A358 Taunton to Southfields Dualling Scheme

Ecological Baseline Report - UK Habitat Classification

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Executive summary

The A358 Taunton to Southfields Dualling scheme would provide a dual carriageway along the length of the A358 between Taunton and Ilminster in Somerset, connecting the M5 motorway to the A303 at Ilminster to the south.

Habitat surveys were part of the suite of habitat and protected species surveys commissioned in relation to the scheme. This report presents the results of the habitat (UK Habitat Classification) surveys and aims to inform the ecology baseline for the scheme.

The objectives of this report are to classify habitats within the Zone of Influence (ZoI) of the scheme, assess the nature conservation value of the site and inform appropriate mitigation and enhancement.

The combined desk study and field surveys identified numerous habitats throughout the study area, varying in proportion, distribution and biodiversity value. Notable habitats identified within the study area included ancient woodland, deciduous woodland, veteran trees, coastal floodplain and grazing marsh, wood-pasture and parkland, ponds, hedgerows, degraded calcareous grassland and lowland fen habitat.

Deciduous woodland was the most frequently occurring priority habitat in each section of the study area. These woodlands consisted of ancient woodland sites, as well as other woodlands and smaller discrete blocks, generally associated with the road network or riparian corridors.

Other priority habitats present included coastal floodplain and grazing marsh (the northern and southern extents of the study area, comprising the floodplains of the Black Brook and the River Isle), two areas of wood-pasture and parkland (including Jordan's Park Local Wildlife Site), seven ponds (each supporting great crested newt) and hedgerows. Many of the hedgerows were species-rich and associated with other features of ecological value, such as mature standard trees and ditch networks. Most hedgerows qualified as priority habitat and supported hazel dormouse.

A single area of degraded calcareous grassland, which was not mapped as the corresponding priority habitat type, is likely to be of local importance given scarcity of this habitat within the landscape.

A single area of lowland fen habitat was identified in the northern section of the study area in the form of a tufa spring. Further specialist survey of this habitat has determined this tufa spring does not unequivocally qualify as the relevant Annex 1 habitat.

Much of the study area comprised common and widespread habitats arising from an agricultural land use, either as arable land or modified grasslands arising from grazing. Watercourses consisted largely of small rivers and streams. Whilst these watercourses did not meet the criteria for priority habitat, they were considered important biodiversity features within the largely arable landscape, offering foraging and commuting resource for protected and/or notable species including otter, water vole and bats. Scrub habitats generally comprised mixed scrub in linear belts of unmanaged land, including the highway verge, outgrown hedgerows, and parts of the disused railway. Habitats associated with human development were widespread and other habitats with limited or patchy distribution include ornamental hedgerows, ditches, marginal aquatic vegetation, and swamp.

Invasive species identified included Japanese knotweed, Himalayan balsam, Japanese rose, variegated yellow archangel and signal crayfish. Based on desk study records, giant hogweed was also assumed to be present within the study area.

1 Introduction

1.1 Purpose and scope of this document

1.1.1 The A358 Taunton to Southfields Dualling scheme (hereafter referred to as 'the scheme') would provide a dual carriageway along the length of the A358 between Taunton and Ilminster in Somerset, connecting the M5 motorway to the A303 at Ilminster to the north. Habitat surveys were part of the suite of habitat and protected species surveys commissioned in relation to the scheme.

1.1.2 This report presents the results of the habitat surveys and aims to inform the ecology baseline for the scheme.

1.1.3 The objectives of this report are to:

- classify habitats within the Zone of Influence (ZoI)
- identify where protected and/or notable species, or habitats suitable for supporting them, are present on, near or adjacent to the scheme
- inform assessment of the biodiversity value of habitats within the ZoI
- identify requirements for further survey to inform the habitat baseline
- provide baseline ecological information to inform appropriate mitigation and enhancement

1.2 Scheme overview

1.2.1 The scheme is part of a programme of improvements planned along the A303/A358 corridor aimed at improving connectivity between London, the south-east and the south-west. The A303, alongside the A30, forms part of the strategic road network (SRN) and together with the A358, provides the link between London, the south-east and the south-west.

1.2.2 The programme of improvements, as set out in the Government's *Road Investment Strategy* [1] made a commitment to, *"…upgrade all remaining sections of the A303 between the M3 and the A358 to dual carriageway standard, together with creating a dual carriageway link from M5 at Taunton to the A303".*

1.2.3 The scheme directly addresses this long-term commitment and would provide a new rural all-purpose dual carriageway link from the M5 at Taunton to the A303 at Southfields roundabout. The new dual carriageway would comprise new and upgraded stretches of the existing A358 road. Full details of the scheme will be provided in Chapter 2 *The Project* of the Environmental Statement (ES). Please refer to Figure 1-1 for scheme plan.

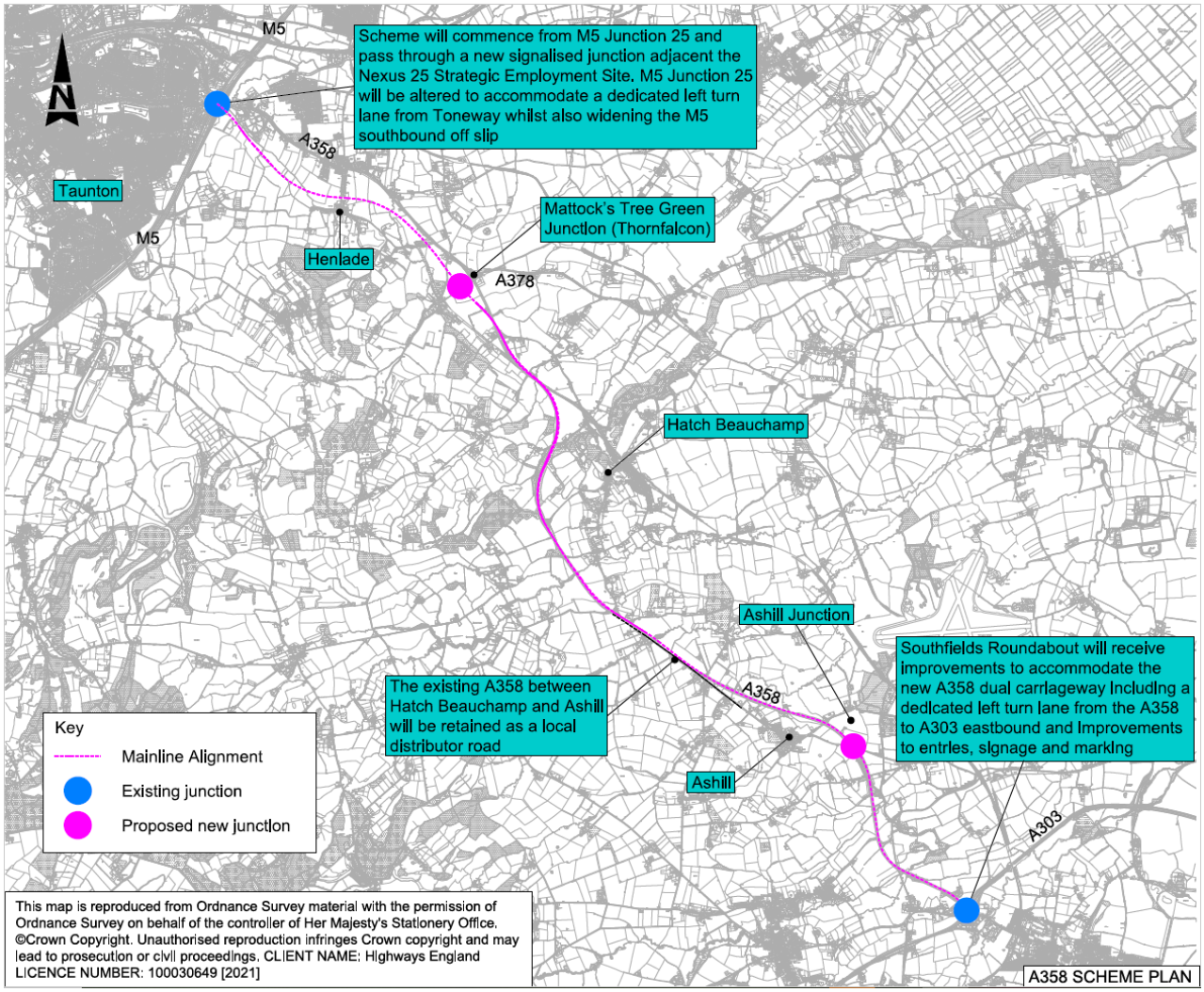

Figure 1-1 Scheme plan

1.3 Study area and zone of influence

1.3.1 The Chartered Institute for Ecology and Environmental Management (CIEEM) *Guidelines for Ecological Impact Assessment* [2] recommend that all potentially important ecological features that occur within the ZoI for a scheme are investigated. The ZoI includes:

- areas to be directly within the land take for the scheme
- areas that would be temporarily affected during construction
- areas likely to be impacted by hydrological disruption
- areas where there is a risk of pollution and noise disturbance during construction and/or operation

1.3.2 The ZoI depends on the ecological features concerned. With regard to the habitats likely to be affected by the scheme, the ZoI has been defined as land within 250 metres of the defined ecology survey zone, which comprises the footprint of the scheme and associated site clearance area. This ZoI is hereafter referred to as the study area.

1.3.3 For protected/notable species, an initial scoping exercise was conducted concurrently within this study area. However, where the ZoI for specific protected and/or notable species differs, these are defined within the relevant survey reports [3] [4] [5] [6] [7] [8] [9].

1.4 Legislation

1.4.1 A framework of international, European, national and local legislation and planning policy guidance exists to protect and conserve wildlife and habitats. This legislation will be listed in full within Chapter 8 *Biodiversity* of the ES. Legislation relevant to and discussed within this report is detailed below:

- The Conservation of Habitats and Species Regulations 2017 (the 'Habitat Regulations 2017')
- Wildlife and Countryside Act 1981
- Natural Environment and Rural Communities (NERC) Act 2006
- Invasive Alien Species (Enforcement and Permitting) Order 2019

1.5 Status of habitats at national level

1.5.1 The NERC Act 2006 is designed to help achieve a rich and diverse natural environment and thriving rural communities. Under Section 41 there is a Duty to conserve biodiversity; specifically, Subsection (1) states *"Every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity."*

1.5.2 Section 41 (S41) of the Act requires the Secretary of State to publish a list of habitats and species of principal importance (HPI and SPI respectively) for the conservation of biodiversity in England. The S41 list is used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under Section 40. A total of 65 HPI and 1,150 SPI have been identified as the most in need of protection.

1.5.3 Priority habitats considered relevant to this report are:

- Deciduous woodland
- Lowland calcareous grassland
- Coastal and Floodplain Grazing Marsh (CFPGM)
- Wood-pasture and Parkland
- Lowland Fens
- Rivers
- Ponds

1.5.4 National planning policy in England is set out in the *National Planning Policy Framework (NPPF)* [10], with policies relating to habitats and biodiversity set out in paragraphs 179 and 180. Of particular relevance to this report is paragraph 180c:

1.5.5 *"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."*

2 Methodology

2.1 Desk study

2.1.1 A detailed desk study exercise was undertaken in January 2021 in order to determine the presence of statutory and non-statutory designated sites, priority habitats and ancient woodlands up to 2 kilometres from the scheme.

2.1.2 Data sources utilised to compile this information included:

- *Multi-Agency Geographic Information for the Countryside (MAGIC)* [11]
- *Natural England Ancient Woodland Inventory* [12]
- *Priority River Habitat Map* [13]

2.1.3 Whilst the details of statutory and non-statutory designated sites within the respective study areas are reported within Chapter 8 *Biodiversity* of the ES, a number of these named sites fall within this study area. These sites therefore hold relevance to this report and are referenced where appropriate.

2.1.4 In addition, a detailed data search from Somerset Environmental Records Centre (SERC) was undertaken in January 2021 and considered designated sites and protected species records up to a 2 kilometre radius of the scheme. Records relating to notable plant and fungi occurring within the study area are summarised within this report.

2.1.5 SERC data and the *A358 Taunton to Southfields Dualling Fish Technical Report (May 2021)* [14] were also reviewed in order to supplement determination of species of qualifying criteria for priority ponds [15] and rivers [16] within the study area.

2.1.6 A review was undertaken of various ecological baseline reports to identify protected and/or notable species of relevance to this report:

- *A358 Taunton to Southfields Dualling Ecological Baseline Report - National Vegetation Classification (NVC)* [8]
- *A358 Taunton to Southfields Dualling Ecological Baseline Report – Amphibians* [6]
- *A358 Taunton to Southfields Dualling Ecological Baseline Report - Aquatic Macroinvertebrates and White-clawed Crayfish* [7]
- *A358 Taunton to Southfields Dualling Ecological Baseline Report - Bat Activity* [9]
- *A358 Taunton to Southfields Dualling Ecological Baseline Report - Breeding Birds* [3]
- *A358 Taunton to Southfiel.ds Dualling Ecological Baseline Report - Water Vole* [5]
- *A358 Taunton to Southfields Dualling Ecological Baseline Report – Otter* [4]

2.1.7 A search of the *Woodland Trust Ancient Tree Inventory* [17] was also conducted to identify any recorded ancient, veteran and notable trees within the study area.

2.2 Field study

2.2.1 The field surveys were conducted at various dates from April to June 2021. Each survey was completed by survey teams consisting of two ecologists, with lead ecologists, all members of CIEEM, experienced with botanical species

identification required for habitat classification. Surveys were led by Jacob Haddon, Steven Mills, Adam Cross, Tracey McLean and Alexander Powell.

2.2.2 Survey dates for 2021 are given below:

- 8 and 9 April
- 13, 14 and 15 April
- 19 and 20 April
- 21 and 22 April
- 22 and 23 April
- 28 and 29 April – (two concurrent teams)
- 4 and 5 May – (two concurrent teams)
- 13 May
- 18 and 19 May
- 18, 19 and 20 May
- 22 and 23 June

2.2.3 Habitats were classified using the UK Habitat Classification (UKHab) methodology [18]. The UKHab system, which is listed as good practice guidance by CIEEM [19], provides a comprehensive approach to classification of terrestrial, coastal and freshwater habitats. Habitat definitions are given in the *UK Habitat Classification – Habitat Definitions* [20], and provide the basis for habitat types within the *Biodiversity Metric 3.1* [21] to be utilised for Biodiversity Net Gain (BNG) assessment of the scheme.

2.2.4 The UKHab classification is based on a hierarchical system suitable for use in terrestrial, freshwater and coastal areas of the UK. The system comprises a principal hierarchy (the primary habitats) – which include ecosystems, broad habitats, priority habitats and Annexe 1 habitats, as well as non-hierarchical Secondary codes [20]. The habitat divisions at each level of the hierarchy are provided in Table 2-1.

Table 2-1 UK habitat classification hierarchy division

Level 1	Level 2	Level 3	Level 4	Level 5
Major ecosystem, covering terrestrial, freshwater and coastal ecosystems	9 ecosystem types, based upon major habitat types within the EUNIS classification	20 broad habitat types, corresponding with UK Biodiversity Action Plan Broad Habitats and closely to EUNIS	80 habitats, including 47 UK Biodiversity Action Plan Habitats, and further splits of level 3 habitats	104 habitats, including 69 Habitats Directive Annex 1 habitats and further splits of Level 4 habitats

Distribution of UK habitat hierarchy, highlighting the number of habitats and underlying data sources utilised for each level. Adapted from Butcher, B (*et al*.) 2020 [18].

2.2.5 Habitats were recorded to at least Level 4 of the hierarchy (except for modified grassland – Level 3), with further recording to level 5 where appropriate.

2.2.6 Non-hierarchical secondary codes are also used in addition to the primary codes to provide further contextual information relating to habitat mosaics and complexes within mapped primary habitats. Secondary codes have been limited to the mandatory codes for habitat mosaics (10-18), Priority and Annex 1 habitats that occur in multiple primary habitats (19-32) and habitat origins (33-41), the corresponding labels of which are shown in Table 2-2.

Table 2-2 UK habitat classification mandatory secondary codes

Secondary code	Label
10	Scattered scrub
11	Scattered trees
12	Scattered bracken
13	Scattered dwarf shrubs
14	Scattered rushes
15	Rushes dominant
16	Tall herb
17	Ruderal/ ephemeral
18	Calcareous - acidic mosaic
19	Ponds (Priority Habitat)
20	Wood-pasture and parkland
21	Traditional orchards
22	Juniper on heaths or calcareous grasslands (H5130)
23	Caves not open to the public (H8310)
24	Depressions on peat substrates (H7150)
25	Coastal and floodplain grazing marsh
26	Machair (H21A0)
27	Heathland on maritime cliffs and slopes
28	Dunes with creeping willow (H2170)
29	Inland saltmarshes (H1340)
30	Estuaries (H1130)
31	Large shallow inlets and bays (H1160)
32	Reefs (H1170)
33	Ancient woodland site
34	Arable reversion grassland
35	Biodiversity offset
36	Plantation
37	Semi-natural woodland
38	Secondary woodland
39	Freshwater - man-made
40	Freshwater - heavily modified
41	Freshwater - natural

2.2.7 Surveyors recorded key botanical species present, particularly any species indicative of the named habitat, as well as their relative abundance and structural composition. Handheld devices were utilised to capture geospatial data for individual habitat parcels accurately within the field.

2.2.8 Field signs of protected and/or notable species, or any habitats considered suitable to support them, were noted.

2.2.9 Additional relevant information outside of the UKHab classification or too small to be mapped as a defined habitat parcel, including identification of field signs of

protected and/or notable species, has been recorded as target notes. Only target notes pertaining to habitat features and/or notable plant species within the study area are referred to in the relevant text within the results section.

2.2.10 The *Vascular Plant Red List for England* [22] was used to determine which species identified during field surveys were of particular conservation concern at a national level. Vascular plant species identified were also checked against SPI lists [23] and Schedule 8 of the Wildlife and Countryside Act 1981 [24].

2.2.11 The *Somerset Notable Species Dictionary* [25] was used to determine which species identified during field surveys were of particular local importance.

2.3 Assumptions and limitations

2.3.1 Whilst the majority of surveys were undertaken within the optimal season for botanical identification, it is recognised that several of the survey timings may fall outside of the optimum survey period for specific habitat types. For instance, surveys conducted in early April fall outside of the optimal survey period for grasslands (May-June), and those conducted in June would be outside of the optimal period for woodlands (April-May). Given the proximity to the respective optimal survey periods, surveyors were able to assess such habitats with confidence (whilst recognising where key botanical indicator species may have been overlooked) and therefore survey timing was not considered to be a significant limitation.

2.3.2 The majority of higher biodiversity value grasslands and woodlands identified were further subject to additional detailed National Vegetation Classification (NVC) surveys within the respective optimal survey periods, providing further botanical context for the UKHab assessment where required. The results of these surveys are provided within the *A358 Taunton to Southfields Dualling Scheme Ecological Baseline Report – National Vegetation Classification (NVC)* [8].

2.3.3 Several areas within the study area were not accessed by surveyors due to various land access restrictions. Where possible, such areas of restricted access were viewed from adjacent land using binoculars, with limitations to the survey noted. Where it was not possible to view or accurately classify habitats with restricted access from adjacent land, habitats were mapped using information from the desk study to estimate the extent and type of defined habitat parcels.

2.3.4 The vast majority of land that was not subject to access for UKHab survey constituted agricultural land given over to grazing or arable production, or urbanised areas, such as villages and areas of Taunton north of the M5 junction 25. Such areas were generally considered to be of lower biodiversity value; however, a precautionary approach was taken to classification of such habitats.

2.3.5 The precautionary approach to classification was particularly pertinent for hedgerows that could not be surveyed from either side and for which more detailed hedgerow survey data was unavailable. In this instance the prevalence of species-rich hedgerows within the landscape was used to precautionarily treat these hedgerows as species-rich hedgerows, with aerial imagery and mapping used to determine association with high biodiversity value features such as ditches and mature trees.

2.3.6 The *Woodland Trust Ancient Tree Inventory* [17] relies on volunteers to identify and record notable trees, and an absence of ancient and/or veteran trees does not preclude their presence. A tree survey and arboricultural impact assessment

has been undertaken, including details on the location of ancient, veteran and potential veteran trees, the results of which will be provided in *Appendix 7.3 Tree Survey and Arboricultural Impact Assessment* of the ES.

2.3.7 The desk study identified Schedule 9 invasive giant hogweed (*Heracleum mantegazzianum)* as present within the study area but this species was not noted in those recorded locations during the 2021 field survey. However, surveys of these locations were originally undertaken in April, prior to the flowering period in June-July. Whilst giant hogweed was also not incidentally reported in subsequent protected species surveys, this species is precautionarily assumed to remain present within the study area.

3 Results

3.1.1 For the purposes of this report, the descriptions of habitats identified has been split into three sections:

- Northern section – M5 junction 25 to Griffin Lane (offline section)
- Central section – Griffin Lane to Woodstock (online section)
- Southern section – Woodstock to Southfields roundabout (online section)

3.2 Desk study

3.2.1 Five ancient woodland sites were identified within the study area from the Ancient Woodland Inventory [12]:

- Huish Coppice – An ancient & semi-natural woodland of approximately 9.4ha in the northern section
- Bickenhall Wood – An ancient replanted woodland of approximately 19.7ha in the central section
- Ashill Wood & Every's Copse – A mixture of ancient & semi natural and ancient replanted woodland totalling approximately 22ha in the southern section

3.2.2 Whilst not mapped on the Ancient Woodland Inventory, the Local Wildlife Site (LWS) designations provided by SERC also highlighted that Saltfield Copse LWS contains, within the central section, woodland to be ancient in origin, with a mixture of semi-natural broadleaf vegetation with conifer plantation.

3.2.3 The *Ancient Tree Inventory* did not identify any mapped ancient or veteran trees within the study area [17].

3.2.4 The MAGiC data search [11] highlighted the presence of the following priority habitats within the study area:

- Deciduous woodland – distributed throughout the study area but with the greatest distribution in the central and southern sections. In the central section, Deciduous woodland priority habitat largely correlates with larger named sites, including parts of Bickenhall Wood, Saltfield Copse LWS, Lady Anna's Wood, Abbey Wood and Herford's Plantation. In the southern section, Ashill Wood & Every's Copse are mapped as deciduous woodland priority habitat, as well as unnamed examples found in association with A358 and A303 verges.
- CFPGM - An area of grassland within agricultural land east of the M5 junction 25 in the northern section was mapped the priority habitat, as well as more extensive areas bordering the A303 in the southern section.
- Wood-pasture and Parkland – Two areas of the priority habitat were mapped within the study area; an unnamed area of wood-pasture and parkland immediately north-east of Stoke Wood in the northern section and Jordan's Park LWS bordering the A358 in the southern section, designated as 'Parkland with an important assemblage of veteran trees in improved grassland'.

3.2.5 The location of ancient woodland and priority habitats described above are shown in Chapter 8 *Biodiversity* of the ES.

3.2.6 No mapped priority rivers were present within the study area [13].

3.2.7 Notable plants and fungi from the SERC data search occurring within the study area included:

- two records of red listed dwarf spurge (*Euphorbia exigua*) and county notable cornfield knotgrass (*Polygonum rurivagum*) in the Mattocks Tree Hill area
- red listed box (*Buxus sempervirens*), county notables grass vetchling (*Lathyrus nissolia*), common centaury (*Centaurium erythraea*) and annual pearlwort (*Sagina apetala* subsp*. apetala*) surrounding Huish Woods.
- county notable bee orchid (*Ophrys apifera*) within Taunton, north of M5 junction 25
- county notables native black poplar (*Populus nigra*) and yellow rattle (*Rhinanthus minor*) east of M5 junction 25
- six records of county notable buck's-horn plantain (*Plantago coronopus*) from west of the A358 in the northern section of the scheme

3.2.8 The desk study also identified the presence of invasive species listed on Schedule 9 of the Wildlife and Countryside Act 1981:

- Giant hogweed in a field west of Hendale and a field adjacent to the A358 south of Stewley.
- Winter heliotrope (*Petasites fragrans*) within road verges leading to Ashill and an earth bank near Thickthorn Cross.

3.3 Field surveys

3.3.1 UKHab classifications are provided in Appendix A *UKHab* primary habitats and secondary codes plans, and target notes with their corresponding descriptions are provided in Appendix B *Target notes*.

3.4 Habitat classification

3.4.1 The locations and extents of all habitats identified within the study area are provided in Appendix A.

3.5 Lowland calcareous grassland (g2a)

3.5.1 Lowland calcareous grassland was identified in a single location within the study area, on a hillside immediately south-east of Huish Wood (TN42). The grassland was characterised by localised areas of forbs indicative of calcareous soils, including lady's bedstraw (*Galium verum*), salad burnet (*Sanguisorba minor*), dwarf thistle (*Cirsium acaule*), common bird's-foot trefoil (*Lotus corniculatus*) and agrimony (*Agromonia eupatoria*). There was increased sward heterogeneity along the adjacent mature tree line due to patches of disturbed and bare ground resulting from anthills and rabbit burrows.

3.5.2 The lowland calcareous grassland was managed through periodic grazing, leading to improvement through input of nutrients and degradation of the calcareous nature of the soil. The sward was dominated by grasses indicative of improved neutral swards, including Yorkshire fog (*Holcus lanatus*), sweet vernal (*Anthoxanthum odoratum*) and red fescue (*Festuca rubra*). The sward became increasingly improved further south of the woodland and hillside, with an increased prevalence of cock's-foot (*Dactylis glomerata*), creeping thistle (*Cirsium arvense*) and creeping buttercup (*Ranunculus repens*), with additional invasion of a large bramble (*Rubus sp.* agg.) dominated bank.

3.5.3 This grassland is not currently mapped as the corresponding priority habitat type on the MAGiC database [11]. A detailed NVC survey [8] undertaken on this grassland determined the majority of the area was the NVC community MG9 *Holcus lanatus-Deschampsia cespitosa* grassland, though with calcareous indicator species such as lady's bedstraw, salad burnet, bird's-foot trefoil and quaking grass (*Briza media*). The dominance of neutral species within the sward further reinforces the conclusion that this area constitutes a degraded calcareous grassland. Given the current status of this grassland, it is not considered to meet the criteria for Lowland Calcareous Grassland priority habitat [26], but may be restorable to a condition where the vegetative community reflects this classification.

3.6 Other neutral grassland (g3c)

3.6.1 Other neutral grassland (level 4 classification) was prevalent in patches throughout the length of the study area. This habitat varied considerably in composition and quality arising from a wide range of land uses.

3.6.2 The majority of other neutral grassland within the study area was associated with agricultural land, arising from lower intensity or periodic grazing (particularly by cattle and occasionally by horses or goats) or through cutting for hay. Most swards were dominated by grasses, particularly Yorkshire fog, with red fescue, false oat grass (*Arrhenatherum elatius*), soft brome (*Bromus hordeaceus*), cock's-foot, common bent (*Agrostis capillaris*), sweet vernal and timothy (Phleum pratense) and occasional perennial ryegrass (*Lolium perenne*). Sections of drier other neutral grasslands were located adjacent to the A358 east of Huish Wood. Characteristic forbs included dove's-foot crane's-bill (*Geranium molle*), creeping buttercup, meadow buttercup (*Ranunculus acris*), oxeye daisy (*Leucanthemum vulgare*), lesser celandine (*Ficaria verna*), common vetch (*Vicia sativa*), red clover (*Trifolium pratense*) and cowslip (*Primula veris*). Occasionally patches of common nettle (*Urtica dioca*), bramble, creeping thistle and spear thistle (*Cirsium vulgare*) were also present, indicating localised disturbance or nutrient input. Less frequently occurring forbs found within higher quality areas of other neutral grassland included pignut (*Conopodium majus*), thyme-leaved speedwell (*Veronica serpyllifolia*), glaucous sedge (*Carex flacca*) and county notable grass vetchling.

3.6.3 Several areas of other neutral grassland have been classified to level 5 of the hierarchy as **Arrhenatherum neutral grassland (g3c5)**, dominated by a grassy sward of false oat grass, with abundant cock's-foot.

3.6.4 In several areas meadow foxtail (*Alopecurus pratensis*) and Yorkshire fog dominated the sward indicating a dampness to the underlying soils. Such swards were particularly prevalent towards the southern extent of the scheme, with large areas found adjacent to the A303 north of Ilminster, likely resulting from periodic flooding of the River Isle. Similar areas were found within the floodplains of Back Stream, Cad Brook and Venner's Water. Indicative species found in such areas included soft rush (*Juncus effusus*), hard rush (*Juncus inflexus*), cuckoo flower (*Cardamine pratensis*), silverweed (*Potentilla anserina*), tufted hair-grass (*Deschampsia cespitosa*), great willowherb (*Epilobium hirsuta*), marsh thistle (*Cirsium palustre*) and meadowsweet (*Filipendula ulmaria*).

3.6.5 Several of these areas have been classified to level 5 of the hierarchy as **Holcus-Juncus neutral grassland (g3c8)**.

3.6.6 Further examples of other neutral grassland identified across the study area included lightly managed roadside verges, tracks and bridleways and a seeded field south of the M5 junction 25. Near threatened field woundwort (*Stachys arvensis*) was noted in a single location in a roadside verge on Rapps Lane.

3.6.7 Schedule 9 listed invasive variegated yellow archangel (*Lamiastrum galeobdolon* subspp. *argentatum*) was identified within a grassed roadside verge adjacent to properties on Rapps Road (TN105).

3.6.8 Winter heliotrope was noted within grassed roadside verges on Griffin Lane, Thickthorn Lane and roads leading into Ashill (TN102 and 111). This species is listed as a naturalised non-native weed [27] with potential impacts on UK biodiversity but is not listed on Schedule 9 of the Wildlife and Countryside Act 1981.

3.7 Modified grassland (g4)

3.7.1 Modified grassland was prevalent throughout the study area, most of which constituted intensively grazed agricultural land, predominantly by sheep and cattle. These areas were usually characterised by an abundance of perennial ryegrass, though damper examples were dominated by Yorkshire fog and meadow foxtail. Other frequently occurring grasses included cock's foot and timothy, with occasional red fescue. Forb cover was generally sparce and characterised by white clover (*Trifolium repens*), creeping thistle, creeping buttercup, dandelion (*Taraxacum officinale*) curled dock (*Rumex crispus*), broad-leaved dock (*Rumex obtusifolius*) and ribwort plantain (*Plantago lanceolata*). Occasional patches of nettle were also present.

3.7.2 Further areas of modified grassland were found in the form of regularly mown amenity grasslands, including some roadside verges, a campsite, and larger gardens. These areas were characterised by an extremely high prevalence of perennial rye grass and white clover.

3.7.3 Two areas of modified grassland constituting wood-pasture and parkland were located within the study area, each mapped as the corresponding priority habitat [11], characterised by numerous highly mature and veteran trees. Within the northern section of the study area, the unnamed area of wood-pasture and parkland was subject to intensive sheep grazing, with numerous standard ash (*Fraxinus excelsior*), pedunculate oak (*Quercus robur*) and small-leaved lime (*Tilia cordata*).

3.7.4 Three fields to the south of the scheme (comprising Jordan's Park LWS) were maintained through a combination of cattle grazing and topping for hay. Mature trees included European turkey oak (*Quercus cerris*), pedunculate oak, London plane (*Platanus x hispanica*), horse chestnut (*Aesculus hippocastanum*) and small-leaved lime. The park showed some signs of active management, with immature trees fenced off to allow establishment without damage from cattle. One of these fields was immediately adjacent to the existing A358.

3.8 Lowland mixed deciduous woodland (w1f)

3.8.1 Lowland mixed deciduous woodland was the predominant woodland type found within the study area, comprising several extensive named woodlands in combination with numerous smaller woodland blocks and copses. Most of these

woodlands were semi-natural in origin, with a large variation in management intensity.

3.8.2 As these woodlands did not meet the criteria for Annexe 1 habitats, they have been classified to level 5 **other lowland mixed deciduous woodland (w1f7).**

3.8.3 Larger named woodland blocks, primarily found within the central and southern sections of the study area, include sites such as Huish Woods, Ashill Woods and Every's Copse, all of which constitute mapped ancient woodlands on the Ancient Woodland Inventory [12].

3.8.4 Huish Woods LWS and Huish Copse East LWS constituted ancient semi-natural woodland, with occasional areas of plantation. The woodlands were actively managed, with the provisioning of deadwood to supplement existing deadwood, guarding of young trees to protect from browsing, and the maintenance of a series of paths and glades. The canopy was dominated by pedunculate oak, with ash and beech (*Fagus sylvatica*), and infrequent Norway maple (*Acer platanoides*). The understorey was well developed including hazel (*Corylus avellana*), field maple (*Acer campestre*), hawthorn (*Crataegus monogyna*), holly (*Ulex aquifolium*) and elder (*Sambucus nigra*). The varied aspect and active management of the woodlands has resulted in a relatively diverse ground flora, with ivy (*Hedera helix*) dominant in parts and dog's mercury (*Mercurialis perennis*), lords and ladies (*Arum maculatum*), yellow archangel (*Lamium galeobdolon*), lesser celandine, sweet woodruff (*Galium odoratum*), primrose, bluebell (*Hyacinthoides non-scripta*), hart's-tongue fern (*Asplenium scolopendrium*), bugle (*Ajuga reptans*), common twayblade (*Neottia ovata*) and pendulous sedge (*Carex pendula*) also present.

3.8.5 Saltfied Copse LWS, adjacent to the A358 south of Bickenhall Wood, is designated as an ancient woodland, constituting a mixture of semi-natural broadleaved woodland, with some areas of conifer plantation. The field survey found the canopy to be oak-dominated, broken with various coniferous species. The understorey included elder, hazel, field maple, holly, wild privet (*Ligustrum vulgare*), field rose (*Rosa arvensis*), crab apple (*Malus sylvestris*) and English elm (*Ulmus procera*). The ground flora was diverse, including early purple orchid (*Orchis mascula*) (TN87), bluebell, ramsons (*Allium ursinum*), lords and ladies, dog's mercury, primrose, goldilocks buttercup (*Ranunculus auricomus*), wood melic (*Melica uniflora*), early dog violet (*Viola reichenbachiana*), yellow archangel, stinking iris (*Iris foetidissima*), wood sedge (*Carex sylvatica*) and sweet woodruff. A number of these species are ancient woodland indicators in the south-west region [22], indicating the LWS designation is correct.

3.8.6 Ashill Wood LWS and Every's Copse LWS are located within the southern section of the study area, adjacent to Park Barn Lane. These connected woodlands comprised a continuous mixture of ancient semi-natural and ancient replanted woodland, reflected in the canopy species present. The canopy was largely oak dominated, with some ash, and various pine (*Pinus sp.*) and cypress (*Cupressus sp.*) dominant in areas of replanting. The understorey was relatively sparce, comprising holly, hawthorn, and hazel and occasional county notable wild service tree (*Sorbus torminalis*). The ground flora was also sparce, locally dominated by bluebell, with lords and ladies, primrose and wood sedge.

3.8.7 Beyond Saltfield Copse, no further unmapped woodlands were considered likely to be ancient in origin.

3.8.8 Numerous further semi-natural woodland blocks were present throughout the study area, variant in size, management and character, many immediately adjacent to or dissected by the existing A358. This included several large woodland blocks immediately adjacent to the A358 north of Bickenhall Wood, including Lady Anna's wood, Abbey wood and Herford's plantation. Whilst not listed as ancient in origin, these woods displayed many similar features as the named sites listed, with canopies oak dominated and intermittent beech and ash. The understories were generally well developed, though with localised cleared areas around tracks, including hawthorn, wild privet, holly, hazel, field maple and guelder rose (*Viburnum opulus*). Several saplings of wild-service tree were identified within Abbey woodland (TN54), which had undergone significant felling. Ground flora was diverse, particularly in areas adjacent to the stream corridor, including abundant ramsons, with sweet woodruff, dog's mercury, wood millet (*Milium effusum*), wood melic, wood sedge, stinking iris, pendulous sedge, wood avens (*Geum urbanum*), pignut, bugle, wood speedwell (*Veronica montana*), enchanter's nightshade (*Circaea lutetiana*), common figwort (*Scrophularia nodosa*), giant fescue (*Schedonorus arundinaceus*), goldilocks buttercup and county notable wood spurge (*Euphorbia amygdaloides*).

3.8.9 Throughout the southern extent of the study area, numerous smaller woodland blocks were identified in association with historic farm ponds, both within fields and on field boundaries. These smaller blocks generally showed signs of abandonment or mismanagement and were frequently used for fly tipping. Canopies were largely ash dominated, but with frequent goat willow (*Salix caprea*) surrounding the waterbodies or damp depressions of remnant or ephemeral waterbodies. The understories of these smaller blocks were poorly developed with a limited ground flora, including ivy, lords and ladies, nettle, ground ivy (*Glechoma hederacea*) and occasional bluebell.

3.8.10 Further notable woodlands were found within watercourse corridors throughout the study area. These woodlands were linear in nature, arising where adjacent land uses did not encroach on the riparian corridor. Examples of these linear woodlands were located within the corridors of Thornwater Stream, Meare Stream south of the A358, Fivehead River west of the A358, Fivehead River main channel 2 east of the A358, Venner's Water and Back Stream each side of the A358. The canopies of these woodlands were more varied, reflecting the damper setting. Oak and ash were still present, but with greater representation of alder (*Alnus glutinosa*) and various willow species (*Salix sp.*) Notably, native black poplar were found within the riparian corridors of Thornwater Stream (TN17 and 22), Meare's Stream (TN44 and 47) and Venner's Water, several of which are likely to meet the criteria for potential veteran or veteran status. Understorey within these corridors constituted frequent hazel, English elm and elder. Ground flora comprised similar species to drier blocks, but frequently dominated by ramsons. Further notable ground flora species included wood anemone (*Anemone nemorosa*) and creeping-Jenny (*Lysimachia nummularia*).

3.8.11 A small stand of immature Schedule 9 listed invasive Japanese knotweed (*Fallopia japonica*) was noted within a single woodland south of Ashill (TN114).

3.8.12 Each of the larger named woodlands are mapped, at least in part, as lowland mixed deciduous woodland on the MAGiC database, as well as several of the unnamed woodlands described [11]. Those restricted in extent, either surrounding remnant ponds or associated with a riparian channel, are generally not mapped as woodland priority habitat, though the majority meet the broad criteria [28].

3.9 Other broadleaved woodland (w1g)

3.9.1 Other woodlands present throughout the study area were largely broadleaved in nature. This included **lines of trees (w1g6)**, which were present as linear features throughout the study area and varied in character dependent upon their origin. The more mature lines of trees were associated with outgrown historic field boundaries or alongside watercourses. These were characterised by mature ash and oak, with additional alder, willow and poplar (*Populus sp.*) alongside watercourses. Whilst some of the more developed of these lines of trees also displayed understorey and ground flora species associated with woodlands, these were relatively sparse and did not retain the character of woodlands, though they did occasionally adjoin them.

3.9.2 Lower biodiversity value lines of trees were found throughout the study area and resulted from more recent planting. These frequently comprised immature and semi-mature trees, often planted within the highway verge, running adjacent to highway boundary hedges. At the central and southern sections of the study area, damp highways drainage ditches were associated with willows which were of a notably greater age than the adjoining planting.

3.9.3 **Other broadleaved woodland types (w1g7)** were more recently planted woodlands and were found throughout the study area. These woodlands were particularly associated with the existing A358, likely originating from highways plantation from the original road construction. These woodlands occurred in relatively restricted, defined blocks, characterised by a low canopy of immature and semi-mature trees. Canopy species comprised high proportional mixtures of ash, field maple, hazel, wild cherry (*Prunus avium*) and white poplar (*Populus alba*). These woodlands frequently displayed signs of abandonment, evidenced by the numerous tree guards remaining on outgrown trees, and the invasion of bramble. These woodlands were characterised by a lack of discernible understorey and a sparse, limited ground flora, generally comprising nettle, lords and ladies, ivy, lesser celandine and occasional bluebell.

3.9.4 These woodlands do not meet the criteria for the deciduous woodland priority habitat type and are therefore not mapped on the MAGiC database [11].

3.9.5 Where the existing A358 was directly adjacent to or dissected semi-natural woodland blocks, the highways plantation canopy merged with the established woodland, though it was discernible in composition and structure. In these locations occasional standard mature trees had been retained amongst the plantation, generally displaying a more diverse ground flora arising from less disturbed soils. One such location was Road Verges West of Hatch Beauchamp LWS, designated for species-rich verge with Somerset notables. In this location, approximately 15 greater butterfly orchid (*Planthera chlorantha*) – red listed and county notable - were noted along the highways boundary, including several within the plantation woodland (TN50).

3.10 Other woodland; mixed (w1h)

3.10.1 Mixed plantation woodland was relatively scarce within the study area, restricted to the central section of the study area.

3.10.2 This includes Bickenhall Wood LWS, an extensive ancient replanted woodland site, constituting a mixture of conifer and broadleaved plantations, though with some areas of semi-natural broadleaved woodland. The sections of woodland

closest to the A358 were characterised by a mixture of oak and cypress, with frequent young, planted beech. The understorey was patchy, with blackthorn (*Prunus spinosa*), dog rose (*Rosa canina*), elder, hazel and holly. Ground flora species included bluebell, lesser celandine, lords and ladies and stinking iris.

3.10.3 The adjoining Five Acre Copse was a plantation of pines and broadleaved species including oak, poplar, ash and field maple. Ground flora was restricted, with some areas dominated by bramble, with pendulous sedge, stinking iris, lords and ladies, dog's mercury, common spotted orchid (*Dactylorhiza fuchsii*) and county notable pyramidal orchid (*Anacamptis pyramidalis*). The copse was used for pheasant rearing.

3.10.4 On the opposite east side of the A358, a bank of establishing mixed plantation woodland ran parallel to the broadleaved plantation in the highways verge. This woodland was dominated by immature ash, with pine, field maple and cherry (*Prunus s*p.). Trees were in regimented rows with many outgrowing the tree guards. Ground flora was sparse with large sections of nettle and cleavers indicating nutrient enrichment and disturbance. Further ground flora included stinking iris, primrose, wood avens, lords and ladies, with occasional common spotted and pyramidal orchid.

3.11 Hedgerows (priority habitat) (h2a)

3.11.1 Given the largely arable nature of land within the study area, hedgerows meeting the definition for priority habitat (consisting over 80% of at least one woody UK native species [20]) were prevalent throughout the study area.

3.11.2 These hedgerows varied in composition and character; however, many were characterised by a species-rich composition, with few hedgerows dominated by only one or two woody species. Frequently occurring species included hawthorn, blackthorn, English elm, field maple and hazel, dogwood (*Cornus sanguinea*) with occasional ash, spindle (*Euonymus europaeus*), wayfaring tree (*Viburnum lantana*) dog rose, field rose and guelder rose.

3.11.3 Where standard trees were associated with well-established historic hedgerows, ash and oak were dominant.

3.11.4 Throughout the southern and central sections of the scheme, most hedgerow networks were associated with a matrix of ditches. Many of these ditches held water either permanently or for a large proportion of the year, as indicated by representative aquatic and marginal plant species.

3.11.5 Where planted hedgerows existed along highways boundary fencing, hedgerows were characterised by high abundances of field maple, hazel and wayfaring tree.

3.12 Other hedgerows (h2b)

3.12.1 Hedgerows that did not meet the criteria for priority habitat were infrequently located throughout the study area. These were generally restricted to ornamental hedgerows where residential and commercial properties sat adjacent to other land uses.

3.12.2 These hedgerows were characterised by a dominance of a single species, such as leyland cypress (*Cupressus x leylandii*), beech or Japanese barberry (*Berberis thunbergii*).

3.13 Bramble scrub (h3d)

3.13.1 Whilst bramble patches were prevalent throughout the study area, these were generally in association with broader habitat types, such as woodlands or forming parts of mixed scrub complexes. However, several extensive bramble banks were located within the study area, generally as linear features alongside woodlands or covering dry ditches, where a lack of active management allowed the bramble to proliferate.

3.14 Mixed scrub (h3h)

3.14.1 Areas of mixed scrub were prevalent throughout the study area. These habitats were generally densely vegetated, with no single species dominating. The most frequently recorded species included hawthorn, blackthorn and bramble, with occasional wild privet, elder, willow, hazel and dogwood.

3.14.2 Many areas of mixed scrub occurred as linear features in association with the existing A358, either within unmanaged sections of the highway verge or along the boundary fence. Several other linear scrub banks had formed from outgrown unmanaged hedgerows, resulting in thick field boundaries marked on each side by establishing saplings.

3.14.3 One area of mixed scrub was identified within an unmanaged field north of Griffin Lane, west of the A358, which was characterised by patches of variant scrub. This scrub was fragmented by glades maintained by rabbit burrowing and grazing.

3.14.4 Notable areas of mixed scrub were located within the highway verge surrounding the M5 junction 25, surrounding the Taunton Gateway Park and Ride, along the disused railway south of Greenway Lane and surrounding the storage reservoir immediately adjacent to the A358.

3.14.5 The Schedule 9 listed invasive Japanese rose (*Rosa rugosa*) was identified as part of a scrub bank formed by immature amenity planting along an embankment off the A303 south of Southfields roundabout (TN155).

3.15 Lowland fens (f2a)

3.15.1 One area of lowland fen was identified within the study area. This was a tufa formation within a wooded location off Ash Road, between Thornfalcon and Thurlbear (TN28). Further targeted surveys were undertaken in March 2022 to determine the formation type and conservation status of this structure, which confirmed that the formation does not unequivocally qualify as the relevant Annex 1 habitat types recorded at Level 5 (see Appendix C).

3.15.2 This habitat meets the criteria for the corresponding lowland fen priority habitat, though it has not been mapped [11].

3.16 Aquatic marginal vegetation (f2d)

3.16.1 Aquatic marginal vegetation was found in association with watercourses and wet ditches throughout the study area. Given this intrinsic association with the overriding habitat feature and the generally limited scale of aquatic marginal vegetation (<0.5m width) [20], aquatic marginal vegetation was not mapped.

3.16.2 Aquatic marginal vegetation in more open areas was frequently dominated by hemlock water dropwort (*Oenanthe crocata*), with great willowherb, marsh figwort (*Scrophularia auriculata*), meadowsweet and pendulous sedge. A single stand of whorled caraway (*Carum verticillatum*) was identified along Cad Brook.

3.16.3 The Schedule 9 listed invasive Himalayan balsam (*Impatiens glanduifera*) was identified as a significant part of the marginal vegetation along several watercourses within the study area, including Black Brook (TN1), Back Stream, Meare Stream, Fivehead River feeder channels and the River Ding and its tributaries (TN142).

3.17 Other swamps (f2f)

3.17.1 Swamps and wet flushes not meeting the definitions of other wetland types occurred infrequently throughout the study area, primarily in association with damp habitats in the southern section of the scheme. These habitats were colonised by a range of marginal and aquatic species, but with no clear dominant species or structure.

3.17.2 The largest area was associated with the A303 north of Ilminster, where the flooding of a wet feeder ditch entering the Back Stream has caused a wet flush beneath the road. The area was dominated by hemlock water dropwort, cuckoo flower, soft rush, great willowherb and water mint (*Mentha aquatica*).

3.17.3 Within a small woodland block adjacent to the A358 north of the Southfields roundabout, a large dry depression was characterised by a diverse marginal and aquatic flora, indicating a previous dampness undergoing succession. Marginal and aquatic species identified included hemlock water dropwort, bulrush (*Typha latifolia*), soft rush, great willowherb, marsh figwort, pendulous sedge, fool's watercress (*Apium nodiflorum*) and square-stalked St John's-wort (*Hypericum tetrapterum*).

3.17.4 Another large area of wet flush was formed on the edge of arable land bordering Venner's Water, north of the A358 at Ashill. Vegetative structure was extremely varied, including several stands of scattered common reed (*Phragmites australis*), interspersed by inundated areas colonised by soft rush, great willowherb, marsh figwort, meadowsweet, water mint, cuckoo flower and county notable great burnet (*Sanguisorba officinalis*).

3.18 Arable field margins (c1a)

3.18.1 Arable field margins associated with extensive arable fields throughout the scheme were generally limited, being under 1m in width. The flora associated with these arable field margins was generally limited to a few species, resulting from direct encroachment and nutrient input from adjacent farming practices.

3.18.2 Species prevalent within these arable margins included Yorkshire fog, cock's foot, false brome (*Brachypodium sylvaticum*), perennial rye grass, creeping thistle, spear thistle and creeping buttercup. Infrequently occurring species included dove's-foot crane's-bill, sweet vernal grass, common vetch and red clover.

3.18.3 Within the central section of the scheme, a number of arable fields surrounding Griffin Lane displayed wider arable margins under light management. These margins displayed a far more diverse flora, including abundant common spotted orchid, pyramidal orchid, ox-eye daisy, meadow vetchling (*Lathyrus pratensis*),

smooth tare (*Vicia tetrasperma*), grass vetchling (TN48), agrimony, red clover and hedge bedstraw (*Galium mollugo*).

3.18.4 Several larger fields contained areas of considerable set aside, evidently sown with wildflower mixes, which could be classified as **arable margins sown with wildflowers or a pollen and nectar mix (c1a6)**. Species prevalent within these mixes included common vetch, oy-eye daisy, dove's-foot crane's-bill, meadow buttercup, and black medic (*Medicago lupulina*). These areas also displayed significant encroachment by arable weeds, such as creeping thistle, spear thistle, barren brome (*Bromus sterilis*), nettle and bristly oxtongue (*Helminthotheca echioides*).

3.19 Temporary grass and clover leys (c1b)

3.19.1 Temporary grass and clover lays were found in a number of larger fields within the study area, particularly at the northern end of the scheme adjacent to the existing A358 at Hendale, the central section of the scheme south of Griffin Lane, and the southern end of the scheme north of the Southfields roundabout.

3.19.2 The majority of these fields have been classified as **rye-grass and clover ley (c1b5)**.

3.20 Cereal crops (c1c)

3.20.1 Numerous extensive fields utilised for arable land uses were found throughout the study area, forming one of the major land uses identified. The majority of these fields were sown with winter wheat (*Triticum sp*.) or maize (*Zea mays*), fitting the level 5 classification of **other cereal crops (c1c7)**.

3.20.2 Numerous highly mature and potential veteran trees were identified as standards within arable fields, particularly in the northern and central sections. Most of these trees were pedunculate oak.

3.20.3 Variegated yellow archangel was identified within an arable field margin immediately adjacent to the A358 at Mattock's Tree Hill.

3.21 Non-cereal crops (c1d)

3.21.1 Non-cereal crop planting within the study area was also noted, with fields planted with courgettes (*Cucurbita pepo*) identified. These fields fit the level 5 classification of **other non-cereal crops (c1d8)**.

3.22 Horticulture (c1f)

3.22.1 A single location, north of Capland, was identified as used for horticulture, with numerous polytunnels present.

3.23 Developed land; sealed surface (u1b)

3.23.1 Developed, artificially sealed surfaces were prevalent throughout the study area, incorporating the road network and associated properties. This included extensive farmyards and associated farm buildings, car parks at Taunton Gateway Park & Ride, services and industrial estates surrounding the Southfields Roundabout, as well as a motorhome dealership adjacent to the A378.

3.23.2 A major area of developed land, within the far northern extent of study area comprised, the area of Taunton immediately north of the M5 junction 25.

3.23.3 These features met the criteria for **buildings (u1b5)** and **other developed land (u1b6).**

3.24 Artificial unvegetated, unsealed surface (u1c)

3.24.1 An extensive area of stripped soil was identified immediately south of the M5 Junction, sparsely colonized by a few pioneer species, including hemlock (*Conium maculatum*), thale cress (*Arabidopsis thaliana*), barren brome and corncockle (*Agrostemma githago*).

3.24.2 Corncockle is likely to have originated from a wildflower seed mix utilised upon nearby arable land, which has subsequently colonised the stripped earth.

3.25 Suburban/mosaic of developed/ natural surface (u1d)

3.25.1 Suburban mosaics of artificially sealed and vegetated surfaces occurred throughout the study area, comprising collections of houses and associated gardens, particularly where villages occurred in close proximity to the scheme, including areas of Hendale and Ashill.

3.26 Eutrophic standing waters (r1a)

3.26.1 Eutrophic standing water in the form of ponds were sporadically present across the study area, though a greater number occurred within the southern section.

3.26.2 As previously described, many of these ponds were associated with historic field boundaries within small, wooded areas that were largely abandoned. These ponds were heavily shaded by surrounding vegetation, with many also showing signs of succession from surrounding goat willow. Occasionally algae or duckweed (*Lemna minor*) was noted as being present, indicating nutrient enrichment, likely from runoff from adjacent arable land.

3.26.3 Due to these detrimental influences the majority of these ponds had no visible aquatic vegetation, though water mint was noted within an unshaded area of one pond north of the A358 at Ashill. Associated marginal vegetation was also largely absent, though pendulous sedge, marsh marigold (*Caltha palustris*), great willowherb, hemlock water dropwort, marsh figwort and meadowsweet were infrequently noted.

3.26.4 A large retention basin was associated with the A358 north of Cad Road. This basin was surrounded by dense scrub and appeared to receive significant runoff from the A358, with a high coverage of filamentous algae.

3.26.5 At the northern extent of the study area, two ponds were associated with scrub and grassland habitats surrounding the Taunton Gateway Park & Ride. These ponds were more open in aspect and were dominated by bulrush and common reed.

3.26.6 In the central section of the study area, several large ornamental duckponds were identified. These ponds were highly sedimented from waterfowl activity with no visible aquatic vegetation, though a significant fringe of marginal vegetation was noted surrounding several ponds.

3.26.7 Monkeyflower (*Mimulus guttatus*) was noted as a marginal species on a pond bank in the northern section of the study area, south of Hendale (TN10). This species is a non-native but is not listed on Schedule 9 of the Wildlife and Countryside Act 1981 [29].

3.26.8 All of these waterbodies have been classified to level 5 **other eutrophic standing waters (r1a6).**

3.26.9 Extensive great crested newt (*Triturus cristatus*) surveys on waterbodies within the study area have identified seven ponds confirmed as supporting great crested newt. These ponds qualify as priority habitat through supporting a species fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 and are shown in Appendix A with the secondary code 19. Given the condition of the remaining ponds identified within the study area they were deemed unlikely to meet the criteria for pond priority habitat, as they were unlikely to support exceptional assemblages of key biotic groups or achieve high ecological quality through the Predictive System for Multimetrics (PSYM) assessment.

3.26.10 A large number of ditches within the study area appeared to hold standing water either permanently or for the majority of the year and supported a range of aquatic and marginal species. Most of these ditches were associated with hedgerow networks, with those retaining standing water more prevalent within the central and southern section of the study area.

3.26.11 Frequently occurring aquatic species include fool's watercress, water cress (*Rorippa nasturtium-aquaticum*) and water mint, with infrequently identified floating sweet grass (*Glyceria fluitans*), amphibious bistort (*Persica amphibia*) and white water-lily (*Nymphaea alba*). Frequently occurring marginal species included hemlock water dropwort, pendulous sedge, soft rush, great willowherb and marsh figwort, with infrequent marsh bedstraw (*Galium palustre*), greater chickweed (*Stellaria neglecta*), greater pond sedge (*Carex riparia*) and marsh marigold. One localised stand of county notable common meadow-rue (*Thalictrum flavum*) was identified within a ditch in the central section of the study area (TN38).

3.27 Other rivers and streams (r2b)

3.27.1 No watercourses within the study area were mapped as river priority habitat [13]. Watercourses within the study area did not display features that would satisfy priority river criteria.

3.27.2 The position of watercourses in the landscape, including stretches of artificial modification and exposure to detrimental agricultural pressures mean that they did not align with the qualifying criteria for any of the following:

- Riverine water bodies of high hydromorphological/ecological status
- Headwaters
- Occurrence of the EC Habitat Directive Annex 1 habitat (H3260 Water courses of plain to montane levels with the *Ranuculion fluitans* and *Callitricho-Batrachion* vegetation) – including but not limited to river SACs designated for the feature
- Chalk Rivers
- Active shingle rivers

3.27.3 No SSSI were identified within the study area designated for river species, riverine features or fluvial geomorphology.

3.27.4 Qualification through supporting key species was also considered unlikely. Aquatic invertebrate surveys did not identify any protected species, including Annex 1 white-clawed crayfish (*Austropotamobius pallipes*), within watercourses in the study area. Whilst evidence of species listed on Criterion level B, widespread BAP priority species which are less dependent on river habitat quality alone, were identified in association with watercourses during both desk study and various field surveys, none of the watercourses recorded at least six species. Species listed on Criterion B identified in association with watercourses in the study area included otter (*Lutra lutra*), water vole (*Arvicola amphibius*) and soprano pipistrelle (*Pipistrellus pygmaeus*), brown trout (*Salmo trutta*), bullhead (*Cottus gobio*) and European eel (*Anguila anguila*).

3.27.5 Therefore, watercourses occurring within the study area have been classified as **other rivers and streams (r2b)**.

3.27.6 The majority of watercourses identified within the study area were either streams or small rivers, rarely more than 4-5m in width. Many of these watercourses had well wooded riparian corridors, providing semi-natural bankside vegetation within an arable landscape. Where adjacent land uses have historically encroached into the riparian corridor, this fringe was generally far thinner, constituting a sparser line of mature trees lacking a developed understorey. Examples include Meare Stream Tributary south of Griffin Lane, the Fivehead River east of the A358, several sections of Venner's Water east of the A358 and the River Ding west of the A358.

3.27.7 Where largely naturalised, watercourses were recorded to show variation in bed substrate, though generally gravel substrates, and flow patterns, with deeper pools broken by riffles.

3.27.8 Whilst the developed riparian fringe indicated that watercourses within the study area had natural flow patterns, most watercourses within the study area showed some signs of artificial straightening, particularly where they passed beneath the existing A358, where many watercourses were channelised. Further examples of artificial channel straightening included Broughton Brook, a Meare Stream Tributary west of the A358 and the River Ding east of the A358. Within the southern extent of the study area, the River Ding and Cad Brook were connected to extensive artificial drainage networks. Significant weir structures were noted on the River Ding and Back Stream.

3.27.9 Himalayan balsam comprised a significant element of the marginal vegetation for several watercourses within the study area, including Black Brook (TN1), Back Stream, Meare Stream, Fivehead River feeder channels and the River Ding and its tributaries (TN142).

3.27.10 Burrows potentially created by Schedule 9 listed invasive principla crayfish (*Pacifastacus leniusculus*) were identified along Black Brook and the River Ding drainage network (TN136).

3.27.11 Detailed surveys of the watercourses have been undertaken to classify their type and condition, reported within the *A358 Taunton to Southfields Dualling Scheme Ecological Baseline Report – River Corridor Survey and Macropyhtes* [30].

3.28 Identification of protected and/or notable species

3.28.1 A number of protected and/or notable vascular plant species were identified, as described throughout the habitat descriptions. Protected and/or notable plant

species identified during the field survey and their key locations are provided in Table 3-2 Protected and/or notable vascular plants identified during field surveyTable 3-2.

Table 3-2 Protected and/or notable vascular plants identified during field survey

Common name	Scientific name	Protection/ notability	Key locations
Bluebell	*Hyacinthoides non-scripta*	Wildlife and Countryside Act 1981 (Schedule 8)	Most woodlands throughout the study area, including both those of arsing from semi-natural processes and plantation. Bluebell was also noted at the base of numerous hedgerows across the study area.
Field woundwort	*Stachys arvensis*	Vascular Plant Red List for England - Near threatened	Base of a hedgerow along Rapps Lane in the southern section of the study area.
Grass vetchling	*Lathyrus nissolia*	County notable	Grassed field margins, particularly in the central section between West hatch and Bickenhall Wood (such as TN48). Also noted as several individual plants in a hay field in the southern section (TN122)
Wild service tree	*Sorbus torminalis*	County notable	Within established semi-natural woodlands including Abbey Wood (TN54), Bickenhall Wood and Every's Copse
Great burnet	*Sanguisorba officinalis*	County notable	Within partially inundated areas of other swamp, associated with Venner's Water and Back Stream
Common meadow rue	*Thalictrum flavum*	County notable	Associated with a wet ditch in the central section (TN38)
Wood spurge	*Euphorbia amygdaloides*	County notable	Several semi-natural woodlands in the central section, namely Hereford's plantation and Lady Anna's Wood
Greater butterfly orchid	*Platanthera chlorantha*	County notable	Localised within grassed field margin and adjacent plantation woodland north of Herford's plantation. Majority of individual plants fall within Road Verges West of Hatch Beauchamp LWS
Pyramidal orchid	*Anacamptis pyramidalis*	County notable	Abundant within grassed field margins and plantation woodland between West hatch and Bickenhall Wood
Black poplar	*Poplus nigra*	County notable	Several individuals in each of the riparian corridors of Thornwater Stream (TN17 and 22), Meare's Stream (TN44 and 47) and Venner's Water

3.28.2 Field signs of badger were found throughout the study area, associated with woodlands, hedgerows and agricultural land. Evidence recorded included both setts (TN2, 8, 11, 13, 18, 21, 23, 35, 36, 40, 41, 45, 51, 60, 62 and 143) and

latrines (TN6, 8, 9, 56, 99, 100, 101, 103, 104 and 130), as well as a dead individual (TN154).

3.28.3 During the field survey, signs of otter were identified across several watercourses within the study area, primarily in the southern section along the River Ding and its drainage network (TN137, 136 and 146), as well as Back Stream (TN141, 143 and 148). Potential water vole footprints were also identified in the River Ding drainage network (TN135).

3.28.4 Hedgerow networks, woodlands and areas of scrub throughout the study area were identified to be of suitability to support hazel dormouse (*Muscardinus avellanarius*). A dormouse wild nest was identified within a hedgerow in the southern section of the scheme (TN107).

3.28.5 Several grasslands were noted with high suitability to support common and widespread reptile species, particularly within the northern section (TN32). Features with the potential to act as hibernacula were also noted (TN 85 and 93).

3.28.6 Several mature trees with the potential to support roosting bats (TN29, 31, 33, 43, 55, 64, 65, 66, 67, 68, 70, 72, 82, 86, 88, 89, 90, 91, 94, 106, 113, 123, 126 and 144) were identified, including within woodlands, standards within hedgerows and in fields. Buildings with potential to support roosting bats were also noted (TN81 and 153).

3.28.7 Several buildings (TN3, 15, 30, 55, 108, 115, 153) and mature trees (TN14, 16, 20, 27, 68, 109, 112, 116, 132, 133, 134, 139, 144 and 149) with potential to support roosting and nesting barn owl (*Tyto alba*) were identified, with pellets found at the base of one tree (TN140). Anecdotal evidence of barn owl was also noted (TN117). Grasslands constituting optimal foraging habitat for barn owl were also identified (TN118, 119, 120 and 125).

3.28.8 Numerous mature trees, some with the potential to qualify as veteran (TN7, 12, 17, 19, 22, 24, 44, 47, 58, 64, 65, 67, 68, 70, 72, 73, 91, 92, 94, 95, 96, 97, 98, 110, 126, 128, 129, 131, 132, 133, 139 and 149), were also noted throughout the study area, both within woodlands and as standard trees.

3.28.9 Various invasive and non-native flora were noted throughout the study area, described in within the relevant sections of the associated habitat type above.

4 Conclusions

4.1.1 The combined desk study and field surveys identified numerous habitats throughout the study area, varying in proportion, distribution and biodiversity value.

4.1.2 The desk study highlighted the presence of several named ancient woodland sites listed on the ancient woodland inventory; Huish Copse, Bickenhall Wood, Ashill Wood and Every's Copse. Saltfield Copse was also indicated to be ancient woodland through the LWS designation, which was corroborated by the presence of numerous ancient woodland indicator species in the field survey.

4.1.3 Deciduous woodland was the most frequently occurring priority habitat in each section of the study area, consisting of the named ancient woodland sites above, as well as further named woodlands and smaller discrete blocks, generally associated with the road network or riparian corridors. CFPGM priority habitat was identified at the northern and southern extents of the study area, comprised of the floodplains of the Black Brook and the River Isle. Two areas of wood-pasture and parkland were identified, including Jordan's Park LWS immediately adjacent to the A358 in the southern section. Seven ponds meeting criteria for priority habitat were present, each supporting a species fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 (great crested newt).

4.1.4 The majority of the study area was occupied by habitats arising from an agricultural land use, either as arable land or modified grasslands resulting from grazing. These areas were generally of lower biodiversity value, though some areas qualified as CFPGM priority habitat, while signs of protected and/or notable species were noted within these habitats, particularly badger and mature standard trees.

4.1.5 Woodlands were widely present within the study area, particularly within the central and southern sections. Higher biodiversity value woodlands of ancient or semi-natural origin, classified as lowland mixed deciduous woodland, included many of the named sites above, as well as discrete blocks and wooded riparian corridors. Such sites were found to support a wide range of protected and/or notable species, including badger, hazel dormouse and mature trees suitable for roosting bats. These woodlands were highly disparate in their nature, with examples under active management largely in better condition than abandoned blocks, which showed signs of significant degradation. Woodlands considered to be of lower biodiversity value were also present throughout the study area and were generally more recent in origin and clearly arising from planting, often associated with the verge of the existing A358.

4.1.6 Grasslands were also present throughout the study area, with the majority comprising modified grasslands arising from grazing by a variety of livestock. Further examples of modified grasslands included amenity lawns and well mown road verges. Neutral grasslands of higher biodiversity value were also present throughout the scheme, though these were highly variable in nature depending on their landscape context and management, including floodplains, topping for hay and low intensity grazing. A single area of degraded calcareous grassland was also identified within the study area, which is not mapped as the corresponding priority habitat type but is likely to be of local importance given the scarcity of this habitat within the landscape.

4.1.7 Hedgerows were a constant feature in the study area, many of which were species-rich and associated with other features of ecological value, such as mature standard trees and ditch networks. The vast majority of hedgerows within the study area qualified as priority habitat. Hedgerows are likely to act as linkages between high value habitats such as woodlands, watercourses and ponds within the largely arable landscape of the study area, offering a commuting and foraging resource for a number of protected and/or notable species, whilst the associated features increase the biodiversity value of these hedgerows. Hazel dormouse were found to be using hedgerows within the study area.

4.1.8 Watercourses were present in each section of the study area, consisting largely of small rivers and streams. Almost all of the watercourses within the study area had wooded semi-natural sections, though in areas were more exposed to the surrounding arable landscape or were artificially straightened, particularly passing beneath the existing A358. Whilst these watercourses did not meet the criteria for priority habitat, they are likely to constitute important biodiversity features within the largely arable landscape, offering foraging and commuting resource for protected and/or notable species including otter, water vole and bats.

4.1.9 Numerous ponds were present within the study area, with particularly degraded examples associated with woodland blocks in the southern section. Seven ponds within the study area qualified as the corresponding priority habitat type through supporting great crested newt.

4.1.10 A single area of lowland fen habitat was identified in the northern section of the study area in the form of a tufa spring. Specialist survey of this habitat has determined it does not unequivocally qualify as an Annex 1 habitat.

4.1.11 Scrub habitats were found throughout the study area, generally comprising mixed scrub in linear belts of unmanaged land, including the highway verge, outgrown hedgerows and parts of the disused railway. These linear scrub habitats provide variation in association with other habitats such as woodland and grassland.

4.1.12 Habitats associated with human development were widespread, including the road network, villages and farms, though these were considered to be of low biodiversity value, particularly where characterised by developed, sealed surfaces.

4.1.13 Further habitats found within the study area with a limited or patchy distribution included ornamental hedgerows, ditches, marginal aquatic vegetation and swamp.

4.1.14 Notable flora species from desk study records included red list and county notable species. The field survey identified a number of county notable flora species associated with woodland, grassland, wet flush and ditch habitats throughout the study area.

4.1.15 A number of invasive species were also found to be present, including Japanese knotweed, Himalayan balsam, Japanese rose, variegated yellow archangel and signal crayfish. Giant hogweed was assumed to be present within the study area (from desk study records) although it was not found during the field survey.

Abbreviations List

Please refer to Environmental Statement Chapter 17 Abbreviations.

Glossary

Please refer to Environmental Statement Chapter 18 Glossary.

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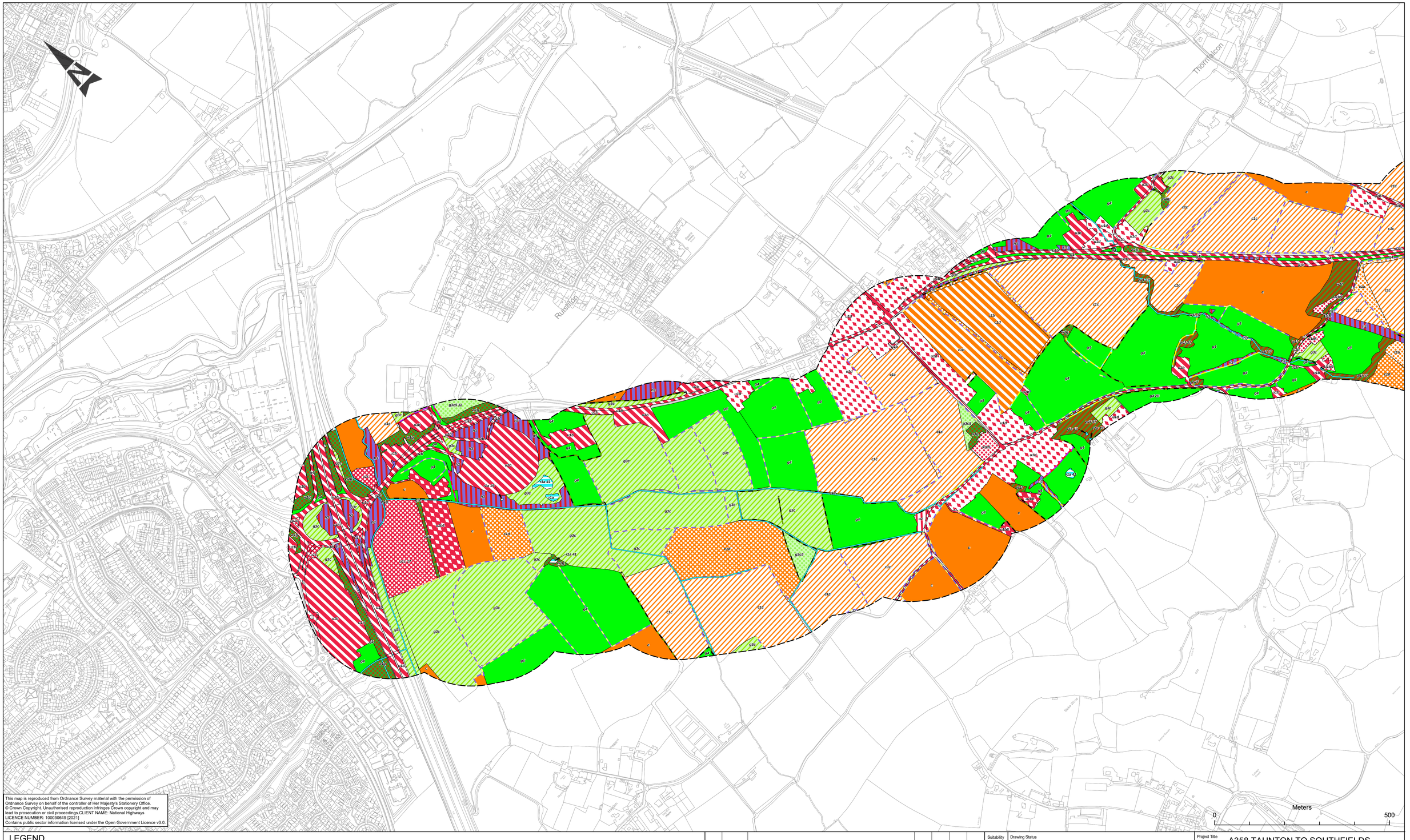
Appendices

Appendix A UKHab primary habitats and secondary codes plans



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- LINE OF TREES
- HEDGEROW (PRIORITY HABITAT)
- OTHER HEDGEROWS
- CANAL OR DITCH
- r2 - RIVERS
- c - CROPLAND
- c1a - ARABLE FIELD MARGINS
- c1b - TEMPORARY GRASS AND CLOVER LEYS
- c1c - CEREAL CROPS
- c1d - NON-CEREAL CROPS
- c1e - INTENSIVE ORCHARDS
- c1f - HORTICULTURE
- f2 - FEN,MARSH AND SWAMP
- f2a - LOWLAND FENS
- g2a - LOWLAND CALCAREOUS GRASSLAND
- g3 - NEUTRAL GRASSLAND
- g3c - OTHER NEUTRAL GRASSLAND
- g3c5 - ARRHENATHERUM NEUTRAL GRASSLAND
- g3c6 - LOLIUM-CYNOSURUS NEUTRAL GRASSLAND
- g3c8 - HOLCUS-JUNCUS NEUTRAL GRASSLAND
- g4 - MODIFIED GRASSLAND
- h3 - DENSE SCRUB
- r - RIVERS AND LAKES
- r1a - EUTROPHIC STANDING WATER
- u1 - BUILT-UP AREAS AND GARDENS
- u1b - DEVELOPED LAND, SEALED SURFACE
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39 - FRESHWATER - MAN-MADE
41 - FRESHWATER – NATURAL

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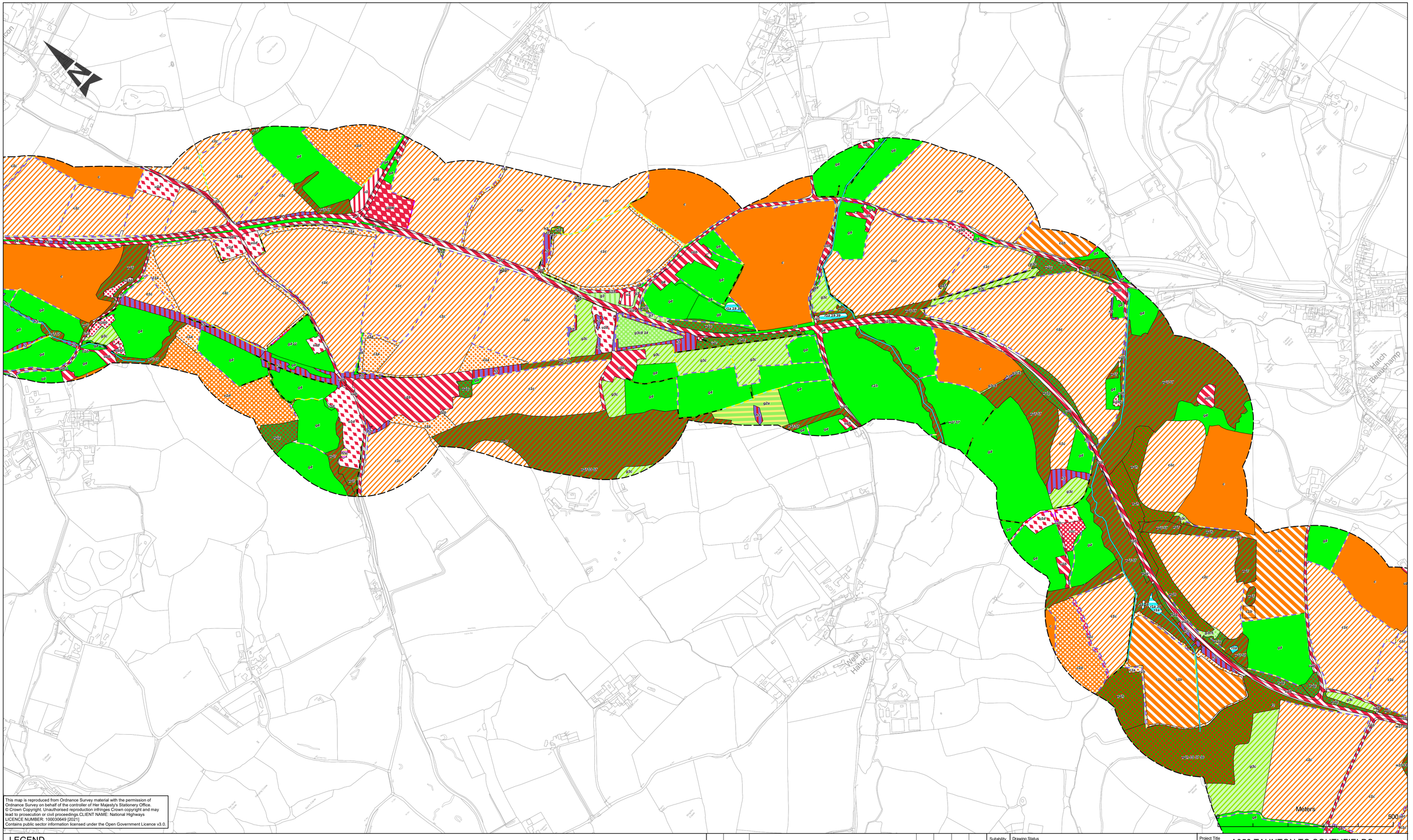

LEGEND

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- u1 - BUILT-UP AREAS AND GARDENS
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- u1e - BUILT LINEAR FEATURES
- w1f - LOWLAND MIXED DECIDUOUS WOODLAND
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- w1h - OTHER WOODLAND, MIXED

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NB. SYMBOLS WILL APPEAR ROTATED FROM WHAT IS DEPICTED IN THE LEGEND DUE TO ROTATION OF THE MAP FRAME.

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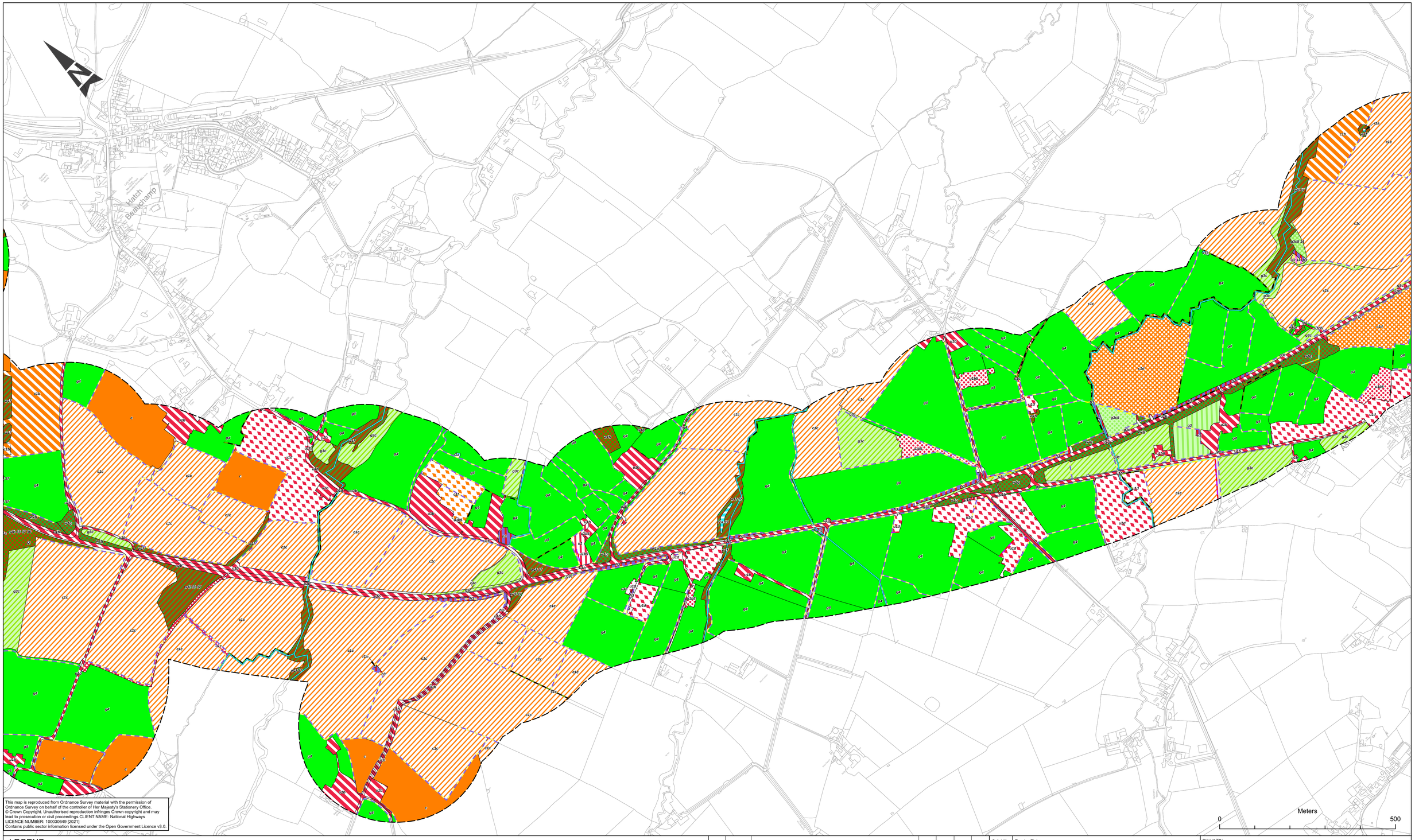

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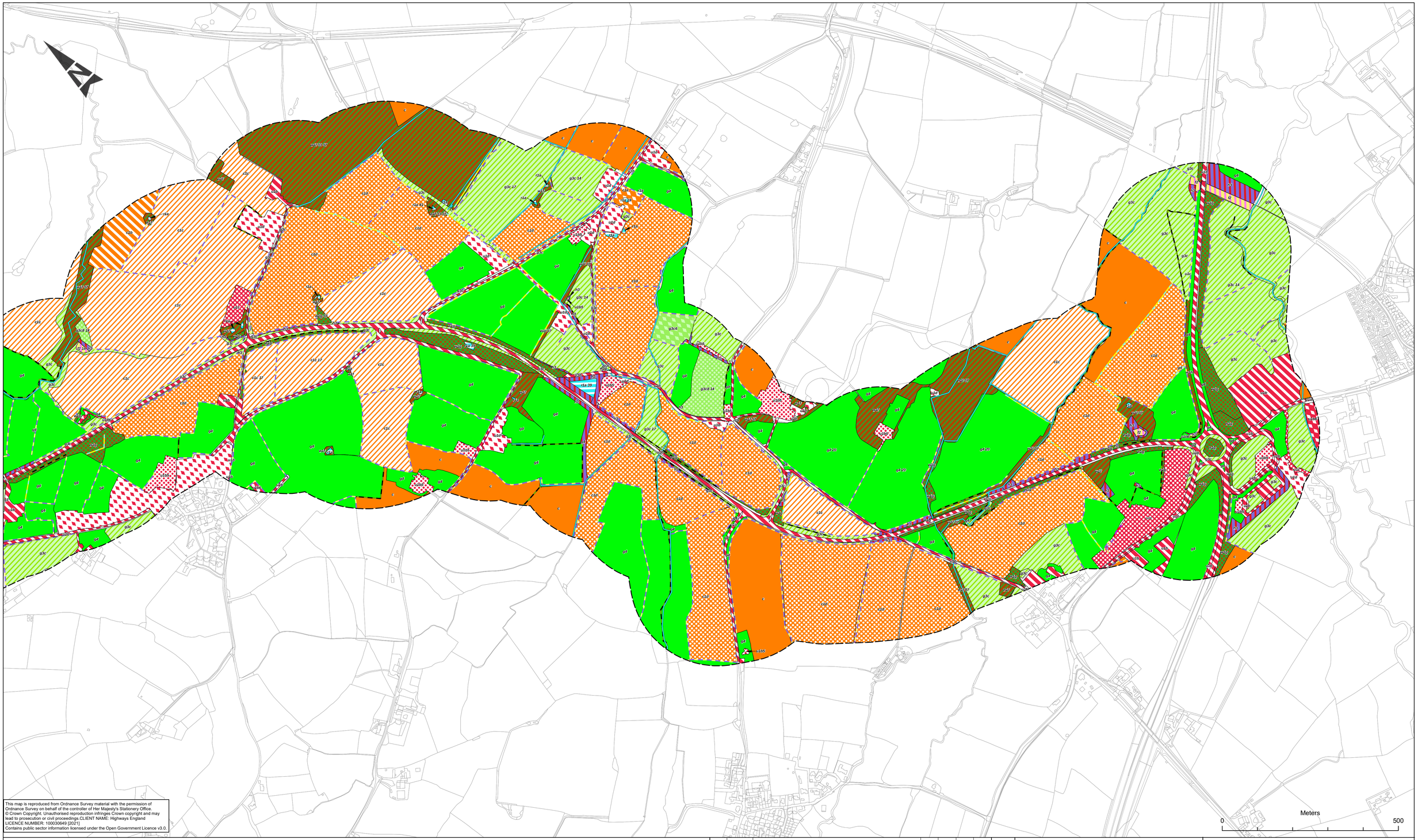

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LEGEND

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(HE P/N | Originator | Volume | Location | Type | Role | Number)

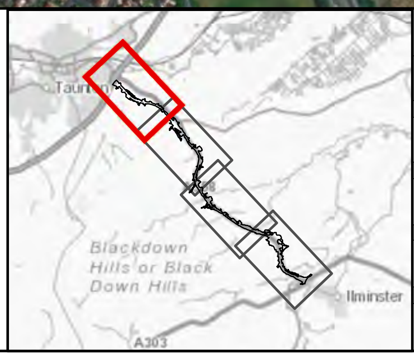
Revision: P02

Appendix B Target notes

B.1 Target notes plan

LEGEND

- TARGET NOTE
- ECOLOGY SURVEY ZONE
- 250 METRE BUFFER OF ECOLOGY SURVEY ZONE



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS (REFERENCE SHALL ALSO BE MADE IN THE DESIGN HAZARD LOG)

CONSTRUCTION
NONE

MAINTENANCE / CLEANING
NONE

USE
NONE

DECOMMISSIONING / DEMOLITION
NONE

Rev.	Date	Description	By	Chk'd	App'd	Auth'd
P02	11/05/22	ISSUE FOR INFORMATION	AC	MA	JS	SV

Suitability	Drawing Status
S2	SUITABLE FOR NFORMATION

Client: national highways

Project Title: A358 TAUNTON TO SOUTHFIELDS DUALLING SCHEME

Drawing Title: TARGET NOTES PLAN SHEET 1 OF 4

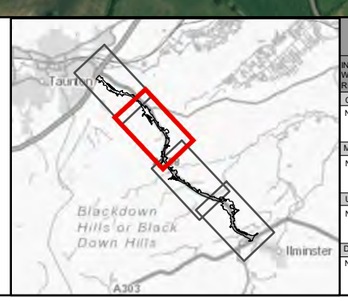
Scale	By	Checked	Approved	Authorised
1:10,000	AC	MA	JS	SV
Original Size	Date	Date	Date	Date
A3	11/05/22	11/05/22	11/05/22	11/05/22

Drawing Number (HE PIN | Originator | Volume | Location | Type | Role | Number): HE551508 - ARP - VES - ZZ - DR - LE - 000249

Revison: P02

LEGEND

- TARGET NOTE
- ECOLOGY SURVEY ZONE
- 250 METRE BUFFER OF ECOLOGY SURVEY ZONE



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS (REFERENCE SHALL ALSO BE MADE IN THE DESIGN HAZARD LOG)

CONSTRUCTION
NONE

MAINTENANCE / CLEANING
NONE

USE
NONE

DECOMMISSIONING / DEMOLITION
NONE

Rev.	Date	Description	By	Chk'd	App'd	Auth'd
P02	11/05/22	ISSUE FOR INFORMATION	AC	MA	JS	SV

Suitability: S2 — Drawing Status: SUITABLE FOR INFORMATION

TAYLOR WOODROW together @ VINCI
ARUP RAMBOLL

Client: national highways

Project Title: A358 TAUNTON TO SOUTHFIELDS DUALLING SCHEME

Drawing Title: TARGET NOTES PLAN SHEET 2 OF 4

Scale	By	Checked	Approved	Authorised
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Original Size	**Date**	**Date**	**Date**	**Date**
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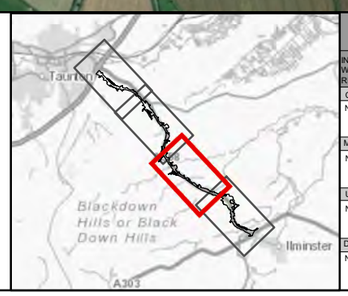
Drawing Number: HE PIN | Originator | Volume | Location | Type | Role | Number
HE551508 - ZZ - ARP - VES - DR - LE - 000250

Revison: P02

LEGEND

- TARGET NOTE
- ECOLOGY SURVEY ZONE
- 250 METRE BUFFER OF ECOLOGY SURVEY ZONE



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS (REFERENCE SHALL ALSO BE MADE IN THE DESIGN HAZARD LOG)

CONSTRUCTION
NONE

MAINTENANCE / CLEANING
NONE

USE
NONE

DECOMMISSIONING / DEMOLITION
NONE

Rev.	Date	Description	By	Chk'd	App'd	Auth'd
P01	11/05/22	ISSUE FOR INFORMATION	AC	MA	JS	SV

Suitability: S2 — Drawing Status: SUITABLE FOR INFORMATION

TAYLOR WOODROW together @ VINCI
ARUP RAMBOLL

Client: national highways

Project Title: A358 TAUNTON TO SOUTHFIELDS DUALLING SCHEME

Drawing Title: TARGET NOTES PLAN SHEET 3 OF 4

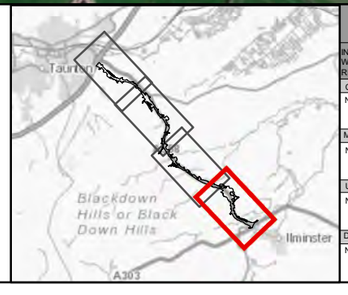
Scale	By	Checked	Approved	Authorised
1:10,000	AC	MA	JS	SV
Original Size	**Date**	**Date**	**Date**	**Date**
A3	11/05/22	11/05/22	11/05/22	11/05/22

Drawing Number: HE551508 - ZZ | Originator: ARP | Volume: VES | Type: DR | Role: LE | Number: 000251

Revison: P01

LEGEND

- TARGET NOTE
- ECOLOGY SURVEY ZONE
- 250 METRE BUFFER OF ECOLOGY SURVEY ZONE



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IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS (REFERENCE SHALL ALSO BE MADE IN THE DESIGN HAZARD LOG)

CONSTRUCTION
NONE

MAINTENANCE / CLEANING
NONE

USE
NONE

DECOMMISSIONING / DEMOLITION
NONE

Rev.	Date	Description	By	Chk'd	App'd	Auth'd
P02	11/05/22	ISSUE FOR INFORMATION	AC	MA	JS	SV

Suitability: S2
Drawing Status: SUITABLE FOR INFORMATION

TAYLOR WOODROW together @ VINCI
ARUP RAMBOLL

Client: national highways

Project Title: A358 TAUNTON TO SOUTHFIELDS DUALLING SCHEME

Drawing Title: TARGET NOTES PLAN SHEET 4 OF 4

Scale	By	Checked	Approved	Authorised
1:10,000	AC	MA	JS	SV

Original Size	Date	Date	Date	Date
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Drawing Number: HE551508 - ZZ - ARP - DR - VES - LE - 000252
(HE P/N | Location | Originator | Volume | Type | Role | Number)

Revison: P02

B.2 Target notes descriptions

Table B-1 Target notes descriptions

Target note number	Date recorded	Description
1	19/05/2021	Himalayan balsam noted in river corridor
2	18/05/2021	Probable main badger sett on edge of scrub and field. At least 5 highly active holes
3	28/04/2021	Dilapidated old outbuildings, full of old debris which indicates some disturbance. Roof open in places and unable to inspect in roof void. No pellets found but need to check roof void for barn owl. More likely to act as roost than nest. Void can be reached with extendable ladders
4	28/04/2021	Potential alien *Vinca major* along back of gardens
5	05/05/2021	Large highly mature oak
6	28/04/2021	Latrine on edge of field
7	18/05/2021	Highly mature, potential veteran London plane in field
8	18/05/2021	Active main sett, minimum 7 entrances, all clear entrances, recently dug, large latrine associated
9	29/04/2021	Badger dung pit
10	30/06/2021	Large stands of monkey flower surrounding field pond
11	28/04/2021	Badger sett 4-5 entrances partly active
12	29/04/2021	Totally hollow oak, veteran, potential ancient
13	20/05/2021	Potential badger sett entrance or otter holt given proximity to stream, view from distance.
14	20/05/2021	Highly mature twin stem aspen on edge of woodland with large cavity with barn owl potential, though possibly in use by jackdaw: 12m high. Requires climbing
15	20/05/2021	Farm outbuildings need barn owl check- possible roost
16	20/05/2021	Highly mature field boundary oak with ivy. Potential large crevice at height with barn owl potential, unable to see if clear behind. Would require climbing, approximately 15m
17	20/05/2021	Probable native black veteran poplar. Requires climbing and assessment
18	20/05/2021	Potential badger sett entrance viewed from distance as dense bramble prevented entrance. Also smelt like badger and mammal paths indicative of badger were present.
19	20/05/2021	Possible veteran oak on field boundary
20	20/05/2021	Huge limb tear out on highly mature beech. Can't see whether cavity has formed from ground level so requires climbing to check barn owl nesting potential. Approximately 9m high
21	20/05/2021	Main badger sett on edge of field and stream. At least 8 active entrances
22	20/05/2021	Potential native black poplar highly mature, possible veteran, allocated adjacent to stream in area poached by cows. (Leaning in photo)
23	28/04/2021	Main badger sett in disused railway line. Active, at least 13 entrances, many with fresh spoil
24	28/04/2021	Potential veteran oak in stream corridor. Displays several indicative veteran features
25	19/04/2021	Single pine tree
26	19/04/2021	Variegated yellow archangel

Target note number	Date recorded	Description
27	18/05/2021	Mature ash tree on the edge of barns. Large hole with barn owl potential requires further investigation. Some whitewash but no pellets seen. Adjacent barns may act as roost. Feature approximately 6-7 m high on sloped ground
28	20/04/2021	Potential tufa spring within woodland adjacent to farm. Lots of algae potentially due to run off from farm, so potentially a good enhancement opportunity to improve the condition. Requires more specialist survey
29	20/04/2021	Mature oak tree with bat roosting suitability - knot holes and cracks
30	18/05/2021	Landowner reported barn owl box in old Dutch barn-says likely unused
31	20/04/2021	Two large ash trees next to each other. Large ivy stems, some bat potential.
32	28/04/2021	Tussocky grassland with adjacent scrub and debris optimal for reptiles. Site manager reports lots of slow worm
33	28/04/2021	Completely hollow fruit tree in school grounds. High bat potential
34	28/04/2021	Good quality grassland, site manager reports high density of slow worm
35	19/05/2021	Partially active outlier badger sett by scrub at top of bank
36	19/05/2021	Probable main badger sett on face of embankment, numerous active holes with large spoil heaps
37	19/05/2021	Ditch with potential for breeding amphibians, abundant aquatic and marginal vegetation
38	19/05/2021	Localised patch of common meadow rue by wet ditch
39	19/05/2021	Three highly mature standard oaks in periodically grazed field
40	19/05/2021	Possible badger sett, active, recently dug, fresh spoil
41	19/05/2021	Disused badger sett minimum 3 sett entrances.
42	18/05/2021	Area of degraded calcareous grassland on hillside. Lady's bedstraw, salad burnet, dwarf thistle, birds foot trefoil, agrimony amongst neutral improved sward resulting from periodic grazing. Ant hills also present towards mature tree line to east
43	20/04/2021	Large oak tree with limited bat roost potential.
44	13/07/2021	Enormous potential veteran poplar, assumed native black poplar. Several other less mature specimens within same stream corridor
45	23/04/2021	Main badger sett. Many holes though many look inactive. Others have evidence of spoil. Some entrances appear to be blocked
46	13/07/2021	Active buzzard nest
47	19/05/2021	Highly mature potential veteran poplar
48	23/06/2021	Numerous grass vetchling in wide arable field margin
49	23/06/2021	9 greater butterfly orchid in neutral grassland on wood end
50	23/06/2021	Numerous greater butterfly orchid within highways verge plantation
51	23/06/2021	Active badger sett, likely to be main. 6 active holes, another 4 partially collapsed entrances no longer in use
52	23/06/2021	Greater butterfly orchid at base of hedgerow near woodland
53	23/06/2021	Nesting buzzard within this area of the woodland left of the path
54	14/07/2021	Sapling wild service tree within area of partially felled woodland
55	23/06/2021	Numerous highly mature oaks views from distance due to access restrictions. All appear to have cracked limbs and other features with potential to support roosting bats or nesting barn owl
56	23/06/2021	Single badger dung pit within dry pond depression at tip of woodland
57	22/04/2021	Small field pond

Target note number	Date recorded	Description
58	28/04/2021	Possible veteran oak approximately 1.5m Diameter at Breast height (DBH)
59	22/04/2021	Mature oak DBH approximately 1m
60	22/04/2021	Badger sett outlier, possibly more holes round the other side. Active with signs of bedding. On the corner of the hedgerow
61	28/04/2021	Rabbit burrow on edge of woodland to north
62	28/04/2021	Badger sett in hedgerow. 1 entrance. Facing west into dry ditch and arable field.
63	28/04/2021	Stinking iris, smaller cluster in between double hedgerow
64	23/04/2021	Potential veteran oak Bat potential DBH 1.5m+
65	23/04/2021	Potential veteran oak old pollard Bat potential DBH 1.5m+
66	28/04/2021	Mature oak tree. <1.5m DBH. ~10m high. Some broken and missing limbs, potential to support roosting bats.
67	28/04/2021	Large Potential veteran oak. DBH >1.5m. Approximately 12m high. Broken limbs and flaky bark have bat roost potential.
68	22/04/2021	Potential veteran oak old pollard DBH 1m + Tag 00468 Barn owl and bat roost potential
69	28/04/2021	Stinking bog iris, small isolated cluster
70	22/04/2021	Potential veteran oak old pollard Bat roost potential POSs on rear side under ivy DBH 1.5m
71	22/04/2021	Mature pollarded willlow, DBH 1m.
72	22/04/2021	Potential veteran oak tree DBH 1.5 m Bat roost potential
73	22/04/2021	Potentially veteran oak. Old pollard rot hole at base DBH 1m
74	22/04/2021	Mature pollarded willlow, DBH 1.2m
75	22/04/2021	Mature pollarded willlow, DBH 1.2m
76	28/04/2021	Mature oak 1.2m DBH
77	28/04/2021	Mature oak tree 1.2m DBH
78	28/04/2021	Mature oak approximately 1m DBH
79	28/04/2021	Mature oak tree 1.2m DBH
80	22/04/2021	4 fruit trees
81	29/04/2021	Houses and outbuildings may have bat roost potential.
82	29/04/2021	Mature horse chestnut in horse grazed field. May have bat roost potential. Assessed from edge of field.
83	04/05/2021	Woodpecker cavity in trunk of willow. Adjacent to small area of inaccessible woodland with a handful if indicator species - dogs mercury and ramsons
84	04/05/2021	Large cavity, approximately 2m above ground. Suitable for nesting owl
85	29/04/2021	Soil and agricultural cutting. Suitable as reptile hibernacula. On track between stream and fields.
86	29/04/2021	Mature oak with flaky bark and missing limbs. Bat roost potential. On dry ditch boundary between fields.

Target note number	Date recorded	Description
87	29/04/2021	Small clusters of early purple orchid
88	29/04/2021	Several mature oaks in hedgerow. All have bat roost potential - wood peck holes, missing limbs, flaky bark
89	29/04/2021	4 large mature oaks trees in centre of field. Maybe >1.5m dustmen. Approximately 12m high. May have bat roost potential.
90	29/04/2021	Mature oak trees within hedgerow. Potential to support roosting bats.
91	29/04/2021	Large mature oak. Likely veteran. DBH >1.5m height approx. 12m. Rookery in tree. Some potential bat roost features present.
92	29/04/2021	Mature oak, potentially veteran. DBH >1.5m, height ~12m.
93	29/04/2021	Logs pills and garden debris. Suitable for reptile refugia.
94	29/04/2021	Large mature oak in garden. Potentially veteran. Trunk is greater than 1.5m DBH and height is approx. 15m high. Bat roost potential. Several other large mature oaks and horse chestnuts within same garden.
95	29/04/2021	2 mature oak, potentially veteran. DBH >1.5m, height ~12m.
96	29/04/2021	Potential veteran cypress tree. Approx. 18m high and DBH > 3m
97	29/04/2021	Potential veteran cypress tree. Approx. 18m high and DBH > 5m.
98	29/04/2021	Three potential veteran cypress trees. Approx. 18m high and DBH > 5m.
99	14/04/2021	Badger latrine- at least 7 dung pits.
100	13/04/2021	Large latrine site with 10 full holes
101	13/04/2021	Fresh dung pit in woodland
102	09/04/2021	Winter heliotrope on road verge, both sides leading into Ashill
103	09/04/2021	Well used fresh badger latrine on edge of small copse
104	09/04/2021	Well used latrine in field corner
105	29/04/2021	Invasive variegated yellow archangel in verge
106	21/04/2021	mature oak in field. No features noted for bats or barn owl
107	18/08/2021	Dormouse wild nest in hedgerow
108	21/04/2021	Collection of old farm buildings require investigation for barn owl, no internal inspection at time of survey
109	21/04/2021	Highly mature ash in field. No large cavities seen but requires further investigation for barn owl as horses limiting access to field
110	21/04/2021	Potential veteran oak in field boundary
111	09/04/2021	Patch of roadside invasive winter heliotrope, approximately 30m long
112	21/04/2021	Highly mature ash in field requires further investigation for barn owl. Limited access due to horses at time of survey
113	21/04/2021	Several stems of multistem semi mature willow with cavities running straight up into hollow trunk. Requires further investigation for bats. Could be endoscoped from ground level
114	28/04/2021	Small stand of immature Japanese knotweed along waterbody in woodland. Approximately 15 m in length. Winter heliotrope also present
115	28/04/2021	Set of farm buildings require further investigation for barn owl
116	28/04/2021	Large torn out limb of highly mature oak on edge of wood. Can't see if cavity behind for barn owl, needs ladder from adjacent field. Feature approximately 5m high. Some whitewash beneath
117	28/04/2021	Landowner reports regularly seeing young barn owls sat on fence posts at edge of property many years ago, indicating historic nest site in close proximity

Target note number	Date recorded	Description
118	08/06/2021	Small orchard with long sward grassland, type 1 barn owl foraging habitat
119	08/06/2021	Type 2 barn owl foraging habitat
120	08/06/2021	Rank grassland type 1 barn owl foraging
121	19/05/2021	Whirled caraway
122	08/06/2021	Number of grass vetchling in corner of hay field
123	21/04/2021	Large mature standard oak. No cavities large enough for barn owl but lots of broken limbs and woodpecker holes suitable for bats
124	19/05/2021	Great spotted woodpecker nesting in old oak tree.
125	08/06/2021	Large field of type 2 grassland for barn owl foraging. Horse grazed in part but largely messy with marshy section
126	21/04/2021	Huge mature oak in field edge, possibly veteran. Looks to be ornamental possibly turkey. No cavities for barn owl but lots of knot holes and woodpecker holes for bats
127	22/04/2021	Rookery
128	22/04/2021	Potential veteran tree
129	22/04/2021	Potential veteran oak tree
130	21/04/2021	Fresh latrine site along highway boundary in field margin
131	22/04/2021	Potential veteran tree
132	22/04/2021	Potential veteran tree with opening at 2m will need reviewing as superficially suitable for barn owl. Likely jackdaw occupied but reachable with extendable ladders
133	22/04/2021	Potential veteran tree with several torn of limbs. Recommend scoping for barn owl but likely jackdaw occupied
134	22/04/2021	Feature occupied by jackdaw but superficially suitable for barn owl, scope in
135	22/04/2021	Potential water vole footprint with bank side vegetation
136	22/04/2021	Probable signal crayfish burrows
137	22/04/2021	Multiple spraints on edge of weir sill in woodland block. At least ten spraints of various ages
138	22/04/2021	Otter slide into watercourse
139	22/04/2021	Potential veteran horse chestnut with numerous snapped limbs leading to large cavities, superficially suitable for barn owl from ground level. All appear occupied by jackdaw at time of survey with several noted flying out and piled twigs in some entrances. Features at heights from 4 to 10 m
140	22/04/2021	Damaged oak tree with several potential features for barn owl. Several cracked limbs with degraded pellets of varying ages at base
141	08/04/2021	Fresh otter spraint on shingle bank. Frequent sprain ring spot
142	08/06/2021	Himalayan balsam along stream side at bridge, few isolated stands
143	08/04/2021	Large mammal hole in watercourse bank at base of mature elder. In amongst rubble with minimal spoil. Possible badger but few other signs, requires further investigation for otter
144	08/04/2021	Highly mature ash with rot. 2 knot holes require further investigation for bats and barn owl, look hollow inside from ground level
145	22/04/2021	Large standing ash in highways boundary
146	08/04/2021	Remains of old spraints on alder roots
147	05/05/2021	A handful of mature trees along watercourse - alder, ash, oak.

Target note number	Date recorded	Description
148	22/04/2021	Multiple spraints on streamside rock
149	22/04/2021	Potential veteran oak on edge of wooded river corridor. Difficult to see from ground level but potential cavity in neck of trunk split. Investigate for Barn owl. Reachable with extendable ladders
150	05/05/2021	Woody indicator species on fringe of hedgerow - bluebell and dogs mercury
151	21/04/2021	Active buzzard nest in woodland block
152	08/04/2021	Old dormouse nest tubes left up in wood, assumed from historical survey
153	08/04/2021	Dilapidated old farm outhouse. Requires further investigation for barn owl and bat. Could only view from one side so number of usable entrances and interior structure unclear
154	08/04/2021	Dead badger in plantation woodland.
155	08/06/2021	Invasive Japanese rose identified within scrubby planting area on embankment

Appendix C Tufa survey report

VEGETATION SURVEY & ASSESSMENT

A358 TAUNTON TO SOUTHFIELDS DUALLING

ASSESSMENT OF TUFACEOUS FORMATION AT ASHE FARM

March 2022

CONTENTS

Sharon Pilkington BSc (Hons) MSc CEnv MCIEEM
Botanist – Bryologist – Vegetation Ecologist

Vegetation Survey & Assessment Ltd
66 Newtown
Westbury
Wiltshire
BA13 3EF

Tel: 01373 827074
Mob: 07801 627449
www.vegetationsurvey.co.uk

1. INTRODUCTION

1.1 Scope of Work and Objectives

This report is the product of a contract to confirm and characterise a tufaceous formation at Ashe Farm, near Taunton, and to identify opportunities to improve its ecological functioning to help offset ecological impacts elsewhere as a result of the A358 Taunton to Southfields dualling scheme.

1.2 Conservation Context

Under the EC Habitats Directive (92/43/EEC), tufaceous formations which qualify as the Annex I habitat *H7220 Petrifying springs with tufa formation (Cratoneurion)* are defined as 'hard water springs with active formation of tufa'. These formations are found in such diverse environments as woodlands or open countryside. They are generally small (point or linear formations) and dominated by the pleurocarpous moss *Palustriella commutata*.

In the UK, the vegetation of such springs conforms to the National Vegetation Classification (NVC) types M37 *Palustriella commutata - Festuca rubra* spring community and M38 *Palustriella commutata - Carex nigra* spring community. As the M38 *Palustriella commutata - Carex nigra* spring community is confined to the uplands and is characteristic of montane springs in the northern Pennines and the central Scottish Highlands (Rodwell 1991), it is not considered relevant to the current assessment.

The most extensive and/or best developed examples of the M37 *Palustriella commutata - Festuca rubra* spring community also tend to be found in upland districts. The majority of sites which have been selected as Special Areas of Conservation because of the presence of *H7220 Petrifying springs with tufa formation (Cratoneurion)* are in upland, lime-rich parts of northern England, Wales and Scotland. Tufaceous springs represented by the M37 *Palustriella commutata - Festuca rubra* spring community also occur locally in southern England and other lowland areas, but such examples are poorly represented in the literature and further study is needed to characterise them properly.

In the lowlands, the M37 *Palustriella commutata - Festuca rubra* spring community is also usually dominated by *Palustriella commutata,* although under certain circumstances *Cratoneuron filicinum* may wholly or partially replace it. Other associates vary greatly but often include *Festuca rubra* (Red Fescue), *Agrostis stolonifera* (Creeping Bent) and the bryophytes *Bryum pseudotriquetrum*, *Didymodon tophaceus* and *Pellia endiviifolia*.

Tufa formation is usually, but not exclusively, associated with hard-water springs, where lime-rich groundwater comes to the surface. On contact with the air, carbon dioxide is lost from the water and a hard deposit of calcium carbonate is formed. These conditions occur most often in areas underlaid by limestone or other calcareous rocks, and particularly in the uplands of northern England and the Scottish Highlands.

There is no standard classification for the freshwater carbonate deposits known as tufa. Pentecost (1981) describes tufa as a soft, porous, calcareous rock formed in springs, waterfalls and lakes in limestone regions and Pedley (1990) describes it as a highly porous or "spongy" freshwater carbonate rich in microphytic and macrophytic growths, leaves and woody tissue. A number of different kinds of tufa deposit have been classified (Table 1). An alternative term, travertine, is generally used to describe older, well lithified and often laminated deposits and is not considered applicable to the features assessed in the current work.

Table 1. Geomorphological classification of tufa formation types (from Lyons and Kelly, 2016)

Category	Description
Cascade	Developing on steep slopes at varying distances from the water source; characterised by massive, frequently complex build-ups
Dam	Similar to cascades but forming along streams and rivers and causing the impoundment of water behind a tufa crest
Stream crust	Sheet-like deposits forming in streams of intermediate to low gradient; these may merge with cascades
Paludal	Formed in low gradient mires where tufa accumulates around the bases of plants, often surrounded by carbonate muds
Cemented rudites	Gravels etc. cemented by tufa; often found on coasts where spring water seeps onto shingle banks
Oncoids/ooids	Unattached, coated grains (<1mm up to 30cm); the cortex may consist of biotic or abiotic particles, such as stones or plant fragments

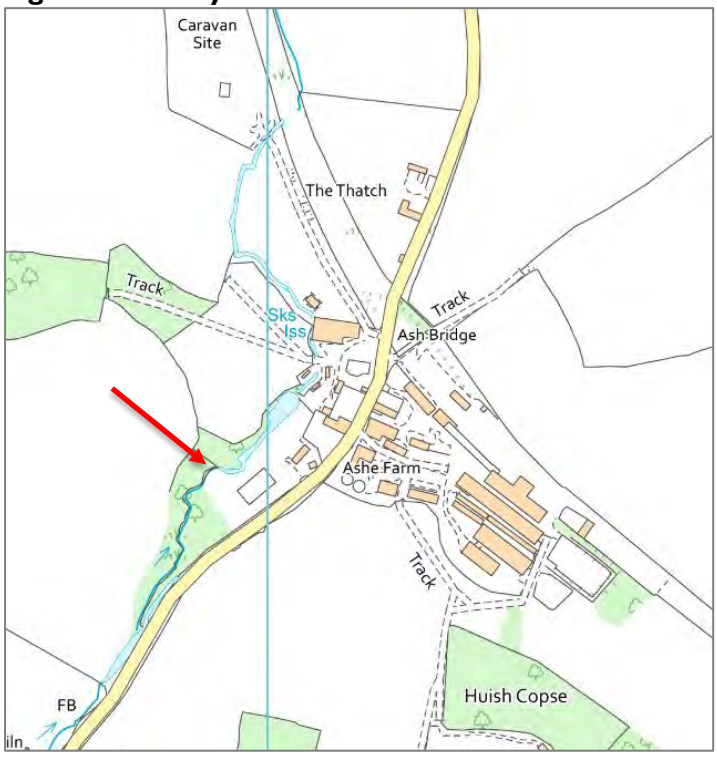
As well as being a rare kind of habitat, *H7220 Petrifying springs with tufa formation (Cratoneurion)* are vulnerable to loss and change because they are:

- often small - many examples are only a few square metres in extent;
- isolated and vulnerable to changes in management;
- sensitive to abstraction or interruption of groundwater – which can cause dewatering and loss of characteristic and rare species;
- low nutrient habitats - nutrient enrichment from surface water, groundwater and/or atmospheric pollution is associated with a decrease in species richness and loss of rare species.

2. METHODOLOGY

A spring-fed stream where a potential tufa formation had been provisionally identified in earlier surveys associated with the road scheme was visited on 1st March 2022 (Figure 1). The stream is at Ashe Farm, approximately 500m south-west of the A358 at Mattock's Tree Green at Ordnance Survey National Grid Reference ST279223. It was visited in dry weather by Sharon Pilkington, a professional botanist, bryologist and vegetation ecologist (Vegetation Survey & Assessment Ltd). Jacob Haddon, an ecologist working for Arup, was also present.

Figure 1. Survey location



There is no standard methodology applicable to the ecological assessment of tufaceous formations. In this case, once the potential formation had been found and confirmed, a subjective assessment was undertaken to classify the geomorphology of the tufa (Table 1) and to describe its broad character and vegetation. Photographs were also taken to highlight particular features.

When it became clear that that the tufa formation was not confined to a single part of the streambed, the assessment was extended up and down-stream (where accessible) to include other tufa deposits.

Although formal NVC sampling was not undertaken, where possible vegetation was provisionally assigned to plant communities as described by Rodwell (1991) on the basis of the higher and lower plant species present. Botanical nomenclature used in this report follows Stace (2019) for vascular plants and Blockeel et al. (2021) for bryophytes.

Any realistic opportunities to enhance the ecological functioning of the tufa formation and its associated ecological features (including scrub, trees and pools) were identified during the assessment.

3. DESCRIPTION OF TUFA FORMATION

An extensive and highly varied tufaceous formation was found to extend almost continuously along the stream bed for at least 250 metres. Its lower limit was marked with a hand-held GPS unit[1] at ST2800722414; the upper at ST2787922219. The surveyors did not venture upstream of this point because of uncertainties about land ownership.

Tufaceous dams, stream crusts, cascades and oncoids/ooids are all present in the stream-bed, which meanders through a shallow wooded combe.

Plate 1 shows a well-developed tufa dam at ST2796622386. This feature is approximately 2m thick, 3-4m wide and forms a rim 10m long aligned north-south across the stream bed, creating a deep pool immediately behind it. A few *Fraxinus excelsior* (Ash) and *Salix cinerea* (Grey Willow) trees are rooted in the dam and there are stream crusts and loose banks of oncoids/ooids (Plate 2) below the dam for approximately 20m. Below that point there are a few more small pools interspersed with small tufa cascades and crusts until the stream opens out into a shallow, ponded section below the wood.

Upstream of the dam and its pool, the streambed also has numerous tufa crusts and loose oncoidal/ooidal deposits.

Plate 1. Tufa dam at ST2796622386

[1] Garmin model GPSMAP 64S

Plate 2. Stream crusts and deposits of oncoids and ooids below the dam at ST2796622386

These tufa formations have sparse vegetation cover characterised by frequent patches of the moss *Cratoneuron filicinum*, with occasional *Brachythecium rivulare*, *Plagiomnium undulatum*, *Didymodon tophaceus* and the thallose liverwort *Pellia endiviifolia*. The absence of the characteristic tufa-forming moss *Palustriella commutata* suggests that the stream flow varies greatly and is likely to leave parts of the streambed dry at times.

Vascular plant associates are also scarce and mainly comprise scattered plants of *Oenanthe crocata* (Hemlock Water-dropwort) and tussocks of *Carex pendula* (Pendulous Sedge). *Mentha aquatica* (Water Mint) and *Apium nodiflorum* (Fool's Water-cress) are also present in the stream but are rare in the tufa.

Willows and other trees and shrubs in and around the tufa dam (and elsewhere in the stream) support diverse communities of common epiphytic bryophytes indicating low levels of airborne sulphur dioxide and relatively high humidity. Frequent species include the mosses *Pulvigera lyellii*, *Orthotrichum pulchellum* and *Cryphaea heteromalla* and the liverworts *Radula complanata*, *Myriocoleopsis minutissima* and *Metzgeria violacea*.

On the slopes of the combe Ash-Field Maple-Dog's Mercury woodland (W8 in the NVC) is the dominant vegetation. A canopy of *Fraxinus excelsior* tops a tangled shrub understorey with abundant *Hedera helix* (Common Ivy) and *Mercurialis perennis* (Dog's Mercury) on the ground. Going upstream the combe becomes shallower and sprawling *Salix* x *fragilis* agg. (Hybrid Crack-willow) and *C. avellana* are prominent.

At ST2772722315 there is a massive stream crust covered by oncoidal/ooidal sediment (Plate 3). The crust creates a tufa platform approximately 15m x 8m and 1-2m thick, with water flowing over a low

cascade at its downstream edge. Various trees grow out of the crust, but other than *Pellia endiviifolia*, herbs, sedges and bryophytes are rare.

Above this crust, the stream diminishes and passes through dense, scrubby vegetation with abundant *Carex pendula*. The only tufa features present are low stream crusts and more oncoids/ooids.

Plate 3. Thick stream crust at ST2772722315 (photograph taken standing on its surface and looking upstream)

4. DISCUSSION

The stream at Ashe Farm supports a very good example of a varied and extensive lowland tufaceous formation. Its calcium carbonate-saturated water rises in a spring a short distance away, at Lime Kiln Farm where interbedded mudstone and limestone of the Blue Lias Formation and/or Westbury Formation and Cotham Member probably meet the impermeable mudstone of the Blue Anchor Formation.

Wherever they occur, tufa formations are highly unusual and ecologically important features, but their value is rarely recognised, especially in southern England where they are often small and hidden from view. As well as their geological interest, they offer habitat for a suite of species of restricted habitat fidelity, including bryophytes and invertebrates.

It is questionable whether the tufa formation in the stream at Ashe Farm could be confidently classified as any NVC community as its vegetation is poorly developed. While the tufa dam and nearby stream crusts support some bryophyte species indicative of the M37 *Palustriella commutata - Festuca rubra* spring community (*Cratoneuron filicinum, Didymodon tophaceus, Pellia endiviifolia*), it is not a straightforward example of this community and therefore should not be unequivocally regarded as the Annex I habitat *H7220 Petrifying springs with tufa formation (Cratoneurion).*

5. OPPORTUNITIES FOR ENHANCEMENT

The varied form and extent of the tufa formation at Ashe farm is likely to be an integral part of the complex of habitat types in the wooded combe and to make a significant contribution to its ecological functioning and biodiversity. Key to this is the secluded nature and lack of management intervention along the stream and therefore little enhancement is considered possible.

One small enhancement could be made to the tufa dam at ST2796622386, however. Where the dam meets the southern bank of the stream (Plate 4) it is drier than the rest of it and has been invaded by *Rubus fruticosus* agg. The dam would benefit from cutting back of this scrub to the ground.

No other enhancements are considered necessary or desirable to improve the ecological functioning of the tufa formations anywhere else in the stream.

Plate 4. Bramble on south side of tufa dam (arrowed)

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