Gavray Drive, Bicester

Appendix 5.1 Ecological Baseline Report

Prepared by:
The Environmental Dimension Partnership Ltd

On behalf of:
L&Q Estates

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Executive Summary

S1 This Ecological Baseline Report has been prepared by The Environmental Dimension Partnership Ltd (EDP). It sets out the technical detail that has informed both the design of, and the impact assessment of, development proposals on 22.7ha of land north of Gavray Drive, Bicester, Oxfordshire (the 'Application Site'). This report has been prepared on behalf of the landowners of the Application Site, namely: L&Q Estates ('the Applicant'); Charles Brown & Simon Digby; and London & Metropolitan International Developments.

S2 Baseline data has been collected from the Application Site since 2002 and has been presented in two previous Environmental Impact Assessments (EIAs), in 2004 and 2013. EDP has gathered updated information from the Application Site from 2019 to 2021. This report primarily presents the update survey data from 2019 onwards, but also provides summaries of historic data where relevant to provide a more complete description of the baseline conditions present within the Application Site, to inform the Ecological Impact Assessment (EcIA).

S3 The updated investigations have comprised a desk study, Extended Phase 1 Habitat Survey and a suite of additional Phase 2 Surveys including detailed botanical surveys of the hedgerows and grasslands and surveys for wintering and breeding birds, roosting and foraging bats, otter, water vole, dormouse, harvest mouse, badger, great crested newt (GCN), reptiles, and terrestrial and aquatic invertebrates.

S4 There are no internationally designated sites within 15km of the Application Site and no nationally designated sites within 5km. However, Wendlebury Meads and Mansmoor Closes Site of Special Scientific Interest (SSSI) and Ormoor SSSI lie 5.4 and 7.3km away, respectively, and within the potential Zone of Influence of the Application Site being connected downstream of the Langford Brook. Gavray Meadows Local Wildlife Site (LWS) and Ray Conservation Target Area (CTA) cover significant portions of the Application Site east of Langford Brook.

S5 The Application Site is divided by Langford Brook. Land to the west of the brook comprises two arable fields of very limited value except for some margins which support uncommon arable weed species. Land to the east of the brook predominantly comprises fields of species-rich grassland ranging from Local to County importance, with discrete areas of locally valuable marshy grassland present, often associated with ponds.

S6 The majority of the high value grassland areas have been left unmanaged for at least 15 years, which has allowed significant encroachment of scrub and tall herb communities, resulting in an overall reduction in both their quantity and quality. Similarly, many former hedgerows have developed into broad bands of scrub and young woodland.

S7 A wide range of protected/notable species have been confirmed or assumed to be present within the Application Site, the most notable of which is the invertebrate assemblage. The full suite of Important Ecological Features (IEFs), which has been

identified for the purposes of assessing potentially significant effects within the formal EcIA, is listed in **Table EDP S1**.

Table EDP S1: Important Ecological Features Identified Within the Application Site

IEF	Summary	Level of Ecological Importance
Statutory Sites		
Wendlebury Meads and Mansmoor Closes (SSSI)	Downstream of Langford Brook – traditionally-managed unimproved neutral meadows supporting a complex variety of plant communities that have developed in response to varying management, drainage and soils.	National
Otmoor SSSI	Downstream of Langford Brook – an area of wetland flooded in winter and traditionally managed as rough grazing marsh. Contains a wide range of habitats with many species of nationally uncommon plants and animals. Approximately half of the site is herb-rich damp grassland which grades into wet sedge and coarse grassland.	National
Non-statutory Sites		
Gavray Drive Meadows LWS	A mosaic of small damp fields with ponds, divided by thick hedges with old trees.	County
Ray CTA	Situated along the alluvial floodplain of the River Ray extending along many small tributary streams and including some areas of land between these streams. Wet grassland – floodplain grazing marsh and lowland meadow and ridge and furrow are noted.	County
Habitats		
Unimproved and Species-rich Semi-improved Neutral Grassland	Small areas within F3, F7, F11 and F12. Showing examples of NVC communities MG1b, MG1c, MG4, MG6b and MG5c	County
Semi-improved Neutral Grassland	Discrete areas within F4, F5, F6, F8, F9, including poorer examples of NVC communities MG6b and MG9a.	Local
Marshy Grassland and Swamp	Discrete areas within Fields F1, F2, F3, F8, F9 and F10, including examples of NVC communities MG9a, MG10b, M23b and S7.	Local–County
Broad-leaved Semi-natural Woodland	In many patches across the Application Site. Mostly developed from mature dense scrub and also incorporates mature standards.	Local
Veteran and Mature Trees	Several veteran and mature trees across the Application Site.	Local
Hedgerows	Many former hedgerows have expanded out into the adjacent fields to form large blocks of dense scrub. Twelve discernible hedgerows are currently present, two of which qualify as 'Important' under the Hedgerows Regulations	Local

IEF	Summary	Level of Ecological Importance
Ponds	Several ponds across the site, most of which are currently in poor condition, being silted and overshaded and subject to regular drying.	Local
Water-course	Langford Brook runs through the centre of the Application Site and forms a wildlife corridor.	Local
Species		
Arable weeds	Associated with the margins in Fields F13 and F14.	Local
Wintering Bird Assemblage	No species recorded that are considered to be of significant ecological value but a good diversity and abundance of species recorded.	Local
Breeding Bird Assemblage	The majority of species associated with the woodland, hedgerows, and scrub; the limited size of other habitats, such as wetland habitats, reduces the potential for large populations of habitat specialists.	Local
Barn Owl	Potential nesting or roosting in mature trees but not recorded recently.	Less than Local
Bat Assemblage	Potential (unconfirmed) roosting in mature trees and a moderate assemblage of predominantly of common and widespread species using the site for foraging and commuting.	Local
Otter	Langford Brook likely forms part of a wider otter territory.	Local
Water Vole	Potential very small population present on Langford Brook.	Less than Local
Badger	No setts or other signs detected during surveys but report of badgers received during EIA scoping and presence assumed on a precautionary basis.	Less than Local
Amphibian Assemblage	Assemblage includes a medium sized metapopulation of great crested newts breeding in ponds within and adjacent to the Application Site, and using rough grass and scrub habitats in their terrestrial phase.	Local–County
Reptiles	A large population of common lizard and a small population of grass snake, supported by the mosaic of rough grass, tall herb and scrub habitats.	Local–County
Invertebrate Assemblage	A very diverse assemblage of invertebrates supported by the mosaic of species-rich grassland, scrub, hedgerow, woodland and aquatic habitats.	Regional

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Section 1
Introduction, Purpose and Context

1.1 This Ecological Baseline Report has been prepared by The Environmental Dimension Partnership Ltd (EDP). It sets out the technical detail which has informed both the design, and the impact assessment of development proposals on 22.7ha of land north of Gavray Drive, Bicester, Oxfordshire (the 'Application Site'). This report has been prepared on behalf of the landowners of the Application Site, namely: L&Q Estates ('the Applicant'); Charles Brown & Simon Digby; and London & Metropolitan International Developments.

1.2 EDP is an independent environmental planning consultancy with offices in Cirencester, Cheltenham and Cardiff. The practice provides advice to private and public sector clients throughout the UK in the fields of landscape, ecology, archaeology, cultural heritage, arboriculture, rights of way and masterplanning. Details of the practice can be obtained at our website (www.edp-uk.co.uk).

Site Context

1.3 The Application Site is centred approximately at Ordnance Survey Grid Reference (OSGR) SP 597 222. The Local Planning Authority (LPA) is Cherwell District Council (CDC). The location and extents of the Application Site is described in the material supporting the planning application, particularly the Design and Access Statement (DAS). The Planning Application Boundary measures 22.71 hectares (ha) and lies immediately to the east of Bicester, Cherwell district, north-east Oxfordshire.

1.4 The Application Site is located in the south-eastern quarter of Bicester. It is bounded by Gavray Drive to the south, beyond which lies the residential area of Langford Village; the Birmingham to Marylebone rail line (Chiltern Line) to the north; the Oxford to Bletchley rail line to the west (East-West Rail); and Bicester's eastern bypass to the east (Charbridge Lane, A4421). North of the site is Bicester Distribution Park, which provides a large footprint of B8 distribution units. Bicester town centre is located approximately 1.3km to the west of the site offering a full range of retail, commercial, employment and residential uses.

1.5 The Application Site comprises two arable field parcels to the west and several parcels of semi-improved neutral grassland with areas of dense continuous scrub and broadleaved semi-natural woodland and several ponds to the east. The east and west portions of the Application Site are separated by Langford Brook. The principal ecological features within the Application Site (identified through site survey) are illustrated on **Plan EDP 1** – *Extended Phase 1 Habitat Plan.*

Development Proposals

1.6 It is proposed to submit an Outline Planning Application (OPA) for the development (the 'Proposed Development'). Outline planning approval is sought with detailed design of the proposed highway access points also being submitted for approval. All other matters are reserved at this time.

1.7 The formal Description of Development is:

"*Residential development for up to 250 dwellings including affordable housing and ancillary uses including retained Local Wildlife Site, public open space, play areas, localised land remodelling, compensatory flood storage, structural planting and access*."

Scope of Baseline

1.8 Baseline data has been collected from the Application Site since 2002 and has been summarised for two previous Environmental Impact Assessments (EIAs), in 2004 and 2013. EDP has gathered updated information from the Application Site during 2019 to 2021. This report primarily presents the update survey data from 2019 onwards, but also provides summaries of historic data where relevant to provide a more complete description of the baseline conditions present within the Application Site, to inform the Ecological Impact Assessment (EcIA).

1.9 The remainder of this report is structured as follows:

- **Section 2** summarises the methodology employed in determining the baseline ecological conditions (with further details provided within appendices and on plans where appropriate);

- **Section 3** summarises the baseline ecological conditions (with further details also provided within Appendices and on Plans where appropriate) and identifies and evaluates any Important Ecological Features (IEFs); and

- **Section 4** summarises the IEFs that are relevant to the EIA of the proposed development.

Section 2
Methodology (Baseline Investigations)

2.1 This section summarises the methodologies employed in determining the baseline ecological conditions within and around the Application Site. The surveys have been undertaken by appropriately experienced and qualified ecologists using relevant best practice methodologies wherever possible. Full details of the techniques and process adopted are, where appropriate, provided within appendices and on plans to the rear of this report.

Desk Study

2.2 The desk study is an important element of undertaking an initial ecological baseline investigation of a site proposed for development, enabling the initial collation and review of contextual information, such as designated sites, together with known records of protected and priority species.

2.3 A desk study was originally completed in 2010 and updated in 2013. The most recent update desk study was undertaken in September 2020. Full details of the approach taken are provided in **Annex EDP 1**.

Consultation

2.4 During the preparation of the planning application to which this report applies, an extensive consultation process has been completed in respect of ecology and biodiversity. This process included the following:

- Correspondence with relevant ecological and wildlife organisations, seeking comments/agreement regarding the scope of the updated baseline survey work, in April 2020;
- Pre-application correspondence and meetings with CDC's Ecology Officer (held virtually due to Covid-19) in July and August 2020;
- Formal EIA scoping in respect of ecology and nature conservation in September 2020; and
- Consultation meetings with local ecological stakeholders and interest groups (held virtually due to Covid-19) in October 2020, December 2020 and February 2021.

2.5 Further details of the correspondence and meetings summarised above are provided in **Annex EDP 2**.

Habitat Surveys

2.6 A number of Phase 1 and Phase 2 habitat surveys were completed at the Application Site between 2002 and 2013. The following surveys were completed during 2019 and 2020 to establish the current type and condition of the habitats present within the Application Site:

- Extended Phase 1 habitat survey and detailed botanical survey of grassland (August 2019);
- Hedgerow survey (May 2020);
- Additional detailed botanical survey of grassland (June 2020); and
- River Corridor Survey of Langford Brook (December 2020).

2.7 Full details of the methodologies employed during these habitat surveys are provided within **Annex EDP 3**.

Detailed Faunal Surveys

2.8 The scope of Phase 2 surveys undertaken at the Application Site was defined based on the substantial quantity of existing/historical survey data and desk study records, and in consultation with a range of relevant ecological stakeholders as described above. The surveys 'scoped in' are summarised in turn below and a brief explanation of those potential surveys 'scoped out' is provided thereafter.

Wintering Birds Survey

2.9 Winter bird activity surveys were undertaken in winter 2013/14 when six survey visits were carried out, between October and March. Due to the lack of nearby wetland sites and the results of the surveys in 2013/14, a reduced scope was considered sufficient to update the baseline.

2.10 Four survey visits were undertaken, between December 2019 and March 2020. These surveys were based on an adapted survey methodology, with reference to Wetland Bird Survey (WeBS) and Common Bird Census (CBC) methodologies. This involved walking to within 100m of each point of the site and recording any relevant activity. Full details can be found in **Annex EDP 4**.

Breeding Bird Survey

2.11 The desk study returned records of 29 birds of conservation concern (BoCC)[1] species within the Application Site (**Annex EDP 5**) and a total of 64 BoCC species within 2km of it. The habitats present within the Application Site were also considered capable of supporting an assemblage of breeding birds including species of conservation concern, especially ground nesting birds such as skylark (*Alauda arvensis*) and lapwing (*Vanellus vanellus*).

2.12 A full breeding bird survey was undertaken in May and June 2013 and updated in April, May and June 2020 by an experienced ornithologist with reference to standard Common Bird Census 'territory mapping' methodology[2] to assess the breeding birds present on the Application Site. Three survey visits were undertaken which involved walking to within 50m of all points within the site and recording breeding activity of any species sighted, particularly those listed on the Birds of Conservation Concern Amber and Red lists[3].

Barn Owl

2.13 Barn owl had been recorded within the Application Site incidentally during previous surveys. Therefore, a check for evidence of breeding or roosting barn owls was combined with the bat tree roost inspection.

Breeding Nightingale Survey

2.14 A single male nightingale was recorded singing from scrub within the site in spring 2016 during a site visit. Specific surveys were then undertaken in order to determine whether the male had successfully paired and bred. Although it was found that the male did not pair, given the ongoing lack of management within the site and the encroachment of scrub into the grassland habitats, it was considered appropriate to update the surveys in Spring 2020.

2.15 The updated nightingale survey included four nocturnal, targeted visits during April, May and June 2020, recording all nightingale activity.

2.16 Full details and results of all breeding bird surveys can be found in **Annex EDP 5**.

<u>Limitations</u>

2.17 All breeding bird surveys were undertaken during optimal conditions at what is considered to be an optimal time of year and so are not seasonally constrained.

[1] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–74.

[2] British Trust for Ornithology. Common Bird Census. www.bto.org.

[3] Eaton, M.A., Aebischer, N.J., Brown, A.F., Hearn, R..D., Lock, L.., Musgrove, A.J., Noble, D.G., Stroud, D.A. and Gregory, R..D. (2015). Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man. British Birds, Vol. 108, 708-746.

Bat Surveys

Preliminary Tree Roost Assessment

2.18 In 2013, the Application Site was found to contain 29 trees that were identified as being potentially suitable for roosting bats. As such, to determine the potential impacts of the Proposed Development on bats potentially roosting within trees, all trees within the Application Site were subjected to an update ground-level visual assessment in April 2020 by a suitably experienced ecologist. Full details of the survey are given in **Annex EDP 6**.

Limitations

2.19 Visual assessments for roosting bats can be undertaken at any time of year and these assessments were not limited by season or weather.

2.20 During the roost overview survey, the trees were searched from ground level, not using climbing equipment. Some features on the trees may therefore have been missed. However, this assessment was simply to provide an overview of roost potential across the Application Site and no trees with bat roost potential are due to be removed.

Roost Emergence Survey

2.21 A single tree with bat roost potential (T27) would be removed to facilitate the development. An emergence survey was therefore carried out on 07 June 2021 to confirm the presence or absence of roosting bats. Full details of the survey are given in **Annex EDP 6**.

Limitations

2.22 Weather conditions were optimum for the emergence surveys, being relatively warm with light winds and no rain. The survey is therefore not considered to be seasonally or climatically constrained. Visibility was somewhat impaired by low light conditions and vegetation. However, one surveyor was equipped with an infrared camera to overcome this potential limitation.

Activity Surveys

2.23 The desk study returned records of at least eight bat species (**Annex EDP 6**) and the Application Site itself is considered to support habitat of moderate quality for foraging bats[4] and several trees with bat roost potential. Bat activity surveys have been conducted at the Application Site since 2010 and update bat surveys were undertaken in 2020 to determine if there has been a material change in the use of the Application Sites by bats.

4 Table 4.1 in: Collins, J (ed) (2016) Bat Surveys for professional ecologists: Good Practice Guidelines. (3rd edn) Bat Conservation Trust, London.

2.24 Bat activity transect surveys were completed during 2020, in each month from May to September (inclusive) to determine the usage of the Application Site by bats. Surveys were undertaken with reference to the Bat Conservation Trust Guidelines[5] and included four transect routes that covered all suitable bat foraging habitat. Transect routes were consistent with those used in 2010 and 2013 where possible and where scrub encroachment allowed. Eight static, automated bat detectors were also deployed across the Application Site to record for a period of five nights. Static detector locations and transects routes are displayed on **Plan EDP 14**.

Limitations

2.25 All activity surveys (transect and static) were undertaken during optimal conditions at what is considered to be an optimal time of year and so are not seasonally constrained.

Dormouse Survey

2.26 Surveys for dormice (*Muscardinus avellanarius*) were not previously undertaken within the Application Site, having been considered unnecessary due to lack of connectivity with other suitable habitat within the local area and a lack of records. However, the on-site habitat has matured to the point of being more suitable for the species, and it was considered possible that a relict population may have survived within on-site woodland and hedgerows.

2.27 A nest tube survey was therefore carried out in 2020 to determine the presence/likely absence of dormouse. A total of 100 nesting tubes were deployed on 03 April 2020 within the on-site scrub, hedgerow and woodland habitat. These tubes were checked monthly throughout May to September 2020, with reference to published guidelines[6], recording any feeding evidence or nest construction recorded. Full details of the dormouse survey are provided in **Annex EDP 7** and on **Plan EDP 16**.

Otter and Water Vole Survey

2.28 Despite not having previously recorded otter (*Lutra lutra*) or water vole (*Arvicola amphibius*) within Langford Brook, the habitat remains suitable for these species and therefore an update survey was undertaken in 2020 with reference to published water vole survey guidance[7]. This involved two survey visits, one on 06 May 2020 and a second on 10 August 2020.

5 Collins, J (ed) (2016) Bat Surveys for professional ecologists: Good Practice Guidelines. (3rd edn) Bat Conservation Trust, London.
6 Bright, P., Morris, P. and Mitchell-Jones, T. (2006). The Dormouse Conservation Handbook (2nd Edition). English Nature
7 Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds Fiona Mathews and Paul Chanin. The Mammal Society, London.

Otter

2.29 All signs of otter activity including evidence of prints, tracks, spraints and feeding remains were searched for and recorded if present.

2.30 Features considered to have the potential to be used as resting sites or for lying up above ground, such as areas of dense vegetation, in addition to underground burrows (holts) potentially present beneath mature, riparian trees, were also documented during the survey.

Water Vole

2.31 In accordance with best practice guidance relevant at the time of the survey[8], the water-course was walked and searched for signs of water vole presence, including:

- Latrines (maintained or disused latrines and individual droppings);
- Burrow entrances;
- Feeding piles (small sections of vegetation cut off at a 45° angle in a distinct pile);
- Feeding lawns;
- Footprints; and
- Possible runs.

2.32 An assessment of the habitats along Langford Brook, including information such as water flow, stream width and depth, emergent and bankside vegetation, drainage works and canalisation, adjacent habitat/land use, and water quality, was also undertaken.

Limitations

2.33 The surveys were undertaken during the water vole breeding season when voles are most active and thus leaving most field signs. Otter surveys can be undertaken at any time of year. Weather conditions were warm, still and dry during the survey with water levels reasonably low and no evidence of recent significant variations. Full details of the otter and water vole surveys can be found in **Annex EDP 8**.

Harvest Mouse Survey

2.34 A presence/absence survey for harvest mouse (*Micromys minutus*) nests was undertaken during November 2013, which involved the searching of suitable rough grassland, ruderal

8 Strachan, R. and Moorhouse, T. (2006). Water Vole Conservation Handbook (2nd edition). Wildlife Conservation Research Unit, University of Oxford.

and scrub habitats for woven nests by five surveyors. To update the baseline for this species, this methodology was repeated on 06 November 2020.

2.35 To establish the presence, or likely absence, of harvest mice in the Application Site, a hand search for harvest mouse nests was undertaken of tall grassland/ruderal/scrub edge vegetation. The survey involved a team of surveyors systematically hand searching through grassland to search for abandoned summer nests. The survey was completed in the winter prior to December, to try and avoid nests being destroyed through stormy weather.

Badger Survey

2.36 During regular visits to the site by EDP ecologists and other ecologists over a period of over 15 years, no evidence of badger activity has been found within the Application Site. However, a report of badger signs (footprints) within the Application Site was included in the EIA scoping response from Dominic Woodfield on 29 September 2020 (summarised in **Annex EDP 1**).

2.37 An updated badger survey was completed on 30 October 2020. During the survey, any signs of badger activity such as holes, latrines, trails, snuffle holes and hairs on fencing or vegetation were recorded. Where holes of a size and shape consistent with badgers were identified, the following signs of badger activity were searched for in order to determine whether they were currently in active use:

- Fresh spoil outside entrances;
- Old bedding material (typically dried grass) outside entrances;
- Holes being cleared of leaf litter;
- Fresh latrines close to entrances;
- Badger guard hairs; and
- Fresh tracks leading to/from the holes.

Limitations

2.38 Due to the dense and impenetrable scrub that has developed over parts of the site, there were considerable access limitations to the survey. However, the survey was undertaken during the colder months when much vegetation has died back, allowing clearer visibility of the ground and potential field signs. It is considered likely that if badger signs were present, these would have been seen.

Great Crested Newt Survey

2.39 Great crested newt has been surveyed extensively on and around the Application Site since 2002 and surveys were updated in 2020.

Presence/Absence Survey

2.40 The Application Site contains five ponds (labelled P1, P2, P4, P5 and P6) and there are six ponds within 250m of the Application Site boundary (P3, P7, P8, P9, P10 and P11). All ponds are numbered and labelled on **Plan EDP 18**.

2.41 These ponds have been surveyed extensively since 2002, with the most recent update surveys having been completed in 2018 and in 2020. The results from both of these surveys are presented in this report. GCN presence/absence surveys have bee completed with reference to standard guidelines[9], full details of which can be found in **Annex EDP 9**.

Limitations

2.42 No surveys have been completed on pond P3 (beside the railway and possibly no longer present) since 2010 due to access constraints. After 2013, P10 was scoped out due to no GCN being found on several previous surveys and P11 was scoped out due to the intervening distance between this pond and the Application Site boundary. Pond P7 was scoped out of survey in 2020 as a medium-sized population had been confirmed in this pond during the 2018 survey and further survey was deemed unnecessary. Access to P9 was only permitted for the first visit in 2018 but not after that. Due to long history of surveys on and around the Application Site, these surveys are considered to give a robust picture of the status of GCN within the Application Site despite the access constraints.

Reptile Survey

2.43 Reptile surveys have been conducted on the Application Site since 2010 and an update reptile survey was completed during 2020. Replicating previous surveys, 397 artificial refugia were placed across suitable habitat within the site during 24 April 2020. Locations are shown on **Plan EDP 19**. The refugia consisted of 383 refugia of heavy-gauge roofing felt and 14 refugia of corrugated metal sheeting measuring c.1.0m by 0.5m.

2.44 Having allowed in excess of 10 days for the refugia to 'bed-in', the refugia were then checked on seven separate occasions between May and September. Full details can be found in **Annex EDP 10**.

2.45 During pre-application consultation in 2012/13, a survey effort of 20 survey visits was requested in order to provide an accurate estimate of population size, and this was subsequently undertaken during 2013. However, given the volume of previous survey data, which has previously confirmed the presence of a large common lizard population,

9 English Nature (2001). Great Crested Newt Mitigation Guidelines, English Nature, Peterborough.

etc, it was considered that seven survey visits would be sufficient to confirm continued presence and approximate distribution during the 2020 update survey.

2.46 In addition to refugia surveys, an early-spring visual survey was undertaken in order to determine possible adder populations. This involved two surveyors recording any reptile activity observed, taking into account all suitable habitat, particularly around potential hibernation features[10].

Limitations

2.47 The surveys were not constrained by weather and took place in suitable weather conditions within the optimal surveying period. However, a significant degree of interference by members of the public was experienced during the 2020 surveys, with large numbers of refugia removed from the Application Site on several occasions. Refugia were replaced, relocated into less visible/visited locations and/or marked up to discourage interference on three separate occasions in May and June, and a full suite of visits was completed. Nonetheless, due to this disruption, the survey findings are likely to be an under-representation of the reptile population present.

Invertebrate Surveys

2.48 A detailed invertebrate survey, following the methodology previously employed in 2005 and 2013, was undertaken throughout the spring/autumn of 2020 by specialist and highly experienced surveyors .

2.49 Terrestrial invertebrates were sampled using the following active methods:

- 10 minute sweep sampling;
- 2 minute vacuum sampling;
- Beating samples; and
- Direct searching.

2.50 In addition, passive sampling of terrestrial invertebrates was undertaken by means of pan trapping.

2.51 Aquatic invertebrates were sampled using the standard 3 minute sweep net in all ponds and wet ditches across the site.

2.52 Datasets from terrestrial and aquatic sampling methods, as well as the separately recorded moth and butterfly data were input into the online Pantheon analytical resource.

10 Natural England Technical Information Note TIN102, Reptile mitigation guidelines (withdrawn)

2.53 Full details on the invertebrate surveys can be found in **Annex EDP 11**.

Butterfly Surveys

2.54 Surveys have been completed within the Application Site for marsh fritillary (*Euphydryas aurinia*), brown hairstreak (*Thecla betulae*), black hairstreak (*Satyrium pruni*), white-letter hairstreak (*Satyrium w-album*) and small heath (*Coenonympha pamphilus*) butterflies since 2005. The scope of these surveys has been discussed and agreed with representatives of Butterfly Conservation nationally and locally (Upper Thames Branch).

2.55 These butterfly surveys were updated in 2020 using the survey scope used previously, largely in combination with the wider invertebrate surveys, as discussed below and detailed in **Annex EDP 11**.

Marsh Fritillary

2.56 A single adult marsh fritillary butterfly and a single larval web were recorded on the Application Site in May and August 2005, respectively. EDP undertook larval web searches annually between 2006 and 2013 during late August/early September. No evidence of this species was recorded, and the species is not considered to be present on the Application Site, with the 2005 records believed to be of specimens introduced artificially to the site[11].

2.57 Despite this, for completeness, the baseline was updated through completion of timed counts to search for adults during the peak flight period.

Brown Hairstreak

2.58 Members of the Upper Thames Branch of Butterfly Conservation (BC) undertook brown hairstreak egg searches, of varying intensity and coverage, at the Application Site between winter 2002/3 and 2010/11. These records have been collated by EDP and confirm the presence of a good population of this species within the Application Site.

2.59 The baseline has been updated through an update desk study to collate recent records, and an egg search of those blackthorn stands at greatest risk of direct impacts from the proposed development. The egg search was undertaken on 10 December 2019. This was soon after autumn leaf fall and before late winter when significant mortality of larvae may occur or when new leaf/flower growth makes finding eggs difficult. The areas searched were mapped and the survey effort and weather conditions during the survey recorded.

Black Hairstreak

2.60 Black hairstreak is a particularly difficult species to detect. However, a small number of confirmed adult sightings within the site were recorded by volunteers from the Upper

11 Pers. comm. Sarah Postlethwaite (CDC and OCC's ecologist) and David Redhead (Butterfly Conservation – Upper Thames Valley Branch)

Thames Branch of BC between 2006 and 2010. In addition, a small number of eggs have been found during brown hairstreak surveys. Three adult timed counts were undertaken by an EDP surveyor during June and July 2011, which did not return any confirmed sightings, although one adult butterfly was recorded which could have been either black or white-letter hairstreak.

2.61 The baseline was updated through completion of a black hairstreak egg search (combined with the brown hairstreak egg search on 10 December 2019) together with four timed counts to search for adults, to be undertaken in suitable weather between mid-June and mid July 2020 by EDP's invertebrate surveyor (in conjunction with other invertebrate surveys). The areas searched were mapped and the survey effort and weather conditions during the survey recorded.

White-letter Hairstreak

2.62 A possible white-letter hairstreak adult was recorded during EDP's black hairstreak adult survey in July 2011. Subsequently, an extensive search of elm for eggs was undertaken by BC specialists with assistance from an EDP surveyor in November 2011, which confirmed the presence of this species within the Application Site. This was updated in 2013.

2.63 Although the 2011 egg search involved a destructive search method, i.e. lopping sample material from elm branches and searching these samples for eggs, it was not considered appropriate to repeat this method only one 'season' on. Instead, BC specialists assessed the suitability of the existing elm in the Application Site for this species through a survey of flowering elm in February 2013, combined with a limited non-destructive egg search from ground level (at the same time), and finally timed counts to search for adults undertaken in suitable weather during the likely peak adult flight period (approximately late June).

2.64 During 2020, an updated white-letter hairstreak egg search, elm condition assessment and adult survey were all completed by BC on behalf of the Applicant. The methodologies used during these update surveys are set out in BC's report contained in **Annex EDP 12**.

Small Heath

2.65 During consultation in 2011, the potential presence of small heath within the Application Site was raised and, subsequently, three adult timed counts were undertaken by an EDP surveyor during June and July 2011 and 2013. The 2013 survey recorded five adult butterflies and therefore, the baseline was updated through three timed counts to search for adults, between mid-May and mid-October by EDP's invertebrate surveyor.

Night-Flying Moth Surveys

2.66 A detailed survey of night-flying macro- and micro-moth fauna was undertaken in fields to the east of Langford Brook in 2014, using light trapping (Robinson's Traps and actinic Heath traps).

2.67 Update surveys in 2020 followed the same methodology and included five survey visits spaced evenly between mid-June and early-October. Full details can be found in **Annex EDP 11**.

Section 3
Results (Baseline Conditions)

3.1 This section summarises the baseline ecological conditions determined through the course of the investigations described in **Section 2**. In particular, it identifies and evaluates those ecological features/receptors that lie within the Application Site's potential ZoI and which are pertinent in the context of the proposed development. This section also identifies Important Ecological Features (IEFs) for the purposes of the assessment of potentially significant effects in the EcIA. Further technical details are, where appropriate, provided within appendices and on plans to the rear of this report.

3.2 In 2013, the *UK Biodiversity Action Plan (BAP) Priority Habitats and Priority Species*, and the *Section 41 Species and Habitats of Principal Importance for Conservation under the Natural Environment and Rural Communities (NERC) Act 2006*, were rationalised. This rationalisation occurred under the 'Post-2010 Biodiversity Framework'. As a result, a new list of Priority Species and Priority Habitats is now in operation at the UK level. These new lists supersede the former UKBAP; they are the new 'Biodiversity Indicators' that are used to monitor the status of biodiversity at the UK level. Each of the four devolved countries of the UK also has a similar list. Within England, the new rationalised lists of 24 Priority Habitats and 213 Priority Species are provided in *Biodiversity 2020,* which is the national biodiversity policy for England.

3.3 Within this Ecological Appraisal report, where relevant, these species and habitats of national nature conservation priority will therefore be referred to as 'Priority Species' and 'Priority Habitats'[12], except where indicated otherwise.

3.4 Where a particular ecological feature/receptor has been confirmed to be present, or presence is inferred based on habitat suitability, the ecological value or significance of the population or assemblage is assessed on the following geographic scale:

- International importance (ecological features which if impacted, would affect the distribution and/or conservation status of this feature in Europe);
- National importance (ecological features which if impacted, would affect the distribution and/or conservation status of this feature in England);
- Regional importance (ecological features which if impacted, would affect the distribution and/or conservation status of this feature in the Thames Valley Region);

12 See the following for more detail:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/382483/2a._priority_habitats2a_2014_final.pdf.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/382951/Technical_Background_Priority_Species__abundance__2014.pdf.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/382487/4a_Status_of_Priority_Species_2014_final.pdf.

- County importance (ecological features which if impacted, would affect the distribution and/or conservation status of this feature in Oxfordshire); and

- Local importance (ecological features which if impacted, would affect the distribution and/or conservation status of this feature in the Cherwell district or the Bicester area).

3.5 Any other ecological features/receptors will be assessed as of less than local level importance, which would result in them being scoped-out as IEFs (on the basis that any adverse effects on these features would be insignificant) unless they are subject to legal protection.

Designated Sites

3.6 Information regarding designated sites was obtained during the desk study from the MAGIC website and TVERC. Statutory designations (those receiving legal protection) and non-statutory designations (those receiving planning policy protection only) are discussed in turn below.

Statutory Designations

3.7 Statutory designations are of recognised importance at an international and/or national level. International designations include Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar Sites. National designations include Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs). Local designations include Local Nature Reserves (LNRs).

3.8 The Application Site is not covered by any statutory designations, nor are there any international designations (European Sites) within 10km. No European Sites are judged to be at risk of adverse impacts resulting from the Proposed Development and therefore an Appropriate Assessment of the proposals, in line with The Conservation of Habitats and Species Regulations 2017, is not required.

3.9 The only national designation occurring within the standard 5km search radius is Bure Park LNR, which lies 1.5km away to the north-west. This 8 hectare (ha) park contains grass meadow, young broad-leaved woodland, hedges and scrub. A small river (the Bure) runs through it, feeding a small pond that supports great crested newts. An additional SSSI occurs within the search radius (Stratton Audley Quarries); this has been cited for geological reasons only and is therefore not considered pertinent to the EcIA.

3.10 There are no surface hydrological or green ecological links between the Application Site and Bure Park. Whilst the Langford Brook meets the River Bure, this occurs downstream of the LNR area. In addition, due to the small scale of the proposed development and the extensive green space provided within the Application Site boundary, there is very limited potential for an increase in recreational pressure on this site as a result of the Proposed Development. Therefore, Bure Park LNR will not be taken forward as an IEF in the EcIA.

3.11 In addition, the following national designations, which lie beyond the 5km search radius around the Application Site, have been identified through pre-application consultation with Natural England to be IEFs owing to the potential for downstream impacts via adverse changes in water quality and/or flow within Langford Brook:

- Wendlebury Meads and Mansmoor Closes SSSI (5.4km south-west); and
- Otmoor SSSI (7.2km south-south-west).

3.12 The location of these SSSIs and Bure Park LNR in relation to the Application Site is shown on **Plan EDP 2**.

Non-statutory Designations

3.13 Non-statutory designations are also commonly referred to in planning policies as 'local sites', although in fact these designations are typically considered to be of importance at a county level. Non-statutory designations in Oxfordshire are known as Local Wildlife Sites (LWSs). In addition, there are other non-statutory designations which may be pertinent in the locality, including Conservation Target Areas (CTAs), which is a landscape scale designation that has been identified as supporting high concentrations of Priority Habitats and Species and potential for restoration.

3.14 Additional designations include proposed LWSs and Cherwell District Wildlife Sites (CDWSs). These are sites of local importance in the Cherwell District with their own selection criteria with lower threshold and requirements than those for LWSs. These sites do not meet the criteria for LWS designation but may be included within Local Plans.

3.15 Details of non-statutory designations within 2km of the Application Site are set out within **Annex EDP 3**; these sites are shown on **Plan EDP 3**. In summary, six LWSs, one CDWS, three proposed CDWSs and a CTA lie within 2km of the Application Site, including the Ray Conservation Target Area and Gavray Drive Meadows LWS, which partially cover the Application Site.

Ray Conservation Target Area

3.16 A large proportion of the site is situated within the River Ray Conservation Target Area (CTA). This is one of 37 CTAs in Oxfordshire and covers 1,192ha, encompassing land on the eastern edge of Bicester and Launton and to the south of Ambrosden and Blackthorn. Rather than being a single feature requiring strict protection, the CTA is a strategic area containing a concentration/network of existing features of ecological importance (including SSSIs and LWSs) but with surrounding land that can buffer and link areas thereby creating important larger and better connected landscapes.

3.17 Policy ESD 11 of the Local Plan requires development within or adjacent to a CTA to identify constraints and opportunities for biodiversity enhancement. The policy also states that development which prevents the aims of a CTA being achieved will not be permitted.

3.18 Within the site boundary, there is a strong degree of overlap with Gavray Drive Meadows LWS (see below) and the CTA. However, additional land is covered by the CTA, which is outside of the LWS. These areas are not strictly constrained for development; however, their position in the CTA presents an opportunity to protect and enhance these non-designated areas and enhance the ecological network.

Gavray Drive Meadows LWS

3.19 Gavray Drive Meadows LWS covers a large proportion of the site and additional land to the south-east on the opposite side of Charbridge Lane (A4421). The LWS boundary is shown on the updated Phase 1 Habitat Plan (**Plan EDP 1**) appended to this report. LWSs receive protection through national and local planning policies including Policy ESD 10 of the Local Plan and specific site allocation polices such as Bicester 13, which covers the Application Site.

3.20 With reference to the LWS citation obtained from TVERC, the LWS is described as *"a mosaic of small damp fields with ponds, divided by thick hedges with old trees"* and is designated on the basis of the following:

- Section 41 (S41) Habitats of Principal Importance[13]: lowland meadows;
- S41 Species of Principal Importance: reed bunting, song thrush, bullfinch, linnet, and great crested newt;
- Nationally scarce species: *Bembidion gilvipes* a ground beetle; and
- Birds of conservation concern: red list – bullfinch, reed bunting, song thrush, yellowhammer, linnet; amber list – dunnock, willow warbler.

3.21 As described in **Annex EDP 2** with respect to the on-site habitats, the continued absence of any management of the habitats within the majority of the LWS had led to significant encroachment of scrub and young trees within formerly open grassland and tall herb communities and therefore an overall decline in the ecological value of LWS. Furthermore, the only two fields under active management which are (partially) within the LWS (Fields F8 and F9 on **Plan EDP 1**) are cut annually in mid-summer, which is sub-optimal in terms of promoting botanical diversity. Accordingly, there is significant scope to reverse this decline through a suitable management regime.

Evaluation

3.22 Gavray Drive Meadows LWS and Ray CTA partially covers the Application Site and will be taken forward as IEFs of County-level ecological importance.

13 Section 41 of the *Natural Environment and Rural Communities* (NERC) *Act* 2006

3.23 Owing to their spatial separation and/or lack of ecological connections with the Application Site, the remaining non-statutory designations occurring within 2km or beyond are not considered to be at risk of significant adverse impacts resulting from the proposed development and will not be taken forward as IEFs.

Habitats

3.24 Information on habitats within and around the Application Site was obtained during the desk study (Priority Habitats), the Phase 1 surveys and detailed botanical surveys.

3.25 The distribution of different habitat types within and adjacent to the Application Site is illustrated on **Plan EDP 1** and the surveyed hedgerow sections are displayed on **Plan EDP 4**. In addition, detailed descriptions of these habitat types, together with illustrative photographs, are provided in **Annex EDP 2**.

3.26 A summary and qualitative assessment of the habitats within the Application Site is provided in **Table EDP 3.1**.

Table EDP 3.1: Summary of Habitats Within the Application Site

Habitat or Feature	Distribution within Application Site	Intrinsic Ecological Importance
Unimproved and Species-rich Semi Improved Neutral Grassland	Small areas within F3, F7, F11 and F12, showing examples of NVC communities MG1b, MG1c, MG4, MG6b and MG5c	**County**: Due to meeting (or with good potential to meet) the definition of Lowland Meadow, and/or due to association with Gavray Drive Meadows LWS
Semi-improved Neutral Grassland	Discrete areas within F4, F5, F6, F8, F9, including poorer examples of NVC communities MG6b and MG9a	**Local**: Owing to botanical diversity and scarcity of habitat in the district.
Marshy Grassland and Swamp	Discrete areas within Fields F1, F2, F3, F8, F9 and F10, including examples of NVC communities MG9a, MG10b, M23b and S7	**Local-County**: Owing to botanical diversity and scarcity of habitat in the district.
Species poor semi-improved grassland	Within Fields F6, F10 and F15, including example of NVC community MG7c	**Less than Local**: Low diversity with some seemingly sown recently with an agricultural grass mix
Broad leaved Semi-natural Woodland	Various patches throughout the Application Site formed from outgrown scrub and hedges	**Local:** Poor example of Priority Habitat and small extents.
Dense and Scattered Scrub	Found widely across the east of the Application Site, predominantly in association with unmanaged hedgerows	**Less than Local**: Limited floristic value, large extents within site are detrimental to the species-rich grassland habitat

Habitat or Feature	Distribution within Application Site	Intrinsic Ecological Importance
Veteran and Mature Trees	Several veteran and mature trees across the Application Site	**Local**: Due to age and condition which provides a wide range of habitat niches.
Hedgerows	Many former hedgerows have expanded out into the adjacent fields to form large blocks of dense scrub. Twelve discernible hedgerows are currently present, two of which qualify as 'Important' under the Hedgerows Regulations	**Local**: Providing a valuable network of linear habitat
Tall Herb and Ruderal	Mainly along western bank of Langford Brook	**Less than Local**: Owing to low distinctiveness and small size.
Arable	Two fields in the west of the Application Site	**Negligible**: Owing to intensive management
Ponds	Several ponds across the site, most of which are currently in poor condition, being silted and overshaded and subject to regular drying	**Local**: Providing a network of open water habitat
Water-course	Langford Brook runs through the centre of the Application Site	**Local**: Only flowing water on site and acts as a wildlife corridor but lacks distinctiveness

3.27 As noted within **Table EDP 3.1**, several habitats within the Application Site are of Local intrinsic value or higher, and these will be taken forward as IEFs in the EcIA. The habitats or other features that are judged to be of less than Local importance due to their having limited intrinsic botanical value may also require consideration in relation to their importance in maintaining populations of protected and/or notable species. This is discussed further below.

Protected and/or Notable Species

3.28 The likelihood of presence, or confirmed presence, of protected/and or notable wildlife species within the Application Site is summarised below with reference to Desk Study records, habitat suitability and detailed surveys. Further details are made available within Appendices and Plans where referenced.

3.29 Where a particular species or taxonomic group has been confirmed to be present, or presence is inferred based on habitat suitability, the ecological value or significance of the population or assemblage is assessed on the geographical scale set out in paragraph 3.4.

Wintering Birds

3.30 Full results of the 2020 wintering bird surveys are included within **Annex EDP 4** and illustrated on **Plans EDP 6** to **9**.

3.31 In summary, a total of 36 species were recorded throughout the 2020 survey visits, of which 12 are considered to be of conservation concern (six Red list; six Amber list). In addition, red kite (*Milvus milvus*), which is Green listed but benefits from legal protection under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), were also recorded. The remaining 23 species are either on the Green list or have no status (not native to the UK).

3.32 The diversity and abundance of species recorded is considered to be fairly typical for a site of this size and type, although the surveys did record very low numbers of several declining farmland species such as skylark (*Alauda arvensis*) and starling (*Sturnus vulgaris*) utilising the Application Site, as well as flocks of other Red-list species including redwing (*Turdus iliacus*), fieldfare (*Turdus pilaris*) and house sparrow (*Passer domesticus*).

3.33 Low numbers of other Red- and Amber-listed species were also recorded during the surveys including song thrush (*Turdus philomenos*), meadow pipit (*Anthus pratensis*), dunnock (*Prunella modularis*), black-headed gull (*Chroicocephalus ridibundus*), herring gull (*Larus argentatus*), bullfinch (*Pyrrhula pyrrhula*) and kestrel (*Falco tinnunculus*).

3.34 In previous surveys in 2013, a total of 42 bird species were recorded including twelve notable species. The species of conservation concern recorded in 2013 and 2020 are summarised together in **Table EDP 3.2**. This higher number of species recorded in 2013 is likely due to the higher number of survey visits conducted at the time.

Table EDP 3.2: Summary of Bird Species of Conservation Concern Present During the Wintering Bird Surveys

Species	Conservation Status	2013	2020
Fieldfare *(Turdus pilaris)*	Red list Schedule 1	Present	Present
Redwing *(Turdus iliacus)*	Red list Schedule 1	Present	Present
Red kite *(Milvus milvus)*	Schedule 1	Present	Present
Reed bunting (*Emberiza schoeniclus*)	Red list NERC S41	Present	-
Linnet (*Carduelis cannabina*)	Red list NERC S41	Present	-
Starling (*Sturnus vulgaris*)	Red List NERC S41	Present	Present
Song thrush (*Turdus philomelos*)	Red List NERC S41	Present	Present
House sparrow (*Passer domesticus*)	Red List NERC S41	Present	Present
Dunnock (*Prunella modularis*)	Amber List NERC S41	Present	Present
Bullfinch (*Pyrrhula pyrrhula*)	Amber List NERC S41	Present	Present

Species	Conservation Status	2013	2020
Snipe (*Gallinago gallinago*)	Amber List	Present	-
Black-headed gull (*Chroicocephalus ridibundus*)	Amber List	Present	Present
Common gull (*Larus canus*)	Amber List	Present	-
Woodcock (*Scolopax rusticola*)	Amber List	Present	-
Mistle thrush (*Turdus viscivorus*)	Amber List	Present	-
Green woodpecker (*Picus viridis*)	Amber List	Present	-
Herring gull (*Larus argentatus*)	Red list	-	Present
Kestrel (*Falco tinnunculus*)	Amber list	-	Present
Meadow pipit (*Anthus pratensis*)	Amber list	-	Present
Skylark (*Alauda arvensis*)	Red list	-	Present

Evaluation

3.35 The winter bird assemblage supported by the Application Site is considered to be relatively typical of an urban edge locality in lowland England being biased towards common generalist resident species and common winter migrants. However, owing to the quality of winter foraging afforded by the dense fruit bearing scrub habitat, the species present are generally in relatively high abundance but the diversity and abundance of over-wintering birds within the Application Site is not exceptional. Overall, the wintering bird assemblage present within the Application Site is considered to be an IEF but of no greater than Local-level ecological importance.

Breeding Birds

3.36 Full results of the 2020 breeding bird surveys are included within **Annex EDP 5** and illustrated on **Plans EDP 10** to **12**.

3.37 In 2020, total of 32 species were recorded during the three survey visits, 11 of which were species of conservation concern: four Red-listed, six Amber-listed, and Red kite, which is on the Green List, but is also listed on Schedule 1 of the Wildlife and Countryside Act (1981, as amended). Three of these Red-listed species were also listed in Section 41 of Natural Environment and Rural Communities Act (2006) as species of principal importance in England.

3.38 Of these 32 species, only house sparrow was confirmed to be breeding. Six species were considered to be probably breeding on site, 20 to be possibly breeding, and five to be non-breeding species.

3.39 In previous surveys in 2013, a total of 37 bird species were recorded within the Application Site with 23 species confirmed as breeding. In addition, a further nine species were recorded as possible breeders and five species as non-breeders. **Table EDP 3.3** summarises the breeding status of the species of conservation concern recorded within the Application Site in 2013 and 2020.

Table EDP 3.3: Summary of the Breeding Status of the Species of Conservation Concern Recorded within the Application Site in 2013 and 2020.

Species	Conservation Status	Status within Application Site	
		2013	2020
Barn owl (*Tyto alba)*	Amber List Schedule 1	Non-breeder	-
Red kite *(Milvus milvus)*	Green List Schedule 1	Non-breeder	Non-breeder
Song thrush (*Turdus philomelos*)	Red List	Breeding	Possible breeder
Starling (*Sturnus vulgaris*)	Red List	Breeding	Possible breeder
Cuckoo (*Cuculus canorus*)	Red List	Possible breeder	-
House sparrow (*Passer domesticus*)	Red List	Possible breeder	Breeding
Dunnock (*Prunella modularis*)	Amber List	Breeding	Probable breeder
Bullfinch (*Pyrrhula pyrrhula*)	Amber List	Breeding	-
Common whitethroat (*Sylvia communis*)	Amber List	Breeding	-
Green woodpecker (*Picus viridis*)	Amber List	Breeding	-
Willow warbler (*Phylloscopus trochilus)*	Amber List	Breeding	Probable breeder
Mallard (*Anas platyrhynchos*)	Amber List	Possible breeder	Possible breeder
Stock dove (*Columba oenas*)	Amber List	Possible breeder	Non-breeder
Swallow (*Hirundo rustica*)	Amber List	Non-breeder	-
Swift (*Apus apus*)	Amber List	Non-breeder	Non-breeder
Mistle thrush (*Turdus viscivorus*)	Red list	-	Possible breeder
Kestrel (*Falco tinnunculus*)	Amber list	-	Possible breeder

Summary

3.40 Abundance and diversity of bird species is considered to be consistent with the extent and diversity of habitats on site. The majority of species recorded on site were associated with the woodland, hedgerows, and scrub. The limited size of other habitats, such as

wetland habitats, is considered to have limited the potential for large populations of habitat specialists. For this reason, the breeding bird assemblage present within the Application Site is considered to be an IEF but of no greater than Local-level ecological importance.

Nightingales

3.41 A single male nightingale was recorded singing during the second midnight survey visit. It was recorded singing in brief bursts in a loop within scrub in the south of the Application Site (between Fields F1, F2, F8, F9, F10) and F15. As a result, dawn survey visits were undertaken as detailed above. No further activity was recorded and it is considered that nightingale did not successfully breed within the Application Site in 2020. It is likely that the bird recorded has dispersed from the known population at MOD Bicester but has yet to successfully breed at the Application Site.

Barn Owl

3.42 No direct evidence of barn owls nesting in the study area was recorded during the daytime assessments of mature trees or during the breeding surveys or the bat activity surveys in 2020. During one of the great crested newt torchlight surveys on 4 June 2013, a pair of barn owls was flushed out of a mature oak tree (T2 on **Plan EDP 13**) on the southern boundary of Field F3. Subsequent inspection of the tree in daylight found no further evidence to confirm that barn owls were nesting in the tree, although it was considered that nesting/roosting of barn owls in the tree cannot be ruled out.

3.43 The Application Site is also considered to support foraging opportunities for barn owls particularly in the drier areas of grassland which are likely to support a good abundance of small mammals as prey items. Owing to the absence of any recent evidence of barn owl presence, this species is considered to be of less than Local-level ecological importance but has been included as an IEF on precautionary basis owing to its legal protection under Schedule 1 of the Wildlife and Countryside Act (1981, as amended).

Bats

3.44 Full results from all bat roosting and activity surveys can be found in **Annex EDP 6**, with some results illustrated on **Plans EDP 13** to **15**.

Tree Roost Inspection

3.45 There are 27 trees across the Application Site with bat roost potential. These are shown on **Plan EDP 13**. The emergence survey carried out on tree T27 recorded no bats emerging. It is therefore considered very unlikely that the tree currently contains a bat roost but the future presence of bat roosts cannot be ruled out.

Foraging and Commuting Bats

3.46 The desk study returned records of Barbastelle (*Barbastella barbastellus*), brown long eared bat (*Plecotus auritus*), common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), noctule (*Nyctalus noctula*), Leisler's (*Nyctalus leisleri*) *Myotis* sp. and serotine (*Eptesicus serotinus*) bats. Records were from 2012 to 2017.

Transect Surveys

3.47 At least seven species were recorded on the manual transects: common pipistrelle, soprano pipistrelle, noctule, Myotis species, Leisler's bat, serotine bat and long-eared species – mostly likely to be brown long-eared.

3.48 Bat activity was, unsurprisingly, concentrated in the eastern part of the Application Site where the grassland, scrub mosaic, woodland and pond habitats are found, and along Langford Brook. However, there was still activity recorded on the boundary hedgerows of the western part of the Application Site but not until July.

3.49 Activity recorded on the transect surveys was predominantly of common pipistrelle. This species was recorded in all areas and all months. Soprano pipistrelle, noctule and Myotis were also recorded in all months but at a much lower level. Activity from serotine, long-eared and Leisler's bats was recorded in most months except May but recordings were few. Bat transect results can be seen on **Plan EDP 15**.

Automated Detector Surveys

3.50 The automated detectors recorded activity from at least nine bat species: common pipistrelle, soprano pipistrelle, noctule, Myotis species, Leisler's bat, serotine bat, long-eared species, Nathusius' pipistrelle (*Pipistrellus nathusii*) and barbastelle. The latter two are an addition from the species detected on the manual transect surveys.

3.51 As with the manual transect surveys, activity was predominantly (54 to 74%) by common pipistrelle with the next highest species activity soprano pipistrelle (1-19%), Myotis species (4-19%) and noctule (4-10%). All other species accounted for less than 4% of activity each month.

3.52 Activity was highest at positions 5, 6 and 7, which correspond to fields F9, F15 and F2/3, respectively. Activity was lowest at positions 3, 4 and 8, which correspond to fields F11, F12 and F5.

3.53 The average number of species did not vary much across the Application Site except that it was slightly lower in positions 1 and 2, which were in the west of the Application Site. This is not surprising for position 1 as it borders a large arable field, which offers less suitable foraging habitat for bats.

Summary

3.54 The Application Site supports a typical assemblage of common and widespread bat species, with big bats such as Leisler's and serotine being recorded more regularly on later surveys.

3.55 The level of bat activity recorded in 2020 was largely consistent with previous surveys and generally lower than might be expected given the quality of foraging habitats in the eastern portion of Application Site. This may be a reflection of the Application Site's urban edge location and the resulting high levels of artificial illumination in the surrounding area.

3.56 The overall bat assemblage, taking into consideration the presence of rare and uncommon species (albeit only present in low numbers), is considered to be of Local-level ecological importance.

Dormouse

3.57 No dormice, or evidence of dormice, were recorded during any of the survey visits and this species is therefore judged to be currently absent from the Application Site.

Otter and Water Vole

Otter

3.58 Several otter spraints and footprints were found under the bridge during the May survey. The spraints were dry and fragmented. Further dry fragmented spraint was found in this location during the August survey but no footprints were seen at this time. The location is shown on **Plan EDP 17**.

3.59 It is considered that Langford Brook supports foraging otter as a part of a much wider territory but the Application Site does not support sheltering, breeding or resting otter. The otter population likely to using Langford Brook is considered to be of Local ecological importance.

Water Vole

3.60 In the 2020 surveys, two possible burrows and some possible feeding signs, namely small amounts of cut burr reed, were found during the May survey. The locations are shown on **Plan EDP 17**. No signs were found during the August survey.

3.61 Based on the survey findings, it is considered possible that Langford Brook supports a very small population of water vole. If present, such a population would be of less than Local ecological importance but has been included as an IEF on precautionary basis owing to its legal protection under the Wildlife and Countryside Act (1981, as amended).

Badger

3.62 No evidence of badger was recorded during the dedicated survey on 30 October 2020 or in any of the other surveys across the Application Site. However, as noted in **Section 2**, a report of badger signs (footprints) within the Application Site was included in the EIA scoping response from Dominic Woodfield on 29 September 2020 (summarised in **Annex EDP 1**). Furthermore, the possibility that badger setts are present but area hidden in areas of dense scrub that could not be accessed during surveys, cannot be entirely ruled out. Badgers are therefore assumed to be present on a precautionary basis.

3.63 Badgers are legally protected on the basis of prevention of cruelty, rather than due to their rarity or conservation concern, and any population potentially present would be of less than Local ecological importance. Badgers have been included as an IEF owing to their legal protection.

Harvest Mouse

3.64 The presence of large areas of tall, unmanaged grassland with a significant scrub interface including dense patches of bramble interspersed with grassland provides an abundance of suitable habitats for foraging and nest building by harvest mice.

3.65 The detailed hand search of the Application Site in 2013 found four harvest mouse nests: in the south-east corner of F13, along the southern boundary of F11, on the eastern boundary of F10 and in the south-west corner of F1.

3.66 No harvest mouse nests were located in the detailed hand search conducted in 2020; however, harvest mouse nests can be difficult to find. As the Application Site supports an abundance of suitable habitats for harvest mouse, and as this species has been found previously on the Application Site, it is likely that a small population of harvest mice is still present.

3.67 Such a population, if present, would be of less than Local value and, whilst a Section 41 Species of Principal Importance, harvest mouse is not legally protected *per se* and is therefore not included as an IEF within the EcIA.

Great Crested Newt

3.68 A summary of GCN survey results dating back to 2002 is provided in **Table EDP 3.4**. Full results of the surveys conducted in 2018 and 2020 can be found in **Appendix EDP 9**. Pond locations are shown on **Plan EDP 18**.

Table EDP 3.4 Summary of GCN Surveys From 2002 to 2020

Pond No. (Plan EDP 18)	On site/- Off site	Great Crested Newt Peak Adult Count						
		2002	2004	2010	2012	2013	2018	2020
P1	On site	0	1	1	2	4	6	10
P2	On site	2	1	2	2	2	3	2

Pond No. (Plan EDP 18)	On site/- Off site	Great Crested Newt Peak Adult Count						
		2002	2004	2010	2012	2013	2018	2020
P3	Off site	2	10	0	No access (possibly removed)			
P4	On site	3	9	5	3	1	4	14
P5	On site	0	1	1	3	1	5	0
P6	On site	4	3	6	3	5	3	0 (eggs found)
P7	Off site	-	-	-	26	65	65	N/A
P8	Off site	-	-	-	0	0	0	0
P9	Off site	-	-	-	24	5	No access	
P10	Off site	-	-	-	0	0	Scoped out	
P11	Off site	-	-	-	26	22	Scoped out	

3.69 All of the on-site ponds have breeding GCN present and have had since 2002. It is likely that the GCN found on the Application Site are a part of a single metapopulation that disperses between all ponds on the Application Site and off-site ponds P7, P8 and P9 (although no GCN have been found in P8, and P9 is declining in quality). The GCN population recorded is of a medium size-class.

3.70 In addition to GCN, the following amphibian species have also been recorded incidentally during the GCN and reptile surveys:

- Common toad (*Bufo bufo*) [a s41 species];
- Common frog (*Rana temporaria*);
- Smooth newt (*Triturus vulgaris*); and
- Palmate newt (*Triturus helveticus*).

3.71 Based on the above, the amphibian assemblage present within the Application Site is considered to be an IEF of Local-County level ecological importance.

Reptiles

3.72 Full details of the 2020 reptile survey can be found in **Annex EDP 10**. In summary, from a total of seven survey visits, a peak count of 70 common lizard was recorded but no grass snake. Grass snake do not use refugia as readily as common lizard, though, and it is still considered likely that grass snake are present in small numbers.

3.73 The number of reptiles recorded in 2020 was considerably lower than in 2013, when a peak count of 146 common lizard and three grass snake were recorded. However, this is likely to be mainly due to the disruption to the survey by members of the public experienced in 2020. The difference in survey effort may also be a factor, together with the effects of scrub encroachment reducing habitat suitability, as was case with Fields F1 and F2.

3.74 Overall, it is concluded that the Application Site still supports a large population of common lizard (with a particularly high concentration in Fields F11 and F12) and is likely to still support small population of grass snake. The reptile population is considered to be an IEF of Local-County level ecological importance.

Invertebrates

3.75 From the 2020 survey, 904 invertebrate species were recorded, compared to 806 species recorded from combined surveys in 2013 to 2016.

3.76 Sixty-four species of recognised conservation status were recorded, including 20 s41 species, two classed as 'Endangered', one 'Vulnerable' and five 'Near Threatened' under post-2001 IUCN criteria, as well as one RDB3 'Nationally Rare' species, three classed in the RDBK or DD classes and 36 species currently listed as Nationally Scarce in the UK. *Macrosteles sardus* was also recorded here for the first time in the UK as well as from one other site in south-east England.

3.77 S41 species of particular note included brown hairstreak, white-letter hairstreak, small heath and the forester moth, as well as the black-headed mason wasp (*Odynerus melanocephalus*), which was recorded for the first time during 2020. The rarest of the three hairstreak butterflies, black hairstreak, classed as 'Endangered' was also reconfirmed from two locations on site.

3.78 A comparison between results of 2020 Pantheon output and re-analysed 2013-16 data, showed a similar deployment of species on a habitat and Species Assemblage Type (SAT) level between the datasets but a small increase in conservation value across all habitat-level assemblages in 2020 compared to the 2013 to 2016 analysis.

3.79 At habitat level, the largest number of species by far were attributed to the 'Tall sward scrub' assemblage and whilst 18 species of recognised conservation were attributed to this assemblage, higher Species Quality Index (SQI) scores were attained for 'Short sward and bare ground', 'Marshland' (in fields F11 and F12) and 'Peatland', the former two of these indicating very high conservation value.

3.80 The 'Arboreal' assemblage, to which the second largest number of species were deployed, was also relatively high scoring, with 12 species of recognised conservation status, including black, brown and white-letter hairstreak butterflies.

3.81 Results from the 2020 survey indicate that the site continues to support invertebrate habitat and species assemblages representative of historically managed ridge and furrow grassland and fen meadow, in mosaic with scrub and remnant ancient hedgerow habitats. Pantheon analysis separately undertaken using both the 2020 survey data and the 2013-16 dataset indicated a small increase in conservation value across all six significantly recorded habitat-level assemblages.

3.82 Based on the SQI scores, especially for habitat-level assemblages including 'Short sward and bare ground', 'Marshland' and 'Peatland' and SATs including A212 'bark and sapwood

decay' and the resource-based F002 'Rich flower resource' and F001 'scrub edge', together with the presence of all three of Britain's rarest hairstreak butterflies, confirm that overall invertebrate population supported by the Application Site is of at least Regional ecological importance, but falls short of being of National importance.

3.83 Full details of the invertebrate survey and analysis can be found in **Annex EDP 11**.

Butterflies and Moths

3.84 In previous ecological assessments of the Application Site, certain rare butterfly species were evaluated individually to reflect the consultation responses and representations from various ecological stakeholders. Whilst targeted butterfly and moth surveys were repeated in 2020, the results of which are summarised below, it is considered more scientifically appropriate to evaluate the importance of these species as part of the overall invertebrate assemblage using the latest analysis tools, namely Pantheon as referred to above.

Grizzled Skipper

3.85 A single record of grizzled skipper (*Pyrgus malvae*) from within the Application Site was submitted to EDP. Despite a seeming abundance of suitable habitat, particularly in Fields F5 and F6, grizzled skipper was not recorded in 2020.

Marsh Fritillary

3.86 No marsh fritillary larval webs have been found in any parts of the study area during the annual larval web searches undertaken between 2006 and 2013. No adults were recorded during the targeted survey in 2013 or 2020.

3.87 During the detailed botanical survey, it was noted that the habitat quality for the marsh fritillary was deteriorating owing to vegetation succession in the absence of any management. The devil's bit scabious (primary larval foodplant) has disappeared from F11 and F12 where it was recorded in the early years of monitoring, having been shaded out by surrounding vegetation. In addition, where stands of the food plant persist, in F7 only, these are becoming increasingly overgrown with coarse grasses and bramble and, as a result, the basal leaves are less accessible to egg-laying females.

3.88 No evidence of marsh fritillary has been recorded within the Application Site since 2005, and the deterioration of habitat quality reduces the likelihood of natural colonisation. Further, no additional records of this species have been identified during the course of the updated desk study. It is therefore considered extremely unlikely that population of this butterfly persists at the Application Site.

Brown Hairstreak

3.89 The most comprehensive search of the Application Site for brown hairstreak eggs was undertaken during winter 2010/2011, which found eggs in many of the hedgerows and

blackthorn scrub in the eastern half of the Application Site. A total of 478 eggs were recorded during 40hrs of search effort. During the 2013 egg search, a total of eight brown hairstreak eggs were recorded in four different blackthorn stands.

3.90 During the 2020 egg search, 45 brown hairstreak eggs were found on the Application Site. Adult sightings are rare; however, between 2005 and 2010, three sightings of adult brown hairstreaks were made and adults were recorded on the 2020 butterfly transects. The 2020 egg locations and adult sightings of brown hairstreak can be found on **Plan EDP 21**.

3.91 The findings of the winter 2010/11 search confirm that the Application Site supports a strong colony of this species. The abundance of young unmanaged blackthorn, together with mature trees (particularly ash and oak and nectar sources) provide optimal conditions for adults, eggs and larvae of the species.

3.92 It is not possible to compare the results of the previous egg searches with the 2020 search due to the differences in sampling and surveyor effort; however, the 2020 survey findings confirm the continued presence of the breeding colony. The abundance of eggs (and size of colony) is likely to fluctuate significantly from year to year depending on the weather conditions experienced during the preceding summer (i.e. during the adult flight period).

Black Hairstreak

3.93 Between 2006 and 2010, recorders from Butterfly Conservation made eleven sightings of adult black hairstreaks on the Application Site. Eight of these eleven sightings were made near the scrub band at the eastern end of Field F12.

3.94 No records of black hairstreak eggs were reported at this time and no black hairstreak eggs were recorded during the 2013 brown hairstreak egg search. A total of two black hairstreak eggs were found during the 2020 egg search, one on the boundary between field F11 and F12 and one on the boundary between F7 and F8.

3.95 During the 2011 survey, one possible black hairstreak was observed on 05 July 2011. No black hairstreak butterflies were recorded during the three targeted surveys in 2013; however, two adults were recorded during the first white-letter hairstreak adult search on 30 June 2013. Both butterflies were seen on the western boundary of Field F9. During the 2020 butterfly transects, black hairstreak butterfly was seen in two locations: one on the boundary between F11 and F12 and one on the boundary between F9 and F12.

3.96 It is not possible to reliably estimate the size of the black hairstreak population supported by the Application Site. However, the 2020 survey findings provide confirmation of continued presence and suggest that a relatively stable breeding colony is present. The 2020 egg locations and adult sightings of black hairstreak can be found on **Plan EDP 20**.

White-letter Hairstreak

3.97 The findings of the updated white-letter hairstreak surveys undertaken by Butterfly Conservation are set out in full in **Annex EDP 12**, and are summarised below together with previous survey data and results from EDP's wider invertebrate surveys.

3.98 In 2020, 124 elms were assessed. The proportion of elm on the site assessed to be Good has declined from 24% to 16%. The proportion of elm assessed to be Medium is approximately the same as it was in 2013. The proportion of elm that was assessed to be poor or dead has increased from 47% to 56%.

3.99 The condition of the elm on the Application Site has declined over the last ten years. Notably a large proportion of the elm (44%) was found to be dead and there were no veteran live elm found. There are many immature elm (some of Good quality) but it is possible that these will also succumb to Dutch elm disease (DED) when they mature. However, the elm population at the Application Site is constantly changing and developing and, while the death rate is high, several younger elms will become suitable soon and there are signs of suckering, which has the potential to provide more suitable elms in the future. Therefore, the site should continue to remain suitable despite the increased level of DED.

3.100 A total of 25 eggs were found in the 2011 surveys and 8 were found in the 2013 surveys. No specific egg searches were conducted in 2020 however, some eggs (number unknown) were found during the elm assessment to confirm that this species still breeds at the Application Site.

3.101 Four white-letter hairstreak adults were recorded in three areas in 2013. A total of ten adult sightings were made in 2020; seven by Butterfly Conservation and three by EDP's invertebrate surveyor. The 2020 egg locations and adult sightings of white-letter hairstreak can be found on **Plan EDP 20**.

Small Heath

3.102 No small heath butterflies were observed in the Application Site during any of the surveys in 2011. However, a total of five adults were recorded during the 2013 surveys. It was recorded in 2020 by both Butterfly Conservation and EDP's invertebrate surveyor.

3.103 The small numbers recorded in 2013 and 2020, suggest that a relatively small population is present. Based on the availability of suitable breeding habitat within the study area, together with a general lack of suitable habitat in the immediate surroundings, it is likely that the species is breeding within the Application Site.

Moths

3.104 Full detailed results of overnight moth trapping undertaken within the Application Site are discussed in **Annex EDP 11**.

3.105 In 2013, 293 species of moth were recorded. In 2020, 282 species were recorded.

3.106 Of the species recorded, only the forester moth was considered noteworthy in terms of current conservation status. There were other species listed on s41 but these were for research purposes only.

Evaluation of the Invertebrate Assemblage

3.107 Results from the 2020 survey indicate that the Application Site continues to support invertebrate habitat and species assemblages representative of historically managed ridge and furrow grassland and fen meadow, in mosaic with scrub and remnant ancient hedgerow habitats. Pantheon analysis separately undertaken using both the 2020 survey data and the 2013-16 dataset indicated a small increase in conservation value across all six significantly recorded habitat-level assemblages.

3.108 Based on the SQI scores, especially for habitat-level assemblages including 'Short sward and bare ground', 'Marshland' and 'Peatland' and SATs including A212 'bark and sapwood decay' and the resource-based F002 'Rich flower resource' and F001 'scrub edge', together with the presence of all three of Britain's rarest hairstreak butterflies, confirm that overall invertebrate population supported by the Application Site is an IEF of at least Regional ecological importance, but falls short of being of National importance.

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Section 4
Summary and Conclusions

Important Ecological Features

4.1 Based on the results of the detailed baseline investigations, a total of 23 Important Ecological Features (IEFs) have been identified for the purposes of assessing potentially significant effects in the EcIA. These are made up of: four designated sites; eight habitats; and 11 species/species assemblages.

4.2 These features, identified on the basis of being of Local level ecological importance or greater (or subject to legal protection), are summarised in **Table EDP 4.1**.

Table EDP 4.1: Important Ecological Features of Local Value or Above

IEF	Summary	Level of Importance
Statutory Sites		
Wendlebury Meads and Mansmoor Closes (SSSI)	Downstream of Langford Brook, this is a traditionally-managed unimproved neutral meadows supporting a complex variety of plant communities that have developed in response to varying management, drainage and soils.	National
Otmoor SSSI	Downstream of Langford Brook and is an area of wetland flooded in winter and traditionally managed as rough grazing marsh. Contains a wide range of habitats with many species of nationally uncommon plants and animals. Approximately half of the site is herb-rich damp grassland which grades into wet sedge and coarse grassland.	National
Non-statutory Sites		
Gavray Drive Meadows LWS	A mosaic of small damp fields with ponds, divided by thick hedges with old trees.	County
Ray CTA	Situated along the alluvial floodplain of the River Ray extending along many small tributary streams and including some areas of land between these streams. Wet grassland – floodplain grazing marsh and lowland meadow and ridge and furrow are noted.	County
Habitats		
Unimproved and Species-rich Semi-improved Neutral Grassland	Small areas within F3, F7, F11 and F12. Showing examples of NVC communities MG1b, MG1c, MG4, MG6b and MG5c.	County
Semi-improved Neutral Grassland	Discrete areas within F4, F5, F6, F8, F9. Including poorer examples of NVC communities MG6b and MG9a.	Local
Marshy Grassland and Swamp	Discrete areas within Fields F1, F2, F3, F8, F9 and F10. Including examples of NVC communities MG9a, MG10b, M23b and S7.	Local–County

IEF	Summary	Level of Importance
Broad-leaved Semi-natural Woodland	In many patches across the Application Site. Mostly developed from mature dense scrub and also incorporates mature standards.	Local
Veteran and Mature Trees	Several veteran and mature trees across the Application Site.	Local
Hedgerows	Many former hedgerows have expanded out into the adjacent fields to form large blocks of dense scrub. Twelve discernible hedgerows are currently present, two of which qualify as 'Important' under the Hedgerows Regulations.	Local
Ponds	Several ponds across the site most of which are currently in poor condition, being silted and overshaded and subject to regular drying.	Local
Water course	Langford Brook runs through the centre of the Application Site and forms a wildlife corridor.	Local
Species		
Arable weeds	Associated with the margins in Fields F13 and F14.	Local
Wintering Bird Assemblage	No species recorded that are considered to be of significant ecological value but a good diversity and abundance of species recorded.	Local
Breeding Bird Assemblage	The majority of species associated with the woodland, hedgerows, and scrub; the limited size of other habitats, such as wetland habitats, reduces the potential for large populations of habitat specialists.	Local
Barn owl	Potential nesting or roosting in mature trees but not recorded recently.	Less than Local
Bat Assemblage	Potential (unconfirmed) roosting in mature trees and a moderate assemblage of predominantly of common and widespread species using the site for foraging and commuting.	Local
Otter	Langford Brook likely forms part of a wider otter territory.	Local
Water vole	Potential very small population present on Langford Brook.	Less than Local
Badger	No setts or other signs detected during surveys but report of badgers received during EIA scoping and presence assumed on a precautionary basis.	Less than Local
Amphibian Assemblage	Assemblage includes a medium sized metapopulation of great crested newts breeding in ponds within and adjacent to the Application Site, and using rough grass and scrub habitats in their terrestrial phase.	Local-County
Reptiles	A large population of common lizard and a small population of grass snake, supported by the mosaic of rough grass, tall herb and scrub habitats.	Local-County
Invertebrate Assemblage	A very diverse assemblage of invertebrates supported by the mosaic of species-rich grassland, scrub, hedgerow, woodland and aquatic habitats.	Regional

Annex EDP 1
Desk Study Method and Results

Methodology

A1.1 EDP undertook an updated ecological desk study for the study area in September 2020 to check for information on designated sites and protected species within the potential zone of influence, as measured from the red line boundary. Previous desk studies were undertaken in 2013 and 2018 by EDP.

A1.2 The desk studies involved collating information from both statutory and non-statutory bodies, including:

- Thames Valley Environmental Records Centre (TVERC); and
- Multi-Agency Geographic Information for the Countryside (MAGIC[14]).

A1.3 Biodiversity information was requested for the following search areas measured approximately from Ordnance Survey Grid Reference SP 596 223:

- 10km radius for sites of European importance;
- 5km radius for sites of national importance;
- 6km radius for Annex II bat species;
- 2km radius for sites of local importance;
- 2km radius for other protected/notable species records; and
- 500m radius for Priority Habitats.

A1.4 These search areas are considered sufficient to cover the potential Zone of Influence (ZoI)[15] of the proposed development in relation to designated sites, habitats and species.

A1.5 Any pertinent information received as a result of the updated desk study has been included and specifically referenced within the results section.

14 MAGIC Partners (2019) Interactive Map. [Online] Available from: https://www.magic.gov.uk. [Accessed 02 September 2020].
15 Zone of Influence - the areas and resources that may be affected by the proposed development.

Results

Statutory Designations

A1.6 International statutory designated sites include Natura 2000 sites regarded as being important at a European level including, Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and globally important wetlands designated as Ramsar Sites. National designations include Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs). Local designations include Local Nature Reserves (LNRs).

A1.7 There have been no new designations since the last desk study. The Application is not covered by any statutory designations. However, there is one site of local importance within 2km as shown in **Table EDP 3.1**. Whilst an additional SSSI occurs within the search radius (Stratton Audley Quarries), this is cited for geological reasons and is not discussed further.

Table EDP A1.1: Statutory Designation within 2km of the Application Site

Site Name	Grid Reference	Approx. Distance from Site	Size (ha)	Interest feature(s)
LNRs				
Bure Park	SP578237	1.5km NW	8	Grass meadow, young broad-leaved woodland, hedges and scrub. A small river (the Bure) runs through the site, feeding a small pond which inhabits great crested newts. A balancing pond at one end of the Reserve is fed by run-off from the area.

Non-statutory Designations

A1.8 Non-statutory designations in Oxfordshire are known as Local Wildlife Sites (LWSs). In addition, there are other non-statutory designations that may be pertinent in the locality, including Conservation Target Areas (CTAs), which is a landscape scale designation that has been identified as supporting high concentrations of UK Biodiversity Action Plan (BAP) habitats and species and potential for restoration.

A1.9 Additional designations include proposed LWS, Local Geological Sites (LGSs), and conservation target areas/biodiversity opportunity areas. These sites do not meet the criteria for LWS designation but may be included within Local Plans.

A1.10 The Application Site is covered by two non-statutory designations and there have been multiple changes since the last desk study. The sites are listed and further detail (as supplied by TVERC) is given in **Table EDP A1.2**.

Table EDP A1.2: Non-statutory Designations within 2km of the Application Site

Site Name	Grid Reference	Approx. Distance from Site	Size (ha)	Interest feature(s)
Oxfordshire Local Wildlife Sites				
Gavray Drive Meadows	SP595226	Within	16	**Retained, formerly a Proposed CWS** Damp fields with associated flora such as devil's-bit scabious and common spotted orchid, ponds and thick hedges. Seven BoCC species, four bat species, 26 beetles including the nationally scarce *Bembidion gilvipes* and diverse butterfly sightings.
Meadows North West of Blackthorn Hill	SP610213	1.1km SE	22	**Retained LWS** Lowland meadow and fen with associated flora species including red data book, tubular water dropwort. Three BoCC species have also been noted.
Cutter's Brook Meadows	SP619218	1.7km E	3	**Addition** Two unimproved hay meadows on the River Ray floodplain. Species-rich sward. NVC MG4 grassland with a pond. Notable birds, hedgerows and trees.
Graven Hill	SP588209	1.5km S	16	**Retained LWS** Oak and ash woodland with a mixed shrub layer. Ancient woodland indicators, sedge and grass species are found.
Bicester Wetland Reserve	SP577262	2km SW	8	**Addition** Wet grassland with a small area of reedbed, open water and ditches. There is a mixture of wetland plants and the site is important for overwintering wildfowl of conservation status.
Bicester Airfield	SP599240	1.4km N	161	**Retained LWS** Species-rich and rough grassland with 24 flora species.
Cherwell District Wildlife Site				
Skimmingdish Lane Balancing Pond	SP590242	1.7km N	1.4	**Addition** Small area of grassland, wetland and scrub with species rich wildflowers and locally rare species. Area of unimproved grassland, remnant lowland meadow and remnant lowland fen. Birds, bats and reptiles of conservation concern present.
Conservation Target Areas				
Ray Conservation Target Area	Multiple	Within and adjacent to E and NE boundary.	1192	**Retained CTA** Situated along the alluvial floodplain of the River Ray extending along many small tributary streams and including some areas of land between these streams. Wet grassland and ridge and furrow are noted.

Site Name	Grid Reference	Approx. Distance from Site	Size (ha)	Interest feature(s)
Proposed Cherwell District Wildlife Sites				
Bicester Triangle	SP594221	190m S	<1	**Addition** Small community woodland
Island Pond Wood	SP609222	718m NE	4	**Retained LWS** Local community woodland and pond which is prone to flooding. Species include willow, alder and ash.
Skimmingdish Lane Balancing Pond (East)	SP591242	1.4km NW	<1	**Addition** Pond with areas of species-rich grassland and scrub. Adjacent to Skimmingdish Lane Balancing Pond.
Sites no longer mentioned				
Kingstone Down	SP596230	405m N	<1	**Removed, former LWS** Linear strip of trees and shrubs along a public right of way. Species rich hedgerows with some mature trees utilised by birds.
Skimmingdish Lane Fields	SP601233	935m N	5	**Removed, former Proposed LWS** Little information known, formerly part of airfield site. Thought to be rough grassland on old allotments.

Priority Habitats

A1.11 Details of priority habitats within 500m of the Application Sites can be found below. Natural England have created National Habitat Network Mapping to assist the UK in reaching conservation targets. A series of mapping zones have been created with specific targets for creation, enhancement and management of the land use. A network expansion zones[16] has been described as targeting action to "*improve connections between existing habitat networks*".

A1.12 The Application Site is listed within the Priority Habitat inventory, and two additional priority habitats occur within 500m. Details are illustrated in **Table EDP A1.3**.

Table EDP A1.3: Priority Habitats within 500m of the Application Site

Habitat	Size (ha)	Approx. distance from site	Locality Note
Retained Deciduous Woodland	2	Adjacent – N	Railway
Retained Deciduous Woodland	1	90m N	Industrial estate
Addition Network Expansion Zone	Extensive	Within	East and south-eastern region
Removed Semi-improved grassland	8	Within	Extending east

16 Edwards J, Knight M, Taylor S & Crosher I. E (May 2020) 'Habitat Networks Maps, User Guidance v.2', Natural England.[Online] Available from: https://magic.defra.gov.uk/Metadata_for_magic/Habitat%20Network%20Mapping%20Guidance.pdf#:~:text=Network%20Enhancement%20Zone%202%3A%20Land%20connecting%20existing%20patches,and%2For%20green%20infrastructure%20provision%20can%20be%20targeted%20here [Accessed 27 August 2020].

Protected and Notable Species

Table EDP A1.4: Notable species records within 2km

Scientific Name	Common Name	Grid Ref	Approx. Distance from Site	Date	Comments	Status
Birds						
29 bird species including: Barn owl, black-headed gull, bullfinch, dunnock, fieldfare, green sandpiper, green woodpecker, grey wagtail, house martin, house sparrow, kestrel, kingfisher, lesser black-backed gull, lesser redpoll, linnet, mallard, redwing, reed bunting, song thrush, willow warbler		**Within Application Site** – multiple observations		2017-2013		WCA S. 1, NERC S. 41, Red and amber BoCC,
64 bird species including: Bullfinch, curlew, dunnock, house sparrow, kestrel, kingfisher, mallard, red kite, skylark, song thrush, starling, stock dove, swallow, swift, willow warbler, yellowhammer		**Wider Area** - Multiple locations within 2km, mainly concentrated near non-statutory designated sites.		2017-2008		WCA S. 1, NERC S. 41, Amber listed BoCC, Local BAP species
Reptiles and amphibians						
Triturus cristatus	Great crested newt	**Within Application Site**		2018-2013	Peak of 64	EPS, WCA, Sch. 5(9.4) NERC s. 41, Local BAP species
		Wider Area - Multiple locations within 2km, mainly concentrated near Graven Hill		2018-2013	Peak of 37	

Scientific Name	Common Name	Grid Ref	Approx. Distance from Site	Date	Comments	Status
Natrix helvetica	Grass snake	**Within Application Site** – eight observations		2013	Peak of 2	NERC s. 41
		SP606235 SP600239 SP611230	1.3km N 1.4km N 1.3km NE	2017-2015		
Zootoca vivipara	Common lizard	**Within Application Site** –14 observations		2013	Peak of 44	NERC s. 41
		Wider Area - Multiple observations and locations with 2km search area, mainly concentrated at designated sites.		2017-2015	Peak of 12	
Mammals						
Muntiacus reevesi	Chinese Muntjac	**Within Application Site**		2017 2016	Non-native species	WCA, Sch. 9
Meles meles	Badger	SP612223 SP600238 SP611230	1.1km NE 1.3km N 1.2km NE	2017 2016 2015	2017 and 2016 records are setts	PBA WCA, Sch. 6
Micromys minutus	Harvest mouse	**Within Application Site**		2013	Four nests found in total	NERC s.41
Erinaceus europaeus	Hedgehog	Multiple locations within 2km		2019- 2007		NERC s.41, Local BAP
Neovison vison	American mink	SP586242	1.6km NW	2019		WCA, Sch. 9

Scientific Name	Common Name	Grid Ref	Approx. Distance from Site	Date	Comments	Status
Bats						
Barbastella barbastellus	Barbastelle	SP607200 SP611199	2km SE 2.2km SE	2015 2015		Annex II EPS
Plecotus auritus	Brown long-eared bat	**Roost within Application Site**		2017	Hawthorn NE woodland	EPS, NERC s. 41, Local BAP species
		Multiple locations within 2km, largely Symmetry Park		2015 - 2012		
Pipistrellus pipistrellus	Common pipistrelle	**Within Application Site –** Three observations		2013		
		Multiple locations within 2km, largely Symmetry Park		2017-2014		
Pipistrellus pygmaeus	Soprano pipistrelle	SP596229 SP597223	**Within**	2013		
		Multiple locations within the wider 2km, largely Symmetry Park		2015		
Nyctalus noctula	Noctule bat	SP596224 SP596237	**Within**	2013		
		Multiple locations within the wider 2km, largely Symmetry Park		2017-2015		
Nyctalus leisleri	Leisler's bat	SP596225	**Within**	2015		
		Multiple locations within 2km, largely Symmetry Park		2015		

Scientific Name	Common Name	Grid Ref	Approx. Distance from Site	Date	Comments	Status
Myotis sp.	*Myotis* species	SP599222 SP596233 SP597223	**Within**	2017	Two tree roosts - 2 x hawthorn	
		Multiple locations within 2km, concentrated near Manor Farm, Graven Hill and Symmetry Park.		2015		
Eptesicus serotinus	Serotine bat	Multiple locations within 2km, largely Symmetry Park		2015		
Unidentified bat droppings found during 2017 at Bicester Airfield						
Flora						
Common bistort, Devil's-bit scabious, narrow-leaved vetch, ragged-robin and tormentil		**Within Application Site**		2013	Including TVERC survey data	Oxon rare, scarce, IUCN NT
Annual pearlwort, bluebell, bloody crane's-bill, dwarf cherry, dwarf gorse, dwarf spurge, field scabious, fine-leaved water-dropwort, grey club-rush, hoary plantain, intermediate polypody, lesser spearwort, mousetail, shepherd's cress, quaking-grass, ragged-robin, Russian-vine, small-flowered buttercup, tormentil, tubular water-dropwort, water fern, wild clary		Within 2km search area		2018-2011		WCA, S. 13(1a), Oxon rare, scarce, IUCN NT, VU
Butterfly-bush, Italian alder, Japanese knotweed, Nuttall's waterweed		Within 2km search area, mainly concentrated near Bicester airfield and Village Retail Park.		2018-2013	Closest was Nuttall's waterweed at 813m NW	WCA, Sch. 9

Scientific Name	Common Name	Grid Ref	Approx. Distance from Site	Date	Comments	Status
Invertebrates						
Rhinocyllus conicus *Thamiocolus viduatus* *Polydrusus (Eustolus) flavipes* *Phytoecia cylindrica* *Phyllobius (Phyllobius) vespertinus* *Coelositona puberulus* *Meligethes rotundicollis* *Stenus (Hypostenus) oscillator* *Tachyporus formosus* *Agabus (Agabus) uliginosus* *Helophorus (Trichohelophorus) alternans*		SP5922	Gavray Drive Meadows	2013	Beetles	IUCN, Notable species
Ceutorhynchus atomus *Larinus planus* *Polydrusus (Eustolus) flavipes* *Rhinocyllus conicus*		SP5820	At Graven Hill	2015	Beetles	IUCN, Notable species
Oxystoma cerdo *Larinus planus* *Catapion pubescens* *Squamapion cineraceum* *Zacladus exiguus*			Within 2km at Bicester heritage	2018	Beetles	Notable species

Scientific Name	Common Name	Grid Ref	Approx. Distance from Site	Date	Comments	Status
Black hairstreak, brown argus, brown hairstreak, comma, common blue, Essex skipper, gatekeeper, green-veined white, grizzled skipper, holly blue, large skipper, large white, marbled white, meadow brown, orange-tip, painted lady, peacock, purple hairstreak, ringlet, small copper, **small heath,** small skipper, small, tortoiseshell, small white, speckled wood, **white-letter hairstreak**		Within the Application Site		2017-2007	butterflies	**NERC, s.41 Regional priority species**
Euphydryas aurinia	Marsh fritillary	SP701168	11km SE	2012		NERC s.41, Regional priority species
Deep-brown Dart, Dot Moth, Dusky Brocade, Forester Green-brindled Crescent, Lackey, Large Nutmeg, Large Wainscot, Latticed Heath, Mottled Rustic, Mouse Moth Oak Hook-tip, Rosy Minor, Rosy Rustic, Sallow, Shaded Broad-bar, Shoulder-striped Wainscot, Small Emerald, Small Phoenix, Small Square-spot, blood-vein, cinnabar, beaded chesnut, buff ermine,		Within Gavray Meadows		2013-2014	Moths	NERC S-41
Fish						
Cottus gobio	Bullhead	SP584218	1km SW	2013		Annex II
Crustacean						
Austropotamobius pallipes	Freshwater crayfish	SP587214	1.2km SW	1994	Dated record	WCA, Sch. 5 (9.1), NERC, s.41

Scientific Name	Common Name	Grid Ref	Approx. Distance from Site	Date	Comments	Status
Crangonyx pseudogracilis	Northern river crangonyctid	SP584218 SP587215	1.1km SW 1.1km S	2015	Invasive species	WCA, Sch. 9
Pacifastacus leniusculus	Signal crayfish	SP584218	130m S	2015	Pond adjacent to Gavray Drive and Redwing Close	WCA, Sch. 9

Abbreviations used within the table: Annex II EC Habitats Directive, BoCC Birds of Conservation Concern, DBH diameter at breast height, EPS European Protected Species, IUCN NT VU International Union for Conservation of Nature – Near threatened, vulnerable, NERC Natural Environment and Rural Communities Act 2006, WCA Wildlife and Country Side Act 1981

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Annex EDP 2
Pre-application Consultation Summary

Table EDP A2.1: Correspondence regarding scope of ecology surveys

Organisation	Name	Date of Contact by EDP	Form of Contact	Date of Response	Summary of Response
Butterfly Conservation	Steve Wheatley	09/04/20	Email with attachments	27/04/20	No objection/agree with scope.
Cherwell District Council (CDC)	Charlotte Watkins	09/04/20 (re-sent on 01/05/20)	Email with attachments	04/05/20	Has a high case load and would prefer to wait for formal pre-app.
		03/06/20	Email	17/06/20	Preparing full pre-app response, but do not see any issues/omissions re: survey scope.
BBOWT	Haidrun Breith	09/04/20 (re-sent on 01/05/20)	Email with attachments	N/A no longer at BBOWT	
	Sam Cartwright	26/05/20	Email with attachments	26/05/20	New contact is Neil Rowntree. EDP email has been forwarded on.
	Neil Rowntree	N/A		26/05/20	Has a high case load and unable to respond at the current time. Welcomes further engagement in future.
Natural England	Rebecca Micklem	09/04/20	Email with attachments	11/05/20	Response from Elizabeth Ball, Consultations Team. No objection in respect of impacts on statutory sites. No specific comments on survey scope (instead refers to Standing Advice).

Table EDP A2.2: Pre-application consultation with CDC on ecology matters

Date	Nature of Communication	Details
22/06/20	Correspondence (Charlotte Watkins)	• Survey scope acceptable but not possible to rule out need for further surveys following additional information • Application should include long term management plan for the LWS including level of public access and funding • Achievement of 10% biodiversity net gain should be demonstrated through the use of a Biodiversity Metric • Request details of enhancements within the built environment e.g. bird and bat bricks

Date	Nature of Communication	Details
06/07/20	Meeting/Video Call	Attendees: Tom Wigglesworth (EDP) Peter Chambers (DLA) Russell Crow (L&Q Estates) Caroline Ford (CDC Case Officer) Charlotte Watkins (CDC Ecology Officer) Alex Keen (CDC Planning Officer)
10/08/20	Meeting/Video Call	Attendees: Tom Wigglesworth (EDP) Peter Chambers (DLA) Russell Crow (L&Q Estates) Caroline Ford (CDC Case Officer) Charlotte Watkins (CDC Ecology Officer)
28/10/20	Correspondence (Charlotte Watkins)	• Draft Ecology Mitigation and Management Strategy (EDP October 2020) generally acceptable • Full document will require details of funding, management body, reviews and a management schedule, including management of public access within the LWS • Full scheme should also include measures and management within the proposed developed areas of the site

Table EDP A2.3: EIA Scoping Responses (Ecology)

Organisation	Name	Date of Response	Summary of Response (Ecology)
Natural England	Rebecca Micklem	21/09/20	• Assessment should follow CIEEM EcIA Guidelines • Welcomes inclusion of Otmoor SSSI and Wendlebury Meads and Mansmoor Closes SSSI in assessment • Recommends consulting BBOWT and TVERC • Refers to NE Standing Advice regarding Protected Species • Recommends consulting Butterfly Conservation
Environment Agency	Sarah Green	07/10/20	• Ensure impacts of disturbance from humans and pets included in assessment • Expect a minimum 10% net gain in biodiversity • Recommends undertaking a River Corridor Survey of the Langford Brook • Assessment should refer to River Basin Management Plan and Water Framework Directive status of the Langford Brook demonstrate that there will be no deterioration

Organisation	Name	Date of Response	Summary of Response (Ecology)
CDC	Charlotte Watkins	07/10/20	• Assessment should include: the Upper Ray Conservation Target Area (CTA); all grassland habitats (not just the LWS); priority hedgerows (not just 'important' hedgerows); all wetlands (not just historic field ponds); water vole; and otter • Assessment methodology should follow CIEEM Guidelines 2019 • Achievement of 10% biodiversity net gain should be demonstrated through the use of a Biodiversity Metric
CPRE	N Dolden	05/10/20	• Assessment should include the Upper Ray Conservation Target Area (CTA) • Assessment should include noise, light and dust pollution during and post construction • Assessment should include marsh fritillary butterfly • Density of housing west of Langford Brook could be increased to enable a reduction in the developable area east of the brook
Bioscan	Dominic Woodfield	29/09/20	• Development should be excluded from the CTA • Density of housing west of Langford Brook could be increased to enable a reduction in the developable area east of the brook • Assessment methodology should follow CIEEM Guidelines 2019 • Information on costings, funding and delivery mechanism of the Wildlife Management Plan should be provided • Achievement of 10% biodiversity net gain should be demonstrated through the use of a Biodiversity Metric • Assessment should include: the Upper Ray Conservation Target Area (CTA); all grassland habitats (not just the LWS); priority hedgerows (not just 'important' hedgerows); all wetlands (not just historic field ponds); water vole; otter; and badger • Agree marsh fritillary butterfly no longer present
Save Gavray Drive Meadows for Bicester	Susan Hall	25/09/20	• Opposed to any development within the CTA • Density of housing west of Langford Brook could be increased to enable a reduction in the developable area east of the brook.
	Patricia Clissold	23/09/20	• Grassland/invertebrate interest is suffering through a lack of management and resulting scrub encroachment • Current development proposals are an improvement on previous proposals • Development must deliver a long-term management plan for the Local Wildlife Site (LWS)

Table EDP A2.4: Summary of Stakeholder/Public Consultation*

Date	Nature of Communication
15/10/20	Ecology Stakeholder Meeting/Video Call
02/12/20	Ecology Stakeholder Meeting/Video Call
05 to 25/01/21	Leaflet drop in local area inviting comments
24/02/21	Stakeholder Meeting/Video Call

*Meeting agendas, minutes and shared information available on consultation website (www.spbroadway.com/gavray/defult-page-4/)

Annex EDP 3
Habitat Surveys

Survey Methodologies

Phase 1 Survey

A3.1 The survey technique adopted for the initial habitat assessment was at a level intermediate between a standard Phase 1 survey technique[17], based on habitat mapping and description, and a Phase 2 survey, based on detailed habitat and species surveys. The survey technique is commonly known as an Extended Phase 1 Survey.

A3.2 The level of survey involves identifying and mapping the principal habitat types and identifying the dominant plant species present in each principal habitat type. In addition, any actual or potential protected species or species of principal importance are identified and scoped.

A3.3 An updated Extended Phase 1 Survey of the Application Site was undertaken by a suitably experienced surveyor on 29 August 2019 to check for any material changes in habitat type or suitability for protected species/species groups during the intervening period between this survey and the survey last undertaken in 2013.

Detailed Botanical Surveys of Grassland

A3.4 Detailed botanical surveys of the grassland habitats within the Application Site were completed during 2002 and updated in 2013. Owing to the time that has since elapsed, a further update survey was completed over two visits by an experienced botanical surveyor: the first on 29 August 2019 and the second on 08 June 2020. The second visit was undertaken to revisit three fields which had been mown in advance of the August visit (F3, F8 and F9), and to revisit the two historic lowland meadow fields (F11 and F12) at a more optimal time of year.

A3.5 Where National Vegetation Classification (NVC) survey was possible in these areas distinct plant communities and sub-communities were identified and where possible five 2m square quadrats were recorded in each community/sub-community with the quadrats being scored in accordance with standard NVC methodology. The species scores were referenced to the plant community tables contained within British Plant Communities Volume 3[18] and Volume 4[19].

[17] Joint Nature Conservation Council (2004) *Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit* (reprinted with minor corrections for original Nature Conservancy Council publication).
[18] British Plant Communities Volume 3: Grasslands and montane communities. Ed J.S. Rodwell. Cambridge University Press 1992 (1998 edition)
[19] British Plant Communities Volume 4: Aquatic communities, swamps and tall-herb fens. Ed J.S. Rodwell. Cambridge University Press 1995 (2005 edition)

A3.6 Field 7, although comprising three small units separated by significant blocks of scrub, supported sufficient homogenous and ungrazed grassland to allow five quadrats to be taken.

A3.7 However, where the grassland areas were too small to offer sufficient scope for quadrats for NVC survey (Field F1), or where the swards were too disturbed to support homogenous plant communities (Fields F5 and F6), NVC survey was not possible and in its place plant species abundance was recorded using the DAFOR scale (Dominant, Abundant, Frequent, Occasional, and Rare).

Hedgerow Survey

A3.8 A detailed hedgerow survey was conducted on 06 May 2020. The Wildlife criteria provided in Part II of Schedule 1 of the Hedgerows Regulations (1997) was followed to determine the ecological importance of the site's hedgerows. The Hedgerows Regulations (1997) serve the purpose of ensuring the retention of important countryside hedgerows; their removal only being approved by the relevant local authority.

A3.9 The aims of the hedgerow assessment were to:

(i) Identify hedgerows that are classified as 'important' under the ecological criteria of the Hedgerows Regulations (1997); and

(ii) Identify hedgerows that, although not deemed 'important' under the ecological criteria of the Hedgerows Regulations (1997), have ecological value in terms of species diversity, or as potential wildlife corridors.

A3.10 A total of 12 hedgerows were surveyed, as shown on **Plan EDP 4**. Hedgerows qualify for assessment by exceeding 20m in length or by being connected at both ends to another hedgerow of any length. The middle 30m of all hedgerows up to 100m in length were surveyed, whilst two 30m sections were surveyed for hedgerows up to 200m. Hedgerows surveyed were assigned points dependent upon the number of qualifying 'features' as defined by the Hedgerows Regulations (1997), with total scores per hedgerow determining their status.

A3.11 Qualifying as an 'important' hedgerow requires the hedgerow assessed to be greater than 30 years of age and contain species listed in Schedule 5 (animals) and 8 (plants) of the Wildlife and Countryside Act 1981 (as amended), birds categorised as declining breeders (Category 3) within the 'Red Data Birds in Britain' (Batten 1990), or any species categorised as 'endangered', 'extinct', 'rare' or 'vulnerable' by any of the British Red Data Books.

A3.12 Hedgerows are also considered important should they satisfy any of the following criteria:

- That the hedgerow is referred to in a record held by a biological records centre as containing protected plants (within 10 years) or birds and animals (within five years); or

- That the hedgerow contains one of the following criteria per average 30m section surveyed:
    - Seven Schedule 3 species; or
    - Six Schedule 3 species and three listed features (see below); or
    - Six Schedule 3 species, including one of the following: black poplar, large-leaved lime, small-leaved lime or wild service-tree; or
    - Five Schedule 3 species and four listed features; or
    - Four Schedule 3 species, two listed features and lying adjacent to a bridleway or footpath.
- Listed features to include:
    - A bank or wall which supports the hedgerow along at least half of its length;
    - Gaps which together do not exceed 10% of the length of the hedgerow;
    - At least one standard tree per 50m of hedge;
    - At least three Schedule 2 woodland species within the hedgerow;
    - A ditch along at least one half of the length of the hedgerow;
    - Connections scoring 4 points or more (1 point per connection of the hedgerow with another, 2 points per connection of the hedgerow to a pond or broad-leaved woodland; and
    - A parallel hedge within 15 m of the hedgerow.

A3.13 A detailed hedgerow survey was conducted on 06 May 2020. The Wildlife criteria provided in Part II of Schedule 1 of the Hedgerows Regulations 1997 was followed to determine the ecological importance of the site's hedgerows. The Hedgerows Regulations (1997) serve the purpose of ensuring the retention of important countryside hedgerows; their removal only being approved by the relevant local authority.

River Corridor Survey

A3.14 In response to a request made in the Environment Agency's EIA scoping response, an additional survey of the Langford Brook and associated riparian habitats was undertaken in accordance with standard River Corridor Survey (RSC) methodology[20].

[20] *National Rivers Authority (1992). River Corridor Surveys.* Conservation Technical Handbook Number 1. *NRA, Bristol*

A3.15 A River Corridor Survey is a standardised approach to characterising the physical and ecological features of a watercourse. Originally developed as a conservation tool, it has previously been used to classify the conservation resource of aquatic habitats, to highlight important features requiring protection and to identify opportunities to rehabilitate damaged habitats.

A3.16 The stretch of the Langford Brook within the Application Site (c. 260m in length) was surveyed spanning from the northern boundary (OS Grid Ref. 59599 22504) to its downstream extent at the southern boundary (OS Grid Ref. SP 59575 22247) where the water course passes through a culvert beneath Gavray Drive.

A3.17 The River Corridor Survey was undertaken by a suitably qualified EDP ecologist on 11 December 2020, during which the weather was 7°C and dry with no rainfall in the preceding days.

A3.18 The River Corridor Survey included an assessment of four definable zones, with mapping of key features and habitats:

- Aquatic zone – plant communities, flow and current features, substrate and physical features;
- Marginal zone – plant communities, substrate and physical features;
- Bank zone – tree species, other plant communities, physical features; and
- Adjacent land zone – habitat types, land use.

A3.19 During the survey, two representative cross-sections were drawn for the surveyed watercourse to indicate:

- Width of the water filled channel;
- Depth of water;
- Bank height, slope and width;
- Flood bank height and width where appropriate;
- Water level relative to the top of the bank; and
- Land use to a minimum of 50m either side of the river.

A3.20 An assessment of land use within 50m of the river corridor was undertaken in accordance with Phase 1 Habitat Survey Guidelines as referred to above.

Limitations

A3.21 Dense vegetation adjacent to the water-course was limited in extent such that a thorough inspection of the water-course and associated marginal and bankside habitats was possible. Although December is typically sub-optimal for the purpose of recording habitats and vegetation associated with the river corridor, this is not considered a significant constraint, particularly given the availability of survey data from previous ecological assessments of the wider Development Site undertaken by EDP since 2002 to inform various planning applications.

A3.22 In addition to the site survey, on-line open data sets held by the Environment Agency were reviewed for any survey data associated with the Langford Brook including archived water quality data[21]. Current classification of the Langford Brook under the *Water Framework Directive* (WFD) was also reviewed to inform potential constraints and opportunities to proposed development.

Survey Findings

A3.23 The habitat descriptions below should be read in conjunction with **Plan EDP 1**, which illustrates the approximate extent of the habitat features and displays the field parcel numbers on the Application Site.

A3.24 The Application Site predominantly comprises fields of semi-improved neutral grassland, the majority of which is species-rich, with discrete areas of marshy grassland present within a number of the fields, often associated with ponds. Some areas of unimproved neutral grassland remain which meet the definition of lowland meadow (a Section 41 Habitat of Principal Importance). Significant scrub encroachment has occurred across the Application Site in recent years (post-2006), resulting in an overall reduction in both the quantity and quality of grassland (as discussed in further detail below).

A3.25 The north-west third of the Application Site supports two fields that were under arable cultivation at the time of the update Extended Phase 1 Survey. A network of hedgerows, a number of which have become outgrown, now form bands of dense scrub and woodland. There is also broadleaved woodland along the roads adjacent to the southern and eastern boundaries and along Langford Brook.

Grassland Habitats

A3.26 The grassland habitats present across the Application Site are described on a field-by-field basis within **Table EDP A3.1**. This table includes additional habitat classification and condition assessment details relating to the UK Habitat Classification System (UK Hab), and the DEFRA Biodiversity Metric 2.0 which is underpinned by UK Hab, which have been

[21] https://environment.data.gov.uk/water-quality/view/explore?search=&area=10-38&samplingPointType.group=&samplingPointStatus%5B%5D=open&loc=561064%2C174349&_limit=500

used within the Biodiversity Impact Assessment (BIA) for the development proposals. The BIA is provided separately as ES Appendix 5.2 (report ref. edp124_r053a).

A3.27 DAFOR and NVC data for the grassland habitats are presented in **Tables EDP A3.2** to **A3.14**. The grassland types found within the Application Site can be summarised as follows:

Unimproved Grassland

A3.28 Unimproved neutral grassland is present in Field F7 (NVC community MG5c) and Field F11 (MG1c/MG4).

A3.29 The unimproved neutral grassland within the Application Site meets the definition of Lowland Meadow which is a Priority Habitat in England. Whilst of recognised importance at a National level, only relatively small areas of intact habitat are present. Accordingly, this habitat is judged to be of County-level ecological importance, which is consistent with its' location within the Local Wildlife Site (LWS) designation.

Image EDP A3.1: Remnant of MG5c with dense devil's bit scabious in field F7.

Semi-improved Grassland

A3.30 Semi-improved neutral grassland (of variable species-richness) is present in Fields F3, F8 and F9 (NVC community MG6b); Field F11 (MG6b/MG1a); Field F12 (MG1c/MG1b and MG6b); and in Fields F4, F5 and F6 (unclassified).

A3.31 The semi-improved grassland in Fields F3, F11 and F12 is the most species-rich. These habitats do not currently meet the definition of Lowland Meadow which, in the case of Fields 11 and 12 within the LWS, is largely due a lack of appropriate management. Based on their botanical diversity and high potential for restoration, these grasslands are judged to be of County-level ecological importance.

A3.32 The remaining, moderately species-rich semi-improved grassland habitats in Fields F4, F5, F6, F8 and F9 are judged to be of Local-level ecological importance.

Image EDP A3.2: Grassland in F3 (cut for hay/silage).

Image EDP A3.3: Grassland in F5 (recovering from damage after railway works).

Image EDP A3.4: Grassland in F11 (unmanaged).

Image EDP A3.5: Grassland, tall herb fen and scrub in F12 (unmanaged).

Marshy Grassland and Swamp

A3.33 Marsh and marshy grassland habitats are present within Fields F1 and F9 (NVC community MG10b); Fields F3 and F8 (MG9a and M23b); and in Fields F2 and F10 (unclassified). A small area of sedge swamp (S7) is also present in Field F6.

These habitats generally occur in small patches and have variable botanical diversity and rarity. The most notable habitats are the wetter grassland in furrows in Field F3 and the sedge swamp in Field F6. Taking these habitats as a group, they are judged to be of Local-County level ecological importance.

Image EDP A3.6: Marshy Grassland in F1.

Image EDP A3.7: Marshy Grassland in furrows in F3.

Poor Semi-improved Grassland

A3.34 Species-poor semi-improved neutral grassland is present in Field F10 (NVC community MG7c) and in Fields F6 and F15 (unclassified). Owing to their low botanical diversity and evidence of modification, these habitats are judged to be of less than Local ecological importance.

Woodland and Scrub

Broadleaved Woodland

A3.35 Forming the southern and south-eastern boundaries of the Application Site is a 5-10m band of planted broadleaved woodland, planted in association with the creation of the service road to its south, which largely comprises field maple (*Acer campestre*), with silver birch (*Betula pendula*), ash (*Fraxinus excelsior),* common hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), English oak (*Quercus robur*), and non-native whitebeam species (*Sorbus* spp). Ivy (*Hedera helix*) is very common in the field layer within this planted woodland.

A3.36 Broadleaved woodland also occurs in the north-east of the site where it has developed from mature dense scrub and also incorporates mature standards and mature shrub species that line the edges of a former trackway. Species here are primarily English oak and ash as standards (along the former trackway) with common hawthorn, blackthorn and ash as the sub-canopy/understorey. Part of the former trackway is still open and is effectively a ride through this small area of broadleaved woodland. Ivy is fairly common in the field layer here but other herbs and grasses were sparse with no species of any note being recorded here.

Image EDP A3.8: Trackway through the broadleaved woodland north of F7.

A3.37 Another small area of broadleaved woodland is present in the south-east; this has developed from mature dense scrub and no species of any note were recorded here.

A3.38 The broadleaved woodland habitats within the Application Site meet the definition of Lowland Mixed Deciduous Woodland which is a Priority Habitat in England. Whilst this broad habitat type is of recognised importance at a National level, the habitats within the Application Site are relatively small in extent, lack diversity or a rich ground flora and show signs of modification and are judged to be of no greater than Local-level ecological importance.

Dense Scrub

A3.39 This is a common habitat found widely across the eastern two thirds of the Application Site, although predominantly in association with unmanaged hedgerows where it is commonly found as an outgrowth of those hedgerows and is dominated by blackthorn and hawthorn. However, in the east, particularly in fields F1, F2 and F4 as well as within most of field F7, the dense scrub habitat is dominated by bramble (*Rubus fruticosus*).

Image EDP A3.9. Dense scrub either side of footpath, south of F11.

Scattered Scrub

A3.40 Recorded in most of the fields in the eastern two thirds of the Application Site, scattered scrub is a significant habitat. Mostly consisting of common hawthorn, bramble, young English oak and young ash it is exceptionally common in Field F11 and very common in Field F12.

A3.41 Whilst providing habitat for a range of species the dense and scattered scrub is of limited floristic value in its' own right. Furthermore, in the specific context of the Application Site, significant scrub encroachment due to a lack of management is resulting in a decline in the extent and quality of the grassland and wetland habitats. Accordingly, the scrub habitats are judged to be of less than Local ecological importance.

Image EDP A3.10: Scattered scrub within unmanaged grassland.

Mature Trees

A3.42 Several mature trees are present across the Application Site outside of the woodland areas, with notable lines mature English oak trees dividing Fields 11 and 12, and Fields F1 and F2. With reference to the Arboricultural Assessment undertaken for the proposed development (edp0124_r055), 21 individual trees have been recorded outside of groups or hedgerows, all but one of which are English oak and the other is an ash. Of these 21 trees, 11 are classed as 'veteran' and five are classed as 'transitional veteran' in that they display features of biological, cultural or aesthetic value that are characteristic of, but not exclusive to, individuals surviving beyond the typical age range for the species. Veteran trees are amongst the habitats defined as 'irreplaceable' at paragraph 175(c) of the NPPF 2019.

A3.43 The veteran and mature trees are judged to be of Local-level ecological importance.

Hedgerows

A3.44 Most of the fields within the Application Site are bounded by hedgerows or former hedgerows which are now effectively linear scrub or broadleaved woodland. The linear habitats which can still be discerned as hedgerows are largely unmanaged although some flailing of the sides of hedgerows abutting Fields F3, F8 and F9 was apparent. Frequently the hedgerows have expanded out into the adjacent fields to form large blocks of dense scrub.

A3.45 For the purposes of the hedgerow survey, 12 sections of discernible hedgerows were identified as indicated on **Plan EDP 4**. The majority of these are classified as Phase 1 habitat level as intact species-rich with trees and any boundary line of native trees or shrubs over 20m long and less than 5m wide, and with gaps less than 20m in width, would meet the definition of Hedgerow which is a Priority Habitat in England.

A3.46 The results of the hedgerow survey are set out in **Table EDP A3.15**. This confirms that just two hedgerows surveyed (H1 and H9) are classified as 'important' under the wildlife criteria of the Hedgerows Regulations (1997) based on botanical data.

A3.47 Overall, the network of hedgerows within the Application Site is judged to be of Local-level ecological importance.

Image EDP A3.11: Flailed hedge (H13) north of F9.

Tall Herb and Ruderal

A3.48 Along the western (right) bank of Langford Brook there is very little scrub and the vegetation is predominantly of tall herbs: great willowherb (*Epilobium hirsutum*), hoary willowherb (*Epilobium parviflorum*) and nettle (*Urtica dioica*) with goosegrass (*Galium aparine*) and common docks (*Rumex* spp.) along with common grasses such as cocksfoot (*Dactylis glomerata*), false oat-grass (*Arrhenatherum elatius*), perennial rye-grass (*Lolium perenne*), Yorkshire fog (*Holcus lanatus*) and common bent (*Agrostis capillaris*).

A3.49 The tall herb and ruderal habitat is judged to be of less than Local ecological importance.

Arable

A3.50 There are two arable fields situated in the west of the Application Site. At the time of survey, the fields comprised cereal stubble with a luxuriant arable weed flora. The weed flora associated with cereal stubble included the notable species dwarf spurge (*Euphorbia exigua*), broad-leaved spurge (*Euphorbia platyphyllos*) and sharp-leaved fluellen (*Kickxia elatine*). Black bindweed (*Fallopia convolvulus*) was abundant and common goosefoot species (*Chenopodium* spp.) also locally abundant.

A3.51 With reference to LWS selection criteria for arable field margins, which is based primarily on arable assemblage criteria published by Plantlife[22], the assemblage would not qualify. It is also relevant to note that no part of Fields F13 and F14 are managed for the arable weed flora. Nonetheless, whilst the arable habitat as a whole is considered to be of negligible ecological importance, the arable weed flora associated with the field margins is judged to be of Local-level ecological importance.

Ponds

A3.52 The Application Site supports a number of ponds as illustrated on **Plan EDP 17**.

Pond 1 (P1)

A3.53 This is a relatively small field pond located in the north-east corner of Field F8. The pond is broadly circular; approximately 5m wide and long with shallow sloping sides. For most of the year this pond does not hold water and supports to aquatic or semi aquatic vegetation.

[22] A.J. & Wilson, P. J. (2005). Important Arable Plant Areas: identifying priority sites for arable plant conservation in the United Kingdom. Plantlife International, Salisbury, UK

Image EDP A3.12: Pond P1 (dry in August 2019) with an abundance of redleg (*Persicaria maculosa*).

Pond 2 (P2)

A3.54 Pond P2 lies within the eastern extent of Field F7. It is oval, approximately 5m long and 2m wide. The pond is overhung by dense willow (*Salix* spp) scrub and is heavily shaded. The extent of open water is negligible and the macrophytes diversity is low, consisting of predominantly floating sweet grass (*Glyceria notata*), soft rush (*Juncus effuses*) and creeping bent (*Agrostis stolonifera*). The bottom of the pond consists of a dense accumulation of dead vegetative material, and the pond is heavily silted up, deoxygenated and turbid. The deepest part of the pond is approximately 0.25m, and it is subject to frequent drying out.

Pond 4 (P4)

A3.55 Pond P4 is located within Field F1 and constitutes a small (0.5m x 0.5m) pond. There is almost no open water and the pond is full of floating sweet grass, reed mace (*Typha latifolia*), sedges (*Carex* spp.) and common duckweed (*Lemna minor*). During periods of high water, adjoining small depressions and hollows fill with water to increase the overall area of the pond. Hence, water depth within the pond varies, but within the small pond itself water depth is a maximum of 0.5m.

Pond 5 (P5)

A3.56 Pond P5 is located in the south-eastern portion of Field F2. The pond consists of approximately five linear water bodies which seem to have formed within the furrows of the evident ridge and furrow system. Water levels within the pond fluctuate significantly

and during dry periods the ponds hold little to no water. Aquatic vegetation consists of locally dominant floating sweet grass and dense algal growth. The ponds are heavily shaded by overhanging willow trees.

Pond 6 (P6)

A3.57 Pond P6 lies along the western boundary of Field F9, within Hedgerow H4. The pond is broadly oval, approximately 4m long and 3m wide. The hedgerow encompasses and overhangs the western half of the pond. The eastern margin is shallow and sloping. The pond supports a dense sediment layer and is heavily silted and turbid. Aquatic vegetation within the pond was dominated by a dense mat of floating sweet grass.

A3.58 Ponds are a Priority Habitat in England. However, the ponds within the Application Site are currently of relatively low quality, having been subject to a neglect of appropriate management over many years resulting in low macrophyte and macroinvertebrate fauna, and are of no greater than Local ecological importance in their own right.

Ditches

A3.59 No wet ditches were recorded during this survey but dry shallow ditches are common along the edges of many of the hedgerows although no aquatic or semi-aquatic plant species were recorded in them. These are considered to be of negligible ecological importance.

Water-course

A3.60 The Langford Brook (source to downstream A41) (WFD waterbody GB106039030160) is located within the Cherwell basin district and is overall currently assessed as being of moderate ecological status with an objective to reach good status by 2027[23]. It is reported that the achievement of ecological status is prevented by pressures upon the watercourse associated with pollution from rural areas[24].

A3.61 In contrast, the Langford Brook (Bicester to Ray inc Gagle Brook) (WFD waterbody GB106039030140) downstream of this waterbody's confluence with the Gagle Brook is reported as having a poor ecological status[25] as a result of pollution from the water industry and agriculture and rural land management.

A3.62 Key features identified during the course of the River Corridor Survey are illustrated at **Plan EDP 5**. In addition, detailed descriptions of the survey length, together with illustrative photographs, are provided below.

A3.63 The Langford Brook as it flows through the Site encompasses a c.260m stretch between the northern and southern site boundaries. To the north, the brook is culverted under the

[23] https://environment.data.gov.uk/catchment-planning/WaterBody/GB106039030160
[24] https://environment.data.gov.uk/catchment-planning/summarypages/summary/WaterBody/GB106039030160
[25] https://environment.data.gov.uk/catchment-planning/WaterBody/GB106039030140

Chiltern Main Line and Bicester-Oxford railway lines for c.45m, and to the south it passes through a culvert running under the Gavray Drive road for c.20m.

A3.64 Overall, the section of Langford Brook within the Site is slightly sinuous, with small sections potentially straightened/realigned, with water flowing north to south. The eastern bank is lined with a belt of dense broad-leaved semi-natural woodland and blackthorn scrub which frequently overhangs the brook with fallen limbs causing natural dams and the leaf litter contributing to a detritus layer within the channel. The proximity of the woodland to the water-course has also resulted in sections of exposed roots. Extending further to the east the woodland and scrub gives way to rough semi-improved neutral grassland interspersed with sections of scattered scrub. In the north-east, a narrow field supporting a mosaic of semi-improved grassland, tall herb/tall ruderal, ephemeral short perennial, marshy grassland and scattered scrub. This extends down to the edge of the water course, with tall ruderal the more dominant habitat along the immediate bankside reducing to ephemeral short perennial and semi-improved grassland around 5m from the brook channel.

Image EDP A3.13. Langford Brook.

A3.65 Land-use to the west of the brook comprises a single large arable field with a c.6m wide margin of tall ruderal vegetation along the edge of the brook, dominated by nettle (*Urtica dioica*) with hogweed (*Heracleum sphondylium*), cow parsley (*Anthriscus sylvestris*), bramble (*Rubus fruticosus*), rosebay willowherb (*Chamerion angustifolium*), pedunculate sedge (*Carex pedunculata*), garlic mustard (*Alliaria petiolata*) and thistle sp. (*Cirsium sp.*) also present. One small group of mature willow trees is also present on the western bank towards the north of the survey section.

A3.66 As a result of the woodland to the west and the tall ruderal vegetation on the bank top to the east, the water-course itself is fairly shaded resulting in a relatively limited submergent macrophyte community. However, where the channel remains open and flow rates are slower, patches of fool's water cress (*Apium nodiflorum*) and branched bur-reed (*Sparganium erectum*) with occasional water crowfoot (*Ranunculus aquatilis*), reed canary grass (*Phalaris arundinacea*), redshank (*Persicaria maculosa*), water chickweed (*Stellaria aquatica*) and greater water plantain (*Alisma plantago-aquatica*) were recorded within channel margins.

A3.67 The profile of the Langford Brook varies slightly along its length though typically has 1-1.5m steep earth banks forming the western side of the channel whilst to the east the wooded bank slope away more gradually, with a channel width between 5 and 11m. Similarly, water depth is typically around 1-1.5m, flowing through a 3-4m channel with a mostly moderate flow rate. Water depth reduces to 0.5m in the north of the site associated with an area of cobbles artificially deposited into the channel, though other natural riffle, pool and run sections are present, albeit less pronounced, along the length of the brook.

A3.68 Substrate in the channel is largely dominated by a 15cm layer of silt though this occasionally gives way to small patches of mostly bare gravel and, as highlighted above, an artificial cobbled section to the north. Several pools were recorded, typically in association with debris dams where the water flow has become impounded behind such features.

A3.69 Sections of erosion were recorded on both banks with some evidence of undercutting resulting in both stable and unstable/eroding cliffs. Three inflows are present along the surveyed section of brook including two ditches in the south both of which are likely only ephemerally wet, a cattle drink is also present near these ditches which has also been recorded channelling rain water from the arable field into the brook though this is not considered likely to be the original function of this now redundant feature. A third ditch in the north of the survey area runs parallel with the railway and whilst not accessible for survey this appears likely to be wet across much of the year. The northern ditch flows into a man-made pool with artificial bank protection immediately adjacent to the culvert beneath the railway.

A3.70 Langford Brook is judged to be of Local-level ecological importance.

Table EDP A3.1. Description of Grassland Habitats in each Field Parcel within the Application Site

Field No.	Habitat Classification				Condition (ref. Defra Metric)	Botanical Summary
	JNCC Phase 1	UK Hab Code	NVC	Defra Metric 2.0		
F1	Marsh/Marshy Grassland	g3c	MG10b	Other neutral grassland	Moderate	Very small parts of this otherwise scrub-dominated field retain a marshy grassland sward. These relict areas are linked by a narrow path running through the scrub which also supports some relict marshy grassland species along its edge.
F2	Marsh/Marshy Grassland	g3c7	MG9a	Other neutral grassland	Fairly poor	This field supports a considerable amount of scrub. Small pockets of relict coarse semi-improved neutral grassland/marshy grassland in mosaic with each other and the scrub were recorded in the south-eastern part of the field which was the only part where physical access was possible.
F3	Marsh/Marshy Grassland	g3c7	MG9a	Other neutral grassland	Moderate	The majority of the furrows in this field support a marshy grassland community which is suggestive of a sward which experiences a degree of waterlogging but which is unlikely to hold standing water for long periods. Here soft rush, creeping bent, tufted hair-grass and hairy sedge are locally very common along with some greater bird's-foot trefoil and marsh thistle. Yorkshire fog, rough meadow-grass, sweet vernal-grass, and creeping buttercup are also common. With regard to the NVC this most strongly equates to the MG9a *Holcus lanatus-Deschampsia caespitosa* grassland *Poa trivialis* sub-community.
	Marsh/Marshy Grassland	f2b/g3c7	M23b/ MG9a	Purple moor grass and rush pastures	Moderate	This community has some affinity to the M23b *Juncus effusus/acutiflorus-Galium palustre* rush-pasture *Juncus effusus* sub-community which is more typical of northern and western Britain and is rarely recorded in lowland England. There is also some resemblance to the MG9a found in the other ditches in this field. Differentiating between MG9a and M23b can be problematic as extremes of both sub-communities can frequently resemble each other.
	Semi-improved Neutral Grassland	g3c6	MG6b	Other neutral grassland	Moderate	This sward equates to a species-rich MG6b *Lolium pernne-Cynosurus* cristatus grassland *Anthoxanthum odoratum* sub-community.

Field No.	Habitat Classification				Condition (ref. Defra Metric)	Botanical Summary
	JNCC Phase 1	UK Hab Code	NVC	Defra Metric 2.0		
F5	Semi-improved Neutral Grassland	u1a	N/A	Other neutral grassland	Moderate	Fields F5 and F6 were significantly impacted by earthworks and infrastructural works (undertaken c.2018) with the northern edges being incorporated within the railway estate and considerable destruction and degradation of the remaining sward. In 2019, bare ground and ephemeral/short perennial habitat dominated and ruderal / tall herb species were common, although patches of relict grassland were present. In 2020 a notable increase in vegetative cover was apparent across the fields with marshy grassland in particular becoming conspicuous. Scattered scrub is also present.
F6	Semi-improved Neutral Grassland	u1a	N/A	Other neutral grassland	Moderate	See above
	Poor Semi-improved Grassland	u1a	N/A	Other neutral grassland	Poor	
	Swamp	f2a	S7	Fens (upland and lowland)	Moderate	Along the southern edge of F6 is a large stand of lesser pond and several young plants of greater tussock sedge; this equates to the S7 *Carex acutiformis* swamp although it was too small an area to be subject to NVC survey
F7	Unimproved Neutral Grassland	g3a	MG5c	Lowland meadow	Fairly poor	Most of this field now supports dense scrub habitat but three small relict areas of grassland remain and these are of high botanical value as they support unimproved neutral grassland habitat that demonstrates a strong acidic influence and is thus an acceptable example of the MG5c *Cynosurus cristatus-Centaurea nigra* grassland *Danthonia decumbens* sub-community despite the dominant grass species being atypical of that sub-community. In 2019, rabbit grazing was intense here but in 2020 there was no evidence of rabbits and the sward was conspicuously tall; however, in 2020 several small areas of species-rich sward had been burned by a rough-sleeper who had been living in this area.

Field No.	Habitat Classification				Condition (ref. Defra Metric)	Botanical Summary
	JNCC Phase 1	UK Hab Code	NVC	Defra Metric 2.0		
F8	Marsh/Marshy Grassland	g3c7	MG9a	Other neutral grassland	Fairly poor	The middlemost of the three managed hay meadows in the east of the site, with a pronounced ridge and furrow topography, this experiences much less waterlogging that the neighbouring meadow F3 and there is only a very small amount of MG9a vegetation in the south-east of the field.
	Semi-improved Neutral Grassland	g3c6	MG6b	Other neutral grassland	Fairly poor	This sward is an MG6b *Lolium perenne-Cynosurus cristatus* grassland *Anthoxanthum odoratum* sub-community but is less species-rich than that in the adjacent field F3.
F9	Marsh/Marshy Grassland	g3c8	MG10b	Other neutral grassland	Fairly poor	The small area of marshy grassland is MG10b *Holcus lanatus-Juncus effusus* rush-pasture *Juncus inflexus* sub-community.
	Semi-improved Neutral Grassland	g3c6	MG6b	Other neutral grassland	Fairly poor	The westernmost of the three managed hay meadows in the east of the site, this is very similar to its neighbouring field F8 but has only one large patch of trailing tormentil. The main body of the field is a relatively species-poor MG6b.
F10	Marsh/Marshy Grassland	g3c	N/A	Other neutral grassland	Poor	On the eastern edge of the field there is a small area of species-poor marshy grassland that was not subject to recent agricultural improvement.
	Poor Semi-improved Grassland	g3c	N/A	Other neutral grassland	Poor	It appears that the sward may have been re-sown with an agricultural grass mix as it is now a poor semi-improved grassland. Some non-agricultural grasses and herbs are however still present and appear to have re-established from the old sward that was present here prior to the agricultural improvement works but they are weak components of an otherwise species-poor sward.
F11	Semi-improved Neutral Grassland	g3c6/g3c5	MG6b/ MG1a	Other neutral grassland	Moderate	The smaller area of slightly finer turf in the west of the field, where most of the pepper saxifrage is recorded, most closely keys out to the MG6b *Lolium perenne-Cynosurus cristatus* grassland *Anthoxanthum odoratum* sub-community but with an affinity towards the MG1a *Arrhenatherum elatius* grassland *Festuca rubra* sub-community.
	Unimproved Neutral	g3c5/g3a5	MG1c/ MG4	Lowland meadow	Moderate	The dominant plant community here (Community 1) is the MG1c *Arrhenatherum elatius* grassland *Filipendula ulmaria* sub-community although

Field No.	Habitat Classification				Condition (ref. Defra Metric)	Botanical Summary
	JNCC Phase 1	UK Hab Code	NVC	Defra Metric 2.0		
	Grassland					there is also some affinity towards the MG4 *Alopecurus pratensis-Sanguisorba officinalis* grassland. It is likely that the sward here represents an MG4 grassland transitioning into an MG1c through prolonged absence of management.
F12	Semi-improved Neutral Grassland	g3c5	MG1c/ MG1b	Other neutral grassland	Moderate	Abandoned meadow with an abundance of tall herbs and with a subordinate grassland component. Some parts of this field are slightly more waterlogged than others and rushes can be relatively frequent in those areas; hairy sedge is very common throughout. Much of the field comprises species-poor swards dominated either by meadow foxtail or by false oat-grass; however tall herbs are still abundant here and both smaller herbs and finer grasses are very uncommon. Scrub is common around the margins and scattered scrub is abundant in this field, in particular young specimens of English oak. In general, lacks the more notable herbs that are recorded in F11. False oat-grass is dominant and other grass species are poorly represented. Less competitive herb species are infrequent and rarely demonstrate any localised abundance however tall herbs are common. This is an MG1c *Arrhenatherum elatius* grassland *Filipendula ulmaria* sub-community although it has an affinity in places towards the MG1b *Arrhenatherum elatius* grassland *Urtica dioica* sub-community.
	Semi-improved Neutral Grassland	g3c5	MG1c	Other neutral grassland	Moderate	Situated mainly in the western centre of the field is a sward where meadow foxtail is the most prominent grass species and false oat-grass, although present, is not overwhelming; grass species of finer swards are relatively uncommon. Herbs requiring finer swards are very uncommon and thus this sward strongly suggests a grassland that has been abandoned for many years. This approximates most closely to the MG1c *Arrhenatherum elatius* grassland *Filipendula ulmaria* sub-community.
	Semi-improved Neutral Grassland	g3c6	MG6b	Other neutral grassland	Moderate	A community which demonstrates a finer sward with conspicuously fewer coarse grasses or tall herbs than elsewhere in this field. It approximates most closely to the MG6b *Lolium perenne-Cynosurus cristatus* grassland

Field No.	Habitat Classification				Condition (ref. Defra Metric)	Botanical Summary
	JNCC Phase 1	UK Hab Code	NVC	Defra Metric 2.0		
						Anthoxanthum odoratum sub-community, although both crested dog's-tail *Cynosurus cristatus* and perennial rye-grass *Lolium perenne* are scarce here. Although of a less coarse nature, herbs are scarce, although a small quantity of greater burnet is present.
F13	Arable	c1c7	N/A	Arable - cereal crops	N/A	
F14	Arable	c1c7	N/A	Arable - cereal crops	N/A	
F15	Poor semi-improved grassland	g3c	N/A	Other neutral grassland	Poor	Almost entirely dense mature scrub with relict common herb and grass species of a neutral grassland sward present along the edges of a narrow footpath which cuts through the scrub.

Table EDP A3.2. DAFOR Species List for Grassland Habitats in each Field Parcel within the Application Site

Species		Field number / DAFOR score													
Common name	Scientific name	1*	2*	3	4	5/6	7	8	9	10	11	12	13	14	15
Field maple	*Acer campestre*	O			O		R					O			O
Yarrow	*Achillea millefolium*	R	O	O		O	R			R	R	R			R
Sneezewort	*Achillea ptarmica*										R				
Fool's parsley	*Aethusa cynapium*												O	F	
Agrimony	*Agrimonia eupatoria*	R	O			R	R				O	R			R
Common bent	*Agrostis capillaris*	F	F	F	F	A	F	A	F	F	F	F			O
Creeping bent	*Agrostis stolonifera*	O	F	O		F		R		F	O	R			
Bugle	*Ajuga reptans*	R	F	O		R					R	O			R
Marsh foxtail	*Alopecurus geniculatus*			R						R					
Black grass	*Alopecurus myosuroides*												O	R	
Meadow foxtail	*Alopecurus pratensis*	R	R	A	R	F	R	A	A	F	F	F			O
Scarlet pimpernel	*Anagalis arvensis*					R							R	F	
Wild angelica	*Angelica sylvestris*	R	R			R				R	O	F			

Species		Field number / DAFOR score													
Common name	**Scientific name**	**1***	**2***	**3**	**4**	**5/6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Sweet vernal-grass	*Anthoxanthum odoratum*	R	R	A	O	O	R	A	A	O	R	O			R
Cow parsley	*Anthriscus sylvestris*	O	R	R	R	O	R		O	R	R	O			F
False oat-grass	*Arrhenatherum elatius*	F	A	R	F	A	O	R	R	A	D	D			F
Mugwort	*Artemesia vulgaris*	R			R	O					R				R
Common orache	*Atriplex patula*												A	A	
False wood-brome	*Brachypodium sylvaticum*	R	F		F	O	R								F
Soft brome	*Bromus hordaceus*	R		O		O		R	O	R					
Brome species	*Bromus sp.*												R		
Hairy sedge	*Carex hirta*	O	A	A		A	F	O	R	O	A	A			
False fox sedge	*Carex otrubae*	R	O			R					R	R			
Spiked sedge	*Carex spicata*		O									R			
Black knapweed	*Centaurea nigra*	R	R	O		F	O	R			O	O			R
Common mouse-ear	*Cerastium fontanum*	R	R	O	R	F	R	O	O	R	R	R			R
Fat hen	*Chenopodium album*					R							O	A	
Fig-leaved goosefoot	*Chenopodium ficifolium*													R	
Many-seeded goosefoot	*Chenopodium polyspermum*													F	
Creeping thistle	*Cirsium arvense*	O	F	A		A	O		R	O	A	D			O
Marsh thistle	*Cirsium palustre*	O	F	F		F	F	R	R	R	F	R			R
Spear thistle	*Cirsium vulgare*	R	R			O					R	R			
Field bindweed	*Convolvulus arvensis*					O									
Crested dog's-tail	*Cynosurus cristatus*		O	O		O	O	R	O	R	R	R			R
Cocksfoot	*Dactylis glomerata*	F	A	F		A	O	O	O	F	F	F			F
Wild carrot	*Daucus carota*	R	R			F					R				R
Tufted hair-grass	*Deschampsia caespitosa*	F	F	F		F	F	R	R	O	F	A			F
Common teasel	*Dipsacus fullonum*	R				F	R								
Common couch	*Elytrigia repens*	O	R			O	O			O					

Species		Field number / DAFOR score													
Common name	**Scientific name**	**1***	**2***	**3**	**4**	**5/6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Great willowherb	*Epilobium hirsutum*	R				R					R	A	A		
Broad-leaved willowherb	*Epilobium montanum*	R			R	O			R		R	R			
Short-fruited willowherb	*Epilobium obscurum*		O	O		O					R	F			R
Hoary willowherb	*Epilobium parviflorum*	O	F			O					R	O	O		R
Field horsetail	*Equisetum arvense*	R				O					O	F	F	O	R
Dwarf spurge	*Euphorbia exigua*												R		
Broad-leaved spurge	*Euphorbia platyphyllos*												R	F	
Black bindweed	*Fallopia convolvulus*					O							D	D	
Tall fescue	*Festuca arundinacea*		R	R		R					O	O			
Sheep's fescue	*Festuca ovina*						F								
Meadow fescue	*Festuca pratensis*			R				R		O	R				
Red fescue	*Festuca rubra*		O	F		F	R	F	F	R	R	R			
Meadowsweet	*Filipendula ulmaria*	O	F	R		O					D	D			R
Ash	*Fraxinus excelsior*	F	F		A	O	O				A	A			F
Goosegrass	*Galium aparine*	O	O			F	R				O	F			O
Hedge bedstraw	*Galium mollugo*					O					R				
Marsh bedstraw	*Galium palustre*	R	O	R		R				R	F	F			
Lady's bedstraw	*Galium verum*					O			R			R			
Cut-leaved cranesbill	*Geranium dissectum*					F								O	F
Ground ivy	*Glechoma hederacea*	O	F		F	F	F			R	O	O			F
Floating sweet-grass	*Glyceria fluitans*		O	R							R				
Great sweet-grass	*Glyceria maxima*													O	
Ivy	*Hedera helix*		O		F		O				O				F
Hogweed	*Heracleum sphondylium*	R	F	R		F	R	R	R	O	F	O			R
Yorkshire fog	*Holcus lanatus*	O	F	D	F	A	F	A	A	A	F	F			O
Meadow barley	*Hordeum secalinum*					R					O	O			
Perforate St John's-wort	*Hypercium perforatum*					R									
Common cat's-ear	*Hypochaeris radicata*	R	R	R		O	R		R	R		R			
Jointed rush	*Juncus articulatus*			R		R									

Species		Field number / DAFOR score													
Common name	**Scientific name**	**1***	**2***	**3**	**4**	**5/6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Compact rush	*Juncus conglomeratus*	O	F	F		O	O	R	R	O	F	F			
Soft rush	*Juncus effusus*	F	O	O		O	R	R		O	F	F			O
Hard rush	*Juncus inflexus*	F	R	O		F			R		R	F			
Sharp-leaved fluellen	*Kickxia elatine*												R		
Field scabious	*Knautia arvensis*					R									
Prickly lettuce	*Lactuca seriola*	R											O		
White dead-nettle	*Lamium album*		R			F				O					R
Meadow vetchling	*Lathyrus pratensis*	O	F	F		A	O	O	R	F	O	F			R
Autumn hawkbit	*Leontodon autumnalis*	R				F	O	R							
Ox-eye daisy	*Leucanthemum vulgare*		R			O					R				R
Perennial rye-grass	*Lolium perenne*	R	O	F		F	O	F	F	F	O	R			R
Common bird's-foot trefoil	*Lotus corniculatus*			O		O		R	R			R			
Greater bird's-foot trefoil	*Lotus pedunculatus*	O	R	O		F	R			O	F	F			R
Field wood-rush	*Luzula campestris*						O								
Ragged robin	*Lychnis flos-cuculi*										R	R			
Pineappleweed	*Matricaria discoidea*					R							O	R	
Scented mayweed	*Matricaria recutita*												O	O	
Black medick	*Medicago lupulina*	R				F	R			R		R			
Golden melilot	*Melilotus altissima*					F									
Corn mint	*Mentha arvensis*					O									
Field forget-me-not	*Myosotis arvensis*	R				F							R	O	
Red bartsia	*Odontites vernus*	O				R	O			R	O	R			R
Pale persicaria	*Persicaria lapathifolia*					O					R				
Redleg	*Persicaria maculosa*		R	O				R		O			A	A	R
Reed canary-grass	*Phalaris arundinacea*					R	R				O	R			
Small cat's-tail	*Phelum bertolonii*					R									
Timothy	*Phleum pratense*		R	O		R		R	O	F		R			
Common reed	*Phragmites australis*					R					O	F			
Bristly ox-tongue	*Picris echioides*	O				F					O	O	O	O	
Ribwort	*Plantago lanceolata*	O	O	O		F	F	O	O	O	O	O	O		O

Species		Field number / DAFOR score													
Common name	**Scientific name**	**1***	**2***	**3**	**4**	**5/6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Greater plantain	*Plantago major*					O							O	R	O
Rough meadow-grass	*Poa trivialis*		F	R		O	R	R		O	F	O			R
Common knotgrass	*Polygonum aviculare*	R				F					R		A	A	R
Trailing tormentil	*Potentilla anglica*			F				F	O						
Silverweed	*Potentilla anserina*	O	F	O		F		R	R	O	O	O			R
Tormentil	*Potentilla erecta*		R				O				R	O			
Creeping cinquefoil	*Potentilla reptans*	F	F	O		A	F	R	R	F	F	F			R
Self-heal	*Prunella vulgaris*	O	F	R		F	O	R	R	R	O	R			O
Blackthorn	*Prunus spinosa*	A	A		A		F				A	A			A
Fleabane	*Pulicaria dysenterica*	O	F			O				R	F	F			
English oak	*Quercus robur*	O	F		F	R	F				A	A			F
Meadow buttercup	*Ranunculus acris*			F		F	R	O		O	R	O			
Creeping buttercup	*Ranunculus repens*	O	F	A	O	A	O	F	O	F	O	O	O	O	O
Yellow-rattle	*Rhinanthus minor*					R									
Field rose	*Rosa arvensis agg.*	R	R			O	R					R			
Bramble	*Rubus fruticosus agg.*	D	D		D	F	A				A	A			A
Sorrel	*Rumex acetosa*	R	F	F		R	O	R	A	F	O	F			R
Curled dock	*Rumex crispus*	R				O		R			F	F			
Broad-leaved dock	*Rumex obtusifolius*	R				O		R	F		F	F	R	R	R
Wood dock	*Rumex sanguineus*	O	O			F	R				F	F			O
Great burnet	*Sanguisorba officinalis*										O	R			
Hoary ragwort	*Senecio erucifolius*									R					
Common ragwort	*Senecio jacobaea*	O	R	O		F	O	R	R		F	F			R
Oxford ragwort	*Senecio squalidus*					R						R			
Groundsel	*Senecio vulgaris*	R				F							O	F	R
Pepper saxifrage	*Silaum silaus*										O				
Charlock	*Sinapis arvensis*					R							O	F	
Bittersweet	*Solanum dulcamara*		F			R					O	R			R
Black nightshade	*Solanum nigrum*													O	
Prickly sow-thistle	*Sonchus asper*	R				F					R		A	O	R

Species		Field number / DAFOR score													
Common name	**Scientific name**	**1***	**2***	**3**	**4**	**5/6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Betony	*Stachys officinalis*						R								
Lesser stitchwort	*Stellaria graminea*		O								O	O			
Devil's-bit scabious	*Sucissa pratensis*			R			F								
Dandelion	*Taraxacum officinale agg.*	O		R		F	R	O	R	R	R				O
Hop trefoil	*Trifolium campestre*					R									
Alsike clover	*Trifolium hybridum*					R									
Red clover	*Trifolium pratense*		R	O		F		O	R						
White clover	*Trifolium repens*	R	R	F		A	F	F	O	O	R	O			R
Yellow oat-grass	*Trisetum flavescens*			R				O			R				
Nettle	*Urtica dioica*	O	O	F	O	F	O			R	A	A			O
Germander speedwell	*Veronica chamaedrys*			R		O	R			R	R				
Common speedwell	*Veronica persica*					O							F	F	
Tufted vetch	*Vicia cracca*		R	R		F		R	R	R	F	R			
Common vetch	*Vicia sativa*		R			O	R			R	R	O			R
Bush vetch	*Vicia sepium*	R	R			R	O				O	O			
Smooth tare	*Vicia tetrasperma*	R	R			A				O	F	O			R

**Heavily scrubbed-over and mostly inaccessible; these scores are almost certainly not representative of the whole field*

Table EDP A3.3: NVC Data for Field F3 Community 1 (Dry grassland): a species-rich MG6b *Lolium pernne-Cynosurus cristatus* grassland *Anthoxanthum odoratum* sub-community.

Common name	**Scientific name**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**DOMIN**
Common bent	*Agrostis capillaris*	2	4		3	3	IV (2-4)
Bugle	*Ajuga reptans*	3		2			II (2-3)
Meadow foxtail	*Alopecurus pratensis*	3	6	5	4	5	V (3-6)
Sweet vernal grass	*Anthoxanthum odoratum*	8	6	6	5	6	V (5-8)
Glaucous sedge	*Carex flacca*				3		I (3)
Hairy sedge	*Carex hirta*			2		1	II (1-2)
Black knapweed	*Centaurea nigra*		3	4	4	1	IV 1-4)
Common mouse-ear	*Cerastium fontanum*	2	2	2		1	IV (1-2)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Creeping thistle	*Cirsium arvense*			1		1	II (1)
Marsh thistle	*Cirsium palustre*		2	3	1		III (1-3)
Cock's-foot	*Dactylis glomerata*					3	I (3)
Red fescue	*Festuca rubra*	5	7	5	6	6	V (5-7)
Yorkshire fog	*Holcus lanatus*	7	3	5	7	8	V (3-8)
Meadow vetchling	*Lathyrus pratensis*				3	1	II (1-3)
Ox-eye daisy	*Leucanthmum vulgare*		4	1	3	5	IV (1-5)
Perennial rye-grass	*Lolium perenne*	2		2		2	III (2)
Bird's-foot trefoil	*Lotus corniculatus*	1	1	3	2		IV (1-3)
Field wood-rush	*Luzula campestris*		2		3	3	III (2-3)
Ribwort	*Plantago lanceolata*	4			2	4	III (2-4)
Rough meadow-grass	*Poa trivialis*	4	5	5			III (4-5)
Trailing tormentil	*Potentilla anglica*			4	4		II (4)
Creeping cinquefoil	*Potentilla reptans*	7	3		5	2	IV (2-7)
Meadow buttercup	*Ranunculus acris*	3		4	4	2	IV (2-4)
Creeping buttercup	*Ranunculus repens*	1	3				II (1-3)
Rose seedling	*Rosa sp.*					1	I (1)
Sorrel	*Rumex acetosa*		3	3		4	III (3-4)
Common ragwort	*Senecio jacobaea*				2		I (2)
Lesser stitchwort	*Stellaria graminea*		3	4	2	3	IV (2-4)
White clover	*Trifolium repens*		4	1			II (1-4)
Tufted vetch	*Vicia cracca*	3					I (3)

Table EDP A3.4: NVC Data for Field F3 Community 2 (Damp furrows): MG9a *Holcus lanatus-Deschampsia caespitosa* grassland *Poa trivialis* sub-community.

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Common bent	*Agrostis capillaris*		3				I (3)
Creeping bent	*Agrostis stolonifera*	5		4	6	3	IV (3-6)
Meadow foxtail	*Alopecurus pratensis*	3	5		2	7	IV (2-7)
Sweet vernal grass	*Anthoxanthum odoratum*	6		3	6	5	IV (3-6)
Cuckoo flower	*Cardamine pratensis*		2		1	2	III (1-2)
Glaucous sedge	*Carex flacca*				2		I (2)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Hairy sedge	*Carex hirta*	8	5	7	7	5	V (5-8)
Marsh thistle	*Cirsium palustre*		5	1	3	2	IV (1-5)
Cock's-foot	*Dactylis glomerata*		2			2	II (2)
Tufted hair-grass	*Deschampsia caespitosa*		4	2	5	4	IV (2-5)
Red fescue	*Festuca rubra*	5	1	4	2	6	V (1-6)
Marsh bedstraw	*Galium palustre*					2	I (2)
Yorkshire fog	*Holcus lanatus*	5	5	7	6	7	V (5-7)
Compact rush	*Juncus conglomeratus*	4		4	1		II (1-4)
Soft rush	*Juncus effusus*	9	5	7	6	7	V (5-9)
Perennial rye-grass	*Lolium perenne*		3		2		II (2-3)
Greater bird's-foot trefoil	*Lotus pedunculatus*			3			I (3)
Ribwort	*Plantago lanceolata*				1		I (1)
Smooth meadow-grass	*Poa pratensis*	3	2		3		III (2-3)
Rough meadow-grass	*Poa trivialis*		4	2	4	7	IV (2-7)
Creeping cinquefoil	*Potentilla reptans*				5		I (5)
Meadow buttercup	*Ranunculus acris*	4	1				II (1-4)
Creeping buttercup	*Ranunculus repens*	7	6	4	5	5	V (4-7)
Sorrel	*Rumex acetosa*	2			2		II (2)

Table EDP A3.5: NVC Data for Field F3 Community 3 (Wet furrows): most like the M23b *Juncus effusus/acutiflorus-Galium palustre* rush-pasture *Juncus effusus* sub-community but there is also some resemblance to the MG9a *Holcus lanatus-Deschampsia caespitosa* grassland *Poa trivialis* sub-community.

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Creeping bent	*Agrostis stolonifera*	4	4	4	5	2	V (2-5)
Marsh foxtail	*Alopecurus geniculatus*	3			5	5	III (3-5)
Cuckoo flower	*Cardamine pratensis*			1			I (1)
Hairy sedge	*Carex hirta*	5	7	6	7	5	V (5-7)
Oval sedge	*Carex leporina*	2		4			II (2-4)
Common sedge	*Carex nigra*	6		10	8		III (6-10)
Marsh thistle	*Cirsium palustre*				2		I (2)
Tufted hair-grass	*Deschampsia caespitosa*	2	2		4	5	IV (2-5)
Marsh bedstraw	*Galium palustre*			3		1	II (1-3)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Plicate sweet-grass	*Glyceria plicata*	9		6	8		III (6-8)
Yorkshire fog	*Holcus lanatus*				3	3	II (3)
Compact rush	*Juncus conglomeratus*			3			I (3)
Soft rush	*Juncus effusus*	5		8	7	3	IV (3-8)
Hard rush	*Juncus inflexus*		3	4		4	III (3-4)
Blunt-flowered rush	*Juncus subnodulosus*	7					I (7)
Greater bird's-foot trefoil	*Lotus pedunculatus*				5		I (5)
Smooth meadow-grass	*Poa pratensis*	2				3	II (2-3)
Rough meadow-grass	*Poa trivialis*		2			1	II (1-2)
Creeping cinquefoil	*Potentilla reptans*					3	I (3)
Creeping buttercup	*Ranunculus repens*	4	8	6	5		IV (4-8)

Table EDP A3.6: NVC Data for Field F7: MG5c *Cynosurus cristatus-Centaurea nigra* grassland *Danthonia decumbens* sub-community

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Common bent	*Agrostis capillaris*	7	2	4	6	3	V (2-7)
Bugle	*Ajuga reptans*		2	3		3	III (2-3)
Meadow foxtail	*Alopecurus pratensis*	6	5	5	4	5	V (4-6)
Sweet vernal grass	*Anthoxanthum odoratum*	2	4	3	3	5	V (2-5)
False oat-grass	*Arrhenatherum elatius*	3	4	5		6	IV (3-6)
Cuckoo flower	*Cardamine pratense*				1		I (1)
Black knapweed	*Centaurea nigra*		2		1	2	III (1-2)
Common mouse-ear	*Cerastium fontanum*	1			1	1	III (1)
Creeping thistle	*Cirsium arvense*					2	I (2)
Marsh thistle	*Cirsium palustre*	1	1	3	2		IV (1-3)
Crested dog's-tail	*Cynosurus cristatus*				2	2	II (2)
Cock's-foot	*Dactylis glomerata*		3	2	1	3	IV (1-3)
Tufted hair-grass	*Deschampsia caespitosa*		2	2		2	III (2)
Sheep's fescue	*Festuca ovina*		5	2	4		III (2-5)
Meadow fescue	*Festuca pratensis*	1					I (1)
Red fescue	*Festuca rubra*	4	3	4	2	3	V (2-4)
Ground ivy	*Glechoma hederaca*	4		3			II (3-4)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Yorkshire fog	*Holcus lanatus*	8	6	8	7	7	V (6-8)
Soft rush	*Juncus effusus*				3		I (3)
Meadow vetchling	*Lathyrus pratensis*			3		3	II (3)
Perennial rye-grass	*Lolium perenne*					2	I (2)
Bird's-foot trefoil	*Lotus corniculatus*	3		1	2	3	IV (1-3)
Field wood-rush	*Luzula campestris*	2	2	3		2	IV (2-3)
Ribwort	*Plantago lanceolata*				2		I (2)
Rough meadow-grass	*Poa trivialis*	7	8	5	6	7	V (5-8)
Tormentil	*Potentilla erecta*	2	3	6	5		IV (2-6)
Creeping cinquefoil	*Potentilla reptans*					6	I (6)
Meadow buttercup	*Ranunculus acris*		1		2		II (1-2)
Creeping buttercup	*Ranunculus repens*					4	I (4)
Sorrel	*Rumex acetosa*	2	2	2	1	1	V (1-2)
Great burnet	*Sanguisorba officinalis*	1		4			II (1-4)
Common ragwort	*Senecio jacobaea*					1	I (1)
Betony	*Stachys officinalis*		5	6	2	4	IV (2-6)
Lesser stitchwort	*Stellaria graminea*	3	2	2	3	1	V (1-3)
Devil's-bit scabious	*Succisa pratensis*		7	7	8		III (7-8)
Red clover	*Trifolium pratense*		3	2	2		III (2-3)
White clover	*Trifolium repens*	2	1			3	III (1-3)
Tufted vetch	*Vicia cracca*	1			3		II (1-3)
Germander speedwell	*Veronica chamaedrys*					4	I (4)
Thyme-leaved speedwell	*Veronica serpyllifolia*			1			I (1)

Table EDP A3.7: NVC Data for Field F8 Community 1 (Dry grassland): MG6b *Lolium pernne-Cynosurus cristatus* grassland *Anthoxanthum odoratum* sub-community

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Common bent	*Agrostis capillaris*	3	7	5	7	6	V (3-7)
Bugle	*Ajuga reptans*	1		1			II (1)
Meadow foxtail	*Alopecurus pratensis*	1	5	3	4	4	V (1-5)
Sweet vernal grass	*Anthoxanthum odoratum*	6	8	4	6	6	V (4-8)
False oat-grass	*Arrhenatherum elatius*	3		4	4	4	IV (3-4)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Soft brome	*Bromus hordaceus*	3			3		II (3)
Cuckoo flower	*Cardamine pratense*					2	I (2)
Spiked sedge	*Carex spicata*		2				I (2)
Black knapweed	*Centaurea nigra*		3				I (3)
Common mouse-ear	*Cerastium fontanum*		1		1		II (1)
Creeping thistle	*Cirsium arvense*	1		3	2	1	IV (1-3)
Cock's-foot	*Dactylis glomerata*	2	2		2	1	IV (1-2)
Tufted hair-grass	*Deschampsia caespitosa*		2	2			II (2)
Red fescue	*Festuca rubra*	6	7		7	5	IV (5-7)
Ground ivy	*Glechoma hederaca*			2		3	II (2-3)
Yorkshire fog	*Holcus lanatus*	7	8	8	8	7	V (7-8)
Meadow barley	*Hordeum secalinum*				3	4	II (3-4)
Soft rush	*Juncus effusus*				2		I (2)
Meadow vetchling	*Lathyrus pratensis*	4	3	2	4		IV (2-4)
Perennial rye-grass	*Lolium perenne*	4		3	3	3	IV (3-4)
Bird's-foot trefoil	*Lotus corniculatus*				3	2	II (2-3)
Field wood-rush	*Luzula campestris*		3		2	3	III (2-3)
Ribwort	*Plantago lanceolata*			3		3	II (3)
Rough meadow-grass	*Poa trivialis*	6	4	7	6	5	V (4-7)
Trailing tormentil	*Potentilla anglica*		4			4	II (4)
Creeping cinquefoil	*Potentilla reptans*			5		6	II (5-6)
Meadow buttercup	*Ranunculus acris*	5	4	5		3	IV (3-5)
Creeping buttercup	*Ranunculus repens*	5	5	3	1	4	V (1-5)
Sorrel	*Rumex acetosa*		1	3	2	3	IV (1-3)
Great burnet	*Sanguisorba officinalis*	1					I (1)
Common ragwort	*Senecio jacobaea*				2	1	II (1-2)
Lesser stitchwort	*Stellaria graminea*	5		1	4		III (1-5)
Red clover	*Trifolium pratense*	4			3	1	III (1-4)
White clover	*Trifolium repens*	4	5	5	1	1	V (1-5)
Germander speedwell	*Veronica chamaedrys*					2	I (2)
Thyme-leaved speedwell	*Veronica serpyllifolia*				2		I (2)

Table EDP A3.8: NVC Data for Field F9 Community 1 (Dry grassland): MG6b *Lolium pernne-Cynosurus cristatus* grassland *Anthoxanthum odoratum* sub-community

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Common bent	*Agrostis capillaris*	6	5	7	6	6	V (5-7)
Meadow foxtail	*Alopecurus pratensis*	4	2	6	5	6	V (2-6)
Sweet vernal grass	*Anthoxanthum odoratum*	5	7	6	7	7	V (5-7)
False oat-grass	*Arrhenatherum elatius*	5	4	5	3	5	V (3-5)
Meadow brome	*Bromus racemosus*				2		I (2)
Soft brome	*Bromus hordaceus*			2			I (2)
Common mouse-ear	*Cerastium fontanum*	1	1	3		2	IV (1-3)
Creeping thistle	*Cirsium arvense*		3	2		3	III (2-3)
Marsh thistle	*Cirsium palustre*			2			I (2)
Cock's-foot	*Dactylis glomerata*				3	3	II (3)
Tufted hair-grass	*Deschampsia caespitosa*		2		1	2	III (1-2)
Red fescue	*Festuca rubra*	5	5	6	2	6	V (2-7)
Lady's bedstraw	*Galium verum*				3		I (3)
Yorkshire fog	*Holcus lanatus*	8	9	6	7	7	V (6-9)
Meadow vetchling	*Lathyrus pratensis*			3	3	3	III (3)
Perennial rye-grass	*Lolium perenne*	1	2	1		3	IV (1-3)
Bird's-foot trefoil	*Lotus corniculatus*				2		I (2)
Field wood-rush	*Luzula campestris*				1	1	II (1)
Ribwort	*Plantago lanceolata*		2	3	4	5	IV (2-5)
Rough meadow-grass	*Poa trivialis*	4		4	5	4	IV (4-5)
Trailing tormentil	*Potentilla anglica*	2			5		II (2-5)
Creeping cinquefoil	*Potentilla reptans*		2		3	4	III (2-4)
Meadow buttercup	*Ranunculus acris*	3	5	1	4	6	V (1-6)
Creeping buttercup	*Ranunculus repens*	3	6	4	7	2	V (2-7)
Sorrel	*Rumex acetosa*	1	3		4		III (1-4)
Lesser stitchwort	*Stellaria graminea*		1	3	3	1	IV (1-3)
Red clover	*Trifolium pratense*	2					I (2)
White clover	*Trifolium repens*			3	4	6	III (3-6)
Nettle	*Urtica dioica*					1	I (1)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Tufted vetch	*Vicia cracca*		2				I (2)

Table EDP A3.9: NVC Data for Field F10: MG7c *Lolium perenne* leys and related grassland *Lolium perenne-Alopecurus pratensis-Festuca pratensis* sub-community

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Yarrow	*Achillea millefolium*		2			1	II (1-2)
Common bent	*Agrostis capillaris*	5	4	5	6	3	V (3-6)
Creeping bent	*Agrostis stolonifera*		1		3		II (1-3)
Meadow foxtail	*Alopecurus pratensis*	4	4	5			III (4-5)
Wild angelica	*Angelica sylvestris*				2		I (2)
Sweet vernal-grass	*Anthoxanthum odoratum*	3	5	2		2	IV (2-5)
Cow parsley	*Anthriscus sylvestris*		1	1			II (1)
False oat-grass	*Arrhenatherum elatius*	2	1	4	3	5	V (1-5)
Soft brome	*Bromus hordaceus*				2		I (2)
Hairy sedge	*Carex hirta*		4			4	II (4)
Common mouse-ear	*Cerastium fontanum*	1	1				II (1)
Creeping thistle	*Cirsium arvense*			3	2	2	III (2-3)
Marsh thistle	*Cirsium palustre*		1		1	1	III (1)
Crested dog's-tail	*Cynosurus cristatus*	2	2			1	III (1-2)
Cock's-foot	*Dactylis glomerata*		3	2	4	3	IV (2-4)
Tufted hair-grass	*Deschampsia caespitosa*	2		2	1	2	IV (1-2)
Meadow fescue	*Festuca pratensis*		3		2	2	III (2-3)
Red fescue	*Festuca rubra*	3					I (3)
Hogweed	*Heracleum sphondylium*			1	1	1	III (1)
Yorkshire fog	*Holcus lanatus*	8	7	8	7	7	V (7-8)
Compact rush	*Juncus conglomeratus*		2	2			II (2)
Soft rush	*Juncus effusus*		3			2	II (2-3)
Meadow vetchling	*Lathyrus pratensis*	3	4	1	1	4	V (1-4)
Perennial rye-grass	*Lolium perenne*	5	4	6	5	4	V (4-6)
Greater bird's-foot trefoil	*Lotus pedunculatus*		2	3			II (1-3)
Black medick	*Medicago lupulina*					1	I (1)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Redleg	*Persicaria maculosa*	2		2		1	III (1-2)
Timothy	*Phleum pratense*	1	1		1	1	IV (1)
Ribwort	*Plantago lanceolata*	3		2	2	1	IV (1-3)
Rough meadow-grass	*Poa trivialis*		2		3	3	III (2-3)
Silverweed	*Potentilla anserina*			3	3		II (3)
Creeping cinquefoil	*Potentilla reptans*	7		5	2	3	IV (2-7)
Self-heal	*Prunella vulgaris*			2	2		II (2)
Meadow buttercup	*Ranunculus acris*	3		2	4	1	IV (1-4)
Creeping buttercup	*Ranunculus repens*	2	4		4	5	IV (2-5)
Sorrel	*Rumex acetosa*	1	2	2	1	2	V (1-2)
Hoary ragwort	*Senecio erucifolius*				1		I (1)
Dandelion	*Taraxacum officinale agg.*		2	1			II (1-2)
White clover	*Trifolium repens*						O
Nettle	*Urtica dioica*		1			1	II (1)
Tufted vetch	*Vicia cracca*	1	2				II (1-2)
Smooth tare	*Vicia tetrasperma*		3		2	2	III (2-3)

Table EDP A3.10: NVC Data for Field 11 Community 1 MG1c *Arrhenatherum elatius* grassland *Filipendula ulmaria* sub-community although there is also some affinity towards the MG4 *Alopecurus pratensis-Sanguisorba officinalis* grassland.

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Yarrow	*Achillea millefolium*				2	2	II (2)
Common bent	*Agrostis capillaris*	3				3	II (3)
Meadow foxtail	*Alopecurus pratensis*	6	6	4	4	5	V (4-6)
Wild angelica	*Angelica sylvestris*	5		6	3	6	IV (3-6)
Sweet vernal grass	*Anthoxanthum odoratum*				2		I (2)
False oat-grass	*Arrhenatherum elatius*	9	7	9	10	9	V (7-10)
Hairy sedge	*Carex hirta*				3		I (3)
Black knapweed	*Centaurea nigra*					3	I (3)
Common mouse-ear	*Cerastium fontanum*	1	2				II (1-2)
Creeping thistle	*Cirsium arvense*	6	1	7	3	2	V (1-7)
Marsh thistle	*Cirsium palustre*			2	2	1	III (1-2)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Hawthorn seedling	*Crataegus monogyna*			2		2	II (2)
Cock's-foot	*Dactylis glomerata*		2		2	3	III (2-3)
Short-fruited willowherb	*Epilobium obscurum*	3			1	1	III (1-3)
Hoary willowherb	*Epilobium parviflorum*		4	3			II (3-4)
Meadow fescue	*Festuca pratensis*			3		3	II (3)
Red fescue	*Festuca rubra*		2		4	2	III (2-4)
Meadowsweet	*Filipendula ulmaria*	7	7	6	6	6	V (6-7)
Goosegrass	*Galium aparine*		4	2		3	III (2-4)
Ground ivy	*Glechoma hederaca*	3		1	1	2	IV (1-3)
Hogweed	*Heracleum sphondylium*		2		3	3	III (2-3)
Yorkshire fog	*Holcus lanatus*	5	3	4	6	7	V (3-7)
Meadow barley	*Hordeum secalinum*				3		I (3)
Hop	*Humulus lupulus*				2	3	II (2-3)
Compact rush	*Juncus conglomeratus*				2		I (2)
Soft rush	*Juncus effusus*	5	4		4		III (4-5)
Hard rush	*Juncus inflexus*					2	I (2)
Meadow vetchling	*Lathyrus pratensis*		1	3			II (1-3)
Perennial rye-grass	*Lolium perenne*					4	I (4)
Bristly ox-tongue	*Picris echioides*	3			2		II (2-3)
Ribwort	*Plantago lanceolata*		2			1	II (1-2)
Smooth meadow-grass	*Poa pratensis*		3		2		II (2-3)
Rough meadow-grass	*Poa trivialis*		5	3		6	III (3-6)
Creeping cinquefoil	*Potentilla reptans*		3		5	2	III (2-5)
Fleabane	*Pulicaria dysenterica*	4	3				II (3-4)
Meadow buttercup	*Ranunculus acris*	1				1	II (1)
Creeping buttercup	*Ranunculus repens*	2	1		4		III (1-4)
Bramble	*Rubus fruticosus agg.*	3			3	4	III (3-4)
Sorrel	*Rumex acetosa*	2	3	2		1	IV (1-3)
Clustered dock	*Rumex conglomeratus*	3				3	II (3)
Curled dock	*Rumex crispus*		3	3			II (3)
Wood dock	*Rumex sanguineus*				6	3	II (3-6)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Great burnet	*Sanguisorba officinalis*	4	5		3	4	IV (3-5)
Hoary ragwort	*Senecio erucifolius*				2		I (2)
Ragged robin	*Silene flos-cuculi*				2	1	II (1-2)
Bittersweet	*Solanum dulcamara*					2	I (2)
Lesser stitchwort	*Stellaria graminea*		1		2		II (1-2)
Red clover	*Trifolium pratense*			2		2	II (2)
Nettle	*Urtica dioica*	3	3	5			III (3-5)
Tufted vetch	*Vicia cracca*		1	1			II (1)
Common vetch	*Vicia sativa*					3	I (3)
Germander speedwell	*Veronica chamaedrys*			2			I (2)

Table EDP A3.11: NVC Data for Field 11 Community 2: MG6b *Lolium perenne-Cynosurus cristatus* grassland *Anthoxanthum odoratum* sub-community but with an affinity towards the MG1a *Arrhenatherum elatius* grassland *Festuca rubra* sub-community (Slightly finer sward)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Yarrow	*Achillea millefolium*			2		2	II (2)
Common bent	*Agrostis capillaris*	5	3	5	3	3	V (2-5)
Bugle	*Ajuga reptans*				2		I (2)
Meadow foxtail	*Alopecurus pratensis*	6		2	3	2	IV (2-6)
Wild angelica	*Angelica sylvestris*			1			I (1)
Sweet vernal grass	*Anthoxanthum odoratum*	6	6	7	5	7	V (5-7)
False oat-grass	*Arrhenatherum elatius*	5		6	4	5	V (4-6)
Soft brome	*Bromus hordaceus*				2		I (2)
Cuckoo flower	*Cardamine pratense*		1			2	II (1-2)
Hairy sedge	*Carex hirta*		4		2	3	III (2-4)
Black knapweed	*Centaurea nigra*		3				I (3)
Common mouse-ear	*Cerastium fontanum*	2	2	2			III (2)
Creeping thistle	*Cirsium arvense*	1	3		4	5	IV (1-5)
Marsh thistle	*Cirsium palustre*	2		1		2	III (1-2)
Hawthorn	*Crataegus monogyna*	1			1		II (1)
Crested dog's-tail	*Cynosurus cristatus*			3	2		II (2-3)
Cock's-foot	*Dactylis glomerata*	4			3		II (3-4)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Tufted hair-grass	*Deschampsia caespitosa*			2			I (2)
Great willowherb	*Epilobium hirsutum*	3	3	2		3	IV (2-3)
Short-fruited willowherb	*Epilobium obscurum*		2			1	II (1-2)
Hoary willowherb	*Epilobium parviflorum*				3		I (3)
Red fescue	*Festuca rubra*	5	2		5		III (2-5)
Meadowsweet	*Filipendula ulmaria*			4			I (4)
Ash seedling	*Fraxinus excelsior*	2		1	2	2	IV (1-2)
Goosegrass	*Galium aparine*				3	3	II (3)
Ground ivy	*Glechoma hederaca*		3			6	II (3-6)
Hogweed	*Heracleum sphondylium*	2	1	1			III (1-2)
Yorkshire fog	*Holcus lanatus*	2	7	5	6	6	V (2-7)
Hop	*Humulus lupulus*			4	4	4	III (4)
Hard rush	*Juncus inflexus*		2				I (2)
Meadow vetchling	*Lathyrus pratensis*	5			3	3	II (3-5)
Perennial rye-grass	*Lolium perenne*	1		1		3	III (1-3)
Bird's-foot trefoil	*Lotus corniculatus*				5	1	II (1-5)
Bristly ox-tongue	*Picris echioides*		2				I (2)
Ribwort	*Plantago lanceolata*	1	3		4	2	IV (1-4)
Smooth meadow-grass	*Poa pratensis*				3		I (3)
Rough meadow-grass	*Poa trivialis*		3	5	1	3	IV (1-5)
Creeping cinquefoil	*Potentilla reptans*	2	6				II (2-6)
Fleabane	*Pulicaria dysenterica*			4		3	II (3-4)
Meadow buttercup	*Ranunculus acris*			2	2		II (2)
Creeping buttercup	*Ranunculus repens*	6			4	5	III (4-6)
Sorrel	*Rumex acetosa*	1	1	2			III (1-2)
Clustered dock	*Rumex conglomeratus*	1					I (1)
Wood dock	*Rumex sanguineus*		2	2	3	1	IV (1-3)
Great burnet	*Sanguisorba officinalis*				3		I (3)
Hoary ragwort	*Senecio erucifolius*				1	1	II (1)
Common ragwort	*Senecio jacobaea*	2					I (2)
Pepper saxifrage	*Silaum silaus*		4	4			II (4)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Lesser stitchwort	*Stellaria graminea*		3			1	II (1-3)
White clover	*Trifolium repens*				2	2	II (2)
Nettle	*Urtica dioica*				5		I (5)
Tufted vetch	*Vicia cracca*		1	3			II (1-3)
Common vetch	*Vicia sativa*		4		2	1	III (1-4)
Thyme-leaved speedwell	*Veronica serpyllifolia*					2	I (2)

Table EDP A3.12: NVC Data for Field 12 Community 1: MG1c *Arrhenatherum elatius* grassland *Filipendula ulmaria* sub-community although there is also some affinity towards the MG1b *Arrhenatherum elatius* grassland *Urtica dioica* sub-community. (*Arrhenatherum elatius* most prominent)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Common bent	*Agrostis capillaris*		4				I (4)
Creeping bent	*Agrostis stolonifera*				3		I (3)
Meadow foxtail	*Alopecurus pratensis*	2	2				II (2)
Wild angelica	*Angelica sylvestris*	4	1		4		III (4)
False oat-grass	*Arrhenatherum elatius*	6	8	9	7	9	V (6-9)
Cuckoo flower	*Cardamine pratense*				2		I (2)
Hairy sedge	*Carex hirta*			5	3	5	III (3-5)
Common mouse-ear	*Cerastium fontanum*	2				2	II (2)
Creeping thistle	*Cirsium arvense*		1		3	2	III (1-3)
Marsh thistle	*Cirsium palustre*		2	2			II (2)
Cock's-foot	*Dactylis glomerata*	1			3		II (1-3)
Tufted hair-grass	*Deschampsia caespitosa*				4	3	II (3-4)
Great willowherb	*Epilobium hirsutum*		1	7	2	3	IV (1-7)
Short-fruited willowherb	*Epilobium obscurum*			3		3	II (3)
Hoary willowherb	*Epilobium parviflorum*	4					I (4)
Red fescue	*Festuca rubra*					3	I (3)
Meadowsweet	*Filipendula ulmaria*	5		2	1	3	IV (1-5)
Goosegrass	*Galium aparine*			2			I (2)
Marsh bedstraw	*Galium palustre*	1					I (1)
Ground ivy	*Glechoma hederaca*		3				I (3)
Hogweed	*Heracleum sphondylium*			1	3		II (1-3)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Yorkshire fog	*Holcus lanatus*		2		5	5	III (2-5)
Hop	*Humulus lupulus*	3	1				II (1-3)
Compact rush	*Juncus conglomeratus*				2		I (2)
Soft rush	*Juncus effusus*	5			1	2	III (1-5)
Meadow vetchling	*Lathyrus pratensis*	2					I (2)
Perennial rye-grass	*Lolium perenne*				2		I (2)
Ribwort	*Plantago lanceolata*		4		1		II (1-4)
Bristly ox-tongue	*Picris echioides*			3	2	2	III (2-3)
Rough meadow-grass	*Poa trivialis*			2	2	2	III (2)
Silverweed	*Potentilla anserina*		3	3	4		III (3-4)
Creeping cinquefoil	*Potentilla reptans*	3	1				II (1-3)
Fleabane	*Pulicaria dysenterica*			4	2	3	III (2-4)
Creeping buttercup	*Ranunculus repens*				3		I (3)
Sorrel	*Rumex acetosa*	1			1		II (1)
Clustered dock	*Rumex conglomeratus*	2					I (2)
Curled dock	*Rumex crispus*			1		2	II (1-2)
Wood dock	*Rumex sanguineus*		2	2	1	1	IV (1-2)
Red campion	*Silene dioica*		1			1	II (1)
Red clover	*Trifolium pratense*				3		I (3)
Nettle	*Urtica dioica*	6	4				II (4-6)
Tufted vetch	*Vicia cracca*					2	I (2)

Table EDP A3.13: NVC Data for Field 12 Community 2: MG1c *Arrhenatherum elatius* grassland *Filipendula ulmaria* sub-community. (*Alopecurus pratensis* most prominent)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Common bent	*Agrostis capillaris*	3					I (3)
Creeping bent	*Agrostis stolonifera*				4	4	II (4)
Meadow foxtail	*Alopecurus pratensis*	3	5	4	6	7	V (3-7)
Wild angelica	*Angelica sylvestris*			3	3	4	III (3-4)
Sweet vernal grass	*Anthoxanthum odoratum*		2				I (2)
False oat-grass	*Arrhenatherum elatius*	3		2	2	3	IV (2-3)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Hairy sedge	*Carex hirta*	1	7	3	7	4	V (1-7)
Spiked sedge	*Carex spicata*				3		I (3)
Common mouse-ear	*Cerastium fontanum*		2	2			II (2)
Creeping thistle	*Cirsium arvense*	5	3		6	6	IV (3-6)
Marsh thistle	*Cirsium palustre*	3		2		4	III (2-4)
Crested dog's-tail	*Cynosurus cristatus*				2	2	II (2)
Cock's-foot	*Dactylis glomerata*	3	3	3	2	2	V (2-3)
Tufted hair-grass	*Deschampsia caespitosa*		2		4	3	III (2-4)
Great willowherb	*Epilobium hirsutum*		4	5	5		III (4-5)
Short-fruited willowherb	*Epilobium obscurum*	2	1			2	III (1-2)
Red fescue	*Festuca rubra*		3			4	II (3-4)
Meadowsweet	*Filipendula ulmaria*		6	4	7	6	IV (4-7)
Goosegrass	*Galium aparine*	1		3	3	3	IV (1-3)
Ground ivy	*Glechoma hederaca*	1	4			5	III (1-5)
Yorkshire fog	*Holcus lanatus*	6	6	3	5	6	V (3-6)
Hop	*Humulus lupulus*	4	5		3	3	IV (3-5)
Compact rush	*Juncus conglomeratus*		3				I (3)
Soft rush	*Juncus effusus*	2					I (2)
Meadow vetchling	*Lathyrus pratensis*			4	1	4	II (1-4)
Perennial rye-grass	*Lolium perenne*	3			3		II (3)
Greater bird's-foot trefoil	*Lotus pedunculatus*				2	2	II (2)
Field forget-me-not	*Myosotis arvensis*	1			1		II (1)
Ribwort	*Plantago lanceolata*		1			3	II (1-3)
Smooth meadow-grass	*Poa pratensis*		3	6	1	3	IV (1-6)
Rough meadow-grass	*Poa trivialis*	5	5	3	6	2	V (2-6)
Silverweed	*Potentilla anserina*	1		1	3	7	IV (1-7)
Creeping cinquefoil	*Potentilla reptans*			2	2	3	II (2-3)
Fleabane	*Pulicaria dysenterica*	4			2	2	II (2-4)
Meadow buttercup	*Ranunculus acris*		3			2	II (2-3)
Creeping buttercup	*Ranunculus repens*	3			4	4	III (3-4)
Sorrel	*Rumex acetosa*			1		2	II (1-2)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Clustered dock	*Rumex conglomeratus*		3			3	II (3)
Curled dock	*Rumex crispus*	5	2	6	5	4	V (2-6)
Wood dock	*Rumex sanguineus*	3	3	3	2		IV (2-3)
Hoary ragwort	*Senecio erucifolius*				2		I (2)
Pepper saxifrage	*Silaum silaus*		3				I (3)
Ragged robin	*Silene flos-cuculi*					2	I (2)
Nettle	*Urtica dioica*	4			3	2	III (2-4)
Germander speedwell	*Veronica chamaedrys*			3	2		II (2-3)
Thyme-leaved speedwell	*Veronica serpyllifolia*	2					I (2)

Table EDP A3.14: NVC Data for Field 12 Community 3: MG6b *Lolium perenne-Cynosurus cristatus* grassland *Anthoxanthum odoratum* sub-community (Finer sward)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Common bent	*Agrostis capillaris*		6	4	3	3	IV (3-6)
Meadow foxtail	*Alopecurus pratensis*	4	2		4		III (2-4)
Wild angelica	*Angelica sylvestris*				2	2	II (2)
Sweet vernal grass	*Anthoxanthum odoratum*	8	5	6	7	2	V (2-8)
False oat-grass	*Arrhenatherum elatius*	2			2	3	III (2-3)
Cuckoo flower	*Cardamine pratense*		1				I (1)
Hairy sedge	*Carex hirta*	6			2		II (2-6)
Spiked sedge	*Carex spicata*		5	4	2		III (2-5)
Black knapweed	*Centaurea nigra*			2			I (2)
Common mouse-ear	*Cerastium fontanum*	1	1				II (1)
Creeping thistle	*Cirsium arvense*	2	2				II (2)
Marsh thistle	*Cirsium palustre*			1		1	II (1)
Crested dog's-tail	*Cynosurus cristatus*			4	2	3	III (2-4)
Cock's-foot	*Dactylis glomerata*	4		3	2	4	IV (2-4)
Tufted hair-grass	*Deschampsia caespitosa*			2		3	II (2-3)
Red fescue	*Festuca rubra*		5	3	5	6	IV (3-6)
Meadowsweet	*Filipendula ulmaria*	3			2	1	III (1-3)
Goosegrass	*Galium aparine*		3				I (3)
Ground ivy	*Glechoma hederaca*			4			I (4)

Common name	Scientific name	Q1	Q2	Q3	Q4	Q5	DOMIN
Hogweed	*Heracleum sphondylium*		1			3	II (1-3)
Yorkshire fog	*Holcus lanatus*	5	7	3	6	7	V (3-7)
Soft rush	*Juncus effusus*			2			I (2)
Meadow vetchling	*Lathyrus pratensis*		2	3	1		III (1-3)
Perennial rye-grass	*Lolium perenne*	3	1			4	III (1-4)
Bird's-foot trefoil	*Lotus corniculatus*				2		I (2)
Field wood-rush	*Luzula campestris*		2	1		2	III (1-2)
Ribwort	*Plantago lanceolata*	4	5		3		III (3-5)
Smooth meadow-grass	*Poa pratensis*	2	4	5	3		IV (2-5)
Rough meadow-grass	*Poa trivialis*	5		5	2	7	IV (2-7)
Creeping cinquefoil	*Potentilla reptans*	2				4	II (2-4)
Fleabane	*Pulicaria dysenterica*				5		I (5)
Meadow buttercup	*Ranunculus acris*		2	2	1	3	IV (1-3)
Creeping buttercup	*Ranunculus repens*	6	4		3	1	IV (1-6)
Sorrel	*Rumex acetosa*	3		4	2	3	IV (2-4)
Clustered dock	*Rumex conglomeratus*		2			2	II (2)
Curled dock	*Rumex crispus*		3				I (3)
Wood dock	*Rumex sanguineus*				2	4	II (2-4)
Great burnet	*Sanguisorba officinalis*		2	1			II (1-2)
Common ragwort	*Senecio jacobaea*	1					I (1)
Red campion	*Silene dioica*			1	1		II (1)
Ragged robin	*Silene flos-cuculi*		2				I (2)
Lesser stitchwort	*Stellaria graminea*			3	3		II (3)
Red clover	*Trifolium pratense*	5			4	1	III (1-5)
White clover	*Trifolium repens*	3		3	2	5	IV (2-5)
Tufted vetch	*Vicia cracca*	1	3				II (1-3)
Common vetch	*Vicia sativa*				3		I (3)
Thyme-leaved speedwell	*Veronica serpyllifolia*	2					I (2)

Table EDP A3.15. Results of the Hedgerow survey

Hedge number (**Plan EDP 4**)	Hedge Length	Woody species (recorded within the 30m sample sections)													Mean count of Schedule 3 species from the 30 m samples#	Woodland plants	Additional Features							Adjacent footpath, bridleway, road used as a public path or byway open to all traffic?	Important Hedgerow?
		Schedule 3 species															Bank/wall	Gaps <10%	Standard Trees	Ditch	Connections (>4)	Parallel hedge	Woodland species		
		Willow (Salix sp.)	Ash (*Fraxinus excelsior*)	Blackthorn (*Prunus spinosa*)	Elm sp. (*Ulmus spp.*)	Elder (*Sambucus nigra*)	Hawthorn (*Crataegus monogyna*)	Hazel (*Corylus avellana*)	Maple, field (*Acer campestre*)	Oak (*Quercus robur*)	Rose sp. (*Rosa spp.*)	Hornbeam (*Carpinus betulus*)	Cherry (*Prunus avium*)	Dogwood (*Cornus sanguinea*)											
1	110m		x	x			x		x	x	x				6	*N/A*		x	x	x					Y
2	50m			x			x						x		3	*N/A*		x							N
3	90m						x				x	x			3	*N/A*		x		x					N
4	70m			x	x	x	x				x	x			6	*N/A*		x							N
5	40m	x		x			x			x	x				5	*N/A*		x	x						N
6	80m			x	x		x		x		x				5	*N/A*		x							N
7	80m			x	x		x		x		x				5	*N/A*		x	x						N
8	130m		x	x	x		x			x	x				4.5	*N/A*		x	x						N
9	80m			x			x		x	x		x		x	6	*N/A*		x	x	x					Y
10	130m		x				x			x	x	x			4	*N/A*		x	x	x					N

Hedge number (**Plan EDP 4**)	Hedge Length	Woody species (recorded within the 30m sample sections)													Mean count of Schedule 3 species from the 30 m samples[#]	Woodland plants	Additional Features							Adjacent footpath, bridleway, road used as a public path or byway open to all traffic?	Important Hedgerow?
			Schedule 3 species														Bank/wall	Gaps <10%	Standard Trees	Ditch	Connections (>4)	Parallel hedge	Woodland species		
		Willow (Salix sp.)	Ash (*Fraxinus excelsior*)	Blackthorn (*Prunus spinosa*)	Elm sp. (*Ulmus spp.*)	Elder (*Sambucus nigra*)	Hawthorn (*Crataegus monogyna*)	Hazel (*Corylus avellana*)	Maple, field (*Acer campestre*)	Oak (*Quercus robur*)	Rose sp. (*Rosa spp.*)	Hornbeam (*Carpinus betulus*)	Cherry (*Prunus avium*)	Dogwood (*Cornus sanguinea*)											
11	100m		x	x			x		x	x	x				6	*Lords and ladies*		x		x					N
12	35m		x	x		x	x		x						5	*N/A*			x	x					N

Annex EDP 4
Winter Bird Surveys

A4.1 Due to the presence of marshy grassland, in addition to extents of arable land and scrub habitat, it was considered that the Application Site had potential to support notable assemblages of farmland and wetland species of conservation concern. British farmland is an essential habitat for many resident bird species and also for many northern and eastern winter immigrants (Gillings *et al*., 2008)[26]. Therefore, a wintering farmland bird survey (WBS) was undertaken to identify whether any notable species populations occur during the winter months.

Methodology

A4.2 The species targeted were those of conservation concern[27] (Red and Amber listed), including the species whose main habitat is farmland, but also those species that use farmland in large numbers in winter but for which it is not necessarily their main habitat.

A4.3 Surveys were conducted by experienced surveyors on a monthly basis, involving four surveys extending from December 2019 to March 2020. The surveys were designed to take surveyors to within c.75m of the suitable habitats for the target species. However, this was not possible in some cases and routes were altered, where necessary, at the discretion of the surveyor and according to the nature of the habitat present and the influence this had on bird detectability (e.g. height of vegetation). Surveyors using binoculars recorded Amber and Red list species encountered, along with any notable behaviour.

A4.4 It is considered that this level of repetition provides an adequate estimate for the total count of the core winter population. It is also considered that such repetition is important as, in most sites, some fields will potentially change habitat type during the survey period, for example when tilled and sown fields develop a covering of germinated winter cereal. This potentially could have an impact on the suitability of such a field to support specific over-wintering bird species.

[26] Gillings, S., Wilson, A.M., Conway, G.J., Vickery, J.A. and Fuller, R.J. (2008). Distribution and abundance of birds and their habitats within the lowland farmland of Britain in winter. *Bird Study*, 55:1, 8-22.
Eaton, M.A., Aebischer, N.J., Brown, A.F., Hearn, R.D., Lock, L.., Musgrove, A.J., Noble, D.G., Stroud, D.A. and Gregory, R.D. (2015). *Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man*. British Birds, Vol. 108, 708-746.

A4.5 Survey visits were completed on days with good visibility and avoiding periods of heavy rain. It is therefore considered that the results provide a representative overview of the wintering bird interest at the Site and have not been limited by seasonal or climatic factors. The dates and timings of the survey visits (each of which took one day to complete), and the weather conditions encountered, are summarised at **Table EDP A4.1**.

Table EDP A4.1: Date, Timing and Weather Conditions during the WBS Visits

Date	Time	Weather Summary
05/12/2019	09:00–12:15	3.5-5°C, wind 1-2, cloud 50-90%, no rain
16/01/2020	09:00-12:00	8–10°C, wind 2-3, cloud 30-80%, no rain
05/02/2020	09:00–11:45	2.5–4.5°C, wind 2-3, cloud 30-60, no rain
02/03/2020	08:45–12:15	4–6°C, wind 2–4, cloud 20-60%, no rain

A4.6 The first and last hours of daylight were not surveyed to avoid counting when birds are moving between foraging and roosting habitats. Registrations of target bird species were recorded and assigned to the location where they were first detected (if flushed). Flying birds were only recorded if they were clearly associated with the Site (e.g. just flushed or about to land).

A4.7 Following completion of the WBS, an average (mean) count and maximum count of each species of conservation concern (Red- and Amber- listed) was calculated for the survey area. Means are only provided where a species was recorded on more than one survey. The assemblage of birds recorded on-site were also compared against national conservation priorities (*Birds of Conservation Concern Report* and Schedule 1 WCA (as amended) and their local conservation statuses, through consultation of *The Oxfordshire Ornithological Society's 'Birds of Oxfordshire'*[28]. Based on these comparisons, an assessment can be made of the importance of the wintering bird species within the study area, both with regard to each species, and the overall assemblage.

Limitations

A4.8 A limitation with surveying birds on arable land (i.e. west of Langford Brook) in winter is that birds vary in detectability. This is typically a function of the species size, species behaviour (including 'flushing' distance, flocking behaviour, crypticity), foraging ecology and field characteristics (including vegetation density and height, area of the field)[29]. As such, a simple 'field perimeter' based count can miss significant numbers of birds, particularly where the field vegetation is tall or dense. This is particularly true for certain bird species, including the Red-listed skylark, and the Amber-listed meadow pipit[2].

A4.9 It should be noted that for a large number of species, including thrushes, sparrows, finches and buntings in most field types, the overall majority (i.e. >90%) can be recorded using a 'perimeter count'. However, where detectability may be an issue, comparisons of

[28] Oxfordshire Ornithological Society (2012). Birds of Oxfordshire 2012.
[29] Atkinson, P.W., Fuller, R.A., Gillings, S. and Vickery, J.A. (2006). Counting birds on farmland habitats in winter. *Bird Study*, 53:3, 303-309

bird densities or total numbers between fields will not be possible purely from using perimeter counts as the field characteristics, and hence detectability, vary between field parcels.

A4.10 The survey methodology therefore involved, where access allowed, walking to within a maximum distance of 75m of all suitable habitats for the target wintering bird species[30]. However, with regard to the effect of vegetation density and height on the ability to record birds, the survey method relies on the judgement of an experienced surveyor to assess when a count is complete. As such, in fields with more ground cover, a greater frequency of transects across open areas (and hence reduced maximum distance) is required.

A4.11 It is considered that 'double counting' could affect results, particularly with the whole-area search approach where birds could be flushed from one field to another. With reference to Wilson *et al*. (1996)[31], although this source of error cannot be eliminated, it can be minimised by taking account (namely through the detailed recording of bird movements on site plans) of birds flushed to fields yet to be counted.

A4.12 The surveys were not limited by seasonal nor climatic factors and were undertaken during optimal months. The surveys are therefore considered to be robust and representative.

Results

A4.13 Results of the 2019/20 winter farmland bird surveys are given in **Table EDP A4.2** and records of species of conservation concern are illustrated on **Plans EDP 6** to **9**. **Table EDP A4.3** provides a full list of those species recorded during the surveys that are not considered to be of conservation concern.

A4.14 A total of 36 species were recorded throughout the survey visits, of which 12 (i.e. 33%) are considered to be of conservation concern (six on the Red list; six on the Amber list of BoCC4). In addition, red kite, which are no longer considered to be of conservation concern due to population increases but benefit from legal protection under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), making it an offence to intentionally or recklessly disturb these species at, on or near an 'active' nest, were also recorded. The remaining 23 species are either on the Green list or have no status (i.e. are not native to the UK).

A4.15 The diversity and abundance of species recorded is considered to be fairly typical for a site of this size and type, although the surveys did record very low numbers of several declining farmland species such as skylark and starling, as well as flocks of other Red-list species including redwing, fieldfare and house sparrow. The flocks of redwing and

[30] Vickery, J.A., P.W. Atkinson, Marshall, J.M., West, T., Norris, K., Robinson, L.J., Gillings, S., Wilson, A. and Kirby, W. (2005) *The Effects of Different Crop Stubbles and Straw Disposal Methods on Wintering Birds and Arable Plants*. BTO Research Report 402. British Trust for Ornithology

[31] Wilson, J.D., Taylor, R. and Muirhead, L.B. (1996) Field use by farmland birds in winter: an analysis of field type preferences using re-sampling methods. Bird Study, 43, 320–332

fieldfare were recorded in the fields in the south-western part of the Site, foraging within the scrub habitat. The skylark and starling were recorded using the arable fields, hedgerow and woodland edge habitats across the Site. The arable fields were used less that the wet grassland and scrub habitats.

A4.16 Low numbers of other Red- and Amber-listed species were also recorded including song thrush, meadow pipit, dunnock, black-headed gull, herring gull, bullfinch and kestrel.

A4.17 It is considered that that the diversity and abundance of over-wintering birds within the Application Site reflects the diversity of habitats present but is not exceptional. Therefore, in EDP's opinion, the wintering bird assemblage present within the Application Site is considered to be of no greater than Local-level ecological importance.

Table EDP A4.2: Winter Bird Survey Results, Red and Amber Status Only

Species	Protection/UK Status/Country Status	Oxfordshire Status[3]	Distribution within the Study Area	Population Within Application Site	
				Mean WBS Count	Maximum WBS Count
Black-headed gull (*Chroicocephalus ridibundus*)	Amber status	Common visitor and a small but increasing breeding population.	Three feeding in the grassland fields in the east of the Site during the first survey and another individual recorded within the Site on the second survey.	1	3
Bullfinch (*Pyrrhula Pyrrhula*)	Amber status	Common resident	Recorded across the Site in very low numbers on every survey.	<2	2
Dunnock (*Prunella modularis*)	Amber status	Common and widespread resident.	Recorded across the Site on every survey, generally associated with the scrub and hedgerow habitats.	<7	11
Fieldfare (*Turdus pilaris*)	Red status, Schedule 1 WCA	Very common winter visitor and passage migrant between October and April.	Seven recorded within mixed flocks with redwing during the first survey only. Associated with the mature trees and scrub habitats.	<2	7
Herring gull (*Larus argentatus*)	Red status	Frequent visitor in mid-winter. Occasional at other times	Recorded in very low numbers.	<2	2
House sparrow (*Passer domesticus*)	Red status	Abundant resident, showing signs of recent decline.	Recorded on the final survey only in the scrub habitat in the south of the Site.	2	8
Kestrel (*Falco tinnunculus*)	Amber status	Common resident	One recorded on hunting over the site on the final survey.	<1	1
Meadow pipit (*Anthus pratensis*)	Amber status	Patchily distributed scarce breeder, usually abundant passage migrant and common winter visitor.	Two individuals recorded during the second survey only, foraging within the grassland fields.	<1	2

Species	Protection/UK Status/Country Status	Oxfordshire Status[3]	Distribution within the Study Area	Population Within Application Site	
				Mean WBS Count	Maximum WBS Count
Redwing (*Turdus iliacus*)	Red status Schedule 1 WCA	Common winter visitor and passage migrant, usually seen from late September to April.	Individuals and flocks recorded on every survey within mature trees and foraging within scrub habitats.	42	51
Red kite (*Milvus milvus*)	Schedule 1 WCA	Established resident	One recorded on the second survey flying low over the centre of the Site and an individual recorded on the final survey perched in a mature tree in the south of the Site.	<1	1
Skylark (*Alauda arvensis*)	Red status	Common resident and passage migrant.	A single bird recorded during the final survey on the arable field in the north of the Site.	<1	1
Song thrush (*Turdus philomelos*)	Red status	Common but unobtrusive resident, perhaps declining in suburban areas Strong autumn immigration augments the wintering population.	Recorded across the Site on the second and third surveys.	<2	5
Starling (*Sturnus vulgaris*)	Red status	Widespread winter visitor but much reduced breeding distribution than in the 1980s.	Recorded during the second and third surveys foraging within the Site.	<1	2

Table EDP A4.3: List of Green Status or Unlisted Species Recorded During Winter Bird Surveys

Common Name	Scientific Name
Blackbird	*Turdus merula*
Blue tit	*Cyanistes caeruleus*
Carrion crow	*Corvus corone*
Chaffinch	*Fringilla coelebs*
Coal tit	*Periparus ater*
Collared dove	*Streptopelia decaocto*
Goldcrest	*Regulus regulus*
Goldfinch	*Carduelis carduelis*
Great spotted woodpecker	*Dendrocopos major*
Great tit	*Parus major*
Green woodpecker	*Picus viridis*
Greenfinch	*Chloris chloris*
Jay	*Garrulus glandarius*
Long-tailed tit	*Aegithalos caudatus*
Magpie	*Pica pica*
Nuthatch	*Sitta europaea*
Pheasant	*Phasianus colchicus*
Pied wagtail	*Motacilla alba yarrellii*
Robin	*Erithacus rubecula*
Rook	*Corvus frugilegus*
Sparrowhawk	*Accipiter nisus*
Woodpigeon	*Columba palumbus*
Wren	*Troglodytes troglodytes*

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Annex EDP 5
Breeding Bird Survey

Methodology

Breeding Bird Survey

A5.1 The breeding bird survey was undertaken with reference to a standard methodology, entailing a modified Common Bird Census (CBC) 'territory mapping' approach[32]. This involved the completion of three visits to the Application Site, undertaken between mid-April and July, i.e. at the height of the breeding bird season for lowland Britain.

A5.2 Following best practice, the three survey visits were timed to start around first light, to coincide with the period of peak activity for birds, most particularly passerine songbird species. They were also undertaken during suitable weather conditions, i.e. days/periods with strong winds and heavy or persistent rain were generally avoided. It is therefore considered that the results are not significantly limited by seasonal or climatic factors.

A5.3 The dates and timings of the three survey visits and the weather conditions encountered are summarised in **Table EDP A5.1**.

Table EDP A5.1: Date, Timing and Weather Conditions During the Breeding Bird Survey Visits

Visit	Date	Time	Precipitation	Wind (Beaufort)	Visibility
1	17/04/20	06:00 am – 09:30 am	Light rain at times, dry for most of survey	3-4	Good
2	18/05/20	05:00 am – 07:00 am	Dry	1-2	Good
3	23/06/20	05:00 am – 08:45 am	Dry	1-2	Good

A5.4 In common with the CBC, the survey methodology involved walking to within 50m of all parts of the Application Site and recording all bird species present and their activity status, with a particular emphasis placed upon those elements considered to relate to, or be indicative of, breeding. This ensured that the survey identified all birds using the margins of the study area, as well as those in the interior.

A5.5 Following the completion of the survey, the breeding status of each bird species identified at the Application Site was determined according to the nature and frequency of the behavioural elements recorded, as set out in **Table EDP A5.2**.

[32] British Trust for Ornithology, Common Bird Census. www.bto.org.

Table EDP A5.2: Summary of field evidence used to determine breeding bird status

Status	Examples
Confirmed	• Distraction display • Nest building • Nest with eggs • Nest with young • Used nest • Recently fledged young • Adult carrying faecal sac/food
Probable	• Pair observed in suitable nesting habitat in breeding season • Permanent territory presumed through registration of territorial behaviour (song, etc.) on at least two different days a week or more apart at the same place • Courtship and display • Visiting a probable nest site • Agitated behaviour or anxiety calls from adults • Brood patch on adult examined in the hand • Nest building or excavating nest-hole
Possible	• Species observed in breeding season in possible nesting habitat • Male in song • Adult giving alarm call
Non-breeder	• Feeding birds only • Birds flying over only • Lack of suitable breeding habitat

A5.6 The survey was carried out by an experienced ornithologist, at an appropriate time of year for the locality, and in suitable weather conditions. It is therefore considered that the results provide a representative overview of the breeding bird interest in the Application Site.

A5.7 An assessment of the individual bird species recorded at the Application Site, as well as the overall assemblage, was subsequently made with reference to the national and local conservation status of the different breeding species recorded according to the Birds of Conservation Concern[33] Report and the Oxfordshire Ornithological Society's (OOS) Oxfordshire List[34].

[33] Eaton, M.A., Brown, A.F., Noble, D.G., Musgrove, A.J., Hearn, R.D., Aebischer, N.J., Gibbons, D.W., Evans, A. And Gregory, R.D. 2015 "Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man" British Birds, Vol. 108, pages 708-746.

[34] Oxfordshire Ornithological Society (undated). The Oxfordshire List, available at https://www.oos.org.uk/oxonlist.php. Last accessed 07/12/20.

Targeted Nightingale Surveys

A5.8 Nightingale (*Luscinia megarhynchos*) is a Red-listed[35] species in England, where the population has decreased significantly and contracted and individuals are now mostly confined to the south and east of the country. Extensive suitable breeding habitat exists across the Application Site, which has matured significantly over the past 15 years through lack of management as scrub has encroached into grassland habitats. Furthermore, an established and well-known population is present at MOD Bicester, situated approximately 4.2km to the south-east of the Application Site.

A5.9 A single male nightingale was first discovered singing from scrub between fields F4 and F7 on 17 May 2016. As a result, targeted surveys were undertaken throughout the remainder of May and June 2016. No breeding activity was recorded despite activity from the male bird, and it was considered to have failed to found a mate. Update surveys were undertaken in Spring 2020 in order to determine whether the site had been colonized by a successful breeding pair.

A5.10 Surveys were undertaken with reference to BTO species-specific methodology contained within "Bird Monitoring Methods: A Manual of Techniques for UK Key Species"[36]. The surveys involved four visits: two 'midnight' surveys (beginning at midnight and ending at 3am), and two pre-dawn (beginning three hours before dawn and ending at sunrise). Midnight survey visits are undertaken to record males establishing territories and attracting mates. If activity is recorded during these survey visits, two further survey visits are undertaken pre-dawn towards the end of the active breeding season to record males defending territories, thereby determining whether the males were successful in establishing a territory and the likelihood of successful breeding. The times, dates and conditions during those surveys is given in **Table EDP A5.3** below.

Table EDP A5.3. Dates, Time and Conditions of the 2020 Nightingale Surveys

Survey Date	Survey Time	Temperature	Wind (Beaufort)	Precipitation
30/04/20	00:00 – 03:00	5 - 8 °C	2	None
18/05/20	00:00 – 03:00	9 - 11 °C	2-3	None
27/05/20	01:55 – 04:55	11 - 13 °C	1	None
04/06/20	01:49 – 04:49	9 - 10 °C	2	None

A5.11 The surveys involved walking a pre-determined route through the Application Site at a consistent pace as many times as was necessary, covering each part of the Application Site three times across the survey period. Much of the Application Site is overgrown, so the route followed established paths, generally defined by the field boundaries or scrub edge.

[35] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746.

[36] Gilbert, G., Gibbons, D.W., & Evans, J. (1998) Bird Monitoring Methods: A Manual of Techniques for UK Key Species.The Royal Society for the protection of Birds, Sandy, Bedfordshire, England.

Results

Breeding Bird Assemblage

A5.12 The results of the breeding bird surveys undertaken in 2020 are provided in **Table EDP A5.4** and the records of species of conservation concern are illustrated on **Plans EDP 10** to **12**.

A5.13 Out of 32 species recorded during the three survey visits, 11 were species of conservation concern: four Red-listed, six Amber-listed, and red kite, which is on the Green List, but is also listed on Schedule 1 of the Wildlife and Countryside Act (1981, as amended). Three of these Red-listed species were also listed in Section 41 of Natural Environment and Rural Communities Act (2006) as species of principal importance in England. Of these species, one was confirmed to be breeding, six were considered to be probably breeding on site, 20 to possibly be breeding, and it was considered that five were non-breeding species.

A5.14 The woodland, hedgerows, and scrub within the Application Site have suitability to support nesting birds. However, owing to the limited extent of habitats, the Application Site is not considered to have potential to support a significant bird assemblage.

A5.15 Abundance and diversity of bird species is considered to be consistent with the extent and diversity of habitats on site. The majority of species recorded on site were associated with the woodland, hedgerows, and scrub. The limited size of other habitats, such as wetland and woodland habitats, is considered to have limited the potential for large populations of habitat specialists. For this reason, the assemblage is considered to be of no greater than Local-level ecological importance.

Nightingale Surveys

A5.16 A single male was recorded singing during the second midnight survey visit. It was recorded singing in brief bursts in a loop within scrub in the south of the Application Site (between Fields F1, F2, F8, F9, F10) and F15. As a result, dawn survey visits were undertaken as detailed above. No further activity was recorded and it is considered that nightingale did not successfully breed within the Application Site in 2020. It is likely that the bird recorded has dispersed from the known population at MOD Bicester but has yet to successfully breed at the Application Site.

Table EDP A5.4: Results of the three Breeding Bird Surveys (2020)

Species	UK Status[37]	Regional Status[38]	On-site Status	Survey Observations	Estimated Number of Breeding Pairs within the Application Site
Mallard (*Anas platyrhynchos*)	**Amber List**	Very common breeding resident and winter visitor	Possible breeder	Three birds seen together on the watercourse that bisects the site on the first survey, and a female bird flew over the site on the third survey.	0-1
Sparrowhawk (*Accipiter nisus)*	Green List	Common breeding resident	Non-breeder	One was seen flying over the site on the second survey.	0
Red kite (*Milvus milvus*)	Green List **Schedule 1**	Uncommon breeding resident	Non-breeder	Two were seen flying over the site: one on the first survey, and one on the second survey.	0
Buzzard (*Buteo buteo*)	Green List	Common breeding resident	Non-breeder	One was seen flying over the site on the third survey.	0
Great spotted woodpecker (*Dendrocopos major*)	Green List	Common breeding resident	Possible breeder	A total of five birds were seen on site: four on the first survey (three of which were in the south-east corner) and one on the third survey, next to the southern access gate to the arable field.	0-1
Kestrel (*Falco tinnunculus*)	**Amber List**	Common breeding resident	Possible breeder	Single female bird seen in tree in the middle of the site during the third survey.	0-1
Swift (*Apus apus*)	**Amber List**	Very common breeding resident	Non-breeder	A total of four birds seen flying over the site on the third survey.	0
Stock dove (*Columba oenas*)	**Amber List**	Common breeding resident	Non-breeder	10 birds were seen in total on the first and second surveys, all in the arable field to the west.	0
Woodpigeon (*Columba palumbus*)	Green List	Very common breeding resident	Possible breeder	A total of 59 birds were seen: 32 on the first survey, 3 on the second survey, and 24 on the third survey. They were spread across the entire site.	0-24

[37] Eaton, M.A., Brown, A.F., Noble, D.G., Musgrove, A.J., Hearn, R.D., Aebischer, N.J., Gibbons, D.W., Evans, A. And Gregory, R.D. 2015 "Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man" British Birds, Vol. 108, pages 708-746.

[38] Oxfordshire Ornithological Society (undated). "The Oxfordshire List", available at https://www.oos.org.uk/oxonlist.php. Last accessed 07/12/20

Species	UK Status[37]	Regional Status[38]	On-site Status	Survey Observations	Estimated Number of Breeding Pairs within the Application Site
Jay (*Garrulus glandarius*)	Green List	Common breeding resident	Possible breeder	A single bird was seen towards the south-east on the third survey.	0-1
Magpie (*Pica pica*)	Green List	Very common breeding resident	Probable breeder	Bird seen carrying food on one occasion. Birds seen across the entirety of the site.	1+
Jackdaw (*Coloeus monedula*)	Green List	Very common breeding resident	Possible breeder	13 birds were seen: two on the first, one on the second, and 10 on the third survey. All but two of these were seen in the arable field.	0-5
Carrion crow (*Corvus corone*)	Green List	Very common breeding resident	Possible breeder	23 birds seen across the site across all three visits.	5-6
Blue tit (*Cyanistes caeruleus*)	Green List	Very common breeding resident	Possible breeder	Widespread across the whole site apart from the arable field.	12-25
Great tit (*Parus major*)	Green List	Very common breeding resident	Possible breeder	Widespread across the whole site apart from the arable field.	7-9
Long-tailed tit (*Aegithalos caudatus*)	Green List	Very common breeding resident	Possible breeder	Two birds seen together on the third survey.	0-1
Willow Warbler (*Phylloscopus trochilus*)	**Amber List**	Very common breeding summer visitor	Probable breeder	One male seen singing in same location on the first and third surveys, in the south-east corner. Two other singing males also seen in south-east corner on the first survey, and one seen singing in the north-east on the third survey.	1-4
Chiffchaff (*Phylloscopus collybita*)	Green List	Very common breeding summer visitor	Possible breeder	Very widespread across the whole site apart from the arable field. 44 singing males seen across the three surveys.	18-30
Blackcap (*Sylvia atricapilla*)	Green List	Common breeding summer visitor	Possible breeder	Widespread across the whole site apart from the arable field. 18 singing males seen across the three surveys.	10-15
Whitethroat (*Curruca communis*)	Green List	Common breeding summer visitor	Probable breeder	Bird seen carrying food. Commonly encountered in the centre of the site. 15 singing males seen across the three surveys.	9-14

Species	UK Status[37]	Regional Status[38]	On-site Status	Survey Observations	Estimated Number of Breeding Pairs within the Application Site
Wren (*Troglodytes troglodytes*)	Green List	Very common breeding resident	Possible breeder	Commonly encountered around the perimeter of the eastern half of the site. 23 singing males seen across the three surveys.	12-18
Nuthatch (*Sitta europaea*)	Green List	Common breeding resident	Possible breeder	Two birds seen, one calling towards the north-east on the first survey and one calling in the south-east on the third survey.	0-1
Starling (*Sturnus vulgaris*)	**Red List Section 41**	Very common breeding resident and winter visitor	Possible breeder	13 were seen on the first survey, and 3 on the third survey, all towards the south-east corner of the site. No birds were singing, but suitable tree holes exist within the Application Site.	0-3
Blackbird (*Turdus merula*)	Green List	Very common breeding resident and winter visitor	Probable breeder	Multiple pairs seen together in suitable habitat. Widespread across the site apart from the arable field. 6 males singing over the three surveys.	6-15
Song thrush (*Turdus philomelos*)	**Red List Section 41**	Very common breeding resident and winter visitor	Possible breeder	A total of five singing birds seen. One bird singing at the north-east of the site on the first survey. Two singing on the second survey: one in the north-west and one in the south-east. Two singing on the third survey: one in the north-east and one halfway along the southern boundary. None of these singing males were seen in the same place on more than one survey, however.	2-5
Mistle thrush (*Turdus viscivorus*)	**Red List**	Very common breeding resident	Possible breeder	Two birds were seen together on the second survey, in a tree at the north end of the watercourse, but neither were singing.	0-1
Robin (*Erithacus rubecula*)	Green List	Very common breeding resident	Possible breeder	Widespread across the site apart from the arable field. 20 males singing across the three surveys.	3-10

Species	UK Status[37]	Regional Status[38]	On-site Status	Survey Observations	Estimated Number of Breeding Pairs within the Application Site
House sparrow (*Passer domesticus*)	**Red List Section 41**	Very common breeding resident	Confirmed breeder	Female seen carrying food on third survey, plus multiple pairs seen together in suitable habitat. 10 birds seen in the south-east corner on the first survey, two birds in the south-east corner on the second survey, and seven birds seen in the north-west corner on the third survey.	5-7
Dunnock (*Prunella modularis*)	**Amber List**	Very common breeding resident	Probable breeder	Birds seen singing in same location on two different surveys, plus male seen displaying to female. Five or six territories identified. 21 males singing across the site, apart from the arable field, over the three surveys.	6-12
Chaffinch (*Fringilla coelebs*)	Green List	Very common breeding resident and winter visitor	Possible breeder	Four birds were seen singing in the south-east, all in April.	0-4
Greenfinch (*Chloris chloris*)	Green List	Very common breeding resident	Probable breeder	Pair seen together in suitable habitat. 25 seen over the central and southern areas, but none were singing.	1+
Goldfinch (*Carduelis carduelis*)	Green List	Very common breeding resident	Possible breeder	Seen across the site, but mostly in the centre and south-east. Three singing males seen.	0-3

Annex EDP 6
Bat Surveys

Methodology

A6.1 Areas of woodland, scrub, grassland and aquatic habitats within the Application Site provide potentially suitable habitat for foraging and commuting bats. In addition, a number of mature trees have the potential to support roosting bat species.

A6.2 Bat roosting assessments and activity surveys have been conducted at the Application Site previously; however, update bat surveys were considered necessary in 2020 to determine if there has been a material change in the use of the Application Sites by bats.

A6.3 The following surveys were therefore undertaken in 2020, with reference to national best practice guidance[39]:

1. Daytime inspections of trees for bat roosting potential;
2. Bat foraging/commuting activity:
   (a) Manual transect surveys; and
   (b) Automated detector surveys.

Bat Roosting – Trees

Preliminary Ground-level Roost Assessment

A6.4 To determine the potential impacts of the proposed development on bats potentially roosting within trees across the Application Site, all suitable trees were subject to a visual assessment with reference to current best practice guidance.

A6.5 The survey involved a visual assessment of all trees for the presence of, or potential to support, roosting bats. The most recent previous survey of this kind was undertaken on 10 June 2013, and this was updated on 09 April 2020. Both surveys were completed by a Natural England (NE) bat licensed ecologist. The trees were searched as thoroughly as possible from ground level, with all elevations covered where access allowed.

A6.6 Suitable features for roosting bats searched for during the assessment included:

- Loss/peeling/fissured bark;

39 Collins, J (ed) (2016) Bat Surveys for professional ecologists: Good Practice Guidelines. (3rd edn) Bat Conservation Trust, London

- Natural holes e.g. rot holes and holes from fallen limbs;
- Woodpecker holes;
- Cracks/splits or hollow tree trunks/limbs; and
- Thick-stemmed ivy.

A6.7 Signs of roosting bats searched for included:

- Bat/s roosting *in situ*;
- Bat droppings within or beneath a feature;
- Staining around or beneath a feature;
- Oily marks (staining) around roost access points;
- Audible squeaking from the roost;
- Large/regularly used roosts or regularly used sites may produce an odour; and
- Flies around the roost, attracted by the smell of guano.

A6.8 Based upon the results of the visual assessment and features/evidence identified, the following ratings for trees were used during the assessment:

- Known or confirmed roost – European Protected Species (EPS) licence required for works to tree to be completed lawfully;
- High potential – Tree supports one or more features that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time;
- Moderate potential – Tree supports one or more features that could be used by bats but are unlikely to support a roost type of high conservation status;
- Low potential – Tree supports one or more features that could be used by individual bats opportunistically, or is of sufficient size and age to contain such features; and
- Negligible potential – Negligible features likely to support roosting bats.

Limitations

A6.9 It should be noted that this type of assessment is based on features visible from ground level and is not considered to be a definitive bat roosting survey. Additional survey work

may therefore be required to establish if any bats are roosting within the trees that have potential and are to be subject to felling/tree surgery, and, if present, to establish the species, number and roost type/status. No trees with bat roost potential are to be impacted by the development proposals and so no further surveys is considered necessary.

A6.10 Given that the assessment was undertaken when the trees were in leaf, trees that were of a suitable size or age to support roosting bats, and that were not wholly visible from the ground owing to leaf cover, were classified as having low potential to support roosting bats, even where no specific features were visible. It is considered that this precaution ensures that the surveys undertaken were sufficiently robust to achieve the aims identified and correctly ascertain the likelihood of a tree supporting bat roosts.

Tree Roost Emergence Survey

A6.11 A single tree with bat roost potential is to be removed (T27 – see **Plan EDP 13**), therefore a dusk emergence survey was undertaken on 07 June 2021 to check for the presence or absence of roosting bats. During the survey, two surveyors were positioned on either side of the tree covering all potential access points. One of the surveyors was equipped with an infrared camera due to the dark conditions beneath the tree canopy. The dusk emergence survey commenced approximately 15 minutes before sunset and continued for 1.5 hours after sunset. A summary of the survey including date, timings and weather conditions is included within **Table EDP A6.1**.

Table EDP A6.1: Summary of Dusk Emergence/Dawn Re-entry

Date	Start/Finish Time	Sunset/-Sunrise Time	Temp (C°)	Cloud (%)	Rain	Wind (Beaufort Scale)
07/06/21	20:06 - 22:51	21:21	18-21	20-50	None	0-1

Limitations

A6.12 Weather conditions were optimum for the emergence surveys, being relatively warm with light winds and no rain. The survey is therefore not considered to be seasonally or climatically constrained.

Investigations of Bat Foraging/Commuting Activity

Manual Transect Surveys

A6.13 Bat activity surveys have been conducted at the Application Site on several occasions since 2010 and were updated in 2020. Manual transect surveys were undertaken across the Application Site to identify areas of bat foraging activity and commuting routes used by bats. These surveys were spread over the course of the active bat season and completed each month from May to September.

A6.14 Dusk activity surveys were initiated at sunset and extended for two hours; a dawn activity survey, completed in August, was undertaken the morning after the previous night's dusk survey, commencing two hours prior to sunrise and finishing at sunrise.

A6.15 Full details including the survey type, date, timing, and weather conditions during each of the transect surveys undertaken is given in **Table EDP A6.2**.

Table EDP A6.2: Date, timing and weather conditions of bat activity transect surveys.

Survey Date	Dusk/-Dawn	Survey Time	Sunrise/--Sunset Time	Weather Conditions			
				Temp (°C)	Cloud (%)	Rain	Wind (Beaufort scale)
06/05/20	Dusk	20:38-22:38	20:38	10-13	0	Nil	1-2
11/06/20	Dusk	21:24-23:24	21:24	14	100	Nil	3-2
15/07/20	Dusk	21:17-23:17	21:17	17-18	100	Nil	2-5
10/08/20	Dusk	20:35-22:35	20:35	23-24	15-30	Nil	1
11/08/20	Dawn	03:43-05:43	05:43	19	20-30	Nil	1
08/09/20	Dusk	19:34-21:34	19:34	20-21	100	Nil	1

A6.16 The transect surveys were completed by experienced bat surveyors across four transect survey routes designed to cover all potential foraging or commuting habitat on the Application Site. Transect routes were walked at a slow pace with 12 'pacing points' to ensure an even speed throughout the transect. All bats were recorded and their behaviour marked on survey maps characterise the value of the Application Site and its component habitats to foraging and commuting bats.

A6.17 Activity surveys were conducted using Elekon batlogger M with a built-in GPS unit. Observations of the time, location, and activity of all bats seen or heard were noted. Bats were identified on the basis of their characteristic echolocation calls, which were recorded and analysed using computer sonogram analysis (BatExplorer) to confirm species identification. Species of myotid bat and long-eared bat are difficult to tell apart solely from their echolocation calls and were therefore grouped as such.

Limitations

A6.18 Weather conditions on each visit were optimum for the majority of the bat surveys, being relatively warm with light to medium winds and no rain. Wind picked up to beyond optimal levels during the July survey but the majority of the survey time has lesser winds and thus the survey is still considered valid. The surveys are therefore not considered to be seasonally or climatically constrained.

Automated Detector Surveys

A6.19 To supplement the transect survey data, bat activity within the Application Site was also sampled using static bat detectors which automatically trigger and record bat echolocation calls. Detectors were deployed for a minimum of 5 nights each month during May to September inclusive. The sampling periods (between deployment and collection) were as follows:

- 05/05/20–11/05/20;
- 11/06/20–16/06/20;
- 15/07/20–19/07/20;
- 11/08/20–17/08/20; and
- 09/09/20–14/09/20.

A6.20 For each survey, eight automated bat detectors (Anabat Express) were deployed across the Application Site as shown on **Plan EDP 14**. The Anabats were fixed in secure locations, with an external microphone attached 1.5m above ground, and directed away from the tree, approximately 45° to the hedgerow, to maximise detection sensitivity.

A6.21 The echolocation calls recorded by the Anabats were filtered for noise files (i.e. sound files created when noise triggers the Anabat to record) and then specifically for each of the UK's bat species using Analook software filter function. The parameters for the noise filter are based on that proposed by Chris Corben and Kim Livengood[40] and are provided in **Table EDP A6.3**. All files passing the various filters were checked manually using sonogram analysis (AnalookW) in accordance with published parameters[41] to confirm the species identification of each bat call.

Table EDP A6.3: Filtration values used by Analook software to remove noise files.

Filter	Smoothness	Frequency (Fc (kHz))		Duration (ms)	
		Min	Max	Min	Max
Noise filter	50	15	120	2	50

Limitations

A6.22 The identification of calls and species using Analook software is dependent upon the quality of the recording made which can be influenced by the following factors, which may limit levels of activity and species recorded:

- Weather conditions – rainfall and wind;

[40] Taken from Making an Antinoise Filter presentation from 2010 Annual Bat Conference
[41] Russ (2012). *British Bat Calls, a guide to species identification*. Pelagic Publishing, Exeter

- Distance of bat from Anabat;
- Presence of obstructions through which the noise must pass, i.e. trees; and
- Proximity of other noise sources such as roads.

A6.23 None of the automatic detector surveys are considered to have been constrained any more than normal in respect of these factors, however.

Results

Bat Roost Assessment – Trees

Preliminary Ground-level Roost Assessment

A6.24 During the update assessment in 2020, 27 trees were assessed as having bat roost potential (BRP), namely: seven with high BRP, seven with moderate BRP and 13 with low BRP. The locations of these trees are illustrated on **Plan EDP 13**.

A6.25 Details of the assessment are provided in **Table EDP A6.4**. This includes cross referencing with the Tree and Tree Group identification numbers used in the Arboricultural Assessment for the Proposed Development.

Table EDP A6.4: Results of Preliminary Roost Assessment of Trees.

Tree ID (ref. Plan EDP 12)	Tree number (ref. Arb. Assessment)	Species	Features Identified	BRP
1	G5	Oak	Woodpecker hole on north side Shallow tear out on west side Minor splits, flaking bark, dense ivy	Low
2	T25	Oak	Small woodpecker tester hole – not deep Downward development of rot hole on eastern branch, some flaking bark	Moderate
3	T24	Oak	Minor limb holes and splits	Low
4	T4	Ash	Many woodpecker holes Several limb holes and tear outs	High
5	T9	Willow	Small tear out and minor splits	Low
6	T10	Oak	Many woodpecker holes Minor splits, some flaking bark and some deadwood	High
7	T11	Oak	Some limbs holes and rot holes Some minor splits and some flaking bark	Moderate
8	T12	Oak	Minor splits, rot holes and some flaking bark	Low
9	T13	Oak	Quite a bit of rot and some splits	Low

Tree ID (ref. Plan EDP 12)	Tree number (ref. Arb. Assessment)	Species	Features Identified	BRP
10	T14	Oak	Rot hole cavity – not sure how deep	Moderate
11	G7	Crack Willow	Some splits and flaking bark	Low
12	G7	Crack Willow	Some splits and flaking bark	Low
13	G7	Crack Willow	Some splits and flaking bark	Low
14	G7	Crack willow	Many tear outs	Moderate
15	G18	Oak		High
16	G18	Ash	Hollow tree with linear cavity	High
17	G18	Oak	Hollow buts of trunk and wood pecker holes	High
18	G18	Oak	Minor splits and tear outs	Low
19	G18	Oak	Multiple woodpecker holes, limb holes and rot holes	High
20	G18	Oak	Some minor splits	Low
21	T16	Oak	Some tearouts, small rot holes, minor splits and flaking bark	Moderate
22	G6	Oak	Some flaking bark and small rot holes	Low
23	G5	Oak	Some flaking bark and small rot holes	Low
24	T28	Oak	Woodpecker holes and limb holes with cavities	High
25	T26	Oak	Small limb hole	Low
26	T23	Oak	Minor limb holes, some tear outs and some splits	Moderate
27	G37	Oak	Large split in stem	Moderate

Tree Roost Emergence Survey

A6.26 No bats were observed emerging from the tree T27 during the emergence survey. Common pipistrelle, soprano pipistrelle and noctule bats were recorded foraging in the area during the survey, mostly at canopy level. It is therefore considered very unlikely that the tree currently contains a bat roost.

Investigations of Bat Foraging/Commuting Activity

Manual Transect Surveys

A6.27 The bat transect results are summarised on **Plan EDP 15**, which includes a separate sheet for each survey month and a sheet with the results amalgamated to create a 'heat map' of activity. At least seven species were recorded on the manual transects; common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*P. pygmaeus*), noctule (*Nyctalus noctula*), *Myotis* species, Leisler's bat (*Nyctalus leisleri*), Serotine bat (*Eptesicus serotinus*) and Long-eared species – mostly likely to be brown long-eared (*Plecotus auritus*).

Activity per Species

A6.28 Activity recorded on the transect surveys was predominantly of common pipistrelle. This species was recorded in all areas and all months. Soprano pipistrelle, noctule and Myotis were also recorded in all months but at a much lower level. Noctule activity was concentrated along Langford Brook and the north-western end of field 14. Activity from serotine, long-eared and Leisler's bats was recorded in most months except May but recordings were few.

Activity per Area

A6.29 Bat activity was, unsurprisingly, concentrated in the eastern part of the Application Site where the grassland, scrub mosaic, woodland and pond habitats are found and along Langford Brook. However, there was still activity recorded on the boundary hedgerows of the western part of the Application Site but not until July.

Automated Detector Surveys

A6.30 The automated detectors have recorded activity from at least nine bat species; common pipistrelle, soprano pipistrelle, noctule, Myotis species, Leisler's bat, Serotine bat, Long-eared species, Nathusius pipistrelle (*Pipistrellus nathusii*) and barbastelle. The latter two are in addition to the species detected on the manual transect surveys.

A6.31 As with the manual transect surveys, **Table EDP A6.5** shows that activity was predominantly (54 to 74%) by common pipistrelle with the next highest species activity soprano pipistrelle (1-19%), *Myotis* species (4-19%) and noctule (4-10%). All other species accounted for less than 4% of activity each month.

Table EDP A6.5: Monthly Summary of Automated Detector Surveys

Survey Month	Species	No. Registrations Recorded	% of Total
May	Common pipistrelle	2944	73.58
	Myotis sp.	288	7.20
	Nathusius pipistrelle	25	0.62
	Noctule	187	4.67
	Soprano pipistrelle	500	12.50

Survey Month	Species	No. Registrations Recorded	% of Total
	Long eared bat	45	1.12
	Serotine	11	0.27
	Barbastelle	1	0.02
	Total	**4001**	**100**
June	Common pipistrelle	1369	73.44
	Long eared bat	4	0.21
	Myotis sp.	135	7.24
	Noctule	84	4.51
	Soprano pipistrelle	210	11.27
	Leisler's	62	3.33
	Total	**1864**	**100**
July	Common pipistrelle	1794	69.75
	Long eared bat	27	1.05
	Leisler's	3	0.12
	Myotis sp.	102	3.97
	Noctule	258	10.03
	Soprano pipistrelle	369	14.35
	Serotine	19	0.74
	Total	**2572**	**100**
August	Common Pipistrelle	973	63.80
	Long eared bat	10	0.66
	Myotis sp.	152	9.97
	Noctule	89	5.84
	Soprano pipistrelle	291	19.08
	Serotine	10	0.66
	Total	**1525**	**100**
September	Common Pipistrelle	978	54.27
	Long eared bat	53	2.94
	Myotis sp.	347	19.26
	Noctule	131	7.27
	Soprano pipistrelle	277	15.37
	Serotine	13	0.72
	Leisler's	1	0.06
	Nathusius pipistrelle	2	0.11
	Total	**1802**	**100**

Activity per Species

A6.32 Common pipistrelle registrations were by far the highest and this species was recorded on all months at all locations. Soprano pipistrelle, *Myotis* species and Noctule were recorded in all months at most locations but at a much lower level.

A6.33 Nathusius pipistrelle was recorded across most positions in May in low numbers, was not recorded in June or July and was only recorded at position 6 in August and 7 in September.

A6.34 Leisler's bat was not recorded in May, August and September. It was recorded in positions 4,6,7 and 8 in June and only positions 1 and 2 in July.

A6.35 Serotine was not recorded in June but was recorded in low numbers at many locations in the other months.

A6.36 A single barbastelle call was recorded in May only at position 3.

A6.37 Long eared bats were recorded on all months at different locations in small numbers.

Activity per Area

A6.38 **Table EDP A6.6** shows the total number of bat registrations per location as well as the average number of species detected at that location.

A6.39 Activity was highest at position 5, 6 and 7 which correspond to fields F9, F15 and F2/3, respectively. Activity was lowest at positions 3, 4 and 8 which correspond to fields F11, F12 and F5.

A6.40 The average number of species did not vary much except that it was slightly lower in positions 1 and 2 which are in the west of the Application Site. This is not surprising for position 1 as it borders a large arable field which offers less suitable foraging habitat for bats

Table EDP A6.6: Total bat registrations and average number of species at each Anabat Location

Location (ref. Plan EDP 14)	Field Number (ref. Plan EDP 1)	Total registrations	Average Number of Species
1	F13	1384	4.4
2	F11	1279	4.8
3	F11	342	5.4
4	F12	307	5.4
5	F9	3015	5.4
6	F15	2186	5.0
7	F2/3	2859	6.0
8	F5	458	5.4

Evaluation

A6.41 Surveys have confirmed that the Application Site supports a typical assemblage of common and widespread bat species, with big bats such as Leisler's and serotine being recorded more regularly on later surveys.

A6.42 The level of bat activity recorded in 2020 was largely consistent with previous surveys and generally lower than might be expected given the quality of foraging habitats in the

eastern portion of Application Site. This may be a reflection of the Application Site's urban edge location and the resulting high levels of artificial illumination in the surrounding area.

A6.43 The overall bat assemblage, taking into consideration the presence of rare and uncommon species (albeit only present in low numbers), is considered to be of Local-level ecological importance.

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Annex EDP 7
Dormouse Survey

Methodology

A7.1 The habitat within the Application Site is considered to have matured to the point of being good for dormouse, and it is possible that a relict population may have survived within on-site woodland and hedgerows. Therefore, a precautionary presence/absence survey was undertaken.

A7.2 A presence/absence survey for dormice was carried out using dormouse nest tubes in accordance with the current industry survey guidance[42]. These tubes are made from black plastic sheet, 5 × 5cm in cross section and 25cm long, sealed at one end, with a plywood tray inside. They are then suspended under horizontal limbs to resemble a hollow branch. The tubes are then inspected for the presence of dormice and also for signs of recently constructed dormouse nests.

A7.3 A total of 100 nest tubes were deployed within the woody/hedge and scrub habitats with the most potential on the Application Site on 03 April 2020 the locations of which are displayed on **Plan EDP 16**. The tubes were then checked five times between May and September 2020. The dates of the dormouse checks are displayed in **Table EDP A7.1**.

Table EDP A7.1: Dates of Dormouse Checks

Check Number	Date
1	27/05/20
2	25/06/20
3	29/07/20
4	29/08/20
5	09/09/20

A7.4 The current industry survey guidance[1] states that a robust and valid survey requires a minimum of 20 points using the values assigned to each month as in **Table EDP A7.2** which is based on 50 tubes being deployed.

Table EDP A7.2: Dormouse Survey Effort Scores

Month	Score
April	1
May	4
June	2
July	2
August	5
September	7
October	2

[42] Bright, P., Morris, P. and Mitchell-Jones, T. (2006). *The Dormouse Conservation Handbook: 2nd Edition*. English Nature, Peterborough.

Month	Score
November	2

Notes: A minimum score of 20 is required to reliably prove presence/absence

Limitations

A7.5 A small number of tubes were lost during the survey duration due to antisocial behaviour. However, the number of tubes remaining was still sufficient to ensure a robust survey.

Results

A7.6 No dormouse evidence was found in any of the tubes and this species is therefore considered to be absent from the Application Site.

Annex EDP 8
Otter and Water Vole Survey

Methodology

A8.1 An update otter and water vole survey of the Langford Brook was undertaken by EDP over two visits on 06 May 2020 and 10 August 2020.

A8.2 Otter have been known to exploit virtually any aquatic habitat and no specific variables have been found to be preferred by otter, thus suitable habitat is indicative of suitability only[43]. Evidence for the presence of otter includes[44]:

- Spraints;
- Tracks (footprints);
- Feeding remains;
- Otter slides (into water);
- Holts (underground dens); and
- Couches (above ground sites where otters rest during the day).

A8.3 Optimal habitat for water voles includes:

- Water more than 50cm deep and relatively stable;
- Muddy bottom;
- Static or slow flowing water;
- Earth banks of >45° (for burrowing);
- Dense vegetation cover on the banks of a good mix of grasses and herbs for summer food and cover and some berry-bearing bushes, tubers and trees for autumn and winter food;
- Emergent, in-channel vegetation; and
- 1–2m wide.

[43] Chanin P (2003). Ecology of the European Otter. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.
[44] https://www.gov.uk/guidance/otters-protection-surveys-and-licences#survey-methods

A8.4 Evidence for the presence of water voles includes:

- Feeding signs (neat piles of short pieces of vegetation cut at a 45° angle);
- Latrines (piles of droppings);
- Burrows;
- Footprints and pathways; and
- Actual sightings.

A8.5 Banks were searched for evidence where possible from within the water channel but where this was not possible due to deep mud and silt of excessive vegetation, banks were searched from the top of the bank itself as recommended by the Water Vole Mitigation Handbook[45].

Limitations

A8.6 The optimal period for water vole survey is during the breeding season (mid-April to end of September) so the surveys were not considered to be limited by seasonal, or any other, factors.

Results

Habitat

A8.7 Langford Brook is wooded to the east and arable to the west. This variation in bankside vegetation offers good cover and a range of seasonal food types for water vole.

A8.8 Along the western bank of Langford Brook, there is very little scrub and the vegetation is predominantly of tall herbs: great willowherb (*Epilobium hirsutum*), hoary willowherb (*Epilobium parviflorum*) and nettle (*Urtica dioica*) with goosegrass (*Galium aparine*) and common docks (*Rumex* spp.) along with common grasses such as cocksfoot (*Dactylis glomerata*), false oat-grass (*Arrhenatherum elatius*), perennial rye-grass (*Lolium perenne*), Yorkshire fog (*Holcus lanatus*) and common bent (*Agrostis capillaris*).

A8.9 The eastern bank supports many mature trees and much scrub along with common grasses with the tall herbs described for the west bank but present in smaller quantity. English oaks (*Quercus robur*), ash (*Fraxinus excelsior*), crack willows (*Salix fragilis*) and field maples (*Acer campestre*) are the main tree species here but included in the scrub are hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), buckthorn (*Rhamnus*

[45] Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016), Water Vole Mitigation Handbook (Mammal Society Mitigation Guidance Series). Eds Fiona Matthews and Paul Channin. Mammal Society, London.

cathartica), guelder rose (*Viburnum opulus*), elder (*Sambucus nigra*) and grey willow (*Salix cinerea*).

A8.10 The channel is 2m deep and 4m wide with steep earth banks, vertical in places. The water is 2m wide and 0.5m deep with a substrate of silt and fine gravel.

A8.11 Submerged vegetation is limited but includes branched burr reed (*Sparganium erectum*), fools water cress (*Apium nodiflorum*), water crow foot (*Ranunculus aquatilis*) and a small quantity of fennel pondweed (*Potamogeton pectinatus*).

Otter Evidence

A8.12 Several otter spraints and footprints were found under the bridge during the May survey. The spraints were dry and fragmented. Further dry fragmented spraint was found in this location during the August survey but no footprints were seen at this time. The location is shown on **Plan EDP 17**.

A8.13 Whilst there are some trees with exposed sections of roots in proximity to the water-course, these do not offer large enough areas to be suitable for otter resting places or holts.

A8.14 It is considered that Langford Brook supports foraging otter as a part of a much wider territory but the Application Site does not support sheltering, breeding or resting otter. The otter population likely to using Langford Brook is considered to be of Local ecological importance.

Water Vole Evidence

A8.15 No evidence of water voles has been previously found on Langford brook within the Application Site and there are limited records from within 2km. The closest record is from the northern boundary of F13 from 2000.

A8.16 In the 2020 surveys, two possible burrows and some possible feeding signs, namely small amounts of cut burr reed, were found during the May survey. The locations are shown on **Plan EDP 17**. No signs were found during the August survey.

A8.17 Based on the survey findings it is considered possible that Langford Brook supports a very small population of water vole. If present, such a population would be of less than Local ecological importance.

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Annex EDP 9
Great Crested Newt Survey

Methodology

A9.1 Five ponds are present with the Application Site with a further six ponds located within 250m of the Application Site. For the purposes of this report these ponds have been numbered as Ponds 1-11 and their locations are shown on **Plan EDP 18**.

A9.2 These ponds have been surveyed extensively since 2002, with the most recent update surveys having been completed in 2018 and 2020. The results from both of these surveys are presented here.

A9.3 No surveys have been completed on Pond P3 (beside the railway and possibly no longer present) since 2010 due to access constraints. After 2013, P10 was scoped out due to no GCN being found on several previous surveys and P11 was scoped out due to the intervening distance between this pond and the Application Site boundary. Pond P7 was scoped out of survey in 2020 as a medium-sized population had been confirmed in this pond during the 2018 survey and further survey was deemed unnecessary. Access to P9 was only permitted for the first visit in 2018 but not after that. Therefore, the 2018 surveys included ponds P1, P2, P4, P5, P6, P7 and P9 (1 visit only) and the 2020 surveys included P1, P2, P4, P5, P6 and P8.

A9.4 Survey visits were undertaken with reference to the survey methodology set out in the English Nature Guidelines[46] by a holder of a Natural England GCN survey licence and an assistant. In accordance with the guidelines, the following three preferred survey techniques were employed to determine the presence/absence of GCN on site:

- Torching – This involves searching water bodies by torchlight between dusk and midnight and is an effective means of detecting adult newts. Each surveyor used a 1,000,000 candle power torch during this part of the survey;

- Bottle Trapping – This involves the use of funnel traps (made from 2 litre plastic bottles) that are inserted into the water along the margin of the water bodies during the evening and checked the following morning. Access permitting, the traps are spaced at roughly 2m intervals around the margins of the ponds; and

- Egg Searching – A search of any suitable aquatic vegetation to check for great crested newt eggs.

A9.5 The standard survey procedure involves a minimum of four survey visits to each pond to confirm the presence/likely absence of GCN. If during any of these four visits, evidence is

[46] English Nature (2001). Great Crested Newt Mitigation Guidelines, English Nature, Peterborough

found of GCN, then a further two survey visits are required to allow for an estimate of population size.

A9.6 The dates of the survey visits and the conditions during the surveys are summarised in **Table EDP A9.1**.

Table EDP A9.1: Timings and Conditions for the Great Crested Newt Surveys in 2018 and 2020

Visit	2018		2020	
	Date (Evening)	**Overnight Air Temp. (°C)**	**Date (Evening)**	**Overnight Air Temp. (°C)**
1	11/04/18	7.5	07/04/20	15.0
2	19/04/18	14.0	20/04/20	17.0
3	03/05/18	8.0	30/04/20	14.0
4	15/05/18	9.0	05/05/20	15.0
5	29/05/18	14.5	18/05/20	18.0
6	11/06/20	17.0	11/06/20	13.0

Limitations

A9.7 The timing and conditions during the surveys are in line with those set out in the English Nature Great Crested Newt Mitigation Guidelines and as such, it is not considered that they were limited by seasonal or climatic factors.

A9.8 High turbidity and/or vegetation limited visibility in some water bodies during the torchlight surveys and may have resulted in GCN being undetected; however, the survey design, which includes other survey techniques, is specifically intended to reduce the significance of this limitation.

Results

A9.9 A complete record of the survey findings, including the number of bottle traps deployed, is provided in **Tables EDP A9.2** and **A9.3** below.

2018 Survey

A9.10 Evidence of great crested newts was recorded in P1, P2, P4, P5, P6 (on site) and P7 (off site). The peak adult counts in the onsite ponds ranged from three to six, whereas the peak adult count for P7 was 65.

A9.11 Smooth newts were recorded in all surveyed ponds apart from P8.

2020 Survey

A9.12 Evidence of great crested newts was recorded in P1, P2, P4 and P6, although only eggs were recorded in P6. The peak adult counts in these onsite ponds ranged from two to 14.

A9.13 Smooth newts were recorded in all surveyed ponds apart from P8 and palmate newts were recorded in P2 and P4.

Table EDP A9.2: Detailed Great Crested Newt Survey Results 2018

Date	Visit No.	Pond No.	No. Traps	Trapping Results	Torching Results	GCN Eggs Found?
11/04/18	1	1	15	GCN (3f,1m) SN (3f, 2m)	SN (6m, 3f)	No
		2	15	SN (5f)	Nil	No
		4	3	Nil	Nil	No
		5	15	SN (1f)	GCN (1 dead)	No
		6	10	SN (1f)	SN (1f)	No
		7	17	GCN (6f, 1m) SN (1f)	GCN (11f) SN (2m)	No
		8	15	Nil	Nil	No
		9	35	SN (2f)	SN (3f, 2m)	No
19/04/18	2	1	13	GCN (1f) SN (3f, 5m)	GCN (1f, 1m) SN (5f, 4m)	Yes
		2	12	GCN (1f) SN (4f)	GCN (1f) SN (1f)	Yes
		4	5	GCN (1f) SN (1f, 1m)	GCN (3f, 1m) SN (1m)	Yes
		5	40	GCN (1f, 4m) SN (3f, 10m)	GCN (1f, 4m) SN (1f)	Yes
		6	10	GCN (3f) SN (2m)	SN (2f, 1m)	Yes
		7	20	GCN (17f, 2m)	GCN (28f, 33m)	Yes
		8	12	Nil	Nil	No
		9	N/A no access			
03/05/18	3	1	15	SN (2m)	SN (3f, 6m)	N/A
		2	14	SN (1m)	GCN (1m) SN (2f, 5m)	N/A
		4	5	Nil	Nil	N/A
		5	30	GCN (1f, 1m)	GCN (3m) SN (2m)	N/A
		6	8	SN (1m)	SN (1f, 1m)	N/A

Date	Visit No.	Pond No.	No. Traps	Trapping Results	Torching Results	GCN Eggs Found?
		7	20	GCN (35f, 6m) SN (2m)	GCN (26f, 30m)	N/A
		8	15	Nil	Nil	No
15/05/18	4	1	15	GCN (3f, 3m) SN (3f, 2m)	GCN (1m) SN (1m)	N/A
		2	10	SN (1m)	Nil	N/A
		4	1	Nil	Nil	N/A
		5	15	GCN (1f, 1m)	SN (1m)	N/A
		6	5	SN (1f, 1m)	SN (1f)	N/A
		7	20	GCN (10f, 2m) SN (1m)	GCN (2f) SN (1m)	N/A
		8	15	Nil	Nil	N/A
29/05/18	5	1	10	GCN (4f) SN (1f)	SN (1m)	N/A
		2	10	Nil	GCN (2f, 1m) SN (3f)	N/A
		4	2	Nil	Nil	N/A
		5	0	Almost dry	Almost dry	N/A
		6	0	Almost dry	Nil	N/A
		7	20	GCN (3f, 3m) SN (3m)	GCN (8m, 19m) SN (1m)	N/A
		8	20	Nil	Nil	N/A
11/06/20	6	1	8	Nil	Nil	N/A
		2	6	Nil	Nil	No
		4	0	Dry	Dry	N/A
		5	0	Dry	Dry	N/A
		6	0	Dry	Dry	N/A
		7	20	GCN (3m)	GCN (8f, 6m) SN (2f)	No
		8	8	Nil	Nil	No

N.B. GCN refers to great crested newt (*Triturus cristatus*)
SN refers to smooth newt (*Lissotriton vulgaris*)
PN refers to palmate newt (*Lissotriton helveticus*)
f refers to female
m refers to male

Table EDP A9.3: Detailed great crested newt survey results 2020

Date	Visit No.	Pond No.	No. Traps	Trapping Results	Torching Results	GCN Eggs Found?
07/04/20	1	1	14	GCN (6f, 1m) SN (4f, 2m)	GCN (5f, 5m) SN (3)	Yes
		2	14	SN (2m, 2f)	Nil	Yes
		4	5	GCN (4f, 1m) SN (4m)	GCN (11f, 3m) SN (30)	No
		5	15	Nil	SN (1m)	No
		6	6	SN (1f)	Nil	No
		8	11	Nil	Nil	No
20/04/20	2	1	13	GCN (4f, 1m) SN (2f, 1m) PN (1f)	GCN (1m) SN (5f)	N/A
		2	12	SN (3m)	Nil	N/A
		4	5	GCN (4f) SN (1m)	GCN (1f, 4m) SN (10)	Yes
		5	23	Nil	Nil	No
		6	5	Nil	Nil	Yes
		8	13	Nil	Nil	No
30/04/20	3	1	14	SN (1m)	SN (5f, 1m)	N/A
		2	14	Nil	Nil	N/A
		4	5	Not located	Not located	N/A
		5	15	Nil	Nil	No
		6	6	Nil	Nil	N/A
		8	11	Nil	Nil	No
05/05/20	4	1	15	GCN (2f) SN (9f)	Nil	N/A

Date	Visit No.	Pond No.	No. Traps	Trapping Results	Torching Results	GCN Eggs Found?
		2	15	GCN (1m, 1f) SN (4m)	Nil	N/A
		4	5	GCN (5m,4f) PN (1f)	GCN (3m, 4f) SN (1f)	N/A
		5	15	SN (1f)	Nil	No
		6	6	Nil	Nil	N/A
		8	11	Nil	Nil	No
18/05/20	5	1	17	SN (1f)	Nil	N/A
		2	10	SN (1f) PN (1f)	Nil	N/A
		4	5	GCN (1m) SN (2m)	GCN (5f, 5m) SN (9f, 2m)	N/A
		5	0	Dry	Dry	N/A
		6	6	Nil	Nil	N/A
		8	20	Nil	Nil	No
11/06/20	6	1	5	11 GCN efts 2 SN efts	Many newt larvae	N/A
		2	5	Nil	Nil	N/A
		4	0	Dry	Dry	N/A
		5	0	Dry	Dry	N/A
		6	3	Nil	Nil	N/A
		8	10	Nil	Nil	No

N.B. GCN refers to great crested newt (*Triturus cristatus*)
SN refers to smooth newt (*Lissotriton vulgaris*)
PN refers to palmate newt (*Lissotriton helveticus*)
f refers to female
m refers to male

Annex EDP 10
Reptile Survey

Methodology

A10.1 Reptiles have been surveyed on the Application Site previously in 2010 and 2013.

A10.2 During pre-application consultation in 2012/13, a survey effort of 20 survey visits was requested in order to provide an accurate estimate of population size, and this was subsequently undertaken during 2013. However, given the volume of previous survey data, which has previously confirmed the presence of a large common lizard population, it was considered that seven survey visits to confirm continued presence and approximate distribution would be sufficient.

A10.3 Therefore, an update reptile survey was completed during 2020 following best practice guidance published by Froglife[47]. A total of 397 artificial refugia were placed across suitable habitat within the Application Site on 24 April 2020. The refugia consisted of 383 refugia of heavy-gauge roofing felt and 14 refugia of corrugated metal sheeting measuring c.1.0m by 0.5m. These 397 refugia amount to 16/ha which is more than the minimum of 'between five and ten refuges per hectare' cited in the Froglife guidance. Refugia locations are shown on **Plan EDP 19**.

A10.4 Having allowed in excess of 10 days for the refugia to 'bed-in', the refugia were then checked on seven separate occasions between May and September.

A10.5 During each survey visit, artificial refugia were individually checked by an experienced EDP Ecologist with any reptiles observed recorded, along with notes on their life stage (adult/juvenile) and sex where possible. A peak count of the total number of individuals of a particular species was recorded. Peak counts were then used to estimate approximate population size for each reptile species recorded. Estimates of population size followed the approach given in the withdrawn draft reptile mitigation guidelines[48]; and are summarised in **Table EDP A10.1**.

Table EDP A10.1: Population Size Class Estimates

Species	Population Size Class Category		
	Small	**Medium**	**Large**
Slow worm	<10	10–40	>40
Common lizard	<5	5–20	>20
Grass snake	<5	5–10	>10
Adder	<5	5–10	>10

[47] Froglife (1999) Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife Advice Sheet 10, Froglife, Halesworth; DMRB (2005) Nature conservation advice in relation to reptiles and roads. Volume 10, Section 4, Part 7, HA/116/05. DMRB

[48] Natural England (2011) *Natural England Technical Information Note TIN102 Reptile Mitigation Guidelines.* WITHDRAWN

A10.6 Detailed weather conditions recorded during each survey visit are summarised in **Table EDP A10.2**.

Table EDP A10.2: Date, Timing and Weather Conditions of Reptile Survey Visits

Visit Date	Start Time	Air Temp Range (°C)	Wind Speed (Beaufort)	Cloud Cover (%)	Rain
05/05/20	12:30	15.0-16.0	3-4	10-50	Nil
22/05/20	09:00	16.1-16.4	1-2	80-90	Nil
12/06/20	08:30	15.4-17.0	0-1	20-30	Nil
24/08/20	11:50	17.7-19.0	0-1	30-70	Nil
02/09/20	09:50	12.0-16.0	0	30-40	Nil
08/09/20	10:40	17.0-19.0	0-2	70-100	Nil
15/09/20	08:15	18.0-19.0	0-1	0-30	Nil

A10.7 In addition to refugia surveys, an early-spring visual encounter survey was undertaken in order to determine possible adder populations. This involved two surveyors recording any reptile activity observed, taking into account all suitable habitat, particularly around potential hibernation features[49].

Limitations

A10.8 The surveys were not constrained by weather and took place in suitable weather conditions within the optimal surveying period. However, a significant degree of interference by members of the public was experienced during the 2020 surveys, with large numbers of refugia removed from the Application Site on several occasions. Refugia were replaced, relocated into less visible/visited locations and/or marked up to discourage interference on three separate occasions in May and June, and a full suite of visits was completed. Nonetheless, due to this disruption, the survey findings are likely to be an under-representation of the reptile population present.

Results

A10.9 In 2013, a peak count of 146 common lizards and three grass snakes were recorded on the Application Site. In 2020, a peak count of 70 common lizards were recorded but no grass snake. Grass snake do not use refugia as readily as common lizard thought and it is still considered likely that grass snake are present in small numbers.

A10.10 Peak common lizard counts per field in 2013 and 2020 are given in **Table EDP A10.3**

[49] Natural England Technical Information Note TIN8102, Reptile mitigation guidelines (withdrawn)

Table EDP A10.3. Peak Common Lizard Counts per Field in 2013 and 2020

Field number (Plan EDP 1)	Peak Common Lizard Count and Population Size	
	2013	**2020**
1	22 (large)	N/A
2	2 (small)	N/A
3	6 (medium)	6 (medium)
4	N/A	N/A
5	9 (medium)	5 (medium)
6	13 (medium)	2 (small)
7	32 (large)	3 (small)
8	8 (medium)	3 (small)
9	8 (medium)	5 (medium)
10	6 (medium)	1 (small)
11	36 (large)	27 (large)
12	44 (large)	26 (large)
13	N/A	N/A
14	N/A	N/A
15	15 (medium)	2 (small)
Whole site	146 (Large)	70 (large)

A10.11 The decline in numbers in all of the fields in 2020 compared to 2013 is likely to be mainly due to the disruption experienced in 2020. The difference in survey effort may also be a factor, together with the effects of scrub encroachment reducing habitat suitability, as was case with Fields F1 and F2.

A10.12 No adders, or any other reptiles, were recorded during the visual surveys.

A10.13 Overall, it is concluded that the Application Site still supports a large population of common lizard (with a particularly high concentration in Fields F11 and F12) and is likely to still support small population of grass snake.

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Annex EDP 11
Invertebrate Survey

Introduction

A11.1 The main aim of the survey was to provide an updated appraisal of the conservation value of terrestrial and aquatic invertebrate assemblages occurring within a 25ha area of land lying immediately north of Gavray Drive, Bicester (the Application Site) to inform an updated proposal to development on it. The aim was achieved through completion of the following objectives:

1) Conduct surveys of the night-flying moth fauna associated with grassland and scrub/woodland habitat;

2) Conduct surveys of the invertebrate fauna associated with terrestrial grassland, scrub and arboreal habitats;

3) Conduct surveys of the invertebrate fauna associated with freshwater habitats;

4) Survey, analysis and assessment of the conservation value of the invertebrate fauna associated with freshwater habitats;

5) Conduct surveys of adult brown, black and white-letter hairstreak butterflies; and

6) To analyse invertebrate data using Pantheon and produce a report including findings/species lists and an evaluation of key assemblages and species in terms of their conservation value.

Methodology

Sampling Protocol

Survey Timings

A11.2 For the purposes of the current survey, standard terrestrial invertebrate survey work was undertaken over five discrete fieldwork events: 02–03 May, 05–06 June, 17 July, 07–08 August and 26 August 2020.

A11.3 All terrestrial invertebrate sampling was completed in suitably warm, sunny weather, between approximately 9.30 and 17.00. Transects for black, white-letter and brown hairstreak butterflies were undertaken alongside the terrestrial survey work, as appropriate for each species from the June survey onwards.

A11.4 Moth trapping was undertaken overnight on all but the July and August survey events. Due to weather conditions being suitable for moth-trapping, but unsuitable for

terrestrial survey, moths were sampled overnight on the 04 July, the Application Site being revisited on 17 July for terrestrial survey. In addition, sampling planned for the night of the 26 August was aborted, due to concerns over travellers on site.

A11.5 Aquatic sampling was undertaken during the initial May visit only.

Fieldwork Personnel

A11.6 All survey-work was undertaken by Jon Mellings (BSc hons, MCIEEM), apart from the overnight moth-trapping, which was undertaken jointly by Jon Mellings and Peter Cranswick (BSc hons).

Terrestrial Invertebrate Sampling

A11.7 Sampling was undertaken in representative habitats prioritised following an initial walkover of the Application Site and with some reference to areas sampled in previous surveys conducted in 2013, 2014 and 2016. Sampling protocol followed standard methods outlined in NERR005 (Drake et al, 2007). The survey aimed to characterise assemblages within the identified habitats, as well as giving a reasonable level of spatial coverage of the whole Application Site. Sufficient samples from each of the target habitats were collected to enable a robust analysis and evaluation using Pantheon.

A11.8 However, to ensure sites were sampled robustly in terms of coverage versus a conventional Common Standards Monitoring condition assessment approach, there was a degree of variability in both method and number of samples collected.

A11.9 To ensure a reasonable level of Pantheon compliance, fields within the survey area were grouped loosely according to geographical position and habitat into three survey zones (A, B and C) and data collected from each zone was analysed separately in Pantheon. The zones are mapped in **Appendix EDP A11.2**, **Figure EDP A11.2.1**, which also indicates areas not subject to formal survey, due to being considered to support habitat of low potential conservation value.

A11.10 Direct methods included timed 10-minute sweep sampling; two-minute vacuum sampling; beating samples (typically 30 minutes per survey) and direct searching. In addition, pan-traps were operated over the duration of the first threes sampling periods. Ten traps comprising yellow bowls half-filled with water and a small amount of detergent (washing up liquid) were deployed on most sites. These were set at the outset of the sampling events and collected on the second day (giving a trapping period of approximately 24 hours).

A11.11 All samples collected are detailed in **Appendix EDP A11.1**, **Table EDP A11.1.1** and a visual representation of sample sites is included in **Appendix EDP A11.2**, **Figure EDP A11.2.2**. **Table EDP A11.1.1** includes sample method, date, location and a habitat description for each field surveyed.

Aquatic Invertebrate Sampling

A11.12 Aquatic invertebrate sampling was undertaken using the standard three-minute sweep method described in Murray-Bligh (1999). The samples collected were preserved and subsequently graded and sorted (using standard Endecotts test sieves). Specimens were then sent to Abrehart Ecology for identification. Sample information, including sample location date and habitat, is included alongside terrestrial sample site information in **Appendix EDP A11.1**, **Table EDP A11.1.1** and sample sites are mapped in **Appendix EDP A11.2**, **Figure A11.2.2**.

A11.13 All 2020 species-level data derived from aquatic sampling was amalgamated with the 2020 terrestrial survey data for analysis using Pantheon.

A11.14 Assessment of 'wetland' fauna in Pantheon takes into account both pure aquatic species and the larval stage of species found on and beneath the water (collected using standard aquatic approaches), as well as species classed within wetland assemblages normally collected only using terrestrial sampling methods of wetland margins).

A11.15 Through terrestrial sampling, hygrophilous species such as ground beetles and rove beetles associated with wetland margins, as well as semi-amphibious species such as shore bugs (*Saldidae*) and adults of two-winged flies (*Diptera*) may be sampled. Such species are less likely to be collected using standard aquatic techniques.

Species Identification

A11.16 Following each sampling event, invertebrate samples were sorted to order level either for identification in-house, or for deployment to specialist taxonomists for identification. Taxon specialists who contributed significantly to the identification of specimens include: Dr Tristan Bantock (*Hemiptera*); Matthew Harrow (*Diptera*); Steve Lane (*Coleoptera* and some *Hemiptera*); Tim Strudwick (*aculeate Hymenoptera*); Toby Abrehart (aquatic invertebrates) and Jon Mellings (*Araneae*, other taxa not covered elsewhere and obvious specimens of a wide range of taxa removed during the sorting stage).

A11.17 The majority of moth species were identified on site by Peter Cranswick and to a lesser extent, Jon Mellings. Where necessary, moth specimens were also taken for *ex situ* identification by Peter Cranswick. In addition to sample data, all other species recorded in the field only (e.g. butterflies and other readily identified species, such as Orthoptera and unmistakable representatives of other taxa) were identified by Jon Mellings.

Moth Trapping (Night-flying moths)

A11.18 As in 2014 and 2016, the 2020 survey followed standard methods for the capture and recording of night-flying moth species as described in Fry and Waring (2001), and a manual recommended within Natural England Research Report NERR005,

'surveying terrestrial and freshwater invertebrates for conservation evaluation' (Drake *et al,* 2007). Both documents are recommended within the Chartered Institute of Ecology and Environmental Management (CIEEM)'s Technical Guidance Series for survey of terrestrial invertebrates.

A11.19 The survey method involved the use of standard light traps designed specifically for the purpose of capturing moth species that are attracted to light. Many moths can be identified visually and without the aid of microscopic dissection, therefore, the majority of specimens can be released following *in situ* identification. However, collection of specimens of certain taxa for *ex situ* identification is necessary in some cases.

A11.20 2020 moth trapping was undertaken over a series of four[50], evenly spaced trapping sessions (locations and general habitat is included in **Appendix EDP A11.1**, **Table EDP A11.1.2**). On each occasion, traps were set at the onset of dusk and emptied and the species recorded in the early morning typically from approximately five am onwards. Identification was typically concluded by 10am although larger counts tended to take longer.

A11.21 Where possible, trapping was undertaken during nights when weather forecasting indicated optimal conditions as stated in Fry and Waring (2001) i.e. 'mild, still, cloudy nights with minimal moonlight'.

A11.22 Traps used included industry standard Robinson traps fitted with 125W mercury vapour (MV) bulbs. In addition, a variable number of actinic Heath traps[51] were deployed.

A11.23 MV traps require a 240V power supply and therefore, a petrol generator was required to run the traps in areas remote from a mains supply. Prior to operation, the catching chamber of each trap was lined with 30cm x 30cm cardboard egg trays cut in half and arranged around the central axis of the base in accordance with recommendations in Fry and Waring (2001). After landing within the trap, moths crawl into the crevices of these boxes and remain stationary until the contents of the traps are examined.

A11.24 Six Robinson traps were deployed during each survey event, with two or three additional actinic Heath traps being deployed on some of the survey events. Trap locations and 10-figure grid references obtained using a basic Garmin Etrex Global Positioning System (GPS) device are provided in **Appendix EDP A11.1**, **Table EDP A 11.1.2**. 1KVA generators, which are both portable, quiet and capable of running for sufficient time to cover the dusk to dawn period, were used to power the MV traps, whilst the actinic traps were powered by 12v motorcycle batteries.

A11.25 Power cables were fitted with RCD circuit breaker trip switches. And traps were checked after several hours of running to ensure lamps and generators were running effectively.

[50] See limitations section
[51] See limitations section

Identification of Specimens (Moths Only)

A11.26 During the early morning following the night of trapping, the contents of each trap was examined in turn. One operative relayed the species names as found to the other operative acting as scribe. A tally of the number of individuals of each species recorded per trap was also recorded.

A11.27 Initially, the ground surrounding the trap and outside of the trap was examined for moths that had alighted within the grass, side of the trap etc. A collapsible cake cover inverted over the trap was used to stop moths escaping from the trap once the lid was removed.

A11.28 Where *in situ* identification was not practical, the specimen in question was contained within a coded specimen tube for *ex situ* identification. The code of the tube was then recorded enabling a tally of repeats of the species to be recorded.

A11.29 Collected specimens were identified *ex situ* and retrofitted to the existing data set; these were killed humanely and retained as voucher specimens where necessary. Species identified in the field were released following identification. In accordance with recommendations outlined in Fry and Waring (2001), care was taken to ensure specimens were reasonably distributed within the surrounding vegetation to minimise the risk of predation by birds.

Butterfly Transects

A11.30 Butterfly transects targeting black hairstreak (*Satyrium pruni*), white-letter hairstreak (*S. w-album*) and brown hairstreak (*Thecla betulae*) were undertaken.

A11.31 Due to the differing adult flight periods of the three species, the species required separate surveys, although there was potential for white-letter hairstreak to overlap with the end of the flight period of black hairstreak and the beginning of the brown hairstreak flight period.

A11.32 For all species, surveys were generally undertaken during the morning (before midday) of the first day of each site visit, as the target species are often at their most accessible during the morning, when they are more likely to feed lower down in the vegetation.

A11.33 Whilst the initial aim was to follow a pre-determined transect route, such an approach proved impractical, due to the intricacy of the Application Site. However, on each occasion, the entire Application Site was walked (including the entire hedge boundaries of enclosed fields with suitable habitat and more organic routes within fields with more developed in-field scrub such as F1, F7, F11 and F12).

A11.34 Particular attention was paid to areas supporting more suitable looking habitat such as uncut, mature blackthorn (*Prunus spinosa*) for black and brown hairstreak and English elm (*Ulmus procera*) for white-letter hairstreak as appropriate for the time of

year and taking into account the presence of other habitat elements such as standard trees in hedgerows, presence of Bramble (*Rubus fruticosus* agg.) and tall herb vegetation.

A11.35 Locations of previous records of both adults and eggs of the three species on site were also taken into account. A pair of binoculars with suitable specification for identification of insects both at close range and at distance was also used during the survey.

Data Analysis

Pantheon Analysis

A11.36 Datasets including species lists collected using both terrestrial and aquatic sampling methods, as well as the separately recorded moth and butterfly data were input into the online Pantheon analytical resource.

A11.37 Pantheon is recommended by Natural England as a means of standardising assessment of invertebrate assemblages in terms of conservation value and as it enables invertebrate assemblages to be evaluated in relation to habitat affinity, it is invaluable in identifying targets for invertebrate-specific habitat creation and management.

Pantheon/ISIS Assemblage Hierarchy

A11.38 Results from three hierarchical levels recognised within the Pantheon output are defined as follows (from Webb *et al,* 2017):

- Broad Biotope Level - Broad Biotopes are a useful way to split sample data into something manageable whilst retaining a strong ecological grounding. They include tree-associated, open, wetland and coastal habitats. Species can occur in more than one broad biotope. This occurs when the same habitat has been typed into two divisions. A good example is wet woodland, which is found in both the tree-associated and wetlands;

- Habitat Level – Habitats are a mid-level category within the hierarchy and often readily identifiable and recognisable by conservation workers (e.g. saltmarsh). Some are identified as broad habitats in the UK but most are new terms used to refer to a series of resources or a series of broad habitat types; and

- Specific Assemblage Types (SATs) – These are characterised by ecologically restricted species and are generally only expressed in lists from sites with conservation value. This classification is particularly useful for identifying assemblages of higher conservation value and is, therefore, the most important metric for assessing a site's invertebrate conservation value.

A11.39 Pantheon results tables are included in **Appendix EDP A11.1**, **Tables EDP A11.1.7** tp **A11.1.10**. **Table EDP A11.1.7** shows Pantheon output from analysis of the whole 2020 dataset; **Table EDP A11.1.8** shows analysis of Zone A, which comprises combined survey data from Field 11 and 12; Zone B (**Table EDP A11.1.9**) includes data from Fields 5 and 6 and Zone C (**Table EDP A11.1.10**) includes combined data from Fields 1, 2, 3, 7, 8, 9 and 10.

Limitations

A11.40 During 2020, there was an observed increase in the use of the night-time use of Application Site by members of the public. During the early part of the season, rough camping and groups of teenagers/young adults were encountered on nights during which moth-trapping was undertaken.

A11.41 During the June moth survey, part of an actinic moth trap located in Field 7, including a motorcycle battery and the actinic lamp, were stolen. This led to reluctance to deploy moth-trapping equipment in more remote areas of the Application Site during subsequent visits.

A11.42 Whilst survey work was continued throughout the period, additional elements of disturbance were encountered during the survey, including verbal abuse during overnight stays for the purpose of moth trapping.

A11.43 During the final survey on 26 August, Field 10 at the site entrance was found to have been inhabited by a travelling community and caravans, vehicles and other infrastructure was encountered. Whilst the travellers were communicative and expressed the desire to be sympathetic to the survey work, the surveyors were reluctant to undertake the overnight moth survey.

A11.44 Therefore, whilst a final round of terrestrial surveys were undertaken, the intended fifth overnight moth survey was postponed. The presence of the travellers, who had occupied the northern hedgeline in Field 10, also restricted brown hairstreak transect work within that field; however, the impact of this was considered to be minimal.

A11.45 Despite efforts to undertake moth trapping during suitable weather conditions, weather was changeable overnight during both the May and June visits and suboptimal conditions lead to lower than expected catches on these occasions.

A11.46 Whilst, in general, a timed, ISIS-compliant sampling regime was undertaken during the survey, with timed samples being collected using standard methods, to gain a more in-depth understanding of the Application Site's invertebrate fauna, a greater number of samples were collected than is required for standard Common Standards Monitoring condition assessment.

A11.47 To improve ISIS compliance, the Application Site has been divided into three survey Zones, the data from which has been analysed separately. However, the results from analysis of the whole site dataset strongly reflect the findings at sub-site/Zone level.

A11.48 It should be noted that Natural England have commissioned a number of status reviews in recent years and many species formerly classed as nationally scarce or RDB species have been subject to status review. Such changes may influence analysis results using methods such as Pantheon where SQI scores are weighted based on rarity status.

A11.49 Aquatic sampling was undertaken only during the initial field visit in May. Whilst additional sampling had been planned later in the season, the majority of waterbodies had dried-out by late summer and the habitat conditions in inundated water-bodies at this time appeared to support only habitat of low quality. Following discussion with the client, it was considered reasonable to complete analysis with samples collected during the spring, which, at a site level provided suitable resolution for meaningful analysis using Pantheon.

Results/Discussion

Species Recorded during Previous Surveys of Gavray Meadows

A11.50 Species of varying conservation statuses recorded from previous surveys by Mellings and Cranswick (2014 and 2016), Colin Plant Associates (2005 and 2013) and Redhead (2011) are listed in **Tables EDP A11.1** to **A11.3.**

Table EDP A11.1: Invertebrate Species of Recognised Conservation Status Recorded Previously Recorded at Gavray Meadows.

Common Name	Designation(s)	Recorded (year)	Location
Black hairstreak (*Satyrium pruni*	Endangered (post-2001 IUCN)	2006, 2007, 2010, 2013	Adults: Fields 1, 8, 9, 11, 12. Unconfirmed: Field 7
White-letter hairstreak (*Satyrium w-album*	s41 'priority species'; Endangered (post-2001 IUCN)	2013	Adults: Field 7, 9
Brown hairstreak *Thecla betulae*	s41 'priority species'; Vulnerable (post-2001 IUCN)	2005-2011	Adults: Fields 7, 12, 13 Eggs: Fields 1 to 12
Grizzled skipper (*Pyrgus malvae*	s41 'priority species'; Vulnerable (post-2001 IUCN)	Unknown	Unknown
Small heath (*Coenonympha pamphilus*	s41 'priority species'; Near Threatened (post-2001 IUCN)	2006 to 2016	Adults: Fields 3, 9, 12
Forester (*Adscita statices*	s41 'priority species'	2005, 2013, 2016	Adults: Fields 3, 8, 9

A11.51 In 2005 a web containing larvae of marsh fritillary (*Euphydryas aurinia*) was also recorded from the Application Site. However, evidence suggested that this occurrence resulted from an 'artificial importation by a member of the public' (Colin Plant Associates, 2013).

A11.52 Twenty-five moth species listed as 'research only' species under section 41 of the NERC Act (2006). These include species which are still predominately widespread and common in much of the UK, but which were included due to having undergone a significant recorded decline in the UK within recent decades.

Table EDP A11.2: Nationally scarce Invertebrate Species Previously Recorded at Gavray Meadows

Common name	Designation(s)	Recorded	Location
A weevil (*Rhinocyllus conicus*)	Nationally scarce (Na)	2013	Not recorded
A rove beetle (*Tachyporus formosus*)	Nationally scarce (Na)	2013	Not recorded
Spined hylaeus (*Hylaeus cornutus*)	Nationally scarce (Na)	2005	Not recorded
Brown tree ant (*Lasius brunneus*)	Nationally scarce (Na)	2005	Not recorded
A picture-winged fly (*Merzomyia westermanni*)	Nationally scarce	2005	Not recorded
A picture-winged fly (*Oxyna parietina*)	Nationally scarce (Na)?	2005	Not recorded
A stilt-legged fly (*Micropeza lateralis*	Nationally scarce	2005	Not recorded
Loosestrife flea beetle (*Lythraria salicariae*)	Nationally scarce (Nb)	2005	Not recorded
A flea beetle (*Podagrica fuscicornis*)	Nationally scarce (Nb)	2005	Not recorded
A rove beetle (*Philonthus fumarius*)	Nationally scarce (Na)	2005	Not recorded
A rove beetle (*Sepedophilus pedicularius*)	Nationally scarce (Na)	2005	Not recorded

Table EDP A11.3: Invertebrate Species Previously Classed as Nationally Scarce which have been Subject to Status Revisions that have been Previously Recorded at Gavray Meadows

Common Name	Former Designation	Current Designation[52]	Recorded
Valerian pug (*Eupithecia valerianata*)	Nationally scarce (Nb)	No designation listed in Pantheon	2016 (Field 2)
Bulrush veneer (*Calamotropha paludella*)	Nationally scarce (Nb)	No designation listed in Pantheon	2014 (Field 12)
Long-winged conehead (*Conocephalus discolor*) *(now C. fuscus)*	Nationally scarce (Na)	Widespread – revised in Sutton (2015)	2013
A flea beetle (*Longitarsus parvulus*)	Nationally scarce (Na)	Widespread south – revised in Hubble (2014)	2013

[52] Most species are included in the 'Least Concern' category based on 2001 IUCN criteria; however, informal status 'local' and 'widespread' have been used here.

Common Name	Former Designation	Current Designation[52]	Recorded
Hawthorn jewel beetle (*Agrilus sinuatus*)	Nationally scarce (Na)	Local – revised in Alexander (2016)	2005
Banded general (*Stratiomys potamida*)	Nationally Scarce	Local – (revised in Drake (2017)	2005
A ground beetle (*Bembidion gilvipes*)	Nationally scarce (Na)	Local – revised in Telfer (2016)	2005
Sharp-collared furrow bee (*Lasioglossum malachurum*)	Nationally scarce (Na)	Widespread south – revised in Edwards and Broad, 2005)	2005
A flea beetle (*Longitarsus dorsalis*)	Nationally scarce (Na)	Widespread south – revised in Hubble (2014)	2005
Black-headed cardinal beetle (*Pyrrochroa coccineus*)	Nationally scarce (Nb)	Local – revised in Alexander *et al* (2016)	2005

A11.53 It should be noted that Natural England have commissioned a number of status reviews in recent years and many species formerly classed as nationally scarce or RDB species have been subject to status review. Such changes may influence results of analysis using methods such as Pantheon.

Survey Results

Recorded Habitat (Terrestrial)

A11.54 Habitat recorded within the Gavray Meadows survey area is described in greater detail in relation to individual fields in the sample site table (**Appendix EDP A11.1**, **Table EDP A11.1.1**). Fields F2 and F4 were subject to extensive scrub encroachment and were not sampled. F15, which comprised densely planted, shelter-belt woodland and the arable Fields 13 and 14 were not sampled due to being considered to be of relatively low potential conservation value for invertebrates.

A11.55 Fields F3, F8 and F9 had changed little since the 2016 surveys, comprising open ridge and furrow meadowland with no in-field scrub due to continued haycutting and seasonal grazing (Fields F3 and F8 are depicted in **Appendix EDP A11.3**, **Photographs 1** and **2**). Field F10 was also little changed since 2016.

A11.56 As in 2016, the hedgerows at the boundaries of Fields F3, F8 and F9 appeared to have not recovered entirely from earlier flaying and generally still appeared trimmed. However, within these fields the perennial herbaceous vegetation margins were generally uncut to a width of about 1m and in some cases there was some outgrowth of species such as blackthorn.

A11.57 The main hedgerow along the northern boundary of Field F10 was more intensively managed by basal cutting/grazing and there was little tall herb vegetation due to haycutting close to the base.

A11.58 Fields 1, 2 and 4 have had extensive scrub encroachment since 2016, which has reduced areas of grassland to small patches. In Field F1, there were pockets of short sward grassland kept open by rabbit grazing; however, the largest of these was no more than 20m x 10m in extent (**Appendix EDP A11.3**, **Photograph 3**).

A11.59 These patches were frequently separated by dense, continuous bramble scrub with hawthorn (*Crataegus monogyna*), blackthorn and other scrub species. Field 7 supported more mature standard trees and mature scrub in mosaic with small clearings of herb-rich grassland, which was also subject to heavy scrub encroachment, although this area was little changed since 2016 (**Appendix EDP A11.3**, **Photograph 4**).

A11.60 Despite the extent of scrub, Fields 1 ,2, 4 and 7 all supported habitat of potential value to hairstreak butterflies. Field 7 supported some grassland edge mature blackthorn and English elm scrub, with young growth, extensive bramble scrub and nearby mature ash (*Fraxinus excelsior*) and pedunculate oak (*Quercus robur*) standards; habitat of high potential for supporting black, brown and white-letter hairstreak butterflies.

A11.61 The wet, ridge and furrow meadows in F11 and F12 had also been subject to scrub encroachment. In 2014, the grassland habitat was also described as 'rank', with patches of tall herb vegetation and encroaching scrub (**Appendix EDP A11.3**, **Photograph 5**). During 2020, the habitat was still generally open, with a rank, wet grassland sward, stands of tall herb vegetation and small, localised pockets of reed sweet grass (*Glyceria maxima*) and lesser pond sedge (*Carex acutiformis*) swamp. Scrub cover had increased, especially adjacent to the field margins, but was less evident than in Fields 1, 2 and 4.

A11.62 The scrub edge habitat within these compartments was structurally diverse with a significant resource of mature blackthorn, with bramble and tall herbs as well as mature standards including mature and veteran ash and pedunculate oak within the field boundaries (**Appendix 3**, **Photograph 6**). The habitat in these fields was, in its current condition, of high potential value for both black and brown hairstreak butterflies; however, ultimately the grassland elements of these fields may be lost to scrub succession without some management.

A11.63 In addition to the more established habitat, Fields 5 and 6 formed a continuous strip of early successional, herb-rich grassland bordering the railway crossing to the north and the woodland and scrub edge habitat of Fields 7 and 12 to the south. These areas were not included in the 2016 survey.

A11.64 The habitat was possibly the result of a habitat creation project and supported herbs typical of wildflower seed mixes, such as ox-eye daisy (*Chrysanthemum leucanthemum*) and common knapweed (*Centaurea nigra*), as well as species typical of early successional habitats over bare ground including bird's-foot trefoil (*Lotus corniculatus*), black medick (*Medicago lupulina*) and a range of other herbs and grasses.

A11.65 Structurally and compositionally, the habitat within F5 and 6 had a strong affinity with 'Open mosaic habitat on previously developed land' (OMH), an s41 priority habitat, well-known for its value to invertebrates. This habitat varied to some extent from the damper habitat in the north-west corner, which supported taller herb and bramble scrub and the drier, herb-rich early successional habitat to the south-east. There was a significant resource of bare-ground within this area, again contributing to the potential value for brownfield and grassland assemblages associated with early successional habitats. (**Appendix EDP A11.3**, **Photograph 7**).

A11.66 The woodland/scrub edge forming the boundary between F7 and F12 was also of note in this area, the edge was uneven and structurally diverse and also provided habitat suitable for hairstreak butterflies and species requiring scrub edge habitats adjacent to a herb-rich flower resource.

Recorded Habitat (Aquatic)

A11.67 During the May survey, the majority of waterbodies, including ponds and ditches that entirely dried out later in the season, still held water. Several of the waterbodies, notably P5 in Field 2, P4 in Field 1 and P2 in Field 7, were heavily shaded and silted, supporting little aquatic vegetation. These ponds were, therefore, not selected for aquatic sampling.

A11.68 The invertebrate conservation value of these ponds is unlikely to be negligible, as shaded silt habitats, especially those with inundated dead-wood (which was observed at least in Ponds 2 and 5), can provide important habitat for larvae of many species of two-winged flies, beetles and other species (**Appendix EDP A11.3**, **Photograph 8** shows the edge of Pond 2). However, these species are unlikely to be detected through aquatic sampling, and the identifiable species including water-beetles, river-fly larvae and aquatic snails would be very unlikely to indicate habitats of high conservation value.

A11.69 Of the remaining waterbodies, Pond 1 in the north-eastern corner of Field 8; the un-named ditch-end ephemeral wetland in Field 10 (**Appendix EDP A11.3**, **Photograph 9**); the seasonally inundated furrows of Field 3, and the brook adjacent to the western boundaries of Fields 11 and 12, were sampled during the May field visit (**Appendix EDP A11.3**, **Photographs 10** and **11**). The habitat within these sites is described under AQ1.1; 1.2; 1.3 and 1.4 in the sample site table (**Appendix EDP A11.1**, **Table EDP A11.1.1**). By the latter part of the field season, the majority of waterbodies had almost entirely dried-out.

A11.70 Whilst not all waterbodies received aquatic sampling attention, 'terrestrial' sampling methods including water traps, sweeping and vacuum sampling was undertaken at the margins of some wetland habitats, notably including: the *Glyceria maxima* swamp in Field 12; the edge of Pond 2 in Field 7; the *Juncus*-dominated furrows in Field 3; and the *Juncus*-dominated swamp habitat at the south-eastern end of F10. The aim being to target wetland-associated invertebrates, including adults of species with aquatic larvae, the adults of which are much more readily identified to species-level.

Species Recorded

A11.71 During the 2020 survey, a total of 903 invertebrate species were recorded from the Application Site, including 594 species derived from terrestrial survey methods, 287 from over-night moth trapping and 28 from aquatic sampling. A tabular breakdown of the number of species identified per taxonomic order is included in **Appendix EDP A11.1**, **Table EDP A11.1.3** and illustrated in the following **Chart EDP A11.1**.

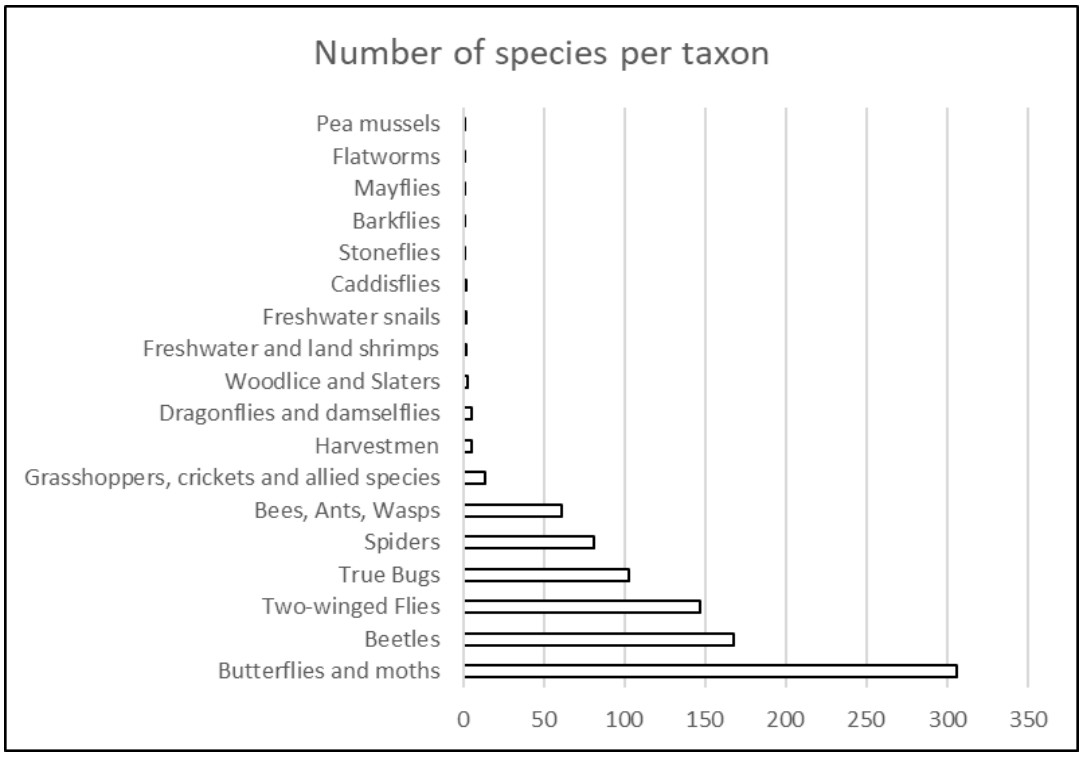

Chart EDP A11.1: A comparison of the relative number of species recorded from each of the major taxons.

A11.72 The chart shows the largest number of species recorded for an individual taxon to be butterflies and moths (*Lepidoptera*), with other major orders including beetles (*Coleoptera*), two-winged flies (*Diptera*), true-bugs (*Hemiptera*), spiders (*Araneae*) and bees, ants and wasps (aculeate *Hymenoptera*) all being well represented.

A11.73 Of the remaining groups including grasshoppers, crickets and allied species (*Orthoptera*), harvestmen (*Opiliones*), dragonflies and damselflies (*Odonata*), woodlice and slaters (*Isopoda*) and freshwater shrimps (*Amphipoda*) are all relatively small orders, or orders with few expected species.

A11.74 The remaining taxa including riverflies (caddisflies (*Trichoptera*), mayflies (*Ephemeroptera*) and stoneflies (*Plecoptera*)) and freshwater snails (*Pulmonata*) were all poorly represented. This was both in terms of representation within the aquatic samples, but also, identification of adult riverflies or terrestrial molluscs was not attempted within the terrestrial element of the project. Barkflies (*Psocoptera*) were also poorly represented within the samples.

A11.75 By far the greatest proportion of *Lepidoptera* recorded from the Application Site were moths recorded from the overnight moth survey. However, whilst only 24 of the 306 *lepidoptera* recorded during the survey were butterflies, this can be considered to be a large species count, constituting more than one-third of the total British butterfly fauna.

A11.76 Arguably, *lepidoptera* received more dedicated survey attention than any other order and the representation of species per taxon, from other orders, can be generally considered to reasonably reflect sampling effort and the expected proportional representation from a typical site in the UK.

A11.77 A complete list of species recorded from the 2020 survey is presented in a matrix in **Appendix EDP A11.1**, **Table EDP A11.1.4**.

Species of Recognised Conservation Status

A11.78 In total, 64 species of recognised conservation status in the UK were recorded from the Application Site. All species of recognised conservation status are tabulated in **Appendix EDP A11.1**, **Table EDP A11.1.5**. The table includes a brief summary of recorded UK and local distribution for each species, together with notes on habitat and known conservation biology.

A11.79 In addition, records of black, white-letter and brown hairstreak butterflies recorded during dedicated transects during 2020, are tabulated in **Appendix EDP A11.1**, **Table EDP A11.1.6** and positions of recorded species are depicted on a site map in **Appendix EDP A11.2**, **Figure EDP A11.1.3**.

A11.80 Of the species of conservation status recorded, 20 species are currently listed under section 41 of the Natural Environment and Rural Communities (NERC) Act (2006); these included the white-letter hairstreak[53]; brown hairstreak; black-headed mason wasp (*Odynerus melanocephalus*); the forester (*Adscita statices*) and small heath (*Coenonympha pamphilus*).

A11.81 Despite a seeming abundance of suitable habitat, particularly in Fields 5 and 6, grizzled skipper (*Pyrgus malvae*) was not recorded.

A11.82 The additional 15 s41 species recorded during 2020 were all moths included in the s41 'research only' category.

A11.83 The rarest butterfly recorded from the Application Site, black hairstreak, is currently classed as 'Endangered' under post-2001 IUCN criteria, but is not included as an s41 species. Black hairstreak is of very restricted range in the UK, being largely confined to a belt of habitat between Oxford and Peterborough in the UK.

[53] White-letter Hairstreak has been previously recorded from the site; however, it was only tentatively recorded during the 2020 survey. The sightings were beyond the flight period of Brown Hairstreak and prior to the flight period of Black Hairstreak as well as being recorded in association with the butterfly's foodplant English Elm.

A11.84 In addition to the s41 species, five species listed in the 'Near Threatened' threat status category under post-2001 IUCN criteria were recorded: two species classed as RDB3 'Nationally Rare' under pre-1994 criteria; and three species in the RDBK pre-1994, or DD (Data deficient) post-2001 IUCN classification and 36 species currently classed as Nationally Scarce in the UK were recorded. Where applicable, these species are listed in relation to the Pantheon assemblages to which they are attributed, in the following paragraphs. Furthermore, the three hairstreak butterflies recorded are considered in relation to transect records following the Pantheon discussion.

Species New to Britain

A11.85 One species never before recorded from the UK was identified. A leafhopper (*Macrosteles sardus*), which was identified from 2020 samples by *Hemiptera* specialist Tristan Bantock. Interestingly, *M. sardus* was also recorded by Dr Bantock from another site in south-east England during 2020. Dr Bantock (pers. com.) argued that the species, which has been increasing its range northwards in Europe over recent years, may have remained undetected due to the relatively few *auchenorrhyncha* specialist operating in the UK and relative difficulty in species-level identification of *Macrosteles* species.

Pantheon Analysis

Overview

A11.86 In the following paragraphs, results from Pantheon analysis of 2020 data are discussed and evaluated in relation to the relative conservation value of recorded assemblages and with reference to deployment of species of recognised conservation status.

A11.87 The Application Site has been divided into three survey zones, the data from which has been analysed separately to improve the level of ISIS compliance, avoiding undue distortion of output caused by analysis of a large number of samples.

A11.88 It is considered that the need for zonal analysis is most relevant to invertebrates attributed to the 'Open habitats' assemblages, which received a greater resolution of sampling than assemblages nested within either the 'Tree-associated' or 'Wetland' assemblages.

A11.89 Pantheon results tables are included in **Appendix EDP A11.1**, **Tables EDP A11.1.7**, to **A11.1.10**. **Table EDP A11.1.7** shows Pantheon output from analysis of the whole 2020 dataset; **Table EDP A11.1.8** shows analysis of Zone A which comprises combined survey data from Field 11 and 12; Zone B (**Table EDP A11.1.9**) includes data from Fields 5 and 6 and Zone C (**Table EDP A11.1.10**) includes combined data from Fields 1, 2, 3, 7, 8, 9 and 10.

A11.90 The most sensitive level in terms of ISIS compliance, is the Specific Assemblage Type (SAT). Favourable Condition targets set for SATs in Pantheon are based on the 'number of species scores'. As 'number of species scores' are derived from a simple count of attributed species, rather than an average, SATs scores are prone to exaggeration when analysis of a non-standard number of samples is undertaken.

A11.91 In comparison, SQI scores are calculated in Pantheon by giving each species in the dataset a score based on current rarity/conservation status and then averaging the sum of all species scores. This provides a more robust method of comparing the conservation value of assemblages derived from larger datasets at 'Broad biotope' and 'Habitat level'.

A11.92 Due to the sampling approach used to obtain species attributable specifically to the tree-associated and aquatic assemblages at biotope-level, it is considered that the habitat and Specific Assemblage Type (SAT)s nested within these assemblages can be evaluated on a whole site level.

Species Deployment by Broad Habitat

A11.93 From Pantheon analysis of the whole 2020 dataset, including both terrestrial and aquatic records, an understanding of the overall species deployment on a broad-biotope level can be gained. **Table EDP A11.4** shows the total number of species attributed to each of the broadest-tier 'biotope' level assemblages, as well as the SQI scores calculated within Pantheon for each assemblage and the number of species of recognised conservation status attributed to each.

A11.94 It should be noted that whilst the majority of species of recognised conservation status attributed to the 'Open habitats' and 'Wetland' assemblages are genuine rarities, mainly comprising species classed as nationally scarce or rarer in the UK, five of the 18 species of conservation status attributed to the Tree-associated assemblage are common and widespread s41 'research only' moth species.

Table EDP A11.4: Total number of species attributed to each 'biotope' level assemblages, SQI score and the number of species of recognised conservation status attributed to each.

Broad Biotope	Total Number of Species	Pantheon SQI Score	Species of Recognised Conservation Status
Open habitats	448	117	33
Tree-associated	212	124	18
Wetland	92	146	11
Coastal	3	n/a	0

A11.95 As expected, the number of species attributed to the 'Open habitats' assemblage at biotope level was by far the most strongly represented in terms of the overall number of species attributed to this assemblage. Interestingly, however, whilst only 28 species were actually recorded from combined 2020 aquatic surveys, a much greater number of 92 species are attributed to 'Wetland' in Pantheon. This illustrates the importance

of terrestrial sampling of wetland edge habitats, above the water-line, in contributing to 'Wetland' assemblages as a whole.

A11.96 As may be expected, the 'Open habitats' assemblages on the broad biotope level were found to support by far the largest number of species of recognised conservation importance. However, the SQI scores for 'Wetland' and to a lesser-extent, 'Tree-associated' assemblages were somewhat higher than 'Open habitats', reflecting the greater number of uncommon species attributed to these assemblages in proportion to the total number of species.

Habitat and SAT-level Assemblages

A11.97 In the following paragraphs habitats and SATs nested in each of the above biotopes are discussed on both a zonal and whole site level.

Open Habitat Assemblages

Tall Sward and Scrub

A11.98 As illustrated in **Table EDP A11.5**, by far the largest number of species were deployed within 'Tall sward and scrub'. From the total site data, 362 species were attributed to this assemblage which was also the strongest represented assemblage in the Pantheon output for Zones, A, B and C.

Table EDP A11.5: Number of Species, SQI Score and Species of Conservation Importance within Each Open Habitat Assemblage

Assemblage		Tall Sward and Scrub	Short Sward and Bare Ground
Total	No. of Species	362	81
	SQI	113	160
	Species of Conservation Significance	18	17
Zone A	No. of Species	222	32
	SQI	116	172
	Species of Conservation Significance	14	5
Zone B	No. of Species	135	43
	SQI	112	150
	Species of Conservation Significance	4	9
Zone C	No. of Species	220	31
	SQI	103	122
	Species of Conservation Significance	10	4

A11.99 The 'Tall sward and scrub' assemblage is one of the largest assemblages in the Pantheon database and in sites supporting predominately tall sward grassland in mosaic with scrub, it is normally the most strongly represented assemblage. 'Hay meadows, scattered scrub and woodland edge' are described amongst typical habitats supporting the assemblage. Unlike most other habitat-level assemblages, 'Tall sward and scrub' has no nested Specific Assemblage types (SATs).

A11.100 For the whole Application Site, a total of 18 species of recognised conservation value were attributed to 'Tall sward and scrub', however, eight of these were 'research only' s41 moth species, comprising mainly common and widespread species in the UK.

A11.101 Species of more genuine conservation significance included the forester a local and declining day-flying moth listed on s41. The forester is associated with traditionally managed old pasture and unimproved grassland habitat. As in previous surveys, the Forester was from the managed ridge and furrow grasslands of Fields 3, 8 and 9 in Zone C. The larval foodplant sorrel (*Rumex acetosa*) was abundant in these fields, as well as elsewhere on the Application Site.

A11.102 However, the rarest species attributed to 'Tall sward and scrub', included a Nationally Rare (RDB3) species of false click beetle (*Trixagus gracilis*) and a picture-winged fly (*Campiglossa malaris*), which was is now classed as RDBK 'unknown' in the UK. Both *C. malaris* and another picture-winged fly (*Merzomyia westermanni*), a nationally scarce species also attributed to 'Tall sward and scrub', are strongly associated with ragworts *Senecio* spp., which were well represented within the Application Site.

A11.103 The remaining species of conservation status attributed to 'Tall sward and scrub' included a nationally scarce and 'Near threatened' flesh fly (*Blaesoxipha plumicornis*) which is associated primarily with calcareous grassland sites and other nationally scarce species including a planthopper (*Criomorphus williamsi*), a ground bug (*Megalonotus antennatus*) and a flea beetle (*Psyllioides luteola*).

A11.104 A SQI score of 113 was recorded on a whole site level, 116, 112 and 103 for Zones A, B and C, respectively. In pre-Pantheon versions of ISIS, a threshold score for Favourable Condition status was set in Pantheon at 160, this being markedly higher than any of the scores attained for 'Tall sward and scrub' from Gavray Meadows.

A11.105 However, the SQI scores are depressed by the large number of common and widespread species attributed to the dataset and two of the rarest RDB species recorded from the Application Site together with five nationally scarce species and the s41 forester moth, contribute to the significance of the assemblage on a site-level.

Short Sward and Bare Ground

A11.106 The Species Quality Index (SQI) scores for 'Short sward and bare ground' were relatively high. An SQI score of 160 was recorded, indicative of an assemblage of high conservation value. From analysis, 32, 43 and 31 'Short sward and bare ground' species were attributed to the Zone A, B and C, respectively.

A11.107 As would be expected, a greater number of 'Short sward and bare ground' species were recorded from Zone B than from the other two; this reflected the sparsely vegetated and generally short sward nature of this habitat. However, the SQI score of 172 recorded for Zone A was higher than the SQI of 150 for Zone B and 122 for Zone C.

A11.108 On a whole site level, 17 species of recognised conservation status were attributed to 'Short sward and bare ground', almost as many as were attributed to 'Tall sward and scrub', but the total number of species attributed to 'Tall sward and scrub' was almost 4.5 times greater. In addition, at least 11 of the species attributed to this assemblage can be seen as genuinely rare and scarce species, compared to only eight[54] attributed to the 'Tall sward and scrub' assemblage.

A11.109 Two species of conservation status, the picture-winged flies (*Campiglossa malaris*) (RDBK) and nationally scarce (*Merzomyia westermanni*) were attributed to both 'Tall sward and scrub' and 'Short sward and bare ground' in the Pantheon output. Species of conservation status attributed only to 'Short sward and bare ground' included s41 species including the nationally scarce black-headed mason wasp and much commoner small heath.

A11.110 Other nationally scarce species included a wolf spider (*Alopecosa cuneata*), the slender-horned leather bug (*Ceraleptus lividus*), two flea beetles (*Longitarsus fowleri* and *L. lycopi*), a rove beetle (*Tachyporus formosus*), a hoverfly (*Triglyphus primus*), ridge-cheeked furrow bee (*Lasioglossum puncticolle*) and red-tailed blood bee (*Sphecodes rubicundus*).

A11.111 An additional four species, including the painted nomad bee (*Nomada fucata*), sharp-collared furrow bee (*Lasioglossum malachurum*), lobe-spurred furrow bee (*L. pauxillum*) and a solitary wasp (*Tiphia minuta*), are all due for status revision following increased recording and/or having undergone a recent recorded UK range expansion. A fifth species, the chalk yellow-faced bee (*Hylaeus dilatatus*), a relatively widespread species, has been erroneously listed as RDB3 in Pantheon.

A11.112 An overall greater number both in terms of common species and rarities were attributed to Zone B (Fields 5 and 6). This reflected the habitat: early successional, herb-rich, short sward habitat with a significant proportion of bare ground.

A11.113 The s41 black-headed mason wasp, slender-horned leather bug, the hoverfly *Triglyphus primus* and picture-winged fly (*Merzomyia westermanni*) are often associated with good quality brownfield or OMH sites in the UK, these species being less commonly recorded in Oxfordshire than in the south-east of England.

A11.114 Other species attributed to this group, including a flea beetle (*Longitarsus lycopi*), red-tailed blood bee and the small heath butterfly, are associated with more established grassland habitats such as permanent pasture.

Open habitat-related Specific Assemblage Types

A11.115 SATs nested within the open habitats assemblage, 'Short-sward and bare ground' or resource-based SATs associated with open habitats should not be considered robust

[54] After the eight s41 'research only' moths, the s41 Forester (which is only local in the UK) and Chalk Yellow-faced Bee *Hylaeus dilatatus* (wrongly assigned to RDB3 due to taxanomic confusion) are removed.

in terms of ISIS compliance. However, the deployment of species in SATs at this level is reasonably reflected at a subsite level.

A11.116 From the total site dataset, F112 'Open short sward' was the best represented, both in terms of species count and in relation to the Favourable Condition target threshold set in Pantheon. In comparison, for the F111 'Bare sand and chalk' SAT, seven species against a FC threshold of 19, were attributed.

A11.117 As such, neither assemblages approached their FC targets at this level, even when the total dataset was analysed. From data analysed at zonal level, both F112 and F111 SATs were poorly expressed in all zones. The largest SAT score attained for any of the zones was six species attributed to F112 'Open short sward' for Zone B; however, this was well below the threshold score of 13 set in Pantheon assemblage.

A11.118 The assemblages are sub-sets of 'Short-sward and bare ground'. The main difference in terms of habitat affinity of species attributed to these SATs is that whilst F112 species are considered to favour established but poached short sward (especially calcareous) grassland, F111 have an affinity with early successional habitats. Bare ground and hot, short sward microclimatic conditions are, however, a feature of both assemblages.

A11.119 Three other SATs nested in the 'Open ground' hierarchy were represented within the Pantheon output for Gavray Drive. All three are classed as 'resource based' SATs[55] and are therefore less habitat-specific than the habitat-based SATs.

A11.120 Compared to F111 and F112 described above, two SATs including F002 'Rich flower resource' and F001 'Scrub edge' 'resource based' SATs were recorded as having exceeded their respective FC thresholds based on Pantheon analysis of the whole-site dataset. At this level, 34 species were attributed to F002, this being well over twice the score required for FC status for this assemblage. For F001, 14 species were attributed compared to a FC threshold of 11.

A11.121 Although, the site-level dataset comprises too many samples for meaningful ISIS compliance at SAT-level, the species score for F002 'Rich flower resource' also exceeded their SAT threshold for the datasets for sampling Zones 1, 2, and 3, with scores of 20, 18 and 16 respectively. However, none of the F001 'Scrub edge' species scores were high enough to exceed the FC threshold of 11 on a zonal scale.

A11.122 Being resource-based, F002 'Rich flower resource' is not a particularly useful SAT for assessing conservation value of a particular habitat as it can be expressed across a wide range of habitat types. However, the assemblage comprises entirely of bee species and can highlight the importance of a site for bees both in terms of diversity and rarity.

[55] Resource-based SATs include species associated with a wide ranging resource, such as 'rich flower resource' which, unlike the habitat-based SATs, is not necessarily associated with a specific habitat, but can be expressed in a variety of habitats supporting flowering plants.

A11.123 Bee species attributed to F002 included species attributed to other open habitat assemblages, including ridge-cheeked furrow bee, painted nomad bee, sharp-collared furrow bee, lobe-spurred furrow bee as well as nine common or local species of mining bee of the genus *Andrena*, six additional furrow bees (*Halictidae*) of the genera *Lasioglossum* and *Halictus*, six bumblebees (*Bombus* spp), three nomad bees (*Nomada* spp.), two yellow-faced bees (*Hylaeus* spp.) and two species of mason bee (*Osmia* spp).

A11.124 Most of the recorded species of mining bee and furrow bee are ground-nesting species, requiring areas of bare ground or short sward grassland for nesting, whilst others such as the yellow-faced bees are stem-nesting, requiring a resource of bramble and/or dead hollow stems of tall herbs, alongside more open habitat.

A11.125 In Pantheon the F001 'Scrub edge' SAT is described as "*found where scrub or woodland grades into or is interspersed with open areas of grassland, heathland or early successional vegetation types. The juxtaposition of open vegetation with woody development is important to insects with complex life cycles that require different microhabitats at different stages of development*."

A11.126 Although none of the sample subsites were attributed with sufficient species to exceed the FC threshold of 11 set in Pantheon, Zones A and C were both reasonably well represented with nine species each.

A11.127 Of these, one nationally scarce species of spider-hunting wasp (*Anoplius caviventris*) was recorded from Zone A (F11 and 12). According to Day (1988), it is "*a species of bushy, vegetated places, particularly riversides and reed marsh*." In relation to the wasp's conservation biology, Day (1988) states that "*It stores spiders in serial cells in hollow plant stems (*Carduus *and* Phragmites*) and deserted aculeate burrows*" and the prey species are spiders of the genus Clubionidae.

A11.128 However, the majority of the remaining species were widespread and common in the UK, such as the short-horned, yellow-faced bee (*Hylaeus brevicornis*), which typically nest in the dead stems of bramble and cavity nesting solitary wasp species such as (*Trypoxylon attenuate*s) and (*Ectemnius continuus*), which nests in burrows in decaying wood.

A11.129 The third 'Open habitat' resource-based SAT represented within the Pantheon output was F003 'Scrub heath and moorland'. Despite its title and description in Pantheon, the F003 SAT is often well represented in non-heathland herb-rich grassland and brownfield sites which support habitat structurally suitable to support species also occurring on heathland. On a whole site-level, seven species were attributed to the F003 SAT, this approaching the FC threshold of nine.

A11.130 Species attributed to this assemblage included two local spiders including an orb-web spider (*Agalenatea redii*) and a crab spider (*Xysticus audax*) as well as a mirid bug (*Lygus pratensis*) – still listed as RDB3 rare despite a huge range increase in the

southern half of the UK. The species was formerly largely confined to lowland heathland and ancient woodland habitats in the UK.

Tree-associated Assemblages

A11.131 The three habitat-level assemblages nested within the tree-associated assemblage, included 'Arboreal', 'Shaded woodland floor' and 'Wood decay'. Of these, only 'Wood decay' has nested SATs. **Table EDP A11.6** illustrates the number of species attributed to each assemblage at a site and sub-site level and where applicable, displays SQI scores and the number of species of conservation status attributed to each assemblage recorded from each zone.

Table EDP A11.6. Number of Species, SQI Score and Species of Conservation Importance within Each Tree Associated Assemblage.

Assemblage		Arboreal	Shaded Woodland Floor	Decaying Wood
Total	No of species	144	50	20
	SQI	125	116	132
	Species of Conservation Significance	12	2	3
Zone A	No of species	83	20	6
	SQI	130	150	n/a
	Species of Conservation Significance	6	2	2
Zone B	No of species	3	6	1
	SQI	n/a	n/a	n/a
	Species of Conservation Significance	0	0	1
Zone C	No of species	106	36	12
	SQI	133	100	n/a
	Species of Conservation Significance	9	0	2

A11.132 By far the largest number of species were deployed within the 'Arboreal' assemblage at habitat-level. From the total site data, 144 species were attributed to this assemblage, with 50 species being attributed to 'Shaded woodland floor' and 20 to the 'Wood decay' habitat-level assemblage, which in turn, were deployed entirely within the A212 'Bark and sapwood decay' SAT.

A11.133 Many of the species attributed to the 'Arboreal' assemblage were recorded during overnight mercury vapour and actinic moth trapping, with additional data being derived from four beating samples undertaken during general survey. The relative paucity of species attributed to this assemblage for Zone B, is due to absence of significant moth trapping and structured sampling being confined to the ground and field levels in this area.

Arboreal

A11.134 In the Pantheon glossary, the 'Arboreal' assemblage is described as "*A habitat in and on trees, including the canopy, trunks and branches*." A SQI score of 125 recorded was for this assemblage at site level, with a slightly higher score of 130, based on 80 contributing species recorded for Zone A and 133 based on a dataset of 106 species being recorded for Zone C.

A11.135 These scores are indicative of a relatively high conservation value, although, none are close to the FC threshold of 170 used in pre-Pantheon versions of ISIS[56].

A11.136 Species of conservation importance attributed to 'Arboreal' include the three hairstreak butterflies: black, white-letter and brown. The commoner purple hairstreak (*Favonius quercus*) was also attributed to this assemblage.

A11.137 These species are all associated with mature and unintensively managed scrub, hedgerow and woodland edge habitats in the UK. The species have declined significantly through a combination of habitat loss, agricultural intensification including changes in hedgerow management, pesticide use and in the case of white-letter hairstreak, the loss of standard English elm following the impact of Dutch elm disease during the 1950s.

A11.138 All three species favour hedgerow and scrub thickets supporting foodplants. Brown and black hairstreaks require mature blackthorn with young shoots and white-letter hairstreak requires English elm and wych elm (*Ulmus glabra*), which mainly occur in scrub form.

A11.139 In addition, mature standard hedgerow or woodland edge broadleaved trees including ash for black and brown hairstreak and oaks or mature elms for white-letter hairstreak, provide an important source of honeydew. Also, low scrub including bramble, privet (*Ligustrum vulgare*) and dog rose (*Rosa canina* agg.), provide important nectar resources for these butterflies.

A11.140 Other species of conservation status attributed to 'Arboreal' were three nationally scarce species including the weevils (*Polydrusus flavipes*) and (*Temnocerus longiceps*) and the lichen sober (*Dichomeris alacella*), a species of micromoth. The RDBK listed Saxon wasp (*Dolichovespula saxonica*) was also attributed to this assemblage; however, this species has expanded its UK range significantly in recent years.

A11.141 In addition, five generally widespread and common UK moths included in the s41 'research only' category were also attributed to 'Arboreal'. These included the oak hook-tip (*Watsonalla binaria*), dusky thorn (*Ennomos fuscantaria*), August thorn (*E. quercinaria*), the lackey (*Malacosoma neustria*) and powdered quaker (*Orthosia gracilis*).

Shaded Woodland Floor

A11.142 According to the Pantheon glossary, shaded woodland floor assemblages are "*Found in closed canopy woodland and scrub"*, and are "*separated vertically rather than horizontally from arboreal assemblage types*." Shaded woodland floor habitats are generally subjected to little disturbance and plant cover at ground level is restricted by

[56] Pre-Pantheon trial versions of ISIS included FC thresholds at both SAT and Habitat-level (then called Broad Assemblage Type - BAT). Current versions of Pantheon provide SQI scores, where applicable, at all levels, but FC thresholds are restricted to SAT level.

relatively low light levels and accumulations of leaf litter. "*Many characteristic species occur in or under leaf litter and are either saprophagous or predaceous. A smaller number of species are phytophagous and develop on shade-loving plants.*"

A11.143 Within Gavray Meadows, shaded woodland floor habitat was well represented, beneath scrub and at the bases of mature trees such as the veteran pedunculate oak within Fields 2 and 7 and scattered mature standards within the majority of the Application Site's hedgerows.

A11.144 From the whole site dataset, a SQI of 116 was recorded, indicating a 'Shaded woodland floor' assemblage on a site-level of reasonable, but not especially high conservation value. However, for Zone A, which comprised the tall sward wet grassland/swamp, scrub woodland edge habitats of Fields 11 and 12, a SQI score of 150 was recorded, albeit from a dataset of 20 species.

A11.145 In the pre-Pantheon ISIS versions, the tentative FC threshold for this assemblage was 150. The elevated SQI attained for Zone A was due to the presence of two nationally scarce species, these included a flesh fly (*Sarcophaga subulate*) and a spider-hunting wasp (*Auplopus carbonarius*).

A11.146 *Sarcophaga subulata* has a rather uncertain biology, although Falk and Pont (2017) state that "*This species has been reared in mainland Europe from the gypsy moth (*Lymantria dispar) (Lepidoptera, Lymantriidae*) and in England from the Kentish snail* (Monacha cantiana) (Helicidae)."

Decaying Wood

A11.147 Wood-decay (saproxylic) species are associated with the decomposition of woody tissues and their agents, notably fungi, or are predators of other saproxylic species. "*Many species develop in specific microhabitats, some of which are mostly or entirely restricted to mature trees. Many of the rarest species are dependent on the presence of ancient trees, whose age can be measured in centuries*." (Pantheon glossary).

A11.148 Fourteen of the 20 species attributed to 'Decaying wood' at habitat-level were included at SAT-level within the A212 'Bark and sapwood decay assemblage'; this assemblage type is mainly associated with older trees and shrubs. The assemblage is primarily associated with death and decay of the outer woody tissues of the trees or shrubs.

A11.149 In terms of representation, 14 species is relatively high, especially in consideration of the relatively few species attributed to the overarching 'Wood decay' habitat-level assemblage. Whilst 14 species is an insufficient number to exceed the FC threshold score of 19, set in Pantheon for the A212 'Bark and sapwood decay assemblage', the score is fairly close to this threshold, indicating that more targeted sampling of wood-decay assemblages may produce a significant result for the Application Site.

A11.150 The majority of species attributed to the A212 SAT were beetles and the nationally scarce pear shortwing (*Glaphyra umbellatarum*) and white-banded longhorn beetle (*Poecilium alni*), were included in this assemblage.

A11.151 According to Hyman and Parsons (1992), pear shortwing is associated with "*broad-leaved woodland, scrub and hedgerows"*, where the larvae are thought to "*develop in deadwood, in the stems of old, wild rose bushes*". White-banded longhorn develop under the bark of recently dead and dying twigs of broadleaved trees such as oak (Duff, 2016).

A11.152 Another locally distributed species attributed to the bark and sapwood decay SAT was a jewel beetle (*Agrilus laticornis*). This species burrows in trunks and branches of oak. The species was previously classed as Nationally Scarce (Notable b) but was downgraded in a review by Alexander (2014), due to a recent increase in records.

Wetland Assemblages

A11.153 The three habitat-level assemblages nested within the 'Wetland' assemblage, included 'Marshland', 'Peatland' and 'Running water'. All three assemblages have nested SATs, although SATs were poorly expressed within the Pantheon output for wetland assemblages. **Table EDP A11.7** illustrates the number of species attributed to each assemblage at a site and sub-site level and where applicable, displays SQI scores and the number of species of conservation status attributed to each assemblage recorded from each zone.

Table EDP A11.7: Number of Species, SQI Score and Species of Conservation Importance within Each Wetland Assemblage.

Assemblage		Marshland	Peatland	Running water
Total	No of species	48	32	8
	SQI	137	158	n/a
	Species of Conservation Significance	4	5	3
Zone A	No of species	23	18	4
	SQI	150	133	n/a
	Species of Conservation Significance	2	2	1
Zone B	No of species	6	8	2
	SQI	n/a	n/a	n/a
	Species of Conservation Significance	0	0	0
Zone C	No of species	32	18	5
	SQI	135	153	n/a
	Species of Conservation Significance	2	2	1

A11.154 The largest number of species were within the 'Marshland' assemblage at habitat-level. From the total site data 48 species were attributed to this assemblage, with 32 species being attributed to 'Peatland' and only eight to the 'Running water' habitat-level assemblage.

Marshland

A11.155 The Marshland assemblage is described in Pantheon as being "*associated with still open water bodies and littoral areas on mineral substrates that may be subject to repeated disturbance, for example by flooding or grazing. Floodplain sites may be inundated for varying periods either by surface run-off or by rising groundwater, but between floods, they can lose surface water to reveal a substrate that is humid rather than saturated.*"

A11.156 The SQI score of 137 from 48 species recorded for 'Marshland' from the total sample data indicated that the assemblage was of relatively high conservation value at site level. On subsite level, a score of 150 was recorded for Zone A, this achieving the FC threshold used in pre-Pantheon versions of ISIS, although the dataset was relatively small, with only 23 attributed species.

A11.157 A SQI of 135 derived from 32 species for Zone C was the best represented zone in terms of attributed species and also attained a fairly high SQI score. For Zone B, only six species were attributed to the Marshland assemblage, this reflecting the lack of aquatic survey and wetland habitat in this area.

A11.158 Species of conservation significance attributed to 'Marshland' included a 'Near Threatened' diving beetle (*Agabus labiatus*) and three nationally scarce species including a ground beetle (*Acupalpus exiguous*), a grooved water-scavenger beetle (*Helophorus granularis*) and a caddisfly larva (*Limnephilus bipunctatus*).

A11.159 *Agabus labiatus* has been recorded from "*exposed, still waters, including acid pools such as in the New Forest, alkaline temporary water such as turloughs of the Burren and dune-slack pools in the north of the Isle of Man"*. (Foster, 2009). *Acupalpus exiguus* is a small, scarce species of ground beetle which has been recorded from widely scattered localities in the southern half of the UK. According to Hyman and Parsons (1991), the beetle is often recorded from coastal localities such as seashores and saltmarshes but is also recorded from inland river margins and grasslands on clay soils, where it is found in mud or silt at the margins of freshwater. During the 2020 survey both species were recorded only from the seasonally inundated swamp habitat in Field 12.

A11.160 According to Foster et al (2014), the typical habitat of *Helophorus granularis* is "*in hard-bottomed pools with fluctuating margins"*. During the survey, the beetle was recorded from the pond (P2) in Field 7. This pond was partially shaded and the water-level fluctuated to some extent over the field season.

A11.161 A larva of *Limnephilus bipunctatus* was recorded only from the seasonally inundated wet ditch in Field 10. Wallis et al., (2003) describe the favoured larval habitat of this caddisfly as "*Streams, ditches and pools which dry up in summer"*.

Marshland Associated SATs

A11.162 The only SAT nested within the Marshland assemblage from the 2020 data was W221 'Undisturbed fluctuating marsh'. Only two species in total were attributed to this assemblage including the previously mentioned *Acupalpus exiguus* and another ground beetle *Bembidion clarki*.

Peatland

A11.163 Compared to 'Marshland', 'Peatland' assemblages in Pantheon are associated with habitat characterised by less significant water level fluctuation or habitat which rarely dries out completely due to occurring on a substrate of wet peat. However, in practice, representatives of these two assemblages are often closely allied in Pantheon output.

A11.164 From the 2020 Gavray Meadows data 'Peatland' was attributed with fewer species than the 'Marshland' assemblage; however, a larger number of species of recognised conservation status were recorded. This concentration of rarities combined with a smaller overall dataset resulted in slightly higher SQI scores of 158 from 32 species for the whole Application Site, 153 from 18 species for Zone C and 133 from 18 species for Zone A. As with the 'Marshland' assemblage, relatively few species were attributed to Zone B, this subsite supporting little wetland habitat.

A11.165 However, the FC threshold used in pre-Pantheon versions of ISIS for 'Permanent wet mire' (the previous title for 'Peatland') was 180, as opposed to 150 set for 'Marshland'.

A11.166 Species of conservation status attributed to 'Peatland' from analysis of the whole dataset were all nationally scarce and included three beetles: *Agabus uliginosus*, *Enochrus quadripunctatus* and *Sepedophilus pedicularius* and two species of spider-hunting wasp *Anoplius caviventris* and *Priocnemis hyalinata*.

A11.167 Whilst *A. uliginosus* is attributed to 'Peatland' in Pantheon, according to Foster (2010), the beetle is "*primarily confined to highly temporary still waters on low ground*". Furthermore, the beetle was recorded during the 2020 survey from seasonally inundated furrows in Field 3. The water-scavenger beetle *Enochrus quadripunctatus* was also recorded from this seasonally inundated waterbody and Foster et al (2014), describes it as "*a mobile species, readily taking flight, and occurring in lowland, base-rich stagnant water with some exposed mineral substratum*". But states that the beetle also occurs in "*mesotrophic fens*".

A11.168 The third nationally scarce beetle attributed to 'Peatland', *Sepedophilus pedicularius* is a species of rove beetle which has been recorded from relatively few, widely scattered sites throughout the southern half of the UK. The beetle has been historically recorded from within close proximity to the Application Site from which it was also recorded during the 2013/14 survey.

A11.169 The biology of this species is uncertain; however other members of the genus *Sepedophilus* are associated with mildew and fungus infested habitats, such as

decaying leaves etc. *S. pedicularius* is attributed to the 'Peatland' assemblage in Pantheon. During the 2020 survey, the beetle was recorded only from the marshy habitat at the southeast corner of F10.

A11.170 *Anoplius caviventris* is also discussed in relation to the F001 'Scrub edge' SAT, the insect typically occurring in wetland habitat in mosaic with scrub, this combination being well represented in Fields 11 and 12, where the insect was found during the 2020 survey.

A11.171 The other nationally scarce spider-hunting wasp *Priocnemis hyalinata* is interestingly described in Collins and Roy (2016) as occurring in 'fairly open habitats such as heathland, acid grassland and chalk downs' During the 2020 survey, it was recorded from damp grassland/fen meadow habitat in Field 12. This habitat has greater affinity to the W314 Reedfen and pools habitat to which the wasp is attributed to in Pantheon, than to that described in Collins and Roy (2016).

Peatland Associated SATs

A11.172 As with 'Marshland', SATs nested within the 'Peatland' assemblage, were poorly represented. The W313 'Moss and tussock fen' SAT was represented by the previously mentioned water-scavenger beetle *Enochrus quadripunctatus* was assigned to this assemblage, as was a diving beetle *Graptodytes granularis*, a former nationally scarce species, downgraded in a review by Foster (2010).

A11.173 The other 'Peatland' SAT, W314 'Reedfen and pools' was attributed with the two previously mentioned *Anoplius caviventris* and *Priocnemis hyalinata*, presumably attributed due to a recorded association with reedbeds.

Running Water

A11.174 The 'Running water' assemblage was not well represented either at habitat, or SAT level. A total of eight species were attributed to this assemblage this dataset being too small for a robust SQI score at any level. 'Running water' assemblages are described in Pantheon as occurring "*along stretches of rivers, streams and stronger spring-fed seepages where water action removes or retards vegetation, scours sediment to reveal bedrock or boulders or deposits fresh shingle, sand or silt.*"

A11.175 The only habitat fulfilling this description on a site level was the brook, data from which was included in Zone A. Nationally scarce species attributed to 'Running water' included the larva of a stonefly *Amphinemura standfussi* recorded from the brook, the caddisfly *Limnephilus bipunctatus*, which was also attributed to 'Marshland' and a ground beetle *Polistichus connexus*. The latter species possibly occurred on Application Site due to an influx from the more usual coastal habitats resulting from unusually hot weather. According to Hynes (1993), the larvae of the stonefly *A. standfussi* occur in "*small stony streams: apparently associated with large amounts of vegetable matter*."

Evaluation

Habitat

A11.176 The Application Site is complex in that it is structurally diverse, supporting a close mosaic of grassland, scrub, woodland and wetland habitat; these include both the ancient ridge and furrow grasslands occupying much of the site, but also early successional habitat comprising Fields 5 and 6.

A11.177 The grassland, wetland and to a certain extent, scrub elements of the Application Site are strongly interrelated and this dynamic juxtaposition of wet and drier grassland habitats together with scrub and more mature wooded elements collectively provide a wide range of niches for invertebrate species. Many of the species are adapted to scrub edge habitats with wetlands.

A11.178 Compared to 2016, the managed ridge and furrow fields 3, 8 and 9 and F10 were little changed; however, significant scrub encroachment had occurred in F1, 2 and 4.

A11.179 Scrub encroachment had also occurred in the large ridge and furrow fen meadows F11 and F12 and the wood-pasture-like F7; however, the extent of encroachment in these compartments was less extensive and the scrub edge conditions within these fields evidently provided the most optimal scrub-edge habitat on site for Black and Brown Hairstreak butterflies. The 'Tall sward and scrub' and 'Short sward and bare ground' assemblages recorded from these fields was also of better than average conservation value in terms of the Application Site as a whole.

A11.180 Whilst some management is required to ensure these fields maintain their open quality and to ensure the remnant fen meadow characteristics are retained, it should be noted that the current invertebrate conservation value in these fields, as well as within the two early successional fields 5 and 6 was generally higher than that recorded during 2020 for the managed fields 3, 8 and 9.

A11.181 The habitat in fields 3, 8 and 9 is arguably more suitable for species such as Forester moth, Small Heath and other meadowland species of conservation value. However, it was felt that management within these fields including hay cutting was leaving too narrow a strip of tall herb vegetation and whilst it was not clear when hedge cutting had last occurred, the hedge profiles still showed signs of being managed inappropriately for hairstreak butterflies and other species of high conservation value, which benefit from a strong saum element.

Invertebrate Assemblages

A11.182 In 2020, 64 species of recognised conservation status were recorded from the Gavray Meadows survey area, including 20 s41 species, two classed as 'Endangered', one 'Vulnerable' and five ‘Near Threatened’ under post-2001 IUCN criteria, as well as one RDB3 ‘Nationally Rare’ species three classed in the RDBK or DD classes and 36 species currently listed as Nationally Scarce in the UK.

A11.183 S41 'species of principal importance' previously recorded from the site including brown hairstreak, small heath and the forester were all recorded again during 2020, together with black-headed mason wasp, which was recorded for the first time during 2020.

A11.184 In addition, the rarest of the three hairstreak butterflies, black hairstreak classed as 'Endangered' based on post-2001 IUCN criteria, was also reconfirmed from Field F9 and on the border between 11 and 12 during the survey.

A11.185 During the July survey, almost a month after black hairstreak was recorded, white-letter hairstreak was almost certainly recorded from the Application Site in fields F3, F7 and F8. However, whilst on all occasions the butterflies were recorded in close proximity to English elm and were distinguishable from commoner purple hairstreak, the butterflies eluded close inspection necessary for conclusive identification.

A11.186 Disregarding Pantheon analysis, this overall tally of uncommon species is very high for a site in Oxfordshire and supports habitats and species which only occur on sites with a very long history of low intensity management.

Comparison between 2020 and 2013-2016 Survey Data

A11.187 Terrestrial and aquatic survey data conducted during 2020 cannot be directly compared with data collected between 2013 and 2016, as different survey methods were employed and different levels of survey effort dedicated to different habitat elements. However, it is known that the overnight moth data was collected using a broadly similar approach in 2020 as it was in 2014 and 2016 and that data collected as result of surveying both terrestrial and aquatic data habitats were combined with moth data in both 2016 and 2020.

A11.188 Despite the compatibility issues, data previously amalgamated and analysed using trial versions of the Invertebrate Species-habitat Information System (ISIS) for the purpose of Mellings and Cranswick (2016) report, was re-analysed using the current online version of Pantheon. It was considered that this would provide the most meaningful method of comparing the 2016 dataset with the total site output from the 2020 dataset.

A11.189 The data analysed for the purpose of this comparison was derived from all 2013 terrestrial and aquatic data collected by Colin Plant Associates, combined with 2014 and 2016 moth trapping data collected by Mellings and Cranswick (2014 and 2016).

Comparison of 2020 and 2013-16 Habitat-level Pantheon Output

A11.190 It was decided that the most meaningful Pantheon output for comparison purposes would be to compare SQI scores derived from the 2020 data at a habitat-level. The SQI scores relating to the different habitat-level assemblages are compared in **Chart EDP A11.2**.

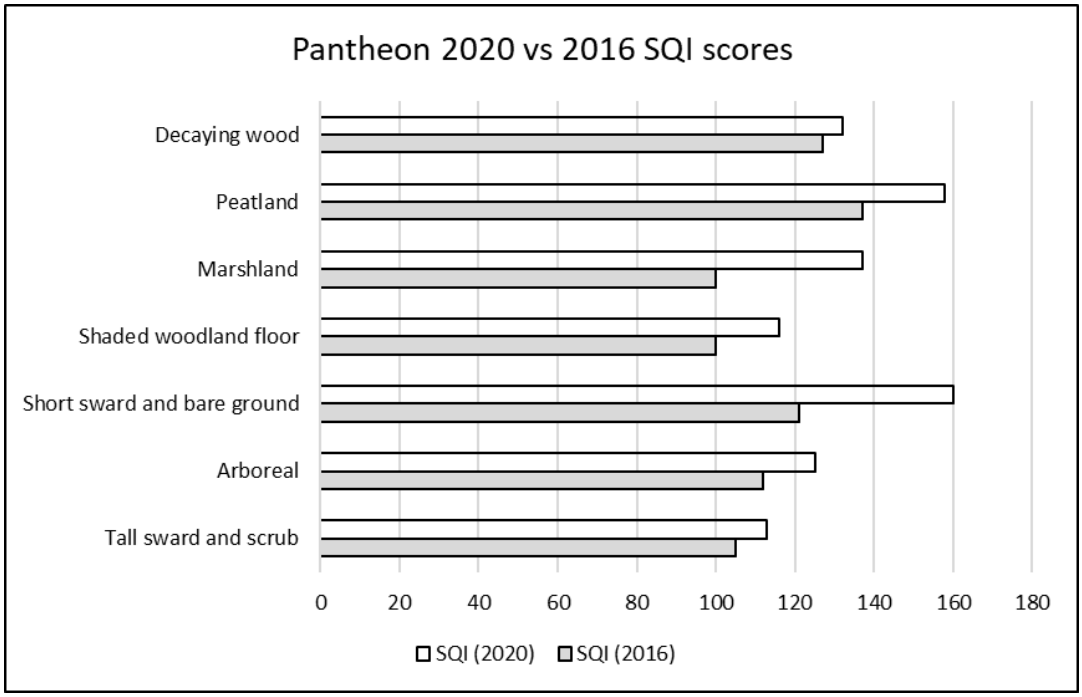

Chart EDP A11.2. Comparison of SQI 2016 and 2020 scores at a habitat-level

A11.191 As mentioned previously, higher SQI scores are achieved within assemblages with a higher proportion of rarities in relation to more common and widespread species. Importantly, however, the graphic representation does not account for the number of species attributed to each assemblage.

A11.192 From the graph it can be seen that, without exception, higher SQI scores were recorded for all habitat-level assemblages. There is also a general pattern between the SQI scores recorded for both assemblages, the main exceptions being for 'Short sward and bare ground' and 'Marshland' assemblages where the 2020 resulted in somewhat higher SQI scores than those recorded from 2013-2016 data.

Comparison of 2020 and 2013-16 SAT-level Pantheon Output

A11.193 A comparison of SAT scores resulting from site-level analysis of 2020 verses 2013-16 data is illustrated in **Chart EDP A11.3**.

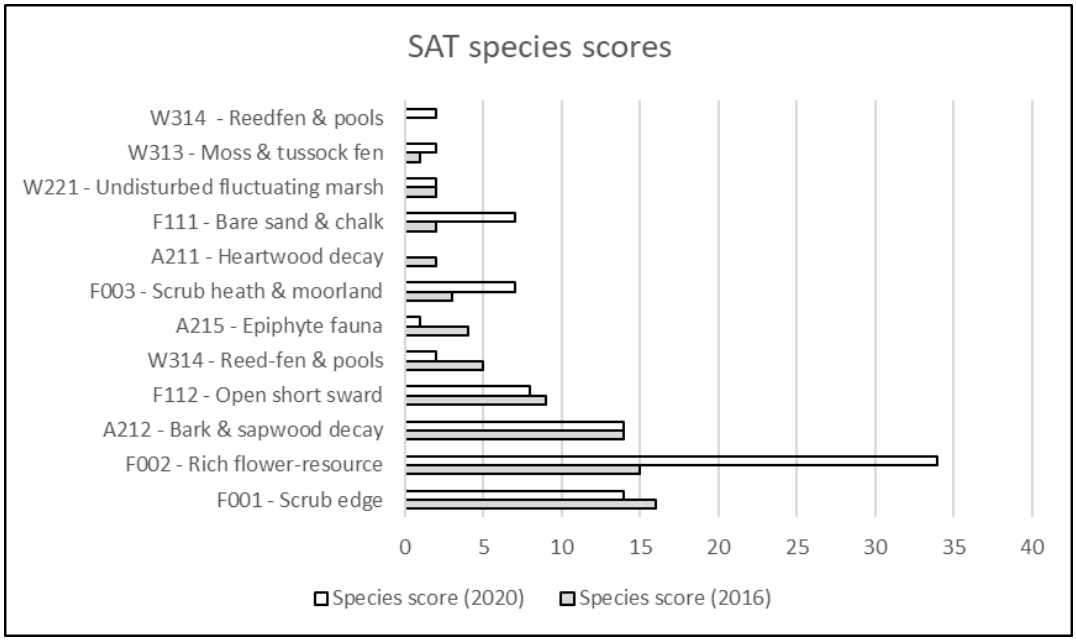

Chart EDP A11.3. A comparison of SAT scores resulting from site-level analysis of 2020 verses 2013-16

A11.194 As expected, the chart shows a less strong pattern of deployment than the SQI-based habitat-level comparison; however, the chart shows the actual number (rather than the average) of species attributed to each assemblage. At SAT-level, the more strongly represented assemblages from both datasets include the F002 'Rich flower resource', F001 'Scrub edge' and A212 'Bark and sapwood decay' assemblages.

A11.195 As previously mentioned, F002 cannot be readily equated to any particular habitat, but provides a reflection of foraging resource specifically for bees on a site. The whole site list of bees from 2020 was more than double that recorded from 2013-16, this difference almost certainly equating to sampling effort and methods in flower-rich habitat areas such as Fields 5 and 6 and other more intensively sampled herb-rich fields.

A11.196 Despite achieving FC status and supporting ridge-cheeked furrow bee and several other relatively uncommon bees, highlighting the importance of the site's rich flower resource, it can be argued that this assemblage is not the site's greatest asset in terms of conservation value.

A11.197 The F001 'Scrub edge' SAT, is also resource-based, but is more tangible in terms of recognisable affinity and the presence of this assemblage and was well attributed within both datasets. A similar range of species were attributed to F001 in 2020 as in 2013-20 dataset. In 2020, a nationally scarce spider-hunting wasp (*Anoplius caviventris*), and in 2013-16, the stem-nesting spined hylaeus (*Hylaeus cornutus*) was attributed to 'Scrub edge'. *A. caviventris* is also attributed alongside another nationally scarce spider-hunting wasp (*Priocnemis hyalinata*) within the W314 reedfen and pools SAT and these species were both recorded from Fields 11 and 12.

A11.198 Alongside species attributed to other scrub and tree associated assemblages such as black, brown and white-letter hairstreak butterflies, the F001 'Scrub edge' SAT reinforces the conservation of mature, unintensively managed scrub-edge habitat, especially in mosaic with damp unimproved grassland habitats.

A11.199 Of the non-resource-based SATs, A212 'Bark and sapwood decay' is the most strongly represented. However, the FC threshold score of 18 set in Pantheon, is higher than for most other SATs. Fourteen species were attributed to this SAT both in 2020 and in 2013-16.

A11.200 Many species attributed to 'Wood decay' assemblages are relatively poor colonisers and assemblages of high conservation value tend to only occur in sites supporting long established woodland, wood-pasture and hedgerows, which have not been subject to intensive management.

A11.201 Whilst there was some overlap of species attributed to A212 between the two sets of survey data, the overall number of species from combined datasets would easily exceed the FC threshold. Species of higher conservation value attributed to this assemblage include beetles such as nationally scarce pear shortwing and white-banded longhorn beetle and jewel beetles (*Agrilus laticornis*) and (*A. sinuatus*), both of which were formerly classed as nationally scarce.

A11.202 The other relatively well represented habitat-based SAT recorded both in 2020 and 2013-16, was F112 'Open short sward'; this assemblage and the closely allied F111 'Bare sand and chalk' SAT were best represented in terms of number within the 2020 dataset from Zone B (which included the two flower-rich early successional grassland habitat).

A11.203 Arguably, the F111 and F112 are better expressed at habitat rather than SAT level. The overarching 'Short-sward and bare ground' assemblage was strongly represented both in terms of number of attributed species and due to the SQI score, approached national significance.

A11.204 Similarly, aquatic species distributed between 'Marshland' and 'Peatland' assemblages at habitat-level were poorly expressed at SAT level, with species, including several rarities being thinly distributed between several assemblages, all of which fall well short of their FC targets.

Confirmation of Findings

A11.205 Key findings of the 2019 to 2020 invertebrate survey of the Purple Haze survey were as follows:

- From the 2020 survey, 904 invertebrate species were recorded, compared to 806 species recorded from combined surveys in 2013 to 2016;

- 64 species of recognised conservation status were recorded, including 20 s41 species, two classed as 'Endangered', one 'Vulnerable' and five 'Near Threatened' under post-2001 IUCN criteria, as well as one RDB3 'Nationally Rare' species three classed in the RDBK or DD classes and 36 species currently listed as Nationally Scarce in the UK;

- In addition, *Macrosteles sardus* was recorded for the first time in the UK during 2020 from Gavray Meadows and one other site in south-east England;

- S41 species of particular note included brown hairstreak, white-letter hairstreak[57], small heath and the forester, as well as the black-headed mason wasp, which was recorded for the first time during 2020. The 15 remaining s41 species were 'research only' moth species of relatively low conservation value;

- In addition, the rarest of the three hairstreak butterflies, black hairstreak classed as 'Endangered' was also reconfirmed from two locations on site;

- A comparison between results of 2020 Pantheon output and re-analysed 2013-16 data, showed a similar deployment of species on a habitat and SAT level between the datasets;

- A small increase in conservation value across all habitat-level assemblages in 2020 compared to the 2013 to 2016 analysis was also recorded; however, due to differences in sampling, the datasets may not be directly comparable;

- At habitat level, the largest number of species by far were attributed to the 'Tall sward scrub' assemblage and whilst 18 species of recognised conservation were attributed to this assemblage, higher SQI scores were attained for 'Short sward and bare ground', 'Marshland' (in fields 11 and 12) and 'Peatland', the former two of these indicating very high conservation value;

- The 'Arboreal' assemblage, to which the second largest number of species were deployed, was also relatively high scoring, with 12 species of recognised conservation status, including black, brown and white-letter hairstreak butterflies;

- At SAT-level results were less well defined. As in 2016, the best represented SATs were F002 'Rich flower resource' and F001 'Scrub edge', these assemblages exceeding their respective Favourable Condition targets in Pantheon at site-level[58]. However, F002 also exceeded its FCT for all three separately analysed subsite zones[59];

[57] White-letter Hairstreak was recorded tentatively during the 2020 survey; however, owing to the location timing and only probable confusion being Black Hairstreak which has an earlier field season which would almost certainly have passed by the time of the White-letter Hairstreak records were made.

[58] Due to the large amount of data contributing to site-level analysis, SATs are not considered reliable in terms of ISIS compliance; however they do provide a means of comparison with 2013 to 2016 site level data.

[59] In order to increase ISIS compliance at SAT-level, analysis was also conducted on a subsite zonal level in 2020.

- Of the remaining SATs, A212 'Bark and sapwood decay' was well represented, being attributed with several species strongly associated with ancient woodland edge habitat. This SAT was equally well represented in the 2013 to 2016 Pantheon output. It is considered likely that with more targeted survey attention the Application Site would be found to support an A212 assemblage of very high conservation value;

- Compared to 2016, the managed ridge and furrow fields 3, 8 and 9 and F10 were little changed; however, significant scrub encroachment had occurred in fields 1, 2 and 4 in particular;

- Scrub encroachment had also occurred in the large ridge and furrow fen meadows fields 11 and F12 and the wood pasture-like field 7. However, this was less evident and the scrub edge conditions within these fields evidently provided the most optimal scrub edge habitat on site for black and brown hairstreak butterflies as well as supporting 'Tall sward and scrub' and 'Short sward and bare ground' assemblages of better than average conservation value in terms of the Application Site as a whole; and

- Whilst some management is required to ensure these fields maintain their open quality and to ensure the remnant fen meadow characteristics are retained, it should be noted that the current invertebrate conservation value in these fields, as well as within the two early successional fields 5 and 6 was generally higher than that recorded during 2020 for the managed fields 3, 8 and 9; although the habitat in these fields is more suitable for species such as forester moth, small heath and other meadowland species of conservation value.

Conclusions

A11.206 Results from the 2020 survey indicate that the Application Site continues to support invertebrate habitat and species assemblages representative of historically managed ridge and furrow grassland and fen meadow, in mosaic with scrub and remnant ancient hedgerow habitats. Pantheon analysis separately undertaken using both the 2020 survey data and the 2013-16 dataset indicated a small increase in conservation value across all six significantly recorded habitat-level assemblages.

A11.207 Based on the SQI scores, especially for habitat-level assemblages including 'Short sward and bare ground', 'Marshland' and 'Peatland' and SATs including A212 'Bark and sapwood decay' and the resource-based F002 'Rich flower resource' and F001 'Scrub edge', together with the presence of all three of Britain's rarest hairstreak butterflies, confirm that overall invertebrate population supported by the Application Site is of at least Regional ecological importance, but falls short of being of National importance.

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Appendix EDP A11.1
Tables

Table EDP A11.1.1: 2020 Invertebrate sample sites

Sample Area	Grid reference	Sample code	Sample method	Sampling time	Sample date	Habitat
Field 1	SP59973 21974	SW4.2	Timed sweep sample	10 mins	07/08/2020	Semi-improved grassland and scrub mosaic habitat. The scrub element has encroached significantly since the 2016 survey, leaving a series of small, grassy clearings separated by dense scrub. The clearings were generally open and with short sward due to rabbit grazing, which also provided localised bare ground patches. Grassland with graminoids including creeping bent (*Agrostis stolonifera*), Yorkshire fog (*Holcus lanatus,* false oat grass (*Arrhenatherum elatius*), cock's foot (*Dactylis glomerata*) and hairy sedge (*Carex hirta*), with herbs including ground ivy *Glechoma hederacea*), creeping cinquefoil (*Potentilla reptans*), meadow vetchling (*Lathyrus pratensis*), common vetch (*Vicia sativa*), tufted vetch (*V. cracca*), black medick (*Medicago lupulina*), lesser celandine (*Ranunculus ficaria*), hoary ragwort (*Senecio erucifolius*) and broad-leaved dock (*Rumex obtusifolius*). Also false fox sedge (*Carex otrubae*), tufted hair grass (*Deschampsia cespitosa*), hard rush (*Juncus inflexus*), fleabane (*Pulicaria dysenterica*) and marsh thistle (*Cirsium palustre*), indicating drainage impedence. Scrub habitat with hawthorn (*Crataegus monogyna*), bramble (*Rubus fruticosus* agg.), blackthorn (*Prunus spinosa*), grey willow (*Salix cinerea*), goat willow (*S. caprea*), dogwood (*Cornus sanguinea,* dog rose (*Rosa canina* (agg.)) and pedunculate oak (*Quercus robur*) (saplings).
	SP59973 21974	VAC4.2	Timed vacuum sample	2 mins + c10mins sorting	07/08/2020	
	SP59945 21988	WT1.2	Water traps (cluster of 10 traps)	Traps left for c24 hours	02/05/2020	

Sample Area	Grid reference	Sample code	Sample method	Sampling time	Sample date	Habitat
Field 3	SP60067 22081	AQ1.3	Aquatic sweep sample/kick sample	3 mins	03/05/2020	Seasonally inundated furrows in ridge and furrow wet meadow. Water-depth gradually increasing in furrows towards southeast margin of field and swollen to form shallow, ephemeral pond-like features. Water depth variable; ranging from c.1cm to c.30cm (mainly c.10cm). inundated area ranging from c.2m to c.5m at widest point. Vegetated with inundated wet grassland vegetation, but mainly floating sweet grass (*Glyceria fluitans*), with occasional in-channel jointed rush (*Juncus articulatus*), soft rush *(J. effusus*) and lesser spearwort (*Ranunculus flammula*), with creeping buttercup (*R. repens*) at margins. Some areas fairly cattle poached and nutrient enriched, with areas of blanket weed (filamentous alga).
	SP60003 22101	SW1.1	Timed sweep sample	10 mins	02/05/2020	General ridge and furrow wet meadow managed by livestock grazing and haycutting. Sward with graminoids including sweet vernal grass (*Anthoxanthum odoratum,* creeping bent (*Agrostis stolonifera),* Red Fescue (*Festuca rubra)* and marsh foxtail (*Alopecosa geniculatus*), with field wood-rush (*Luzula campestris*) and herbs including cuckoo-flower (*Cardamine pratense*), meadow buttercup (*Ranunculus acris*), creeping buttercup (*R. repens*), common bird's-foot Trefoil (*Lotus corniculatus*), Greater bird's-foot Trefoil (*L. pedunculatus*), sorrel (*Rumex acetosa*), curled dock (*R. crispus*), dandelion (*Taraxacum officinale* (agg.)), Creeping thistle (*Cirsium arvense*), an eyebright (*Euphrasia* sp.), common mouse-ear (*Cerastium fontanum*) and ground ivy (*Glechoma hederacea*). Also, localised devil's-bit scabious (*Succisa pratensis*) and soft rush (*Juncus effusus*) and jointed rush (*J. articulatus*) and compact rush (*J. conglomeratus*), locally abundant in furrows. Also, mature/veteran pedunculate oak (*Quercus robur*) in field corner and in hedgerow. Habitat in field corner with extensive ground cover of Ground ivy and lesser celandine (*Ranunculus ficaria*), with common nettle *Urtica dioica*) and cleavers (*Galium aparine*).
	SP60001 22156	SW2.3	Timed sweep sample	10 mins	05/06/2020	
	SP59957 22086	VAC1.2	Timed vacuum sample	2 mins + c10mins sorting	02/05/2020	
	SP60001 22156	VAC2.3	Timed vacuum sample	2 mins + c10mins sorting	05/06/2020	
	SP59957 22086	WT1.3	Water traps (cluster of 10 traps)	Traps left for c24 hours	02/05/2020	
	SP60045 22132	WT1.4	Water traps (cluster of 10 traps)	Traps left for c24 hours	02/05/2020	
	SP60054 22102	WT2.4	Water traps (cluster of 10 traps)	Traps left for c24 hours	05/06/2020	
Field 5	SP59929 22323	SW3.1	Timed sweep sample	10 mins	17/07/2020	F5 and 6 consists of a flattish, narrow (15-30m wide) strip of continuous herb-rich OMH or created grassland habitat. The northern boundary is contiguous and parallel with the railway track, whilst the southern boundary comprises a mixture of mature woodland and scrub habitat
	SP59905 22336	SW5.2	Timed sweep sample	10 mins	26/08/2020	

Sample Area	Grid reference	Sample code	Sample method	Sampling time	Sample date	Habitat
	SP59929 22323	VAC3.1	Timed vacuum sample	2 mins + c10mins sorting	17/07/2020	bordering F12 and F7. OMH with bare ground, up to around 50 percent cover, with graminoids including common bent (A*grostis capillaris*), creeping bent (*A. stolonifera*), Yorkshire fog (*Holcus lanatus*), Red Fescue (*Festuca rubra*), crested dog's-tail (*Cynosurus cristatus*) and tufted hair grass (*Deschampsia cespitosa*) and a diverse range of neutral to calcareous herbs including ox-eye daisy (*Chrysanthemum leucanthemum*), yarrow (*Achillea millefolium*), bristly ox-tongue (*Picris echioides*), common ragwort (*Senecio jacobaea*), ribwort plantain (*Plantago lanceolata*), common bird's-foot trefoil (*Lotus corniculatus*), common vetch (*Vicia sativa*), black medick (*Medicago lupulina*), meadow vetchling (*Lathyrus pratensis*), creeping cinquefoil (*Potentilla reptans*), common knapweed (*Centaurea nigra*), lady's bedstraw (*Galium verum*), hedge bedstraw (*G. mollugo*), meadow buttercup (*Ranunculus acris*), creeping buttercup (*R. repens*), wild basil (*Clinopodium vulgare*), selfheal (*Prunella vulgaris*), teasel (*Dipsacus fullonum*), imperforate St John's-wort (*Hypericum maculatum*), mugwort (*Artemisia vulgaris*), broad-leaved dock (*Rumex obtusifolius*) and occasional hard rush (*Juncus inflexus*). There was localised colonisation of low-growing bramble (*Rubus fruticosus* agg.) scrub. The habitat was generally drier in composition, with localised indications of drainage impedence. Sward height varied from short sward, with localised stands of tall-herb vegetation.
	SP59905 22336	VAC5.2	Timed vacuum sample	2 mins + c10mins sorting	26/08/2020	
	SP59929 22323	WT3.1	Water traps (cluster of 10 traps)	Traps left for c24 hours	17/07/2020	
Field 6	SP59743 22410	SW4.1	Timed sweep sample	10 mins	07/08/2020	
	SP59631 22482	SW5.1	Timed sweep sample	10 mins	26/08/2020	
	SP59743 22410	VAC4.1	Timed vacuum sample	2 mins + c10mins sorting	07/08/2020	
	SP59631 22482	VAC5.1	Timed vacuum sample	2 mins + c10mins sorting	26/08/2020	
	SP59809 22388	WT2.3	Water traps (cluster of 10 traps)	Traps left for c24 hours	05/06/2020	
Field 7	SP59965 22232	BS3.1	Timed beating sample	30 mins	17/07/2020	The habitat in F7 included patches of open grassland in mosaic with dense, continuous scrub. There were also mature and veteran boundary trees and a rather shaded pond (P2). Some of the remnant grassland patches were relatively botanically diverse with graminoids including Yorkshire fog (*Holcus lanatus*), red fescue (*Festuca rubra*), meadow foxtail (*Alopecurus pratensis*), Hairy sedge(*Carex hirta*) and field wood-rush (*Luzula campestris*) and herbs including tormentil (*Potentilla erecta*), ground ivy (*Glechoma hedercea*), great burnet (*Sanguisorba officinalis*), devil's-bit scabious (*Succisa pratensis*), common bird's-foot trefoil (*Lotus corniculatus*), meadow vetchling (*Lathyrus pratensis*), meadow buttercup (*Ranunculus acris*), marsh thistle (*Cirsium palustre*)
	SP59978 22218	SW1.3	Timed sweep sample	10 mins	02/05/2020	
	SP59985 22213	SW4.3	Timed sweep sample	10 mins	07/08/2020	
	SP60003 22202	WT1.5	Water traps (cluster of 10 traps)	Traps left for c24 hours	02/05/2020	
	SP59970 22236	WT1.6	Water traps (cluster of 10	Traps left for c24 hours	02/05/2020	

Sample Area	Grid reference	Sample code	Sample method	Sampling time	Sample date	Habitat
			traps)			and betony (*Stachys officinalis*) in the sward. The scrub included extensive patches of bramble (*Rubus fruticosus* agg.), with hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), English elm (*Ulmus procera*) and some mature pedunculate oak (*Quercus robur*). The habitat was mainly sheltered but relatively unshaded and structurally diverse. Habitat with potential to support all four hairstreak butterflies known to occur on site. More wooded track adjacent to F7 with hedgebank with mature Ash (*Fraxinus excelsior*, Pedunculate Oak and Hawthorn, with common dog violet (*Viola riviniana*), Ground Ivy and some wood-decay habitat.
	SP59928 22283	WT2.5	Water traps (cluster of 10 traps)	Traps left for c24 hours	02/05/2020	
Field 8	SP59908 22154	SW2.2	Timed sweep sample	10 mins	05/06/2020	Field 8 and the very similar Field 9 are old ridge and furrow meadows managed for hay. The Sward height varied over the season due to periodic cutting but was generally uniform. Both F8 and 9 supported vegetation of similar composition to that of F3 but were somewhat drier. The sward comprised graminoids including red fescue *Festuca rubra*, sweet vernal grass (*Anthoxanthum odoratum*), meadow foxtail (*Alopecosa pratensis*) and Yorkshire fog (*Holcus lanatus*), with false oat grass (*Arrhenatherum elatius*) occurring mainly at field boundaries. Herbs recorded included meadow buttercup (R*anunculus acris*), creeping buttercup (*R. repens*), sorrel (*Rumex acetosa*), creeping cinquefoil (*Potentilla reptans*), common mouse-ear (*Cerastium fontanum*), white clover (*Trifolium repens*), lesser stitchwort (*Stellaria graminea*) and (*Veronica chamaedrys*). Taller field margin vegetation with upright hedge parsley (*Torilis japonica*). Sward height pre-haycut during June c15-25cm. Hedgerow with relatively diverse range of woody species including blackthorn *Prunus spinosa*, hawthorn (*Crataegus monogyna*), bramble *(Rubus fruticosus* (agg.)), English elm (*Ulmus procera*), dog rose (*Rosa canina* (agg.)), Grey willow (*Salix cinerea*), goat willow (*S. caprea*) and mature pedunculate oak (*Quercus robur*) and Ash (*Fraxinus excelsior*) standards. Edge succession somewhat diminished by unsuitable management in recent years. Some Blackthorn sucker growth of benefit to Black and Brown Hairstreak at edge of field.
	SP59908 22154	VAC2.2	Timed vacuum sample	2 mins + c10mins sorting	05/06/2020	

Sample Area	Grid reference	Sample code	Sample method	Sampling time	Sample date	Habitat
Field 8 (Pond 1)	SP59971 22168	AQ1.4	Aquatic sweep sample/kick sample	3 mins	03/05/2020	Shallow margin of rather eutrophic pond (P1) in northeast corner of F8. Pond with shallow margins, deepening in centre to c50cm. Fairly silted and partially overshaded by grey/goat willow (*Salix cinerea/caprea*). Little macrophyte vegetation, but floating sweet grass (*Glyceria fluitans*) encroaching from margins, also marginal soft rush *(Juncus effusus*), with water forget-me-not (*Myosotis scorpioides*), bittersweet (*Solanum dulcamara*) and some water starwort (*Callitriche* sp.).
Field 9	SP59834 22259	BS2.1	Timed beating sample	30 mins	05/06/2020	Field 9 is very similar in terms of management and composition to F8, as well as also being an old ridge and furrow meadow. The field margin was also similar to F8, both in terms of management and composition, being mature with standards and supported an evident wood decay resource. A small pond (P6) occurs in hedge boundary with Grey Willow (*Salix cinerea*) and encroaching floating sweet grass (*Glyceria fluitans*).
	SP59820 22232	SW2.1	Timed sweep sample	10 mins	05/06/2020	
	SP59820 22232	VAC2.1	Timed vacuum sample	2 mins + c10mins sorting	05/06/2020	
Field 10	SP59908 22016	AQ1.2	Aquatic sweep sample/kick sample	3 mins	03/05/2020	Terminal section of field drain expanded into shallow, ephemeral scrape, inundated at the time of survey, but dried out later in season (most of western end of field drain also dried out at time of survey). Aquatic habitat mainly open water with encroaching graminoids including marsh foxtail *(Alopecurus geniculatus*), creeping bent grass (*Agrostis stolonifera*) and floating sweet grass (*Glyceria fluitans*); with soft rush (*Juncus effusus*) and false fox sedge (*Carex otrubae*).
	SP59908 22016	VAC1.1	Timed vacuum sample	2 mins + c10mins sorting	02/05/2020	Sward in field relatively improved compared to more herb-rich contiguous fields. With a small amount of in-field scrub and hedgerow boundaries typical of site as a whole, but particularly uniform along northern margin in particular. Feature of greatest interest in field included the wetland habitat adjacent to the drainage channel in the field's southeast corner. The habitat in this area with abundant soft rush (*Juncus effusus*), alongside other wetland graminoids including marsh foxtail (*Alopecurus geniculatus*), floating sweet grass (*Glyceria fluitans*) and false fox sedge (*Carex otrubae*), as well as some grey willow (*Salix cinerea*) scrub.
	SP59908 22016	WT1.1	Water traps (cluster of 10 traps)	Traps left for c24 hours	02/05/2020	
Field 11	SP59705 22245	SW3.3	Timed sweep sample	10 mins	17/07/2020	Damp, mesotrophic grassland. Sward tall (c20 to 40cm) with localised shorter sward on paths where rabbit grazing was occasionally evident, with scrub encroachment. Grassland with graminoids including Yorkshire
	SP59633	SW5.3	Timed sweep	10 mins	26/08/2020	

Sample Area	Grid reference	Sample code	Sample method	Sampling time	Sample date	Habitat
	22295		sample			fog (*Holcus lanatus*), creeping bent (*Agrostis stolonifera*), false oat grass (*Arrhenatherum elatius*), tufted hair grass *(Deschampsia cespitosa*) and downy oat grass (*Helictotrichon pubescens*); with herbs including meadowsweet (*Filipendula ulmaria*), marsh thistle (*Cirsium palustre*), great burnet (*Sanguisorba officinalis*) and ragged robin *(Lychnis flos-cuculi*), common nettle (*Urtica dioica*) and creeping thistle (*Cirsium arvense*). Scrub including establish stands of mature hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), bramble (*Rubus fruticosus* (agg.)) (forming large patches), grey willow (*Salix cinerea*) and goat willow (*S. caprea*) with encroaching saplings, including pedunculate oak (*Quercus robur*), rowan (*Sorbus aucuparia*). More disturbed tall herb habitat towards north-western end of field with wild angelica (*Angelica sylvestris*), common ragwort (*Senecio jacobaea*), Fleabane (*Pulicaria dysenterica*), bristly ox-tongue (*Picris echioides*) and willowherbs (*Epilobium* spp.) alongside previously mentioned species, including abundant meadowsweet.
	SP59705 22245	VAC3.3	Timed vacuum sample	2 mins + c10mins sorting	17/07/2020	
	SP59633 22295	VAC5.3	Timed vacuum sample	2 mins + c10mins sorting	26/08/2020	
	SP59758 22240	WT2.1	Water traps (cluster of 10 traps)	Traps left for c24 hours		
	SP59705 22245	WT3.4	Water traps (cluster of 10 traps)	Traps left for c24 hours	17/07/2020	
Field 12	SP59710 22367	BS4.1	Timed beating sample	30 mins	07/08/2020	Damp, tall-sward mesotrophic grassland/scrub mosaic of similar composition to F11. Grassland generally more rank and less diverse than managed areas, but with localised patches of more diverse habitat with remnant fen meadow vegetation. Graminoids including false oat grass (*Arrhenatherum elatius*), Yorkshire fog (*Holcus lanatus*), creeping bent (*Agrostis stolonifera*), Red Fescue (*Festuca rubra*), Sweet Vernal Grass (*Anthoxanthum odoratum*), tufted hair grass (*Deschampsia cespitosa*), marsh foxtail (*Alopecurus geniculatus*), hairy sedge (*Carex hirta*) and common sedge (*Carex nigra*) and herbs including (*Filipendula ulmaria*) (abundant and locally dominant), silverweed (*Potentilla anserina*), bugle (*Ajuga reptans*), ground ivy (*Glechoma hederacea*), lesser celandine (*Ranunculus ficaria*), cuckoo-flower (*Cardamine pratensis*), marsh thistle *(Cirsium palustre*), great burnet *(Sanguisorba officinalis*) and sorrel (*Rumex acetosa*). Also localised stands of seasonally inundated swamp habitat including stands of reed sweet grass (*Glyceria maxima*) and lesser pond sedge (*Carex acutiformis*), with greater willowherb (*Epilobium hirsutum*), curled dock (*Rumex crispus*), marsh bedstraw (*Galium*
	SP59707 22362	SW1.2	Timed sweep sample	10 mins	02/05/2020	
	SP59710 22367	SW3.2	Timed sweep sample	10 mins	17/07/2020	
	SP59592 22425	VAC1.3	Timed vacuum sample	2 mins + c10mins sorting	02/05/2020	
	SP59710 22367	VAC3.2	Timed vacuum sample	2 mins + c10mins sorting	17/07/2020	
	SP59709 22363	WT2.2	Water traps (cluster of 10 traps)	Traps left for c24 hours	05/06/2020	
	SP59710 22367	WT3.3	Water traps (cluster of 10 traps)	Traps left for c24 hours	17/07/2020	

Sample Area	Grid reference	Sample code	Sample method	Sampling time	Sample date	Habitat
						palustre). Scrub including establish stands of bramble *(Rubus fruticosus* (agg.)), blackthorn (*Prunus spinosa*), hawthorn *(Crataegus monogyna*), grey willow (*Salix cinerea*), dog rose (*Rosa canina*) with encroaching saplings including pedunculate oak *(Quercus robur).* Mature and veteran pedunculate oaks also in field boundary wooded strips.
Field 12 (Langford Brook)	SP59592 22425	AQ1.1	Aquatic sweep sample/kick sample	3 mins	03/05/2020	Langford Brook: Slightly meandering, with artificial rocky weir upstream creating riffles and pools, but little in-channel vegetation and signs of seasonal scouring (banks locally steep-sided and unvegetated). Channel varying in width between c.2 to 4m (at widest point); depth range c.5 to 70cm. Bottom substrate variously shingle with sand and silt; flow relatively fast at weir becoming slow downstream towards southern end. In-channel and marginal vegetation very sparse throughout; some greater willowherb (*Epilobium hirsutum*) and common nettle (*Urtica dioica*) at bank edge around weir and thinly scattered branched bur-reed (*Sparganium erectum*) downstream to south where channel was often heavily shaded (mainly from eastern bank) by trees and scrub including crack willow (*Salix fragilis*), ash (*Fraxinus excelsior*), hawthorn (*Crataegus monogyna*) and filed maple (*Acer campestre*).

Table EDP A11.1.2: 2020 Gavray Meadows moth trap locations

Field number	Trap Location	Grid Ref	Habitat
Field 1	Gavray Drive (Bicester) Field 01	SP59952195	Grassland: neutral: semi-improved
Field 1	Gavray Drive (Bicester) T03	SP5994622007	Grassland: neutral: unimproved
Field 1	Gavray Drive (Bicester) T13	SP5994021985	Scrub: dense
Field 1	Gavray Drive (Bicester) T14	SP5997821976	Scrub: dense
Field 1	Gavray Drive (Bicester) T15	SP5998421953	Scrub: dense
Field 2	Gavray Drive (Bicester) Field 02	SP60002200	Grassland: neutral: semi-improved
Field 2	Gavray Drive (Bicester) T08	SP5993722053	Grassland: neutral: semi-improved
Field 2	Gavray Drive (Bicester) T10	SP5999522036	Grassland: neutral: semi-improved
Field 3	Gavray Drive (Bicester) Field 03	SP60002210	Grassland: neutral: semi-improved
Field 3	Gavray Drive (Bicester) T12	SP5996922110	Grassland: neutral: semi-improved
Field 3	Gavray Drive (Bicester) T19	SP5994722086	Boundaries: hedge and trees
Field 5	Gavray Drive (Bicester) T16	SP5996922295	Woodland: broadleaved: semi-natural
Field 7	Gavray Drive (Bicester) T06	SP5986922297	Scrub: scattered
Field 7	Gavray Drive (Bicester) T07	SP5991822279	Scrub: scattered
Field 7	Gavray Drive (Bicester) T17	SP5996922233	Woodland: broadleaved: semi-natural
Field 8	Gavray Drive (Bicester) Field 08	SP59902210	Grassland: neutral: semi-improved
Field 8	Gavray Drive (Bicester) T09	SP5998822176	Grassland: neutral: semi-improved
Field 8	Gavray Drive (Bicester) T11	SP5994622112	Grassland: neutral: semi-improved
Field 9	Gavray Drive (Bicester) Field 09	SP59802215	Grassland: neutral: semi-improved
Field 10	Gavray Drive (Bicester) Field 10	SP59852205	Grassland: neutral: semi-improved
Field 10	Gavray Drive (Bicester) T04	SP5990222028	Fen
Field 11	Gavray Drive (Bicester) T05	SP5963222308	Grassland: neutral: unimproved
Field 11	Gavray Drive (Bicester) T22	SP5966822304	Grassland: neutral: semi-improved
Field 12	Gavray Drive (Bicester) T01	SP5969222358	Grassland: neutral: semi-improved
Field 12	Gavray Drive (Bicester) T02	SP5964322361	Grassland: neutral: semi-improved
Field 12	Gavray Drive (Bicester) T18	SP5977822314	Grassland: neutral: semi-improved
Field 12	Gavray Drive (Bicester) T20	SP5967222359	Grassland: neutral: semi-improved
Field 12	Gavray Drive (Bicester) T21	SP5970422335	Grassland: neutral: semi-improved
Field 15	Gavray Drive (Bicester) Field 15	SP59752210	Woodland: broadleaved: semi-natural

Table EDP A11.1.3: Number of species recorded by taxon from total survey data

Order	Vernacular	Number of Species per Taxon
Lepidoptera	Butterflies and moths	306
Coleoptera	Beetles	168
Diptera	Two-winged Flies	147
Hemiptera	True Bugs	103
Araneae	Spiders	81
Hymenoptera	Bees, Ants, Wasps	61
Orthoptera; Dermaptera, Dictyoptera	Grasshoppers, crickets and allied species	14
Opiliones	Harvestmen	5
Odonata	Dragonflies and damselflies	5
Isopoda	Woodlice and Slaters	3
Amphipoda	Freshwater and land shrimps	2
Pulmonata	Freshwater snails	2
Trichoptera	Caddisflies	2
Plecoptera	Stoneflies	1
Psocoptera	Barkflies	1
Ephemeroptera	Mayflies	1
Trichoptera	Flatworms	1
Veneroida	Pea mussels	1
	Total	**904**