otherwise be separated, particularly through areas of human development and infrastructure.

## Appendix 2: Stakeholder engagement summary

8.1.1 Two stakeholder engagement meetings were held (28<sup>th</sup> January 2022 and 19<sup>th</sup> May 2022). The list of organisations that attended are detailed below, along with queries raised and responses.

- Stakeholder session 1 Attendees– 28/01/2022
- Hastings Borough Council officers
- East Sussex Council - Public Health
- East Sussex Council – Ecologist
- East Sussex Council - Landscape
- Rother District Council – Planning Policy team
- High Weald AONB
- Sussex Wildlife Trust
- Woodland Trust
- Natural England
- Environment Agency
- Southern Water
- Marine Management Organisation
- IFCA Sussex
- South East River Trust

### Stakeholder session 2 Attendees – 19/5/2022

- Hastings Borough Council officers
- East Sussex Council - Public Health
- East Sussex Council – Ecologist
- Rother District Council – Planning Policy team
- High Weald AONB
- Sussex Wildlife Trust
- Woodland Trust
- Natural England

**Table 5: Stakeholder engagement queries and responses**

Query	Response
Does the mapping tool take into consideration different types of open space?	Yes, we have considered different types of open space and their contribution to biodiversity and delivery of ecosystem services.
Will the report look at recommendations to improve current sites as well as opportunities for new and increased green infrastructure sites?	Yes, this report has looked at both elements, as these are critical for building resilience across the GBI network.
Could you include the geographical extent of the study (i.e. does it include terrestrial as well as mean low water and marine)?	The study has focused on terrestrial and coastal habitats.
There was mention in the presentation of going further than the 10% net gain requirement to	Yes, justification has been provided in this report.

Query	Response
potentially 20%. Is this backed up with further evidence from local fieldwork or other sources?	
How does the metric for biodiversity net gain take into consideration areas of land under private control (e.g. Gardens) where the level of biodiversity depends on the management which is outside the scope of the councils control?	The metric isn't designed for land under private ownership, but land subject to a planning application. However residents could use the recommendations in Chapter 12 to improve their gardens for wildlife.
Is the study at a strategic level or will this drill down into further details for specific recommendations (e.g. A grassland might be recommended but without knowing soil conditions then proposals may fail)?	The recommendations are strategic, and where habitat is created, further studies may be required to determine the appropriateness of this habitat.
Does the study include links over the borough boundary to rother particularly in relation to areas such as the country parks?	The GBI network includes links across the borough and links to the surrounding areas.
Does the study include assessment of sites which may now be biodiverse but has planning permission/allocations?	Yes, this has been considered.
How have rivers/streams been incorporated into the model in relation to their length and scope outside of the borough boundary?	Blue infrastructure has been incorporated. Impacts from external factors have not been incorporated.
How does this study link with the work being developed on the Local Nature Recovery Strategy?	This GBI study can be shared with stakeholders to ensure a coherent and consistent approach is undertaken across multiple organisations.
How does the following study include issues of climate change alongside the main requirements of the study (e.g. Reg 18 of the plan includes a carbon mitigation site to the north of the borough, how is this covered in the study?).	Carbon mitigation comprises carbon sequestration, habitat resilience and habitat connectivity. All the measures outlined in this strategy are aims to contribute to the Council's carbon strategy and mitigation. Specific measures delivered for carbon mitigation should reflect the recommendations in this report to ensure multiple benefits are delivered across the GBI network.
How is the study dealing with baseline data for biodiversity net gain at a site level?	Methods are provided in this report and were based on desk study information. It is the responsibility of future developers to assess biodiversity net gain for their projects. However this study does provide an indication of impacts, gains and losses associated with future development within Hastings.
Concern that certain protected sites were not included in the network (e.g. SSSIs).	The network was updated to include SSSIs, LNRs and LWS. Parcels of ancient woodland was also included as stepping stone habitat.

**Appendix 3: Statutory and non-statutory designated sites**

Site name	Brief description
<b>Statutory designated sites</b>	
Hastings Cliffs SAC	Selected for presence of Annex I habitat: Vegetated sea cliffs of the Atlantic and Baltic Coasts. This is a rare habitat for the southeast of England. Also contains other maritime habitats including maritime heath and grassland, as well as successional cliff-face vegetation following from cliff-falls caused by erosion of the soft rock.
Dungeness, Romney Marsh and Rye Bay SPA	This is a large SPA that expands well outside of Hastings. Within the Borough, the habitats are primarily the beachfront, including the semi-natural beaches where it overlaps with Hastings Cliffs SAC and Hastings Cliffs to Pett Beach SSSI, and along the entire coastal front of the Borough, where it eventually connects to the adjacent Bulverhythe Shingle Beach and Cliffs SNCI to the west. Within the Borough, the SPA comprises shingle beach, as well as the sandy beaches maintained for public amenity.
Hastings Cliffs to Pett Beach SSSI	The SSSI mostly falls within Hastings Cliffs SAC, and the habitats described above apply here, including littoral sediment and broadleaved, mixed and yew lowland woodland (including ancient semi-natural woodland) The SSSI citation does indicate some units are declining, including the eastern cliffs and the quarries, and the vegetated shingle being in Unfavourable condition, however overall most units are Favourable condition, with Fairlight Glen recovering from Unfavourable.
Marline Valley Wood SSSI	Contains the smaller Marline Valley Woods LNR, but also extends further north. This site comprises predominantly ancient semi-natural woodland, an 'irreplaceable habitat'. The woodland forms around a gill, which contains Atlantic flora, rare in the southeast. Additionally, the woodland composition is uncommon within the UK, being pedunculate oak-hornbeam (birch-hazel variant). The site also contains unimproved grassland, which is declining nationally. Also present are unimproved lowland meadows, sandstone outcrops and a classic Sussex gill stream situated on the edge of Hastings (Sussex Wildlife Trust, 2022). The site is divided into three linked areas: Park Wood at the southern end, Marline Wood in the centre, and Four Acre Wood in the north. All three woods are classified as ancient semi-natural woodland. The site is well-known for its diverse community of rare liverworts and mosses, which can be found growing alongside the gill stream and on the sandstone outcrops within the wood. The humid gill woodlands support a unique community of rare ferns and lower plants as well as populations of broad-leaved and violet helleborine. The woodlands support breeding willow tit, firecrest, nightingale and hawfinch. Insects such as white admiral and purple hairstreak are also present. The meadows support common spotted orchid, dyer's greenweed and yellow rattle, alongside many other wildflowers. Many different butterfly species use these meadow habitats, including grizzled skipper and green hairstreak (Hastings Borough Council, 2022a).
Combe Haven SSSI	A large SSSI, of which the eastern third falls within the Borough. This overlaps with Filsham Reed Bed LNR and LWS, but also extends further north, bordering Wishing Tree LWS and Old Filsham Golf Course LWS. This SSSI includes the catchment of the Combe Haven as it passes through this undeveloped area of the borough. The fen vegetation, alluvial meadow and reedbed are all nationally important, and are of significant importance to the local bird population. As the geology is slightly different to the majority of the borough (Wadhurst Clay), the floral communities differ, resulting in more biodiversity within the Borough.
Marline Wood LNR	See summary for Marline Valley Woods SSSI (which encompasses this LNR).
Ponds Wood LNR	Contains ancient semi-natural woodland in addition to deciduous woodland HPI not qualifying as ancient, but still holding important value. The woodland is connected with transitional meadow habitats, and standing and running water is present, including the Hollington Stream. The wood provides an important wildlife corridor within the urban area of Hollington, as it is the most significant natural open space in the Gillsmans Hill and Hollington area of the borough. It provides easy access for residents to experience a high-quality natural asset within the urban environment. One of the main features of the LNR is the ancient semi-natural woodland with a ground flora of wood anemone, bluebell, dog's mercury and moschatel. The woods are one of the few places in Hastings where barren strawberry grows in abundance. The Hollington Stream supports a dense carpet of ramsons, wild celery and ferns (Hastings Borough Council, 2022e).
Summerfields Wood LNR	Semi-natural deciduous woodland, which covers a network of streams and ponds. This site is locally important for birds, including both migrants and residents, as well as supporting a large population of badger. It is an important wildlife corridor, surrounded by suburban and urban areas, including St Leonards Silverhill and Hollington.
Filsham Reed Bed LNR	A large reedbed, situated in the larger Combe Haven SSSI. The reedbed also supports a network of ditches, and the Combe Haven passes through the site.
St Helen's Wood LNR	Also referred to as St Helens Park, this site contains a network of ancient semi-natural woodland surrounding large and small glades of the highly distinctive lowland meadow habitat, with a series of ponds. It is an important site for plants and invertebrates as well as terrestrial and arboreal mammals. The woods have an extensive footpath network for people to enjoy the habitats and natural open space. The meadow supports colonies of common spotted-orchid, green-winged orchid, as well as a host of meadow and woodland flora. In summer, the meadows support large communities of insects (Hastings Borough Council, 2022f).

Site name	Brief description
Old Roar Gill and Coronation Wood LNR	<p>Old Roar Gill is a deeply cut, narrow ancient gill woodland valley site feeding into two ponds with very dense carr habitat. The micro habitat supports unique diversity of mosses and liverworts. This site leads into the upper reaches of Alexandra Park, which is a historic public garden park important for drainage within the Borough.</p> <p>The gill is rich in ferns, mosses and liverworts, supporting ancient woodland flora including bluebell, wood anemone and wood-avens. The scarce parasitic plant, toothwort, is a feature of the gill and the park.</p> <p>The deadwood present in the stream and on the woodland floor supports many rare and scarce invertebrates including the endemic crane fly <i>Lipsothrix nervosa</i>, and the nationally scarce door snail (<i>Macrogastra rolphii</i>) (Hastings Borough Council, 2022d).</p> <p>However, the field survey undertaken by SWT Ecology Services recorded various patches of rhododendron (listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) as an invasive non-native species).</p>
Church Wood and Robsack Wood LNR	<p>The site is almost entirely remnant ancient woodland and meadow complex, which used to cover much of the Hollington area, but is now significantly reduced. Notable features include hornbeam coppice, streams, gill woodland and a vetch-dominated meadow flora, Robsack Meadow.</p> <p>The reserve provides a valuable and unique area of natural open space for residents and visitors to enjoy. The recently-cut coppice and woodland edge around the meadow supports a rich invertebrate community, with bats making use of the woodland edge as an important commuting corridor (Hastings Borough Council, 2022b).</p>
Hastings Country Park LNR	<p>As the largest area of public open space in the borough (covering 345 ha of habitat and 5 km of cliff and coastline), the LNR incorporates Hastings Cliffs SAC, a stretch of Dungeness, Romney Marsh and Rye Bay SPA/Ramsar, and Hastings Cliffs to Pett Beach SSSI. In addition, it also comprises a complex of maritime cliff and slope habitats, including maritime grassland and heathland, as well as sustainably-managed farmland in mosaic with ancient gill woodland, with waterfalls supporting the Atlantic flora. The farmland is managed in a sustainable manner, including conservation grazing using belted Galloway cows, and Exmoor ponies. The LNR is of high importance for low plants including bryophytes and lichens, as well as invertebrates.</p> <p>Many rare and scarce liverworts, mosses and lichens occur within the gills. Peregrine falcon, black redstart and fulmar breed on the cliffs. Dartford warbler, stonechat and yellowhammer breed on the gorse-covered hillsides.</p> <p>A large population of hazel dormouse occurs within the woodland areas, and stoat and weasel are also regularly observed.</p> <p>Within the LNR there are also heritage designations including scheduled ancient monuments such as an Iron Age fort, and the site is known to be an area of archaeological importance.</p> <p>The LNR is situated within the High Weald AONB.</p>
Beachy Head East MCZ	<p><i>“Beachy Head East Marine Conservation Zone (MCZ) is an inshore site - It lies between Beachy Head lighthouse in the west and Hastings pier in the east. The MCZ extends just beyond 6 nautical miles offshore (Curtis et al., 2014). Beachy Head East has a sandstone/chalk reef system which provides a variety of habitats for a wide range of species”</i></p>
Non-statutory designated sites	
Beauport Park (LWS)	Old historic parkland with mosaic of habitats including woodland, woodland coppice, ancient woodland remnants, old fields, arboretum. Site also incorporates golf course and caravan park
Broomgrove (LWS)	Relatively undisturbed mature scrub complex including areas of semi-mature woodland and open grassland. Amenity and wildlife value.
Bulverhythe Shingle Beach and Cliffs (LWS)	Maritime cliffs of rough grassland at high risk of erosion. Vegetated shingle with rare plants including sea kale and long horned poppy.
Castle Hill (LWS)	Castle site with recreation and wildlife value. Sandstone outcrops with only known population of lesser calamint in borough. It also has significant archaeological value. It bounds a public park (West Hill).
Caves Road Cliffs (LWS)	Cliff face, providing undisturbed habitat with abundant and diverse flora and fauna and providing aesthetic value to area.
Church Wood (LWS)	Remnant ancient woodland and meadow complex. Notable features of hornbeam coppice, ghyll woodland and vetch dominated meadow flora.
Clive Vale (LWS)	Semi natural wooded stream habitat surrounding two reservoirs. Important as a wildlife corridor and for passive recreation. At risk of development – has been cleared by landowners in the past to facilitate development.
Filsham Reed Beds (LWS)	Reedbed site, designated LNR and component of Combe Haven SSSI.
Foul Ness (LGS)	Cliffs and foreshore exposing Ashdown Formation sandstones, siltstones and mudstones and the overlying lower Wadhurst Clay Formation (Cliff End Sandstone and overlying shales). Foul Ness Fault is exposed at the centre of the site.
Glyne Gap (LWS)	Marshy grassland and reedbed, part of more extensive wetland complex of Combe Haven SSSI
Hastings Cemetery (LWS)	Semi natural woodland with limited access. Some good open areas with notable wild flower with scope to extend with more sensitive grassland management.
Hastings Country Park (LWS)	Falls within Hastings CP LNR incorporating SSSI site. Coastal, heathland and wooded habitats with open agri-environment farmland and recreational access.
High Street and All Saints Wall (LWS)	Major vegetated sandstone walls unique to Hastings and supporting a range of specialist plants. Records of black spleenwort were recorded here.
Hollington Valley (LWS)	Major stream corridor incorporating ancient semi-natural woodland with diverse ground flora, meadows with willow carr and water dropwort, diverse meadow flowers, wooded stream habitats (including Hollington Stream), open running water and pond.
Holmhurst St Mary (LWS)	Habitat matrix with open semi natural woodland and orchard with diverse grassland understorey, semi mature mixed woodland, rough meadow, hedgerows and pond.

Site name	Brief description
Little Galley Hill (LGS)	About 450m of low cliffs up to 10m high, and wavecut platform exposing Lower Ashdown Formation. Occasional emergence of submerged forest. Dinosaur footprints also found
Marline Valley Woods (LGS)	Massive Ashdown sandstone blocks have been undercut by a stream to form a typical Wealden ghyll, with a waterfall.
Marline Valley Woods (LWS)	Site of extensive ancient and ghyll woodland with associated uncommon flora and fauna.
Ochiltree Woods (LWS)	Relatively undisturbed semi-natural broadleaved woodland dissected by stream and field with species rich ground flora.
Old Filsham Golf Course (LWS)	Semi improved grassland with wetland components, mature semi-natural woodland and scrub. Forms part of a large mosaic habitat including Filsham reedbed LNR and Combe Haven SSSI.
Old Roar Gill & Coronation Wood (LWS)	Ancient Ghyll Woodland site feeding into two ponds with very dense carr habitat. The micro habitat supports unique diversity of mosses and liverworts
Ponds Wood (LWS)	Semi natural and ancient woodland and transitional meadow habitats with a stream and pond. Wildlife corridor and recreational value
Rock-a-Nore Shingle Beach (LWS)	Disturbed vegetated shingle beach supporting a diverse range of adapted flora
South Saxons (LWS)	Wetland habitat of open water, reedbed and carr. Dry habitat of rough grassland and meadow with grass vetchling,
St Helens Wood (LWS)	Overlaps with St Helens Wood LNR – same habitats. There is a small section to the northeast which is in addition to the LNR – this is additional woodland as well as park-style grassland.
Summerfields Wood (LWS)	Semi natural woodland with stream and ornamental neglected ponds. Areas of diverse tree species and home to large population of badgers and important area for migratory and resident birds
Wainwright Close (LWS)	A small urban wildlife area consisting of species rich grassland, scrub and pond, with mature hedgerows bounding the entire site. Recreational and wildlife value.
West St Leonards Railway Embankments (LWS)	Undisturbed railway embankment providing a corridor of mature woodland, scrub and tall herb vegetation.
Wishing Tree (LWS)	Habitat matrix with semi-improved meadow with abundant ant communities and mature hedgerows, a reservoir with marginal marshy vegetation and native flora and semi natural woodlands with dead wood and open glades.
<b>Biodiversity Opportunity Areas</b>	
Romney Marsh Area (ID 57)	Overlaps with Hastings Country Park, but mainly falls outside of the Borough. The relevant features are primarily the same as those that have resulted in the designation of Hastings Country Park LNR, and the SSSI, SAC and SPA areas which fall within the LNR (see designated sites, below). This includes Hastings Cliffs, which are an area of actively eroding soft cliffs, important for their cliff-face vegetation community. There are also ancient woodland, maritime grassland and vegetated shingle, all of which support rare lichens, bryophytes, beetles and vascular plants.
Combe Haven & Marline	Overlaps with Filsham Reed Beds LNR, Combe Haven SSSI and Marline Valley Woods SSSI and LNR. Old Filsham Golf Course LWS and Wishing Tree LWS also overlap. The relevant features are primarily those that have resulted in the designation, including extensive wetlands, as well as ancient woodland including Marline Valley and Queens Wood, which are notable as they extend into the more urban areas of the borough.
Hastings Fringe	Bounds the northeast of the borough, and comprises the land north of the B2093 (The Ridge). This BOA presents the opportunity to link up ancient and semi-natural woodland, grassland and hedgerow, including woodland supporting Atlantic flora, rare in the southeast UK.

## Appendix 4: Habitats in Hastings (Hastings Borough Council, 2022c)

### Urban

Hastings consists of many constructed, industrial and artificial habitats. Urban habitats are extremely diverse and examples include parks, cemeteries, vacant lots, streams and lakes, gardens and yards, campus areas, golf courses, bridges, airports, and landfills.

Examples of urban areas are provided in Plate 1.

### Plate 2: Urban habitats within Hastings



Castle Hill Passage (TQ 81957 09501)



Town Centre (TQ 81834 09430)



Warrior Square Gardens (Greenspace Compartment 107)



Devonshire road (TQ 81595 09617)



Example of industrial area on Bridge way (TQ 77474 08486)



View from Bourne Car Park of All Saints C of E (Greenspace Compartment 10)

These habitats are highly dynamic, influenced by both biophysical and ecological drivers on the one hand and social and economic drivers on the other. Urban landscapes often represent cases of extreme habitat fragmentation (Elmqvist, 2008)

Parks and gardens make up a large area of open space within Hastings Borough and can be outstanding for wildlife and play a crucial role in the conservation of some species (Hastings Borough Council, 2022).

Some of the wildlife highlights of parks and gardens include toothwort in Alexandra Park, purse-web spider at White Rock Gardens, and great crested newt breeding in garden ponds.

Seven species of orchid have been recorded growing in parks and gardens in Hastings and St Leonards and include broad-leaved helleborine (*Epipactis helleborine*), autumn lady's-tresses (*Spiranthes spiralis*), common twayblade (*Neottia ovata*), early-purple orchid, green-winged orchid, bee orchid, and common spotted orchid (Hastings Borough Council, 2022).





Two listed historic parks and gardens are present within Hastings Borough: Alexandra Park and St. Leonard's Gardens.

In addition to the listed sites, nine additional public parks and gardens are present.

This list does not include the various private-access gardens that are present within Hastings, such as Markwick Gardens in St Leonards, which has restricted access to members of the Markwick Gardens association.

Other areas of open space, as defined by Ordnance Survey, are presented in Table 6.

**Table 6: Types of open space**




Feature	Definition	Photograph example
Allotments Or Community Growing Spaces	Areas of land for growing fruit, vegetables, and other plants, either in individual allotments or as a community activity. Produce is for the growers own consumption and not primarily for commercial activity (Ordnance Survey, 2021).	 <p>3</p>
Amenity - Residential or Business	Landscaped areas providing visual amenity or separating different buildings or land uses for environmental, visual or safety reasons. Where the area is better described by another category this will be used in preference (e.g., playing field, public park, play space) (Ordnance Survey, 2021).	 <p>4</p>
Amenity - Transport	Landscaped areas providing visual amenity or separating different buildings or land uses for environmental, visual or safety reasons when related to a transport function, such as a road, or within a transport hub (Ordnance Survey, 2021).	 <p>5</p>  <p>6</p>
Land Use Changing	Area of land underdeveloped or waiting to be developed (Ordnance Survey, 2021).	
Bowling Green	A specially prepared area intended for playing bowls (Ordnance Survey, 2021).	
Camping Or Caravan Park	An organised area of ground designated for tents or caravans, intended for temporary occupation by holidaymakers (Ordnance Survey, 2021).	

<sup>3</sup> Bos field allotments (Greenspace Compartment 29) (TQ81941127)

<sup>4</sup> Residential land surrounding (Greenspace Compartment 83b) (TQ79071152)

<sup>5</sup> St Leonards Warrior Square Train Station (TQ80340940)


<sup>6</sup> A railway wildlife corridor near Greenspace Compartment 95 (TQ78640976)

Feature	Definition	Photograph example
Cemetery / religious grounds	Areas of land associated with burial areas or crematoriums with churches and other places of worship (Ordnance Survey, 2021).	 <p>7</p>
Golf Course	A large area of land that is specially prepared for playing golf (Ordnance Survey, 2021).	
Institutional Grounds	Areas of land normally enclosed and associated with institutions. Grounds may be reserved for private use or have restricted access. Includes Universities, Hospitals, Nursing homes, Emergency Services, Prisons, Military Sites, Government and Community Buildings providing public services, Libraries, Museums, Zoos and Theatres (Ordnance Survey, 2021).	
Natural	Land use areas with no other function but with Form attribute of woodland, open semi-natural, open water, beach or foreshore (Ordnance Survey, 2021).	Examples provided in the text below.
Other Sports Facility	Land used for other sports not specifically described by other categories. Includes facilities for sports spectating (e.g., stadiums) as well as participation (Ordnance Survey, 2021).	
Play Space	Areas providing safe and accessible opportunities for children's play, usually linked to housing areas or parks and containing purpose-built equipment. Not captured if within schools or paid-for tourist attractions (Ordnance Survey, 2021).	 <p>8</p>
Playing Field	Large, flat areas of grass or specially designed surfaces, generally with marked pitches, used primarily for outdoor sports, i.e., football, rugby, cricket (Ordnance Survey, 2021).	 <p>9</p>

<sup>7</sup> All Saints C of E Church (Greenspace Compartment 10) (TQ82770989)

<sup>8</sup> Children's playground (Greenspace Compartment 30) (TQ81851111)

<sup>9</sup> Old helipad (Greenspace Compartment 81) (TQ78371195)

Feature	Definition	Photograph example
Private Garden	Areas of land normally enclosed and associated with private residences and reserved for private use (Ordnance Survey, 2021).	 <p>10</p>
Public Park or Garden	Areas of land normally enclosed, designed, constructed, managed and maintained as a public park or garden. These normally have a defined perimeter and free public access, and generally sit within or adjacent to urban areas. Access is granted for a wide range of uses and not usually restricted to paths or tracks within the area. May include areas with managed facilities such as benches and flowerbeds, and more natural areas (Ordnance Survey, 2021).	Photographs provided below.
School Grounds	Areas of land normally enclosed and associated with a school and primarily reserved for their use (Ordnance Survey, 2021).	
Tennis Court	A specially prepared area intended for playing tennis (Ordnance Survey, 2021).	

<sup>10</sup> Community Garden on site of old pub in old town (TQ 82443 09583)

### Alexandra Park

A very large, listed historic public park, which has a great importance for public access to green space as well as importance from a historical perspective. The park lies within a large valley. Most prominent is the series of large ponds which are fed by many of the gills throughout the borough, as well as a lot of the surface runoff that is collected from the surrounding area. The lower ponds support a natural filtration system comprising floating vegetation islands with deep-reaching roots. These help to purify the water so that is clean enough to feed into the sea. Historically, the park started out as a waterworks. Two ponds are managed for angling, and all other ponds are managed for wildlife.

Around the ponds are several ornamental gardens as well as pathways and lawns, with various themes and planting styles, mainly within the southern section of the park. There is also native planting, including some purposefully separate ecological zones, as well as some mature trees with veteran features. The northern section of the park comprises semi-natural woodland, where it transitions into the adjacent Old Roar Gill & Coronation Wood LNR/LWS.

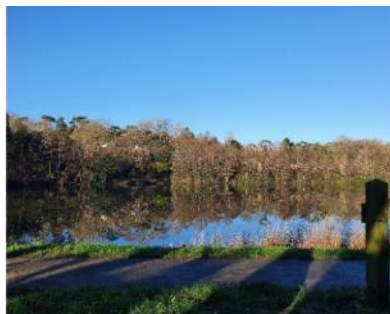
The park is also an arboretum, and this is an important characteristic of the park's history and as such the non-native trees within the park's boundary form a part of the arboretum collection and have important amenity value. The park additionally supports a miniature railway, and there are plans to implement a designated cycle path through the park.

Photographs of Alexandra Gardens are provided in Plate 2.

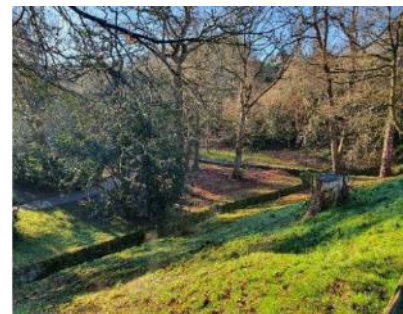
#### Plate 3: Alexandra Park



Alexandra Park (Compartment 62A) (TQ6156410419)



Alexandra Park (Compartment 62a) (TQ80651089)



Alexandra Park (Compartment 62a) (TQ80621087)

### Amherst Gardens

A small public garden, of which the majority comprises tennis courts. The garden is bounded by a line of trees, and the main pathway across the garden is punctuated with young ornamental tree planting. The small amount of grass habitat comprises closely-mown amenity lawn.

### Cornwallis Gardens:

This historic public park is sited on what was originally a meadow. The garden comprises amenity grassland with a proportionally large covering of trees, which creates shade. The garden is situated close to the built-up urban centre of Hastings and as such it is an important amenity green space for those living in the town. An example photograph is provided in Plate 3 (Greenspace Compartment 69) (TQ8130409563)

#### Plate 4: Cornwallis Gardens



#### Gensing Gardens

A historic public garden, with close-mown lawn in mosaic with a mix of ornamental and native planting, including trees and shrubs, bounded by a mixed hedge. Has high amenity value, situated within the built-up area of St Leonards. The native trees are a mix of semi-mature and mature – there are no truly old trees within the gardens. Like many of the grassy areas within Hastings, the site does not drain well and as such tends to become waterlogged during times of heavy rain. A pond used to be present, up until the 1960s.

Example photographs are provided in Plate 4.

#### Plate 5: Gensing Gardens



Gensing Gardens (Compartment 102) (TQ79980967)

#### Linton Gardens

A large historic public garden, which is situated on a natural slope, and as such the park comprises a series of levelled steps. The garden is situated close to the built-up urban centre of Hastings and as such it is an important amenity green space for those living in the town. The park is a mixture of lawn, scattered trees and a small, open woodland. Small sections of the lawn areas support various stands of flowers and other herbs.

### **St Leonard's Gardens**

A large, listed historic public garden, built on a natural slope, supported by sandstone walls. It comprises amenity lawn with ornamental planting, including non-native species such as rhododendron, as well as some native trees and shrubs. At the bottom of the park, there is a large ornamental pond, which has steep concrete banks, and little to no opportunity for bankside vegetation, although an emergent vegetation stand is present in the northwest of the pond, and water lilies cover a large portion of the surface. The park is an important green space provision in an otherwise built-up area of the borough. It is used by dog-walkers, and all dogs must be kept on a lead. The uninterrupted view to the sea is an important feature of this garden. An example photograph is provided in Plate 5 (Greenspace Compartment 100) (TQ79880913).

### **Plate 6: St Leonards Gardens**



### **Warrier square gardens**

A series of square/rectangular open green spaces situated close to Hastings' coast. The northern two sections are separated from the smaller southern section by a main road. The gardens have been designed with ornamental features in mind, and as a result species present are mainly ornamentals, including palms. There appear to be a handful of native trees planted on the boundary. The northernmost section comprises an ornamental rose garden. The open view of the sea is an important feature of this park. Bed planting includes ornamental bulb planting such as tulips. The park is an important green space provision in an otherwise built-up area of the borough. It is used by dog-walkers, and all dogs must be kept on a lead. An example photograph is provided in Plate 6 (Greenspace Compartment 107) (TQ 80531 08990)

## Plate 7: Warriar Square Gardens



### **Wellington square gardens**

A small grassy square within the town centre, surrounded by very urban, built-up environment of tall, terraced housing. The grass is regularly mown to a short sward, and the centre of the square supports ornamental non-native planting, including a palm. Several mature native/naturalised trees line the boundary of the square. The park supports some amenity value, with benches present for visitors.

### **West Hill**

An open public field, used frequently by dog walkers and pedestrians. Conjoins with Castle Hill LWS, which comprises much less managed, semi-natural habitat including scrub and grassland. The park tends to become waterlogged during periods of heavy rain, as the clay soils have limited capacity for drainage.

### **West Marina Gardens**

Appear to sometimes be referred to on mapping as 'Grosvenor Gardens'. This is a medium-sized historic public garden, of which about a quarter is taken up by the West Marina Bowls Club green. The garden is otherwise predominantly amenity lawn, with ornamental planting alongside some of the pathways. It is situated on the coastal front, and the sea view is an important feature. A photograph is presented in Plate 7 (Greenspace Compartment 99a) (TQ 78955 08783).

### Plate 8: West marina gardens



#### **White Rock Gardens**

Mainly comprises sports facilities and is used for recreational purposes.

#### **Recreational grounds**

In addition to the parks, numerous recreational grounds occur, including Bulverhythe, Tilekiln and Sandhurst. These are all very similar in nature – they are large areas of mown grassland which are used by members of the public for various amenities, including sports and general outdoor exercise, dog walking, relaxation and commuting. A theme across these fields is that they do not drain well. Bulverhythe Recreational Ground does have a boundary ditch, which aids in its drainage, but otherwise these sites tend not to have any drainage solutions. This results in significant waterlogging of the ground during periods of heavy rain, which reduces their amenity function.

#### **Coastal**

Hastings sits where the High Weald meets the sea. The High Weald is a ridge of sands and clays created by the deposition of sand and silt by rivers and estuaries millions of years ago, raised up by movements in the earth's crust and eroded by ice and rain over thousands of years to the shape it is now. It extends south from Tunbridge Wells down to the English Channel here in Hastings.

The coast of Hastings is a cross section of the High Weald cut out by the sea, the best example of this being the sandstone and clay cliffs at Hastings Country Park Nature Reserve (Plate 8)

### Plate 9: Maritime cliff and slope habitat



View of cliffs from Rock-a-Nore car park which includes a local geological site, local wildlife site, local nature reserve and SSSI and showcases the maritime cliff and slope habitat.



Maritime cliffs and slopes (Compartment 47) (TQ8299509548)

Similar soft rock cliffs also occur at West St Leonards and Glyne Gap. Soft rock cliffs made of sands and clays are one of the richest habitats for wildlife in Britain, especially for insects and spiders. They are also home to several specialist cliff breeding birds such as black redstart, fulmar, peregrine and rock pipit.

The shingle beach that extends along the coast is created mainly from the deposition of flints moved eastwards from the chalk cliffs further west at Beachy Head and deposition of more local sands.

In the intertidal zone (the part of the beach that is exposed at low tide) the underlying sandstone bed rock is visible in places such as Goat Ledge and Lee Ness Ledge. Most of the intertidal zone is covered by sand and mud which is very rich in marine invertebrates that provide food for gulls and waders at low tide (Hastings Borough Council, 2022).

#### **Amenity shingle beach**

The majority of the Hastings seafront comprises amenity beaches, including Bulverhythe Beach, St. Leonards On Sea Beach, and Hastings Beach. These beaches are accessible to the public, connected by a raised coastal path running parallel to the beach which has accommodation for cyclists. Several beach huts are present along the beach.

At the eastern end of Hastings Beach is a small amusement park, with a pedalo lake. Further east from here, between the amusement park and Rock-A-Nore car park, is the centre for the fishing fleet, alongside multiple buildings used by the fishing industry. Hastings Pier juts out into the sea opposite from the White Rock Theatre, which partially shades a small portion of the beach beneath it.

The beaches are primarily composed of shingle, and groynes are present at strategic locations to prevent excessive movement of the shingle along the beaches. Due to their amenity use, they are managed such that vegetation growth is restricted. As the seafront has little green infrastructure in general, this results in a fairly barren beach which has little capability of

connecting the two HPI coastal vegetated shingle beaches of Bulverhythe Shingle Beach and Cliffs LWS and Rock-A-Nore Shingle Beach LWS.

### Coastal and floodplain grazing marsh

Grazing marsh is defined as periodically inundated pasture, or meadow with ditches which maintain the water levels, containing standing brackish or fresh water. The ditches are especially rich in plants and invertebrates. Almost all areas are grazed, and some are cut for hay or silage. Sites may contain seasonal water-filled hollows and permanent ponds with emergent swamp communities, but not extensive areas of tall fen species like reeds, although they may abut with fen and reed swamp communities (Hastings Borough Council, 2007).

Coastal and floodplain grazing marsh is found in:

- Glyne Gap LWS
- Combe Haven SSSI
- South Saxons LWS

### Coastal vegetated shingle

At Glyne Gap the shingle beach is undisturbed and stable enough for vegetated shingle to develop. Vegetated shingle is a globally scarce habitat and is home to a range of nationally rare species such as sea kale and the jumping spider (*Sitticus inexpectus*) (Hastings Borough Council, 2022).

Plants will grow among shingle on sheltered coasts only where:

- Sand or other fine material is mixed with the shingle.
- Seaweed or other organic material provides nutrients (Nature Scot, 2022).

Coastal habitat examples are provided in Plate 9.

### Plate 10: Coastal habitats



Hastings sea front (TQ 77512 08424)



Shingle beach (TQ 77512 08424)



Along sea front Compartment 99 (TQ 79877 08797)

### Woodlands

**Ancient semi-natural woodland and other lowland, mixed, deciduous woodland, lowland wood pasture and parkland and wet woodland**

Hastings supports woodland habitat that includes ancient woodland, considered to be an irreplaceable habitat under the National Planning Policy Framework (NPPF) 2021. While much of the woodland can be classified as Lowland Mixed Deciduous Woodland, there are also parcels of wet woodland, including Speckled Wood, situated in the Ore Valley.

Most of the important and larger woodlands in Hastings contain gill woodland. The word gill comes from the Norse 'gil' meaning steep sided ravine (Hastings Borough Council, 2022h).

Old Roar Gill, Marline Valley, Churchwood and the glens of Hastings Country Park Nature Reserve are classic examples of woods with steep sided valleys cut out of the sandstone bedrock by thousands of years of erosion by freshwater streams (Hastings Borough Council, 2022h). These woodlands all form important areas within many of the designated sites present within the borough.

Given their biodiverse nature, many of these are afforded statutory and non-statutory protection, including:

- Old Roar Gill LNR
- St Helen's Wood LNR
- Ponds Wood LNR
- Church Wood LNR
- Marline Valley Woods LNR/SSSI/LWS
- Summerfield's Wood LWS
- Hastings Country Park LNR
- Hollington Valley LWS
- Speckled Wood

Example photographs are provided in Plate 10.

**Plate 11: Woodland habitats**



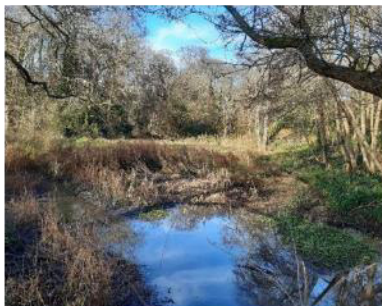
St Helens Wood (Greenspace compartment 18) (TQ812861475)



Speckled wood (Compartment 39) scrub and woodland (TQ83321137)



Old Roar Gill & Coronation Wood LNR and LWS (Greenspace Compartment 62) (TQ804331478)



Old Roar Gill & Coronation Wood LNR and LWS (Greenspace Compartment 62) (TQ8057011132)



Summerfields Wood LNR & LWS (Greenspace Compartment 67) (TQ8105109666)



Marline Valley Woods SSSI/LNR/LWS (Compartment 74) (TQ7822712398)

### Other woodland habitat

Aside from semi-natural woodland, Hastings supports many other non-priority woodland habitat parcels, particularly in the more suburban areas. These woodlands tend to have been planted up for amenity purposes (e.g. through garden landscaping) or as screening alongside main roads or around business parks. Generally, this habitat remains primarily deciduous, although for some parcels there is more of mixture of deciduous and evergreen species, particularly where woodland has been created for aesthetic landscaping purposes.

A large portion of the woodland within Hastings, including many of the ancient semi-natural woodland parcels, is under pressure from invasive non-native species encroachment. Both rhododendron and cherry laurel are extremely frequent within the woodland habitats, either purposefully planted for ornamental means, or as escapees which have propagated from gardens and garden waste. These species spread very readily, with rhododendron (specifically *Rhododendron ponticum*) being listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) due to its threat level to native wildlife.

Where these species have become prevalent, they are outcompeting the native shrub layer, and their dense evergreen foliage is resulting in a barren ground flora, which is overall reducing the condition of woodland within the borough.

### Grassland

Hastings supports a mixture of neutral and acid grasslands growing on the underlying sands and clays. The grasslands provide a diverse habitat and support many protected and rare species (Hastings Borough Council, 2022).

#### Amenity grassland

Amenity grassland (also referred to as modified grassland due to its typical management) is the most common grassland habitat across Hastings. It can be found in the most urban and the most rural regions, in the form of roadside verges, public parks, recreational grounds, commercial landscaping and private gardens.

The condition of the amenity grassland borough-wide varies, with differences resulting from varied management practices, differing land uses and baseline soil composition. However in general, these grassland parcels are regularly mown throughout the year, and are dominated by palatable grasses such as perennial rye-grass, predominantly supporting common species tolerant of intensive management practices such as daisy, white clover and dandelion.

In areas where amenity grassland has been recently disturbed, for example where development has paused, stands of tall ruderal plants such as nettle and thistle occur. These ruderal habitats are also found frequently alongside roadside verge margins.

Amenity grassland tends to have only limited drainage capabilities compared to other habitats, and as Hastings does not currently support many SuDS, these amenity grassland habitats tend to suffer from waterlogging. Where these grasslands receive a lot of foot traffic, such as recreational parks and gardens, footfall through the wet soil results in larger areas of bare ground being generated and reduces the effectiveness of these grasslands as amenity spaces.

### Species-rich neutral grassland (not qualifying as HPI)

The best examples of unimproved species-rich neutral grassland can be found at Marline Valley LNR, St Helens Park LNR and Hastings Country Park LNR. Acid grassland and heath can be found at Hastings Country Park LNR within Warren Glen and the Firehills (Hastings Borough Council, 2022).

Aside from this, species-rich neutral grassland is present in small pockets in areas of the borough which have remained undeveloped, particularly as larger woodland glades, and where sites qualify as LWS' (e.g. Castle Hill LWS). These parcels do not appear to receive a regular mowing regime and as such tussocks have formed, which provides good habitat for reptiles, amphibians, small mammals and invertebrates. In many cases, these grasslands form a mosaic with scrub (particularly bramble and mixed scrub), where they gradually transition into woodland.

Species-rich neutral grassland within Hastings that does not qualify as lowland meadow HPI habitat is at risk of loss due to development. This is because suitable sites for development is very limited within the built-up urban centres, and in the more rural areas the incised valleys further reduce available area as the valleys are very steep and unsuitable for building on. As such, to meet the demand of commercial and residential development, some parcels of species-rich neutral grassland have been flagged as allocated development sites, to avoid impacting on habitats of a higher distinctiveness.

### Lowland meadow

Lowland meadow includes most forms of unimproved neutral grassland across the enclosed lowland landscapes of the UK. These generally support *Cynosurus cristatus* - *Centaurea nigra* grassland, *Alopecurus pratensis* - *Sanguisorba officinalis* floodplain meadow and *Cynosurus cristatus* - *Caltha palustris* flood-pasture National Vegetation Classifications (Joint Nature Conservation Committee, 2022).

Lowland meadows are found within Marline Valley Woods SSSI/LNR/LWS.

Semi-improved grassland occurs on a wide range of soils and may be derived from grassland priority habitats following agricultural improvement (Magnificent Meadows, 2022).

Examples of good quality semi-improved grassland that are within the Hastings are:

- St Helens Wood
- Hasting Country Park
- Ponds Wood LNR
- Filsham Reedbed LNR

### Other grassland habitats

Lowland dry acid grassland does not exist within Hastings, however examples of acid grassland do occur.

The sandier free draining soils in the east of Hastings are much more acidic and acid grassland develops.

Hastings Country Park contains areas of acid grassland.

Acid grassland has less species of wildflowers growing in it but contains more specialised species and it is on these soils that dwarf scrub communities consisting of heather, bell heather and dwarf gorse develop (Hastings Borough Council, 2022).

Example photographs of grassland habitat are provided in Plate 11.

### Plate 12: Grassland habitat examples



South Saxons Local Wildlife Site  
(Greenspace Compartment 95)  
(TQ78690932)



View of Filsham Reed Beds LNR  
(Greenspace Compartment 93).  
It also overlaps with Combe Haven SSSI (TQ78490993).



Grassland, woodland and scrub habitat (Greenspace Compartment 73) (TQ78341310)



Hastings Country Park  
(Greenspace Compartment 1)  
(TQ85971166)



St Helens Wood (Greenspace Compartment 18)  
(TQ8124611490)



Castle Hill (LWS) (Greenspace Compartment 46)  
(TQ8219709475)

### Wetlands

The most important wetland area in Hastings is Combe Haven Valley which also supports grazing marsh, freshwater drainage ditches, willow carr and sedge fen.

Many ponds and a small number of larger reservoirs can be found throughout the town. Wishing Tree reservoir, Bucks Hole Reservoir and Ecclesbourne Reservoir are all excellent sites for fishing and wildlife watching (Hastings Borough Council, 2022g).

### Lowland Fen

Fens are peatlands which receive water and nutrients from the soil, rock and ground water as well as from rainfall: they are minerotrophic. Two types of fens can broadly be distinguished: topogenous and soligenous.

Topogenous fens are those where water movements in the peat or soil are generally vertical. They include basin fens and floodplain fens (Joint Nature Conservation Committee, 2022).

Lowlands are categorised by their hydrological regime, base-richness and nutrient status.

Lowland Fen is present within Filsham Reedbeds LNR.

### Purple moor grass and rush pastures

Purple moor grass and rush pastures occur on poorly drained, usually acidic soils in lowland areas of high rainfall in western Europe.

Their vegetation, which has a distinct character, consists of various species-rich types of fen meadow and rush pasture. Purple moor grass *Molinia caerulea*, and rushes, especially sharp-flowered rush *Juncus acutiflorus*, are usually abundant (Joint Nature Conservation Committee, 2022).

Purple Moor grassland occurs within Filsham Reedbeds LNR.

### Reedbeds

The most important wetland area in Hastings is Combe Haven Valley. The valley contains Filsham Reedbed, one of the largest reedbeds in Southeast England and many rare birds have been recorded breeding there including Savi's warbler and spotted crane (Hastings Borough Council, 2022g). An example reedbed is provided in Plate 12.

### Plate 13: Glyne Gap LWS comprising reedbed and wetland



### Heathland

Heathland is a nationally scarce and globally restricted habitat and provides an important role in carbon sequestration. The heathland present on the cliff-tops at Warren Glen and Firehills is maritime heath, which is even more rare and of a different character to the larger expanses of heathland inland such as Ashdown Forest and the West Sussex Heaths around Midhurst.

Heathland is more of a landscape type rather than a habitat. Contained within it are a mosaic of different habitats such as dwarf scrub communities consisting of heather, bell heather and dwarf gorse, acid grassland, patches of bracken and gorse and wetland components such as ponds and streams (Hastings Borough Council, 2022). Another very important heathland habitat is bare ground where sandy soil and bedrock is exposed. This bare ground provides nesting habitat for many species of solitary bees and wasps such as the beewolf wasp (*Philanthus triangulum*), the spiny digger wasp (*Oxybelus uniglumis*) and ornate tailed digger wasp (*Cerceris rybyensis*) (Hastings Borough Council, 2022).

Lowland Heathland is described as a broadly open landscape on impoverished, acidic mineral and shallow peat soil, which is characterised by the presence of plants such as heathers and

dwarf gorses (Joint Nature Conservation Committee, 2022). Heather, bell Heather, and gorse dominate this habitat.

An amazing diversity of invertebrates live on the cliff habitats and within the heathland and acid grassland including some species which occur in very few other places in Britain. Some notable examples are including the hedgehog weevil, *Cathormiocerus myrmecophilus*, the ant mimic ground spider, *Micaria albovittata*, and the nomad bee, *Nomada sexfasciata* (Hastings Borough Council, 2022c).

Lowland Heathland occurs within Hastings, sites include:

- Hastings Country Park
- Area around North's Seat

## Marine

### Coastline

The climate of Hastings is dominated by the presence of the English Channel. The cooling and humidifying effect of the sea in summer keeps the coast green and the warming effect in winter keeps the coast here relatively frost free compared to a few miles inland (Hastings Borough Council, 2022).

### Maritime cliff and slope

Maritime cliffs and slopes comprise sloping to vertical faces on the coastline where a break in slope is formed by slippage and/or coastal erosion (Joint Nature Conservation Committee, 2022).

Hastings Beach and Hastings Country Park includes areas of maritime cliffs and slopes, especially in the Eastern Area of Hastings.

## Aquatic

### Standing water

The most prominent and well-known areas of standing water within Hastings can be found within Alexandra Park, and have been discussed in more detail in the Alexandra Park section of this report, above.

Other larger waterbodies within the borough include a series of reservoirs, such as Clive Vale Reservoirs, Shorn den Reservoir, Harmer's Reservoirs, Buckshole Reservoir, Wishing Tree Reservoir and Ecclesbourne Reservoir. Several of these reservoirs are fed directly by gills, and some of these are used by angling clubs, and are artificially stocked with fish.

A large ornamental pond is present within St Leonard's Gardens, and numerous others occur as smaller ponds on the public and private land.

### Running water

The largest river present within Hastings is the Combe Haven, which passes through the Borough boundary within the Combe Haven SSSI, turning south to pass by Bulverhythe recreational ground, then east along Bulverhythe Road until it passes underneath the railway line and is fed into an outfall which releases the river into the sea at a distance from the beach through an underground pipe. As such, the river does not have a mouth. The river remains narrow for its entire stretch, and the section of the Combe Haven within Hastings gives the

appearance of a canal in places due to modifications allowing it to pass through a very built-up urban area.

Details of the Combe Haven catchment have been discussed in detail further above in this report.

Other running water habitats of note include Hollington Stream, which runs from the top of Hollington in the north of the borough southwards to eventually feed into the Combe Haven via a culvert; the Bourne Stream which runs from the north of Hastings Country Park LNR and runs southwest to feed into Clive Vale Reservoir. These streams and many others form the gill network resulting from Hastings' incised valley formations. As a result, these streams predominantly pass through woodland habitat. They are of mixed condition – as many of them are publically accessible they are at risk of pollution through rubbish dumping and dog fouling, and the banks are at risk of poaching through human and dog walking activity.

## Agricultural

### Cereal field margins

This habitat is found as strips of land between cereal crops and field boundaries. They generally support species that benefit from regular ploughing such as rare arable flora.

### Open Mosaic Habitats on Previously Developed Land

The OMH HPI is an often-overlooked habitat that forms on brownfield sites where the land underwent ground disturbance e.g. quarrying, excavations etc. It is of great importance to urban environments as it can often be found situated in very built-up areas which have otherwise very little vegetation. Open mosaic habitat on brownfield sites can be extremely diverse, supporting a wide range of terrestrial and aquatic habitats. As such OMH is crucial for urban invertebrate populations, as well as lichens, plants, birds, reptiles and amphibians. The varying microhabitats which are characteristic of the habitat type provide niches for invertebrates at multiple life stages, and the areas can provide a 'hub' for pollinating species such as bees to return to. Many invertebrates have low dispersal distances due to their size, particularly flightless species, and as such, the loss of these highly distinctive habitats through redevelopment can have significant negative impacts on the abundance and diversity of invertebrate species within an urban area.

Examples of UK BAP invertebrates strongly associated with brownfields:

- Dingy skipper (*Erynnis tages*)
- Grayling (*Hipparchia semele*)
- Shrilc carder bee (*Bombus sylvarum*)
- Brown banded carder bee (*Bombus humilis*)
- Distinguished jumping spider (*Sitticus distinguendus*)
- Five-banded weevil wasp (*Cerceris quinquefasciata*)
- Four-banded weevil wasp (*Cerceris quadricincta*)
- Saltmarsh shortspur beetle (*Anisodactylus poeciloides*)
- Streaked bombardier beetle (*Brachinus sclopeta*)
- Phoenix fly (*Dorycera graminum*)
- Black-headed mason wasp (*Odynerus melanocephalus*)

- Horehound longhorn moth (*Nemophora fasciella*) (buglife, 2022).

Criteria must be met to be categorised as this habitat type:

- The area of open mosaic habitat is at least 0.25ha in size.
- Known history of disturbance at the site or evidence that soil has been removed or severely modified by previous use(s) of the site. Extraneous materials/substrates such as industrial spoil may have been added.
- The site contains some vegetation. This will comprise early successional communities consisting mainly of stress-tolerant species (e.g. indicative of low nutrient status or drought). Early successional communities are composed of annuals, or mosses/liverworts, or lichens, or ruderals, or inundation species, or open grassland, or flower-rich grassland, or heathland.
- The site contains unvegetated, loose bare substrate and pools may be present.
- The site shows spatial variation, forming a mosaic of one or more of the early successional communities above plus bare substrate, within 0.25ha ( (Joint Nature Conservation Committee, 2022).

There are parcels of Open Mosaic Habitat within Hastings including:

- Area in Broomgrove (TQ 8258 1088).
- Area off Braybrooke Road (TQ 8167 0995).  
Area off West Hill Road (TQ 7889 0889).
- Murdock Mews (TQ 7891 1086).

As OMH is easily overlooked, it is at risk of loss through development. The Draft database by Natural England is one means of identifying potential areas; however this should be supported by a field survey conducted by an experienced botanist, through a National Vegetation Classification (NVC) survey (i.e. detailed botanical survey undertaken by specialist ecologists) or equivalent.

## Appendix 5: Legislation and Planning Policy

### Legislation

#### Conservation of Habitats and Species Regulations 2017 (as amended)

Provides for the protection of Natura 2000 sites (SACs, SPAs and Ramsar sites), European Protected Species and habitats. European Protected Species are protected from:

- Deliberate capture, injury or killing.
- Deliberate disturbance of a European Protected Species, such that it impairs their ability to breed, reproduce or rear their young, hibernate or migrate or significantly affect their local distribution or abundance.
- Deliberately take or destroy effect.
- Damage or destroy a breeding site or resting place.
- Keep, transport, sell or exchange any live, dead or part of a European Protected Species.

European Protected Species include, but are not limited to:

- Great crested newt
- Natterjack toad
- Otter
- Smooth snake
- Sand lizard
- All bat species
- Hazel dormouse

The LPA will be aware of its legal duty under Regulation 9(3) of Conservation of Habitats and Species Regulations 2017, as amended, which states that “*a competent authority in exercising any of its functions, must have regard to the requirements of the Directives so far as they may be affected by the exercise of those function*”.

Also, under Regulation 55 (9b) of the above regulations, the LPA must apply the following three tests when deciding whether to grant planning permission where a Protected Species (bats) may be harmed, in line with of the Conservation of Habitats and Species Regulations 2017, as amended.

- The activity must be for imperative reasons of overriding public interest or for public health and safety;
- There must be no satisfactory alternative;
- Favourable conservation status of the species must be maintained.

Natural England has stated that they would expect these three tests to be adequately considered by the LPA before planning permission is granted. Natural England will require evidence from the applicant that the LPA has considered the three tests and how they were met, before a mitigation licence can be issued. Where a mitigation licence is required to avoid breach of legislation, development cannot proceed even where a valid planning permission is granted.

### **Wildlife and Countryside Act 1981 (as amended)**

Key piece of legislation consolidating existing wildlife legislation to incorporate the requirements of the Bern Convention and Birds Directive. It includes additional protection measures for species listed under the Conservation of Habitats and Species Regulations 2017 (as amended) and includes a list of species protected under the Act. It also provides for the designation and protection of Sites of Special Scientific Interest (SSSI).

Development which would adversely affect a SSSI is not acceptable except only in special cases, where the importance of a development outweighs the impact on the SSSI when planning conditions or obligations would be used to mitigate the impact. Developments likely to impact on a SSSI will likely require an Environmental Impact Assessment (EIA).

The Impact Risk Zones (IRZs) dataset is a GIS tool which details zones around each SSSI according to the particular sensitivities of the features for which it is notified and specifies the types of development that have the potential to have adverse impacts. Natural England uses the IRZs to make an initial assessment of the likely risk of impacts on SSSIs and to quickly determine which consultations are unlikely to pose risks and which require more detailed consideration. Local Planning Authorities (LPAs) have a duty to consult Natural England before granting planning permission on any development that is in or likely to affect a SSSI.

Further information on specific legislation relating to species protected under the Wildlife and Countryside Act 1981 (as amended) is detailed below, under Protection of Protected Species and Habitats.

### **Environment Act (2021)**

The Environment Act (2021) makes a provision for biodiversity net gain to be a condition of planning permission in England. Planning applications will need to demonstrate a 10% biodiversity net gain can be met. A biodiversity net gain plan must be submitted and must include:

- (a) information about the steps taken or to be taken to minimise the adverse effect of the development on the biodiversity of the onsite habitat and any other habitat
- (b) the pre-development biodiversity value of the onsite habitat,
- (c) the post-development biodiversity value of the onsite habitat,
- (d) any registered offsite biodiversity gain allocated to the development and the biodiversity value of that gain in relation to the development,
- (e) any biodiversity credits purchased for the development,

### **Countryside and Right of Way Act 2000**

Amends and strengthens the Wildlife and Countryside Act 1981 (as amended). It also details habitats and species for which conservation measures should be promoted.

### **Natural Environment and Rural Communities Act 2006**

Section 40 of the Act places a duty on local planning authorities to conserve and enhance biodiversity in England whilst carrying out their normal functions. Section 41 comprises a list of Habitats of Principal Importance (HPIs) and Species of Principal Importance (SPIs) which should be considered.

The LPA will need to have particular regard to any relevant local nature recovery strategies, and any relevant species conservation strategy or protected site strategy prepared by Natural England.

### **Hedgerows Regulations 1997**

Under these regulations it is an offence to intentionally or recklessly remove, or cause or permits another person to remove, a hedgerow. Important hedgerows are defined in Section 4 of the Regulations. This includes hedgerows that have existed for over 30 years or satisfies at least one criteria listed in Part II of Schedule 1.

### **Wild Mammals (Protection) Act 1996**

Under this act wild mammals are protected from the intentional unnecessary suffering by crushing and asphyxiation.

## **Planning policy**

### **National Planning Policy Framework (2021)**

Details the Government’s planning policies for England and how these should be applied, particularly to contribute to the Government’s commitment to halt the decline of biodiversity. When assessing planning applications, LPAs should have regard to conserving and enhancing biodiversity by applying a number of principals, including:

- Avoiding impacts to biodiversity through appropriate site selection.
- Mitigating residual impacts.
- Encouraging the preservation and enhancement of biodiversity.
- Preventing the development of protected sites, such as SSSIs.
- Refusing permission where habitats that cannot be recreated, such as ancient woodland, would be lost.
- Encouraging good design that limits light pollution.

Relevant paragraphs in the NPPF (2021) are detailed below.

Paragraph Number	Detail
174	<p>“Planning policies and decisions should contribute to and enhance the natural and local environment by...minimising impact on and providing net gains for biodiversity”</p> <p>Protection of sites of biological values</p> <p>Preventing new and existing development from adverse impacts to soil, air, water or noise</p> <p>Development should help improve local conditions</p>
175	<p>Maintenance and enhancement of networks of habitats and green infrastructure; plan for the enhancement of natural capital at a catchment or landscape scale</p>
179	<p>“To protect and enhance biodiversity and geodiversity, plans should:</p> <p>a) Identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity; wildlife corridors and stepping stones that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation; and</p>

Paragraph Number	Detail
	b) promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for <b>securing measurable net gains for biodiversity.</b> ”
180	<p>“When determining planning applications, local planning authorities should apply the following principles:</p> <ul style="list-style-type: none"> <li>a) if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;</li> <li>b) development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest;</li> <li>c) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists; and</li> <li>d) development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to improve biodiversity in and around developments should be integrated as part of their design, especially where this can secure measurable net gains for biodiversity or enhance public access to nature where this is appropriate.” </li></ul>
185	<p>“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:</p> <p>...</p> <p>c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.”</p>

**Policies relating to Hastings Borough**

Policy Reference	Policy number/Paragraph Number	Detail	Relevant to Ecosystem Services							
			Air quality	Water quality	Pollution	Noise	Biodiversity	Well being	Flood management	Erosion control
Hastings adopted local plan (Hastings Borough Council, 2014)	Policy EN2	Establish and protect a green infrastructure network comprising open spaces and nature conservation areas.	✓	✓	✓	✓	✓	✓	✓	✓
	Policy EN3	Protection of biodiversity and geological resource. Ensures development delivers no net loss in biodiversity. Improving green infrastructure network.	✓	✓	✓	✓	✓	✓	✓	✓
	Policy EN4	Protection of ancient woodland.	✓	✓	✓	✓	✓	✓	✓	✓
	Policy EN5	Protection of Local Nature Reserves	✓	✓	✓	✓	✓	✓	✓	✓
	Policy EN6	Protection of Local Wildlife Sites	✓	✓	✓	✓	✓	✓	✓	✓
	Policy EN7	Working in collaboration with the Rother District Council to improve access to and management of urban fringe areas, in line with the High Weald Area of Outstanding Natural Beauty Management plan.					✓	✓		
	Policy EN8	Enhancement of open spaces, particularly in areas where these are in deficit. Where open space is not included in developments, alternative open space provision will need to be provided.	✓	✓	✓	✓	✓	✓	✓	✓
(Hastings Borough Council, 2020b)	N/a	Policy to be carbon neutral by 2030, focussing on six priority themes: communication and partnership working, grid decarbonisation, reduced energy demand, renewable energy, low carbon sustainable transport, offsetting emissions.	✓	✓	✓	✓	✓	✓		
Hastings Local Plan Consultation Draft (Regulation 18) (Hastings Borough Council, 2021)	Policy OSP1	Plan developed to tackle climate change, including sustainable transport, development of green infrastructure and exploring the use of a carbon mitigation zone in Breadsell. New development plans to incorporate green infrastructure and flood management strategies.	✓	✓	✓	✓	✓	✓		
	Policy SP1	Protection of areas that have been designed for natural environmental quality, and formal open spaces will be protected and enhanced.					✓	✓		
	Policy SP5	Expand and improve access to green infrastructure, capitalising on benefits to health and well-being and climate change mitigation and resilience.	✓	✓	✓	✓	✓	✓		
	Policy SP7	Support of projects that demonstrate and improvement to coastal and flood defence, minimising erosion. Support for green infrastructure.	✓	✓	✓	✓	✓	✓		
	Focus Area Policy 1 (Hastings Central)	Improved flood management							✓	✓
	Focus Area Policy 2 (Bohemia)	Enhancing connectivity through pocket parks.					✓	✓		
	Focus Area Policy 4 (West Marina and West Leonards)	Enhancement to incorporate landscape character including sand and shingle, planting to reflect local habitats. Incorporation of features along Hollington stream. Flood and coastal erosion management.					✓	✓	✓	✓
	Policy DP4	Incorporation of Sustainable Urban Drainage systems (SUDs), contribute to existing defences.		✓	✓		✓	✓	✓	✓
	Policy DP5	Proposals to avoid harm to biodiversity, delivery of a minimum of 10% biodiversity net gain on all greenfield sites, using the DEFRA metric. Offsite compensation required where gains cannot be met on site.	✓	✓	✓	✓	✓	✓	✓	✓
	Policy DP6	Development to identify and protect green infrastructure, and support climate change adaptation and ecosystems. Development to include local access, connectivity to the wider landscape, creation of woodlands and waterbodies, inclusion of bird and bat boxes on new development, and incorporation of green and blue roofs and walls. Noise and pollution control measures to be included and planting to have known biodiversity benefits.	✓	✓	✓	✓	✓	✓	✓	✓
Policy DP8	Local authority will seek planning obligations, such as biodiversity measures off site or a financial contribution towards these.					✓				

## Protection of protected species and habitats

### Amphibians

Natterjack toad, pool frog and great crested newt are protected under the Conservation of Habitats and Species Regulations 2017 (as amended). They are also afforded additional protection under the Wildlife and Countryside Act 1981 (as amended).

Natterjack toad, common toad, great crested newt and northern pool frog are also SPIs.

### Reptiles

Smooth snake and sand lizard are protected under the Conservation of Habitats and Species Regulations 2017 (as amended). They are afforded additional protection under the Wildlife and Countryside Act 1981 (as amended).

Adder, grass snake, common lizard and slow-worm are all protected from killing and injury under the Wildlife and Countryside Act 1981 (as amended). All UK reptile species are SPIs.

### Birds

All wild birds are protected under the Wildlife and Countryside Act 1981 (as amended). This includes damage and destruction of their nests whilst in use, or construction. Species listed under Schedule 1 of the Act, such as barn owl, are afforded protection from disturbance during the nesting season.

The following 50 bird species are SPIs: lesser redpoll, aquatic warbler, marsh warbler, skylark, white-fronted goose, tree pipit, scaup, bittern, dark-bellied brent goose, stone-curlew, nightjar, hen harrier, northern harrier, hawfinch, corncrake, cuckoo, Bewick's swan, lesser spotted woodpecker, corn bunting, cirl bunting, yellowhammer, reed bunting, red grouse, herring gull, black-tailed godwit, linnet, twite, Savi's warbler, grasshopper warbler, woodlark, common scoter, yellow wagtail, spotted flycatcher, curlew, house sparrow, tree sparrow, grey partridge, wood warbler, willow tit, marsh tit, dunnock, Balearic shearwater, bullfinch, roseate tern, turtle dove, starling, black grouse, song thrush, ring ouzel and lapwing.

### Badger

Badger is protected under the Protection of Badgers Act 1992. Under this legislation it is an offence to kill or injure a badger; to damage, destroy or block access to a badger sett; or to disturb badger in its sett. The Act also states the conditions for the Protection of Badgers licence requirements.

### Bats

All bat species are protected under the Conservation of Habitats and Species Regulations 2017 (as amended), as detailed above. Bats are further protected under the Wildlife and Countryside Act 1981 (as amended), making it an offence to:

- Deliberately or recklessly damage or destroy any structure or place which bat(s) use for shelter or protection.
- Disturb bat(s) while occupying a structure or place which it uses for shelter or protection.
- Obstruct access to any structure or place which they use for shelter or protection.

Furthermore, seven bat species are SPIs, covered under Section 41 of the NERC Act 2006. These include western barbastelle, Bechstein's, noctule, soprano pipistrelle, brown long-eared, lesser horseshoe and greater horseshoe.

### **Hazel dormouse**

Hazel dormouse is protected under the Conservation of Habitats and Species Regulations 2017 (as amended). It is afforded additional protection under the Wildlife and Countryside Act 1981 (as amended), including obstruction to a place of shelter or rest.

Hazel dormouse is also a SPI.

### **Hedgerow**

Under the Hedgerows Regulations 1997 it is against the law to remove or destroy certain hedgerows without permission from the LPA, which are also the enforcement body for offences created by the Regulations. LPA permission is normally required before removing hedges that are at least 20 m in length, more than 30 years old and contain certain plant species. The authority will assess the importance of the hedgerow using criteria set out in the regulations. The regulations **do not** apply to hedgerows within the curtilage of, or marking a boundary of the curtilage of, a dwelling house.

Hedgerow is a HPI.

### **Otter**

Otter is protected under the Conservation of Habitats and Species Regulations 2017 (as amended) and is afforded additional protection under the Wildlife and Countryside Act 1981 (as amended). Otter is also a SPI.

### **Water vole**

Water vole is fully protected from capture, killing or injury; damage, destruction or blocking access to a place of shelter; disturbance whilst in a place of shelter or possessing, selling any part of a water vole, dead or alive under the Wildlife and Countryside Act 1981 (as amended).

Water vole is also a SPI.

### **Other mammals**

West European hedgehog, brown hare, mountain hare, pine marten, harvest mouse, polecat and red squirrel are all SPIs.

The following mammals are listed under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended): wildcat, brown hare (Schedule 5A), mountain hare (Schedule 5A), pine marten and red squirrel.

### **Invertebrates**

Fifty-six terrestrial and freshwater invertebrate species are listed under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). These include Reddish buff, Norfolk hawk, Purple emperor, High brown fritillary, Northern brown argus, White-clawed crayfish, Pearl-bordered fritillary, DeFolin's lagoon snail, Chequered skipper, Fairy shrimp, Rainbow leaf beetle, New Forest cicada, Southern damselfly, Large heath, Small blue, Wartbiter, Fen raft spider, Ivell's sea anemone, Mountain ringlet, Ladybird spider, Marsh fritillary, Spangled diving beetle, Mole cricket, Field cricket, Duke of Burgundy, Silver-spotted skipper, Medicinal leech,

Lesser silver water beetle, Moccas beetle, Wood white, Violet click beetle, Large copper, Freshwater pearl mussel, heath fritillary, Glanville fritillary, Glutinous snail, Starlet sea anemone, Large tortoiseshell, Brackish hydroid, Swallowtail, Bembridge beetle, Barberry carpet, Silver-studded blue, Adonis blue, Chalk hill blue, Fiery clearwing, Sandbowl snail, Black hairstreak, White-letter hairstreak, Black-veined moth, Sussex emerald, Brown hairstreak, Northern hatchet-shell, Lulworth skipper, Tadpole shrimp, New Forest burnet.

A total of 398 invertebrates are Species of Principal Importance. These include: beetles (including stag beetle), butterflies (high brown fritillary, large heath, small blue, white-letter hairstreak, brown hairstreak, damselflies (southern damselfly), moths (marsh moth), ants, bees etc. Impacts to SPI must be considered by the LPA when assessing planning applications.

### **Non-native invasive plant species**

Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) is a list of non-native plant species for which Section 14 of the Act applies. It is an offence to plant, or otherwise cause to grow in the wild species listed under Schedule 9 of the act. These include, but are not limited to:

- Himalayan balsam
- Cotoneaster sp.
- Japanese knotweed
- Giant hogweed

### ***Habitats of Principal Importance***

Section 41 of the NERC Act 2006 details 56 HPs, of which the following could be present in south-east England: Lowland calcareous grassland, Lowland dry acid grassland, Lowland meadows, Lowland Heathland, Open Mosaic Habitats on Previously Developed Land, Lowland fens, Lowland raised bog, Reedbeds, Lowland beech and yew woodland, Lowland mixed deciduous woodland and Wet woodland.

Impacts to HPI are of material planning consideration.

## Appendix 6: Development of GBI network

### Introduction

The GBI network was identified by developing a Circuitscape® model, which applies circuit theory to animal movement and gene flow across a resistance surface (McRae B. &, 2007) (McRae B. D., 2008). It is widely accepted as an approach to identifying suitable green and blue infrastructure corridors due to its applicability and flexibility for a wide variety of situations and parameters (Marrotte, 2017) (Strange, Panzacchi, & van Moorter, 2019) (Vincent Wildlife Trust, 2020) (Orly, 2011) (Grafius, 2017) (Koen, 2014). Circuitscape requires two inputs, a calculated resistance raster (i.e. barriers to the movement of genes) and identified core areas (i.e. where animals spend most of their time) (Strange, Panzacchi, & van Moorter, 2019). The approach conducts quantitative analysis of current GBI features using the least-cost method and identifies the relative importance of greenspace areas based on circuit theory. The model allows for the development of landscape scale maps to be produced which give a visual representation of likely valuable areas for wildlife and ecosystem services which allows priority areas for green infrastructure to be determined e.g. (Honeck, 2020) (Wang J. R., 2022).

In developing the model, a key consideration is the complexity of ecology, the dynamic nature of ecosystems and diversity of species' habitat requirements, mobility and ability to adapt to its surroundings. It would be impossible to account for all this variation within the model as corridors for some species may represent barriers for others (Bolliger, 2020). For this reason, the model is based on pragmatic and attainable data that can reduce the many dimensions of multiple species requirements to a manageable set of criteria (Wiens et al. 2008). Connectivity analysis is commonly framed around a single species, utilising autecological information such as dispersal distances and home ranges to parametrise the model. In this study, the decision was made to use a generalised terrestrial analogue species as the application was intended to create multi-purpose green corridors through Hastings, not improvements targeted to a specific species or habitat. The model was parametrised assuming that this species was limited to terrestrial movements and was unable to fly or to swim long distances. We assumed that the single species would benefit from more complex, diverse green spaces and choose to make its route through these, avoiding roads and buildings where possible.

The output provided by Circuitscape® is in a cumulative current map, which provides a cumulative view of the connectivity scenarios between core areas in pairwise comparisons. The value of each cell is determined by the number of occurrences it has in the connectivity pathways calculated in each pairwise comparison. Inferentially, this shows the overall optimal pathways but also pathways that would be less frequently used but are still valid routes through Hastings. These cumulative current maps can be reviewed qualitatively, using the values of each cell as a guidance for optimal routes, but can also be reviewed empirically with the use of the Linkage Mapper tool (discussed below). A variety of information is to be used as a contextual overlay of these maps, to enable further assessment of their viability for use in GBI plans. These additional layers would detail information such as designated sites, land in positive management and areas targeted for development.

Details of how the model was developed are provided in the following sections.

## Limitations

The outputs of any model depend on the quality and degree of uncertainty of the input data as well as the conditions and assumptions built into it. Furthermore, actual landscapes are more complex than discrete representations of “habitat” or “no habitat” included in model parameters. Habitat quality (or preference) generally varies along a gradient from completely unsuitable to optimal (or most preferred) habitat (Strange, Panzacchi, & van Moorter, 2019). Private gardens for example can vary from extremely high habitat quality if managed specifically for wildlife to very low if covered in decking and artificial grass. A metric for green infrastructure can only generalise as to the expected average habitat quality of a given habitat.

To manage these limitations, model inputs were based on a literature review (evidence provided within the relevant section) and expert judgement. The GBI was then further tested against aerial imagery and evidence collected during the field surveys, to ensure these reflected actual habitats within Hastings.

During the creation of the resistance layer a decision was made to remove the “natural” classified polygons from the OS Mastermap Greenspace as this was directing all the least-cost pathways to the ocean, rather than identifying viable routes through Hastings. This effectively created an impassable “no data” area along the coastline, limiting routes to terrestrial areas. Considering the aims of the GBI and Biodiversity Net Gain Strategy, this was considered an appropriate measure to identify GBI throughout Hastings.

## Stage 1: Establish model baseline

### Protected sites

Information on statutory and non-statutory designated sites were obtained from the local records centre and location of these mapped using ArcGIS.

### Habitats

The local records centre provided information on protected and notable habitats, including Habitats of Principal Importance and ancient woodland.

Additional data sources were reviewed and incorporated, as presented in Table 7.

**Table 7: Model data sources**

Dataset	Source	Coverage	Accessibility
OS MasterMap Greenspace	Ordnance Survey	National	Free via PSGA
OS Open Roads	Ordnance Survey	National	Public
OS MasterMap Topography <sup>11</sup>	Ordnance Survey	National	Free via PSGA
OS Strategi <sup>12</sup>	Ordnance Survey	National	Public

<sup>11</sup> These data were used to derive the footprint of buildings.

<sup>12</sup> These data were used to derive railway data.

Dataset	Source	Coverage	Accessibility
Hastings BOAs	Sussex Biological Records Centre	County	Private
Aerial Imagery	APGB BlueSky <sup>13</sup>	County	Open source
Site allocations	Hastings Borough Council	Borough	Public

### ***Habitat quality***

The primary dataset used was the OS MasterMap Greenspace layer, which details urban greenspaces and classifies them as previously discussed. This was the basis for landcover type within the urban zones, in the absence of more detailed data from other land cover data sets. LandCoverMap 2019 (CEH), for example, designated the majority land within urban areas as “Urban”, “Suburban” or “Improved Grassland” - which would then ignore the differentiation between different green spaces within urban areas. These subtleties are necessary, as the output of the project is to inform detailed green infrastructure strategies and some green and blue spaces provide more ecosystem services than others and are therefore considered to be more valuable in the context of this study.

Habitat quality refers to a combination of landscape features that provide the crucial resources required for long-term persistence of a species or ecosystem (Strange, Panzacchi, & van Moorter, 2019).

Although high habitat quality is associated with natural habitats, high habitat quality can also be found within urban areas. A study in 2006 found that the amount of urban cover that surrounded a site was not related to the plant community present on the site (Angold, 2006) and Hardy et al (1999) found that small urban green space patches are useful for providing nectar resource for vagrant butterflies.

Different types of habitats often included in green infrastructure have very variable habitat quality. Studies are available for some of these habitats for example indicating the ecological value of habitats such as allotments (Baldock, 2019) (Borysiak, 2015) and cemeteries (Loki, 2019) (Castel, 2018) (Wheater, 1999).

The valuation of the differing land cover types contained with OS MasterMap Greenspace data is shown in Table 8. These are based on a combination of habitat quality and connectivity.

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<sup>13</sup> Data from 2019 taken at 12.5 resolution, between 1<sup>st</sup> April and 31<sup>st</sup> October when the sun angle was greater than 20° to ensure consistency

**Table 8: Valuation of habitat quality**

Feature	Class	Justification
Allotments Or Community Growing Spaces	4	The value of allotments to wildlife is well recognised. It has been found that allotments and community gardens are pollinator hotspots due to their high pollinator diversity (Baldock, 2019) and that they have on average, up to 30% higher species diversity than urban parks (National Society for allotment and leisure gardeners, n.d.). Borysiak et al (2016) found that allotment areas studied in Poland exhibited high plant species richness and diversity and concluded that "allotment gardens should be considered as biodiversity hotspots for native species within green infrastructure".
Amenity - Residential Or Business	3	Often shortly mown grass with manicured ornamental planting. However, planting can provide food for pollinators and often includes trees which increases connectivity (Tremblay, 2011) (Grafius, 2017)
Amenity - Transport	3	Grafius et al (2017) found that major road verges, may act as valuable movement corridors however their high current variability suggests this may only be true in some cases or at specific points in the network. Additionally, the roads themselves act as barriers to movement, presumably leading to a complex mixture of conflicting effects. Della et al 2017 found that the stag beetle remains within the proximity of urban settlements and is positively affected by the presence of roads.
Land Use Changing	1	
Bowling Green	1	Shortly mown grass with little biodiversity value
Camping Or Caravan Park	2	The value of camping and caravan parks will be very variable and range from a site entirely covered by concrete to much less intensively managed areas. Most sites would at least include some trees which increases connectivity (Tremblay, 2011) (Grafius, 2017) as well as ornamental planting.
Cemetery / religious grounds	4	Due to their relatively undisturbed nature and long-term existence cemeteries and churchyards can be of considerable value to wildlife. Loki et al (2019) found that they often act as refuges for populations of rare and endangered species and Castel et al (2018) described how urban churchyards are home to a surprising diversity of lichens, wildflowers and animals. Wheater (1999) described how largely undisturbed habitats in churchyards and cemeteries can support rare plants and lichens on gravestones and provide basking sites for reptiles. Most sites would at least include some trees which increases connectivity (Tremblay, 2011) (Grafius, 2017)
Golf Course	3	Tanner & Gange (2005) found that the three indicator taxa studied; birds, beetles and bumblebees showed higher species richness and higher abundance on the golf course habitat than in nearby farmland. They concluded that golf courses of any age can enhance the local biodiversity of an area by providing a greater variety of habitats than intensively managed agricultural areas. Colding & Folke (2009) undertook an analysis of studies in the scientific literature which compared biota on golf courses to that of biota in green area habitats related to other land uses and found that golf courses had higher ecological value in 64% of comparative cases
Institutional Grounds	2	Often shortly mown grass with manicured ornamental planting. However, planting can provide food for pollinators and often includes trees which increases connectivity (Tremblay, 2011) (Grafius, 2017)
Natural	5	Natural habitat will have the highest habitat quality and connectivity value as it will provide the resources required for our native species and the least resistance for movement. Areas in positive management will be of greatest value.
Other Sports Facility	0	Often hardstanding or shortly mown grass with little biodiversity value.
Play Space	0	Often hardstanding or shortly mown grass with little biodiversity value.
Playing Field	2	Often shortly mown grass with little biodiversity value.
Private Garden	4	The value of private gardens to wildlife is obviously very variable depending on how they are managed. However, several comprehensive studies have attempted to show their value for biodiversity. The BUGS research project (1999–2007) carried out by the University of Sheffield was the first large-scale study to reveal the importance of domestic gardens for urban biodiversity. The evidence gathered showed, that the extent of gardens, their unique features, and the biodiversity they support makes them a nationally important ecological resource, contributing enormously to conservation and human–nature interactions in urban environments ( <b>Sheffield, 2007</b> ). Davies et al (2009) carried out a national scale inventory of resource provision for biodiversity within domestic gardens and found that gardens provide one bird feeder for every nine potentially feeder-using birds in the UK, and at least one nest box for every six breeding pairs of cavity nesting birds. Gardens also contain 2.5–3.5 million ponds and 28.7 million trees, which is just under a quarter of all trees occurring outside woodlands. Modelling suggests that gardens form an important role in urban habitat connectivity.
Public Park or Garden	3	Borysiak et al (2015) found that urban parks, in comparison to allotment gardens, lack the species richness of allotments and do not score well within provisioning ecosystem service.
School Grounds	2	These will be very variable. They often will mostly consist of shortly mown grass with little biodiversity value; however, planting can provide food for pollinators and often includes trees which increases connectivity (Tremblay, 2011) (Grafius, 2017). Often, they will also include a small nature area which could include a pond.
Tennis Court	0	Likely to be hardstanding of little value to wildlife
Water features – Rivers and streams	4	Rivers and streams are important for biodiversity and provide a range of ecosystem services, including pollution control, carbon sequestration, flood protection and health and well-being (Office of National Statistics, 2015) (Mitsch, Bernal, & Hernandez, 2016). At a landscape scale it is not possible to determine habitat quality, however it is assumed that rivers and streams have a high habitat quality.
Water features – Drainage lines	1	Although drainage ditches do provide habitat for a range of species at a landscape scale, their association with roadsides, farmland and ephemeral nature, significantly increase their chances of being highly polluted and provide minimal habitat for a range of species.
Wetlands	4	As with rivers and streams, wetlands identified as being Habitats of Principal Importance under the NERC Act (2004), mean that their quality, whilst variable, is likely to be higher than that of poorly managed, wetlands or stocked lakes.

### **Habitat variability**

To provide an index of the variability within OS MasterMap Greenspace Categories, the pixel heterogeneity was analysed on aerial imagery overlaying those polygons. The aerial imagery was clipped to the study area using the Extract By Mask (Spatial Analyst) tool, coarsening the resolution to 0.5 cell size, in order to enable the imagery to be worked with efficiently in other tools. Vegetation indices are commonly used with aerial and satellite imagery to analyse the presence of vegetation, frequently substituting the red band of the image with an infrared band due to the way chlorophyll reflects infrared light (ref). However, the aerial imagery available in this study only captured the standard red, green and blue (RGB) bands. Some vegetation indices have been developed to be used with RGB bands only, but these are weaker than ones which incorporate infrared. The Excess Green Index (ExGI) was selected as it has been shown to outperform other indices and accurately predict infrared based indices such as NDVI (Larrinaga et al. 2019). Running the imagery through the ExGI produces a new image, which picks out the areas highlighted in the green portion of the light spectrum, using the following equation:

$$ExGI = (2 * G) - (R + B)$$

The Zonal Statistics (Spatial Analyst) tool was used on the ExGI output image to calculate the VARIETY in raster values (in this instance, shades of green extracted by ExGI from the original aerial imagery) within the boundary of each unique object from the OSMM Greenspace layer. This is underwritten by the assumption that greater variety in the "greenness" present in the aerial imagery corresponds to more complex habitat (and therefore more valuable habitat) on the ground. By calculating the vegetation index first, this removes issues created by the presence of man-made features, for example, greenhouses and patios in private gardens. For each category, output raster from Zonal Statistics (Spatial Analyst) was split by fifths (class intervals 1-5) using the Reclassify (Spatial Analyst) tool. Reclassify (Spatial Analyst) used the Equal Interval data classification method to divide the values into equal sized sub-ranges.

The rasters utilised in this analysis were derived from publically available aerial imagery. Whilst the imagery is relatively dated, it is a high resolution dataset (12.5cm) and was taken during a single flyover, minimising the impacts of weather variability. Alternative datasets, such as LandSat 8 satellite imagery were too coarse in resolution or behind steep paywalls.

### **Establish landscape permeability**

For the analysis of the least-cost path, quantified data are needed to estimate the resistance of the target species depending on the characteristics of various substrate surfaces. The following section details the data used in the creation of the resistance layer and the processes and assumptions that were made in its calculation.

All layers were clipped to the study area and rasterised to cell size 5 in preparation for their use in the Habitat and Resistance Calculator tool. The tool requires that each value in the raster be assigned a resistance score, for the output to reflect the variations in resistance within each layer. These scores should be based on ecological knowledge and peer-reviewed evidence of the resistance created by different land covers, the presence of roads, etc.

Resistance values should fall between 1-100. One indicates ideal conditions that provide zero resistance to the species moving across it, with numbers above one indicating how far a species

would go out of its way to avoid that area, with the maximum being 100. The SUM calculation method was used to account for confounding impacts of multiple features being present, for example, the presence of a road within a built up area would provide additional resistance than either the built up area or the road alone (McRae, Shirk, & Platt, 2013). This would also allow easier weighting of features providing severe barriers to movement, whilst also allowing for the necessary variation between greenspace features. Use of the SUM calculation method also enables features to be given negative values as well as positive values. Negative values can be used to indicate features which would reduce resistance if present, rather than contribute to additional resistance.

### Habitat quality

The rankings of the land cover types detailed in Table 8 were converted into resistance scores between 1-100 which is detailed in Table 9, below. The OS MasterMap Greenspace layer has the most complete coverage of the study area, but there are still small gaps in places for example, where there are fields – these would be represented as NODATA. It is important to avoid NODATA values within input layers, as these are read as areas of infinite resistance. Accordingly, the Nibble (Spatial Analyst) tool was used to extrapolate the OS MasterMap Greenspace raster into areas of NODATA, utilising the values of nearest neighbours to fill in gaps in the raster. This meant that because there was full coverage in this layer, there would not be any cells with NODATA, regardless of the coverage of other layers.

**Table 9: Resistance values**

Data Layer	Class	Class Description	Resistance	Expand Cells
OSRoads	1	Motorway	95	3
OSRoads	2	A road	85	2
OSRoads	3	B road	70	1
OSRoads	4	Local/Minor	55	0
OS Rail	1	Present	-5	1
Buildings	1	Present	95	0
BOAs	1	BOA	0	0
OS MasterMap Greenspace	0	Worst	50	0
OS MasterMap Greenspace	1	Very Bad	40	0
OS MasterMap Greenspace	2	Bad	30	0
OS MasterMap Greenspace	3	Average	20	0
OS MasterMap Greenspace	4	Good	10	0
OS MasterMap Greenspace	5	Best	0	0
Vegetation Index	1	Least Greenness	0	0
Vegetation Index	2	Low Greenness	-3	0

Data Layer	Class	Class Description	Resistance	Expand Cells
Vegetation Index	3	Average Greenness	-6	0
Vegetation Index	4	High Greenness	-9	0
Vegetation Index	5	Most Greenness	-12	0

### Stage 3: Least-cost pathway

The Linkage Mapper tool uses vector core habitat areas and a resistance map to identify core areas and creates maps of least-cost corridors between them. This allows users to identify routes that encounter fewer features impeding movement between core areas.

To ensure that least-cost path calculations were carried out through the urban area, all core area pairs were connected, rather than only adjacent pairs, and corridors that intersect other core areas were removed. This forced movement through the urban area, rather than allowing least-cost paths to be calculated on the urban periphery or along the coast.

This was further supported by establishing the neighbouring areas as core areas. This is common practice within the Circuitscape® suite. This was because the aim was to find appropriate routes for GBI across Hastings, and BOAs are selected for their biodiversity based on land cover, geology and other characteristics. As such, it made sense to utilise these areas as cores to avoid additional complications of parametrising the core area calculator for a generic urban species.

### Stage 4: Determining the GBI network

The Circuitscape® analysis and least-cost pathway is presented in Figure 4. The spectrum ranges from high resistance (low connectivity) in the reds, and lower resistance in the greens.

8.1.2 In December 2021, Natural England published their green infrastructure mapping tool that details (Natural England, 2021):

- Green and blue infrastructure assets across England
- Access to Natural Green Space Standards (ANGSt)
- Linear access network
- Designated and defined areas
- Access to Nature Close2Home
- Accessible Natural Greenspace Inequalities
- Socio-economic statistics

Given the least-cost pathway was predominately located in the east of the borough, and the GI tool developed by Natural England indicated areas to the west experienced the highest deficiency in access to green space, environmental issues (e.g. flooding and coastal erosion, and association with poor health, mental health and areas requiring economic development, professional judgement was used to identify the railway line running west from the town centre as an opportunity for species movement.

A 50m buffer was then established either side of the least-cost pathway and railway line and the GBI network was established by overlaying the buffer to the existing GBI assets and

including all of those that intersected with the buffer, along with all statutory and non-statutory designated sites. Where statutory and non-statutory designated sites did not intersect with the buffer, these were included in the network as stepping stones within the GBI network.

The GBI network is presented in Figure 5.

**Appendix 7: Case studies for delivery of biodiversity net gain targets**

Authority	Relevant policy	Minimum net gain threshold	Supported by
Brighton and Hove City Council	<p>City Plan Part One:</p> <ul style="list-style-type: none"> <li>Policy CP10 Biodiversity</li> </ul> <p>Proposed Submission City Plan Part Two:</p> <ul style="list-style-type: none"> <li>Policy DM37 Green Infrastructure and Nature Conservation</li> </ul>	Not specified in local plan – relies on national legislation	<p>Draft Biodiversity and Nature Conservation SPD (January 2022)</p> <p>Guidance Note for Provision of Swift Boxes (June 2020)</p>
Bath and East Somerset Council	<p>Local Plan (Core Strategy and Placemaking Plan) Partial Update:</p> <ul style="list-style-type: none"> <li>New Policy DM11: New Policy for Biodiversity Net Gain</li> </ul>	<p>Currently in consultation, with options to set to:</p> <ul style="list-style-type: none"> <li>10% minimum</li> <li>15% minimum</li> <li>10% minimum, with bespoke considerations for brownfield sites and householder applications.</li> </ul>	No SPD yet published, however a Biodiversity SPD will be published setting local requirements for biodiversity net gain delivery.
Greater Cambridge Shared Planning	<p>South Cambridgeshire Local Plan:</p> <ul style="list-style-type: none"> <li>NH/2 Protecting and Enhancing Landscape Character</li> <li>NH/3: Protecting Agricultural Land</li> <li>NH/4 Biodiversity</li> <li>NH/5 Sites of Biodiversity or Geological Importance</li> <li>NH/6 Green Infrastructure</li> <li>NH/7 Ancient Woodlands and Veteran Trees</li> <li>CC/8 Sustainable Drainage Systems</li> <li>HQ/1 Design Principles</li> </ul> <p>Cambridge Local Plan:</p> <ul style="list-style-type: none"> <li>7 The River Cam</li> <li>8 Setting of the city</li> <li>31 Integrated water management</li> <li>52 Protecting garden land and the subdivision of existing dwelling plots</li> <li>57 Designing New Buildings (criteria h.)</li> <li>58 Altering and extending existing buildings</li> <li>59 Designing landscape and the public realm</li> <li>66 Paving over front gardens</li> <li>69 Protection of sites of biodiversity and geodiversity importance</li> <li>70: Protection of Priority Species and Habitats</li> <li>71: Trees</li> </ul>	10% minimum, but LPA encouraged to push for 20% wherever possible.	<p>Biodiversity SPD (Consultation Draft)</p> <p>Doubling Nature Strategy</p> <p>Biodiversity and Green Spaces Topic Paper</p>
Swale Borough Council	<p>The Swale Borough Local Plan (in review)</p> <p>Policy DM28 – Biodiversity and geological conservation</p>	Proposals for 20% minimum threshold, in consultation.	<p>Local Plan Viability Study</p> <p>Swale Biodiversity Baseline Report in Preparation for Requirements of the Environment Bill</p>
Mole Valley District Council	Draft Local Plan	20% minimum requirement, in consultation	
Guildford Borough Council	Development management policies	20% minimum, in consultation	

**Appendix 8: Green and blue infrastructure and biodiversity net gain checklist**

Number	Objective	Information to provide
1	<b>Protect, restore and enhance</b> the GBI network	Ecological impact assessment proportional to the proposals
		Biodiversity net gain assessment using the latest DEFRA metric with a clear statement of how: <ul style="list-style-type: none"> <li>- Impacts have been avoided</li> <li>- Impacts have been minimised</li> <li>- Retained habitats have been restored</li> <li>- Compensation will be delivered within the GBI network and in line with the GBI and biodiversity net gain strategy, as a last resort.</li> </ul>
2	<b>Create</b> high-quality multi-functional GBI	Assessment of impacts on ecosystem services through submission of an Environmental Benefits Tool calculator. Results should demonstrate a neutral or positive impact on environmental benefits.
		Demonstration of how proposals have been designed in line with the Building with Nature Standards.
3	Provide and encourage <b>community</b> growing spaces.	Landscape plans incorporate community growing spaces.
4	Increase <b>connectivity</b> of green and blue infrastructure for people and wildlife	Species incorporated into landscape plans are dominated by: <ul style="list-style-type: none"> <li>- Native species, reflective of local conditions AND consider future impacts of climate change</li> <li>- Non-native species that provide benefits to nature and other climate change adaptations (e.g. high carbon sequestration)</li> <li>- Where developments are in close proximity to the coast, incorporate species that are tolerant to saline conditions, and also can mitigate coastal erosion.</li> </ul>
5	Maximise <b>tree protection</b> and encourage planting the <b>right tree in the right location</b>	Arboricultural plans, method statements and impact assessments. Species selection to include those that are of local provenance, native and where non-native have a known benefit to biodiversity. Species selection to consider carbon sequestration and consider resilience of tree populations. Hedgerows should be native and have a minimum of five species per 30m.
6	Deliver an ambitious biodiversity net gain target	Biodiversity net gain assessment using the latest DEFRA metric with a clear statement of how: <ul style="list-style-type: none"> <li>- Impacts have been avoided</li> <li>- Impacts have been minimised</li> <li>- Retained habitats have been restored</li> <li>- Compensation will be delivered within the GBI network and in line with the GBI and biodiversity net gain strategy.</li> </ul>
7	Minimise urban heating	Demonstration of how proposals have been designed in line with the Building with Nature Standards.
		Landscape plans incorporates green roof with a minimum settled substrate of 150mm and diverse semi-natural habitats of at least moderate condition.
8	Incorporate measures to enhance biodiversity opportunities across all developments.	Plan showing the location of integrated and non-integrated ecological features including: <ul style="list-style-type: none"> <li>- Bird and bat boxes at a ratio detailed in the BS 42021:2021 Integral nest boxes)</li> <li>- Inclusion of gaps under fences to maximise movement of species across the landscape</li> <li>- Integrated invertebrate boxes</li> <li>- Inclusion of reptile and amphibian hibernacula in secluded garden areas, where feasible.</li> </ul>
9	Provide benefits to the community through inclusive designs for all users, irrespective of social group or abilities and promote health and well-being across the GBI network	Demonstration of how proposals have been designed in line with the Building with Nature Standards.