



# Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

## Environmental Statement

### **Volume 3**

### Appendix 20.1 - Extended Phase 1 Habitat Survey Report

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



This report conforms to the British Standard 42020:2013 Biodiversity - Code of practice for planning and development.

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**LIST OF ACRONYMS**

BCT	Bat Conservation Trust
BNG	Biodiversity Net Gain
CP	Civil Parish
DCO	Development Consent Order
DEP	Dudgeon Offshore Windfarm Extension Project
DM	Dalcour Maclaren
EP1HS	Extended Phase 1 Habitat Survey
GIS	Geographic Information System
INNS	Invasive Non-Native Species
JNCC	Joint Nature Conservation Committee
Km	Kilometre
MAGIC	Multi-Agency Geographic Information for the Countryside
NBIS	Norfolk Biodiversity Information Service
NFI	National Forest Inventory
PEIR	Preliminary Environmental Information Report
PHI	Priority Habitat Inventory
SEP	Sheringham Shoal Offshore Windfarm Extension Project
UKHab	United Kingdom Habitat Classification
WFE	Wild Frontier Ecology Ltd.

## GLOSSARY OF TERMS

Term	Definition
Order Limits	The area subject to the application for development consent, including all permanent and temporary works for SEP and DEP.
Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
DEP onshore site	The Dudgeon Offshore Wind Farm Extension onshore area consisting of the DEP onshore substation site, onshore cable corridor, construction compounds, temporary working areas and onshore landfall area.
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive. This includes candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas, and is defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017.
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach, and information to support, the EIA and HRA for certain topics.
Expert Topic Group (ETG)	A forum for targeted engagement with regulators and interested stakeholders through the EPP.
Horizontal directional drilling (HDD) zones	The areas within the onshore cable route which would house HDD entry or exit points.
Jointing bays	Underground structures constructed at regular intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The point at the coastline at which the offshore export cables are brought onshore, connecting to the onshore cables at the transition joint bay above mean high water
Onshore cable corridor	The area between the landfall and the onshore substation sites, within which the onshore cable circuits will be installed along with other temporary works for construction.
Onshore export cables	The cables which would bring electricity from the landfall to the onshore substation. 220 - 230kV.
Onshore Substation	Compound containing electrical equipment to enable connection to the National Grid.
PEIR boundary	The area subject to survey and preliminary impact assessment to inform the PEIR.
Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Shoal Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
SEP onshore site	The Sheringham Shoal Wind Farm Extension onshore area consisting of the SEP onshore substation site, onshore cable corridor, construction compounds, temporary working areas and onshore landfall area.
Study area	Area where potential impacts from the project could occur, as

	defined for each individual Environmental Impact Assessment (EIA) topic.
The Applicant	Equinor New Energy Limited

## EXECUTIVE SUMMARY

Wild Frontier Ecology Ltd. (WFE) was commissioned by Equinor New Energy Ltd. to complete an Extended Phase 1 Habitat Survey (EP1HS) of the Preliminary Environmental Information Report (PEIR) boundary associated with the proposed onshore cable corridor and onshore grid connection for the Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects. The EP1HS involved walkover surveys by ecologists to identify and map habitats within accessible parts of the PEIR boundary. The survey was extended to include an appraisal of the suitability of habitats for protected or notable species; field signs of such species were also recorded where observed. The survey also aimed to record any occurrence of invasive non-native species (INNS).

The majority of the survey was completed between March and September 2020. A small number of landholdings which had not been accessible in 2020 were subsequently surveyed in January and September 2021. From 2020 to 2021, the results of the EP1HS, along with results of other ecological surveys underway at the same time, were used to inform the site selection process. The PEIR boundary was accordingly refined into the narrower Development Consent Order (DCO) boundary. This refinement process drew on information obtained during the EP1HS (and other ecological surveys) with the aim of avoiding or minimising impacts on areas and features identified as being of relatively high ecological value.

This report therefore presents the results of the EP1HS of the DCO boundary only, as areas outside this boundary (but formerly surveyed as part of the PEIR boundary) are no longer within the impact zone.

Within the DCO boundary, the EP1HS recorded a range of habitats, identified numerous habitats suitable for protected species (and found some signs thereof), and found some occurrences of INNS, mostly along watercourses.

The DCO boundary passes through a predominantly arable landscape with field boundaries comprised of hedgerows (many of which have trees) and occasional ditches. There are also occasional grasslands within the DCO boundary, most of which are small, improved or poor semi-improved grassland fields used for grazing livestock. There are occasional ponds within the boundary, with higher densities in the south and far north. The DCO boundary passes through a small number of woodlands including semi-natural broadleaved woodlands and various (deciduous, conifer and mixed) plantations. Between Bodham/Weybourne and the landfall location, the DCO boundary passes through a swathe of woodland habitat including Bodham Wood, Weybourne Wood and Hundred Acre Wood. There are also some coastal habitats (intertidal shingle, soft cliffs, coastal grassland and semi-improved neutral grassland) at the landfall location.

The DCO boundary passes through six river corridors, bisecting the river channels and/or tributaries of the rivers Bure, Wensum, Tud, Yare, Tiffey and Intwood Stream (listed from north to south). The DCO boundary also runs very close to the headwaters of the River Glaven at Bodham. The Wensum and Glaven are both chalk rivers, a rare and ecologically sensitive ecosystem. All rivers and the riparian habitats around them have relatively (compared to much of the rest of the DCO boundary) high potential to support protected/notable species. The INNS Himalayan balsam is present along the banks of some of these watercourses and/or their tributaries.

The appraisal of the suitability of habitats for protected species identified extensive areas of suitable habitat for nesting birds throughout the majority of the DCO boundary. The survey also identified numerous trees with bat roost potential. The survey also found signs of badgers (including setts) within the DCO boundary. There are

some small areas and features which are suitable for other protected species including reptiles, otters, water voles and white-clawed crayfish (the latter three are confined to watercourses, mostly the aforementioned rivers). There were incidental observations of signs of some of these protected species, such as reptiles. Dedicated surveys for great crested newts were completed in 2020-21, and a separate report is provided outlining the results. Small areas also have potential to support notable invertebrate assemblages. Targeted surveys for all relevant protected and notable species have been completed in 2020-21, and results are provided in respective Technical Appendices. The results of those surveys, together with the EP1HS results, have further informed the site selection process. This has meant the DCO boundary now avoids entirely, or has a reduced footprint/impact within, most of the features of relatively high ecological value such as woodlands, river corridors and areas supporting protected and notable species.

The results of this EP1HS are used to inform the habitats impact assessment. The scope has also incorporated Biodiversity Net Gain (BNG) baseline calculations which will be used separately to calculate the change in 'Biodiversity Units' within the DCO boundary and help determine the type and location of appropriate ecological enhancements.

The EP1HS was constrained by restricted landowner access. In total, approximately 90% of the area of the DCO boundary has been surveyed. Habitats within the remaining 10% have not been surveyed. However, a data search with the Norfolk Biodiversity Information Service (NBIS) obtained habitat classifications for the un-surveyed areas via the Norfolk Living Map; this data has been used to classify inaccessible and un-surveyed parts of the DCO boundary. This habitat classification data does not include any details on protected or valued species signs, the suitability of habitat for such species, or on the presence of INNS.

## 1. BACKGROUND

Equinor New Energy Limited (hereafter Equinor) is proposing to extend the existing operational Sheringham Shoal Offshore Wind Farm and Dudgeon Offshore Wind Farm, named the Sheringham Shoal Extension Project (SEP) and Dudgeon Extension Project (DEP). SEP and DEP will consist of a number of offshore and onshore elements including the offshore wind turbines, offshore export cables and offshore substation(s). The offshore export cables will connect to shore on the North Norfolk coast, with onshore infrastructure connecting the offshore wind farms to the National Grid, which will comprise underground cables from landfall to an onshore substation and National Grid connection at Norwich Main. A full description of SEP and DEP is provided within **ES Chapter 4 Project Description** (document reference 6.1.4).

In 2019, Wild Frontier Ecology (WFE) was commissioned by Equinor to undertake an Extended Phase 1 Habitat Survey (EP1HS) of the PEIR boundary associated with the onshore grid connection for SEP and DEP. The onshore components comprise a c.60 kilometre (km) route with landfall location around Weybourne on the North Norfolk coast, with the onshore cable route then running southwards and eventually eastwards around the west and south sides of Norwich, where it is to connect with a proposed onshore electricity substation, feeding into the National Grid near Norwich Main Substation.

The EP1HS initially covered the PEIR boundary, which was a relatively wide corridor with extensive scope for route refinement within its limits. The results of the EP1HS (along with results from various other ecological and non-ecological surveys which were concurrently underway) were then used to inform the site selection process. Specifically, the results of the EP1HS were used to ensure that habitats and features identified as being of relatively high ecological value were avoided where possible, or subject to reduced impacts (e.g. by minimising the construction footprint or nature of construction activities within certain areas). This initial stage took place from 2020 until early 2021, and informed the site selection process whereby the wider PEIR boundary was refined to become the narrower DCO boundary.

The results of the EP1HS have then been used to inform the ecological impact assessment (i.e. of habitats) which is confined to the DCO boundary only. Habitats outside the DCO boundary but which were within the wider PEIR boundary are now outside the scope of the impact assessment as they are not considered vulnerable to impacts from SEP and DEP.

Maps showing the results from the survey within the DCO boundary are provided in **Figure 3** to **Figure 18**, below.

This report outlines the aims, methods and results of the EP1HS surveys which were completed between March 2020 and September 2021.



## 2. RELEVANT LEGISLATION AND POLICY

### 2.1. Plants

Schedule 8 of the Wildlife and Countryside Act (WCA), 1981, lists plant species which are afforded special protection. It is an offence to pick, uproot or destroy any species listed on Schedule 8 without prior authorisation, and all plants are protected from unauthorised uprooting (i.e. without the landowner's permission) under Section 13 of the WCA 1981.

A Vascular Plant Red List for England<sup>1</sup> provides a measure of the current state of England's flora measured against standardised IUCN criteria. Any taxon that is Threatened (Critically Endangered [CR], Endangered [EN], Vulnerable [VU]) or Near Threatened (NT)) does not have statutory protection but should be regarded as a priority for conservation in England. It should be noted that 'threat' is not synonymous with 'rarity'; some of the species concerned are relatively common and widespread.

It is an offence to plant or cause to spread in the wild of certain plant species under Section 14 and Schedule 9 of the WCA 1981. Plant species relevant to the East of England are as follows:

- Himalayan balsam *Impatiens glandulifera*
- Variegated yellow archangel *Lamium galeobdolon* ssp. *argentatum*
- Virginia creeper *Parthenocissus quinquefolia*
- False acacia *Robinia pseudoacacia*
- Water fern *Azolla filiculoides*
- Giant hogweed *Heracleum mantegazzianum*
- Knotweed species including Japanese knotweed *Fallopia japonica*
- Parrot's feather *Myriophyllum aquaticum*
- Floating pennywort *Hydrocotyle ranunculoides*
- Rhododendron *Rhododendron ponticum*
- Giant rhubarb *Gunnera tinctoria*
- New Zealand pigmyweed *Crassula helmsii*
- Waterweeds *Elodea* spp.

All waste containing Japanese knotweed comes under the control of Part II of the Environmental Protection Act 1990, and is classified as controlled waste.

### 2.2. Priority Species and Habitats

Other priority species and habitats are a consideration under the National Planning Policy Framework (NPPF<sup>2</sup>) 2021, placing responsibility on Local Planning Authorities to

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<sup>1</sup> Stroh P.A., Leach S.J., August T.A., Walker K.J., Pearman D.A., Rumsey F.J., Harrower C.A., Fay M.F., Martin J.P., Pankhurst T., Preston C.D. & Taylor I. (2014). *A Vascular Plant Red List for England*. Botanical Society of Britain and Ireland, Bristol.

<sup>2</sup> Ministry of Housing, Communities and Local Government (2021). *National Planning Policy Framework*. UK Government.

aim to conserve and enhance biodiversity and to encourage biodiversity in and around developments. There is a general biodiversity duty in the Natural Environment and Rural Communities (NERC) Act 2006 (Section 40) which requires every public body in the exercising of its functions to ‘have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity’. Biodiversity, as covered by the Section 40 duty, includes all biodiversity, not just the Habitats and Species of Principal Importance.

Section 41 of the NERC Act requires the Secretary of State to publish a list of species and habitats as being Species/ Habitats of Principal Importance. These are species/habitats in England (commonly known as Priority Habitats/Species) which had been identified as requiring action under the UK BAP, and which continue to be regarded as conservation priorities under the UK Post-2010 Biodiversity Framework. The protection of either Priority Species or Habitats is not statutory, but “specific consideration”<sup>3</sup> should be afforded by Local Planning Authorities when dealing with them in relation to planning and development control. Also, there is an expectation that public bodies would refer to the Section 41 list when complying with the Section 40 duty.

Priority Habitats relevant to the onshore elements of SEP and DEP include:

- Arable field margins
- Traditional orchards
- Hedgerows
- Coastal vegetated shingle
- Maritime cliffs and slopes
- Eutrophic standing waters
- Ponds
- Rivers
- Lowland calcareous grassland
- Lowland dry acid grassland
- Lowland meadows
- Lowland fen
- Coastal and floodplain grazing marsh
- Reedbeds
- Lowland mixed deciduous woodland
- Wet woodland
- Wood-pasture and parkland

Widespread Priority Species in East Anglia (which have no specific legal protection) include:

- Common toad *Bufo bufo*
- Hedgehog *Erinaceus europaeus*
- Brown hare *Lepus europaeus*

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<sup>3</sup> JNCC (2015) UK BAP priority species and habitats

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- Harvest mouse *Micromys minutus*
- Small heath butterfly *Coenonympha pamphilus*
- Wall butterfly *Lasiommata megera*
- Cinnabar moth *Tyria jacobaeae*

Many bird species with Birds of Conservation Concern<sup>4</sup> Red or Amber listings are also Priority Species.

### 2.3. Local Species and Habitat Designations

The Norfolk Biodiversity Partnership (NBP) has published Habitat and Species Action Plans for selected habitats and species occurring within Norfolk. Each Action Plan lists current actions and defines objectives and targets.

The NBP has also published a Biodiversity Supplementary Planning Guidance for Norfolk. This document sets out the key considerations relating to wildlife and biodiversity that should be taken into account for all Norfolk development proposals.

### 2.4. Policy

#### 2.4.1 National Policy Statements

The National Policy Statements (NPS) are the principal decision-making policy documents for Nationally Significant Infrastructure Projects. Those relevant to SEP and DEP are:

- Overarching NPS for Energy (EN-1);
- NPS for Renewable Energy Infrastructure (EN-3); and
- NPS for Electricity Networks Infrastructure (EN-5).

The specific assessment requirements relating to biodiversity and ecology are contained primarily in NPS EN-1, section 5.3.

#### 2.4.2 National Planning Policy Framework

The overarching policy guidance for biodiversity is included within the NPPF. Section 15 of this document (Conserving and Enhancing the Natural Environment) outlines the approach that Local Authorities should adopt when considering ecological issues within the planning framework, including the principles of the Mitigation Hierarchy. This espouses that in addressing impacts on valued features, avoidance should be the first option considered, followed by mitigation (minimising negative impacts). Where avoidance and mitigation are not possible, compensation for loss of features can be used as a last resort.

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<sup>4</sup> Stanbury, A.J., Eaton, M.A., Aebischer, N.J., Balmer, D., Brown, A.F., Douse, A., Lindley, P., McCulloch, N., Noble, D.G. & Win, I. (2021). Birds of Conservation Concern 5: the status of our bird populations: the fifth birds of conservation concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain, available online at [\[REDACTED\]](#)

Paragraph 180(d) of the NPPF requires opportunities to incorporate biodiversity improvements in and around development as part of the design, especially where this can secure measurable **net gains** for biodiversity or enhance public access to nature where this is appropriate. Paragraph 179 specifies that plans should identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including locally designated sites (such as CWS). It also promotes the conservation, restoration and enhancement of priority habitats and ecological networks and the protection and recovery of priority species.

## 3. SURVEY METHODS

### 3.1. Background

During the Terrestrial Ecology and Ornithology Expert Topic Group (ETG) meeting on 28<sup>th</sup> January 2020, attended by Natural England, the Environment Agency, Norfolk County Council, Broadland District Council, North Norfolk District Council and South Norfolk District Council, it was discussed and agreed that the PEIR boundary (which was later refined to become the DCO boundary) should be subject to an EP1HS.

In February and March 2020, land agents at Dalcour Maclaren Ltd. (DM) commenced arranging access for various surveys, including the EP1HS, with relevant landowners along the PEIR boundary. Access agreements were gradually obtained over the following 19 months, and surveys of accessible land parcels were subsequently completed as access was obtained.

### 3.2. Extended Phase 1 Habitat Survey

Each accessible land parcel within the survey area (which was initially the PEIR boundary from 2020 until early 2021, and then the DCO boundary from early 2021 onwards) was visited by a pair of WFE ecologists. These surveyors walked-over accessible parts of the land parcels, and categorised all observed habitats and features to prescribed Phase 1 Habitat classifications<sup>5</sup>, recording these onto paper maps of the land parcel. For certain habitats such as hedgerows, grasslands and woodlands, the survey involved recording plant species and noting structural conditions to refine habitat classifications; for example, hedgerows are classified according to whether they are species-rich (containing five or more ‘woody’ species), whether they contain distinct trees and whether they are intact or defunct (for the purposes of this survey, a defunct hedgerow was one in which gaps amounted to 10% or more of the length of the hedgerow). This information was recorded on paper forms.

The ecological surveyors photographed each habitat, other than arable fields or built features (roads, buildings etc.).

Any features of ecological note were ‘target-noted’. Surveyors recorded relevant ecological information and plotted the location of the target note on the paper map.

The survey was extended to include an evaluation of the suitability of the observed habitats for use by protected species. This information was recorded on paper forms, which included specific sections on any observed habitats or features suitable for badgers, bats, breeding birds, great crested newts, reptiles, riparian mammals (otters and water voles) and white-clawed crayfish. The survey also recorded any signs of such species observed during the walk-over survey. This included (but was not limited to) direct sightings of animals, badger setts, sloughed reptile skins, footprints, droppings/latrines, dead animals/remains, feeding remains, features in trees or buildings which are suitable for use by roosting bats, and birds’ nests or signs of nesting/breeding birds. As with target-notes, the location of any signs of, or suitable habitat for protected species was recorded on paper maps and the detail of the

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<sup>5</sup> Joint Nature Conservation Committee (2010.) Handbook for Phase 1 Habitat Survey - A Technique for Environmental Audit. JNCC

observation was recorded on paper forms. Photographs were taken of such features wherever possible.

The appraisal of the suitability of trees and buildings for roosting bats was based on Bat Conservation Trust (BCT) guidelines<sup>6</sup>. From a ground-level appraisal, surveyors looked for features such as rot-holes, hazard beams, tear-outs, dense ivy *Hedera helix* cladding or other niches within the tree which could provide suitable niches for roosting bats. Depending on the number and apparent suitability of these features, the bat roost potential of each tree was then classified per the BCT guidelines into one of four categories; High, Moderate, Low or Negligible. Any clear signs of roosting bat presence (such as droppings, urine/body-oil stains, audible bat noise/squeaking or direct sightings) were noted if observed; this would not necessarily have a bearing on the classification of the tree's bat roost potential but demonstrates that the tree does (or is more likely to) support roosting bats.

Surveys were completed by the following WFE staff, always working in pairs (with job titles at the time shown in brackets):

- Susannah Dickinson BSc MCIEEM (senior ecologist)
- Jenny Donelan BSc MSc (assistant ecologist)
- Mary Goddard BSc MSc ACIEEM (ecologist)
- Alex Lowe BSc MArborA (arborist - working in a pair with an ecologist)
- Ptolemy McKinnon BSc MSc (assistant ecologist)
- Justin Parry BSc (assistant ecologist)
- Alice Petherick BA MA (assistant ecologist)
- William Riddett BA ACIEEM (senior ecologist)
- Graham Riley BSc ACIEEM (senior ecologist)
- Katrina Salmon BSc (assistant ecologist)
- Adam Stickler BSc MSc ACIEEM (ecologist)
- Robert Yaxley BSc CEnv CCol MCIEEM (principal ecologist)

In order to increase surveyor capacity at times when extensive land parcel access was granted, the following subcontractor surveyors were used to assist a WFE ecologist (i.e. making up one of the pair of surveyors):

- Daniel Carne BSc (independent ecological and ornithological consultant)
- Phillip Farndon BSc (independent ecological and ornithological surveyor)
- David Showler (independent ecological and ornithological consultant)

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<sup>6</sup> Collins, J. (ed) (2016). *Bat Surveys - Best Practice Guidelines, 3rd Edition*. Bat Conservation Trust, London.

Each of the above subcontractor surveyors completed one day of survey, working as one of a pair with a WFE surveyor.

The main EP1HS effort commenced on 3<sup>rd</sup> March 2020 and ceased on 17<sup>th</sup> September 2020. However, there was a cessation in the surveys in late March and early April due to Covid-19 related restrictions and to allow time for relevant precautionary working methods to be put in place. EP1HS were also paused in June 2020 to allow the ecologists to focus on great crested newt surveys, which are seasonally restricted and must be completed before the end of June. Due to these cessations in the survey and the ongoing access agreement process (whereby relatively few land parcels were accessible in March, April and May), the vast majority of EP1HS was completed between July and early September 2020, which is also a more optimal time of year for EP1HS.

In January 2021, the landowner access situation was reviewed with DM and it was determined that sufficient new land parcels had become available for access to warrant recommencing with the EP1HS. Surveys were therefore restarted (and completed in accordance with the same methodology as outlined above) and ran from 13<sup>th</sup> to 27<sup>th</sup> January 2021, covering land parcels within survey area which had not been accessible for surveys in 2020. This same situation occurred again in September 2021 following incremental increases in landowner access, and the ongoing site selection process relating to the DCO boundary which meant new parcels required surveying.

### 3.3. Biodiversity Net Gain

At the start of July 2020, the survey scope was increased to include collection of baseline data to allow Biodiversity Net Gain (BNG) calculations to be completed. This involved recording plant species lists for each habitat, noting any indicators of good- or poor-quality habitat conditions and classifying the habitat type in accordance with UK Habitat Classification (UK Hab) criteria rather than Phase 1 Habitat Survey classifications, which use the Joint Nature Conservation Committee defined habitat categories. As the survey technique is easily incorporated with the EP1HS, both surveys were conducted for each land parcel surveyed from the start of July 2020 onwards. The surveyors and methods are largely the same as outlined above for the EP1HS.

The prevalence of plant species within each habitat was recorded using the DAFOR scale (D: dominant, A: abundant, F: frequent, O: occasional and R: rare).

Full detail of the methods used during the BNG surveys (along with the results of the calculations) is provided in **Appendix 20.6: Initial Biodiversity Net Gain Assessment Report**.

### 3.4. Data Search

In order to address gaps in the survey coverage related to restricted landowner access, NBIS was consulted in January 2021 and asked to provide all 'Norfolk Living Map' data held for the area covered by the DCO boundary. The data are Geographic Information System (GIS) digitised shapefiles relating to relatively broad habitat classifications (not as detailed as EP1HS or UKHab), which has been compiled by NBIS for the whole of the county of Norfolk.

Priority Habitats within the DCO boundary were identified from the Multi-Agency Geographic Information for the Countryside (MAGIC) website<sup>7</sup>, which lists habitats

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<sup>7</sup> <https://magic.defra.gov.uk/magicmap.aspx>

included on the Priority Habitats Inventory (PHI). The MAGIC website was also used to help inform certain habitat classifications, such as by using the National Forest Inventory (NFI).

### **3.5. GIS Digitising**

The field notes and maps were transcribed and digitised in Quantum GIS (QGIS), a GIS software programme. Metadata was incorporated within each relevant mapped feature, such as plant species, structure, surveyors and other notes recorded (meaning each hedgerow, grassland, woodland etc. has its data related to the mapped polygon or polyline). Each feature had a unique reference assigned, such as H0001, H0002 etc. for hedgerows.



## 4. RESULTS

The results of the EP1HS are provided in **Figure 3** to **Figure 18** and Target Notes are described in **Table 6**, below. Given the extensive size of the DCO boundary, a full description of all habitats (feature by feature) within the survey area is not provided in writing here. Instead, a summary of the general habitat mosaic throughout the boundary is provided, and specific features of notable ecological value (e.g. woodlands, rivers etc.) are then listed and described.

GIS metadata is provided alongside this report, which includes a unique reference for each mapped feature (hedgerow, field, grassland waterbody etc.) within the DCO boundary, along with relevant details on each feature such as species composition, structure etc.

The maps do not include protected species information denoting issues such as trees which have bat roost potential or signs of badger activity. Instead, individual protected species survey appendices are provided which outline in detail the results of all targeted protected species surveys completed to date.

### 4.1. General Overview of Phase 1 Habitat Survey Results

A summary of all habitat types recorded during the EP1HS is provided in **Table 1**, below (excluding linear features such as hedgerows, which are summarised in

**Table 4).** This table shows the cumulative area of each non-linear habitat type recorded within all surveyed parts of the DCO boundary. Habitat classifications and areas returned by NBIS Norfolk Living Map data (covering areas which were not accessible for EP1HS) are summarised in **Table 2**, below.

**Table 1: Summary of Habitat Types and Areas Recorded Within DCO Boundary during the EP1HS**

Phase 1 Habitat Code and Type	Total Area (square metres)	Percentage of EP1H-Surveyed DCO Boundary Covered by Habitat
J.1: Arable	3,667,178	81.93%
B4: Improved grassland	241,357	5.39%
B6: Poor semi-improved grassland	119,891	2.68%
A1.2.2: Plantation coniferous woodland	111,897	2.5%
A1.1.1: Semi-natural broadleaved woodland	60,789	1.36%
A1.1.2: Plantation broadleaved woodland	52,605	1.18%
B2.2: Semi-improved neutral grassland	41,126	0.92%
J1.3: Ephemeral/short perennial vegetation	37,479	0.84%
A1.3.1: Semi-natural mixed woodland	30,299	0.68%
H8.4: Coastal grassland	20,408	0.46%
A1.3.2: Plantation mixed woodland	20,393	0.46%
J6: Hardstanding (excluding roads)	10,372	0.23%
H3: Shingle (above high-tide mark)	9,997	0.22%
A2.2: Scattered scrub	9,712	0.22%
C3.1: Tall herb and ruderal vegetation	7,107	0.16%
A2.1: Dense scrub	7,078	0.16%
B5: Marshy grassland	6,552	0.15%
J1.2: Amenity grassland	6,318	0.14%
A3.1: Scattered broadleaved trees	5,561	0.12%
G2: Flowing water	5,309	0.12%
J4: Bare ground	2,906	0.06%
G1: Standing water	816	0.018%
E3.3: Fen (flood plain mire)	673	0.015%
F1: Swamp	166	0.004%

**Table 2: Summary of Habitat Types and Areas Within the DCO Boundary as Provided by NBIS Norfolk Living Map Data**

NBIS Norfolk Living Maps Habitat Type	Total Area (square metres)	Percentage of NBIS Norfolk Living Maps-Covered DCO Boundary Covered by Habitat
Arable	443,151	92.42%

Woodland	11,690	2.46%
Semi-improved grassland	10,414	2.19%
Improved grassland	8,934	1.88%
Building	4,226	0.89%
Water	386	0.08%
Scrub	325	0.07%

The habitat classifications of the EP1HS do not fully align with those provided by NBIS' Norfolk Living Map data. To provide an indication of habitat classifications across the whole DCO boundary (the 90.4% covered by the EP1HS and the 9.6% covered by NBIS's Norfolk Living Map data), the habitat classifications have been amalgamated into broad habitat categories in **Table 3**, below. When reviewed across the whole of the DCO boundary, habitat categorisations cannot be divided to show more intricate differences between them, such as between semi-natural and plantation woodlands or between broadleaved and coniferous woodlands, because the NBIS Norfolk Living Map Data does not make this distinction in its mapping of woodland. The broad habitat categories applied to all habitats across the entire DCO boundary are therefore largely defined by the more expansive/less precise terms used on NBIS's Norfolk Living Maps.

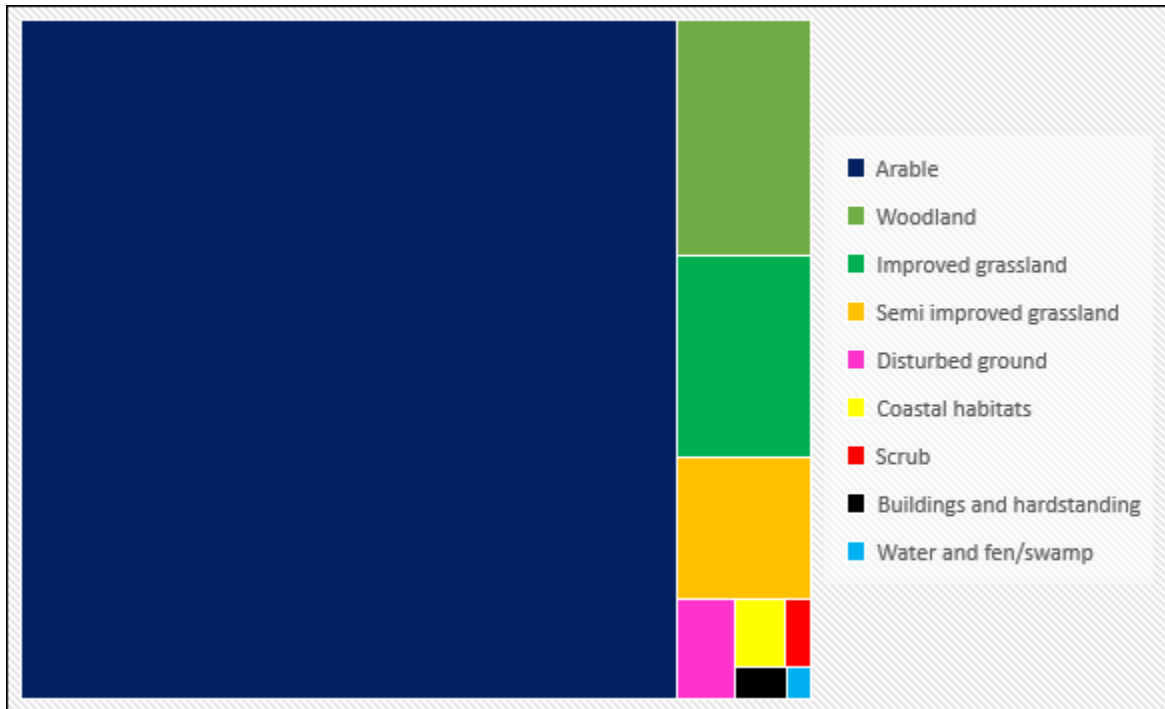
**Table 3: Combined Habitat Data**

Broad Habitat Category	Habitat Classification/s Included from:		Total area (square metres) from all relevant Habitat Classifications	Percentage of DCO Boundary Covered by Habitat Category
	EP1HS	NBIS Norfolk Living Map Data		
Arable	J.1: Arable	Arable	4,110,329	82.95%
Woodland	A1.2.2: Plantation coniferous woodland	Woodland	293,234	5.92%
	A1.1.1: Semi-natural broadleaved woodland			
	A1.3.1: Semi-natural mixed woodland			
	A1.1.2: Plantation broadleaved woodland			
	A1.3.2: Plantation mixed woodland			
	A3.1: Scattered broadleaved trees			
Improved grassland	B4: Improved grassland	Improved grassland	250,291	5.05%
Semi-improved grassland	B6: Poor semi improved grassland	Semi-improved grassland	177,983	3.59%
	B2.2: Semi-improved neutral grassland			
	B5: Marshy grassland			
Disturbed ground	J1.3: Ephemeral/short perennial vegetation	n/a	53,810	1.09%
	C1.3: Tall herb and ruderal vegetation			
	J1.2: Amenity grassland			
	J4: Bare ground			
Coastal habitat	H8.4: Coastal grassland	n/a	30,405	0.61%
	H3: Shingle (above high tide mark)			
Scrub	A2.2: Scattered scrub	Scrub	17,115	0.35%
	A2.1: Dense scrub			
Buildings and hard-standing	J6: Hardstanding	Building	14,598	0.29%
Water	G2: Flowing water	Water	6,511	0.13%
	G1: Standing water			
Fen and swamp	E3.3: Fen	n/a	839	0.02%
	F1: Swamp			

The proportionate division of these habitat types across the whole DCO boundary is visually represented in a ‘treemap’ in **Figure 1**, below. In this figure, the two smaller habitat categories (water and fen and swamp) are amalgamated because individually

they occupy a visually indiscernible area, and they are broadly similar habitat categories. This treemap has been produced to illustrate the dominance of arable habitat as a proportion of all habitats within the DCO boundary.

**Figure 1: 'Treemap' Showing Proportional Spatial Coverage of Broad Habitat Categories within the DCO Boundary**



As shown above, the DCO boundary runs through a predominantly arable landscape, with arable habitat by far the most abundant habitat type noted during the survey. Field boundaries bordering arable fields are mostly comprised of hedgerows, with others marked by ditches (dry/seasonal and wet), verges/field margins, fences and tree-lines/shelter-belts.

A small number of arable fields were found to be in uncultivated (fallow/set-aside) condition at the time of the survey. The habitat classification of these fields is arable (because this is their typical, long-term habitat type), even though at the time of the survey the habitat may have been closer to classifications such as tall-herb and ruderal, ephemeral/short perennial or improved/poor semi-improved grassland. However, these classifications do not reflect the long-term condition of the habitat (indeed, it is likely that many of these fields will be re-cultivated in the near future).

Arable fields are typically of low ecological value and provide suboptimal conditions for protected and notable species. However, they often provide opportunities for ground-nesting birds such as skylark *Alauda arvensis*, as outlined in the **Breeding Birds Survey Report 20.5**. Terrestrial mammals such as brown hares *Lepus europeus* also use arable fields for foraging and shelter.

There are a small number of waterbodies (namely ponds, rivers, streams and ditches) scattered throughout the DCO boundary, particularly in the south. More detail on ponds as a habitat is provided in the **Great Crested Newt Survey Report 20.2**.

The DCO boundary passes through the river corridors of the Rivers Bure, Wensum, Tud, Yare and Tiffey, including their associated tributaries and drainage ditches. These river

corridors are amongst the more diverse mosaics of habitat within the DCO boundary, with various grasslands, woodlands, scrub, hedgerows, ditches and ponds (amongst other habitats) often recorded in close proximity to the river channels and floodplains. All these rivers are either classified as chalk streams or are tributaries of rivers which are classified as such; for example, the River Tiffey is a tributary of the River Yare (which is a chalk stream), which itself converges with the River Wensum (another chalk stream). The DCO boundary also runs adjacent to the source/headwaters of the River Glaven (also a chalk stream), to the east of Hart Lane near Bodham in the district of North Norfolk.

The DCO boundary also passes through a number of woodlands, listed below. Most of these are small pockets of semi-natural broadleaved or plantation woodland. In general, the DCO boundary avoids woodland, with the boundary aligned around the edges of woodlands such as Mossymere Wood (**Figure 7**), Black Bridge Wood and Bluestone Plantation (**Figure 8-Figure 9**), Scotchwood Hills (**Figure 12**), Colton Wood (an ancient woodland - **Figure 14**) and Smeeth Wood (an ancient woodland - **Figure 16**).

There are occasional grasslands along the DCO boundary, most of which are improved or poor semi-improved grassland used for grazing livestock. There are a small number of semi-improved grasslands (including but not limited to acid and neutral), typically occupying small pockets of land which have not been as intensively managed as other grassland within the DCO boundary.

There are assorted other habitat types within the DCO boundary, typically occupying small, linear and disused parcels of land such as along roadsides, beside railways (including disused railways), beneath electricity pylons and within and around villages. These disused areas of land support a range of habitat classifications including scrub, tall herb and ruderal, bare ground and poor semi-improved grassland, amongst others. None of these habitats qualify as Priority Habitats unless stated in their individual descriptions below.

#### **4.2. Hedgerows and Other Linear Habitats**

All eight Phase 1 Habitat Survey hedgerow classifications were recorded within the DCO boundary, as follows:

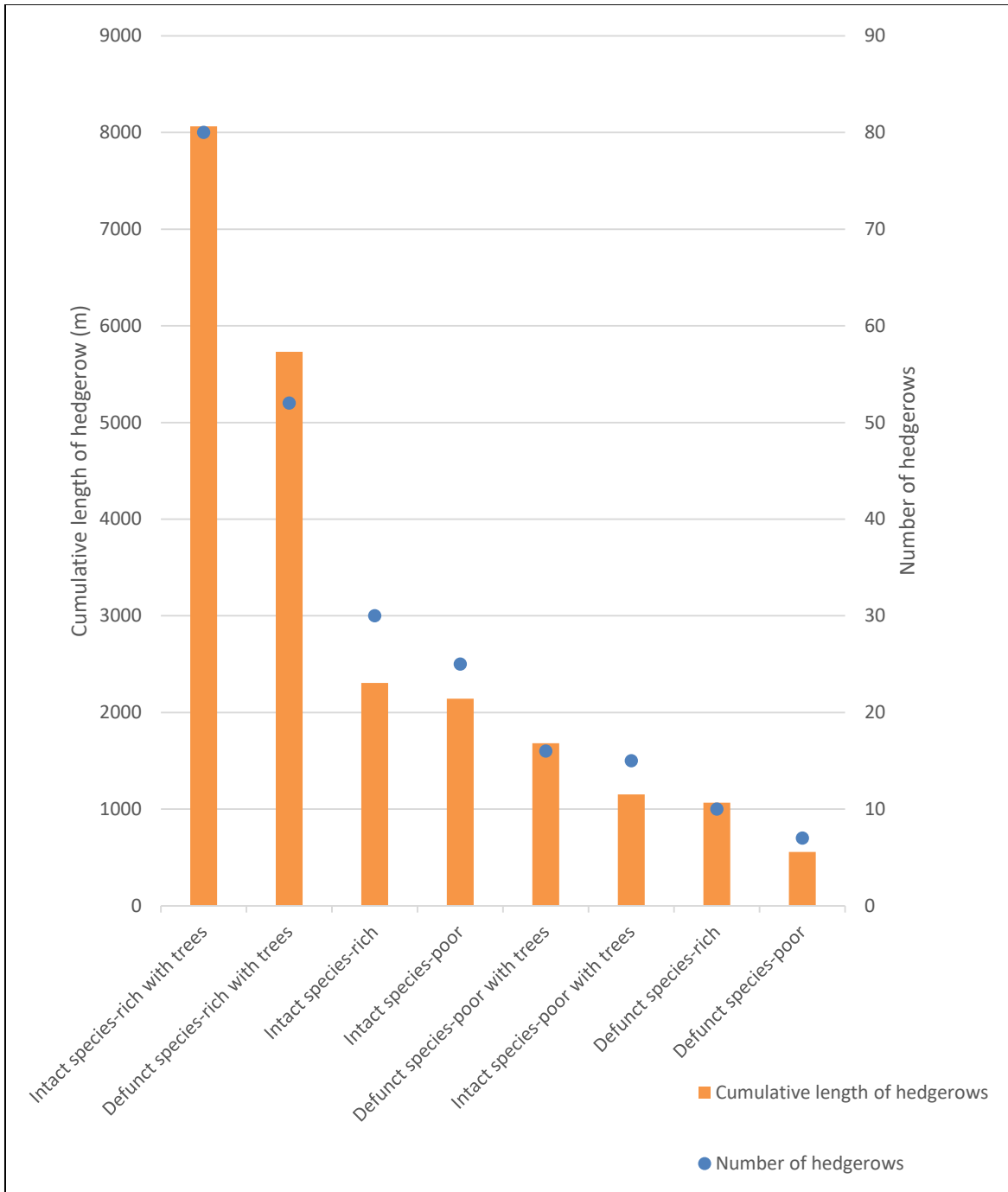
**Table 4: Hedgerow (and Other Linear Habitat) Classifications Recorded within the DCO Boundary**

Phase 1 Hedgerow Code and Classification	Number of Classified Hedgerows within Surveyed parts of the DCO Boundary	Cumulative Length (metres) of Classified Hedgerows within Surveyed parts of the DCO Boundary
J2.1.1: Intact, species-rich hedgerow	30	2,306
J2.1.2: Intact, species-poor hedgerow	25	2,143
J2.2.1: Defunct, species-rich hedgerow	10	1,067
J2.2.2: Defunct, species-poor hedgerow	7	557
J2.3.1: Intact, species-rich hedgerow with trees	80	8,064
J2.3.2: Intact, species-poor hedgerow with trees	15	1,153
J2.3.3: Defunct, species-rich hedgerow with trees	52	5,731
J2.3.4: Defunct, species-poor hedgerow with trees	16	1,683
Other Linear Habitat/Feature Code and Classification	Number of Classified Features within Surveyed parts of the DCO Boundary	Cumulative Length (metres) of Classified Feature within Surveyed parts of the DCO Boundary
A1.1: Line of trees	22	2,192
G1: Wet ditch	22	2,033
J2.6: Dry (seasonal) ditch	14	1,436
J2.4: Fence	23	4,140
J2.8: Bank	5	350
H8.2: Cliff	1	178

As shown in

Table 4 and in the visual representation of this data in Figure 2, below, the most common hedgerow types are intact species-rich with trees, defunct species-rich with trees and intact species-rich (without trees). These three hedgerow classifications account for approximately 69% of all hedgerows recorded within the DCO boundary.

**Figure 2: Total Numbers and Cumulative Lengths of Hedgerows (by Phase 1 Habitat Survey Classifications) within Surveyed Parts of the DCO Boundary**



In general, hedgerows which are combinations of intact, species-rich and inclusive of trees are of relatively greater ecological value than hedgerows which are combinations of defunct, species-poor and without trees. As shown in



**Table 4** and **Figure 2**, above, the majority of hedgerows recorded are those which have combinations of the higher value features; for example, hedgerows which are of the relatively highest value (i.e. intact, species-rich and with trees) were the most commonly recorded classification of hedgerow. Hedgerows which are of the relatively lowest value (i.e. defunct, species-poor hedgerows without trees) were the least frequently recorded classification of hedgerow.

Hedgerows are mostly comprised of common hedgerow shrub species such as hawthorn *Crataegus monogyna*, blackthorn *Prunus spinosa*, field maple *Acer campestre*, elder *Sambucus nigra*, dog-rose *Rosa canina* and hazel *Corylus avellana*. Climbing plants such as bramble *Rubus fruticosus* agg. and ivy *Hedera helix* were also recorded in most hedgerows.

Trees in hedgerows within the DCO boundary are mostly oak *Quercus robur*, although field maple and ash *Fraxinus excelsior* were also commonly recorded.

The protected species value of hedgerow habitat is outlined in relevant technical appendices, such as for breeding birds and foraging bats. In addition to providing sheltering, nesting and feeding habitat for a range of wildlife (including some protected species), hedgerows also have an ecologically important connective function. Most hedgerows have associated margins or verges which contribute to their ecological function (although there is no Phase 1 Habitat classification for verge or margin, and these are not mapped). Arable margins, where managed for the benefit of wildlife, can qualify as a Priority Habitat, reflecting their conservation importance.

All hedgerows within the DCO boundary qualify as Priority Habitat.

Arable field margins are not a distinct Phase 1 Habitat category and so have not been captured by this survey; arable margins are considered to be part of arable habitat in accordance with the Phase 1 classification, mainly because they can be dynamic features (which are often ploughed up, sown with different plants between years, or created along new field edges) rather than more permanent habitats such as hedgerows. Furthermore, had the EP1HS captured the locations and extents of arable field margins during the 2020 and 2021 surveys, this information will likely become obsolete far more rapidly than other habitat information precisely because this habitat is so changeable. However, it is clear, given the extent of arable habitat across the DCO boundary, that arable field margins are and will continue to be a common and widespread habitat across the DCO boundary (albeit a habitat which is difficult to accurately capture and map). Per the precautionary principle it should be assumed that any arable field margins are a Priority Habitat.

### 4.3. Woodland

Whilst the DCO boundary is aligned to avoid most woodland habitat, it passes through the following notable areas of woodland (listed from north to south):

- Weybourne Wood (between Bodham and Weybourne - **Figure 3**): conifer plantation dominated by black pine *Pinus nigra*, spruce *Picea* sp., and Scot's pine *Pinus sylvestris*. There is a small section of mixed plantation woodland with oak, rowan *Sorbus aucuparia* and western red cedar *Thuja plicata*. The relevant parts of Weybourne Wood are listed on the NFI on the MAGIC website as Conifer woodland, with small areas classified as "Young trees" and "Felled woodland". In total, approximately 760m (length) of the DCO boundary overlaps this woodland.

- Unnamed woodland (west of Oulton - **Figure 8**): broadleaved plantation dominated by oak, sweet chestnut *Castanea sativa*, ash, alder *Alnus glutinosa* and wild cherry *Prunus avium*. The woodland is listed on the NFI as “Mainly mixed conifer woodland”. Approximately 60m (length) of the DCO boundary overlaps this woodland.
- Southern edge of Moegoe’s Plantation (north-east of Swannington - **Figure 11**): semi-natural broad-leaved woodland dominated by oak, hazel, hawthorn, elm *Ulmus* sp., and blackthorn. The woodland is listed on the PHI as “Deciduous woodland” and on the NFI as “Broadleaved woodland”. Approximately 90m (length) of the DCO boundary overlaps this woodland.
- The Spinney, north-east of Ringland Lane (east of Weston Longville - **Figure 12**): semi-natural broadleaved woodland dominated by sycamore *Acer pseudoplatanus*, oak, wild cherry, field maple, ash and hawthorn. This woodland is listed on the PHI as “Deciduous woodland” and on the NFI as “Broadleaved woodland”. Approximately 45m (length) of the DCO boundary overlaps this woodland.
- A band of woodland on the south side of The Broadway (south-east of Weston Green - **Figure 13**): semi-natural mixed woodland dominated by Scots pine, sycamore, sweet chestnut, beech *Fagus sylvatica* and larch *Larix decidua*. The woodland is listed on the PHI as “Deciduous woodland” and on the NFI as “Broadleaved woodland”. Approximately 35m (length) of the DCO boundary overlaps this woodland.
- Ringland Covert (south-west of Ringland - **Figure 13**): semi-natural broadleaved woodland. This woodland is designated as Hall Hills/Ringland Covert CWS (no. 2105). The canopy is dominated by ash, beech, sycamore, silver birch *Betula pendula*, hornbeam *Carpinus betulus* and sweet chestnut. This woodland is also listed on the PHI as “Deciduous woodland” and on the NFI as “Broadleaved woodland”. Approximately 240m (length) of the DCO boundary overlaps this woodland.
- Unnamed woodland adjacent to Colton Wood, north of the River Yare (between Barford and Colton - **Figure 14**): semi-natural broadleaved woodland dominated by grey willow *Salix cinerea*, alder, ash, goat willow *S. caprea*, crack willow *S. fragilis*, hazel and elder. This woodland is designated as Yare Valley (Colton Wood) CWS (no. 228). This woodland is also listed on the PHI as “Deciduous woodland” and on the NFI as “Broadleaved woodland”. Approximately 40m (length) of the DCO boundary overlaps this woodland.
- Two unnamed pockets of woodland adjacent to the River Tiffey (east of Barford - **Figure 15**): not accessible for survey so woodland classification is unknown. The southern part of this woodland is designated as Yare Valley (Marlingford Hall) CWS (no. 229). These woodlands are also listed on the PHI as “Deciduous woodland” and on the NFI as “Broadleaved woodland”. Approximately 80m (length) of the DCO boundary overlaps with the southernmost section of woodland.
- Durrell’s Clump (south-east of Barford - **Figure 15**): conifer plantation (Christmas trees), parts of which had been recently harvested at the time of the survey, and with small areas of mixed and broadleaved plantation woodland in the north-east, dominated by oak, field maple, ash, hazel, beech, hawthorn, sweet chestnut, silver birch, wild cherry and Scots pine. The woodland is listed

- on the NFI as “Young trees”. Approximately 450m (length) of the DCO boundary overlaps this woodland.
- The Wong (south of Wong Farm near Hethersett - **Figure 16**): broadleaved plantation woodland in the east and a band of semi-natural broadleaved woodland in the west, both dominated by mature oak and ash with an understorey of hawthorn, holly *Ilex aquifolium*, elder and field maple. The band of woodland in the west is listed on the PHI as “Deciduous woodland” and on the NFI as “Broadleaved woodland”. Approximately 25m (length) of the DCO boundary overlaps with the western band of woodland.
  - Two unnamed woodland belts north of Outerpark Wood (in Ketteringham - **Figure 16**): The easternmost belt is a mixed plantation woodland dominated by ash, field maple, hawthorn and sycamore. The westernmost is a semi-natural broadleaved woodland dominated by ash, oak, wych elm *Ulmus glabra*, sweet chestnut, holm oak *Quercus ilex* and Scots pine, with an understorey of elder and hazel. The westernmost woodland belt is listed on the PHI as “Deciduous woodland” and on the NFI as “Broadleaved woodland”. Approximately 15m (length) of the DCO boundary overlaps with the westernmost woodland and approximately 45m (length) overlaps with the easternmost woodland.
  - The Oval (east of Ivy Farm, between Swardeston and Ketteringham - **Figure 17**): broadleaved plantation woodland dominated by sweet chestnut, oak and ash with an elm and hazel understorey. This woodland is listed on the PHI as “Deciduous woodland” and on the NFI as “Broadleaved woodland”. Approximately 50m (length) of the DCO boundary overlaps this woodland.
  - Norwich Hill (south-west of Five Ways road junction, between Swardeston and Ketteringham - **Figure 17**): semi-natural mixed woodland, mostly broad-leaved, dominated by oak, sycamore and Scots pine, with a dense understorey of bramble. This woodland is listed on the PHI as “Deciduous woodland” and on the NFI as “Broadleaved woodland”. Approximately 260m (length) of the DCO boundary overlaps this woodland.
  - Furze Meadow (between Swardeston and Ketteringham - **Figure 17**): broadleaved plantation woodland dominated by poplar *Populus* sp. trees, with a band of semi-natural broadleaved woodland in the south dominated by alder in a low-lying area with standing water (during the January survey). There are some nearby sections of conifer plantation dominated by Scots pine, and mixed plantation dominated by Scots pine, oak, beech, silver birch and sweet chestnut. All of this woodland is listed on the NFI but only the central section is listed on the PHI; the northernmost part of this woodland is listed on the NFI as “Conifer woodland”, the central part as “Broadleaved woodland” (this part is also listed on the PHI as “Deciduous woodland”) and the southernmost part is listed as “Broadleaved woodland”. Approximately 90m (length) of the DCO boundary overlaps this woodland.
  - An unnamed woodland belt south of the existing Norwich Main electricity substation (near Swardeston - **Figure 18**): broadleaved plantation woodland with some nearby pockets of scrub, which is dominated by sycamore, oak, Norway maple *Acer platanoides* and elm, with an understorey of elder, hawthorn and bramble.

The DCO boundary also passes through or marginally overlaps the edges of some other small woodlands.

#### 4.4. Grassland

The majority of grasslands within the DCO boundary are classified as improved or poor semi-improved, meaning they have historically been heavily influenced by management such as intensive grazing or application of fertilisers and herbicides to a degree that suppresses the diversity of grasses and forbs within the sward. Most such grasslands were found to be dominated by perennial rye grass *Lolium perenne*, cocksfoot *Dactylis glomerata*, Yorkshire fog *Holcus lanatus*, false oat *Arrhenatherum elatius* and bent grasses *Agrostis* spp., with clovers *Trifolium* spp., common daisy *Bellis perenis*, dandelions *Taraxacum* spp., plantains *Plantago* spp., docks *Rumex* spp., thistles *Cirsium* spp. ragwort *Senecio jacobaea* and stinging nettle *Urtica dioica* also widely recorded. These more improved grasslands are not considered to be Priority Habitats.

Semi-improved neutral grassland and semi-improved acid grassland were rarely recorded, and occupy small pockets of land, mostly in close proximity to or enclosed by woodland, scrub or heathland. These grasslands support notably more diverse swards which include species which would typically be outcompeted on more nutrient-enriched soils.

All sizeable areas of non-improved grassland are summarised below:

- Coastal grasslands north-west of Weybourne, at the landfall location (**Figure 3**). The northernmost (seaward) areas of vegetation are listed on the Priority Habitat Inventory as “Coastal vegetated shingle” and the landward areas are listed as “Maritime cliff and slope”.
- Improved and poor semi-improved grasslands with tall herb and ruderal vegetation, scrub and ditches near the River Bure between Itteringham and Saxthorpe (**Figure 7**). Most of the grassland is listed on the PHI as “Coastal and floodplain grazing marsh”.
- Multiple poor semi-improved grasslands east of Swannington (**Figure 11**). The areas of grassland south of Moegoe’s Plantation are listed on the PHI as “Good quality semi-Improved grassland”.
- Semi-improved neutral grassland and poor semi-improved grassland south of Attlebridge near the River Wensum (**Figure 12**). This grassland is listed on the PHI as “Coastal and floodplain grazing marsh”.
- Poor semi-improved grassland east of Taverham Road and north of Brickkiln Clump, north-east of Honingham (**Figure 13**).
- Improved grassland bordering the River Tud near Easton (**Figure 13**). This grassland is listed on the PHI as “Good quality semi-improved grassland”.
- Semi-improved neutral grassland north of the River Yare and east of Colton Wood (**Figure 14**). This grassland is considered to be of sufficient quality to qualify as the Priority Habitat of “Coastal and floodplain grazing marsh”.
- Marshy grassland, semi-improved neutral grassland and poor semi-improved grassland on the north side of the River Tiffey at Barford (**Figure 15**). This grassland is considered to be of sufficient quality to qualify as the Priority Habitat of “Coastal and floodplain grazing marsh”.
- Poor semi-improved grassland on the north side of the B1108 Watton Road, and south of the River Tiffey at Barford (**Figure 15**). This grassland is considered to

be of sufficient quality to qualify as the Priority Habitat of “Coastal and floodplain grazing marsh”.

- Poor semi-improved grassland with a small area of marshy grassland south of Valley Farm near Swardeston (**Figure 17**). This grassland is listed on the PHI as “Coastal and floodplain grazing marsh”.

There are further areas of grassland habitats within the DCO boundary, but these typically occupy small parcels of land (e.g. gardens and paddocks on the edges of the corridor) which are expected to be avoided/avoidable, or are heavily improved and so are not ecologically notable.

#### 4.5. Rivers

The six river corridors through which the DCO boundary passes are all broadly classifiable as chalk streams, meaning they are all either classified as chalk streams in their own right or feed into larger river systems which are classified as chalk streams. This habitat classification (which is not a Phase 1 Habitat category) is highlighted because it denotes an ecologically rare and sensitive habitat type; it is also a Priority Habitat. Chalk streams occur in landscapes with chalky and therefore highly permeable bedrock. Consequently, chalk streams are fed by aquifers with largely constant/consistent temperature, nutrient levels and flow rates. These rivers do not receive significant amounts of water from overland flow or runoff (due to the permeable nature of land in the surrounding catchments), which can often lead to nutrient enrichment, high sediment load or other forms of pollution in non-chalk-streams. The water in chalk streams is therefore typically very clear, with a low but stable nutrient content. These habitat conditions are conducive to establishment of oxygenating plants such as crowfoots *Ranunculus* spp., which in turn provide suitable conditions for aquatic animals such as white-clawed crayfish *Austropotamobius pallipes* and brown trout *Salmo trutta*. These animals also require the type of gravelly (rather than muddy) river beds, which are typical of chalk streams, in which to breed.

In terms of their global occurrence, chalk streams are a very rare ecosystem, with around 200 known globally, 85% of which (around 170) are found in the UK<sup>8</sup>, and most of these are located in southern and eastern England.

Given their ecological diversity, river corridors are ecologically important features both in a connective capacity but also as a foraging, sheltering and breeding habitat in their own right.

The crossings of all river corridors of the DCO boundary are listed below (running from north to south):

- River Bure between Saxthorpe and Itteringham (**Figure 7**). At the point the DCO boundary crosses the river channel, the river is also crossed by the B1354 road, running north-west to south-east across the river which flows south-west to north-east. The road crossing is bridged. South of the road, the river channel is heavily shaded by a bank of trees to the south-east. It appears to have a partially silty/muddy substrate with gravel/stones visible in patches. The banks of the river to the north-west are dominated by poor semi-improved grassland with occasional shrubs and stands of Himalayan balsam. To the north-west of

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<sup>8</sup> [wildlifetrusts.org/habitats/freshwater/chalk-rivers](http://wildlifetrusts.org/habitats/freshwater/chalk-rivers)

the river there is an area of improved grassland with ponds, ditches and scattered shrubs and trees. To the north of the road crossing, the river is bordered to the north-west by a poor semi-improved grassland field occasionally grazed by cattle. The grassland also has a network of drainage ditches and ponds, with scattered trees and scrub.

- An unnamed stream north-east of Swannington, south of Moegoe's Plantation (a tributary of the River Wensum) (**Figure 11**). This small drainage channel flows southwards around the east and south side of Moegoe's Plantation, then along the west side of a cattle-grazed poor semi-improved grassland with scattered scrub. The stream itself is heavily shaded by surrounding trees, scrub and a hedgerow. It supports little aquatic or semi-aquatic vegetation at the point the DCO boundary passes it.
- Two unnamed streams east of Swannington (tributaries of the River Wensum) (**Figure 11**). The northernmost of the streams is bordered by emergent vegetation such as meadowsweet *Filipendula ulmaria*, hemp agrimony *Eupatorium cannabinum*, wild angelica *Angelica sylvestris* and purple loosestrife *Lythrum salicaria*. The land between and immediately around the streams are sheep-grazed improved grasslands with occasional seasonal drainage ditches. The southernmost stream is bordered by a bank of broadleaved trees on its south side, so supports relatively little emergent and aquatic vegetation due to shading. However, in small areas the aforementioned species were recorded. This channel also has dense stands of Himalayan balsam on certain stretches of its banks.
- River Wensum south of Attlebridge (**Figure 12**): The River Wensum is considered a tributary of the River Yare (with the rivers converging south-east of Norwich) even though the Wensum is the larger of the two rivers. The River Wensum is, for its 78km length, designated as a Special Area of Conservation (SAC) (and Site of Special Scientific Interest) for the presence of one Annex I habitat and one Annex II species. The site also supports three Annex II species, although these are not primary reasons for the site's designation. The designations apply to the section of the river which intersects with the DCO boundary near Attlebridge. Information on the River Wensum's SAC designation<sup>9</sup> is listed below:
  - Annex I habitat which is a primary reason for selection of the site:
 

3260: Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. The Wensum represents sub-type 1 in lowland eastern England. Although the river is extensively regulated by weirs, *Ranunculus* vegetation occurs sporadically throughout much of the river's length. Stream water-crowfoot *R. penicillatus* ssp. *pseudofluitans* is the dominant *Ranunculus* species but thread-leaved water-crowfoot *R. trichophyllus* and fan-leaved water-crowfoot *R. circinatus* also occur.
  - Annex II species that are a primary reason for selection of the site:
 

1092: white-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*. The Wensum is a chalk-fed river in eastern England, and is an

<sup>9</sup> <https://sac.jncc.gov.uk/site/UK0012647>

eastern example of riverine white-clawed crayfish populations. As with most of the remaining crayfish populations in the south and east of England, the threats from non-native crayfish species and crayfish plague are severe. Designation of the river as a SAC provides as much protection as can be afforded to such vulnerable populations.

- Annex II species present as a qualifying feature but not a primary reason for site selection:

1016: Desmoulin's whorl snail *Vertigo moulinsiana*

1096: brook lamprey *Lampetra planeri*

1163: bullhead *Cottus gobio*

At the proposed crossing point of the DCO boundary, the river corridor comprises part of the floodplain of predominantly improved and semi-improved neutral grassland, occasionally grazed by cattle and sheep. The grasslands are intersected by a network of drainage ditches which are seasonally inundated. There are also scattered trees (mostly willows) throughout the floodplain. The grasslands themselves are occasionally inundated, mostly from late autumn to spring. There are, therefore, seasonal pools, ponds and scrapes within the floodplain. The river channel itself is bordered by dense marginal vegetation, mostly common reed *Phragmites australis*. The riverbed appears to be stony/gravelly with submerged aquatic vegetation including crowfoot species.

Part of the grassland floodplain to the south-west of the river is designated as Wensum Pastures at Morton Hall CWS (no. 2070).

- River Tud between Easton and Honingham (a tributary of the River Wensum) (**Figure 13**): The river channel is narrow and meandering, with extensive common water crowfoot *Ranunculus aquatilis* growing within the river, and scattered trees on the banks. The immediate surrounds of the river are improved grassland pasture, with a seasonal drainage channel to the north of the river channel. To the south of the river and grassland floodplain, there is a narrow band of mixed plantation woodland.
- River Yare between Barford and Marlingford (**Figure 14**): The river channel is bordered by arable fields and improved/poor semi-improved grassland fields to the south, and by a semi-natural broad-leaved woodland to the north. The river channel itself is meandering with a stony river-bed.
- River Tiffey east of Barford (a tributary of the River Yare) (**Figure 15**): the river channel here is surrounded by grasslands of varying quality, including marshy and semi-improved neutral grasslands to the north. To the south of the river, there are areas of fen (flood-plain mire), pockets of wet broadleaved woodland and a network of small drainage ditches and ponds which feed into the river. The river channel itself is fairly narrow and appeared (during the EP1HS) to have a silty/muddy substrate.
- Unnamed stream north of East Carleton (a tributary of the River Yare) (**Figure 17**); the stream flows through Furze Meadow woodland so is heavily shaded and largely devoid of any discernible aquatic or semi-aquatic vegetation.
- Unnamed stream (referred to as Intwood Stream) and ditches west of Swardeston (a tributary of the River Yare) (**Figure 17**): the stream and ditches

are bordered by areas of poor semi-improved and marshy grassland, plus an area of semi-natural broad-leaved woodland. The grassland is listed on the PHI as “Coastal and floodplain grazing marsh”, and the woodland is listed as “Deciduous woodland”.

#### 4.6. Other Notable Habitats and Features in the DCO Boundary

The DCO boundary also runs through the following areas and features:

- Yare Valley (Marlingford Hall) CWS no. 229 is located east of Barford at the DCO boundary’s crossing point of the River Tiffey (**Figure 15**). It is notified for its woodland, marshy (mostly neutral) grassland and fen bordering the river.
- Yare Valley (Colton Woods) CWS no. 228 is located south of Colton Wood (**Figure 14**). The CWS is an area of low-lying marshy grassland and tall fen bordering the River Yare. The site also supports areas of wet semi-natural woodland and scrub.
- Hall Hills/Ringland Covert CWS no. 2105 is located west of Ringland (**Figure 13**). It is an area of woodland (listed as an ancient woodland in the CWS citation but not included on Natural England’s database of ancient woodland) with widespread replanting.
- Wensum Pastures at Morton Hall CWS no. 2070 borders the River Wensum south of Attlebridge (**Figure 12**). It is an area of predominantly cattle grazed improved grassland within the floodplains of the River Wensum and crossed by a network of drains supporting diverse aquatic flora. The site is periodically flooded and contains small areas of neutral and damp grassland.
- Marriott’s Way CWS no. 2176 is a former railway line which crosses the DCO boundary in two locations, north of Attlebridge (**Figure 11**) and north of Cawston (**Figure 9**). It is a long, linear feature with embankments and cuttings dominated by scrub, mature trees, waterbodies and grass verges.
- Roadside Nature Reserve no. 63 on Matlask Road between Saxthorpe and Little Barningham (west of Mossymere Wood - **Figure 7**). The verge is up to 20m wide and is backed by a hedgerow set back from the roadside. The NBIS citation specifies that the grassland is lowland calcareous with the only noted species of interest being long-stalked cranesbill *Geranium columbinum*.
- Kelling Heath Park and 100 Acre Wood CWS no. 1150 is a semi-natural broad-leaved woodland with dry heath and associated scrub (**Figure 3**).
- Beach Lane, Weybourne CWS no.1156 is an area of reedbed within a shallow pool just inland of the shingle sea defences (**Figure 3**). It is fed by a stream so the pool is part freshwater and part brackish.
- Kelling Hard CWS no. 1107 is located on the coast at the far north-western edge of the DCO boundary (**Figure 3**). It is a mosaic of unimproved, calcareous, neutral and marshy grasslands with some swamp vegetation, which are influenced by the site’s proximity to the coast. Much of the nearby grassland within the DCO boundary (but outside of this CWS) is also a mosaic of non-improved coastal grasslands.
- Sandy cliffs above the shingle beach at the landfall location north of Weybourne (**Figure 3**). The cliffs are part of the same cliff-line which form Weybourne Cliffs



SSSI which is notified principally for geological interest but is also noted for its ecological interest related to nesting sand martins *Riparia riparia* and fulmars *Fulmaris glacialis* on/in the cliff faces. The cliffs are listed on the PHI (as noted above).

Further information on these designated sites is provided in **Appendix 20.7: Onshore Ecology Desk Study**.

#### 4.7. Invasive Non-Native Species

The EP1HS recorded INNS in certain locations along the DCO boundary. **Table 5**, below, lists the INNS of plant recorded along with their approximate location.

**Table 5: Invasive Non-Native Species Recorded During the EP1HS**

Species (common name)	Location	Description
Himalayan balsam	TG 1232 1152 Between Honingham and Easton (Figure 13)	Himalayan balsam within stands of woodland bordering the River Tud. This is outside of the DCO boundary so it does not have a Target Note assigned in Table 6 but the species may be present throughout the course of the River Tud.
Himalayan balsam	TG 1411 1893 East of Swannington (Figure 11, Target Note TN0009 in Table 6)	Dense stands of Himalayan balsam on the banks of an unnamed stream which is a tributary of the River Wensum.
Himalayan balsam	TG 1309 2987 East of Saxthorpe (Figure 7, Target Note TN0011 in Table 6)	Stands of Himalayan balsam on the banks of the River Bure.

A method of working in proximity to these listed occurrences (and any others within the DCO boundary), to minimise the risks of spreading this INNS, is set out within the **Outline Ecological Management Plan** (document reference 9.19).

Figure 3: Phase 1 Habitat Survey Results Map 1 (Weybourne Woods to Landfall)

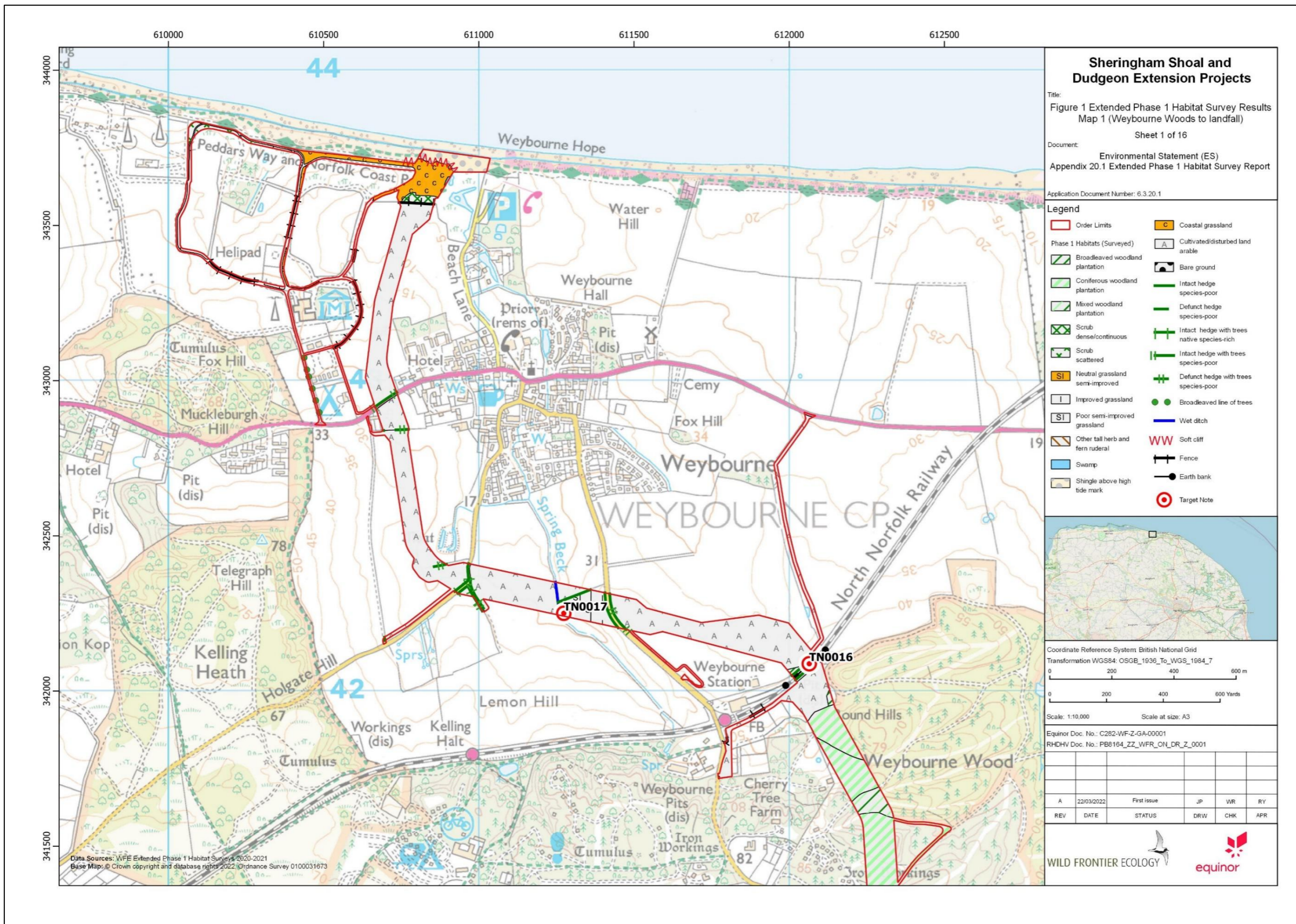


Figure 4: Phase 1 Habitat Survey Results Map 2 (Bodham)

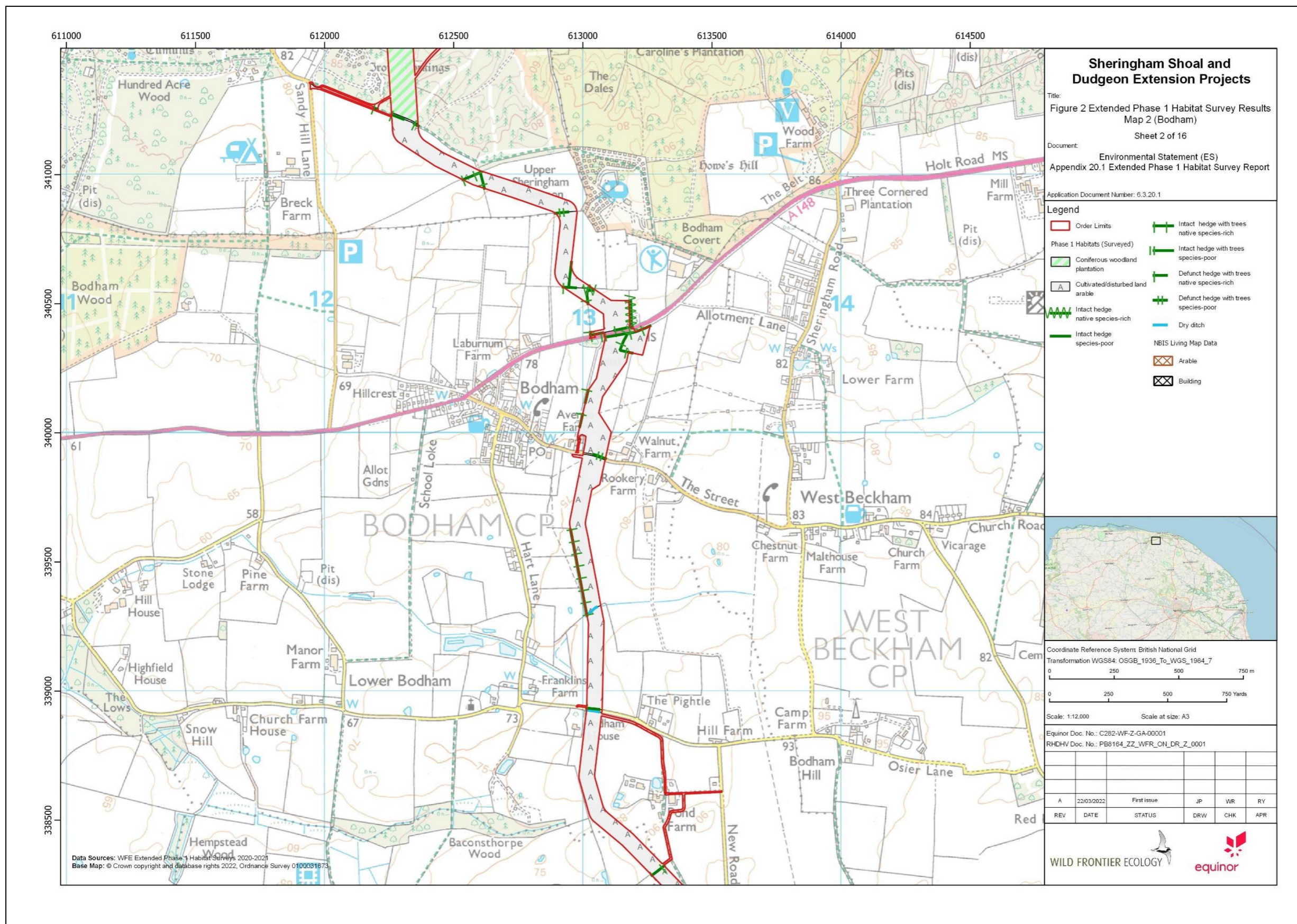


Figure 5: Phase 1 Habitat Survey Results Map 3 (Plumstead to Baconsthorpe)

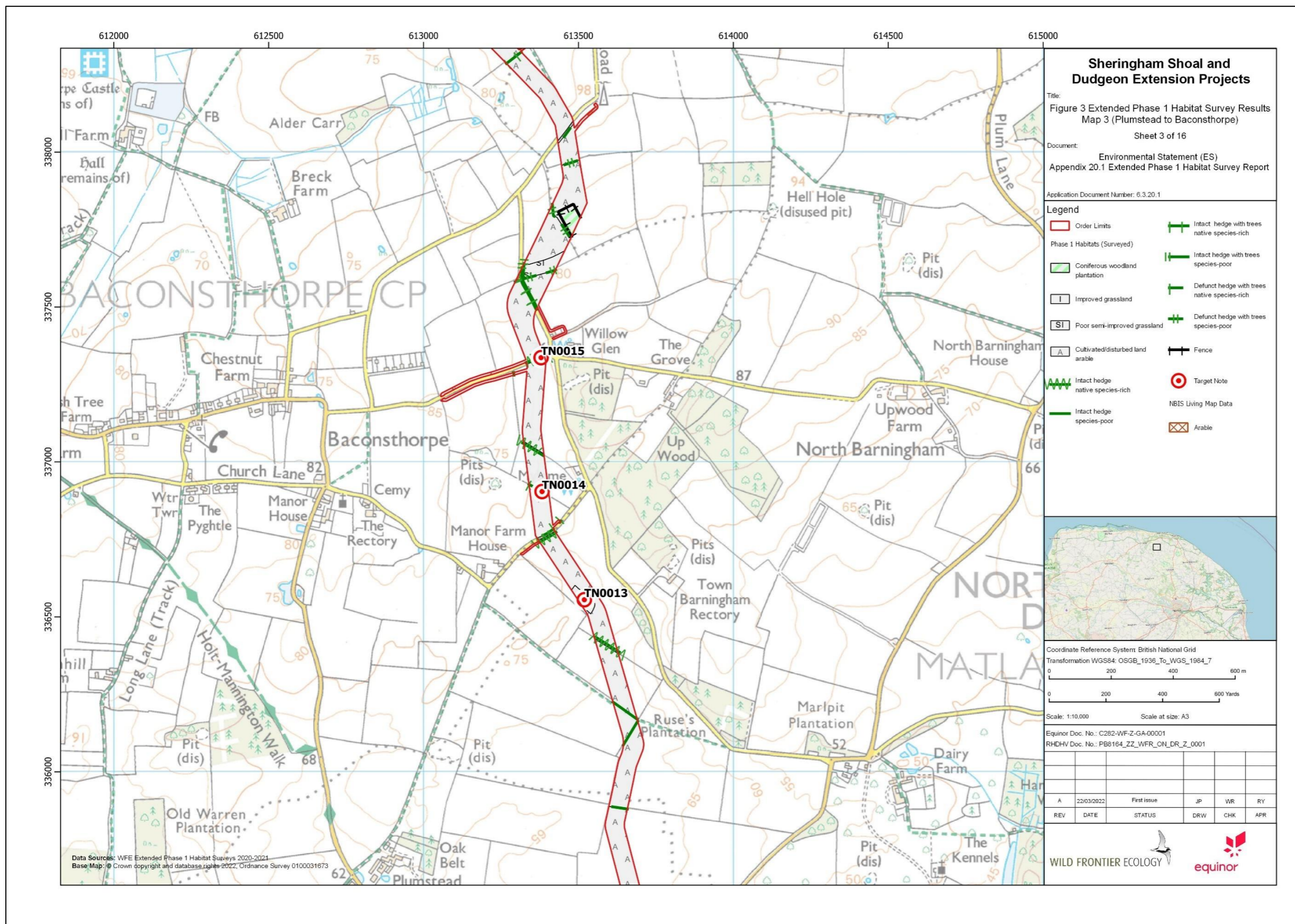


Figure 6: Phase 1 Habitat Survey Results Map 4 (Little Barningham to Plumstead)

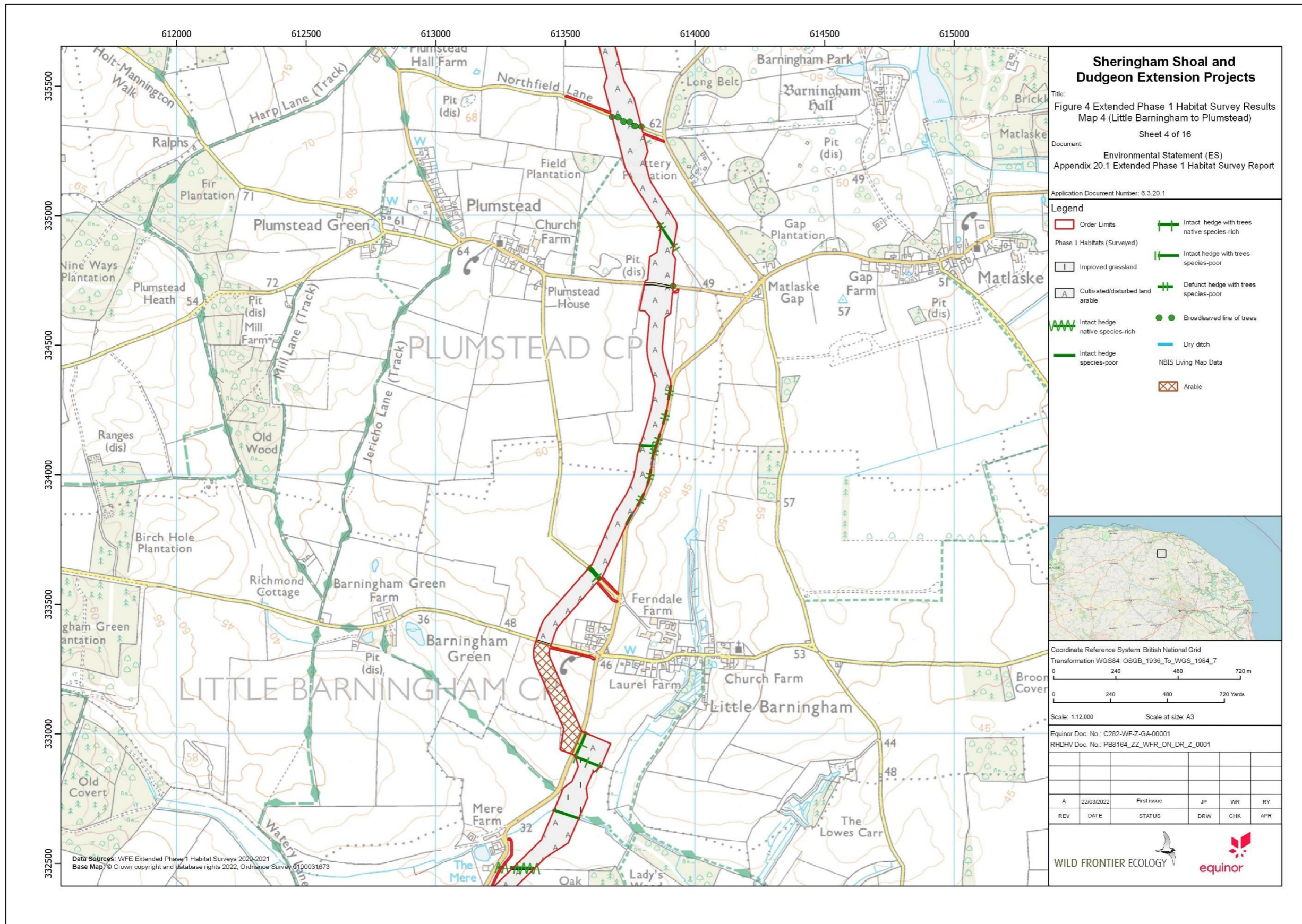


Figure 7: Phase 1 Habitat Survey Results Map 5 (Saxthorpe)

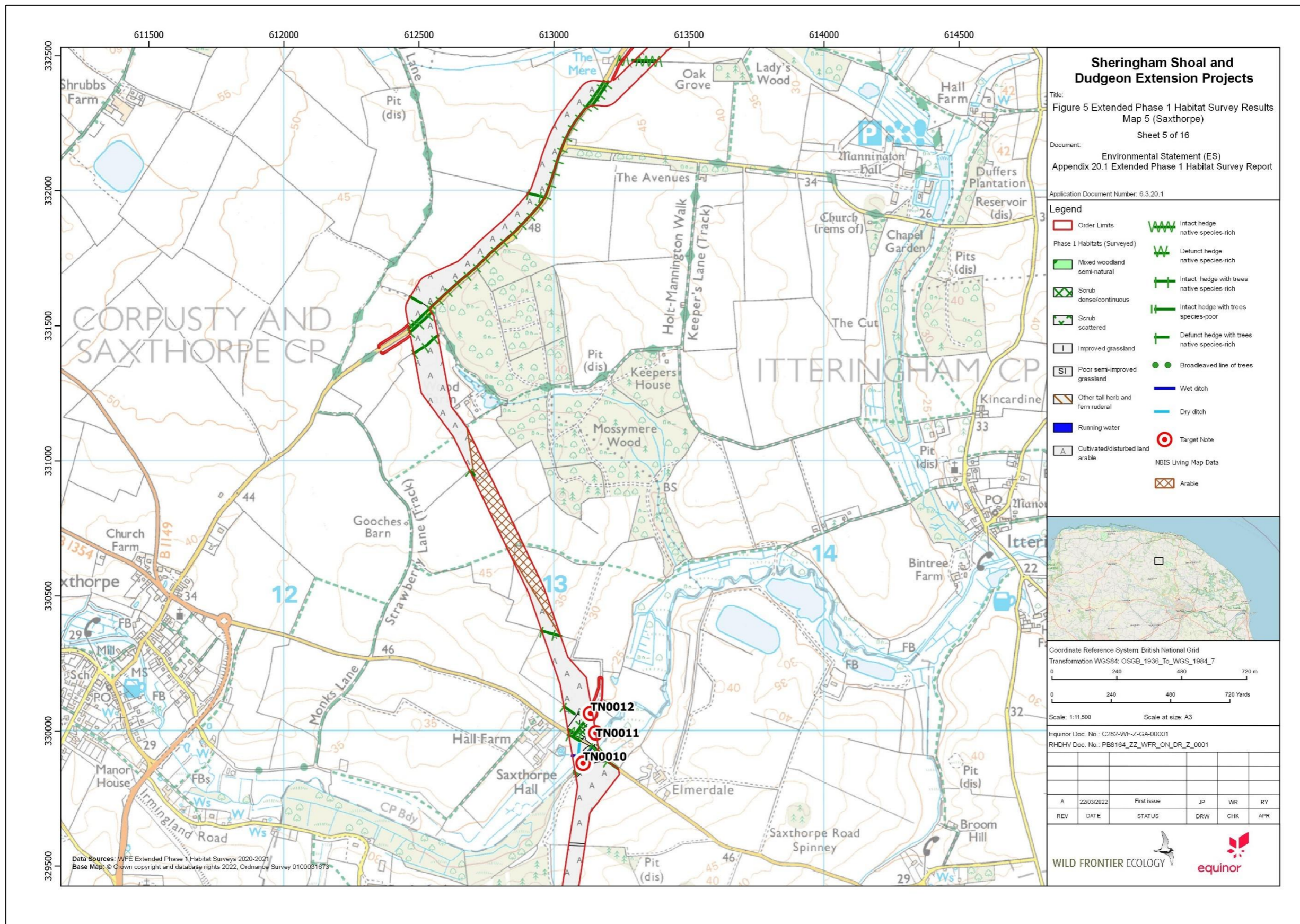


Figure 8: Phase 1 Habitat Survey Results Map 6 (Oulton)

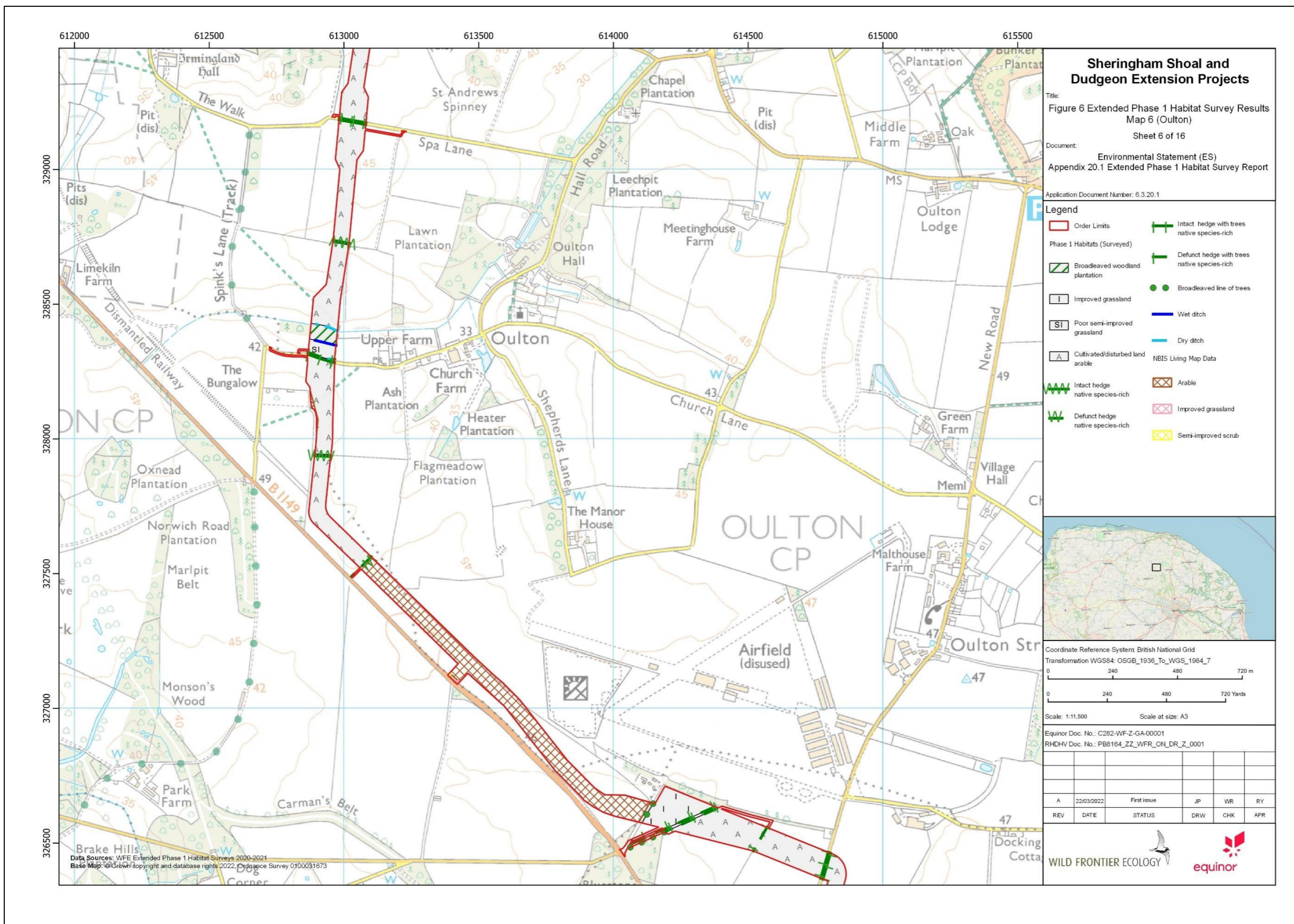


Figure 9: Phase 1 Habitat Survey Results Map 7 (Cawston)

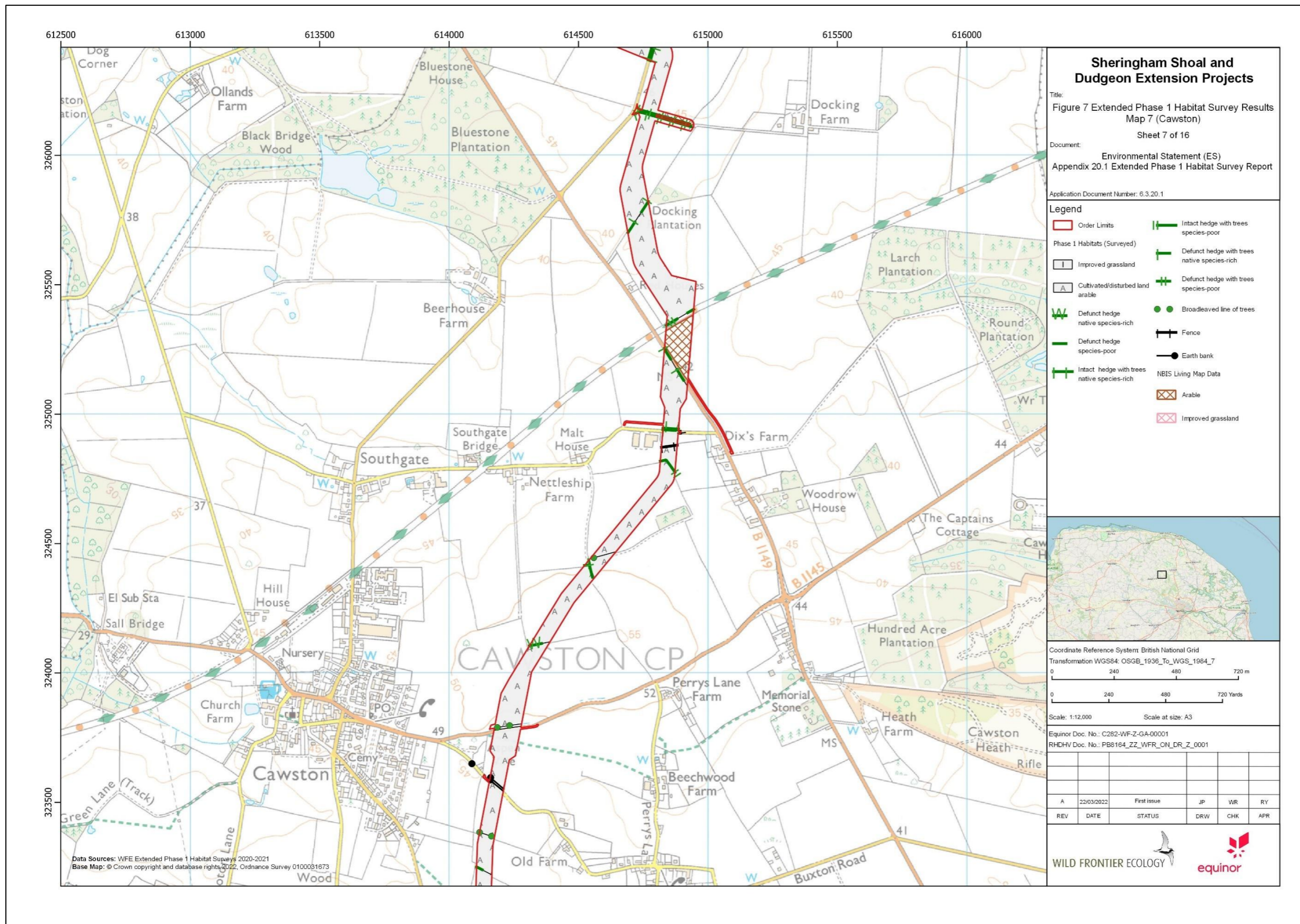




Figure 10: Phase 1 Habitat Survey Results Map 8 (Swannington to Cawston)

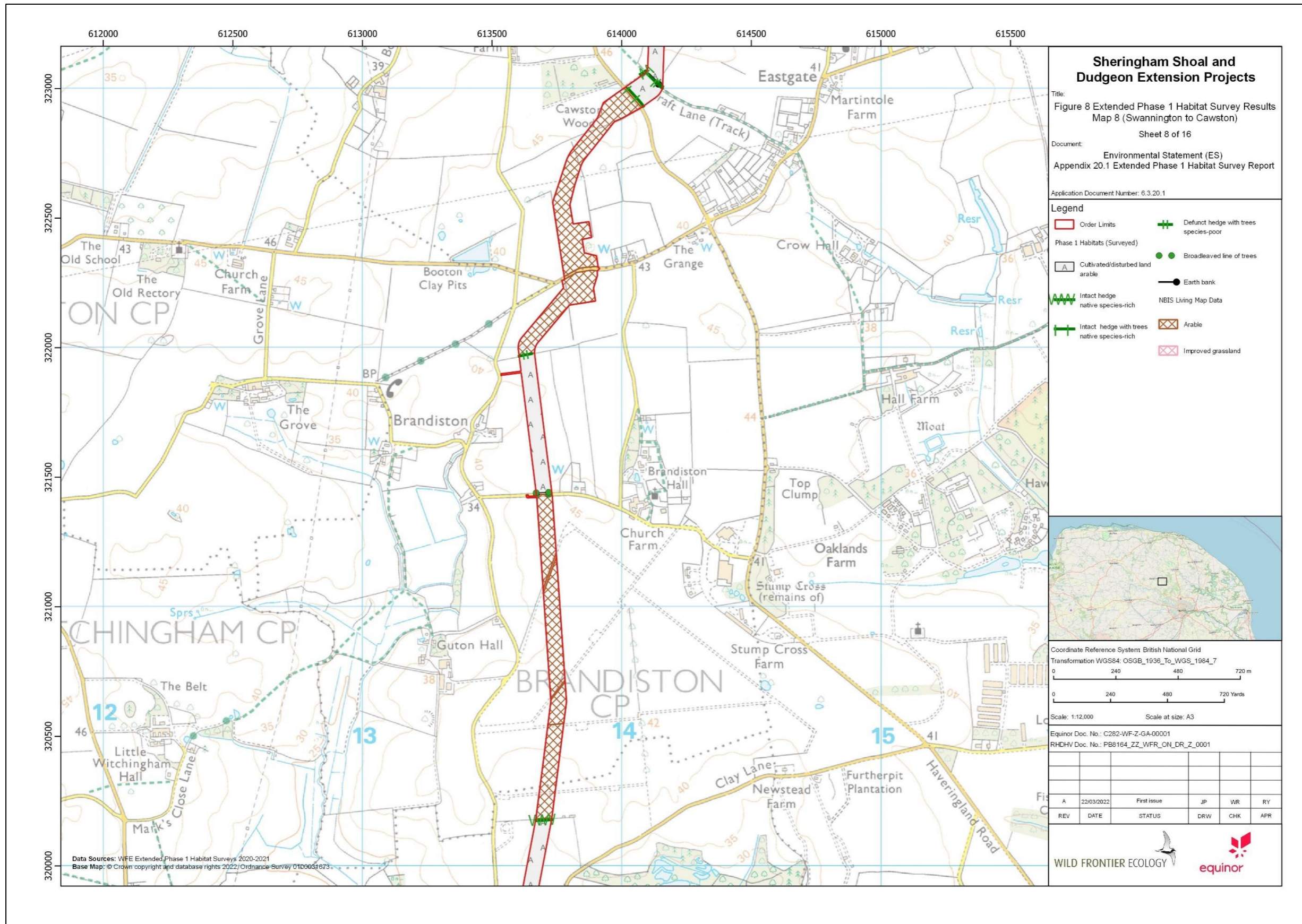


Figure 11: Phase 1 Habitat Survey Results Map 9 (Attlebridge to Swannington)

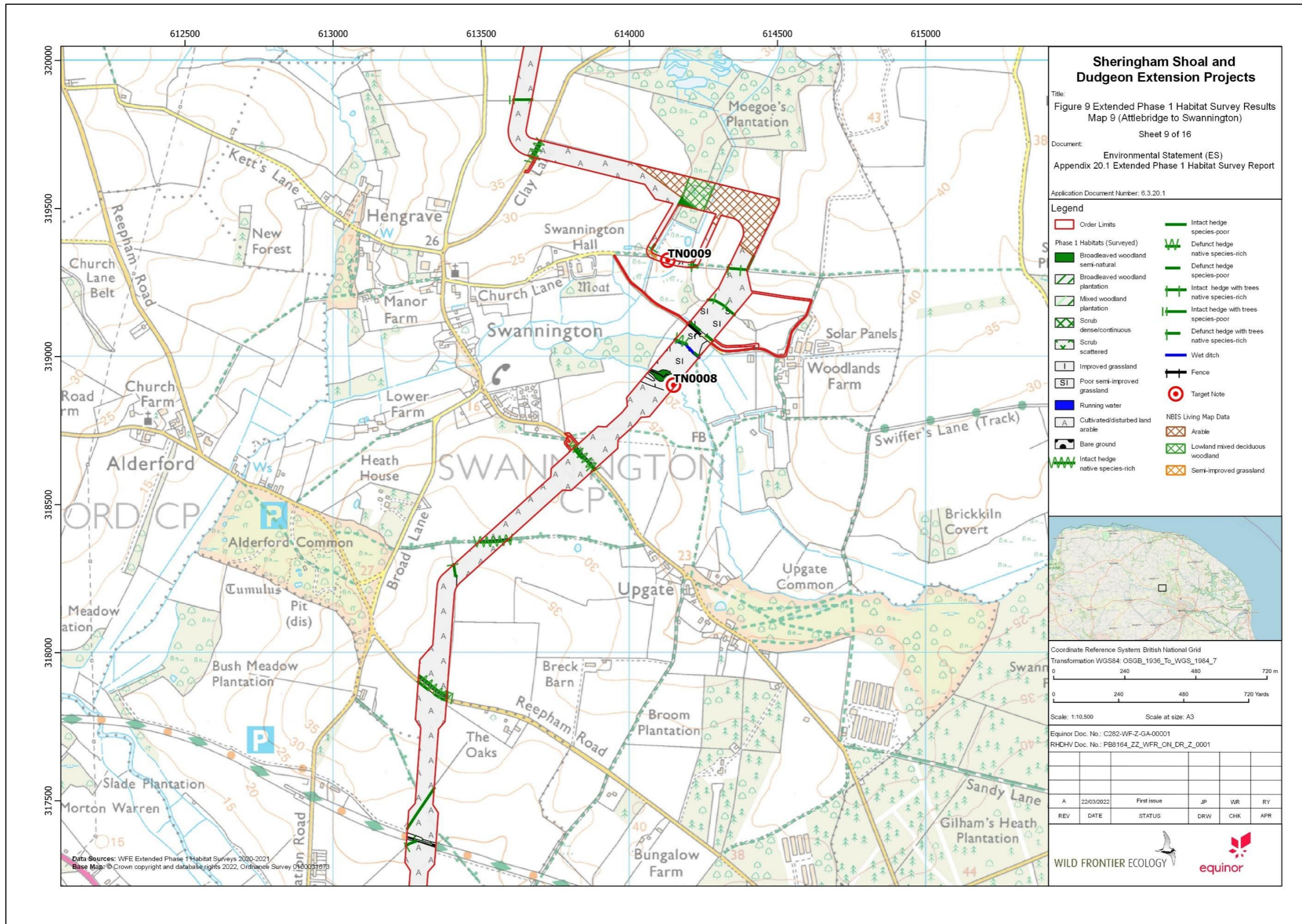


Figure 12: Phase 1 Habitat Survey Results Map 10 (Ringland to Attlebridge)

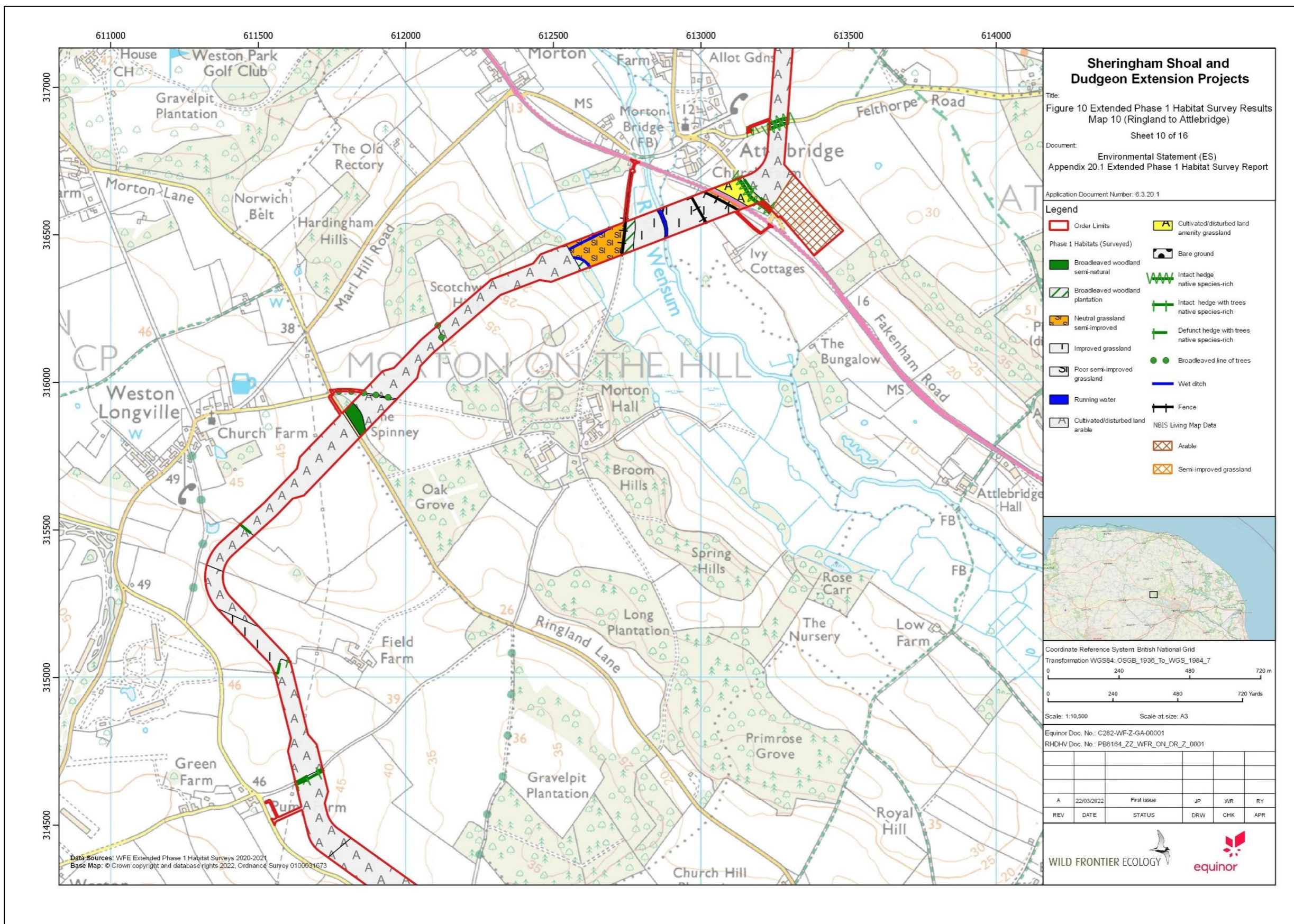


Figure 13: Phase 1 Habitat Survey Results Map 11 (Easton to Ringland)

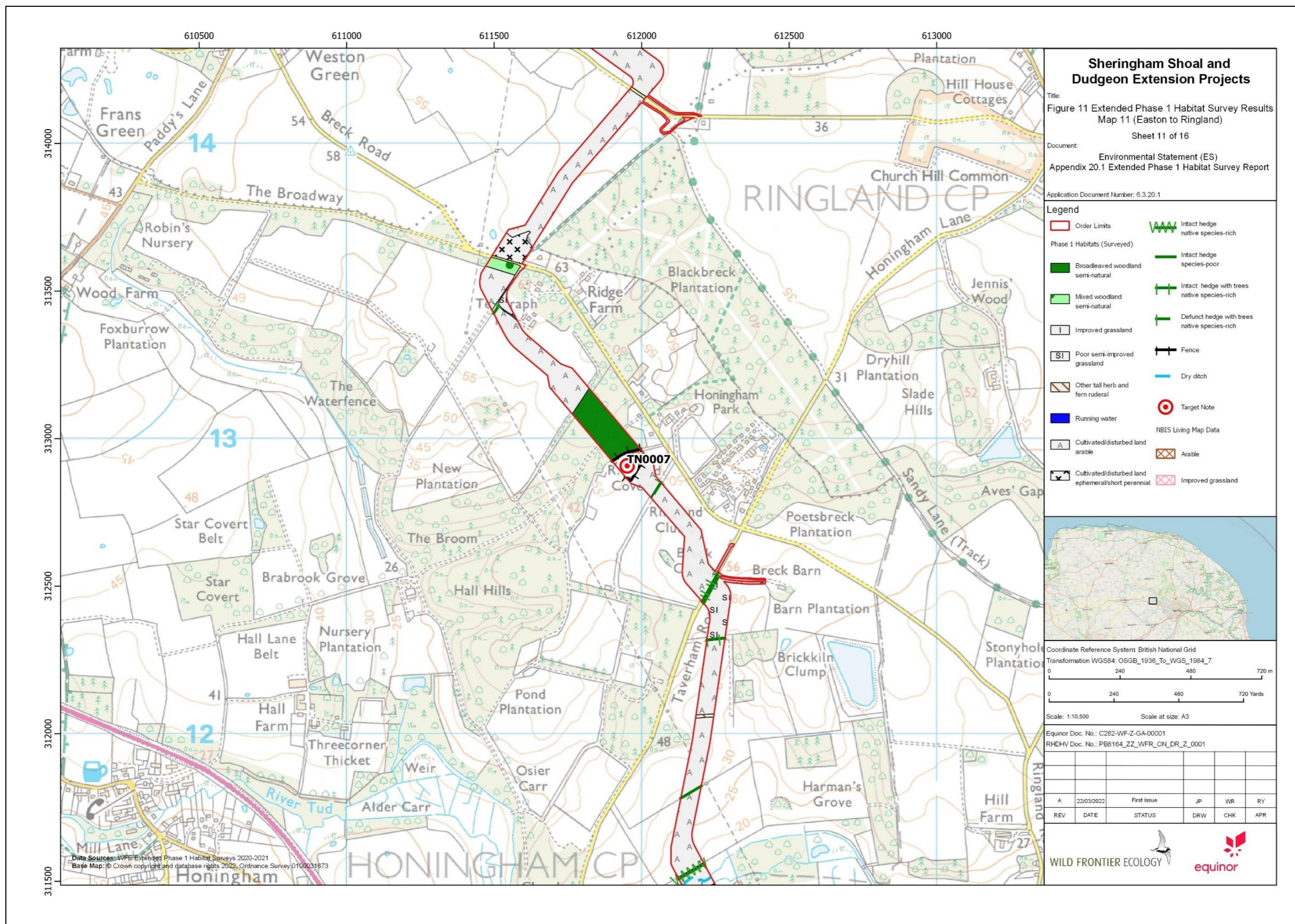


Figure 14: Phase 1 Habitat Survey Results Map 12 (Barford to Easton)

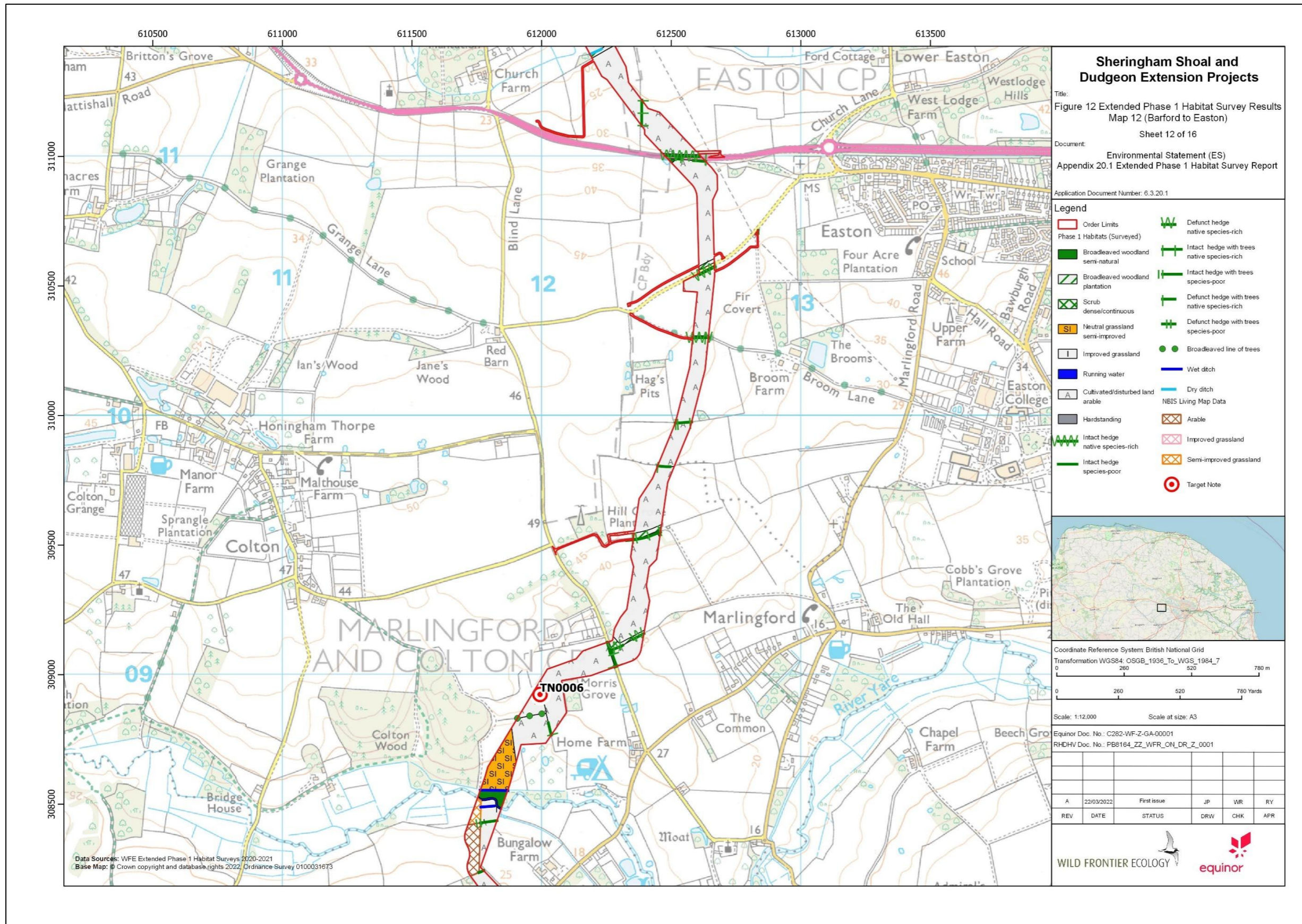


Figure 15: Phase 1 Habitat Survey Results Map 13 (Wramplingham to Barford)

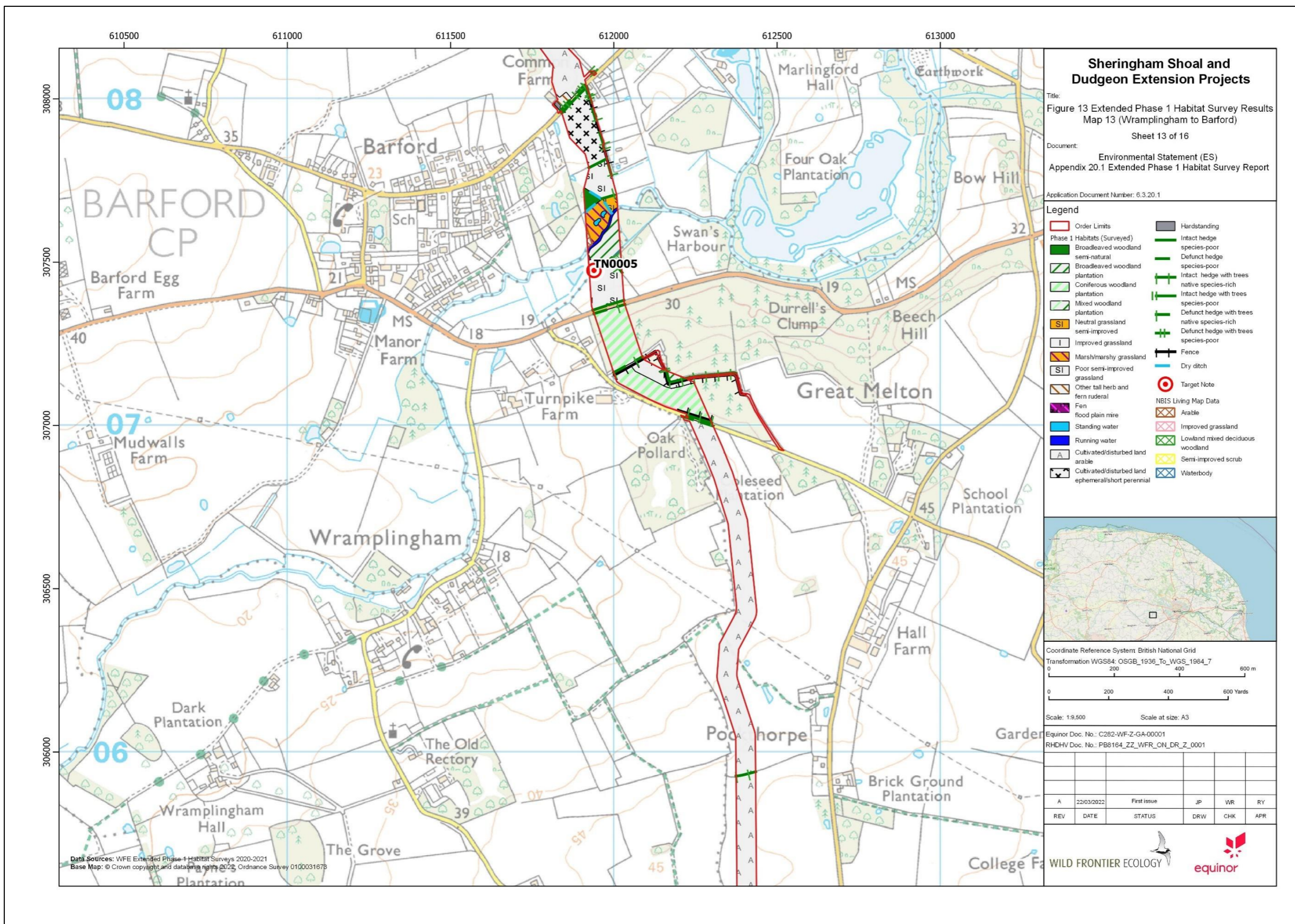


Figure 16: Phase 1 Habitat Survey Results Map 14 (Hetherset)

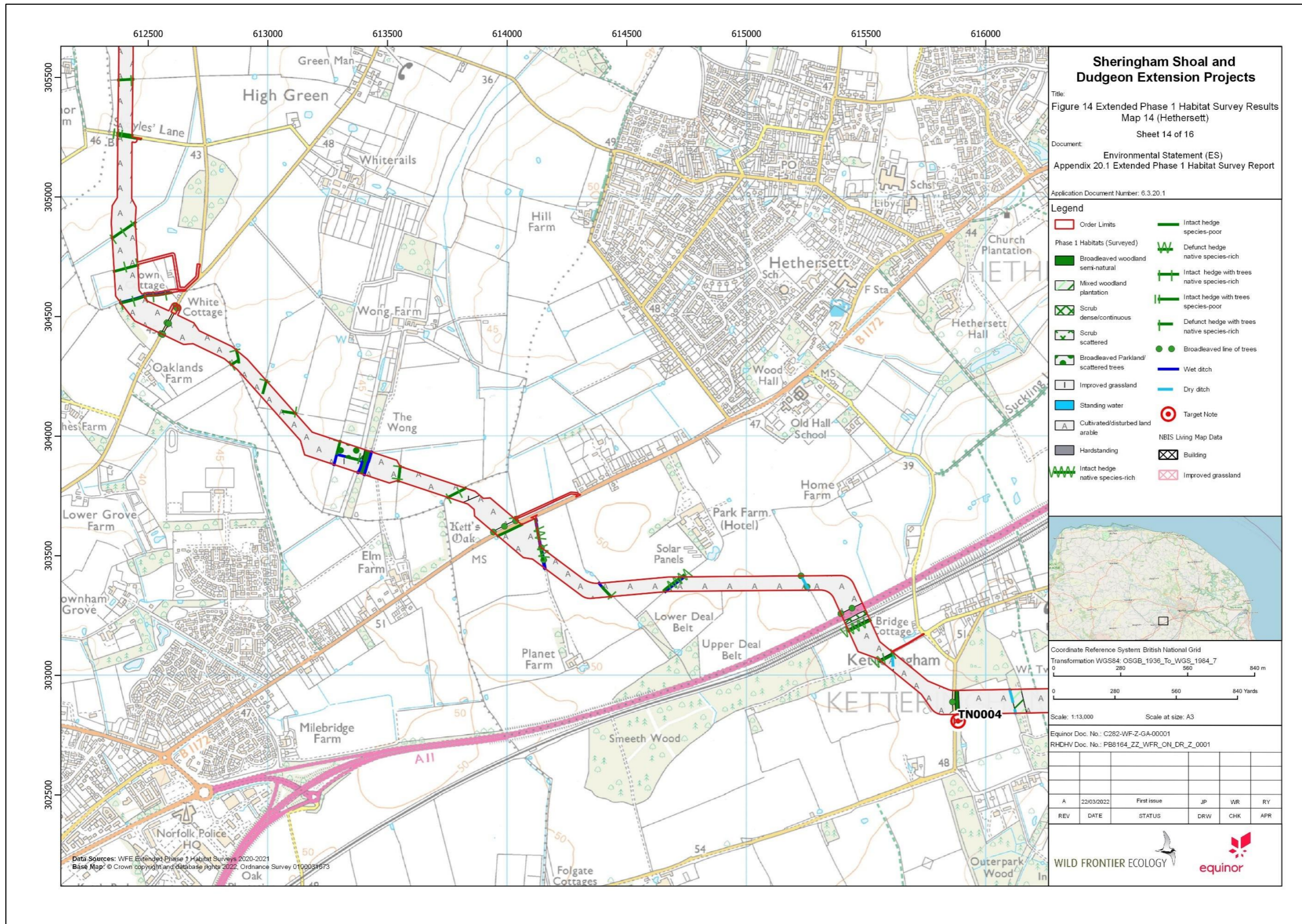


Figure 17: Phase 1 Habitat Survey Results Map 15 (East Carleton to Ketteringham)

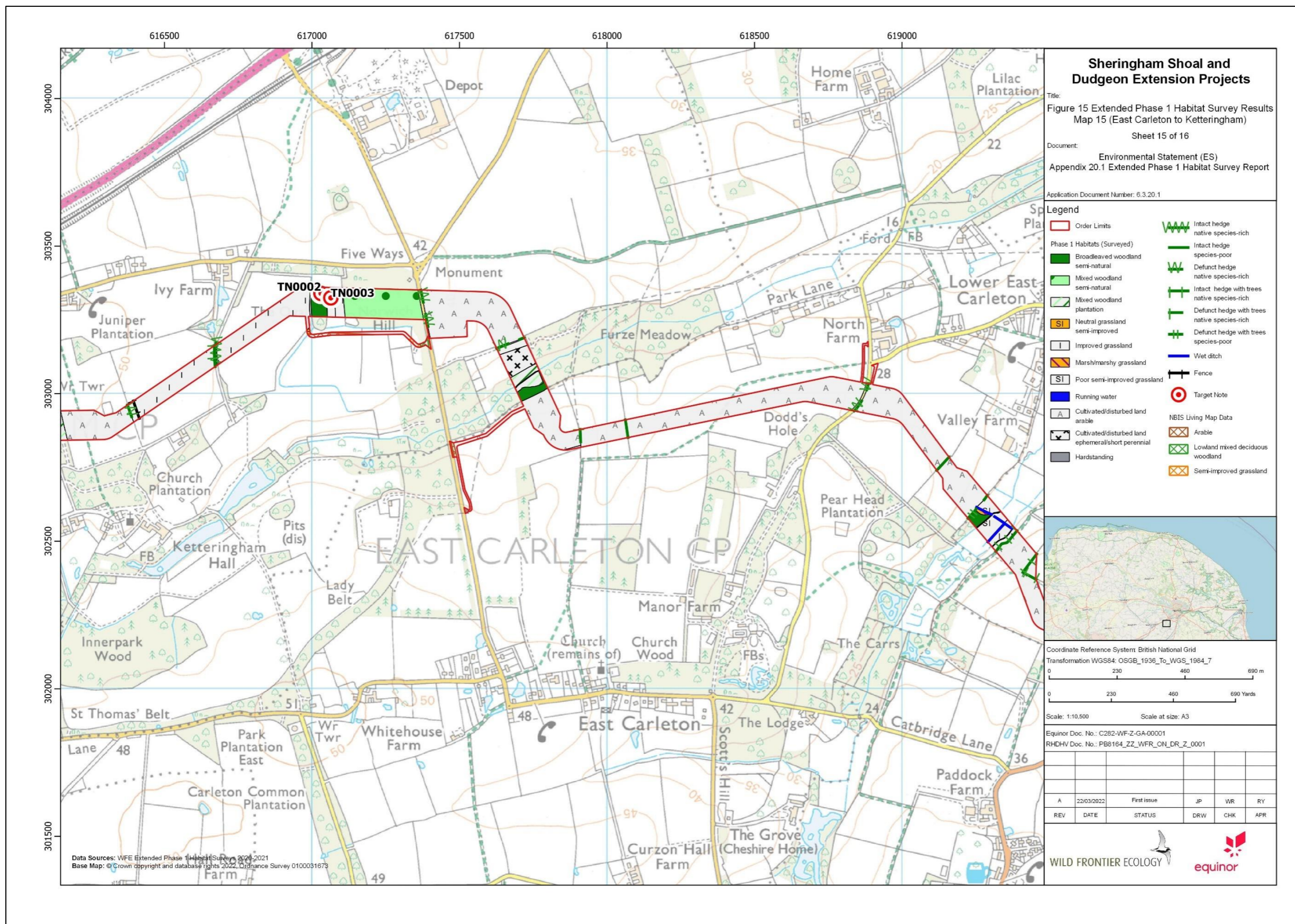
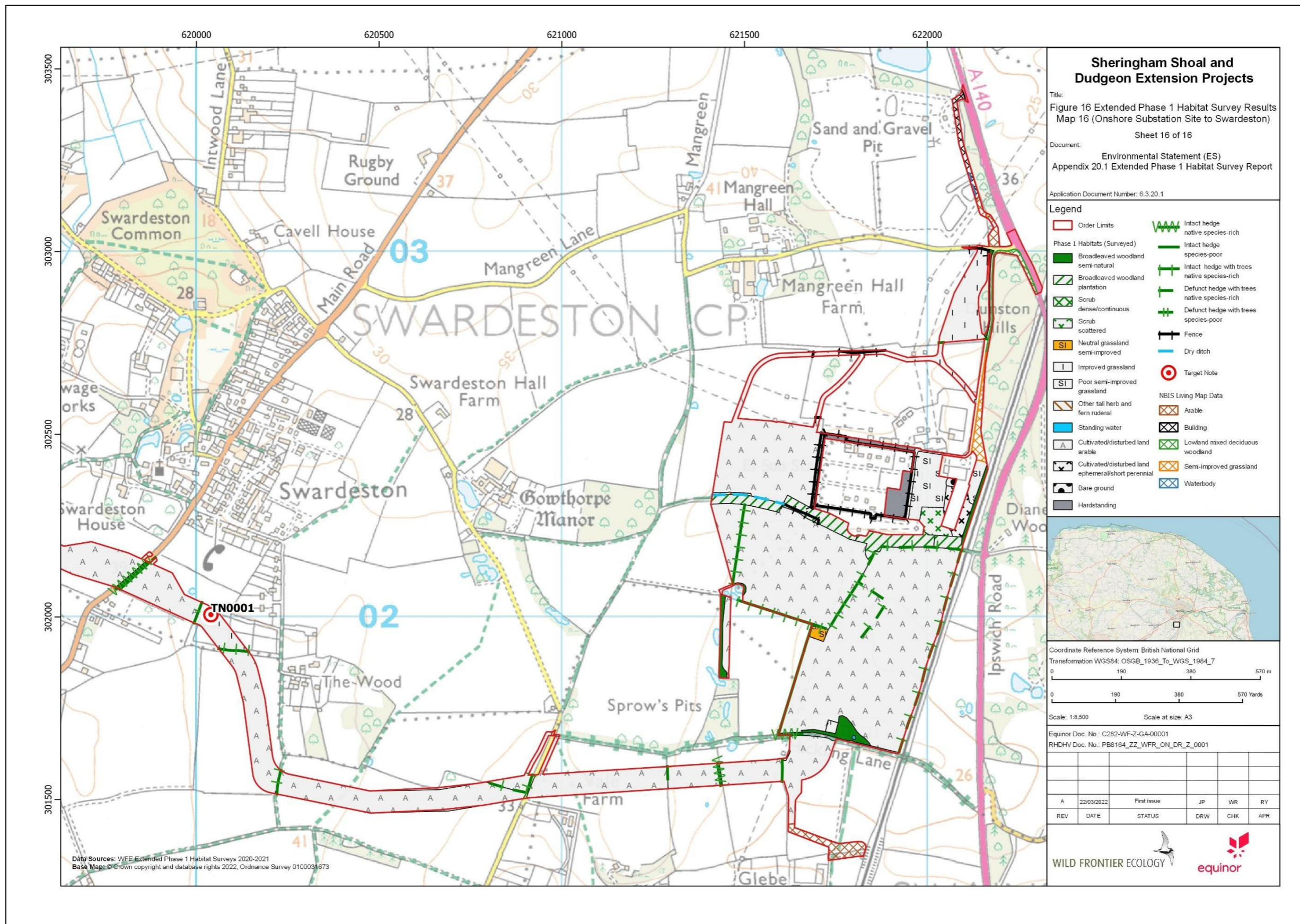




Figure 18: Phase 1 Habitat Survey Results Map 16 (Onshore Substation to Swardeston)



#### 4.8. Target Notes

Details for each Target Note denoted on the above maps are given in **Table 6** below:

**Table 6: EP1HS Target Notes**

Target Note	Description
TN0001	Dry pits within wooded area. Ponds may hold water at certain times of the year but were dry when surveyed.
TN0002	Developing hawthorn scrub in horse paddock.
TN0003	Dry pit in woodland
TN0004	Species poor, semi-improved grassland sown with a nectar wildflower mix.
TN0005	Gap in belt of woodland. Possible opportunity to align construction footprint through this gap.
TN0006	Owl box mounted on a pole close to hedgerow. Box is surrounded by dense vegetation so it was not possible to establish whether it was in-use.
TN0007	Improved grassland sown with a pollinator wildflower mix.
TN0008	Enclosed pheasant pens (not surveyed as access was restricted)
TN0009	<b>INNS</b> - Dense stands of Himalayan balsam on the banks of unnamed stream
TN0010	Poor semi-improved sward with scattered scrub adjacent to woodland and ditch with flowing water. Also, multiple piles of deadwood/other materials throughout area to the north. Overall habitat is likely to support a relatively rich invertebrate assemblage.
TN0011	<b>INNS</b> - Stands of Himalayan balsam on the banks of the River Bure.
TN0012	Badger paths recorded approximately 40 metres to the north-east
TN0013	Likely ancient hedgerow with hazel coppice.
TN0014	Improved grassland sown with a pollen and nectar mix
TN0015	Multiple owl pellets recorded within veteran oak tree in hedgerow.
TN0016	Harvest mouse nest recorded within hedgerow.
TN0017	Deep railway cutting besides the active railway line. Banks are dominated by tall herb and ruderal vegetation, with hedgerows/scrub/trees near the tops of the banks. Mining bees recorded within railway bank.
TN0018	An approximately 10m long Spring and Flush habitat situated to the east of, and parallel to, the stream. The habitat is relatively species poor and dominated by horsetail <i>Equisetum</i> sp. but likely supports a rich invertebrate population.

#### 4.9. Constraints and Limitations of Survey

The main constraint to the habitat survey relates to the limited landowner access; approximately 10% of the DCO boundary has not been surveyed because landowner access has not been agreed. This has meant habitat classifications of the inaccessible areas use Norfolk Living Maps data from NBIS, rather than detailed walkover surveys. The Norfolk Living Maps data does not identify signs of, or suitable habitat for, protected species, and some habitat classifications are quite broad, certainly in comparison to EP1HS categorisations.

The vast majority of the EP1HS took place during the optimal survey season between May and September in 2020. Small parts of the survey area were surveyed in March and April 2020, and in January and September 2021. These are acceptable times of year for completing EP1HS (as the survey can be done at any time of year), but January, March and April are outside the optimal season. This is not considered a significant constraint because most of the areas surveyed at those times were arable habitats or improved grasslands which can be accurately classified at the times of year they were surveyed. It is extremely unlikely that any habitats would have been misclassified; the surveys completed outside of the optimal survey window may, however, have recorded slightly reduced species diversity in certain habitats, if flowering plants were not identifiable at the time the survey was completed.

The EP1HS recorded habitats on accessible land parcels within a former, mostly wider iteration of the survey area (i.e. the PEIR boundary). All features were therefore classified according to their total footprints within that boundary; for example, hedgerow classifications were based on all features of a hedgerow within the relevant area, but not on parts of the hedgerow outside the survey area as it was at the time. As the DCO boundary has subsequently been refined it is possible that some of these classifications are now slightly, technically incorrect. For example, the PEIR boundary may have covered a length of hedgerow where there were multiple trees and hedge gaps at one end of the hedge, meaning the hedgerow was classified as having trees and being defunct. Subsequent refinements to the survey area could mean those sections of the hedgerow with gaps and trees are now outside the DCO boundary, leaving only an intact section of hedgerow without trees inside the DCO boundary. However, as the precise locations of gaps, trees and species-diversity/richness was not recorded during the EP1HS, hedgerow classifications cannot be retrospectively adjusted, meaning that in the example given the hedgerow would still be classified as defunct and with trees. The same issue may apply for numerous other habitats such as grasslands and woodlands, where the overall classification assigned to an area applied to a wider area than is now relevant.

#### **4.10. Further Survey Requirements and Expiry Dates**

Typically, EP1HS results should be considered valid for planning application purposes for at least one year. However, given the extent of the DCO boundary and logistical complexities in organising surveys (particularly arranging access with landowners), it has taken approximately 18 months to survey the c.90% of the parts of the DCO boundary which have been accessible. Therefore, the one-year expiry limit cannot be reasonably applied to this project. It is relevant to note that the majority of the DCO boundary overlaps arable habitat. The data on these sections is arguably valid for much longer than one year given this habitat is very unlikely to change year on year. Data on non-arable habitats is perhaps more likely to change in time, albeit the majority of habitat classifications relevant to the DCO boundary (improved grasslands, poor semi-improved grasslands and conifer plantation woodlands) are extremely unlikely to vary over the course of a few years.

Although most habitat classifications are unlikely to change within one year, there is a realistic chance that protected/notable species activity could change within this timeframe. For example, badgers could establish new setts and trees could become suitable for use by roosting bats. Therefore, repeated ecological walkover surveys of the whole DCO boundary will be required pre-construction, to revalidate the findings of the EP1HS and certain protected species (e.g. badger) surveys.

## 5. CONCLUSIONS

The EP1HS and desk study with NBIS has identified a range of habitats within the DCO boundary, most of which are heavily managed areas of farmland (i.e. arable and improved grassland fields). There are some areas of rare or otherwise ecologically valued habitats such as woodlands, rivers/streams/ditches, ponds, non-improved grasslands and scrub, but these occupy a small proportion of the overall DCO boundary. These habitats, many of which qualify as Priority Habitats, are more ecologically valuable and the site selection process has minimised land-take or other impacts to these areas, by largely focussing construction impacts to arable and improved grassland habitats which are of relatively low value.

The survey recorded occasional instances of INNS, which will require further consideration if construction impacts to these areas cannot be avoided.