One Earth Solar Farm

Preliminary Environmental Information Report [EN010159]

Chapter 7: Biodiversity

May 2024

One Earth Solar Farm Ltd

Contents

7. Biodiversity

Summary of Preliminary Likely Significant Effects

7.1. This Chapter concludes that there are no likely significant environmental effects arising from our Project on the Ecological Features scoped into the assessment. The majority of negative effects identified arise from the construction phase and will be mitigated by environmental measures set out in the outline Construction and Environmental Management Plan (oCEMP) and detailed in the construction environmental register in **Appendix 4-2.**

7.2. Overall, our Project will result in likely significant positive effects during the operational phase, resulting from habitat creation and enhancement delivered through embedded measures and Biodiversity Net Gain (BNG).

Introduction

7.3. This Chapter of the PEIR has been prepared by Logika. It presents preliminary findings and identifies the likely significant environmental effects of our Project upon biodiversity, including habitats and legally protected or notable[1] species on, and adjacent to the Site. It is based on the environmental information collected to date (which is detailed in this Chapter), as well as the current description of our Project, as set out in **Chapter 4: Our Project**.

7.4. Specifically the PEIR presented herein has been undertaken with reference to applicable wildlife and countryside legislation, national and local planning policy (see **Appendix 7-1**) and the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018)[2]. The assessment methodology also reflects the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations') and focuses on those activities that could potentially generate significant effects on ecological features.

7.5. This Chapter is supported by further detailed information in the appendices:

- Appendix 7-1: Key Policy and Legislation
- Appendix 7-2: Phase 1 Habitat Survey
- Appendix 7-3: Bat Baseline
- Appendix 7-4: Breeding Bird Baseline

[1] Notable species are those with conservation designations but no specific legal protection e.g. birds that appear on the red or amber list of the Birds of Conservation Concern (BoCC) or invertebrates listed in relevant Red Data Books.

[2] CIEEM (2018, version 1.2 updated 2022) Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.

- Appendix 7-5: Great-Crested Newt Baseline
- Appendix 7-6: Badger and Riparian Mammal Baseline
- Appendix 7-7: Wintering Bird Baseline
- Appendix 7-8: Scientific Names of Species Referred to in the Main Document

Current Biodiversity Conditions

Study Area

7.6. The study area varied for different ecological receptors, depending on their sensitivity to environmental change. Study areas adopted are defined in **Table 7-1** (presented in **Figure 7-1**) below and were determined using best practice guidance (issued by the CIEEM, professional judgement and a high-level assessment of the types of ecological features present, or potentially present.

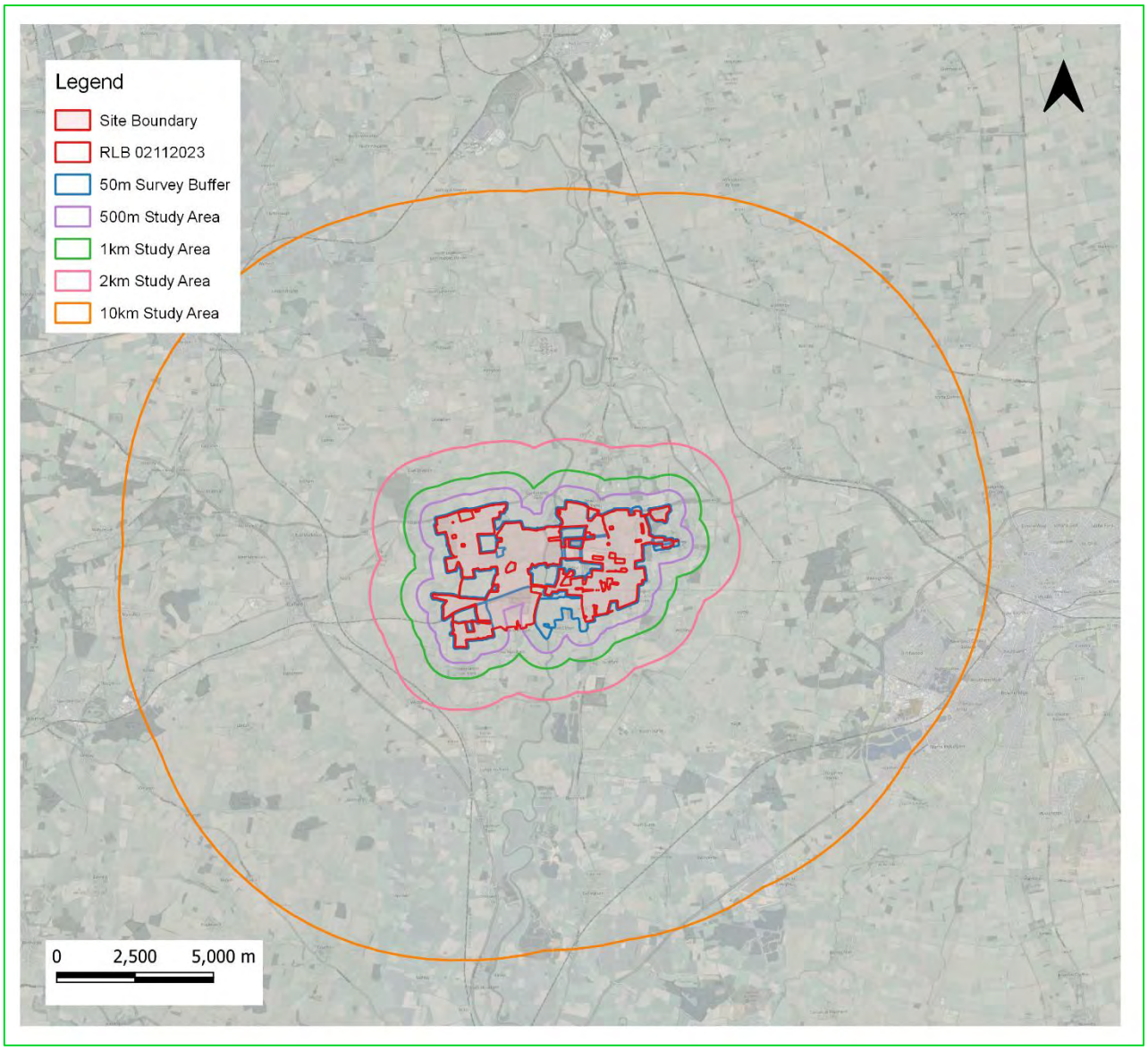
Table 7-1: Extent of Data Search (ZoI) for Ecological Features

Ecological feature*	Study area
European Designated Sites	Site, plus a 10km buffer
Statutory Designated Sites	Site, plus a 2km buffer
Non-Statutory Designated Sites	Site, plus a 2km buffer
Priority Habitats and Veteran Trees	Site, plus a 1km buffer
Legally protected and notable species	Site, plus a 2km buffer
Habitats	Site, plus a 50m buffer
Waterbodies and water courses	Site, plus a 500m buffer

Refer to **Appendix 7-1** for the legislation and policy under which sites, habitats and species are designated and/or protected.

7.7. The study area is continuously reviewed and amended in response to design refinement and consultation feedback, ensuring that there is sufficient data available to conduct the assessment.

Figure 7-1: Study Area



Collection of Biodiversity Data

7.8. Establishment of the biodiversity baseline within the study area involves reference to existing data sources (biodiversity records centres), consultation with stakeholders, including statutory bodies, and field survey data.

Desk Study

7.9. The following sources have been used to inform the assessment:

- Magic website[3]

[3] Multi-Agency Geographic Information Centre (MAGIC) website: https://magic.defra.gov.uk/magicmap.aspx

- Joint Nature Conservation Committee (JNCC) website[4]
- Natural England's (NE) website[5]
- Greater Lincolnshire Nature Partnership (GLNP)
- Nottinghamshire Biological and Geological Records Centre (NBGRC)
- Ordnance Survey (OS) online mapping[6]
- Woodland Trust's Ancient Tree Inventory (ATI) for veteran trees[7]

Field Survey

7.10. This chapter has been informed by a series of field surveys for habitats and protected, notable and controlled species which are included in detail within **Appendices 1.2 to 1.8**. A summary of surveys undertaken, dates and methodologies adopted is provided in below in **Table 7-2**.

Table 7-2: Field Survey Methodologies

Ecological feature*	Main guidance document	Method
Habitats and vegetation	JNCC '*Handbook for Phase 1 habitat survey: A technique for environmental audit*' UK Habitat Classification methodology (2020)	This comprised a walkover of land within our Site and recording of habitat types and boundary features. Hedgerow habitat was considered with reference to the Hedgerows Regulations thereby allowing Important Hedgerows within our Site to be identified. Protected, notable and controlled species scoping was carried out during the Phase 1 habitat survey. This identified the potential for there to be animal and plant species for which there was the requirement for further species-specific field surveys. Survey was undertaken in May and June 2023. Full methodologies are provided in **Appendix 7-3**.

[4] Found at https://jncc.gov.uk/

[5] Found at https://designatedsites.naturalengland.org.uk/

[6] Found at https://explore.osmaps.com/

[7] Found at https://ati.woodlandtrust.org.uk/

Ecological feature*	Main guidance document	Method
Bats	Bat Conservation Trust's '*Bat Surveys for Professional Ecologists*' (Collins, 2016) British Standard: (BS 8596:2015) '*Bat Roosts in Trees'* (Andrews 2018)	Surveys followed a sampling approach due to the extent of generally poor-quality habitat within the Site with only isolated parcels of moderate and high-quality habitat. Ground-level roost assessment for trees within our Site was undertaken alongside habitat assessment. Three transect routes were designed to incorporate a range of habitat types present within our Site and were visited once per season (spring, summer, autumn) with six associated static locations monitored for five full nights in each survey season. Survey visits were conducted from April to October 2023. Full methodologies are provided in **Appendix 7-3**.
Badger	'*Surveying for Badgers: Good Practice Guidelines'* (Scottish Badgers, 2018)	Formal badger surveys were undertaken concurrently with habitat assessment, and during all other ecological surveys conducted in 2023. Full methodologies are provided in **Appendix 7-6**.
Breeding Birds	British Trust for Ornithology's (BTO) *Common Birds Census* (CBC) *methodology* (Gilbert *et al*., 1998)	Due to the extent of generally poor-quality habitat that occurs across our Site, a sampling approach was used. This focused on hedge and ditch networks within the River Trent Corridor that were considered to provide the best breeding bird habitat. All bird species observed or heard were recorded and mapped in each of six survey visits. Survey visits were undertaken between May and late-July 2023. Full methodologies are provided in **Appendix 7-4**.

Ecological feature*	Main guidance document	Method
Great-crested newt	*'Evaluating the suitability of habitat for the great-crested newt (Triturus cristatus)'* (Oldham *et al*, 2000) *Using eDNA to develop a national citizen science-based monitoring programme for the great crested newt (Triturus cristatus)* (Biggs *et al*, 2015)	Where access allowed, waterbodies within and adjacent to our Site were assessed to calculate a habitat suitability index (HSI) for great-crested newt. All waterbodies within our Site (access permitting) were sampled for environmental DNA (eDNA) analysis. Surveys were conducted between May and June 2023. Full methodologies are provided in **Appendix 7-5**.
Otter	'*Monitoring the Otter*' (Chanin, 2003a)	An assessment was made of riparian and connected scrub and woodland habitats within our Site for their potential to support otter. Surveys were conducted in May and June 2023. Full methodologies are provided in **Appendix 7-6**.
Water vole	'*Water Vole Mitigation Handbook*' (Dean *et al*., 2016)	An assessment was made of riparian and agricultural ditch habitats for their potential to support water vole. Surveys were conducted in May and June 2023. Full methodologies are provided in **Appendix 7-6**.
Wintering birds	British Trust for Ornithology's (BTO) Common Birds Census (CBC) methodology (Gilbert *et al*, 1998)	Ten transect routes were designed to incorporate the range of habitats identified across our Site. Each route was surveyed once per month. Survey visits occurred from October to March 2023 to 2024. Full methodologies are provided in **Appendix 7-7**.
Priority species	N/A	Priority Species such as hedgehog and brown hare were recorded during other ecological surveys undertaken in 2023.

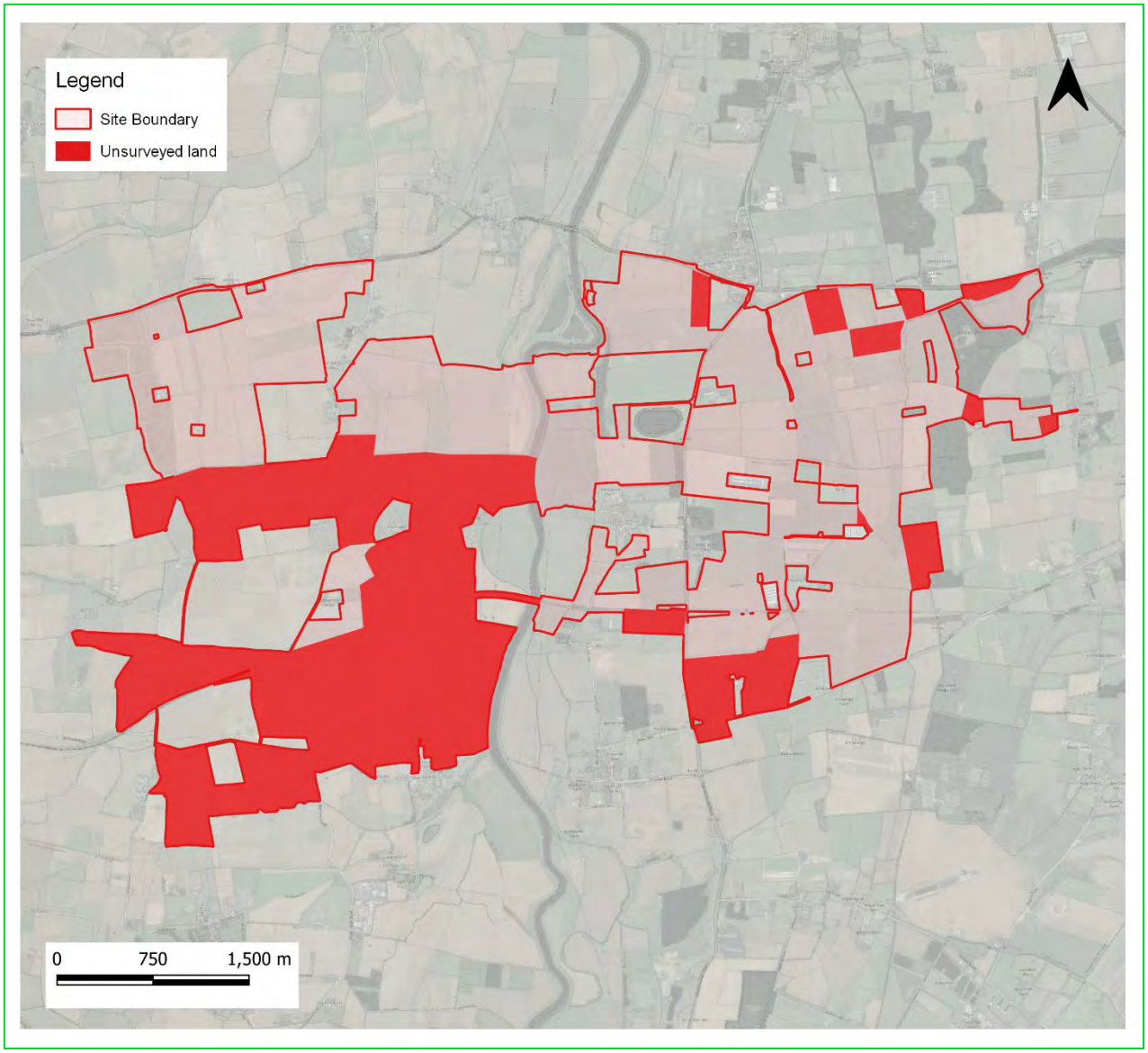
Biodiversity Net Gain

7.11. It is now mandatory for Town and Country Planning Act (TCPA) applications to demonstrate a quantifiable biodiversity net gain ('BNG') of at least 10% under the Environment Act 2021 (see **Appendix 7-1**), with nationally significant infrastructure projects (DCOs) becoming mandatory in November 2025. The submitted ES will demonstrate BNG using the DEFRA Biodiversity Metric Calculator to provide evidence of achievable on-Site BNG associated with our Project and will be presented as an Appendix to the ES Chapter.

Limitations and Assumptions

7.12. Our Site boundary changed a number of times over the duration of survey visits, incorporating new areas which were not included in the initial walkover survey, as new landowners joined our Project. These areas were incorporated into surveys where possible, otherwise they were assessed using aerial images and 'on the ground' knowledge of the area. **Figure 7-2** shows the extent of Phase 1 survey coverage within our Site.

Figure 7-2: Survey Coverage



7.13. The static acoustic monitoring surveys aimed to record for a minimum of 5 nights per season at each monitoring location, however, technical failures occurred, impacting recording at static detector locations along transect 2 (in summer and autumn) and transect 3 (in spring, summer and autumn).

7.14. Extensive flooding along the River Trent in December and January limited access to certain areas within the winter bird survey. These areas were viewed from vantage points and from the other side of the river so the areas were still partially surveyed and bird records were taken, but it may have impacted records of smaller bird species not visible or audible from a distance. As a result, three of 60 transects over the season were altered, the locations of which are presented in **Appendix 7-7**.

7.15. The sampling of waterbodies for great-crested newts is typically conducted for all waterbodies within our Site and a 500m buffer (the study area). However, due to access restrictions (located within private land, presence of dense vegetation surrounding ponds) this was not possible. As a result, two of the six ponds within our Site were sampled, and eight of 34 ponds outside of our Site, within the 500m Study Area. Additional detail is provided in **Appendix 7-5**.

Current Results

Desk Study

7.16. There are no sites designated as being of international nature conservation value within the 10km study area.

7.17. There is one site of national nature conservation value within the 2km study area: Spalford Warren SSSI lies 1.92km south and comprises the best remaining example of grass heath dominated by wavy hair-grass and sand sedge in Nottinghamshire and one of the last to be found in the Midlands. Its location is shown in **Figure 7-3**.

7.18. SSSI Impact Risk Zones (IRZ) extend across our Site. These relate to specific developments likely to impact SSSIs and require consultation with Natural England. The types of developments described do not include solar farms.

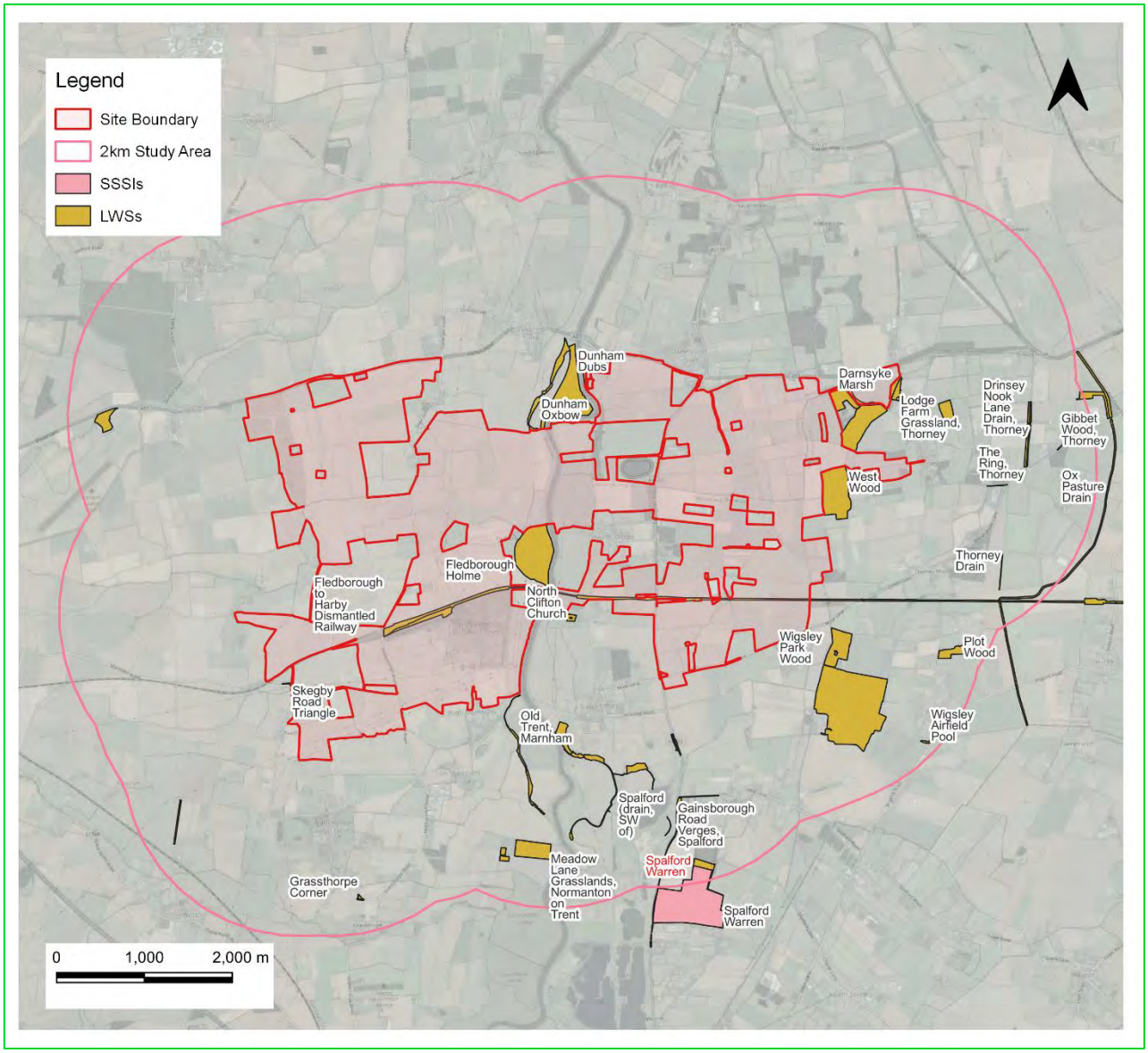
7.19. There are 34 LWSs within the 2km study area, one of which occurs within our Site itself, with a further seven immediately adjacent to our Site. Details of those sites that occur either within or adjacent to our Site and therefore have the potential to be impacted by our Project are summarised in **Table 7-3**, the 26 LWSs that lie further afield are here scoped out. The locations of all LWSs considered within the study area are shown in **Figure 7-3**.

Table 7-3: Summary of LWSs within or adjacent to our Site

LWS name	Area (ha)	Location	Qualifying features
Fledborough to Harby Dismantled Railway	20.88	Within Site	Grassland and scrub on disused railway line.
Dunham Dubs	19.52	Adjacent to northern Site	Two lakes with improved grassland, planted broad-leaved trees and associated marginal flora and marsh.
Dunham Oxbow	4.45	Adjacent to northern Site	Marsh and wet woodland habitat supporting an interesting variety of characteristic plant species.
Fledborough Holme	22.20	Adjacent to central Site	Trees, shrubs, tall herb and semi-improved grassland.

LWS name	Area (ha)	Location	Qualifying features
South Clifton Grassland	2.78	Adjacent to southern Site	Neutral pasture on floodplain.
West Wood	16.28	Adjacent to eastern Site	Deciduous woodland, plantation woodland and acid grassland With ancient woodland indicators (wood anemone and bluebell).
Road Wood	18.44	Adjacent to eastern Site	Broadleaved woodland.
Darnsyke Marsh	1.05	Adjacent to eastern Site	Deciduous woodland, marshy grassland and emergent plant species associated with the Darnsyke drain.

Figure 7-3: Sites of National and Local Nature Conservation Value



7.20. Priority Habitats identified within our Site are:

- Coastal and Floodplain Grazing Marsh, associated with the River Trent.
- Deciduous Woodland at a single location west of Hall Water Reservoir.

7.21. Priority Habitats which lie outside of our Site but adjacent, are:

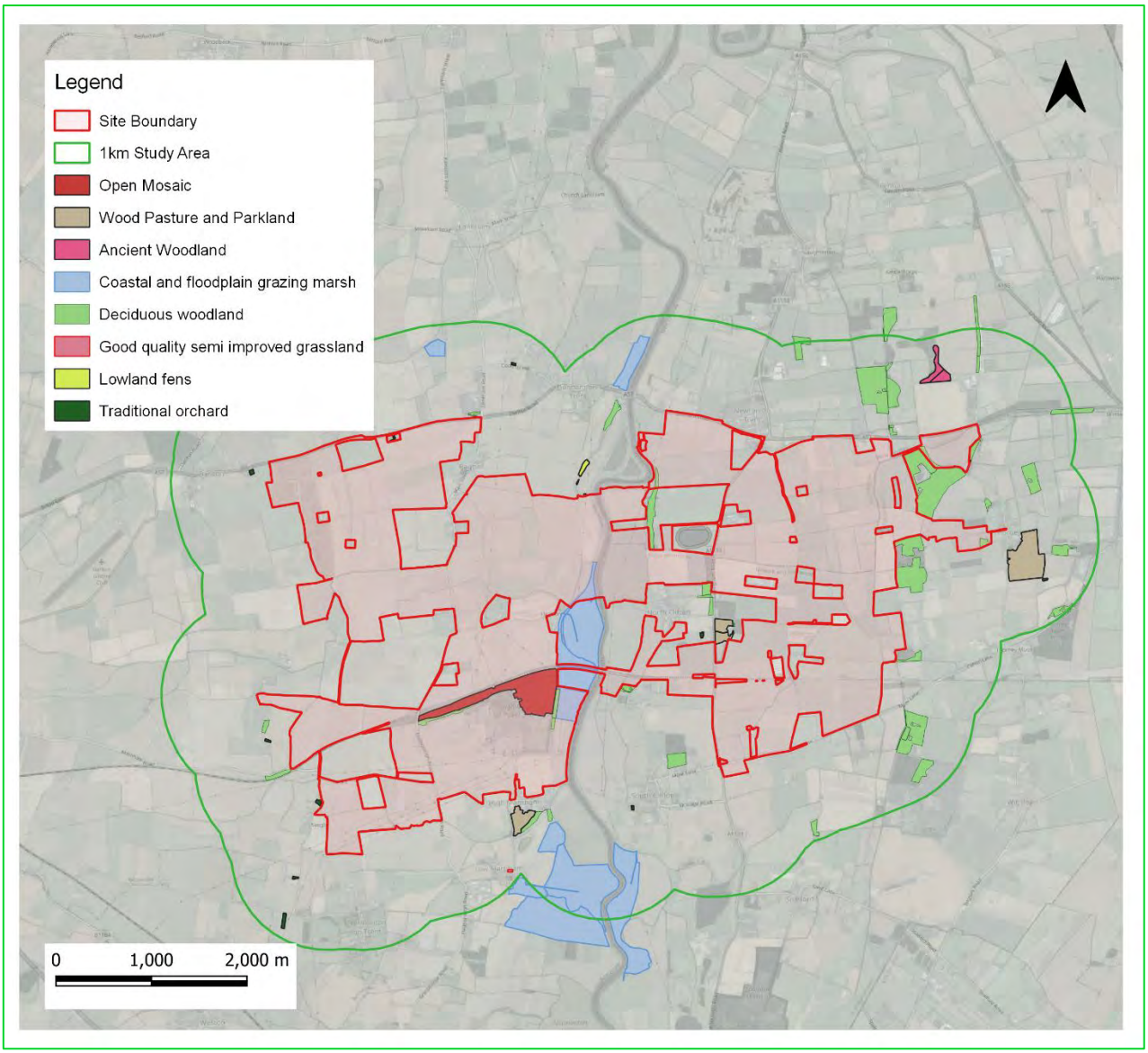
- Traditional Orchard in the northwest of our Site.
- Lowland Fens, to the north and associated with the River Trent.

- Open Mosaic Habitat, associated with the dismantled railway LWS.
- Wood Pasture and Parkland in North Clifton.

7.22. There were no trees assigned veteran status within our Site. However, two veteran crack willow lie adjacent to our Site in North Clifton and three more are located north of the A57 in Dunham.

7.23. In addition, Good Quality (in HPI terms) Semi-Improved Grassland was recorded 865m south of our Site and Ancient Woodland was recorded at Blackthorn Wood, 514m north of our Site. The location and extent of Priority Habitat and Ancient Woodland is presented in **Figure 7-4**.

Figure 7-4: Priority Habitats and Ancient Woodland

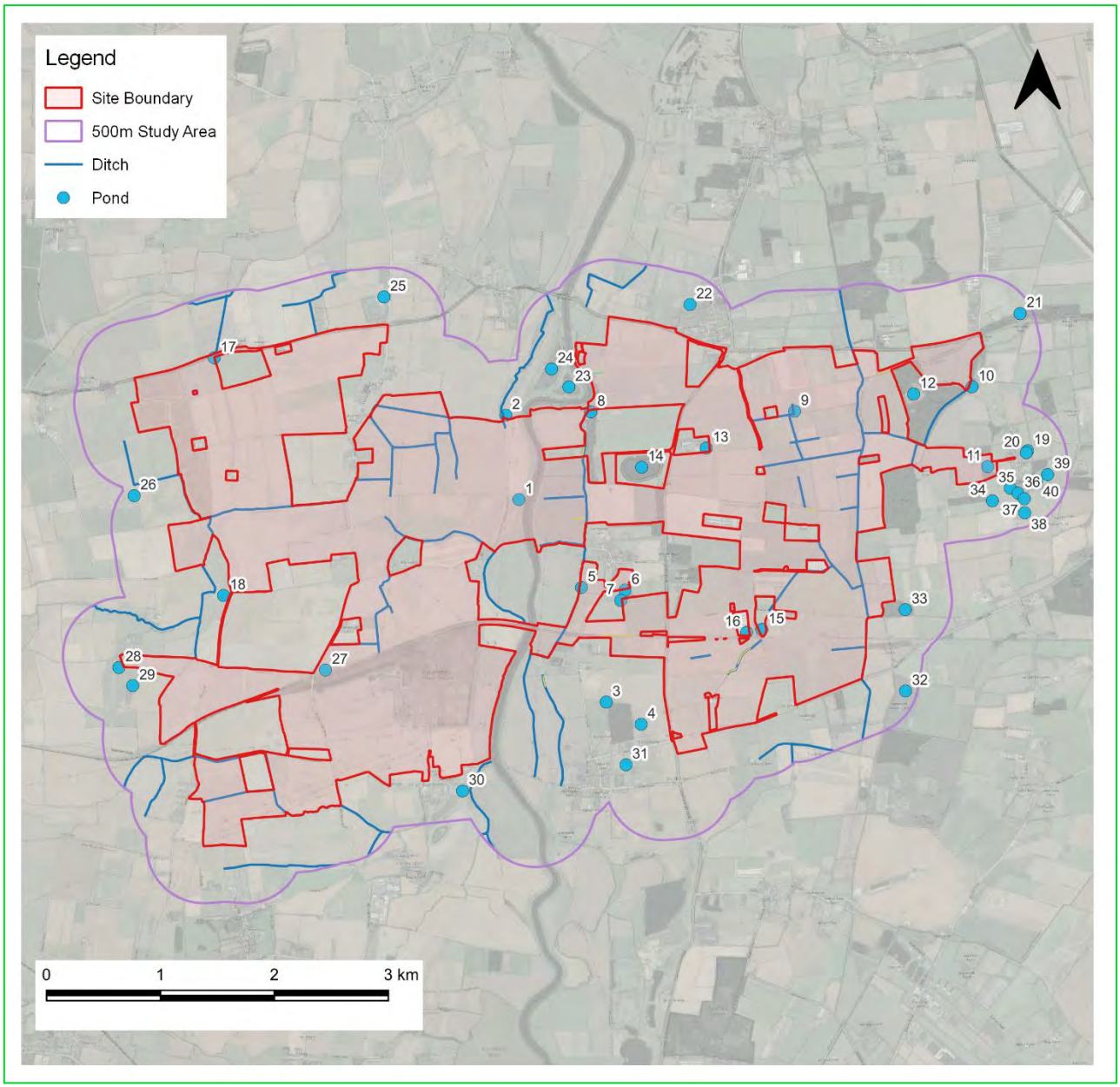


7.24. In addition to the habitats recorded on the Priority Habitat Inventory, several other habitat types recorded during the field survey qualify as HPI in England. These include rivers, ponds and hedgerows.

7.25. There are 40 waterbodies within the Study Area, of which three are located within the Site: 1, 5 and 9. Waterbodies and ditches holding water within our Site and the 500m Study Area are presented in **Figure 7-5**.

7.26. Agricultural ditches holding water are found throughout the Study Area, running parallel to and east of the River Trent, Fledborough Beck in the west of our Site and a ditch extending the full length from north to south in the east.

Figure 7-5: Waterbodies and Watercourses

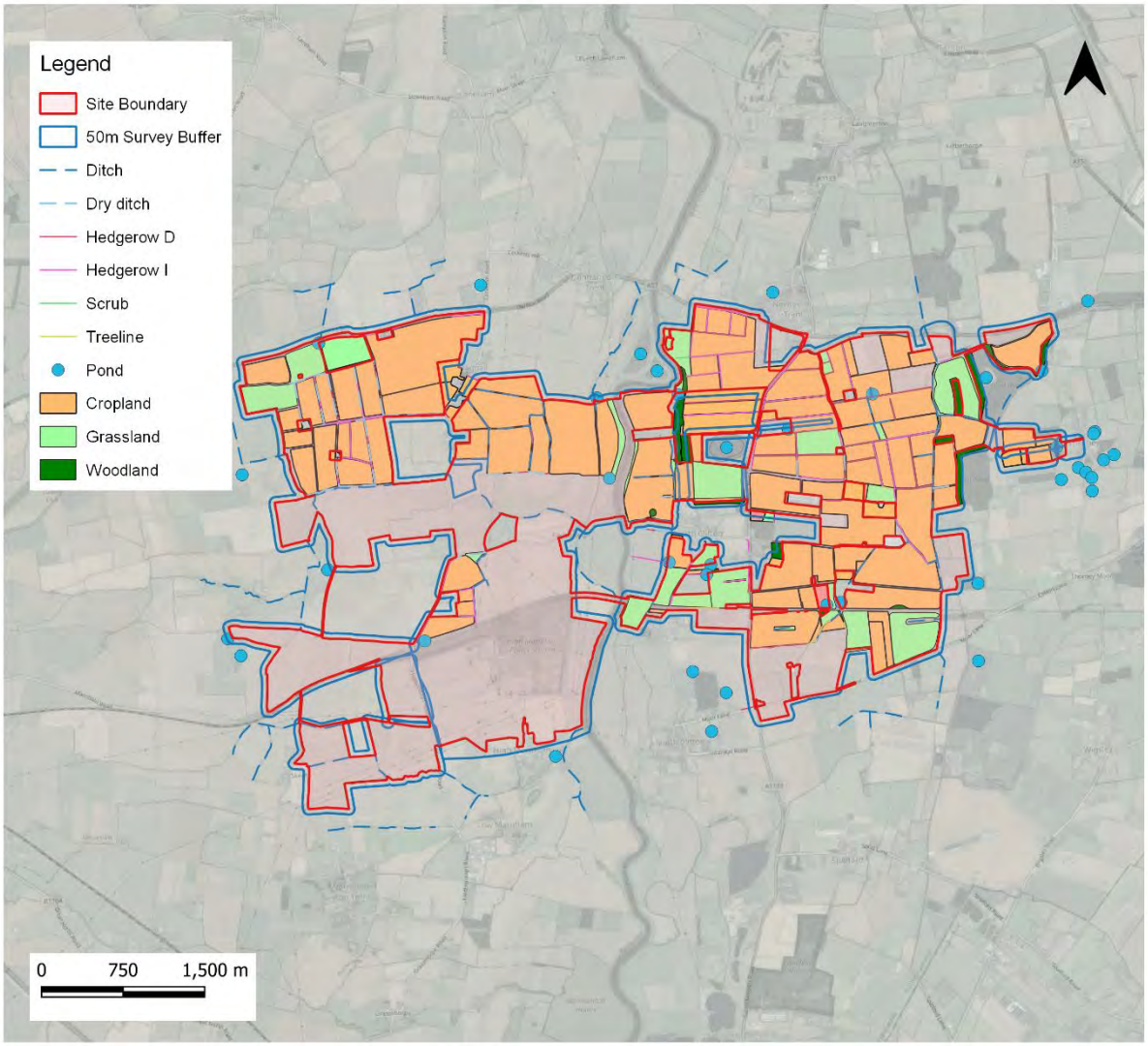


Field Survey

7.27. The current Site cover approximately 1,591ha of which approximately 60 percent (957ha) has been incorporated into Phase 1 habitat survey, UK Habitats Classification and condition assessment. Areas not subject to this level of survey at this stage, in particular because of access issues, have received a high-level assessment based on satellite imagery. All mapped habitats (UK Habs) are presented in **Figure 7-6**.

7.28. The River Trent bisects our Site from north to south with approximately half of the area of our Site lying to the west and the remaining to the east. Arable fields account for approximately 87 percent of our Site. They include cereal and non-cereal crops and substantial grass-leys used for turf production. Additional grassland occurs within narrow field margins (~1m) and as grazing pasture or hay crop. There is floodplain grazing marsh adjacent to the River Trent on both its sides, with water levels managed within the area via a matrix of water-filled ditches with associated sluice gates. Hedgerows and treelines bound the majority of the agricultural fields with species assemblages occurring typical of such features within the region.

Figure 7-6: Habitat Assessment (UK Habitat Classification)



Full details on habitats recorded as a result of field survey are presented within Technical **Appendix 7-2**. In summary habitats recorded are presented in **Table 7-4** below.

Table 7-4: Summary of Habitats Recorded in the Study Area

Phase 1	UKHabs	Area	Condition
Arable	Cropland - Cereal and Non-Cereal Crops	1278ha	N/A

Phase 1	UKHabs	Area	Condition
Improved and Semi-improved grassland	Modified and Other Neutral Grassland	197ha	Poor to Moderate, with the majority of modified grassland, namely grass-leys, assessed as Poor.
Broad-leaved woodland (semi-natural and plantation	Woodland and Forest - Other	7.6ha	Poor or Moderate for plantation woodlands, with the HPI woodland parcel and any other semi-natural woodland qualifying as Moderate.
Dense continuous scrub	Heathland and Shrub – Hawthorn scrub	5.7ha	Areas were assessed as being Moderate or Good condition.
Tall Ruderal	Grassland – Secondary Code 16: Tall forbs	1ha	N/A
Standing Water	Lakes – Ponds (priority and non-priority habitats)	0.3ha	The condition of the ponds varied between Poor and Good.
Open Mosaic Habitat (OMH)	Open Mosaic Habitat on Previously developed land	30.4ha	The condition of OMH (if present) will be varied between Poor and Good.
Intact and Defunct Hedgerows	Hedgerows and Lines of Trees – Native with and without trees, banks and/or ditches	58.2km	Species-poor and defunct hedgerows qualify as Poor. Those with increased species diversity and improved structure qualify as Moderate or Good.
Treelines	Hedgerows and Lines of Trees	9.2km	Range from Poor to Good.
Running water	Watercourse – ditches (wet and dry)	25.9km	Dry ditches are not assessed, wet ditches ranges from Poor to Good.

Bats

7.29. The desk study identified 577 records of a minimum of seven bat species within the study area. Species recorded within our Site were common pipistrelle and Leisler's bat and the genera Nyctalus, Pipistrellus and Myotis, where acoustic records could not be identified to species level. Brown long-eared bat and soprano pipistrelle were recorded within 120m of our Site, and barbastelle and noctule more than 1km from our Site. In addition, whiskered bat was recorded 1.77km from our Site, this is a species of the genus Myotis.

7.30. A single bat European Protected Species Licence (EPSL) was granted for a location 80m from our Site, near South Clifton, allowing the destruction of a resting place for both common pipistrelle and brown long-eared bats.

7.31. During the field survey sixty-six trees within our Site were found to support features potentially suitable for roosting bats, with the majority of these being located to the east of the River Trent in species including oak, ash, beech, willow and poplar.

7.32. Habitats within our Site are generally considered to be of low and moderate quality for foraging and commuting bats due to the extensive cover of arable fields with species poor and defunct hedgerow boundaries. More valuable commuting and foraging habitat is present to the east of the River Trent, associated with woodland habitat, treelines and species-rich, intact hedgerows and the River Trent corridor.

7.33. Activity surveys identified a minimum of seven bat species within our Site, consistent with those identified in the desk study and confirming noctule, brown long-eared bat, barbastelle and Nathusius' pipistrelle within our Site. Common pipistrelle was the most frequently recorded species being found to be foraging and commuting on all transect routes and monitoring locations within our Site and in all seasons the surveys occurred. Soprano pipistrelle was the second most frequently recorded and bats of the genus Myotis the third most frequent. Nathusius' pipistrelle and barbastelle were the least frequently recorded species. Monitoring locations in the north of our Site recorded the highest levels of activity, with the most active period being during the spring monitoring surveys.

Badger

7.34. The desk study identified 159 records of badger within the study area in the last decade, including records from within our Site, although due to badger welfare concerns, exact locations are not divulged. To the east of the River Trent, all records were located in the north of our Site. Records were more widely distributed on the western side of the River Trent specifically: west of North Farm, north of Polly Taylor's Road, west of Main Street in Ragnall, east of Dunham on Trent, and near Newton on Trent. The most recent records were from 2022.

7.35. Evidence of badger activity including sett entrance holes, footprints and latrines, was observed in locations consistent with the desk study results, in particular in the north of our Site.

Birds

7.36. The desk study returned 59,491 records of legally protected or notable bird species within the study area including within the Site themselves. However, the majority of record locations provided were of a low accuracy, being within a 100km square or a 10km square. Only barn owl and house sparrow allowed accurate identification of a specific record location being outside of our Site.

7.37. During the breeding bird surveys undertaken during 2023, 78 species were recorded in total within the study area. Of those, 39 were considered to show territorial behaviour associated with potential breeding attempts, such as singing males or displaying on two or more occasions, nest building or active nests being found, carrying food or faecal sacks to/from an area.

7.38. Of species potentially breeding within the sampling area:

- Three are listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended): quail, barn owl, and hobby.
- Nine are Red-listed on the Birds of Conservation Concern (BoCC) 5: skylark, yellowhammer, house sparrow, yellow wagtail, linnet, greenfinch, grey partridge, house martin, and turtle dove.
- Eleven are Amber-listed on BoCC5: wren, whitethroat, reed bunting, woodpigeon, sedge warbler, dunnock, song thrush, mallard, oystercatcher, quail, and kestrel.

7.39. Wintering bird surveys identified a flooded area in the north of our Site, adjacent to the River Trent, which supported large flocks of greylag goose, lapwing, black headed gull, wigeon and common gull. They were recorded foraging or resting in this area in December and January.

7.40. A temporary scrape in a grass-ley in the southeast of our Site supported large flocks of lapwing, starling, woodpigeon and common gulls. They were recorded throughout the winter, foraging and resting in the area. In addition, a large flock of golden plover (approximately 400 individuals) was recorded foraging in an arable field in the southwest of our Site, to the south of Crabtree Lane in November. Smaller flocks of this species were recorded at various locations within our Site throughout the winter period.

Great-crested newt

7.41. The majority of records identified by the desk study were historic, with the only recent positive record located 250m east of our Site in 2017. Additional records were provided for negative eDNA results at ponds to the south of our Site.

7.42. Arable habitats are sub-optimal for great-crested newt in their terrestrial life phase. Therefore, although ponds within and adjacent to our Site provide some suitable breeding habitat, these locations are not well-connected to the wider landscape, with limited opportunities for the terrestrial phase, including refuge and hibernation opportunities found in scrub, woodland edge and hedgerow habitat.

7.43. Regardless of their habitat suitability for great-crested newt, all ponds within and adjacent to our Site, where access was available, were sampled for eDNA. Ten samples (for ponds 1 to 10) were analysed and returned negative results for great-crested newt.

Otter

7.44. Only historic records of otter within the study area were returned by the data search, the most recent being submitted in 2005, north of our Site along the River Trent.

7.45. The River Trent was considered to provide suitable habitat for commuting and foraging, with branching ditches providing access to woodland habitat suitable for holts and resting. No evidence of otter was however, observed during habitat surveys.

Reptiles

7.46. Two records of grass snake were located to the northeast of the study area, the closest being 950m from our Site, recorded in 2015.

7.47. Rough grassland with open areas and close to scattered scrub and woodland edge habitat and riparian habitats are suitable to support the common and widespread reptile species. These were located either side of the River Trent and alongside agricultural ditches, including Sewer Dyke, the Old Trent and Fledborough Beck. Reptiles were not observed during habitat surveys.

Water vole

7.48. The data search revealed 39 records of water vole within the past decade. Several of which occurred within our Site, with the most recent having been submitted in 2017. Most of the records were from the west of the River Trent, associated with the Fledborough Beck and the Old Trent ditches.

7.49. Wet agricultural ditches with marginal, emergent vegetation, 45-50 degree earth banks with a variety of vegetation providing forage and cover from predators, are suitable for water vole. These occurred within our Site to the east and west of the River Trent, namely Fledborough Beck, the Old Trent, Sewer Dyke and a large drain running south to north in the east of our Site and the smaller agricultural drainage network associated with these watercourses. No evidence of water vole presence was identified during habitat surveys.

Notable species

7.50. The desk study identified two mammals listed as priority species (SPI), both of which were recorded within our Site. West European hedgehog was recorded east of the River Trent and south of the A57, with the most recent record being in 2021. Brown hare was recorded to the west of North Clifton in 2017. Brown hare were also recorded frequently in all areas of our Site throughout the ecology surveys that were undertaken.

7.51. Thirty-eight records within the last 10 years of European eel were identified by the desk study. Several were located within watercourses that occur within our Site: south of Dunham Road, southeast and southwest of Ragnall, south of Woodcoates Lane, and south of Polly Taylor's Road, with the latest record in 2022.

7.52. All notable invertebrate records identified in the desk study were for butterfly or moth species which occurred outside of our Site. The closest was for wall brown, a priority (SPI) species of butterfly approximately 1km north of the of our Site, most recently recorded in 2020.

7.53. The data search returned 124 records of legally protected and/or priority flora within the study area in the past 10 years. Some of the records had low accuracy grid references and could not be mapped, others are confirmed to occur within our Site, such as rye brome, common cudweed (*vulgaris* and *germanica*), the aquatic plant frogbit, hoary cinquefoil, and the tree species bird cherry. A high density of records outside of our Site are located at the High Marnham Power Station and along the disused railway LWS.

Legally controlled species

7.54. Several legally controlled plant species were identified by the desk study, mostly those which have an association with aquatic or riparian habitats. Water fern was recorded at two locations within our Site, west of the River Trent, while parrot's feather, Himalayan balsam, floating pennywort and New Zealand pygmyweed were recorded outside of our Site. In addition, a single record of wall cotoneaster and another of Japanese knotweed were identified outside of our Site.

7.55. Several records of Chinese mitten crab were located along the River Trent, within and to the north of our Site, and American mink were recorded at a similar location. American mink was recorded incidentally during the ecology surveys undertaken occurring at the same location as was identified by the desk study.

Future Biodiversity Conditions

7.56. This section considers the likely changes to the current baseline that may occur over the duration of our Project. It also considers the changes that may occur in the absence of our Project.

7.57. The study area within our Site and up to 50m is dominated by arable fields, with occasional sheep grazed improved grassland fields, bounded by ditches and hedgerows with occasional standard trees. Woodland copses fall adjacent to our Site, with woodland ponds occasionally present. The River Trent bisects our Site from north to south at Dunham.

7.58. In the absence of our Project, these habitats will be managed in the same way, continuing to provide habitat for those (limited) legally protected, notable and controlled species identified in the current baseline. Some of these species have adapted to live successfully in agricultural habitats, such as badger, hare and ground nesting birds.

7.59. In the short, medium, and long term, species populations and distributions will continue to fluctuate in response to standard agricultural management, such as crop rotations and grazing. As a result of intensive farming practices, the majority of UK species populations are in decline. Therefore, in the absence of our Project, it is likely that this trend would continue, with more common, widespread and adaptable species populations continuing to decrease.

7.60. In the longer term, changing climatic conditions resulting from climate change may impact the resilience of certain habitats and species, for example water levels in the ditch systems may change over time. Generally though, because of the intensive nature of management that already exists in the areas of agricultural land, climate change is unlikely to significantly impact the vast majority of land that occurs within our Site.

Environmental Measures

7.61. Our Project seeks to minimise adverse ecological effects and to maximise the opportunities for biodiversity benefit by following the 'mitigation hierarchy' as referred to in the revised NPPF 2023 (paragraph 181) and EIA Regulations 2017 (paragraph 18 (3)(c)), including measures to avoid, prevent, reduce and if possible, offset any identified significant adverse effects with an overall objective of delivering biodiversity net gain.

7.62. Avoidance and mitigation measures are being achieved as a result of the careful planning and design that has occurred, and will continue to occur until our Project design is fixed, and through the adoption of good construction and operation principles as described below. Specifically:

- Higher value habitats, such as woodland, hedgerow, trees and ponds, will be avoided and retained where they occur, and will be subject to biodiversity enhancement where appropriate.
- Appropriate buffers (minimum 5m) will be maintained or created around habitats which are of value, including watercourses, woodland, hedgerows, trees and ponds (see **Chapter 4: Our Project**, which includes the design principles on setback distances and buffers adopted for our Project).
- Existing trees and hedgerows will be retained as far as possible and protected in accordance with best practice (BS 5837). Where the removal of such features is unavoidable, lower value features will be selected over higher value.

- Existing tracks and field access locations across our Site will be utilised and where new access is unavoidable, it will be in the footprint of lower value habitats and to a maximum width of up to only 6m.
- The crossing of ditches will be avoided wherever possible so that the current design incorporates the crossing of a single ditch only. The crossing itself will be designed in such a way as to ensure the maintenance of connectivity for aquatic fauna (fish) and semi-aquatic fauna (water vole and otter).

Embedded Measures

7.63. Measures which will be managed throughout the life of our Project will primarily be associated with habitat creation and enhancement. These measures are designed to result in positive effects on biodiversity and to establish an overall Biodiversity Net Gain to deliver in excess of the minimum ten percent required uplift in habitat units, hedgerow units and river units.

7.64. Habitats will be enhanced and created both within land which will be developed, as well as land outside of development areas (set aside for biodiversity and green infrastructure enhancement). The broad aim will be to improve connectivity, both within our Site and the wider landscape, and to create a connected mosaic of a range of habitat types, benefitting a diverse variety of fauna as a result. They will be managed appropriately so that they attain their highest value for biodiversity with a flexible approach, responsive to conditions recorded, attained through regular monitoring.

7.65. This will achieved through:

- Hedgerow planting and enhancement – planting will include a range of native species typical of the region, such as hawthorn, blackthorn, hazel, privet and guelder-rose, with supplementary planting of species-poor and defunct hedgerows. A range of species results in availability of berries, nuts and flowers over the year, provisioning for a range of animal species.
- Species-rich grassland – created under and around solar panels and other infrastructure, utilising a range of seed mixes for specific locations to ensure successful establishment, for example, the use of shade tolerant species underneath solar panels.
- Coastal and floodplain grazing marsh – created along the River Trent corridor, specifically in locations where this habitat type has been mapped as HPI but has lost its qualifying features.

- Ditches – these are likely to improve in terms of water quality providing associated ecological benefits due to the absence of adjacent agricultural activities, such as the spraying of chemicals and resulting runoff. Where ditches have become overgrown with successional vegetation such as willow scrub and bramble, management will be carried out to remove this vegetation allowing sunlight to penetrate and improve the growth of ground flora. Seeding or planting of common reed and other emergent species can be carried out at strategic locations, providing habitat for breeding birds and forage and cover for small mammals. Bankside habitats will be managed to create a 'riparian zone', increasing the habitat availability for associated riparian species. This may include seeding with a species-rich, tussocky meadow mix.
- Scrub – there will be scrub creation which will include a range of native species typical of the region, planted to create marginal habitat between woodland and tall grassland. This would create in extension for woodland fauna and cover for grassland fauna. Consideration will also be paid to planting to improve connectivity between habitats of value, such as along the disused railway track running east to west, and between woodland parcels in the east of our Site.
- Ponds and temporary scrapes and pools – created to improve heterogeneity of habitats, benefiting a range of species. They will be situated in strategic locations where water logging/pooling has been recorded and in close proximity to hedgerow and scrub habitats.
- Badger gates and wildlife-friendly fencing will be permeable to small animals (hedgehogs, reptiles etc.)

7.66. **Appendix 4-1** also sets out the minimum off-sets which have been incorporated from environmental features to protect and improve the local environment.

7.67. Habitat enhancement and creation will provide opportunities for a range of protected and notable species. Additional measures will be incorporated into the design to benefit species identified as local targets, including:

- Barn owl – through improvement of grassland thereby providing better quality habitat for small mammal prey.
- Bats – creation of habitats to improve connectivity and provision of bat roost boxes fixed to trees within suitable habitat.
- Farmland birds including turtle dove – through enhancement and creation of hedgerows, provision of cover crops seeded as narrow strips along field edges, with species such as millet to provide forage and cover.
- Hairstreak butterflies – scrub and hedgerow enhancement and creation.
- Harvest mouse – creation of species-rich grassland, tall, tussocky grassland and provision of cereal cover crops.

- Pollinators – through species-rich grassland creation and the selection of seed mixes for a range of pollinators at strategic locations.
- Skylark – via creation of species-rich grassland.
- Turtle dove – creation of species-rich grassland alongside hedgerow habitat, seeding with a specialised mix for this species.
- Water vole – through enhancement of ditches and bankside habitat.

7.68. In addition, habitat enhancement will include the provision of log piles to create hibernacula for reptiles and amphibians, and bee and beetle banks running east to west between rows of panels.

7.69. Our Project will collaborate with the Local Wildlife Trusts to implement an invasive species management plan. This would focus on the removal and prevention of spreading of Himalayan balsam and Japanese knotweed, and the control of American mink.

Construction Phase

7.70. To ensure that impacts arising from construction are avoided and minimised, our Project will follow an agreed oCEMP (see **Appendix 4.2** of the likely environmental measures to be included) and a 'Decommissioning Management Plan' which will outline the working methods and details of restoration once the construction phase is complete (see **Chapter 4: Our Project** for further details on these plans).

7.71. The oCEMP will include avoidance measures to ensure legal compliance for protected species, including badgers, bats, breeding and wintering birds, otter, reptiles and water voles.

7.72. In addition, an appropriately qualified Ecological Clerk of Works will be appointed for the duration of the construction phase to provide toolbox talks to workers, providing information about protected habitat and species and the legislation relating to them, and to be a point of contact for issues which arise over the duration.

Stakeholder Consultation

7.73. Consultation to date has included meetings with Natural England (NE), Lincolnshire Wildlife Trust and all the host authorities. A summary for which is present in **Table 7-5** below.

Table 7-5: Consultation to Date

Consultee	Date	Stage	Issue raised	Response/ Action taken
Lincolnshire Wildlife Trust	16/10/2023	Pre-EIA Scoping	Workshop run by Lincolnshire Wildlife Trust with multiple solar developers and other stakeholders	N/A
Natural England	05/02/2024	Post EIA scoping	Project overview, baseline, approach to assessment and scoping of the Discretionary Advice Service (DAS) inputs	DAS set up and agreed between parties
Lincolnshire Wildlife Trust	29/02/2024	Post EIA scoping	Project overview, baseline, identifying local conservation priorities, biodiversity enhancement and Biodiversity Net Gain (BNG)	Agreement reached on extent of baseline data collection requirements and need to ensure habitat creation is focused on local conservation priorities as well as delivery of BNG
Solar developers in Lincolnshire and Nottinghamshire	07/03/2024	Post EIA scoping	Coordination of biodiversity enhancements, designing habitat enhancements in light of local nature conservation priorities, approaches to mitigation	Agreement on further coordination and desire to ensure solar development can provide a positive benefit to biodiversity

Consultee	Date	Stage	Issue raised	Response/ Action taken
Lincolnshire County Council, Nottinghamshire County Council, Bassetlaw District Council, Newark and Sherwood District Council, West Lindsay District Council	11/03/2024	Post EIA scoping	Project overview, baseline, identifying local conservation priorities, biodiversity enhancement and Biodiversity Net Gain (BNG)	Agreement reached on extent of baseline data collection (with one outstanding consideration) requirements and need to ensure habitat creation is focused on local conservation priorities as well as delivery of BNG

Potential Likely Significant Effects Scoped Out

7.74. **Table 7-6** presents the elements which have been scoped out from the detailed assessment for all ecological features, as it is considered no likely significant effects will occur.

Table 7-6: Likely Significant Effect Scoped Out of the Assessment

Effects scoped out	Justification
Construction and decommissioning emissions (traffic and construction plant)	Emissions from plant and delivery traffic during the construction and decommissioning phases can lead to habitat change through nutrient deposition, acidification and direct toxicity. However, they are scoped out of the assessment because there are no European sites within 200m of roads on which a detectable rise in traffic would be predicted during the construction phase. There are two SSSI within 200m of the A1133 (Spalford Warren SSSI and Besthorpe Warren SSSI), however these are south of our Site on a stretch of road that is unlikely to be a major construction traffic route, given access from the A57 is proposed. Further, construction and decommissioning traffic can anyway be discounted as the increase in traffic will be temporary and limited, ensuring that the extent of the effect will be low, temporary and reversible. This justification equally applies to LWSs present within the area.
Electro-magnetic fields (EMF)	The effects of electro-magnetic fields (EMF) from buried cables can result in environmental changes in close proximity to cables through soil heating (altering habitat composition) and magnetic fields discouraging certain species from moving through the area. However, cabling for solar farms is no different to those already in position across the country (e.g. connections for on and offshore wind farms, parts of the national grid and district network distribution system and other solar farms) and there is no evidence to suggest they have an effect on ecological features. Heating of the soil would occur over a small area only with typical estimates of measurable changes in temperature being at most between 1 and 1.5m from the cable, thus making any potential effect highly localised. Cabling may be required to pass underneath the River Trent (if the alternative cable crossing of using the Fledborough Viaduct is not possible), this would be installed using directional drilling, at a depth of at least 5m, therefore, EMF effects such as heating will not extend to the water.

7.75. The scope of the biodiversity assessment was to use the baseline data collected through desk study and field survey to-date to determine which of the identified ecological features are 'important'. Following CIEEM (2018, updated 2019) guidance, the importance of each ecological feature was determined using a geographic scale[8] (see **Table 7-7**). The importance of the ecological features has been described in relation to UK legislation and policy, and with regard to the extent of habitat or size of population that may be significantly affected by our Project.

7.76. The importance of ecological features can therefore differ from that which would be conferred solely by legislative protection or identification as a conservation notable species. For example, house sparrow is important at a national level (in policy terms) because it is a priority species (SPI) and features on BoCC red list[9]. However, a small population that could be affected by a development might be assessed as only being of local importance due to the large, albeit declining, UK population (in excess of five million pairs). Similarly, a small length of hedgerow (a HPI), even if deemed to be 'important[10]' with regard to the Hedgerow Regulations, is unlikely to be considered to have greater than 'local' importance due to the extent of this habitat type across a given county.

7.77. Wherever possible, information regarding the extent and population size, population trends and distribution of the ecological features was used to inform their categorisation, and determine their importance at the project level. Where detailed criteria or contextual data were not available at this stage of our Project, professional judgement was used to determine importance.

Table 7-7: Defining Importance of Ecological Features

[8] Where this was not possible due to the level of baseline information currently available the highest relevant level of importance is assumed to ensure no ecological features are scoped out of future assessment when not appropriate.

[9] The IUCN red list provides taxonomic, conservation status and distribution information on taxa that have been globally evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those taxa that are facing a higher risk of global extinction - those listed as Critically Endangered, Endangered and Vulnerable. [Online] Available from: http://www.iucnredlist.org/apps/redlist

[10] This refers to the legal definition of 'important' within the Hedgerow Regulations 1997 – this is different from how the same term is used within the CIEEM guidelines.

Geographic context of importance	Description
International or European	National site network constituents including SPAs, SACs and candidate SACs. pSPAs, pSACs, Ramsar sites (designated under international convention) and proposed Ramsar sites are also considered in the same manner, in accordance with national planning policy. Areas of habitat or populations of species which meet the published selection criteria based on discussions with Natural England and field data collected to inform the EcIA for designation as a constituent of the national site network, but which are not currently designated at this level.
National	A nationally designated site including SSSIs and NNRs. Areas (and the populations of species which inhabit them) which meet the published selection criteria guidelines for selection of biological SSSIs but which are not themselves designated based on field data collected to inform the EcIA, and in agreement with Natural England. SPIs and HPIs, Red listed and legally protected species that are not addressed directly in Part 2 of the 'Guidelines for Selection of Biological SSSIs' but can be determined to be of national importance using the principles described in Part 1 of the guidance. Areas of ancient woodland, for example woodland listed within the Ancient Woodland Inventory and ancient and veteran trees.
Regional (East Midlands)	*A Biodiversity Strategy for the East Midlands* (2006) provides information on habitats at a regional scale. In respect of our Project, habitats of regional importance will be determined based on the targets set in this chapter. Regularly occurring HPI or populations of SPI, Red listed and legally protected species may be of regional importance in the context of published information on population size and distribution.
County (Lincolnshire and Nottinghamshire)	LNRs and Non-Statutory Designated sites including: LWSs and notable roadside verges.

Geographic context of importance	Description
	Areas which, based on field data collected to inform the EcIA, meet the published selection criteria for those sites listed above (for habitats or species, including those listed in relevant Local Biodiversity Action Plans) but which are not themselves designated.
Local	HPI and SPI, Red listed and legally protected species that based on their extent, population size, quality etc are determined to be at a lesser level of importance than the geographic contexts above. Common and widespread semi-natural habitats occurring within the study area in proportions greater than may be expected in the local context. Common and widespread native species occurring within the study area in numbers greater than may be expected in the local context.
Negligible	Common and widespread semi-natural habitats and species that do not occur in levels elevated above those surrounding the study area. Areas of heavily modified or managed land uses (for example, hard standing used for car parking, as roads etc.)

7.78. Where protected species are present and there is the potential for a breach of legislation due to our Project, those species are considered to be 'important' features regardless of extent of occurrence. With the exception of such species receiving specific legal protection, or those subject to legal control (for example, invasive species), all ecological features determined to be of 'negligible' importance are scoped out of the assessment. This approach is consistent with that described in CIEEM (2018, updated 2019).

7.79. Through an understanding of the activities associated with our Project and the resulting environmental changes, it is possible to identify ecological features that may be subject to potentially significant effects. Ecological features including legally protected species that are of sufficient importance that effects upon them arising from our Project could be significant, were then taken through to the next stage of the scoping assessment.

7.80. To identify such ecological features, all the activities and consequent environmental changes associated with the construction, operation and decommissioning of our Project have been considered. Given the ongoing design process, at this stage of our Project, the environmental changes have been considered in broad categories only. Wherever there is uncertainty as to the potential level of effect or the occurrence of a particular ecological feature, a precautionary approach has been taken.

Spatial Scope

7.81. Key to establishing a potentially significant effect is the determination of a Zone of Influence (ZoI) for each ecological feature (in other words the area within which a significant effect on an ecological feature may occur as a result of our Project). ZoIs differ depending on the type of environmental change (in other words the change from the existing baseline) as a result of our Project, and the ecological feature being considered.

7.82. The construction, operation and maintenance, and decommissioning phases of our Project may result in the following broad environmental changes:

- Temporary land take and habitat degradation during construction.
- Permanent land take, and habitat loss and degradation associated with presence of permanent infrastructure.
- Fragmentation of semi-natural habitats due to habitat loss or degradation and reduction in landscape permeability due to the presence of infrastructure.
- Increases in noise, vibration and human presence during the construction and decommissioning phases resulting in disturbance of fauna.
- Increases in temporary and permanent lighting through all phases of our Project resulting in disturbance of fauna.
- Changes in ground water levels and surface water movement patterns due to imposition of temporary and permanent drainage resulting in habitat degradation.
- Accidental spread of invasive non-native species due to construction activity.
- Pollution of terrestrial and freshwater habitats through loss of chemicals and fines or dust from work areas during construction and decommissioning.
- Changes in hydrology (ground water levels and surface water run-off rates) resulting in habitat change.

7.83. The most straightforward ZoI to define is the area affected by land-take and direct land-cover changes associated with our Project. This ZoI is the same for all affected ecological features. By contrast, for each environmental change that can extend beyond the area affected by land-take and land-cover change (for example noise created by construction), the ZoI may vary between ecological features, dependent upon their sensitivity to the change and the precise nature of the change. For example, a dormouse might only be disturbed by noise generated very close to its nest, whilst nesting lapwing might be disturbed by noise generated at a much greater distance; other species (for example many invertebrates) may be unaffected by changes in noise at all.

7.84. In view of these complexities, the definition of the ZoI that extends beyond the land-take area was based upon professional judgement informed, as far as possible, by a review of published evidence (for example disturbance criteria for various species). The ZoIs for each broad environmental change are specified below. Due to the level of information currently available for this preliminary assessment, the ZoIs have been applied broadly to be precautionary:

- Temporary or permanent land take and habitat degradation - ZoI within our Site for habitats and sedentary species; mobile species may be affected beyond that if the land within our Site lies within their typical home-ranges.
- Fragmentation of semi-natural habitats due to habitat loss or degradation and reduction in landscape permeability due to the presence of infrastructure - ZoI within our Site for habitats and sedentary species; mobile species may be affected beyond that if land within our Site forms part of their typical home-ranges.
- Increases in noise, vibration and human presence during the construction and decommissioning phases resulting in disturbance of fauna - ZoI for sensitive species is up to 500m from construction works, noting that for mobile features of designated sites this is related to the species land use, as opposed to designation boundary.
- Increases in temporary and permanent lighting through all phases of our Project resulting in disturbance of fauna - ZoI for sensitive species up to 450m from areas which require lighting, noting that for mobile features of designated sites this is related to the species land use, as opposed to designation boundary.
- Changes in ground water levels and surface water movement patterns due to imposition of temporary and permanent drainage resulting in habitat degradation - ZoI within the Site for habitats and sedentary species; mobile species may be affected beyond that if land within our Site forms part of their typical home-ranges.
- Accidental spread of invasive non-native species (INNS) due to construction activity - ZoI for habitats and species is up to 500m from our Site, or further if the source and the ecological feature are directly linked via the river system.

- Pollution of terrestrial and freshwater habitats through loss of chemicals and fines or dust from areas of construction and decommissioning - ZoI for habitats and species is up to 500m from our Site, or further if the source and the ecological feature are directly linked via the river system.
- Changes in hydrology (ground water levels and surface water run-off rates) resulting in habitat change - ZoI for sensitive species is within the surface and ground water features described in **Chapter 8: Hydrology and Hydrogeology**, noting that for mobile species that occur on designated sites, this is related to the species range, as opposed to designation boundary.

7.85. It should be noted that the avoidance of potential effects through design are implicitly taken into account through the consideration of each ZoI. Furthermore, when scoping in or out ecological features from further assessment, embedded environmental measures associated with good practice have been taken into account (for example dust suppression, appropriately scheduled vegetation removal etc.).

7.86. **Table 7-8** presents the biodiversity scoping assessment.

Table 7-8: Defining Importance of Ecological Features

Ecological feature	Importance (legislation and policy)	Importance (project level)	Scoped in or out of detailed assessment
Spalford Warren SSSI	National	National	Scoped out – this SSSI lies outside of the ZoI and has been designated for its floral composition rather than for any mobile species. Pollution and runoff from our Project will be controlled through the oCEMP.
Fledborough to Harby Dismantled Railway LWS	County	County	Scoped in – parts of this site occur within our Site, embedded measures will prevent negative effects with enhancement measures resulting in positive effects.
Dunham Dubs, Dunham Oxbow, Darnsyke Marsh, and Fledborough Holme LWS	County	County	Scoped in – these sites support waterbodies within the ZoI for groundwater, pollution and INNS, the environmental measures (best practice construction methods, use of spill kits and detailed drainage design) will prevent negative effects, with habitat enhancement resulting in positive effects, e.g. control/removal of INNS, reduction of polluted runoff from arable fields.
Road Wood, West Wood and South Clifton Grassland	County	County	Scoped out – these lie outside of ZoI for relevant environmental changes in relation to the habitats they support.
Coastal and floodplain grazing marsh	National	National	Scoped in – this habitat lies within our Site it will be retained and enhancement measures will result in positive effects.

Ecological feature	Importance (legislation and policy)	Importance (project level)	Scoped in or out of detailed assessment
Deciduous Woodland	National	County	Scoped out – although this habitat lies within our Site, the embedded measures will result in retention and protection, specifically incorporating a buffer during construction works and as a standoff for solar panel installation.
Other HPIs (hedgerows, ponds, ditches)	National	County	Scoped in – these habitats occur within the ZoI for all environmental changes, however, environmental measures will result in the retention of these habitats. An overall biodiversity gain will be achieved in the enhancement and creation of these habitat types through green infrastructure provision and BNG.
Higher value habitats (plantation woodland and neutral grassland)	National	County and Local	Scoped in – these habitats occur within the ZoI for all environmental changes, however, environmental measures will result in positive effects through the retention and enhancement of these habitats.
The River Trent	National	National	Scoped in – occurs within the ZoI for all environmental changes.
Common and widespread habitats	Local	Local	Scoped out – local losses of common and widespread habitats are not a material consideration. Delivery of the green infrastructure strategy and commitment to BNG ensures overall benefit to the biodiversity of the area.

Ecological feature	Importance (legislation and policy)	Importance (project level)	Scoped in or out of detailed assessment
(cropland, modified grassland, scrub, tall ruderal and dry ditches)			
Badger	Local	Local	Scoped in – occur within the ZoI for all environmental changes. Badger are a highly mobile species and it is possible that new sett excavation may occur within areas of proposed land take prior to the construction phase.
Bats	International	County	Scoped in – bat species occur within the ZoI for all environmental changes.
Birds	International to Local	International to Local	Scoped in – bird species occur within the ZoI for all environmental changes.
Great-crested newt	International	County	Scoped out – it is unlikely that this species occurs within the ZoI for all environmental changes. Pond habitats will not be directly impacted and the creation of ponds, scrapes, scrub and hibernacula will be beneficial for this species, should dispersal occur from the wider landscape.

Ecological feature	Importance (legislation and policy)	Importance (project level)	Scoped in or out of detailed assessment
Otter	International	Local	Scoped in – this species was confirmed to occur within the ZoI as a result of the desk study. Consultation feedback has identified the requirement for further survey to establish presence or likely absence within our Site.
Reptiles (common species)	National	Local	Scoped in – grass snake was confirmed to occur within the ZoI as a result of the desk study. Consultation feedback has identified the requirement for further survey to establish presence or likely absence of grass snake within our Site.
Water vole	National	County	Scoped in – this species was confirmed to occur within the ZoI as a result of the desk study. Consultation feedback has identified the requirement for further survey to establish presence or likely absence within our Site.
Fish	International to Local	International to Local	Scoped out – European eel and river lamprey are confirmed to occur within the ZoI. Consultation feedback identified river lamprey as being a species to consider, however, the only environmental change with potential to impact this species is EMF emitted by cables. There is an option that a cable route may be buried under (via directional drilling) the River Trent channel at a depth of more than 5m, far beyond the distance to which EMF would extend. Environmental measures will ensure that connectivity between and throughout watercourses will be maintained and pollution or runoff will be controlled through the oCEMP.

Ecological feature	Importance (legislation and policy)	Importance (project level)	Scoped in or out of detailed assessment
SPIs (hare and hedgehog)	National	County	Scoped out – these species occur within the ZoI for all environmental changes. However, the extent of land take will be far exceeded by habitat creation and enhancement which will benefit these species.
Invertebrates	International to Local	International to Local	Scoped out – no protected or notable invertebrates recorded within the ZoI.
Plants	International to Local	International to Local	Scoped out – no protected or notable plants recorded within the ZoI.

Temporal Scope

7.87. The temporal scope of the biodiversity assessment is consistent with the period over which our Project will be carried out and therefore covers construction, operation, maintenance, and decommissioning phases. Further details regarding each phase of our Project are provided within **Chapter 4: Our Project**, with a summary relevant to biodiversity provided below:

- Construction: years 1 to 2.
- Operation and maintenance: years 3 to 63.

7.88. Within this assessment the majority of likely significant adverse effects are associated with the construction phase, and even though they may have longer term consequences are only considered at one point of time (e.g. land take). The assessment describes the effects on the ecological features scoped in and highlights the importance of the temporal scope as necessary; however there is not a separate consideration (with a separate conclusion) of the same likely significant effect on each feature in different phases.

Methodology for PEIR Assessment

7.89. Our Project-wide generic approach to assessment is set out in **Chapter 2: Environmental Impact Assessment**. The biodiversity assessment methodology for the PEIR is consistent with that provided in the Scoping Report (November 2023) and no changes to that methodology have been made since the scoping phase.

7.90. The assessment methodology within this chapter is aligned with the standard industry guidance provided by CIEEM (2018, updated 2019), informed by the general approach described in this document. The assessment is based upon the results of the desk study and field surveys (partially complete at present), and relevant published information (for example on the status, distribution, sensitivity to environmental changes and ecology of the features scoped into the assessment, where this information is available), technical engagement with stakeholders, and professional knowledge of ecological processes and functions.

7.91. For each scoped-in ecological feature (see **Table 7-8**), effects are assessed against the baseline conditions for that feature during construction, operation and decommissioning phases. Throughout the assessment process, findings about likely significant effects have been used to inform the definition of requirements for additional baseline data gathering and the identification of embedded environmental measures to avoid or reduce adverse effects or to deliver enhancements.

7.92. It is acknowledged that the assessment that will be documented within the Environmental Statement that will accompany the DCO application will have been informed by more detailed baseline data and also by a greater understanding of the specific details of our Project's design. This assessment is therefore by its very nature preliminary although still meets all statutory requirements.

Significance evaluation methodology

7.93. CIEEM (2018) defines a significant effect as one 'that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general'.

7.94. When considering likely significant effects on ecological features, whether these are negative or positive, the following characteristics of environmental change are taken into account:

- Extent – the spatial or geographical area over which the environmental change may occur.
- Magnitude – the size, amount, intensity or volume of the environmental change.
- Duration – the length of time over which the environmental change may occur.
- Frequency – the number of times an environmental change may occur.
- Timing – the periods of the day / year / season during which an environmental change may occur.
- Reversibility – whether the environmental change can be reversed through restoration actions or regeneration.

7.95. Although the characteristics described above are all important in assessing effects, the magnitude of the environmental change as a result of our Project provides useful context, described in **Table 7-9**, to provide understanding of the relative scale of change from the baseline position.

Table 7-9: Defining Importance of Ecological Features

Magnitude	Criteria and resultant effect
High	The change permanently (or over the long-term) affects the conservation status of a habitat/species, reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area. Relative to the wider habitat resource or species population, a large area of habitat or large proportion of the wider species population is affected. For designated sites, integrity is compromised. There may be a change in the level of importance of the feature in the context of our Project.

Magnitude	Criteria and resultant effect
Medium	The change permanently (or over the long term) affects the conservation status of a habitat/species reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area. Relative to the wider habitat resource or species population, a small-medium area of habitat or small-medium proportion of the wider species population is affected. There may be a change in the level of importance of this feature in the context of our Project.
Low	The quality or extent of designated sites or habitats or the sizes of species' populations, experience some small-scale reduction or increase. These changes are likely to be within the range of natural variability and they are not expected to result in any permanent change in the conservation status of the species or habitat or integrity of the designated site. The change is unlikely to modify the evaluation of the feature in terms of its importance.
Very Low	Although there may be some effects on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats, or the size of species populations, means that they would experience little or no change. Any changes are also likely to be within the range of natural variability and there would be no short-term or long-term change to conservation status of habitats/species features or the integrity of designated sites.
Negligible	A change, the level of which is so low, that it is not discernible on designated sites or habitats or the size of species' populations, or changes that balance each other out over the lifespan of a project and result in a neutral position.

Negative and Positive Effects

7.96. A negative effect is assessed as being significant if the favourable conservation status of an ecological feature would be compromised or lost as a result of our Project. Conservation status is defined in CIEEM 2018, updated in 2019 as follows:

- 'habitats - conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area'; and
- 'species - conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area".

7.97. The decision as to whether the conservation status of an ecological feature has been compromised will be made using professional judgement, drawing upon the results of the assessment of how each feature is likely to be affected by our Project.

7.98. A similar procedure will be used where designated sites may be affected by our Project, except that the focus will be on the effects on the integrity of each site; defined as: "the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified."

7.99. The assessment of effects on integrity will draw upon the assessment of effects on the conservation status of the features for which our Site has been designated.

7.100. A development may result in positive effects where there is a resulting change from baseline that improves the quality of the environment (for example increases species diversity, increases the extent of a particular habitat etc.), or halts or slows down an existing decline. For a positive effect to be considered significant, the level of importance of an ecological feature determined at the baseline state would need to increase by one or more geographical levels (for example where an ecological feature of borough importance becomes of county importance following delivery of our Project).

7.101. The likely significance (or otherwise) of identified effects is defined as follows:

- Not significant – no significant effect to an environmental resource or receptor.
- Significant beneficial – advantageous or positive effect to ecological feature.
- Significant adverse – detrimental or negative effect to ecological feature.

Preliminary Assessment

Fledborough to Harby Dismantled Railway LWS

7.102. Likely significant effects of our Project include changes to ground water levels and surface water movement patterns, accidental spread of invasive non-native species and pollution of terrestrial habitats during the construction and operational phase.

7.103. Habitats within the LWS (scrub and grassland) will not be directly impacted by construction activities and will be protected from indirect impacts through the implementation of environmental measures as detailed earlier. These include the use of buffers, standoff distances from solar panels and best practice construction methods to control dust and other potential pollutants and spread of invasive non-native plant species, as well as the use of spill kits and strategic drainage design to prevent pollution resulting in negative effects of negligible magnitude, on a feature of importance at the County scale and therefore not significant.

7.104. Environmental measures (habitat creation and enhancement) resulting in positive effects of a low magnitude, by improving connectivity and planting in and around the LWS to improve species diversity and increase the overall extent of habitats.

Dunham Dubs, Dunham Oxbow, Darnsyke Marsh, and Fledborough Holme LWSs

7.105. Likely significant effects of our Project include changes to ground water levels and surface water movement patterns, accidental spread of invasive non-native species and pollution of freshwater habitats during the construction and operational phase.

7.106. These LWSs lie outside of our Site and will not be directly impacted during the construction phase. They will be protected through best practice construction methods as well as the use of spill kits and strategic drainage design to prevent pollution resulting in negative effects of negligible magnitude, on a feature of importance at the County scale and therefore not significant.

7.107. The change in habitat from arable to grassland over much of our Site likely to result in positive effects of a low magnitude due to the reduction in chemical (pesticides, fertiliser, etc) runoff associated with arable management. This would result in improved water quality, in turn likely improving the state of biodiversity in the sites.

Coastal and Floodplain Grazing Marsh HPI

7.108. Likely significant effects of our Project include direct land-take, habitat fragmentation, changes to ground water levels and surface water movement patterns, accidental spread of invasive non-native species and pollution of freshwater habitats during the construction and operational phase.

7.109. Although this HPI is said to occur within our Site, in its current condition it does not qualify as the habitat type described. Notwithstanding, the area will not be directly impacted by construction activities, with environmental measures preventing any indirect impacts, namely those relating to best practice construction methods i.e. spill kits, and suitable drainage preventing changes to surface water runoff and pollution of the water table. These measure will result in overall negative effects of negligible magnitude, on a feature of importance at the National scale and therefore not significant.

7.110. Environmental measures associated with the delivery of BNG will result in positive effects on this habitat at a low magnitude, with seeding and ongoing management aiming to restore it to its former condition (for which it was allocated priority status).

Other HPI habitats (Hedgerow, Ponds and Ditches)

7.111. Likely significant effects of our Project include direct land-take, habitat fragmentation, changes to ground water levels and surface water movement patterns, accidental spread of invasive non-native species and pollution of freshwater habitats during the construction and operational phase.

7.112. Hedgerows, ponds and ditches are HPI habitats which occur within our Site. Direct land-take of these features will only occur where there is no other alternative, with features of poor condition selected over those of good. They will be protected from indirect effects through environmental measures including the use of buffers and standoff distances from solar panels and best practice construction activities relating to the prevention and control of pollution and appropriate drainage design to prevent impacts from pollution and changes in surface water. These measure will result in negative effects of negligible magnitude, on a feature of importance at the National scale and therefore not significant.

7.113. Environmental measures associated with the delivery of BNG will include enhancement and creation of these habitat types, resulting in positive effects on these habitats at a low magnitude, with seeding and ongoing management aiming to restore it to its former condition (for which it was allocated priority status).

Higher Value Habitats (Plantation Woodland and Neutral Grassland)

7.114. Likely significant effects of our Project include direct land-take, habitat fragmentation, changes to ground water levels and surface water movement patterns, accidental spread of invasive non-native species and pollution of freshwater habitats during the construction and operational phase.

7.115. These habitats occur within our Site, although are not included within the proposed development footprint and, as such, will not be directly impacted by construction activities and will be protected from indirect impacts through environmental measures. These include the use of buffers, standoff distances from solar panels and best practice construction methods to control dust, noise and other potential pollutants, as well as the use of spill kits and strategic drainage design to prevent pollution resulting in negative effects of negligible magnitude, on a feature of importance at the National scale and therefore not significant.

7.116. Environmental measures (habitat creation and enhancement) resulting in positive effects of a low magnitude for plantation woodland and medium magnitude for neutral grassland, by improving connectivity and seeding/planting in and around the these habitats to improve species diversity and increase the overall extent of habitats.

The River Trent

7.117. Likely significant effects of our Project include changes to ground water levels and surface water movement patterns, accidental spread of invasive non-native species and pollution of freshwater habitats during the construction and operational phase.

7.118. The River Trent lies outside of our Site but within the ZoI for watercourses. This feature will be protected through best practice construction methods including the use of spill kits and strategic drainage design to prevent pollution, spread of invasive non-native plant species and changes to surface water patterns resulting in negative effects of negligible magnitude, on a feature of importance at a National scale and therefore not significant.

7.119. Should horizontal directional drilling under the River Trent be undertaken for the cable crossing, this will consider and avoid breeding seasons and migration of protected water species (such as lamprey). The impacts of the cable crossing on the River Trent is therefore not significant.

7.120. The change in surrounding habitat, from arable to grassland, will likely result in positive effects of a low magnitude due to the reduction in chemical (pesticides, fertiliser, etc) runoff associated with arable management. This would result in improved water quality, in turn improving the state of biodiversity within the river.

Badger

7.121. Likely significant effects of our Project include direct land-take, habitat fragmentation, increases in noise, vibration and human presence, increases in temporary and permanent lighting and changes to ground water levels and surface water movement patterns during the construction and operational phase.

7.122. The preconstruction walkover will confirm active setts and identify new ones within our Site and the application of buffers surrounding setts will protect them from noise, vibration and human presence during the construction phase. There will be no temporary or permanent lighting used and appropriate licensing will be sought where construction activity is required within 30m of a sett. Suitable drainage design will prevent changes in surface water movement patterns and oraging territories will be maintained through embedded measures. These measures will result in an overall negative effect of low magnitude, on a feature of importance at a Local scale and therefore not significant.

7.123. Although there will be an initial loss of foraging habitat for this species, this will be small, with habitat creation and enhancement mitigating for this loss, whereby the diversity of species will result in an abundance of berry producing plants and an increase in invertebrates, which make up a significant proport of the badger's diet. These measures will result in an overall positive effect of low magnitude.

Bats

7.124. Likely significant effects of our Project include direct land-take, habitat fragmentation, increases in noise, vibration and human presence, increases in temporary and permanent lighting during the construction and operational phase.

7.125. Construction-related effects on bats are likely to involve the loss of a small extent of low value foraging habitat (arable farmland). All features of moderate or high interest for bats (hedgerows, woodland edge, mature trees, ponds, strips of semi-improved grassland) will be retained unless there is no alternative and protected from construction activities. Where unavoidable, removal of moderate or high value habitat for bats will be limited.

7.126. There will be no habitat fragmentation and no permanent lighting of the facility will be required. Pre-construction walkover surveys will identify trees which provide suitable roosting opportunities for bats, the application of buffers around these trees will protect than from noise and vibration during the construction phase. Where walk is required within these buffers, further surveys will be required to establish the necessity for, and support licence applications.

7.127. Natural England Guidance TIN101 states that there is some evidence from a laboratory-based study that bats may occasionally collide with solar panels; however, there is no evidence to date substantiating any associated collision risk[11]. The panels to be used for our Project will have a matt metal frame which breaks up the surface visual effect.

7.128. The above measures will result in an overall negative effect of negligible magnitude on a feature of importance at a County scale and therefore not significant.

7.129. Habitat enhancements proposed as part of the design and delivering BNG include new native species hedgerow planting which along with extensive grassland creation, will enhance foraging opportunities and strengthen habitat links for commuting, which results in a positive effect of low magnitude.

Birds

7.130. Likely significant effects of our Project include direct land-take, habitat fragmentation, increases in noise, vibration and human presence, increases in temporary and permanent lighting and changes to ground water levels and surface water movement patterns during the construction and operational phase.

7.131. Land-take during the construction phase may result in the loss of breeding or foraging habitat, directly within our Project footprint, or indirectly within adjacent areas through disturbance or displacement, if undertaken within the bird breeding season. Hedgerows and trees located along field boundaries (which will largely be retained and protected) will typically support a range of farmland nesting bird species; these habitats will likely be subject to some level of localised indirect disturbance or displacement for a temporary period during the construction phase (should this occur during the breeding season).

7.132. Specifically, the potential for disturbance to skylark, depending on the period of construction, may result in significant effects at a Local scale. On a precautionary basis, potential effects on either individuals or local populations of skylark are therefore assessed as being of low magnitude (breeding season only), temporary and not significant on this receptor of importance at a Local scale, in the absence of mitigation (embedded measures and the Construction Environmental Register). Effects would be negligible if undertaken outside the breeding season.

7.133. In relation to other species (the general bird population), temporary disturbance, habitat loss and displacement impacts on small numbers of birds during construction are considered to be temporary and low magnitude (breeding season only), on receptors of importance at the Local scale, in the context of this rural agricultural landscape, temporary (during the construction phase only).

[11] Harrison, C., Lloyd, H. & Field, C. (2016). *Evidence review of the impact of solar farms on birds, bats and general ecology*. Manchester Metropolitan University.

7.134. The reversion of arable land into extensive meadow grassland on completion of construction works will increase the value of our Site for most bird species, providing strengthened habitat connectivity; as such any habitat losses or disturbance during construction would be considered short-term and reversible.

7.135. Measures are proposed to ensure legal compliance and prevent the risk of accidental destruction of nests if works are undertaken during the breeding season and to reduce the overall potential disturbance effects on farmland birds.

7.136. Habitat enhancements proposed as part of the design include new native species hedgerow planting which, along with extensive grassland creation, results in a positive effect of low magnitude for this feature.

Otter

7.137. Likely significant effects of our Project include direct land-take, habitat fragmentation, increases in noise, vibration and human presence, changes to ground water levels and surface water movement patterns, and pollution of freshwater habitats during the construction and operational phase.

7.138. Otter have been recorded within the ZoI and habitats within our Site are suitable for this species, namely the River Trent and smaller associated watercourses. However, surveys are yet to be conducted to establish their presence or likely absence within our Site.

7.139. If they are found to be present, it is unlikely that they would be directly impacted during construction activities, with watercourses avoided in the most part. A cable route across the River Trent is either to use an existing structure or to be buried under the River via directional drilling. As a result there will be no effect to otter, should they be present, from this crossing.

7.140. Current designs do however, include the crossing of one ditch within our Site, environmental measures for which will ensure connectivity for riparian mammals. In addition, watercourses will be protected from adverse impacts through best practice construction methods and appropriately designed drainage. Overall, negative effects on otter from construction are considered to be of low magnitude and temporary, on a feature of importance at the Local scale and are therefore not significant.

7.141. The permanent change of habitat from arable to grassland will likely result in positive effect of a low magnitude due to the reduction in chemical (pesticides, fertiliser, etc) runoff associated with arable management. This would result in improved water quality, in turn improving the state of biodiversity throughout our Site. Environmental measures associated with BNG will result in the enhancement of water ways and associated bankside habitats and the creation of scrub habitat which may be used as a resting place for otters along the River Trent.

Reptile

7.142. Likely significant effects of our Project include direct land-take, habitat fragmentation, increases in noise, vibration and human presence, changes to ground water levels and surface water movement patterns, and pollution of freshwater habitats during the construction and operational phase.

7.143. One species of reptile; grass snake, was identified in the ZoI for environmental changes. This species is closely associated with riparian habitats which occur within our Site itself. However, surveys are yet to be conducted to establish their presence or likely absence on-Site.

7.144. If they are found to be present, it is unlikely that they would be directly impacted during construction activities, with watercourses avoided in the most part. Current designs include the crossing of one ditch within our Site, environmental measures for which will ensure connectivity for riparian fauna. In addition, watercourses will be protected from adverse impacts through best practice construction methods and appropriately designed drainage. Overall, negative effects on grass snake from construction activities are likely to be of low magnitude and temporary, on a feature of importance at the Local scale and therefore not significant.

7.145. A permanent change of habitat from arable to grassland will likely result in positive effects of a low magnitude due to the reduction in chemical (pesticides, fertiliser, etc) runoff associated with arable management. This would result in improved water quality, in turn improving the state of biodiversity throughout our Site. Environmental measures associated with BNG will result in the creation of waterbodies and improved management of bankside habitats.

Water Vole

7.146. Likely significant effects of our Project include direct land-take, habitat fragmentation, increases in noise, vibration and human presence, changes to ground water levels and surface water movement patterns, and pollution of freshwater habitats during the construction and operational phase.

7.147. Water vole was identified in the ZoI for environmental changes as a result of the desk study, some records occurred within our Site itself. In addition, agricultural drains and ditches within our Site provide suitable habitat for this species. Surveys are yet to be conducted to confirm their current presence on our Site.

7.148. If they are found to be present, it is unlikely that they would be directly impacted during construction activities, with watercourses avoided in the most part. A cable route across the River Trent is either to use an existing structure or to be buried under the River via directional drilling. As a result there will be no effect to water vole, should they be present, from this crossing.

7.149. Current designs do however, include the crossing of one ditch within our Site, environmental measures for which will ensure connectivity for riparian mammals. In addition, watercourses will be protected from adverse impacts through best practice construction methods and appropriately designed drainage. Overall, negative effects on otter from construction are considered to be of low magnitude and temporary, on a feature of importance at the Local scale and are therefore not significant.

7.150. No negative effects would be associated with the operational phase, with a permanent change of habitat from arable to grassland likely to result in positive effects of a low magnitude due to the reduction in chemical (pesticides, fertiliser, etc) runoff associated with arable management. This would result in improved water quality, in turn improving the state of biodiversity throughout our Site. Environmental measures associated with BNG will result in the creation of waterbodies and improved management of bankside habitats.

Further Data Collection

- Due to the refinement and subsequent amendments made to our Site boundary, the Phase 1 habitat survey requires minor updating to cover areas not previously incorporated into the study area and to 'ground truth' areas which were subject to assessment at this stage, from satellite imagery.
- Minor changes to our Site boundary will not impact the extended study area, from 1 to 10km, however, prior to submission of the ES, an updated data search will be conducted to ensure that any recent records are considered in the final assessment.
- Any new or recent signs of badgers recorded during other ecology surveys in 2024 will be considered. Badger are highly mobile species, moving around the landscape and sometimes switching between main setts.
- Additional information regarding the activity of bats within our Site will be recorded over the active bat season (April to October) at strategically selected monitoring locations. These locations will aim to compare bat activity within the full range of habitat types present, providing a baseline for monitoring conducted during the operational phase.
- Species specific surveys for riparian mammals: water vole and otter, will be carried out in 2024. Specifically this will involve the survey of water-courses identified during habitat assessment, as providing suitable habitat for these species.
- A small proportion of habitats within our Site provide suitability for common and widespread reptile species. In response to consultation, a sample of riparian/bankside habitat will be surveyed, with the specific aim to establish a population estimate of grass snake which were identified as occurring within the study area by the desk study.

Conclusions

7.151. **Table 7-10** presents a summary of the preliminary likely significant effects, with further information. Where further works will be undertaken **Tabel 7-10** also includes the next steps to be undertaken as part of the Environmental Impact Assessment.

Table 7-10: Summary Ecological Features

Ecological feature	Preliminary Likely Significant Effect	Further Information	Next Steps
Fledborough to Harby Dismantled Railway LWS	No likely significant effects	The adoption of a CEMP will mitigate any significant effects.	-
Dunham Dubs, Dunham Oxbow, Darnsyke Marsh, and Fledborough Holme LWSs	No likely significant effects	The adoption of a CEMP will mitigate any significant effects.	-
Coastal and Floodplain Grazing Marsh HPI	No likely significant effects	The adoption of a CEMP will mitigate any significant effects.	-
Other HPI habitats (Hedgerow, Ponds and Ditches)	No likely significant effects	The adoption of a CEMP will mitigate any significant effects.	-
Higher Value Habitats (Plantation Woodland and Neutral Grassland)	No likely significant effects	The adoption of a CEMP will mitigate any significant effects.	-
The River Trent	No likely significant effects	The adoption of a CEMP will mitigate any significant effects.	-
Badger	No likely significant effects	The adoption of a CEMP will mitigate any significant effects.	Incidental observations of badger activity will update current records.

Ecological feature	Preliminary Likely Significant Effect	Further Information	Next Steps
Bats	No likely significant effects	The adoption of a CEMP will mitigate any significant effects.	Further survey will establish constant effort acoustic monitoring locations.
Birds	No likely significant effects	The adoption of a CEMP will mitigate any significant effects.	-
Otter	No likely significant effects	The adoption of a CEMP will mitigate any significant effects.	Further survey required of suitable habitat.
Reptiles	No likely significant effects	The adoption of a CEMP will mitigate any significant effects.	Further survey required of suitable habitat.
Water vole	No likely significant effects	The adoption of a CEMP will mitigate any significant effects.	Further survey required of suitable habitat.

Appendices

Appendix 7-1: Key Policy and Legislation

Appendix 7-2: Phase 1 Habitat Survey

Appendix 7-3: Bat Baseline

Appendix 7-4: Breeding Bird Baseline

Appendix 7-5: Great-Crested Newt Baseline

Appendix 7-6: Badger and Riparian Mammal Baseline

Appendix 7-7: Wintering Bird Baseline

Appendix 7-8: List of Species with Scientific names

Appendix 7-1: Key Policy and Legislation

Review of Policy, Legislation and Relevant Guidance

Legislation, planning policy and guidance relating to biodiversity, and pertinent to the our Project comprises:

Legislation

The Environment Act (2021)

This legislation is part of a post-Brexit legal framework in the UK for environmental protection. The Act makes provisions for targets, plans and policies toward general improvement of the natural environment. Specifically in relation to biodiversity, Part 6 of the Act, introduced a 10% Biodiversity Net Gain (BNG) mandatory requirement for new development falling under the Town and Country Planning Act 1990.

The Act also introduces new measures toward the conservation of biodiversity, specifically on the duty of local authorities, including the strengthening of woodland protection enforcement measures, Conservation Covenants, Protected Site Strategies, Species Conservation Strategies, and Local Nature Recovery Strategies to supplement a Nature Recovery Network.

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

Also referred to as the Habitats Directive, this legislation sets out the designation of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) across the UK. These designations give an increased level of legal environmental protection in comparison to domestic protections. Specific species listed under this legislation are also given a higher level of protection. The 2017 regulations were amended in 2019 and became operable from 1st January 2021, which included an amended process for the designation of SACs, and further amendments to ensure operational effectiveness when excluding functions from the European Commission.

Natural Environment and Rural Communities Act (2006) (as amended)

Also referred to as the NERC Act (2006), Section 40 of this legislation set out the need for public bodies and statutory undertakers to have regard to biodiversity to ensure no net loss of biodiversity going forward. This legislation also establishes Natural England as a non-departmental public body. Section 41 of the Act places a duty on the Secretary of State to maintain species and habitat lists that are of principal importance for the conservation of biodiversity in England, also known as priority species or habitats.

Countryside and Rights of Way Act (2000) (as amended)

This legislation relates to right of access across the UK, giving public access to land which is mapped as “open country” or registered common land. Collectively, these areas are referred to as “open access land” through the CROW Act. The Act sets out the rights permitted on open access land, and subsequently what isn’t permitted. The Act also clearly sets out the exclusion of access to land which is referred to as ‘excepted land.’

Hedgerow Regulations (1997)

The Hedgerow Regulations (1997) were introduced as part of the Environment Act 1995, specifically relating to arrangements for local authorities in England and Wales to protect hedgerow. These regulations set out protections to control removal of ‘important’ hedgerows via the implementation of a system of notification. This means that local planning authorities must be notified when managers of land (or utility operators) want to remove hedgerow and must provide robust justification. Local authorities can refuse consent for hedgerow removal.

Protection of Badgers Act 1992 (as amended)

This Act consolidates previous legislation on the protection of badgers and outlines that it is an offence to take, injure, kill, or ill-treat a badger, interfere with badger setts, sell and come into possession of live badgers, or marking a badger, without obtaining a license from a statutory authority. The Act lists the explicit exceptions to this, as well as the licensing process, enforcement and penalties associated with any offence.

Wildlife & Countryside Act (1981) (as amended)

This Act consolidated previous legislation on the protection and conservation of birds, wild creatures and wild plants, and now provides protection to a range of species of flora and fauna. This Act also details the law relating to Sites of Special Scientific Interest (SSSI). Schedule 9 of the Act lists the flora and fauna for which it is illegal to introduce into the wild or cause the spread of, within the UK.

National Planning Policy

Overarching National Policy Statement for Energy (EN-1) (2023)

This provides overarching government policy on energy NSIPs, and the way in which any impacts and mitigation measures will be considered. Specific extracts relating to the Proposed Development are as follows:

Paragraph 4.6.2 states that *“Biodiversity net gain is an essential component of environmental net gain. Projects in England should consider and seek to incorporate improvements in natural capital, ecosystem services and the benefits they deliver when planning how to deliver biodiversity net gain.”*

Paragraph 4.6.7 states that *"In England applicants for onshore elements of any development are encouraged to use the latest version of the biodiversity metric to calculate their biodiversity baseline and present planned biodiversity net gain outcomes. This calculation data should be presented in full as part of their application."*

Paragraph 5.4.19 states that *"The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests."*

Paragraph 5.4.21 states that *"…the design process should embed opportunities for nature inclusive design. Energy infrastructure projects have the potential to deliver significant benefits and enhancements beyond Biodiversity Net Gain, which result in wider environmental gains (see Section 4.6 on Environmental and Biodiversity Net Gain). The scope of potential gains will be dependent on the type, scale, and location of each project."*

Paragraph 5.4.36 states that *"Applicants should produce and implement a Biodiversity Management Strategy as part of their development proposals. This could include provision for biodiversity awareness training to employees and contractors so as to avoid unnecessary adverse impacts on biodiversity during the construction and operation stages."*

Paragraph 5.4.53 states that *"The Secretary of State should not grant development consent for any development that would result in the loss or deterioration of any irreplaceable habitats, including ancient woodland, and ancient and veteran trees unless there are wholly exceptional reasons, and a suitable compensation strategy exists."*

National Policy Statement for Renewable Energy Infrastructure (EN-3) (2023)

This provides overarching government policy on energy NSIPs, and the way in which any impacts and mitigation measures will be considered. Specific extracts relating to the Proposed Development are as follows:

Paragraphs 2.10.75 to 2.10.83 state that *"Generic environmental, biodiversity, ecology, geological and water management impacts are covered in section 4.3 (Environmental Principles), section 4.6 (Environmental and Biodiversity Net Gain), section 5.4 (Biodiversity and Geological Conservation) and section 5.8 (Flood Risk) of EN-1.*

The applicant's ecological assessments should identify any ecological risk from developing on the proposed site.

Issues that need assessment may include habitats, ground nesting birds, wintering and migratory birds, bats, dormice, reptiles, great crested newts, water voles and badgers.

The applicant should use an advising ecologist during the design process to ensure that adverse impacts are avoided, minimised or mitigated in line with the mitigation hierarchy, and biodiversity enhancements are maximised.

The assessment may be informed by a 'desk study' of existing ecological records, an evaluation of the likely impacts of the solar farm upon ecological features, and should specify mitigation to avoid or minimise these impacts, and any further surveys required.

Applicants should consider earthworks associated with construction compounds, access roads and cable trenching.

Where soil stripping occurs, topsoil and subsoil should be stripped, stored, and replaced separately to minimise soil damage and to provide optimal conditions for site restoration. Further details on minimising impacts on soil and soil handling are above at paragraphs 2.10.33 and 2.10.34.

Applicants should consider how security and lighting installations may impact on the local ecology. Where pole mounted CCTV facilities are proposed the location of these facilities should be carefully considered to minimise impact. If lighting is necessary, it should be minimised and directed away from areas of likely habitat.

Applicants should consider how site boundaries are managed. If any hedges/scrub are to be removed, further surveys may be necessary to account for impacts. Buffer strips between perimeter fencing and hedges may be proposed, and the construction and design of any fencing should account for enabling mammal, reptile and other fauna access into the site if required to do so in the ecological report."

National Planning Policy Framework (2023)

The National Planning Policy Framework (NPPF) is an overarching document which sets out government planning policy for development outside of the NSIP regime in England, and how this is expected to be applied by local authorities and developers. The NPPF can be an important and relevant consideration for NSIPs as well, but in the event of any conflict, the NPS policy prevails. The NPPF provides a framework for local sustainable development via local plans. Specific extracts relating to this Proposed Development are as follows:

Paragraph 179 states that *"Local planning authorities should limit the planned lifetime of development in a Coastal Change Management Area through temporary permission and restoration conditions, where this is necessary to reduce a potentially unacceptable level of future risk to people and the development."*

Paragraph 180 states that *"Planning policies and decisions should contribute to and enhance the natural and local environment by:*

> *a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);*
>
> *b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;*

c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate;

d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate."

Local Planning Policy

Local planning policy relevant to our Site is set out below. Local policies can be an important and relevant consideration for NSIPs as well, but in the event of any conflict, the NPS policy prevails.

Newark and Sherwood District Council (2023) Local Development Framework, Amended Allocations and Development Management Development Plan Document (AADMDPD), Submission Version, January 2024

This amended local Development Plan Document (DPD) has been compiled to ensure that the wider development framework within Newark and Sherwood District Council sufficiently allocates land for development to meet the needs of the area, up until 2033.

The document includes *"new and amended Housing and Affordable Housing Policies which replace those included in the Amended Core Strategy and new Gypsy Roma Traveller policies and allocations. The document also sets out amendments to urban boundaries and village envelopes, retail boundaries as well as sites requiring continued protection from development (open space and green infrastructure designations). It also includes a suite of Development Management policies to provide greater direction, help deliver specific allocations and assist in the day-to-day assessment of planning applications."* This DPD is currently under examination via the Secretary of State with an independent planning inspector.

Specific policies within the AADMDPD relevant to our Project include Policy DM7 "Biodiversity and Green Infrastructure", which states that *"New development, in line with the requirements of Core Policy 12 of the Amended Core Strategy, should protect, promote and enhance biodiversity and the ecological network of habitats, species and sites of international, national and local importance."*

Policy DM8 “Development in the Open Countryside” is also specifically relevant to our Project and states that *“In accordance with the requirements of Spatial Policy 3 of the Amended Core Strategy, development away from villages or settlements, in the open countryside, will be strictly controlled and limited to the following types of development:*

Agricultural and Forestry Development Requiring Planning Permission;

New and Replacement Rural Workers Dwellings, the Extension of Existing Rural Workers Dwellings, and the Removal of Occupancy Conditions Attached to Existing Dwellings;

New and Replacement Dwellings;

Replacement of Non-Residential Buildings;

Conversion of existing buildings;

Rural Diversification;

Equestrian Uses;

Employment uses;

Community and Leisure Facilities;

Roadside Services; and

Visitor Based Tourism Development and Tourist Accommodation.”

Newark and Sherwood District Council (2019) Amended Core Strategy Development Plan (2019)

The Amended Core Strategy for Newark and Sherwood District is part of the Local Development Framework for the area. This strategy outlines the overarching issues and objectives to address over a 20-year period, contextualising this into wider vision, series of objectives and core policies toward delivery.

Core Policy 12 “Biodiversity and Green Infrastructure” is relevant to this Proposed Development and states that *“The District Council will seek to conserve and enhance the biodiversity and geological diversity of the District by working with partners to implement the aims and proposals of the Nottinghamshire Local Biodiversity Action Plan, the Green Infrastructure Strategy and the Nature Conservation Strategy. The District Council will therefore:*

Expect proposals to take into account the need for continued protection of the District’s ecological, biological and geological assets. With particular regard to sites of international, national and local significance, Ancient Woodlands and species and habitats of principal importance identified in Section 41 of the Natural Environment and Rural Communities Act 2006 and in the Nottinghamshire Local Biodiversity Action Plan;

Seek to secure development that maximises the opportunities to conserve, enhance and restore biodiversity and geological diversity and to increase provision of, and access to, green infrastructure within the District;

Promote the appropriate management of features of major importance for wild flora and fauna;

Provide for Suitable Alternative Natural Green Space to reduce visitor pressure on the District's ecological, biological and geological assets, particularly in the Newark area and for 5kms around the Birklands and Bilhaugh Special Area of Conservation;

Support the development of a Green Infrastructure Network, as illustrated in the Green Infrastructure Diagram, linking together Key Strategic Routes throughout the District and providing for, in appropriate locations, visitor infrastructure that improves accessibility. The District Council will, in particular, promote improved green infrastructure linkages between:

- *Newark and Southwell; and*
- *Southwell and the north-west of the district*

Development proposals crossing or adjacent to the network should make provision for its implementation and/or enhancement;

Positively view proposals that seek to enhance the District's Green Infrastructure resource in support of tourism development. Proposals in the Bilsthorpe, Edwinstowe and Ollerton & Boughton areas, in connection with the Sherwood Forest Regional Park, will be supported. In Newark, new Green Infrastructure schemes that maximise the potential of the Trent Riverside area will be supported;

Support the implementation of area-based Strategic Green Infrastructure interventions; and

Work with partners to develop a strategic approach to managing Air Quality in the Sherwood Area, including through the development of a Supplementary Planning Document."

Central Lincolnshire Local Plan (2023)

The Local Plan for the central Lincolnshire area sets out the approach to planning policy and overarching development allocations to drive growth in the area over a 20-year period. The Local Plan is contextualised into a wider vision, series of objectives and core policies toward delivery.

Specific policies detailed in the Local Plan and are relevant to our Project, as below.

Policy S59 "Green and Blue Infrastructure Network" states that:

"The Central Lincolnshire Authorities will safeguard green and blue infrastructure in Central Lincolnshire from inappropriate development and work actively with partners to maintain and improve the quantity, quality, accessibility and management of the green infrastructure network.

Proposals that cause loss or harm to the green and blue infrastructure network will not be supported unless the need for and benefits of the development demonstrably outweigh any adverse impacts. Where adverse impacts on green infrastructure are unavoidable, development will only be supported if suitable mitigation measures for the network are provided.

Development proposals should ensure that existing and new green and blue infrastructure is considered and integrated into the scheme design from the outset. Where new green infrastructure is proposed, the design and layout should take opportunities to:

a) incorporate a range of types and sizes of green and blue spaces, green routes and environmental features that are appropriate to the development and the wider green and blue infrastructure network to maximise the delivery of multi-functionality;

b) deliver biodiversity net gain and support ecosystem services;

c) respond to landscape/townscape and historic character;

d) support climate change adaptation and resilience including through use of appropriate habitats and species; and

e) encourage healthy and active lifestyles.

Development proposals must protect the linear features of the green and blue infrastructure network that provide connectivity between green infrastructure assets, including public rights of way, bridleways, cycleways, and waterways, and take opportunities to improve and expand such features.

Development will be expected to make a contribution proportionate to their scale towards the establishment, enhancement and on-going management of green and/or blue infrastructure by contributing to the development of the strategic green infrastructure network within Central Lincolnshire, in accordance with the Developer Contributions SPD."

Policy S60 "Protecting Biodiversity and Geodiversity" states that:

"All development should:

a) protect, manage, enhance and extend the ecological network of habitats, species and sites of international, national and local importance (statutory and non-statutory), including sites that meet the criteria for selection as a Local Site;

b) minimise impacts on biodiversity and features of geodiversity value;

c) deliver measurable and proportionate net gains in biodiversity in accordance with Policy S61; and

d) protect and enhance the aquatic environment within or adjoining the site, including water quality and habitat.

Part One: Designated Sites

The following hierarchy of sites will apply in the consideration of development proposals:

1. *International Sites*

The highest level of protection will be afforded to internationally protected sites. Development proposals that will have an adverse impact on the integrity of such areas, will not be supported other than in exceptional circumstances, in accordance with the NPPF.

Development proposals that are likely to result in a significant adverse effect, either alone or in combination with other proposals, on any internationally designated site, must satisfy the requirements of the Habitats Regulations (or any superseding similar UK legislation). Development requiring Appropriate Assessment will only be allowed where it can be determined, taking into account mitigation, that the proposal would not result in significant adverse effects on the site's integrity.

2. *National Sites (NNRs and SSSI's)*
   Development proposals should avoid impact on these nationally protected sites. Development proposals within or outside a national site, likely to have an adverse effect, either individually or in combination with other developments, will not normally be supported unless the benefits of the development, at this site, clearly outweigh both the adverse impacts on the features of the site and any adverse impacts on the wider network of nationally protected sites.

3. *Irreplaceable Habitats*
   Planning permission will be refused for development resulting in the loss, deterioration or fragmentation of irreplaceable habitats, including ancient woodland and aged or veteran trees, unless there are wholly exceptional reasons and a suitable compensation strategy will be delivered.
4. *Local Sites (LNR, LWS and LGS)*
   Development likely to have an adverse effect on locally designated sites, their features or their function as part of the ecological network, will only be supported where the benefits of the development clearly outweigh the loss, and the coherence of the local ecological network is maintained. Where significant harm cannot be avoided, the mitigation hierarchy should be followed.

Part Two: Species and Habitats of Principal Importance

All development proposals will be considered in the context of the relevant Local Authority's duty to promote the protection and recovery of priority species and habitats.

Development should seek to preserve, restore and re-create priority habitats, ecological networks and the protection and recovery of priority species set out in the Natural Environment and Rural Communities Act 2006, Lincolnshire Biodiversity Action Plan, Lincolnshire Geodiversity Strategy and Local Nature Recovery Strategy.

Where adverse impacts are likely, development will only be supported where the need for and benefits of the development clearly outweigh these impacts. In such cases, appropriate mitigation or compensatory measures will be required.

Part Three: Mitigation of Potential Adverse Impacts

Development should avoid adverse impact on existing biodiversity and geodiversity features as a first principle, in line with the mitigation hierarchy. Where adverse impacts are unavoidable they must be adequately and proportionately mitigated. If full mitigation cannot be provided, compensation will be required as a last resort where there is no alternative.

Development will only be supported where the proposed measures for mitigation and/or compensation along with details of net gain are acceptable to the Local Planning Authority in terms of design and location, and are secured for the lifetime of the development with appropriate funding mechanisms that are capable of being secured by condition and/or legal agreement.

If significant harm to biodiversity resulting from development cannot be avoided, adequately mitigated, or, as a last resort, compensated for, then planning permission will be refused."

Policy S61 "Biodiversity Opportunity and Delivering Measurable Net Gains" states that:

"Following application of the mitigation hierarchy, all development proposals should ensure opportunities are taken to retain, protect and enhance biodiversity and geodiversity features proportionate to their scale, through site layout, design of new buildings and proposals for existing buildings with consideration to the construction phase and ongoing site management.

Development proposals should create new habitats, and links between habitats, in line with Central Lincolnshire Biodiversity Opportunity and Green Infrastructure Mapping evidence, the biodiversity opportunity area principles set out in ***Appendix 4*** *to this Plan and the Local Nature Recovery Strategy (once completed), to maintain and enhance a network of wildlife sites and corridors, to minimise habitat fragmentation and provide opportunities for species to respond and adapt to climate change.*

Proposals for major and large scale development should seek to deliver wider environmental net gains where feasible.

Biodiversity Net Gain

The following part of the policy applies unless, and until, subsequently superseded, in whole or part, by national regulations or Government policy associated with the delivery of mandatory biodiversity net gain arising from the Environment Act 2021. Where conflict between the policy below and the provisions of Government regulations or national policy arises, then the latter should prevail.

All qualifying development proposals must deliver at least a 10% measurable biodiversity net gain attributable to the development. The net gain for biodiversity should be calculated using Natural England's Biodiversity Metric.

Biodiversity net gain should be provided on-site wherever possible. Off-site measures will only be considered where it can be demonstrated that, after following the mitigation hierarchy, all reasonable opportunities to achieve measurable net gains on-site have been exhausted or where greater gains can be delivered off-site where the improvements can be demonstrated to be deliverable and are consistent with the Local Nature Recovery Strategy.

All development proposals, unless specifically exempted by Government, must provide clear and robust evidence for biodiversity net gains and losses in the form of a biodiversity gain plan, which should ideally be submitted with the planning application (or, if not, the submission and approval of a biodiversity gain plan before development commences will form a condition of any planning application approval), setting out:

> *a) information about the steps to be taken to minimise the adverse effect of the development on the biodiversity of the onsite habitat and any other habitat;*
>
> *b) the pre-development biodiversity value of the onsite habitat;*
>
> *c) the post-development biodiversity value of the onsite habitat following implementation of the proposed ecological enhancements/interventions;*
>
> *d) the ongoing management strategy for any proposals;*
>
> *e) any registered off-site gain allocated to the development and the biodiversity value of that gain in relation to the development; and*
>
> *f) exceptionally any biodiversity credits purchased for the development through a recognised and deliverable offsetting scheme.*

Demonstrating the value of the habitat (pre and post-development) with appropriate and robust evidence will be the responsibility of the applicant. Proposals which do not demonstrate that the post-development biodiversity value will exceed the pre-development value of the onsite habitat by a 10% net gain will be refused.

Ongoing management of any new or improved onsite and offsite habitats, together with monitoring and reporting, will need to be planned and funded for 30 years after completion of a development."

Bassetlaw District Council (2010) Local Development Framework, Publication Core Strategy and Development Management Policies

The Core Strategy for the Bassetlaw District sets out the overarching vision for the area up until 2026, including the policy approach to deliver this.

Policy DM9 "Green Infrastructure; Biodiversity & Geodiversity; Landscape; Open Space and Sports Facilities" is related to our Project and states:

"A. Green Infrastructure

Development proposals will be expected to support the Council's strategic approach to the delivery, protection, and enhancement of multi-functional Green Infrastructure, to be achieved through the establishment of a network of green corridors and assets (please refer to the Council's Green Infrastructure work for a full list of Green Corridors and Nodes within, and running beyond, the District) at local, sub-regional, and regional levels. Particular support will be given to proposals that will further the development of:

- *The Idle Valley Project;*
- *The Trent Vale Partnership;*
- *Sherwood Forest Regional Park.*

Development proposals (particularly for allocated sites) will be expected to demonstrate, in line with the Council's Green Infrastructure work, that:

- *they protect and enhance green infrastructure assets affected by the development and take opportunities to improve linkages between green corridors;*
- *where they overlap with or will affect existing green infrastructure nodes or corridors, such assets are protected and enhanced to improve public access and use;*
- *where opportunities exist, development proposals provide improvements to the green infrastructure network that benefit biodiversity through the incorporation of retained habitats and by the creation of new areas of habitat;*
- *they provide robust delivery mechanisms for, and means of ensuring the long-term management of, green infrastructure.*

Development that will result in the loss of existing green infrastructure may be supported where replacement provision is made that is considered to be of equal or greater value than that which will be lost. Where new development may have an adverse impact on green infrastructure, alternative scheme designs that minimize impact must be presented to the Council for consideration before the use of mitigation measures (e.g. off-site or through financial contributions for improvements elsewhere) is considered.

B. Biodiversity and Geodiversity

Development proposals will be expected to demonstrate that they will not adversely affect or result in the loss of features of recognized importance, including:

- *Trees and hedgerows subject to preservation orders;*
- *Ancient woodlands;*
- *Sites of Special Scientific Interest(SSSI);*
- *Regionally Important Geodiversity Sites;*
- *Local Wildlife Sites(Sites of Importance for Nature Conservation(SINC));and*
- *Local and UK Biodiversity Action Plan Habitats.*

Development that will result in the loss of such features may be supported where replacement provision is made that is considered to be of equal or greater value than that which will be lost and which is likely to result in a net gain in biodiversity. Where new development may have an adverse impact on such features, alternative scheme designs that minimize impact must be presented to the Council for consideration before the use of mitigation measures is considered. Where sufficient mitigation measures cannot be delivered, compensation measures must be provided as a last resort.

C. Landscape Character

New development proposals in and adjoining the countryside will be expected to be designed so as to be sensitive to their landscape setting. They will be expected to enhance the distinctive qualities of the landscape character area in which they would be situated, as identified in the Bassetlaw Landscape Character Assessment. Proposals will be expected to respond to the local recommendations made in the Assessment by conserving, restoring, reinforcing, or creating landscape forms and features accordingly.

D. Open Space and Sports Facilities

Development proposals will be expected to demonstrate that they will not adversely affect or result in the loss of protected open spaces and sports facilities (please see Proposals Map) identified in the Council's Open Space and Sports Facilities studies. Exceptions may be made if the open spaces or facilities are identified as surplus to demand in a given location and that alternative provision, or a contribution towards new or improved facilities elsewhere, would be preferable. Alternative scheme designs that minimize impact should be considered before the use of mitigation (on-site, off-site, or through contributions as appropriate).

New development proposals (particularly for allocated sites) will be expected to provide functional on-site open space and/or sports facilities (which will become protected for the purposes of this policy), as well as contributions for ongoing maintenance, to meet any deficiencies in local provision (when assessed against locally defined standards as set out in the Council's Open Space and Sports Facilities studies) that will be caused by the development or to provide contributions towards new or improved facilities elsewhere locally."

Draft Bassetlaw Local Plan (2023) 2020-2038: Main Modifications Version, August 2023

This Local Plan sets out Bassetlaw District's planning and policy framework, development strategy and site allocations to inform effective delivery of the overall vision up until 2038.

Policies set out in the Local Plan relate to our Project.

Policy ST39 "Green and Blue Infrastructure" states that:

"The connectivity, quality, multifunctionality, biodiversity and amenity value of the green and blue infrastructure network will be enhanced, extended and managed through:

a) protecting and enhancing the landscape character and the distinctiveness of Green Gaps, Registered Parks and Gardens and ornamental parklands, registered Common Lands and Village Greens, and Local Green Spaces;

b) protecting, enhancing and restoring watercourses, ponds, lakes and water dependent habitats where appropriate;

c) providing for biodiversity net gain, including reconnecting vulnerable and priority habitats (see policy ST41);

d) protecting and enhancing ancient and mature woodland and hedgerows, and providing for tree planting to secure recreational benefits and/or to aid carbon offsetting climate change mitigation;

e) making appropriate provision for new green/blue infrastructure in new development including open space, allotments, playing fields and outdoor sports facilities, and natural and semi natural greenspace and bluespace; and/or incorporating and where practicable facilitating the improvement of existing provision through the design of development;

f) applying climate change mitigation and adaptation measures through new development, including flood risk and watercourse management;

g) linking walking and cycling routes, bridleways and public rights of way to and through development, where appropriate;

The function, setting, and biodiversity, landscape, access and recreational value of the following main and minor green corridors, as identified on the Policies Map will be protected and enhanced:

a) Main green corridors

i. Chesterfield Canal

ii. River Idle

iii. River Ryton

iv. River Trent

b) Minor green corridors

i. Trent Valley Way

ii. Cuckoo Way

iii. National Cycle Route 6

iv. River Maun

v. Robin Hood Way

vi. River Meden

vii. River Poulter

c) Major development proposals that lie wholly or partly within the minimum buffer zone of a main green corridor (30m measured from each side of the centre point), or a minor green corridor (15m measured from each side of the centre point) should be supported by an Ecological Impact Assessment and/or landscape statement proportionate to the type, nature and scale of the proposal. This should confirm the extent of the buffer zone in that location and demonstrate how the design and layout of the scheme will positively respond to its green/blue infrastructure location and minimise the environmental effects upon the green corridor.

All new green and blue infrastructure should be accompanied by appropriate management and maintenance arrangements."

Policy ST40 "Biodiversity and Geodiversity" states that:

"The Council will seek to protect and enhance the biodiversity and geodiversity of Bassetlaw, including:

International Sites

a) a proposal that may impact on a Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site and/or the Sherwood Forest ppSPA will only be supported where it can be demonstrated that there will be no adverse effects on their integrity, unless there are no alternative solutions and it is justified by an 'imperative reasons of overriding public interest' assessment under the Habitats Regulations;

b) any scheme within the 5km buffer zone of the Sherwood Forest ppSPA will require a project level 'shadow level' Habitats Regulations Assessment to ensure any significant adverse effects on the Sherwood Forest ppSPA are identified and appropriately mitigated;

National Designations

c) a proposal (either individually or in combination with other developments) that may either directly or indirectly adversely impact a Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR) or ancient woodland and their buffer zones will be refused, other than in wholly exceptional circumstances where it can be demonstrated that the benefits of the development in the location proposed clearly outweigh any harm to the special interest features of the asset. In such circumstances measures should be identified through an Ecological Impact Assessment to mitigate the adverse effects resulting from the development. proposals of 50 dwellings or more (which includes piecemeal planning applications for less than 50 dwellings within a wider site) that fall within an 'Impact Risk Zone' of a SSSI will be required to demonstrate that appropriate consideration has been given to the development's impact upon the integrity of that SSSI, including recreational impact. Where relevant, appropriate Bassetlaw Local Plan 2020-2038: Publication Version 160 mitigation measures will be sought, which may include an appropriate design and layout on a development site to protect the integrity of the SSSI, and/or a financial contribution to help mitigate identified impacts at the affected SSSI.

Local Designations and Locally Important Ecological Features

d) proposals having a direct or indirect adverse effect on a Local Nature Reserve, Local Wildlife Site or Local Geological Site and their buffer zones or other biodiversity/geodiversity asset, will only be supported where there are no reasonable alternatives; and the case for development clearly outweighs the need to safeguard the ecological, recreational and/or educational value of the site.

In all cases, where the principle of development is considered appropriate the mitigation hierarchy must be applied so that:

a) firstly harm is avoided wherever possible; then

b) appropriate mitigation is provided to ensure no net loss or a net gain of priority habitat and local populations of priority species;

c) as a last resort, compensation is delivered to offset any residual damage to biodiversity;

d) they protect, restore, enhance and provide appropriate buffers around wildlife and geological features at a local and wider landscape-scale to deliver robust ecological networks, to help deliver priorities in the draft Nottinghamshire Biodiversity Opportunity Model for Bassetlaw and Idle Valley 201814 or any successor;

e) they establish additional ecological links to the Nature Recovery Network.

Biodiversity Net Gain

In line with national legislation, all new development should make provision for net biodiversity gain on site, or where it can be demonstrated that for design reasons this is not practicable, off site through an equivalent financial contribution.

A commuted sum equivalent to 30 years maintenance will be sought to manage the biodiversity assets in the long term."

Policy ST41 "Trees, woodlands and hedgerows" states that:

"The Council will protect existing trees, woodland and hedgerows and secure additional planting that increases canopy cover in the interests of biodiversity, amenity and climate change adaptation by:

> *a) retaining, protecting and improving woodland and trees subject to Tree Preservation Orders (TPOs), trees within conservation areas, and 'important' hedgerows as defined by the Hedgerows Regulations 1997;*
>
> *b) making Tree Preservation Orders;*
>
> *c) giving consideration to trees and hedgerows both on individual merit as well as their contribution to amenity and interaction as part of a group within the broader landscape setting;*
>
> *d) resisting the loss or deterioration of ancient woodland and ancient or veteran trees unless there are wholly exceptional reasons and a suitable compensation strategy exists;*
>
> *e) seeking from major development provision for new trees or an equivalent financial contribution to help mitigate the impacts of climate change in accordance with Policy ST50.*

Where development would adversely affect trees or hedgerows the application must be accompanied by:

> *a) an accurate tree survey and arboriculture assessment, undertaken by an experienced arboriculturist, of all existing trees and hedgerows on site in accordance with BS5837 (Trees in relation to design, demolition and construction – Recommendations) 201217;*
>
> *b) details of protective measures to be put in place during the development to ensure the health and safety of each specimen and hedgerow to be retained;*
>
> *c) an avoidance and mitigation strategy to include replacement planting for specimens of at least equal amenity and ecological value of a local provenance; and*
>
> *d) a detailed management plan providing details of maintenance arrangements for 10 years."*

National Guidance

Planning Policy Guidance (2023) – Guidance Natural Environment (2019)

This guidance sets out the key issues in implementing the policies which protect and enhance the natural environment, also taking into consideration any local requirements. This guidance gives further specific information on land and soil of environmental value, green infrastructure, biodiversity (including geodiversity and ecosystems) and landscape considerations.

Chartered Institute Ecology and Environmental Management (2018, updated 2022) Guidelines for Ecological Impact Assessment in the UK and Ireland

The aim of these guidelines is to promote good practice when producing ecological impact assessments across a variety of environments, relevant to the UK and Ireland. In regard to our Project, these guidelines can be used to help provide decision makers with a rigorous EcIA which details any relevant likely ecological effects as a result of our Project.

British Standards Institution (2013) Biodiversity – Code of Practice for Planning and Development (BS 42020:2013)

This British Standard provides *"recommendations on professional ethics, conduct, competence and judgement that are intended to give confidence that proposals for biodiversity conservation, and consequent decisions/actions taken, are sound and appropriate."*

Local Guidance

Lincolnshire Biodiversity Partnership (2011) Lincolnshire Biodiversity Action Plan 2011-2020 (3rd Edition)

This Action Plan was developed in collaboration with local authorities and other stakeholders to set overarching priorities for conservation of wildlife within the county of Lincolnshire, in line with local authority obligations within the NERC Act 2006.

Nottinghamshire Biodiversity Action Group (date unknown) Local Biodiversity Action Plan

This Action Plan is specific to the local Nottinghamshire area and helps to ensure that wider national targets for species and habitats are effectively actioned at local level. This Action Plan identifies targets to the local area, provides a basis for monitoring progress, aims to raise awareness of local biodiversity conservation, and aims to ensure that this conservation is maintained through a long-term approach.

Appendix 7-2: Phase 1 Habitat Survey

Report

One Earth Solar Farm

Appendix 7-2 Phase 1 Habitat Survey

For One Earth Solar Farm Ltd

17 May 2024

Document control

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1 Introduction

1.1 Background

1.2 This Appendix should be read in conjunction with Chapter 7: Biodiversity of the Preliminary Environmental Information Report (EN010159) which provides information pertaining to the approach taken in establishing a biodiversity baseline for our Project.

1.2.1 This Appendix describes the methods and summarised results of the Extended Phase 1 habitat surveys undertaken between April and June 2023.

1.3 Purpose of this Annex

1.3.1 To inform an assessment of potential likely significant effects of our Project upon biodiversity, an Extended Phase 1 habitat survey was scoped into the assessment to provide baseline information about the habitats within our Project area.

1.3.2 The proposed Development Consent Order (DCO) Order Limits cross through habitats with the potential to support priority habitats, irreplaceable habitats and legally protected or controlled and otherwise notable vascular plant species, it is therefore necessary to assess these habitats and gather information as to their potential presence and baseline condition. Information gathered for protected, controlled or notable faunal species during the Extended Phase 1 habitat survey is presented within individual species appendices (**Appendix 7-3 to 7-7**).

1.3.3 This Appendix outlines the methodologies used, and summarises the habitat results gathered as part of an Extended Phase 1 habitat survey within the proposed DCO Order Limits (as defined in **Chapter 4: Our Project**) hereafter referred to as the Study Area (shown on **Figure A-2, Annex A**).

1.4 Structure of this Annex

1.4.1 This Annex is structured as follows:

- **Section 2:** Methods
- **Section 3:** Results
- **Section 4:** References
- **Annex A:** Figures

2 Methods

2.1 Phase 1 Habitat Survey

2.1.1 The Phase 1 habitat survey is an established field-scale vegetation survey method that classifies land parcels into various habitat categories. In line with the Joint Nature Conservation Committee (JNCC) Phase 1 Habitat survey methodology (JNCC. 2010). A Phase 1 habitat survey was undertaken between April 2023 and June 2023 of all accessible habitats within the proposed DCO Order Limits and within a 30m buffer of it.

2.1.2 Distinct habitats were identified and any conservation-notable habitats or interest features that were too small to map were subject to a more detailed description, presented in the results. As the standard Phase 1 habitat survey methodology is largely concerned with vegetation communities only, the survey was 'extended' in accordance with the Guidelines for Baseline Ecological Assessment (IEA 1995) to include:

- Preliminary searches for evidence of protected or conservation-notable species species-groups (including dormice; bats; great crested newts; badger; water voles; reptiles; and otters), and for habitats or features likely to support them if direct evidence is absent.
- Hedgerow assessments, aimed at identifying hedges that might be classified as 'important' based on the relevant ecological and structural criteria set out in The Hedgerows Regulations 1997.
- The identification of other constraints (e.g. non-native invasive plant species) or opportunities (e.g. opportunities for micro-siting or enhancement) that may be present at the site; and

2.1.3 It should be noted that while every effort has been made to provide a comprehensive description of the Site, this survey did not constitute a full botanical survey.

2.1.4 The nomenclature for the vascular plants in this report follows Stace (2019) for both scientific and English names, see **Annex 7.8**.

2.2 Legally controlled species

2.2.1 The presence of any legally controlled, non-native, invasive plants, such as Japanese knotweed and Himalayan balsam, was recorded during the Phase 1 habitat surveys.

3 Results

3.1.1 The following sections describe the Phase 1 habitat types recorded within and adjacent to the proposed DCO Order Limits. The distribution of habitats present is shown in **Annex A, Figure A-2** and are described below in order of prevalence within the Site.

3.1.2 The Phase 1 Habitat surveys were undertaken during the optioneering phase of the Project before design freeze was reached. As such, some of the recorded areas now fall outside of the proposed DCO Order Limits, with additional areas included in the Order Limits following completion of the Phase 1 Habitat survey.

3.1.3 At the time of survey, a total of 85.5% of the DCO Order Limits was subject to ground-based Phase 1 habitat survey, with the additional 14.5% remotely sensed using aerial imagery. Following design changes, approximately 68.5% of the 1592 hectare (ha) Order Limits have been subject to ground survey, with 31.5% remotely sensed. Areas surveyed are shown in **Annex A, Figure A-1**. Areas without previous survey coverage due to land access limitations or Order Limits changes will be subject to further survey throughout 2024.

3.2 Arable

3.2.1 This habitat type was the most prevalent within the Site, accounting for approximately 1,165ha of the Order Limits. The arable fields are located either side of the River Trent, with an average size of 12.45ha to the west of the River Trent and 6.98ha to the east. In general, arable fields were noted to be low-lying, intensely farmed with limited to no field margins recorded.

3.2.2 Arable crops planted at the time of survey include a range of spring and autumn sown crops, predominantly cereals, wheat and barley, and non-cereal crops including oil seed rape, broad beans, potato and maize. Depending on the time of year and crop rotation, fields were noted to have been recently sown, cropped, ploughed or fallow at the time of survey.

3.3 Improved grassland

3.3.1 Grass-leys, one field to the west of the River Trent and nine fields to the east, consist of one or two grass species and are maintained short with frequent watering prior to harvest for use as turf.

3.3.2 There are seven grassland fields, one to the west of the River Trent with six to the east, either grazed by sheep or used as hay meadows, some of which were being cut during the field survey. Narrow grass margins (less than 1m in width) were recorded within the majority of arable fields, with wider margins recorded in the east of the Order Limits, tending to support a higher diversity of species.

3.4 Poor quality semi-improved grassland

3.4.1 A continuous length of poor-quality semi-improved neutral grassland extended either side of the River Trent, along the bund which supports the Public Footpath. Some areas of this were sheep grazed, whilst others were managed, with cutting taking place at the time of the field survey.

3.4.2 Due to the recent cutting of large areas, species identification was limited during the survey, however, species were typical of the types of grassland recorded and their management regime. Grasses included soft brome, barren brome, Yorkshire fog, meadow foxtail, crested dog's tail, meadow grass, bent-grass, red fescue, perennial rye-grass, tall fescue and cocksfoot grass. Herb species included common and widespread white clover, creeping buttercup, ribwort plantain, greater plantain, cleavers, common nettle, creeping thistle, yarrow, spear thistle, tufted vetch, dandelion, ground ivy

and broad-leaved dock. Locally common species were white campion, field pansy, stitchwort, mugwort, herb-Robert, weld, bugloss, hemlock, white dead-nettle and red dead-nettle, common vetch, common sorrel, and various sedge and rush species in locations with water logging.

3.5 Semi-natural broadleaved woodland

3.5.1 There are three parcels of potential ancient semi-natural woodland (ASNW) within the area including an intact woodland parcel on the sloping escarpment directly east of the River Trent that sits partially within the Site, and a remnant parcel with associated scrub in the field adjacent to the escarpment.

3.5.2 These two parcels consist semi-mature and mature examples of ash, field maple, sycamore and elder. There is a dense understorey of hawthorn and elder, with standing and fallen deadwood present. The canopy is partially open before opening out further south within the parcel (outside of the Site boundary) as the woodland grades into scrub. Due to environmental factors including the gradient and soil structure on this escarpment, it is possible that scrub represents the ecological climax community – the final successional stage a habitat can reach. Within the Site boundary, these two parcels are 0.118ha (remnant potential ASNW) and 0.727ha (potential ASNW).

3.5.3 The third parcel of potential ANSW is 0.361ha in size and is located towards the south of the Site, bordering the historic railway (to the south) that runs east-west. This parcel consists of semi-mature oak, ash, and field maple with a good understorey of hawthorn and elder. The ground flora is dominated by grasses at the edge, with abundant *Claytonia* spp.

3.5.4 In addition to the three parcels of potential ancient semi-natural woodland, there are nine small parcels of semi-natural woodland found along boundary features / surrounding ponds that have grown out into self-sustaining woodland parcels, two of these parcels are west of the Trent, with seven on the east.

3.6 Broadleaved woodland-plantation

3.6.1 There are five plantation woodland parcels, with one on the west of the Trent and four in the east. These woodlands are of plantation origin, with evidence of planting and in some cases, on-going management. All plantation woodlands are broadleaf deciduous or mixed plantation; containing mainly broadleaved species. There are no conifer plantations within the Order Limits.

3.6.2 The plantation woodlands vary in age and structure, with signs of planting and recent management such as tree guards or recently compressed ground and with no established ground flora. Two of the plantations are classed as semi-mature, with some large, well-established trees present. Species vary between parcels, though oak is present in all plantation mixes. Field maple is the second most commonly occurring species, followed by sweet chestnut, sycamore and single occurrences of holly, cherry, elder, privet, hazel, guelder rose, rowan, blackthorn and hawthorn.

3.7 Scrub-dense/ continuous or scattered

3.7.1 Due to the intensive agricultural nature of the Site, there are very few areas of scrub present within the landscape. Pockets of habitat within the Site, that do qualify as scrub, are associated with grown out field margins, where a lack of management of hedgerows has enabled them to develop into a wider scrub belt, and along the embankment of the now disused railway line.

3.7.2 All scrub habitats within the area are hawthorn dominated, with blackthorn and bramble frequently present. Such habitats are typical of areas where there is limited land management and if left, will continue expanding with eventual succession to woodland habitat.

3.7.3 The largest aggregation of scrub habitat within the survey area is along the embankments of the Sustrans Route 647 that runs east-west through the Order Limits.

3.8 Hedgerows

3.8.1 A total of 242 hedgerows were recorded within the Survey equating to a total of approximately 58.3km. Hedgerows are first divided into two broad categories (defunct or intact) before further divisions based on species assemblage and hedge characteristics. Within the Order Limits are 137 intact hedges totalling 32.9km in length, and 105 defunct hedges totalling 25.4km.

3.8.2 Defunct hedges are considered to be hedges that no longer function as stock-proof boundary features predominantly due to horizontal gappiness or large canopy breaks, with intact hedges considered to be continuous linear features that lack horizontal gappiness (other than field gates).

3.8.3 Hedgerows were then categories based on their physical characteristics and species abundance into the following groups:

- Native species-poor hedgerow – hedgerows with fewer than five woody species present within a 30m stretch.
- Native species-poor hedgerow associated with a bank or ditch – hedgerows with fewer than five woody species present within a 30m stretch that are associated with a bank or dry- or wet ditch running parallel to the hedge line.
- Native species-poor hedgerow with trees – hedgerows with standard trees present, though fewer than five woody species present within a 30m stretch.
- Native species-poor hedgerow with trees, associated with a bank or ditch – hedgerows with standard trees present, though fewer than five woody species present within a 30m stretch that are associated with a bank or dry- or wet ditch running parallel to the hedge line.
- Native species-rich hedgerow – hedgerows with five or more woody species present within a 30m stretch, or where the hedgerows contain fewer woody species but have rich basal herbaceous flora.
- Native species-rich hedgerow associated with a bank or ditch – hedgerows with five or more woody species present within a 30m stretch, or where the hedgerows contain fewer woody species but have rich basal herbaceous flora that are associated with a bank or dry- or wet ditch running parallel to the hedge line.
- Native species-rich hedgerow with trees – hedgerows with standard trees and five or more woody species present within a 30m stretch, or where the hedgerows contain fewer woody species but have rich basal herbaceous flora.
- Native species-rich hedgerow with trees, associated with a bank or ditch – hedgerows with standard trees and five or more woody species present within a 30m stretch, or where the hedgerows contain fewer woody species but have rich basal herbaceous flora Native species-rich hedgerow with trees – hedgerows with standard trees and five or more woody species present within a 30m stretch, or where the hedgerows contain fewer woody species but have rich basal herbaceous flora.
- Non-native / Ornamental hedge – Hedge made up of predominantly non-native species such those associated with landscaped gardening (*Leylandii)*.

3.8.4 The majority of hedgerows within the Order Limits were considered to be either native species poor intact hedgerows, native species poor defunct hedgerows or non-native / ornamental hedgerows (*Leylandii*). With hedgerows varying in length, width and structure though it is evident most receive a similar level of management; with annual flailing to reduce height and width within fields adjacent to agricultural cropland. The hedgerows are cut into box shapes and field margins that lie adjacent are closely mown, maintaining the floral structure as grass and forb species only, with successional scrubby growth removed. There is evidence of under-management in places, with hedges along the northern boundary having grown tall and leggy.

3.8.5 Within the Order Limits there are fewer hedgerow features within the area west of the River Trent, than the east. This is likely due to historic land management practices where boundary features have been removed to create larger agricultural fields within the west. Hedgerows within the west of the Order Limits are on average smaller, more species poor and more frequently defunct than those east of the Trent.

3.8.6 Species present within the hedgerows include hawthorn, blackthorn, elder, goat willow, hazel, dog rose, sycamore, field maple, pedunculate oak, privet, lilac and wych elm, with guelder rose cherry and holly recorded less frequently. No hedgerows were recorded to have more than six woody species per 30-metre stretch, with most being dominated by hawthorn, or hawthorn and two to three other commonly found species.

3.8.7 Several hedgerows have standard trees present, including semi-mature sycamore, lime, pedunculate oak and ash. There are two large non-native ornamental hedgerows adjoining residential properties, these are Leylandii dominated, with lilac also present.

3.9 Treelines

3.9.1 There are 50 treelines within the Order Limits, equalling approximately 9.2km in length, the majority (31) of which are located to the east of the River Trent. Treelines form borders to agricultural fields, grassland fields, highways and byways, and vary considerably in species assemblage, age and structure.

3.9.2 The most common tree species found within the treelines are oak and ash. Other species present include sycamore, horse chestnut, rowan, lime, willow, field maple, sweet chestnut, and Scot's pine.

3.9.3 The treelines range from lines of young saplings to those with semi-mature and mature specimens. There are no veteran trees identified within treelines within the Order Limits. The majority of trees within the lines are considered to be semi-mature.

3.10 Hardstanding

3.10.1 Hardstanding was recorded along highways, byways, access roads and tracks, and railway sidings and lines associated with Sustrans Route 647.

3.11 Tall ruderal vegetation

3.11.1 Tall ruderal habitats are rare within the Order Limits, with small areas found within field margins and associated with banks and ditches. These habitats are typically dominated by hemlock, bracken, common nettle and creeping thistle.

3.12 Standing water

3.12.1 There are 18 waterbodies identified within the Study Area, four of which (Ponds 1, 5, 9 and 11) are located within the Order Limits. Ponds within the Order Limits, in addition to Ponds 6, 7 and 28 located outside of the Order Limits, are small farm pits that appeared to be of low biodiversity value with dense scrub vegetation surrounding the edges and wildfowl present.

3.12.2 Of the remaining 11 ponds that all lie outside of the Order Limits:

- 17 was dry at the time of field survey
- 3, 4, 10, 11 and 12 are woodland ponds with high levels of shading resulting from surrounding trees. 12 is within a private garden and could not be accessed.
- 13 is a farmyard pond with sparse, shallow banks and high presence of waterfowl.
- 2 and 8 are dominated by reedbed,
- 27 is a garden pond with sparse vegetation.

3.12.3 There are two main ditch systems to the west of the River Trent, both appear to support agricultural land drainage. Many branches of these two major ditch systems appear to remain wet year-round, with outlier (and connecting) branches found to be dry during the field survey. These ditch systems are named on OS mapping as Fledborough Beck and the Old Trent. It is possible that during periods of high flow, these systems become connected via unidentified pathways.

3.12.4 The Fledborough Beck drains the fields west of Ragnall village, with the ditch extending more than 6km through the landscape when all systems (including currently dry ditch branches) are considered. The ditch is cut into the landscape at depths varying between 1.5 and 5m deep, with its width at its base being between 0.5 and 1m. At the time of survey there was only shallow water evident, with tall ruderal vegetation and goat willow present.

3.12.5 The Old Trent drains fields east of Ragnall, with the ditch extending more than 5km through the landscape. This ditch is cut into the landscape at depths varying between 1.5 and 4m deep with width varying between 0.5 and 2m. At the time of survey there was slow flowing water within this system that was estimated to be 0.5m deep. Tall ruderal vegetation including nettles and bramble occur, with sluice gates present to manage water levels found toward the eastern edge of the ditch.

3.12.6 Two major ditch systems are also located to the east of the River Trent, Sewer Dyke – which predominantly runs north to south parallel to the River Trent, with branching arms draining adjacent fields, and; a large unnamed channel that is fed by ditches off the fields east of North Clifton and flows north through the Order Limits.

3.12.7 The Sewer Dyke is a large ditch system that extends more than 5km through the Order Limits, flowing south to north with water levels managed via a series of sluice gates that feed directly into the River Trent at the Dyke's northern extent. The ditch is between 2 and 4m deep, and 1.5m wide at its base. Water within the base of the ditch appears to be between 0.5 and 1m deep, though water within the system was turbid at time of survey making this difficult to establish with certainty. There was no evidence of emergent or aquatic vegetation in any part of the Dyke at the time of survey.

3.12.8 The unnamed channel that drains the fields east of North Clifton is a large ditch system cut between 2 and 3m into the landscape which varies in width between 1.5 and 2m at its base. At the time of survey there was a water depth of approximately 0.3m though, for safety reasons, this was estimated from its bank tops. The main channel is dominated by tall ruderal growth including with reeds. There

was evidence during the surveys that this ditch system was used to irrigate the fields adjacent, with a large pump seen to be extracting water.

3.13 Running water

3.13.1 The River Trent, a large and navigable river, dissects the DCO Order Limits along a roughly north-south axis. Within the Order Limits, the River Trent presents itself as a major river with a large tidal range, measuring on average 75m wide as it flows for approximately 3.2km through the Order Limits.

3.13.2 The River Trent at this location is considered a key migratory route for Atlantic salmon, smelt, sea lamprey, river lamprey, Allis shad, Twaite shad and European eel.

3.13.3 The banks along both sides of the river have been raised adjacent to areas of coastal floodplain grazing marsh and farmland to defend the landscape against frequent flooding events. However the River still functions semi-naturally and is connected to its floodplains via a complex of ditches and main dykes (which flood during spate flow).

3.13.4 The River has historically been deepened and dredged to ensure there is a clear navigable route for large vessels moving quarried materials up and down the Trent between major industrial cities.

3.14 Protected and rare plant species

Notable Species

3.14.1 No protected and rare plant species were recorded on Site.

Legally controlled plant species

3.14.2 No legally controlled invasive non-native plant species were recorded within the Order Limits.

Legally protected species

3.14.3 **Table 3-3** indicates habitat suitability of the Phase 1 Habitats recorded within the Study Area for legally protected species. Information pertaining to legally protected species can be found in Appendix 7-3 to 7-7.

Table 3-1: Protected species with the potential of occurring within the DCO Order Limits

Legally protected species	Suitable habitat
Badger	All woodland types, all grassland types, arable fields and scrub.
Bats	Broadleaved woodland, all grassland types, hedgerows, tree lines and standing and running water.
Breeding and wintering birds	Broadleaved woodland, hedgerows, scrub, arable fields and their margins, rivers and ditches.
Riparian mammals	Rivers and ditches
Reptiles	Improved/semi-improved grassland, dense scrub, tall ruderal vegetation, marginal areas of ponds, rivers and ditches
Great Crested Newt (GCN)	Improved/semi-improved grassland, dense scrub, tall ruderal vegetation, ponds and ditches

Legally protected species	Suitable habitat
Invertebrates	Improved/semi-improved grassland, dense scrub, tall ruderal vegetation, marginal areas of ponds, rivers and ditches

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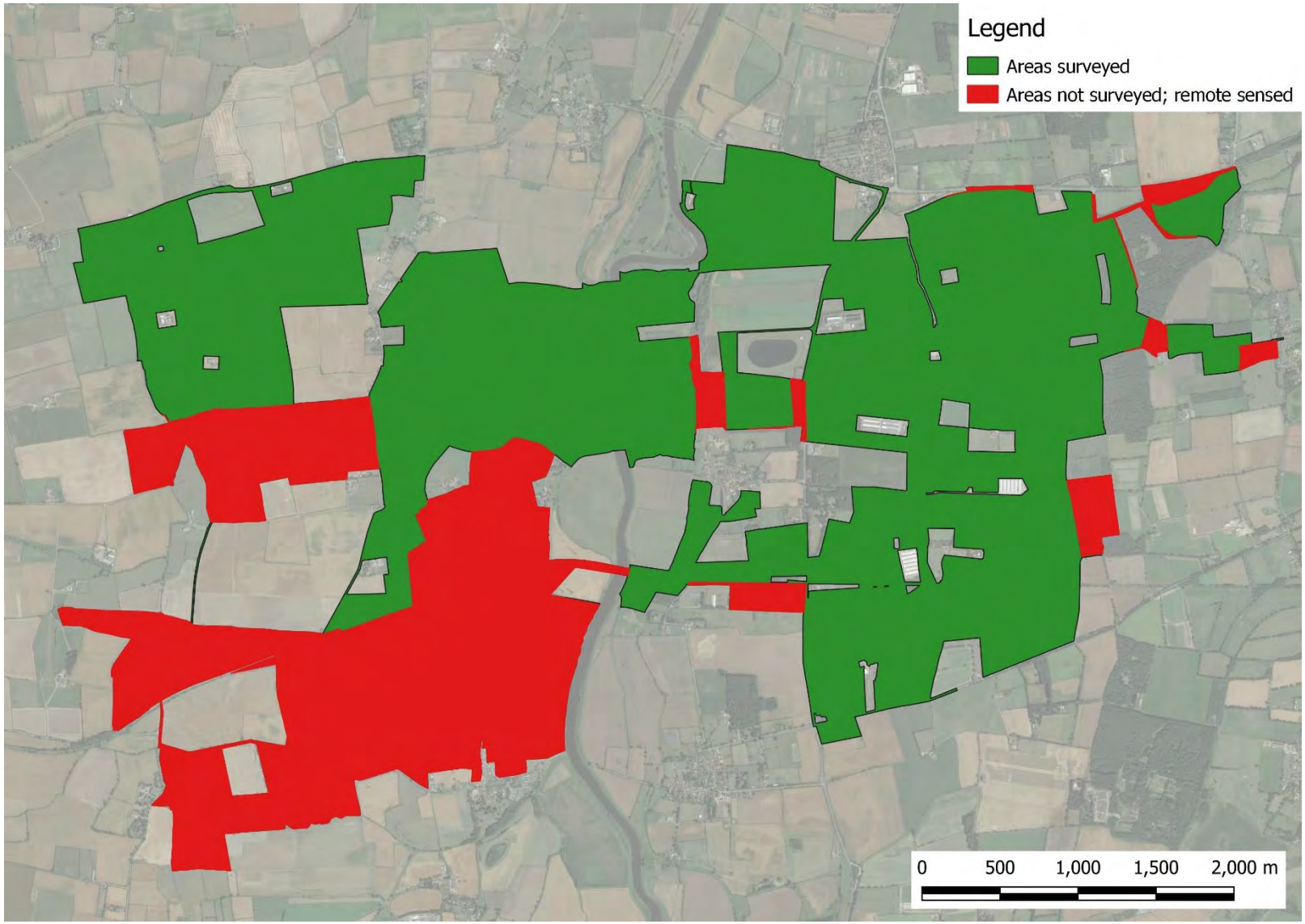
A1 Annex 1 – Figures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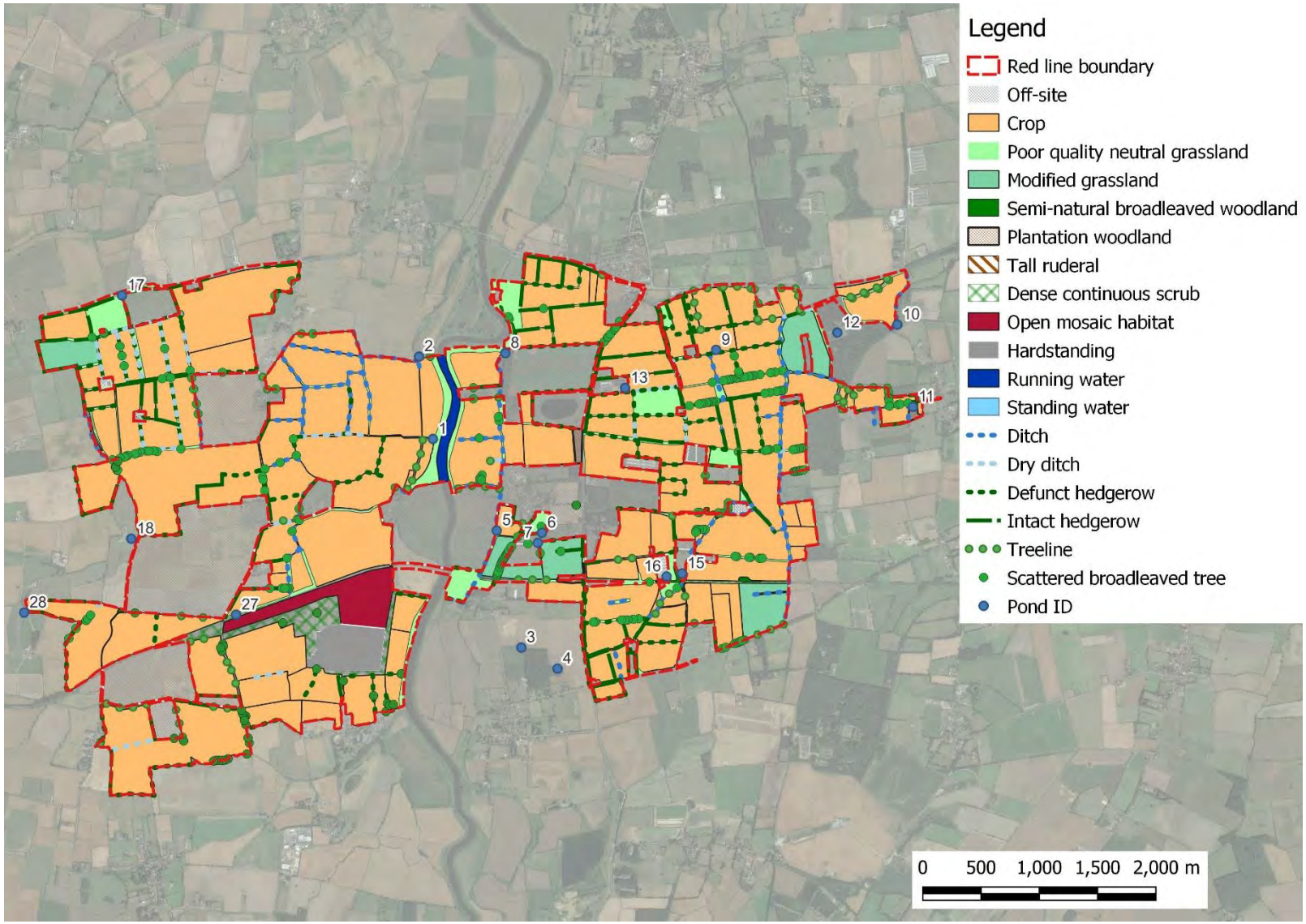
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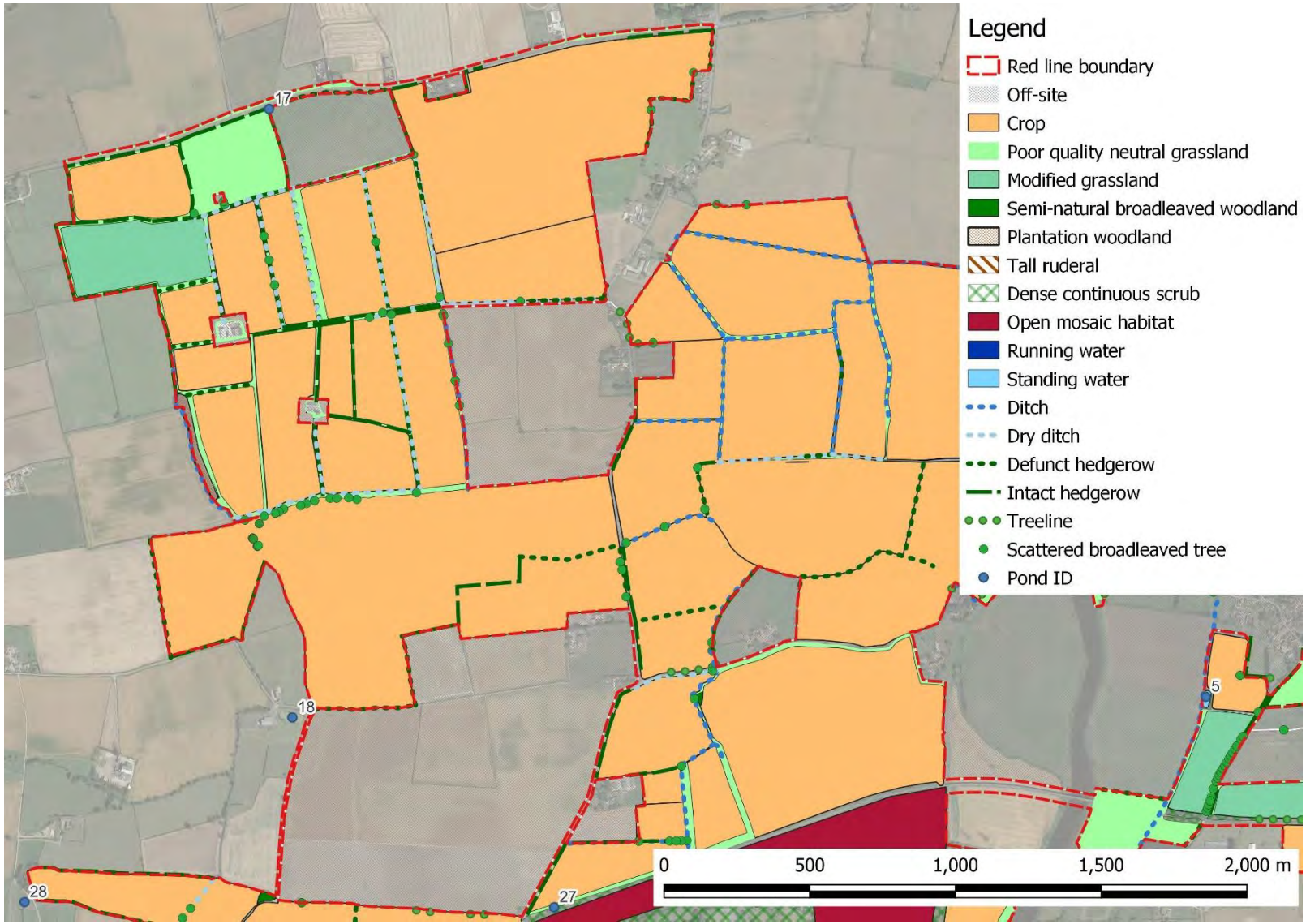
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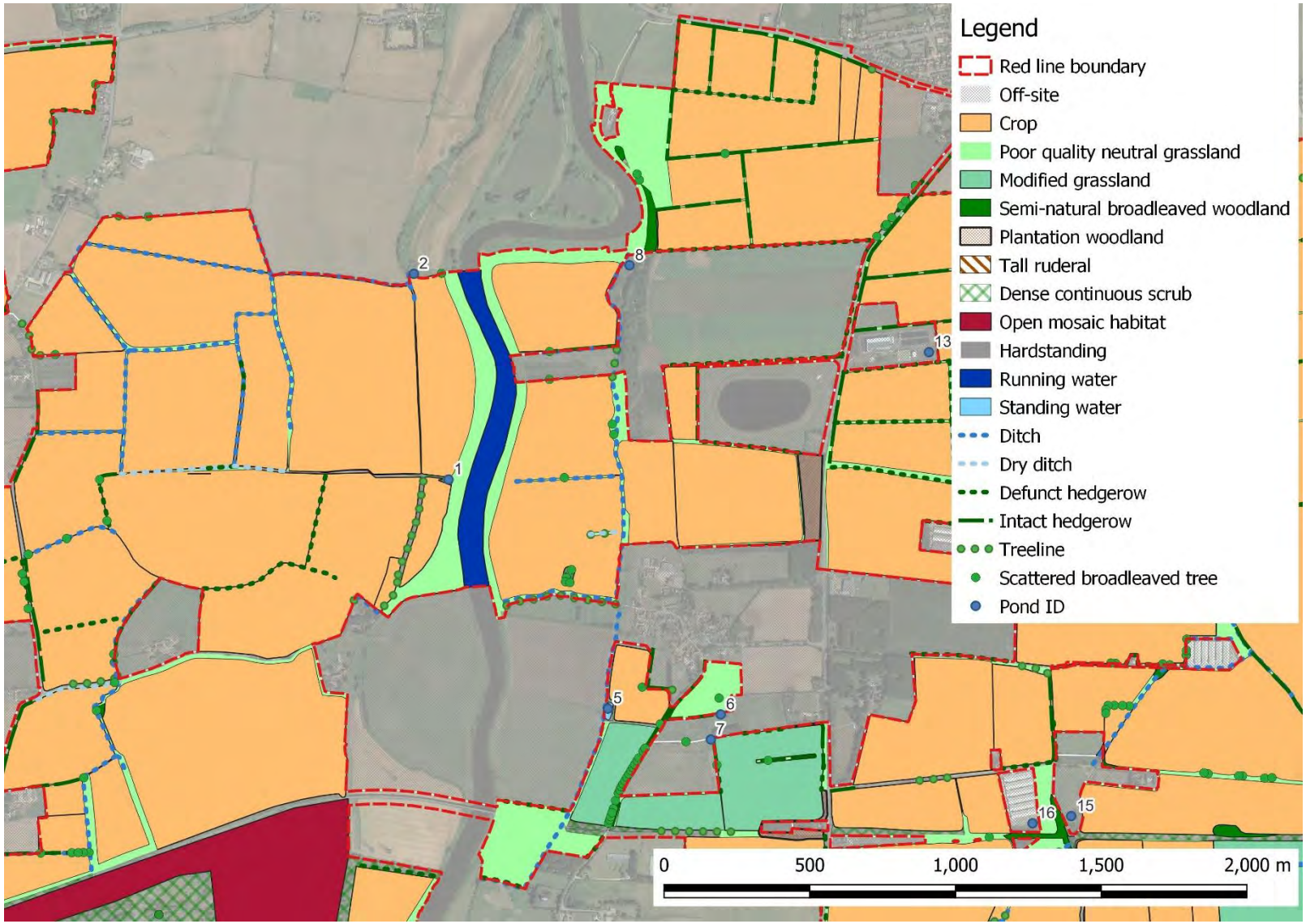
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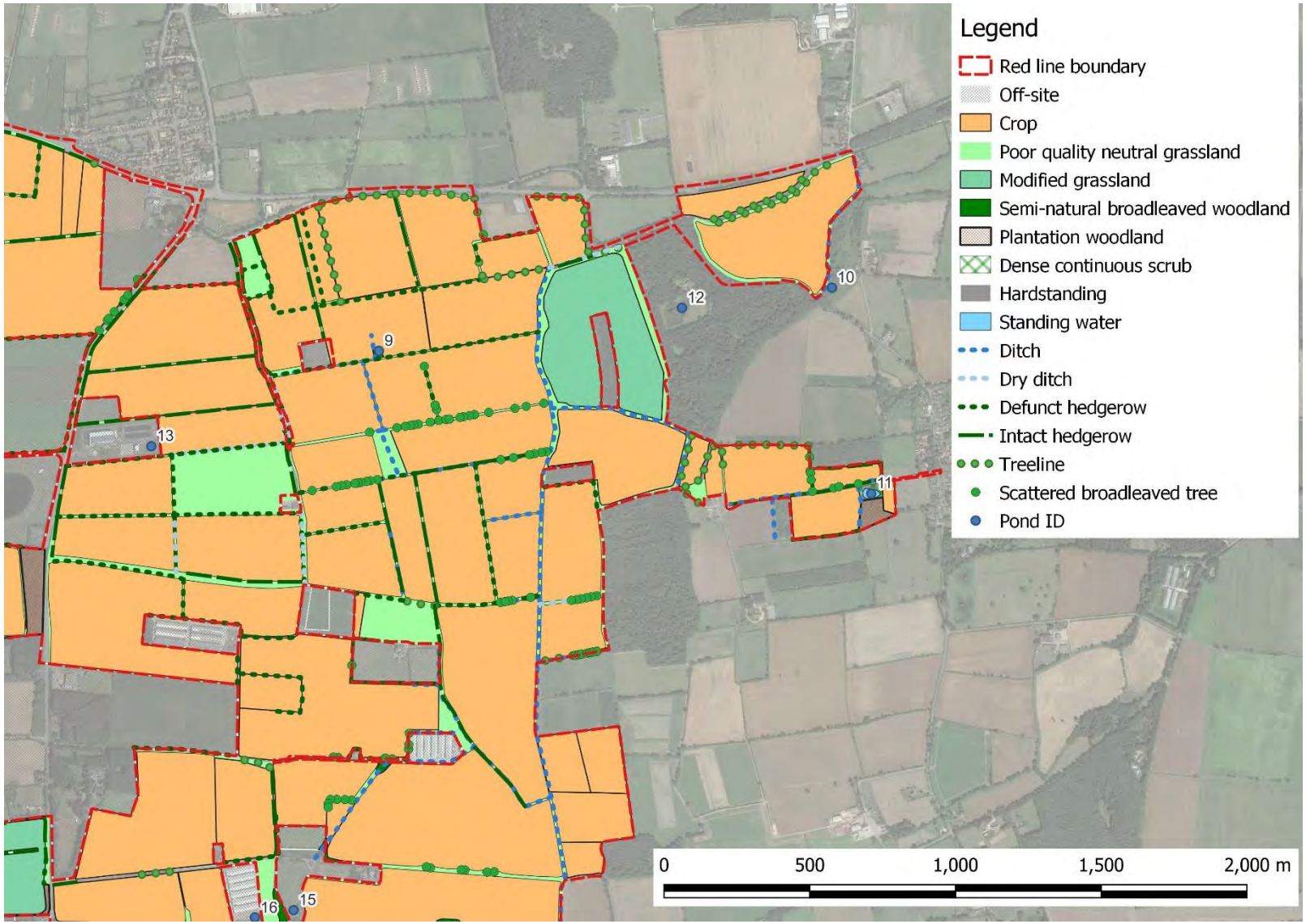
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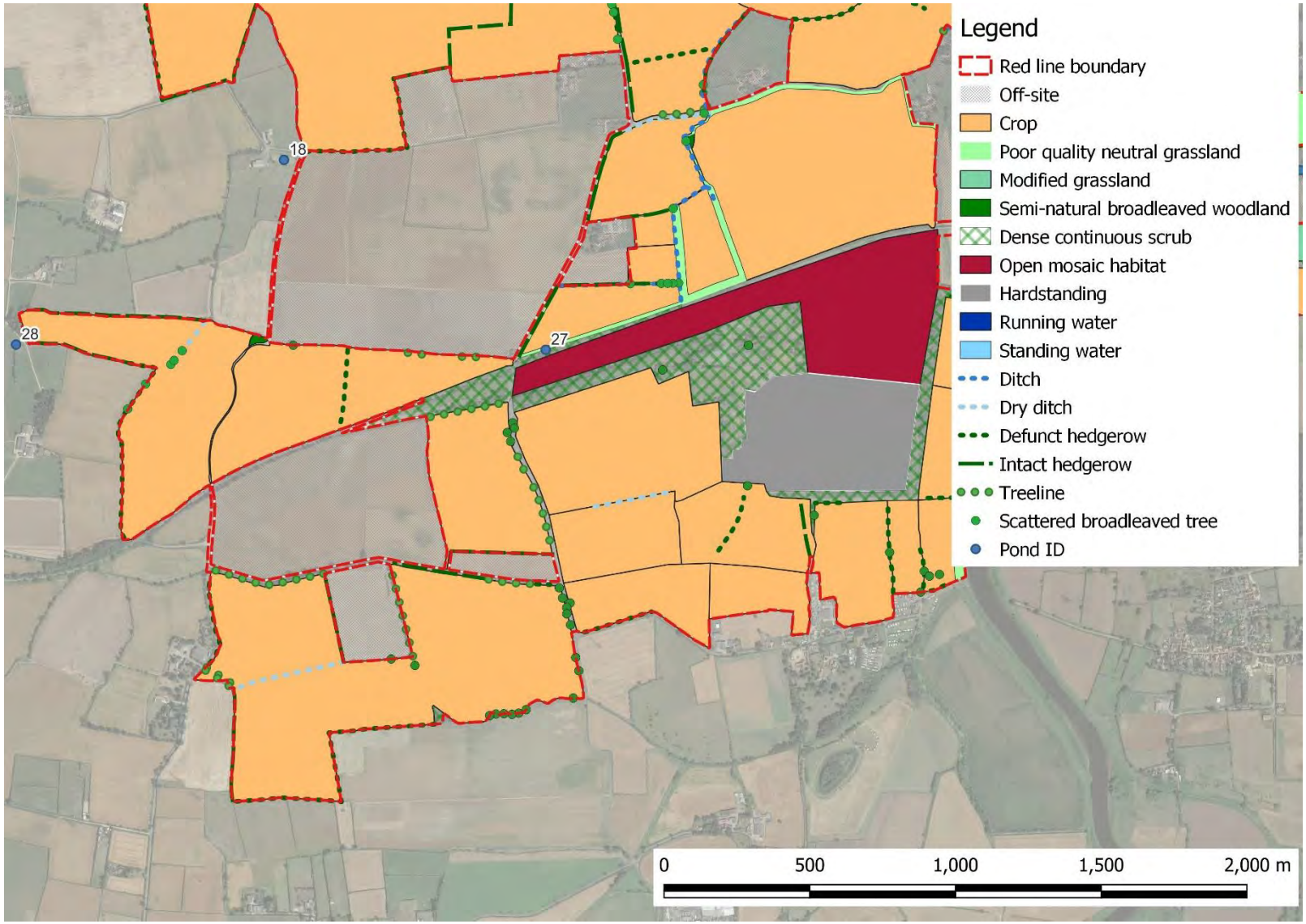
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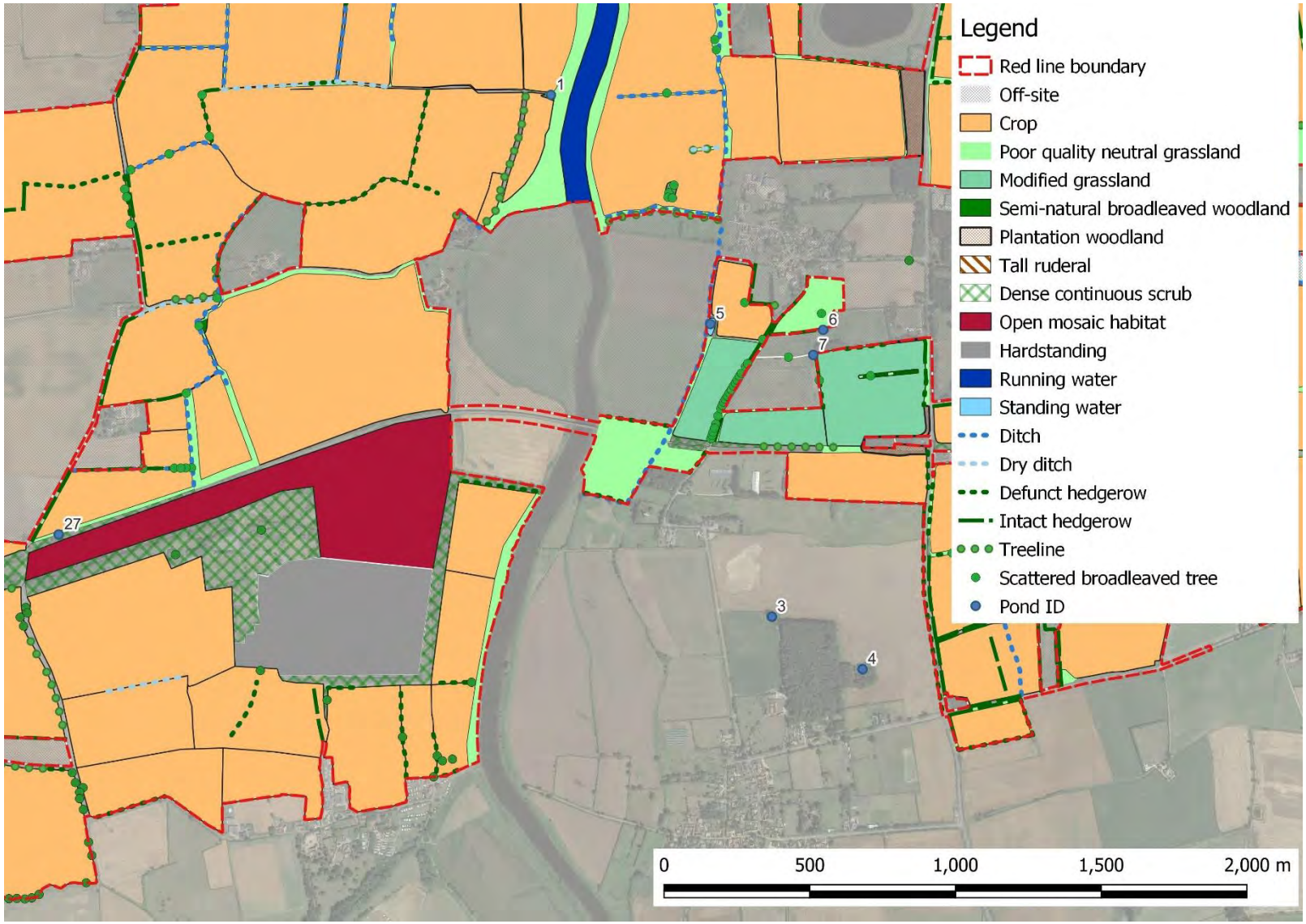
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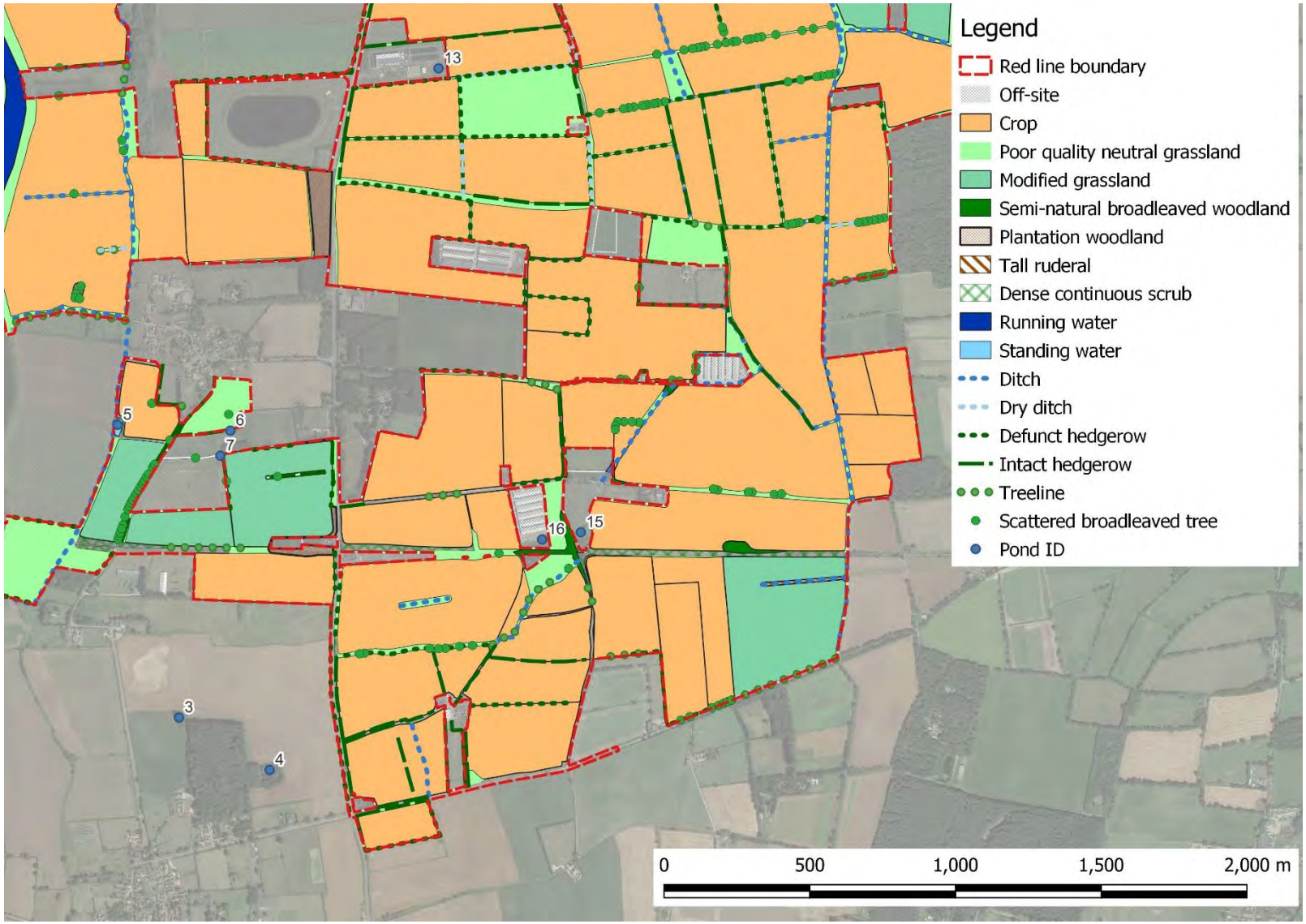
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Appendix 7-3: Bat Baseline

Report

One Earth Solar Farm

Appendix 7-3: Bat Baseline

For One Earth Solar Farm Ltd

17 May 2024

Document control

Project Title:	One Earth Solar Farm
Project Number:	14529A
Client:	One Earth Solar Farm Ltd
Document Title:	Appendix 7-3: Bat Baseline
Document Number:	14529A
Prepared By:	Alexandra Jackson
Reviewed By:	Craig Brookes

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Revision History

01	14/05/2024

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Contents

Tables

Figures

1 Introduction

1.1 Background

1.2 This Appendix should be read in conjunction with Chapter 7 of the Preliminary Environmental Information Report (PEIR) which is provided in support of the delivery of an Environmental Impact Assessment (EIA) associated with the One Earth Solar Farm, hereafter referred to as the 'Site'.

1.3 Purpose of this Appendix

1.3.1 The purpose of the Appendix is to present the methods and findings of the baseline bat surveys which were undertaken to identify and assess the assemblage of bat species potentially impacted by the Project.

1.3.2 Surveys were completed within the active bat season between April and October in 2023 following an adapted method based on the Bat Surveys for Professional Ecologists: Good Practice Guidelines third edition (Collins 2016).

1.3.3 The bat surveys were designed to identify the distribution, density and activities of bats within the Site. The adapted method involved a sampling approach, focusing on habitats considered to be of high-quality for bats and to represent the full range of habitats present within the Site.

1.3.4 This report does not allude to any requirements for mitigation and/or compensation in respect of bats, nor does it assess the potential impacts that proposals might have upon bats, as both issues will be covered in detail as part of an ES.

1.4 Structure of this Appendix

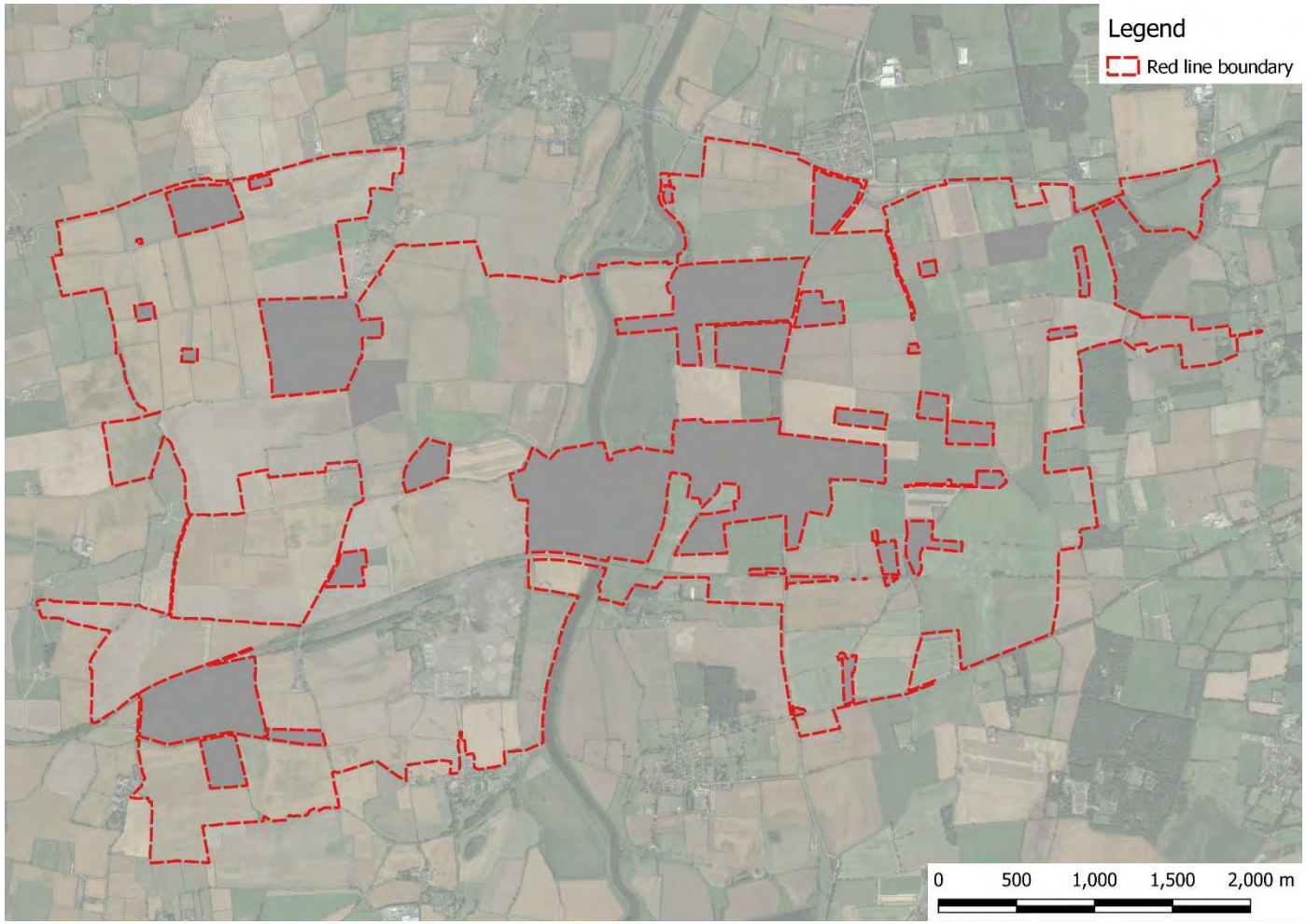
1.4.1 The remainder of this Appendix is structured as follows:

- **Section** Error! Reference source not found.**: Methods**
- **Section** Error! Reference source not found.**: Results**
- **Section** Error! Reference source not found.**: Summary**
- **Section 5: References**
- **Annex A: Details of Preliminary Roost Assessment**

1.5 The Site

The Site is approximately 1,500ha and comprises approximately 170 agricultural fields bordered in parts by hedgerows, treelines, woodlands and ditches. The Site is bisected north to south by the River Trent, and falls across two county boundaries and three local authorities. The Site has a central grid reference of SK816718 and is shown in **Figure 1-1**.

Figure 1-1: Site boundary



2 Methodology

2.1 Survey Guidance

2.1.1 Survey methods follow best practice guidelines, interpreted using professional experience. Survey design was informed by Bat Surveys for Professional Ecologists: Good Practice Guidelines third edition (Collins 2016). The fourth edition of these guidelines was published in September 2023 and were therefore not available at the time of survey design.

2.1.2 The Bat Mitigation Guidelines (Reason & Wray 2023) and Bat Workers' Manual (Mitchell-Jones 2004) provide further guidance which has been taken into account when designing the survey methods. With regard to trees, the British Standard (BS 8596:2015) and Bat Roosts in Trees (Andrews 2018) have also been considered. Surveys were designed and conducted by Alexandra Jackson MZool (Hons) and Kelly Jones MSc MCIEEM (Natural England survey licence levels 3 and 4: 2020-45088-CLS-CLS & 2020-45091-CLS-CLS)).

2.2 Desk Study

2.2.1 An environmental desk study was undertaken in September 2023 to identify records of bats within 2km of the Site boundary, from Greater Lincolnshire Nature Partnership (GLNP) and Nottinghamshire Biological and Geological Records Centre (NBGRC) and for European Protected Species Licences (EPSL) using the Multi-Agency Geographic Information for the Countryside (MAGIC) website (an internet-based Geographic Information Systems database provided by the Department for Environment, Foods and Rural Affairs (DEFRA) (Defra, 2024)).

2.3 Environmental Conditions

2.3.1 All active bat surveys were undertaken when there was little to no rain, no excessive wind and the temperature was above 10ºC. In these weather conditions, bats are unlikely to be deterred from flying. Temperature, humidity, cloud cover and rainfall levels were recorded by surveyors during each survey visit. Any other environmental conditions that may affect bat activity, such as noise or artificial light levels, were also recorded. Environmental conditions are given in Table 2.1.

2.4 Preliminary Roost Assessment

Ground-Level Tree Assessment

2.4.1 A Ground Level Tree Assessment (GLTA) was carried out between 25th May and 20th June 2023. Trees were assessed for their potential suitability to support roosting bats using close focussing binoculars and a powerful light source to search for potential roost features (PRFs). Suitable features include cracks in limbs and trunks, split branches, knot or woodpecker holes, rot holes, or areas of dense ivy forming plates. Details of trees supporting PRFs were recorded, including:

- Grid reference.
- Tree species.
- Approximate height and diameter at breast height (DBH).
- PRF number and type.
- Approximate location, height and aspect of PRF.

2.4.2 Trees which could not be fully assessed due to their age and/or size or where visibility was limited by foliage, were also recorded where the species and condition indicated that PRFs could be present.

2.4.3 Trees were categorised as either:

- None – Either no PRFs in the tree or highly unlikely to be any,
- FAR – Further assessment required to establish if PRFs are present in the tree, or
- PRF – A tree with at least one PRF present.

2.5 Bat Activity

Scoping

During the initial scoping process, habitats within the Site were assessed for their potential suitability to support foraging and commuting bats and were allocated to the following categories:

- **None**:
  - No habitat features on Site likely to be used by any commuting or foraging bats at any time of the year (i.e. no habitats that provide continuous lines of shade/protection for flight lines, or generate/shelter insect populations available to foraging bats).
- **Negligible**:
  - No obvious habitat features on Site likely to be used as flight-paths or by foraging bats; however, a small element of uncertainty remains in order to account for non-standard bat behaviour.
- **Low**:
  - Habitat that could be used by small numbers of bats as flight-paths such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat.
  - Suitable but isolated habitat that could be used by small numbers of foraging bats, such as a lone tree (not in a parkland situation) or a patch of scrub.
- **Moderate**:
  - Continuous habitat connected to the wider landscape that could be used by bats for flight-paths, such as lines of trees and scrub or linked back gardens.
  - Habitat that is connected to the wider landscape that could be used by bats for foraging, such as trees, scrub, grassland or water.
- **High**:
  - Continuous, high-quality habitat that is well connected to the wider landscape and is likely to be used regularly by bats for flight-paths, such as river valleys, streams, hedgerows, lines of trees and woodland edge.
  - High-quality habitat that is well connected to the wider landscape and is likely to be used regularly by foraging bats, such as broadleaved woodland, tree-lined watercourses and grazed parkland.

- The Site is close to and connected to known roosts.

Transect Survey

2.5.1 Following the desk study and initial habitat surveys, the majority of the Site was considered to be of low suitability for commuting and foraging bats, dominated by large, open arable fields. Due to the large extent of the Site and the limited anticipated impacts on high-quality habitats for bats, a sampling approach was designed to assess bat activity at carefully selected locations considered to be representative of the Site.

2.5.2 Three transect routes were designed to incorporate potential bat foraging habitat and flight-lines that might be used for commuting (for locations refer to **Figure 2-1**) and focussed on moderate and high-quality habitat. However, due to the spatial distribution of habitats across the Site, low-quality habitat was also incorporated into the transect routes.

2.5.3 Each transect route was between 3 and 5km in length and was surveyed once per season at dusk; spring, summer and autumn. Transect routes were not walked simultaneously, but over a series of nights, usually one after the other to improve chances of similar environmental conditions.

2.5.4 Details of these surveys are summarised in **Table 2-1**.

Table 2-1: Bat activity transect dates and environmental data

Transect Route	Season	Date	Timing	Weather*
1	Spring	01/06/2023	21:33 – 23:33	Start: 15°C, 8/8 cloud cover, wind 1, no rain End: 10°C, 8/8 cloud cover, wind 2, no rain
	Summer	07/08/2023	20:47 – 22:47	Start: 15°C, 0/8 cloud cover, wind 0, no rain End: 10°C, 1/8 cloud cover, wind 1, no rain
	Autumn	08/10/2023	18:23 – 20:23	Start: 22°C, 7/8 cloud cover, wind 1, no rain End: 17°C, 6/8 cloud cover, wind 0, no rain
2	Spring	25/05/2023	21:11 – 23:42	Start: 17°C, 8/8 cloud cover, wind 1, no rain End: 12°C, 8/8 cloud cover, wind 1, no rain
	Summer	08/08/2023	20:45 – 23:06	Start: 17°C, 1/8 cloud cover, wind 1, no rain End: 11°C, 0/8 cloud cover, wind 0, no rain
	Autumn	09/10/2023	18:21 – 20:21	Start: 20°C, 1/8 cloud cover, wind 0, no rain End: 16°C, 1/8 cloud cover, wind 0, no rain
3	Spring	24/05/2023	21:09 – 23:20	Start: 23°C, 7/8 cloud cover, wind 1, no rain End: 14°C, 8/8 cloud cover, wind 0, no rain
	Summer	09/08/2023	20:46 – 22:53	Start: 20°C, 7/8 cloud cover, wind 0, no rain End: 18°C, 8/8 cloud cover, wind 0, no rain
	Autumn	10/10/2023	18:19 – 20:19	Start: 20°C, 4/8 cloud cover, wind 2, no rain End: 14°C, 1/8 cloud cover, wind 2/3, no rain

* Wind speed measured in Beaufort scale; cloud cover measured in Oktas

2.5.5 During each survey visit, surveyors walked two circuits of the transect route, from sunset until two to three hours after sunset. Surveyors used a combination of visual observation (light levels permitting) and aural full spectrum detectors (Elekon Batlogger M2 and EchoMeter Touch Pro) to monitor bat

activity; recording the number of passes of each bat species heard or seen, and the type of activity observed or heard (for example foraging or social calls). For the purpose of this assessment, a 'pass' is defined as a sequence of calls (individual clicks made by bats as they echolocate) that a bat emits as it flies past, typically getting louder and then quieter as the distance between the bat and the surveyor changes.

2.5.6 It should be noted that acoustic records collected during manual surveys are intended to give an indication of relative levels of bat activity during each season, on each transect, and do not represent actual numbers of bats. A single bat may pass the surveyor several times, with each pass counted separately.

Static Acoustic Monitoring

2.5.7 The quality of habitats within the Site were highly varied, comprising large areas of habitat of negligible and low-quality for foraging and commuting bats, with a lower proportion of areas of moderate and high-quality. To allow for comparison of activity across the Site, a consistent survey effort was applied to all areas, with survey effort based on habitat of moderate-quality.

2.5.8 To monitor bat activity throughout the night, static bat detectors (Anabat Swift) were positioned at two locations on each transect route. Monitoring locations are shown in **Figure 2-1**. The static bat detectors were set to record for a minimum of five consecutive nights in each season (spring, summer and autumn). Detectors were set to record from 30 minutes before sunset to 30 minutes after sunrise, dates for which are presented in **Table 2-2.**

Table 2-2: Static acoustic monitoring dates, per static per season

Season	Dates of nights recorded					
	Transect 1		Transect 2		Transect 3	
	East static	West static	North static	South static	North static	South static
Spring	1st – 5th June 2023	1st - 5th June 2023	25th - 29th May 2023	25th - 29th May 2023	24th – 27th May 2023	24th – 28th May 2023
Summer	7th - 11th August 2023	7th -11th August 2023	8th – 11th August 2023	8th – 10th August 2023	-	9th – 13th August 2023
Autumn	8th – 12th October 2023	8th – 12th October 2023	9th – 13th October 2023	9th – 12th October 2023	10th – 14th October 2023	10th October 2023

2.6 Data Analysis

2.6.1 Analysis of bat sound recordings was carried out with reference to Russ (2021) to aid species identification. Where records from bat detector surveys were not identified to species level during the sound analysis process due to overlapping call parameters, records were identified to genus/species group, with the following groups used:

- *Myotis* sp. (bat species within the genus *Myotis*)
- Big bat (noctule, serotine or Leisler's bat)
- Bat sp. (calls that could not be ascribed to a species group).

2.6.2 Usually, *Plecotus* species (brown and grey long-eared bats) calls cannot be differentiated from one another, however the known range for grey long-eared bats is restricted to the south of England, and it is highly unlikely that this species would be recorded in the survey area. As such, all long-eared calls have been identified as brown long-eared bat.

2.7 Limitations

2.7.1 The red line boundary for the Site changed during the survey period, including additional areas, particularly in the west, which were not assessed in the initial scoping survey. This is not considered a major limitation as the surveys were undertaken to gain an understanding of the bat species present, and indicative activity levels. Habitats that were included in the expansion of the red line boundary were common in the Site and generally of low-quality for bats.

2.7.2 Assessment of trees was conducted outside of the optimal period for this type of survey, whereby foliage limits visibility and may have obscured features higher up in the canopy which are suitable for roosting bats. A precautionary approach incorporated any trees of size and status likely to support features.

2.7.3 The sampling design of transect surveys meant that survey visits were conducted in each area on a different night. This means that the data are comparable temporally but not spatially, providing indicative activity levels for each area of the Site.

2.7.4 Due to a fault in the recording equipment during the transect survey in October, only part of the survey for Transect 1 was recorded. Surveyors made recordings based on acoustic outputs of the bat detector during the survey, although subsequent analysis was not possible, and timings were estimated. This did not impact the overall assessment as the transect is designed primarily to establish spatial and behavioural use of the Site, which was achieved.

2.7.5 The static acoustic monitoring surveys aimed to record for a minimum of 5 nights per season at each monitoring location, however some static bat detectors did experience technical failures. A summary of these failures are detailed in **Table 2-3** below.

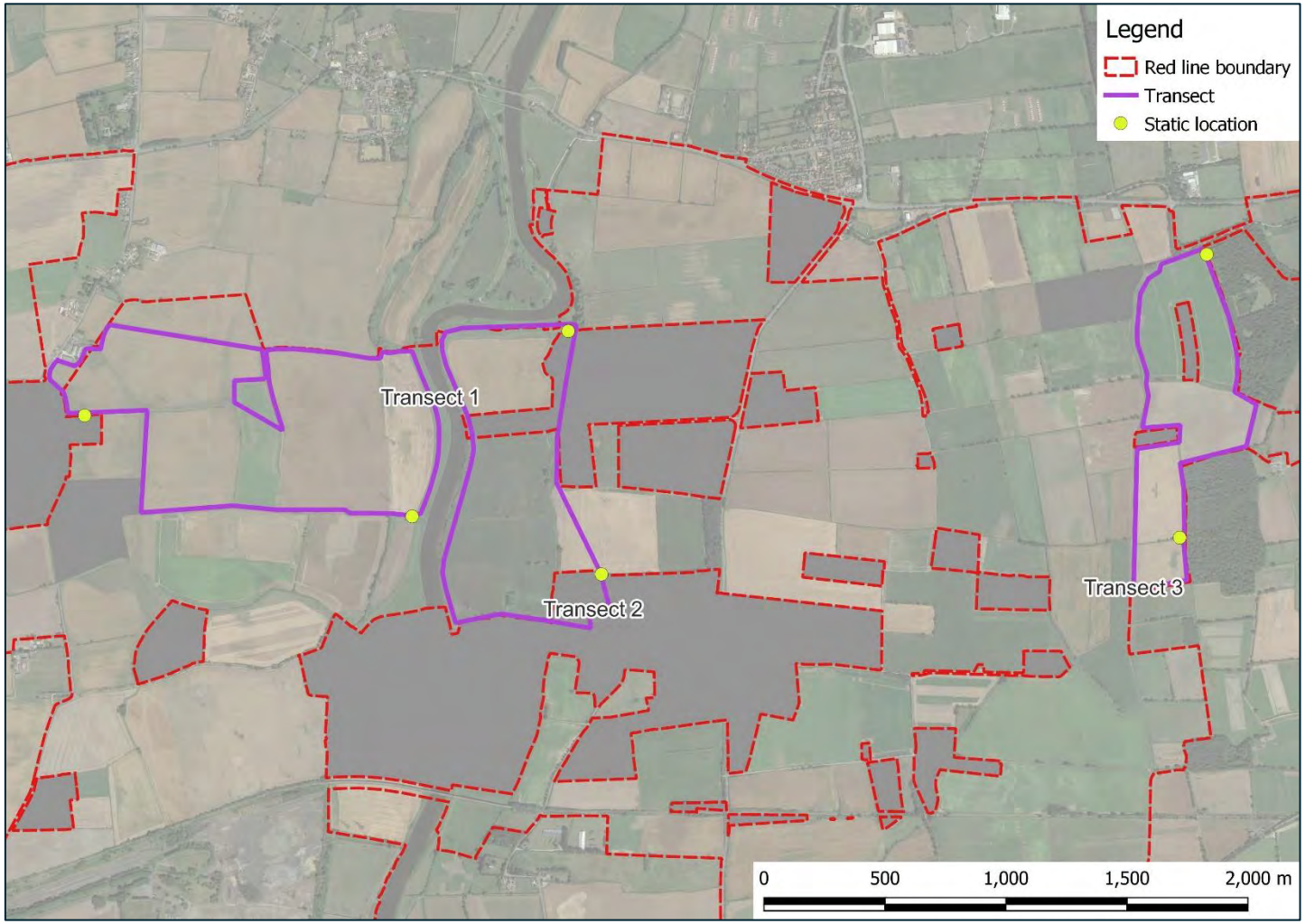
Table 2-3: Number of nights each static recorded, per season

Season	Number of nights recorded					
	Transect 1		Transect 2		Transect 3	
	East static	West static	North static	South static	North static	South static
Spring	5	5	5	5	4	5
Summer	5	5	4	3	0	5
Autumn	5	5	5	4	5	1

2.8 Surveyors

2.8.1 All surveys were undertaken by Kelly Jones MSc MCIEEM (Class 4 licence holder – reference 2020-45088-CLS-CLS & 2020-45091-CLS-CLS) and Alexandra Jackson MZool (Hons), both who have extensive experience in ecological consultancy and bat ecology.

Figure 2-1: Bat survey transect routes and static bat detector locations



3 Results

3.1 Desk Study

3.1.1 GLNP returned a total of nine bat records, within the past decade within 2km of the Site. Among these, six records were for '*Chiroptera*' and not allocated to a species, with the closest sighting being 127m east of the north-eastern boundary near Kettlethorpe, in 2015. Additionally, three records were found for brown long-eared bat *Plecotus auritus*, with the most recent and closest sighting occurring 1.6km north, near Newton-on-Trent, in 2020.

3.1.2 In contrast, the NBGRC yielded a substantial 568 records of at least eight bat species within the last ten years, which are detailed in **Table 3-1**.

Table 3-3-1: Summary of bat records within the search area

Species	No. of Records	Closest Distance from Site	Most Recent Record
Bat sp.	5	On-Site, South Clifton	2019
Barbastelle bat *Barbestella barbastellus*	1	1.72km south, Spalford	2016
Pipistrelle sp.	2	On-Site along hedgerow, near North Clifton	2016
Common pipistrelle *Pipistrellus pipistrellus*	334	On-Site in several locations; North Clifton, Kettlethorpe, Skegby and Marnham	2022
Soprano pipistrelle *Pipistrellus pygmaeus*	13	0.14km north, Dunham-on-Trent	2022
Nathusius pipistrelle *Pipistrellus nathusii*	1	1.4km south, near Spalford	2016
Nyctalus sp.	8	0.25km west of the Site, near High Marnham	2018
Noctule *Nyctalus noctula*	96	On-Site near Ragnal and North Clifton.	2019
Leisler's bat *Nyctalus leisleri*	2	On-Site, along boundary hedgerows near Ragnal	2018
Plecotus sp.	1	0.2km south, within South Clifton	2014
Brown long-eared	59	0.1km south, near Moor Lane in South Clifton	2022
Myotis sp.	46	On-Site along hedgerow, near North Clifton	2022

3.1.3 The MAGIC search identified a single granted European Protected Species Licence (EPSL) within 2 km of the Site. This licence was located 0.08km from the Site boundary, located along Church Lane, near Saint George the Martyr North and South Clifton. In place from 2011 to 2013, it allowed destruction of a resting place for both common pipistrelle and brown long-eared bats.

3.2 On-site Conditions

3.2.1 Most of the Site is agricultural habitat and, as such, there is little vegetation cover. This, in addition with a large amount of ambient light from nearby settlements, including Lincoln City approximately 10km east, means the Site is fairly light at night.

3.2.2 Given the rural nature of the Site, artificial lighting is limited to villages, such as North and South Clifton. Additionally, some illumination is provided along key roadways, including at intersections on the A47 and along the Main Road in Ragnall, near residential homes.

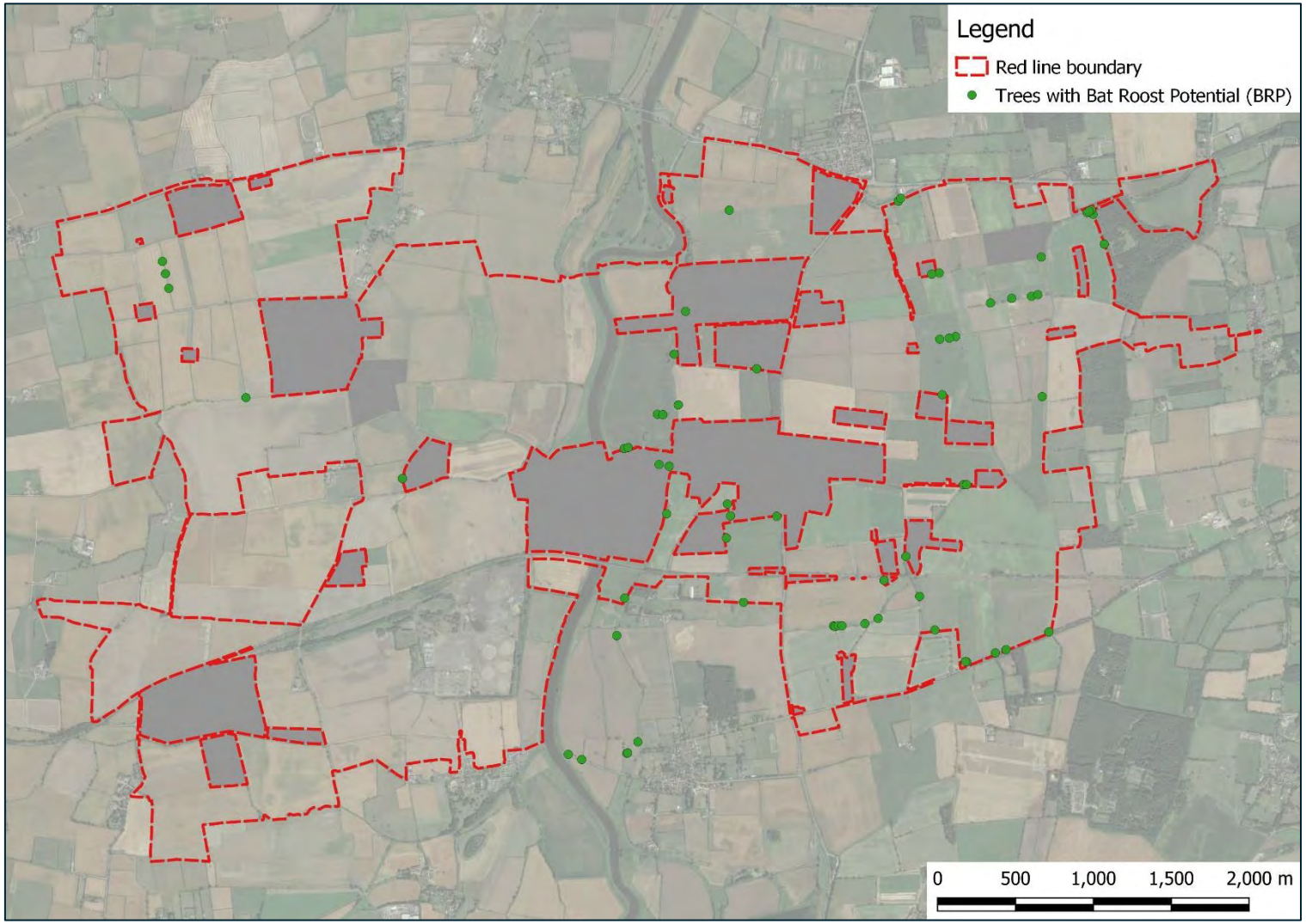
3.3 Preliminary Roost Assessment

Trees

3.3.1 In total, 66 trees were assessed as PRF or FAR, the majority of which were located to the east of the Trent. Species included oak *Quercus robur*, ash *Fraxinus excelsior*, beech *Fagus sylvatica*, willow *Salix sp.*, and poplar *Populus sp.*

3.3.2 Their locations are shown on **Figure 3-1** below, and detailed within **Annex A**.

Figure 3-1: Overall locations of trees with bat roost potential



3.4 Bat Activity

Scoping

3.4.1 The Site is comprissed of habitats that are generally of low suitability for bats. Over 85% of the Site is agricultural habitat (arable fields), with generally small, intensively managed field margins and species-poor hedgerows. Higher quality commuting and foraging habitat is present, with a network of wet ditches throughout the Site, the River Trent with associated floodplain grazing marsh, and nine woodland blocks to the east of the River Trent.

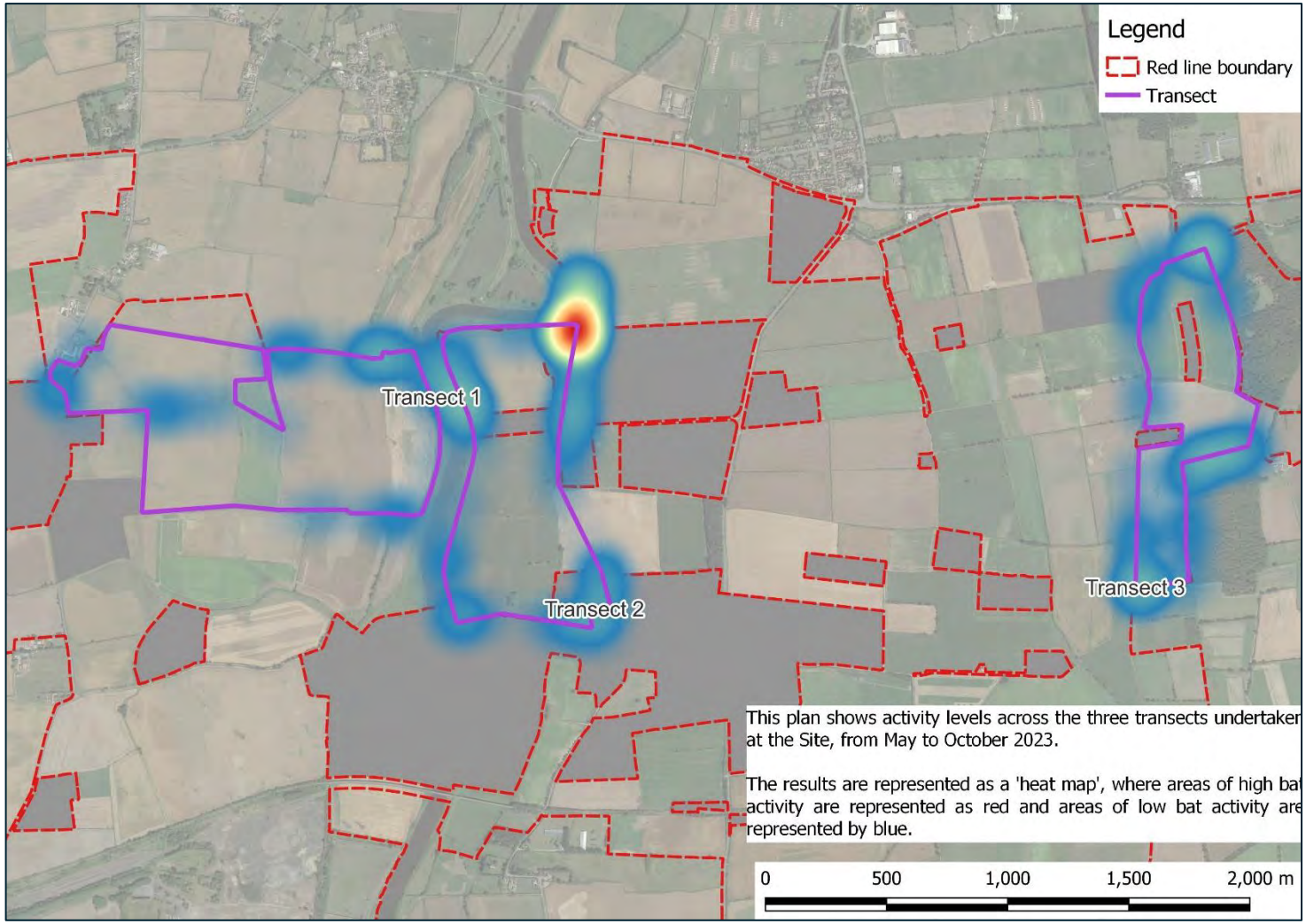
Transect Survey

3.4.2 A minimum of seven species were recorded during the three transect routes surveyed:

- Barbastelle
- Common pipistrelle
- Soprano pipistrelle
- Noctule
- Serotine
- Brown long-eared bat
- *Myotis* sp.

Figure 3-2 presents a heat map of bat activity recorded over the survey period, where light blue shows areas of low activity, and red shows areas of high activity. Overall, the highest levels of bat activity were identified around higher quality habitats such as woodland, floodplain grassland and the River Trent.

Figure 3-2: Bat activity levels across the Site



Barbastelle

3.4.3 The least recorded species during the transect surveys, only being recorded once in August at 22:18 (92 minutes after sunset), along the woodland edge in the southeast of the Site.

***Pipistrellus* sp.**

3.4.4 Common pipistrelle was the most frequently recorded species during the survey, accounting for 70.93 % of all passes, and were found throughout all habitat types of the three transect routes. Although higher levels were recorded along woodland edges and along the River Trent, common pipistrelles were also recorded commuting through open arable fields. In addition, common pipistrelle was generally the first bat recorded, ranging from 31-55 minutes after sunset for Transect 1, 12-30 minutes for Transect 2 and 36 minutes for Transect 3. Activity levels in each season was broadly similar, although a peak was recorded in summer (~226 files), compared to spring and autumn (~186 and ~181 files, respectively).

3.4.5 Soprano pipistrelle was the second most frequently recorded species (11.96 % of all passes), with most of their activity recorded around woodland habitat. In Transect 1, soprano pipistrelles were seen commuting along the northern treeline and ditch, foraging and commuting within the woodland in the north of Transect 2 and foraging and commuting along the woodland edges in the east of Transect 3.

Big bat (Noctule/Serotine/Leisler's bat)

3.4.6 Noctules were recorded at species level, accounting for 8.61 % of all passes and recorded in 3 transects. They were mainly recorded commuting across open arable habitat commuting and along the River Trent. They were the first bats recorded in Transect 3 for the summer and autumn surveys, where they were seen commuting across the Site, towards the woodland 9 and 15 minutes after sunset. Peak activity levels were recorded in summer.

3.4.7 Serotine was recorded at species level only twice within Transect 3, these records were subsequently sent to an acoustic specialist and confirmed to be an atypical call of noctule.

3.4.8 In addition, 1.79 % of all passes were recorded as 'big bat'. These were all recorded in autumn, across all three transects. They were recorded across all habitat types, seen commuting through open arable fields, along the River Trent, woodland edges and wet ditches.

Brown long-eared

3.4.9 Brown long-eared bat were only recorded in Transect 2 and 3, with two passes in both spring and summer, accounting for only 0.48 % of all passes. In Transect 2, records were near the village of North Clifton and in Transect 3, they were recorded along woodland edge and a wet ditch.

***Myotis* sp.**

3.4.10 Myotis sp., was the third most recorded species or species group, accounting for 5.86 % of all passes, and recorded on all three transect routes. In Transect 1, *Myotis* was recorded in the north, near a patch of trees and a pond; in Transect 2, they were recorded within the woodland and along the River Trent; and in Transect 3, they were recorded around the whole route, with highest activity levels along woodland edge in the east. Similar to common pipistrelle, there was not much difference in activity levels across the seasons, with the highest levels recorded in spring (20 passes), followed closely by summer (18) and lowest levels recorded in autumn (11).

Static Acoustic Monitoring

3.4.11 At least seven species of bat were identified during the static acoustic monitoring:

- Barbastelle
- Common pipistrelle
- Soprano pipistrelle
- Nathusius' pipistrelle
- Noctule
- Brown long-eared bat
- *Myotis* sp.

3.4.12 A summary of the results is provided in **Table 3-2**, showing the average number of files per night, for each species or species group, at each location. **Figures 3-3** and **3-4** show the average number of files per night, per species in each location and **Figures 3-5** and **3-6** show the average number of files per night; per species during each monitoring period.

3.4.13 Owing to the high proportion of common and soprano pipistrelle species recorded, a division has been implemented to enhance the visibility of lesser recorded bats on the graphs.

Table 3-2: Average number of files per night in 2023

Species/Species group	Transect 1		Transect 2		Transect 3		Total
	East static	West static	North static	South static	North static	South static	
Barbastelle	1.07	0.00	0.00	1.58	1.78	3.00	**7.43**
Common pipistrelle	244.67	212.73	687.57	261.00	811.22	360.82	**2578.01**
Soprano pipistrelle	24.53	4.60	111.14	13.75	79.89	33.18	**267.10**
Nathusius' pipistrelle	0.40	0.33	1.57	0.00	0.33	0.00	**2.64**
Big bat	0.13	4.80	22.57	7.83	1.67	10.64	**47.64**
Noctule	0.07	0.67	50.57	2.67	0.67	7.91	**62.55**
Brown long-eared	6.53	1.07	3.29	10.75	4.56	15.45	**41.65**
Myotis sp.	18.07	1.73	11.43	38.75	49.56	49.18	**168.72**

Figure 3-3: Average number of files per night, for each species, at each monitoring location

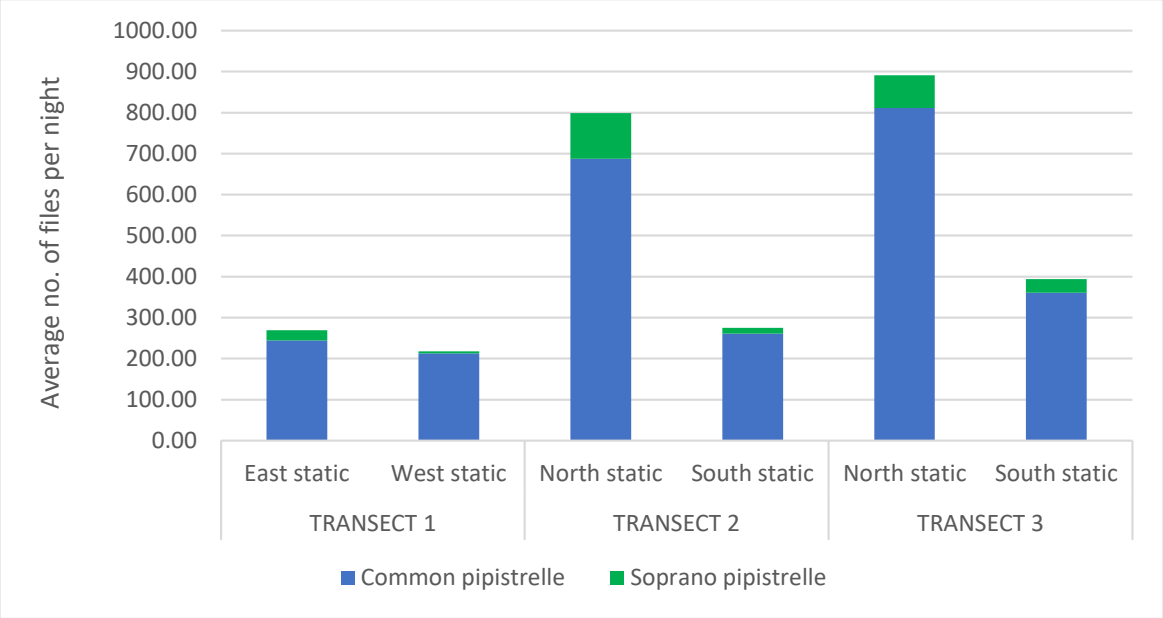


Figure 3-4: Average number of files per night, for each species, at each monitoring location

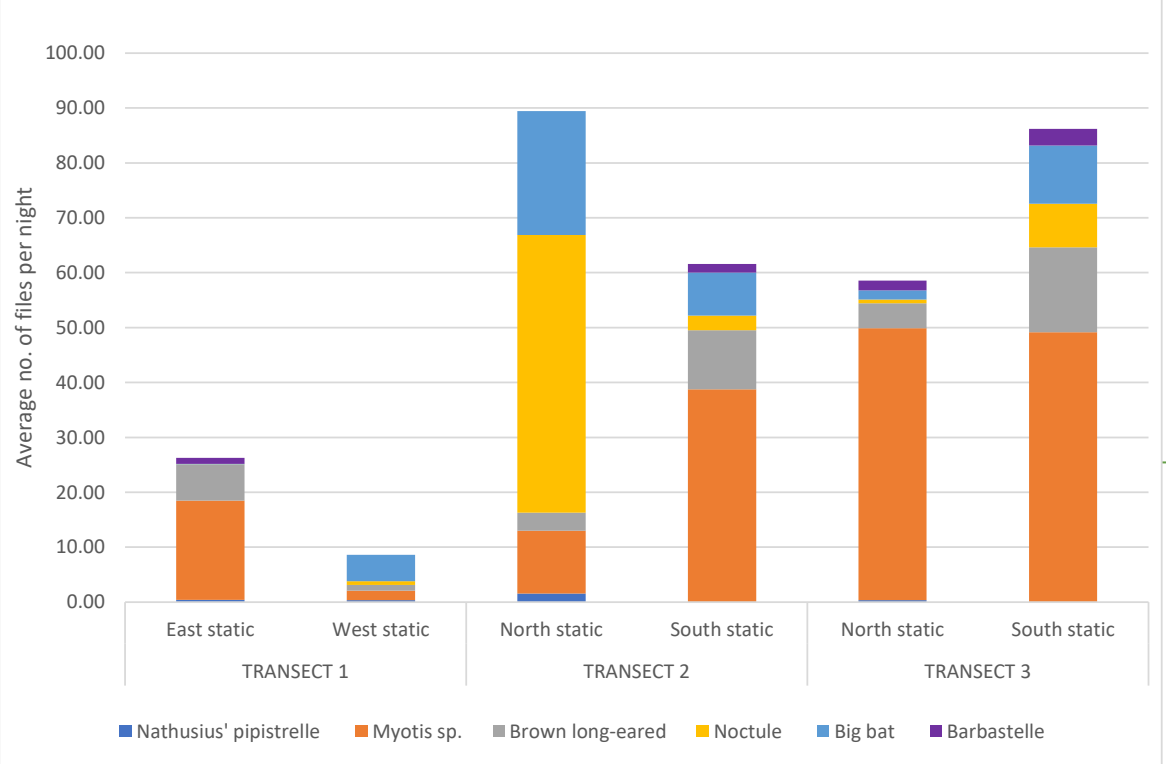


Figure 3-5: Average number of files per night for common pipistrelle, during each monitoring period

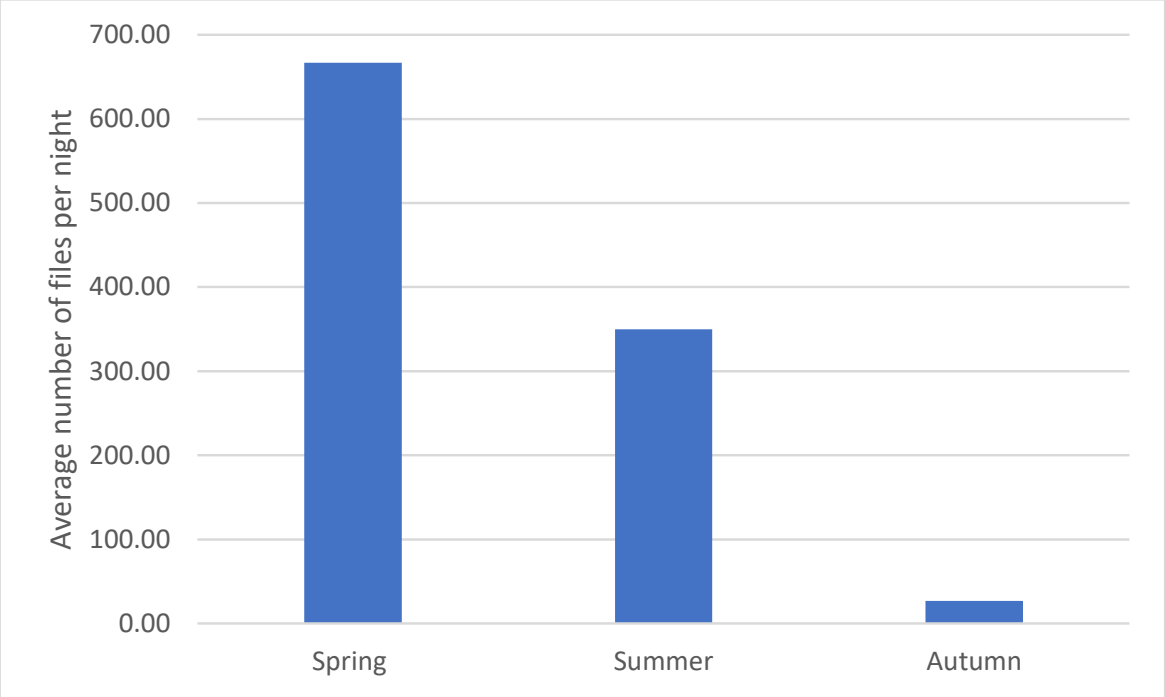
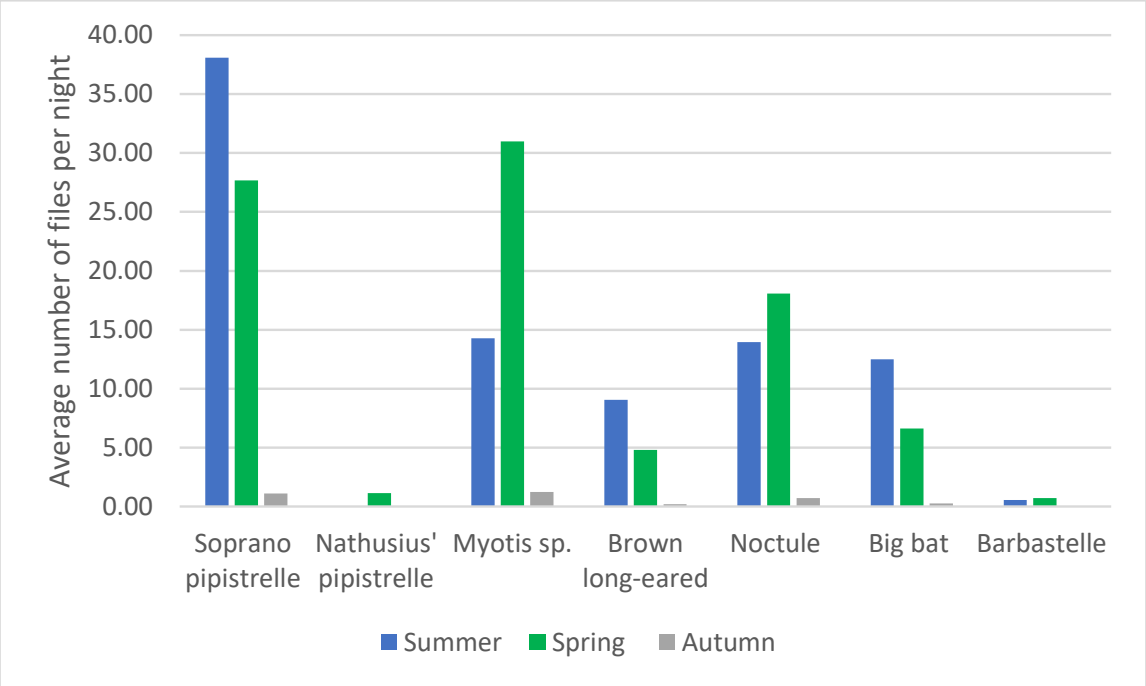


Figure 3-6: Average number of files per night, for each species, during each monitoring period



Barbastelle

3.4.14 Barbastelle accounted for 0.23 % of all files recorded during the static acoustic monitoring, making it the second least recorded species. It was recorded at all static locations bar the western static in Transect 1 and the southern static in Transect 2. Highest levels of activity were recorded in the southern static of Transect 3 and within the spring monitoring period.

Pipistrellus sp.

3.4.15 Following the same trend as for transect survey, common pipistrelle was the most frequently recorded species, accounting for 81.18 % of all files recorded. This species was found across all six static locations, with activity levels peaking within the northern static of Transect 3 and within the spring monitoring period.

3.4.16 Soprano pipistrelle were the second most recorded species, accounting for 8.41 % of all files recorded. This species was recorded at all six static locations, with activity levels peaking within the northern static of Transect 2 within the summer monitoring period.

3.4.17 Nathusius' pipistrelle was the least recorded bat species, with only 72 files (0.08 %) recorded throughout. This species was found at both static locations in Transect 1 and both northern static locations in Transects 2 and 3. Activity levels peaked with an average of 1.57 passes within the northern static of Transect 2. The highest levels of activity were recorded in spring, with none of the static locations recording Nathusius' pipistrelle within the summer monitoring period.

Big bat (Noctule/Serotine/Leisler's bat)

3.4.18 Big bat accounted for 1.50 % of all files and were found across all six static locations. Activity levels peaked within the northern static of Transect 2 during the summer monitoring period.

3.4.19 1.97 % of all files recorded were identified at species level for noctule. Similar to the activity recorded for the big bat species group, this species was recorded at all six locations, with activity levels peaking at the northern static in Transect 2. Unlike the big bat species group however, noctule were observed to have higher activity levels in the spring monitoring period.

Brown long-eared bat

3.4.20 Brown long-eared bat accounted for 1.31 % of all files, making it the third least recorded species during the monitoring period. It was recorded at all static locations, with peak activity levels within the southern static of Transect 3 and within the summer monitoring period.

***Myotis* sp.**

3.4.21 The third most recorded species or species group during the monitoring period, *Myotis* accounts for 5.31 % of all recorded file. This species group was recorded across all six static locations, with peaks within Transect 3, where both northern and southern statics recorded a similar average number of files per night (49.56 and 49.18) respectively. The spring monitoring period yielded the highest activity levels.

4 Summary

4.1 Overview

4.1.1 Sixty-six trees within the Site were unable to be fully assessed or were assessed as providing potential to support roosting bats.

4.1.2 Activity survey results indicate a minimum of seven species of bat recorded across the Site, between April and October 2023.

4.1.3 **Table 4-1** presents a summary of the bat species recorded within, or potentially occurring within, the Site in line with desk study and activity survey results.

Table 4-4-1: Species occurring or potentially occurring on the Site

Species	Desk study	Field survey	Summary
Barbastelle	✓	✓	This species was confirmed on-Site in the desk study and the activity surveys. It was the second lowest recorded species during the static monitoring surveys and recorded only once during the transect surveys and was found along woodland edges. Their status on-Site is consistent with their UK status, as barbastelle are rare, with a restricted range, having a close association with ancient woodland habitat.
Common pipistrelle	✓	✓	Common pipistrelle was identified in the desk study and the activity surveys. They were the most frequently recorded species, foraging and commuting across the Site over the entire survey/monitoring period. These findings are consistent with the species status in the UK, which is common and widespread throughout England and Wales
Soprano pipistrelle	✓	✓	This species was identified in the desk study and in the activity surveys. Soprano pipistrelles were the second most frequently recorded species on the Site, recorded as a result of surveys and monitoring. This species is common and widespread in the UK but is typically associated with riparian and open water habitat.
Nathusius' pipistrelle	×	✓	Nathusius was only recorded during the acoustic monitoring survey and was the least recorded bat species. Although they are typically associated with riparian habitats, particularly near the eastern and southern coasts, they have a patchy distribution across mid and southern England and across Wales.

Species	Desk study	Field survey	Summary
Noctule	✓	✓	Noctule were confirmed on-Site by the desk study as well as the activity surveys. They also have the potential to be roosting on-Site in trees with suitable features. They were recorded frequently across the Site, to species level and within the 'NSL' species group and were recorded both commuting and foraging. This is to be expected as this species is common in England and Wales.
Leisler's bat	✓	Possible	This species was identified in the desk study and potential recorded in the activity surveys to 'NSL' level. This species is widespread but with patchy distribution, possibly due to the difficulty in acoustic identification of this species.
Brown long-eared bat	✓	✓	*Plecotus* species cannot be differentiated by acoustics alone. However, due to the restricted range of grey long-eared bat, it is likely that all records are that of brown long-eared bat. Brown long-eared were recorded within the desk study and during the transect and monitoring surveys. This species is common and widespread in England and Wales, although the quiet calls typical of this species may result in the under-representation of them on the Site.
Daubenton's bat (*Myotis daubentonii)*	✓	Possible	Myotis sp., is the third most recorded species (*Myotis* sp.) and were recorded within the data search during transect and static monitoring surveys. This species group may be under-represented on the Site due to the quiet calls typical of this genus. Daubenton's bats are closely associated with riparian habitat.
Natterer's bat (*Myotis nattereri)*	✓	Possible	Myotis sp., is the third most recorded species (*Myotis* sp.) and were recorded within the data search during transect and static monitoring surveys. This species group may be under-represented on the Site due to the quiet calls typical of this genus. Natterer's bat are closely associated with woodland habitat.
Bechstein's bat	✓	Unlikely	Myotis sp., is the third most recorded species (*Myotis* sp.) and were recorded within the data search during transect and static monitoring surveys. This species group may be under-represented on the Site due to the quiet calls typical of this genus. This species is

Species	Desk study	Field survey	Summary
			rare in the UK, with a known range restricted to the south of England and Wales. This is, in part, due to their close association with ancient woodland, typically requiring extensive parcels of woodland. As such, they are unlikely to occur on the Site.
Whiskered bat (*Myotis mystacinus)*	✓	Possible	Myotis sp., is the third most recorded species (*Myotis* sp.) and were recorded within the data search during transect and static monitoring surveys. This species group may be under-represented on the Site due to the quiet calls typical of this genus. Whiskered bats favour woodland habitat.
Alcathoe's bat (*Myotis alcathoe)*	✓	Unlikely	Myotis sp., is the third most recorded species (*Myotis* sp.) and were recorded within the data search during transect and static monitoring surveys. This species group may be under-represented on the Site due to the quiet calls typical of this genus. Alcathoe's bat has a restricted range, primarily Sussex and Kent, however, this may be in part due to the difficulty in acoustic and visual identification of this species, which was only acknowledged as a separate species (from Whiskered bats) in 2010. Alcathoe's bats favour woodland habitat.
Brandt's bat (*Myotis brandtii)*	✓	Possible	Myotis sp., is the third most recorded species (*Myotis* sp.) and were recorded within the data search during transect and static monitoring surveys. This species group may be under-represented on the Site due to the quiet calls typical of this genus. Brandt's bats are under-recorded in the UK, they are woodland specialists.

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A1 – Details of Preliminary Roost Assessment

Figure A-5-1: Locations of trees with bat roost potential in the west

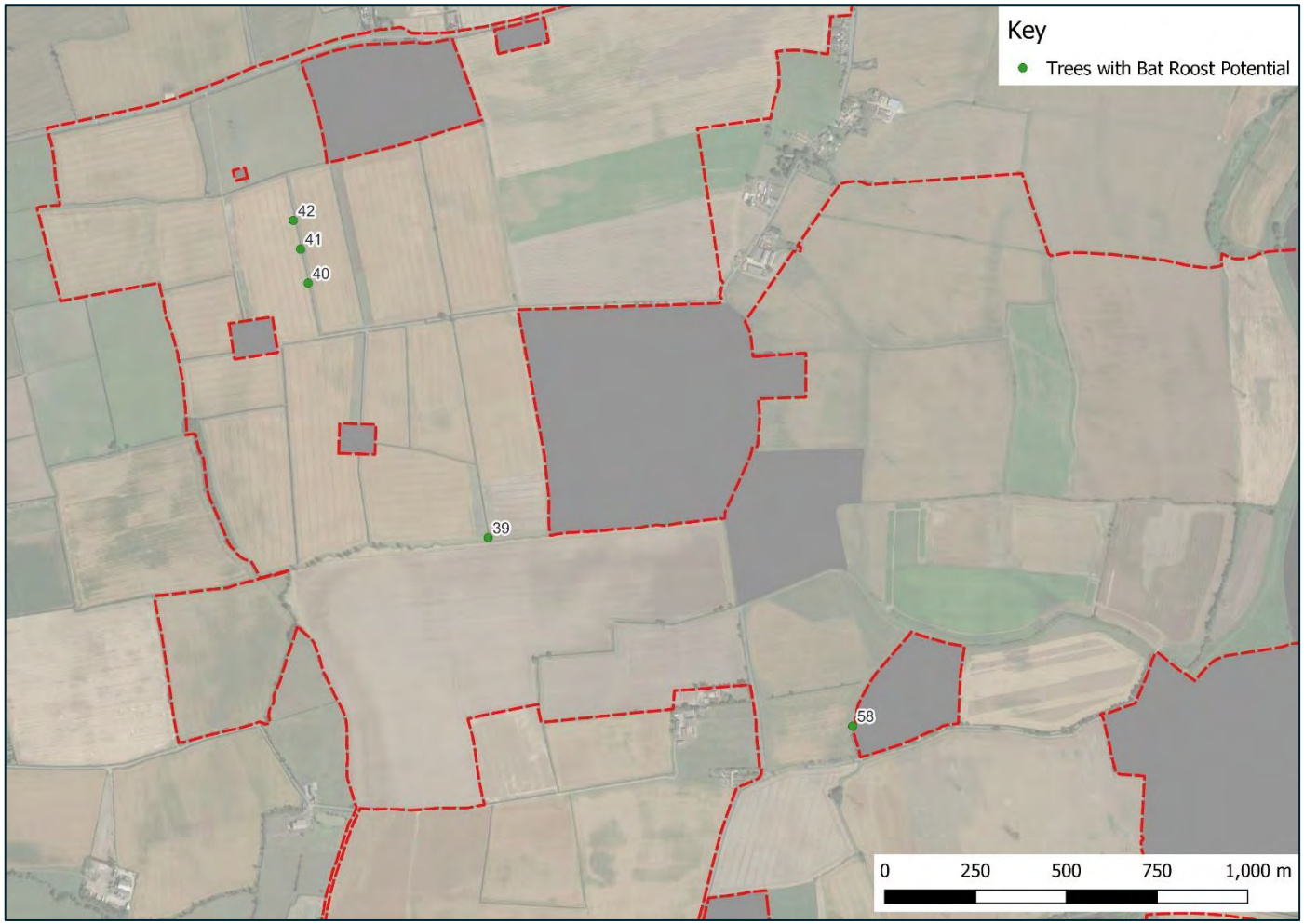

Figure A-5-2: Locations of trees with bat roost potential in the south

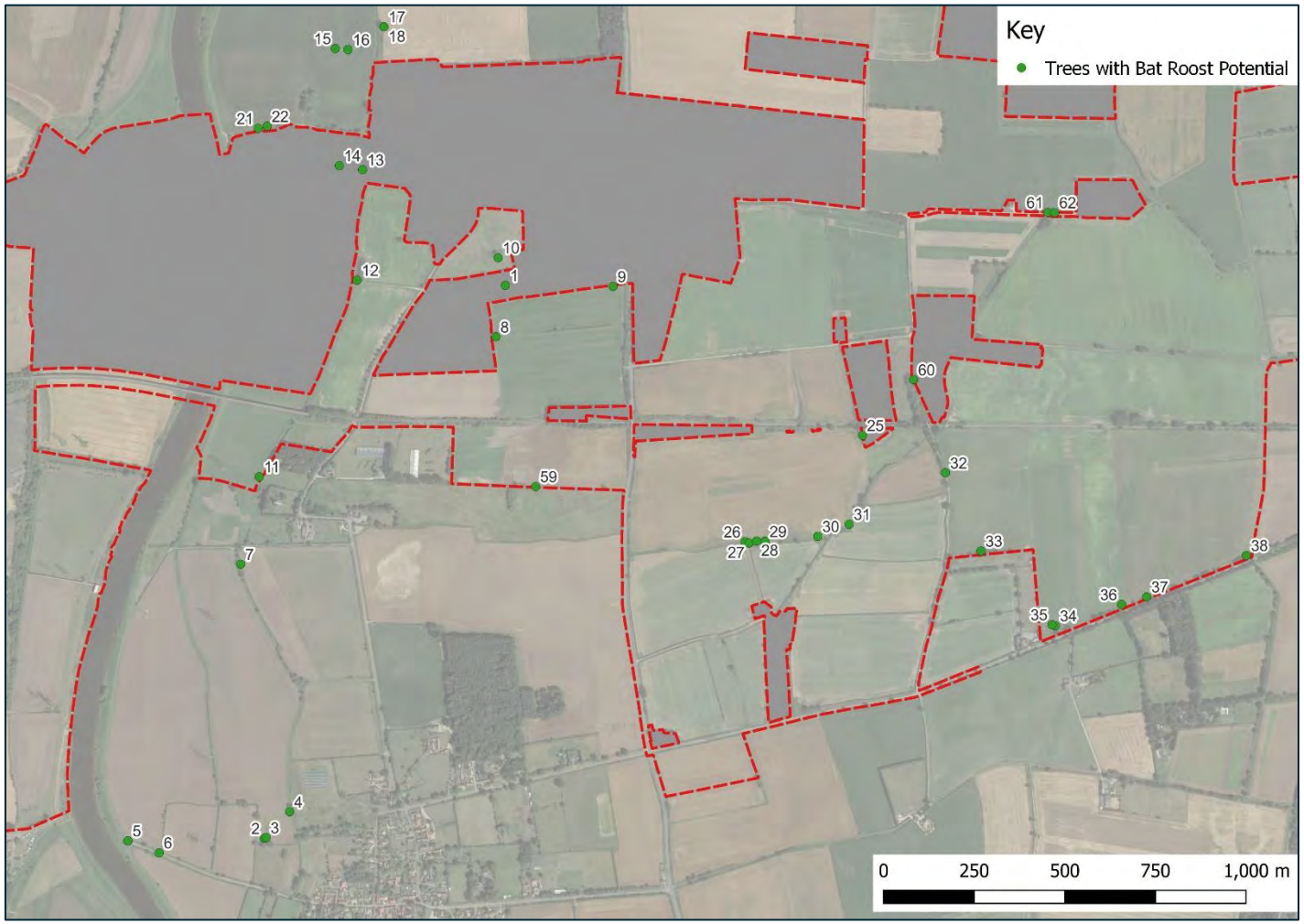

Figure A-5-3: Locations of trees with bat roost potential in the east

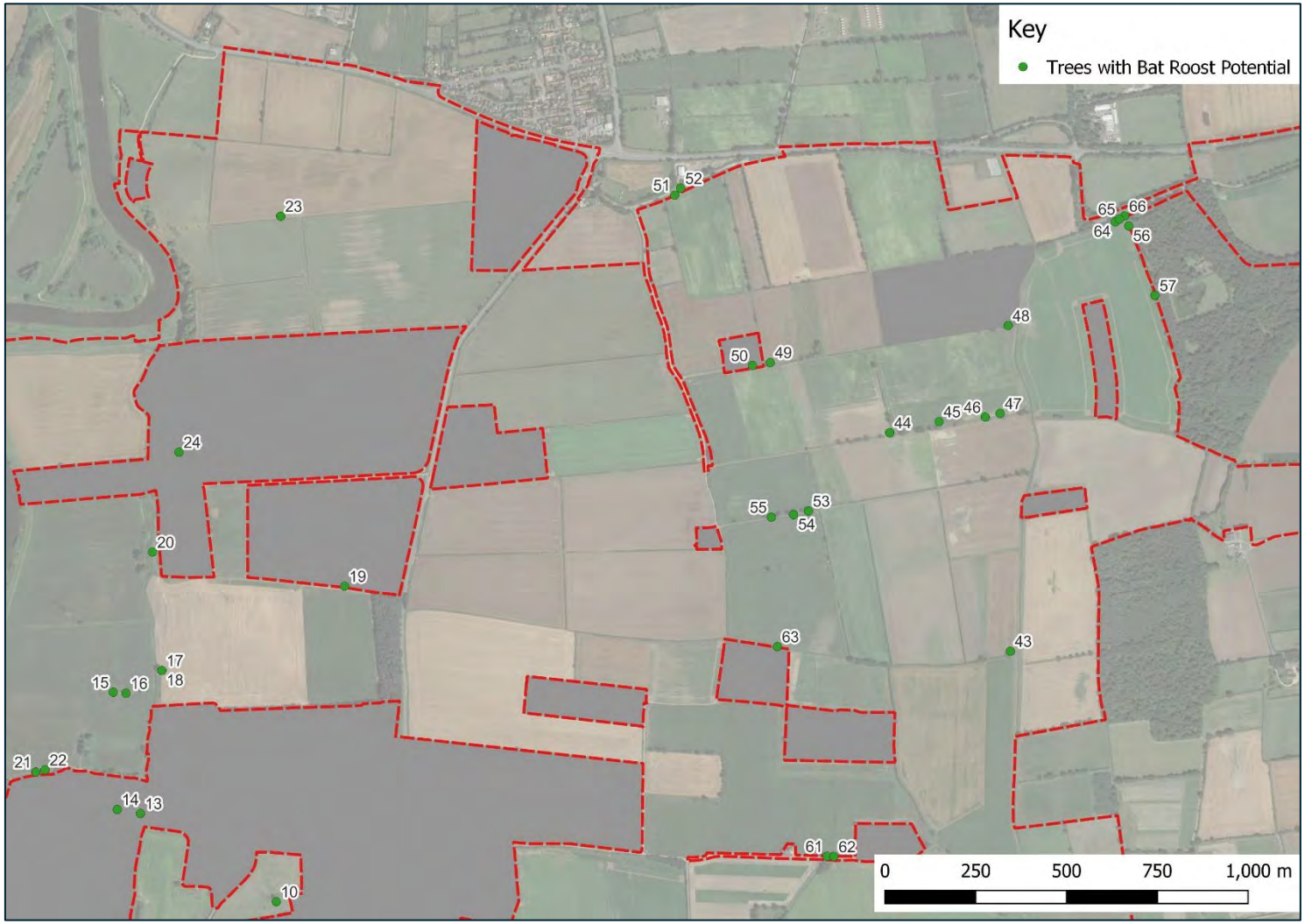

Table A-5-1: Results of Preliminary Roost Assessment

Tree ID	Species	Features
1	Oak	Lifted bark
2	Oak (southern tree)	Barn owl box
3	Ash (western)	Knot hole
4	Ash	None (restricted vis)
5	Oak	None (restricted vis)
6	Oak	Tear out
7	Ash	Dense ivy
8	Ash	Tear out
9	Oak	None (restricted vis)
10	Oak	Lifted bark and splits
11	Crack willow	Tear outs and cracks
12	Ash	Knot holes
13	Ash	None (restricted vis)

Tree ID	Species	Features
14	Ash	Knot hole and ivy
15	Ash	Knot holes
16	Ash	Knot holes
17	Oak	None (restricted vis)
18	Oak	None (restricted vis)
19	Ash	Tear out
20	Poplar	Woodpecker/knot holes
21	Ash	Woodpecker hole
22	Ash	Tear out on limb
23	Oak	Hollow stem
24	Oak	Barn owl box
25	Ash	Tear out
26	Oak	Gaps round heartwood
27	Oak	Knot hole
28	Oak	Knot hole

Tree ID	Species	Features
29	Oak	Knot hole
30	Oak	Tear out and cracks
31	Ash	Knot hole
32	Oak	Dead wood
33	Oak	Woodpecker hole
34	Oak	Knot hole
35	Oak	Dense ivy
36	Oak	Knot hole
37	Oak	Knot hole
38	Oak	Dense ivy
39	Ash	Knot hole
40	Oak	Massive tear out
41	Oak	Spilt and owl box
42	Oak	None (restricted vis)
43	Oak	Knot holes

Tree ID	Species	Features
44	Oak	Woodpecker holes
45	Oak	Hazard beam
46	Oak	None (restricted vis)
47	Oak	Tear out
48	Oak	Tear out
49	Oak	None (restricted vis)
50	Oak	Woodpecker holes
51	Ash	Knot hole/tear out
52	Ash	Hole in dead wood
53	Oak	Multiple
54	Oak	Barn owl box
55	Oak	Tear out
56	Oak	Knot hole
57	Oak	Multiple woodpecker holes
58	Ash	Broken limb
59	Willow	Cracks

Tree ID	Species	Features
60	Beech	Cracked limb
61	Ash	Holes in base
62	Oak	Multiple woodpecker holes 5m up
63	Oak	Large crack
64	Oak	Cracks
65	Oak	Cracks
66	Oak	Cracks

Appendix 7-4: Breeding Bird Baseline

Report

One Earth Solar Farm

Appendix 7-4: Breeding Bird Baseline

For One Earth Solar Farm Ltd

17 May 2024

Document control

Project Title:	One Earth Solar Farm
Project Number:	14529A
Client:	One Earth Solar Farm Ltd
Document Title:	Appendix 7-4: Breeding Bird Baseline
Document Number:	14529A-A
Prepared By:	Craig Brookes
Reviewed By:	Alan Kirby

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Contents

Tables

1 Introduction

1.1 Background

1.1.1 This Appendix should be read in conjunction with Chapter 7 of the Preliminary Environmental Information Report (PEIR) which is provided in support of the delivery of an Environmental Impact Assessment (EIA) associated with the One Earth Solar Farm, hereafter referred to as the 'Proposed Development' or 'One Earth'.

1.1.2 This Appendix described the survey methodologies used and summarised the results of the breeding bird surveys undertaken in 2023 within the proposed DCO Order Limits; with emphasis on open farmland habitats including those containing complex ditch and hedgerow networks that have the potential to support important populations of breeding birds.

1.2 Purpose of this appendix

1.2.1 The purpose of the Appendix is to present the results of the breeding bird assessment which was undertaken to identify and assess the assemblage of breeding birds potentially impacted by the Proposed Development.

1.2.2 Surveys were completed within the breeding period between May and July in 2023 (where breeding species are most likely to be encountered) following an adapted method based on the British Trust for Ornithology's (BTO's) Common Bird Census (CBC) methodology (Gilbert *et al.*, 1998).

1.2.3 The breeding bird surveys were designed to identify the distribution, density and activities of breeding birds within an appropriate sampling area within the DCO Order Limits. This sampling area targeted habitats representative of the DCO Order limits that are likely to support breeding bird assemblages.

1.3 Structure of this appendix

1.3.1 This appendix is structured as follows:

- Section 2: Methods;
- Section 3: Results;
- Section 4: References;
- Annex A: Figures;
- Annex B: Species recorded during the breeding bird survey;
- Annex C: Full survey details; and
- Annex D: Territory mapping criteria.

2 Methods

2.1 Desk Study

2.1.1 An environmental desk study was undertaken to identify statutory designated sites of international and national importance for ornithology within 10km of the proposed DCO Order Limits, and non-statutory designated sites of ornithological importance within 2km of it. The search for statutory sites was carried out using the Multi-Agency Geographic Information for the Countryside (MAGIC) website (an internet-based Geographic Information Systems database provided by the Department for Environment, Foods and Rural Affairs (DEFRA) (Defra, 2024)) and for non-statutory sites through a data request to Greater Lincolnshire Nature Partnership (GLNP). Information on statutory designated sites was gathered from the websites of Natural England (Natural England, 2024) and the Joint Nature Conservation Committee (JNCC) (JNCC, 2024).

2.1.2 In addition to information on designated sites, species specific data was gathered from GLNP within 2km of the proposed DCO Order Limits.

2.2 Breeding bird surveys

2.2.1 Breeding bird surveys were undertaken between May and July 2023 inclusive. The purpose of the breeding bird survey was to collect data to confirm the typical distribution and assemblages of species present within the area surveyed (See **Section 3.1**)

Data collection locations

2.2.2 The survey adopted a sampling approach and focused on large areas of accessible land within which the breeding bird assemblage has the potential to be impacted by the proposed development. The survey area covered 633 hectares (ha) of the 1478 ha red-line boundary, at the time of survey. The survey area covered large areas of open farmland, ditch, and hedgerow complexes on both sides of the river Trent, woodland edge habitats (east of the river Trent) and linear features including the river Trent corridor and the embankment of the dismantled railway line that runs east-west through the Site serving as a functional Sustrans Route 647. The survey was undertaken based on the proposed DCO Order Limits, plus a 50m buffer, where the survey areas directly overlapped Order Limits, information was gathered for birds outside of the Order Limits.

2.2.3 For the purposes of the breeding bird survey, this area was divided into five survey areas. These survey areas received systematic coverage with surveys undertaken by a single surveyor to avoid duplication of counting or overlap of adjacent area recordings (**Figures 2.1 to 2.1e**, **Annex A**). Data from all survey areas was combined for reporting purposes.

2.2.4 Area 1: lies within the northwest of the Site boundary and includes areas of open farmland (with predominantly large rectangular fields), divided in places by narrow hedgerows and ditches. This area covers approximately 136 ha of land and includes a proposed battery storage facility adjacent to the Sustrans route 647, northwest of the National Grid substation at High Marnham. The area is dominated by cereal crop production including wheat and oil seed rape.

2.2.5 Area 2: abuts Area 1 to the southeast and continues south- and eastwards from the hamlet of Ragnall toward Fledborough. This area covers approximately 168 ha and consists of a large expanse of agricultural crop fields including examples of the largest agricultural fields within the DCO Order Limits. These large fields were predominantly used for wheat and oil seed rape production with boundary features of hedgerows and overgrown ditches also present. The area includes a agricultural land considered as coastal floodplain grassing marsh (on the priority habitat inventory) on the west of the river Trent. Three agricultural fields east of the river Trent are also within Area 2, these fields are set

back from the Trent corridor to the north of a small off-site reservoir and west of the A1133 road. These fields are bordered by intact hedgerows and small treelines, which reach approximately 5 metres (m) high in places.

2.2.6 Area 3: Consists of approximately 70 ha of agricultural fields directly east of the river Trent between the villages of South- and North Clifton. These large fields are bordered by linear features including hedgerows and ditches. To the immediate west of the Area is the river Trent, with Church Lane immediately east. These arable fields were cropping wheat, legumes and sports turf during the breeding bird survey period.

2.2.7 Area 4: Includes two satellite parcels of agricultural land within the land east of the river Trent. The largest area, approximately 66 ha, lies immediately east of the river Trent on low-lying agricultural land used for crop production. This area includes fields north of Trent Lane between the river corridor escarpment to the east and the river to the west. This land was used for wheat production and also had a set-aside or sacrificial crop used for game cover. Along the eastern side of these fields there is a large pond and ditch network (the Sewer Dyke) which forms a transitional habitat from low-lying agricultural land into a scrub / wooded escarpment. The other parcel of land within Area 4 consists of 45 ha of agricultural cropland east of the A1133, located immediately north of the decommissioned railway (Sustrans Route 647) which forms a proposed location for battery storage within the Site.

2.2.8 Area 5: Includes a large area of agricultural cropland in the northeast of the Site. The area covers approximately 148 ha. At the time of survey these field were cropping mixed cereals and root crops including wheat, oil seed rape, barley, potatoes, legumes, set-aside and sports turf. Well established hedgerows with trees form boundary features to major blocks of fields with smaller defunct hedgerows and ditch systems also present on field edges. There were three small parcels of young plantation woodland within this area and three small stubble fields which had been ploughed through at the time of survey.

2.2.9 Full survey details, including surveyor names, visit dates and times, and weather conditions are available in **Table C-1**, Annex C.

Data collection methods

2.2.10 The surveys followed an adapted method based on the BTO's CBC methodology (Gilbert *et al*., 1998), whereby the observer undertakes a census of all species present. The location of each bird detected (visually and / or aurally) was mapped using the standard two-character BTO codes, and bird activity was recorded using standard behaviour codes (Marchant, 1983).

2.2.11 Survey visits were undertaken between May and July 2023, at broadly 10-day intervals from the previous visit.

2.2.12 Six survey visits were undertaken during the 2023 breeding season: one in Mid-May, three in June (early, mid-month and late in the month) and two in July (Early and mid-month).

2.2.13 All surveys were undertaken in favourable conditions, avoiding periods of heavy rain, or strong or cold winds, therefore minimising variation in bird activity levels due to weather conditions.

2.2.14 Visits started at least half and hour after dawn and were completed no later than midday, with an exception during visit four (See Deviations, constraints, and limitations section (paragraphs 2.2.19 to 2.2.22).

2.2.15 A different route (start and end point) was used on each survey visit to ensure that certain parts of the survey area did not receive systematically better coverage due to a possible decline in song (or other breeding bird activity) output later in the morning.

Territory mapping

2.2.16 On completion of the field survey, results were collated and analysed, and provided as maps of indicative territory centre-points, made across all visits within the survey period. Territory mapping analysis was based on criteria adapted from Amar *et al*. (2006) (See **Annex D**) and involved an experienced ornithologist looking for spatial groupings of song registrations.

2.2.17 No temporal restrictions have been applied, such that any grouping within more than one visit represented, or consisting of at least one registration of song, has been assessed as a territory. These data have been used to determine the number and distribution of species, and overall breeding assemblage within the survey area.

2.2.18 As territory location were derived from a combination of mapped visits (as per the CBC methodology (Gilbert *et al*., 1998)); it should be noted that mapped territory locations represent indicative breeding territories and not specific nesting locations.

Deviations, constraints and limitations

2.2.19 Surveys were conducted within a sampling area based on the potential for habitats within the DCO Order Limits to provide breeding bird habitat. The sampling area focussed on areas with higher habitat diversity within the DCO Order Limits to assess greater quality habitats for breeding birds and form a baseline (worst case scenario) that can be used to assess the potential impacts of the proposed development. In undertaking these surveys during the early stages of the Scheme, areas subject to survey may no longer fall within the DCO Order Limits at submission, similarly additional areas outside of the current DCO Order Limits may be brought forwards for inclusion with the Scheme. This represents a limitation and constraint to the overall breeding bird assessment of the scheme as potential breeding bird information provided below may no longer be relevant at submission. This limitation, along with the solution to provide a robust assessment will be discussed further within the ES.

2.2.20 During the field survey, there were deviations from the methodology during visits four, five and six within selected Areas; with surveys continuing beyond midday to ensure full survey coverage. During visit four in Area 5, surveys were completed by 12:45, with surveys in Area 2 completed by 14:45. During visit five in Areas 1 and 2 surveys were completed by 13:55, to avoid inclement and sub-optimal weather in the following days. During visit 6 in Area 2, surveys were completed by 13:30, 90 minutes after suggested timings. There were no deviations, constraints, or limitations within Areas 3 or 4.

2.2.21 Surveys were conducted between May and July having commenced slightly later within the field season than would normally be considered appropriate (April – mid-June). However, given the habitats present within the Site and the continuation of surveys beyond mid-June to capture further breeding evidence and provide a robust evidence base for the breeding bird assemblage, it is not considered that this limitation has had a negative impact on the overall breeding bird assessment.

2.2.22 Despite the deviation, constraints and limitations describe above, the dataset is considered to provide a robust approximation of the breeding bird assemblage within the survey area. This conclusion can be drawn as constraints and limitations faces within the breeding bird assessment were not extensive enough to negatively impact the territory mapping exercise undertaken following the completion of the surveys. Further the areas sampled as part of this assessment include the areas most likely to present increased species diversity and density therefore using these areas to extrapolate potential impacts on the overall breeding bird assemblage will create a robust baseline. Expansive areas of open arable land which were not subject to breeding bird survey are considered to be of limited importance to breeding birds due to the homogeneity of the habitats and lack of suitable nesting cover within woody vegetation.

3 Results

3.1 Statutory designated sites of ornithological importance

3.1.1 There are no nationally or internationally statutory designated sites of ornithological importance within 10km of the DCO Order Limits.

3.2 Non-statutory designated sites of ornithological importance

3.2.1 There are no non-statutory designated sites of ornithological importance within 2km of the DCO Order Limits.

3.3 Species records

3.3.1 As part of the environmental desk study, species data for birds likely to be breeding within, or in proximity to the DCO Order Limits was gathered from GLNP. Species data was screened to include all records within the breeding season (here considered to be 1st March – 31st August inclusive) from within the last ten years.

3.3.2 GLNP returned 40 records of 19 species considered to be notable[1] during the breeding season, including:

- Six Schedule 1 listed species – barn owl, corncrake, hobby, kingfisher, marsh harrier and red kite.
- 11 Species of Principal Importance (SPI) (Natural Environment and Rural Communities Act (NERC), 2006) – bullfinch, corncrake, cuckoo, house sparrow, lapwing, linnet, reed bunting, skylark, song thrush, yellowhammer, and yellow wagtail.
- Nine birds of conservation concern[2] (BoCC) Red-listed species – corncrake, cuckoo, house sparrow, lapwing, linnet, skylark, swift, yellowhammer, and yellow wagtail.

3.3.3 Further details of the GLNP records can be found within Appendix 7-2 (Document Reference: Ecology Desk Study).

3.4 Breeding bird survey

3.4.1 A total of thirty-nine species were recorded breeding or holding territory during the breeding bird survey (See **Figures 3.1a** to **3.1m**, **Annex A**), of which:

[1] GLNP returned records of birds considered notable if listed as local priority species (Listed as UK Biodiversity Action Plan (UK BAP) species), protected by Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) or priority species listed on Birds of Conservation Concern 5 – Red List.
2 BoCC Red list = The background to the establishment of a 'traffic light system' of conservation concern for UK birds is discussed in Gregory et al. (2002). The updated criteria and lists are detailed in Stanbury et al. (2021). Broadly, 'Red-listed' species include those that are globally threatened, have suffered a historical population decline in the UK (between 1800 and 1995) or which have experienced rapid declines in their UK breeding population or contractions in their UK range of more than 50% over the past twenty-five years. Amber-listed' species include any species on the European Red List (Critically Endangered, Endangered or Vulnerable), these are detailed in Stanbury et al. (2021).

- Three species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended): barn owl, hobby and quail;
- Ten species listed as SPI: dunnock, grey partridge, house sparrow, linnet, reed bunting, skylark, song thrush, turtle dove, yellowhammer, and yellow wagtail.
- Nine species recorded as BoCC red-listed species: greenfinch, grey partridge, house martin, house sparrow, linnet, skylark, turtle dove, yellowhammer, and yellow wagtail.

3.4.2 **Table 3.1**, below, presents the total number of territories for each species within the survey area, along with any legislative protection or conservation status.

Table 3-1 – Territory assemblage recorded during breeding bird surveys

BTO code	Species	Number of territories	Sch. 1[3]	SPI[4]	BoCC[2]
BO	Barn owl	1	✓		Green
B.	Blackbird	28			Green
BC	Blackcap	10			Green
BT	Blue tit	2			Green
BZ	Buzzard	4			Green
C.	Carrion crow	2			Green
CH	Chaffinch	40			Green
CC	Chiffchaff	12			Green
CD	Collared dove	1			Green
D.	Dunnock	10		✓	Amber
GO	Goldfinch	5			Green
GT	Great tit	7			Green
GR	Greenfinch	5			Red
P.	Grey partridge	3		✓	Red
HY	Hobby	1	✓		Green
HM	House martin	3			Red

[3] **Sch.1** = listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). These species are afforded additional levels of protection making it an offence to intentionally or recklessly disturb at, or near an 'active nest'. Schedule 1 protection extends to the nest, eggs, and dependent young of a Schedule 1 species.
[4] **SPI** = Species "of principal importance for the purpose of conserving biodiversity" covered under Section 41 (England) of the NERC Act (2006).

BTO code	Species	Number of territories	Sch. 1[3]	SPI[4]	BoCC[2]
HS	House sparrow	12		✓	Red
K.	Kestrel	1			Amber
LW	Lesser whitethroat	1			Green
LI	Linnet	7		✓	Red
LO	Little owl	1			Green
MG	Magpie	1			Green
MA	Mallard	3			Amber
OC	Oystercatcher	3			Amber
PW	Pied wagtail	2			Green
Q.	Quail	2	✓		Amber
RB	Reed bunting	14		✓	Amber
R.	Robin	13			Green
SW	Sedge warbler	12			Green
S.	Skylark	98		✓	Red
ST	Song thrush	9		✓	Amber
SD	Stock dove	1			Amber
SL	Swallow	6			Green
TD	Turtle dove	1		✓	Red
WH	Whitethroat	39			Amber
WP	Woodpigeon	13			Amber
WR	Wren	55			Amber
Y.	Yellowhammer	29		✓	Red
YW	Yellow wagtail	7		✓	Red

The breeding bird assemblage recorded within the survey area is typical of open farmland habitats with limited vegetative cover (aside from seasonal crop) to provide breeding cover. The species assemblage and overall abundance of breeding territories recorded is also typical of open farmland with a reduced species count and a low overall breeding density. As the DCO Order Limits do not

include habitats synonymous with breeding bird habitat, such as woodlands, wetland or areas of continuous scrub, the species list is restricted.

There were noticeable increases in species diversity and abundance within well established marginal features such as those found along the river Trent corridor, the escarpment along the east of the Trent and the woodland and scrub edges within the 50m buffer from the DCO Order Limits. There were also notable increases in breeding bird activity around farmsteads and built infrastructure, with species including collared dove, house martin, house sparrow, little owl, pied wagtail, stock dove and swallow nesting within built up areas.

Barn owl nested off-site within the outbuildings surrounding South Clifton.

A full list of species observed during the breeding bird surveys is available in **Annex B.**

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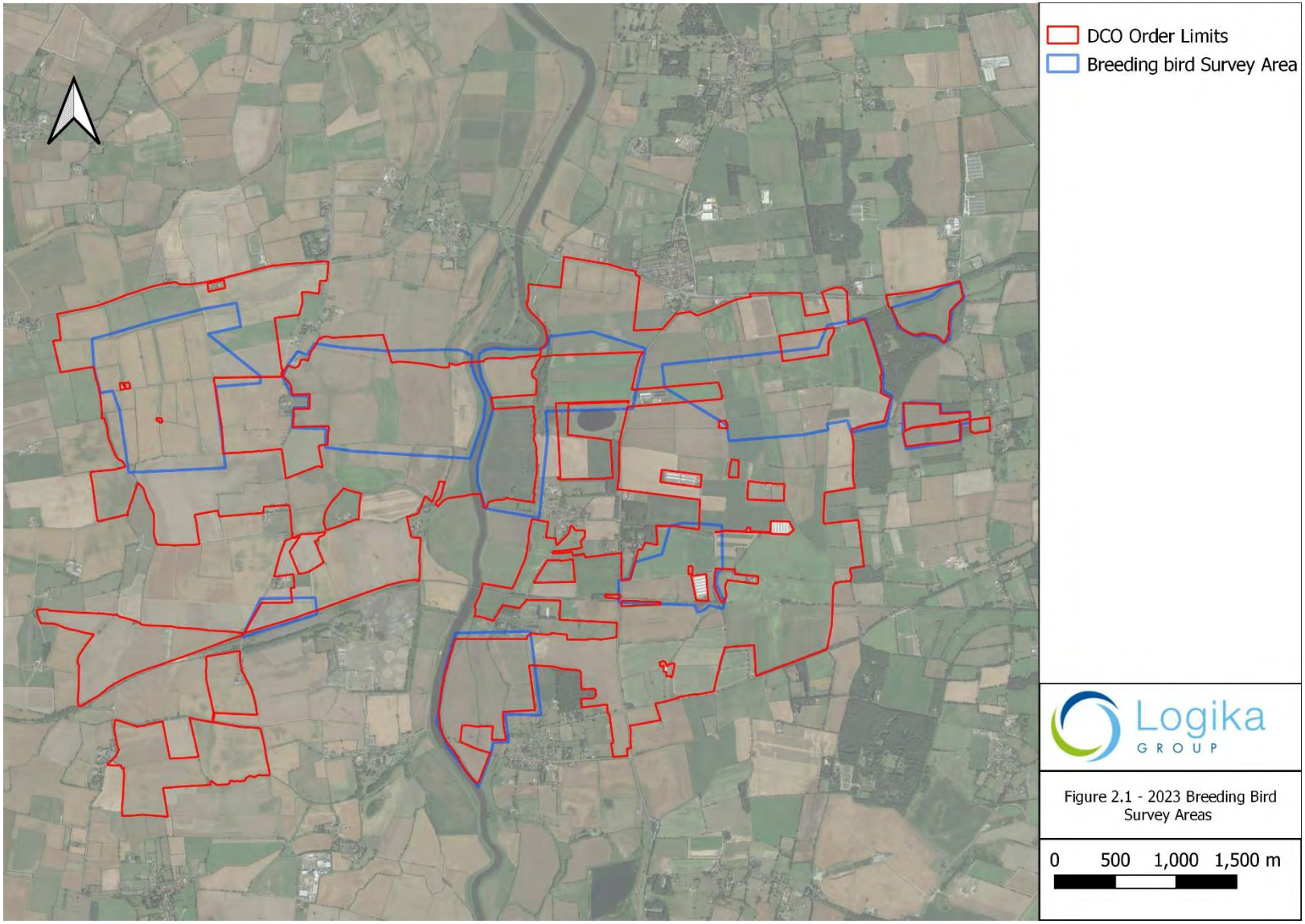
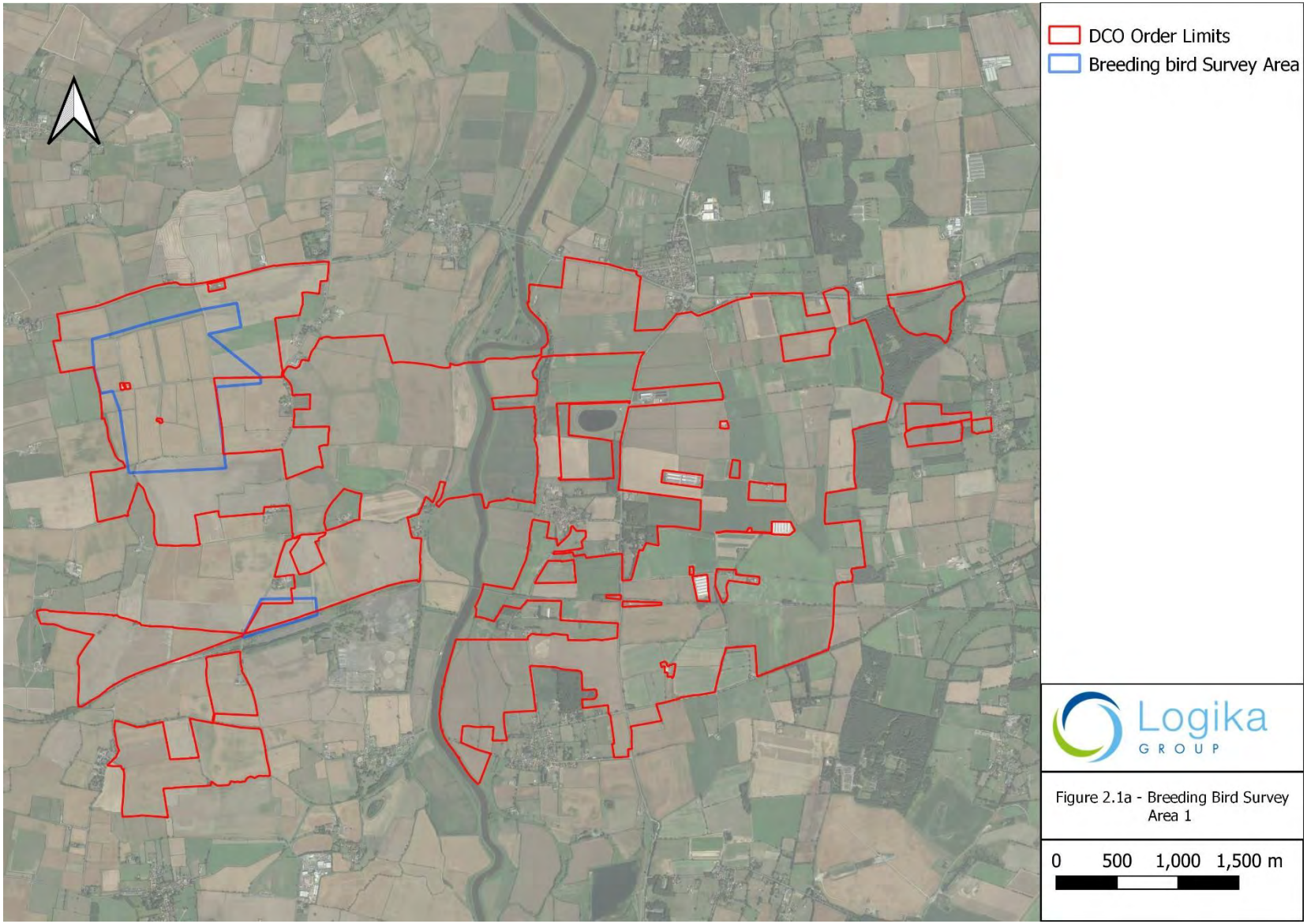
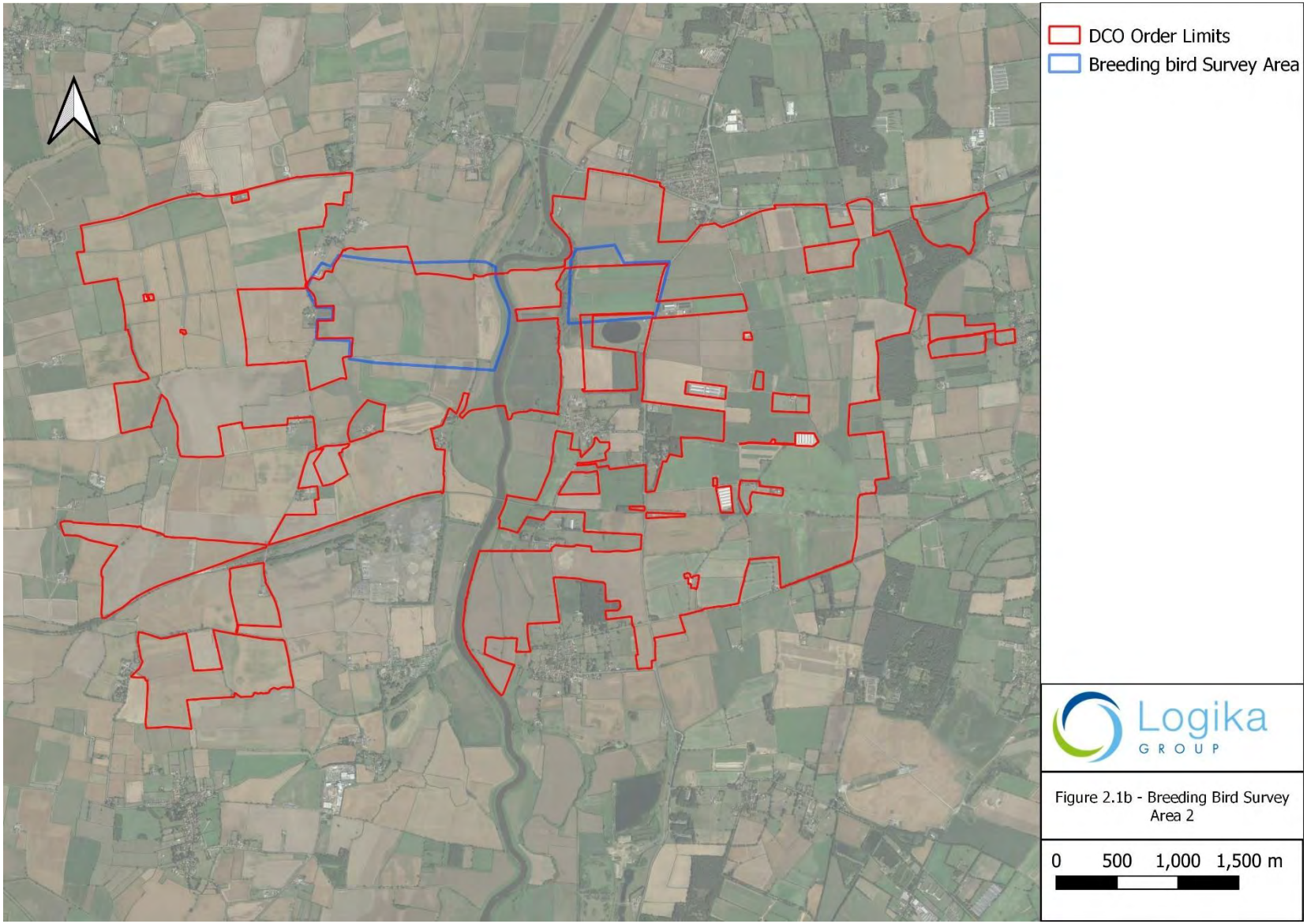
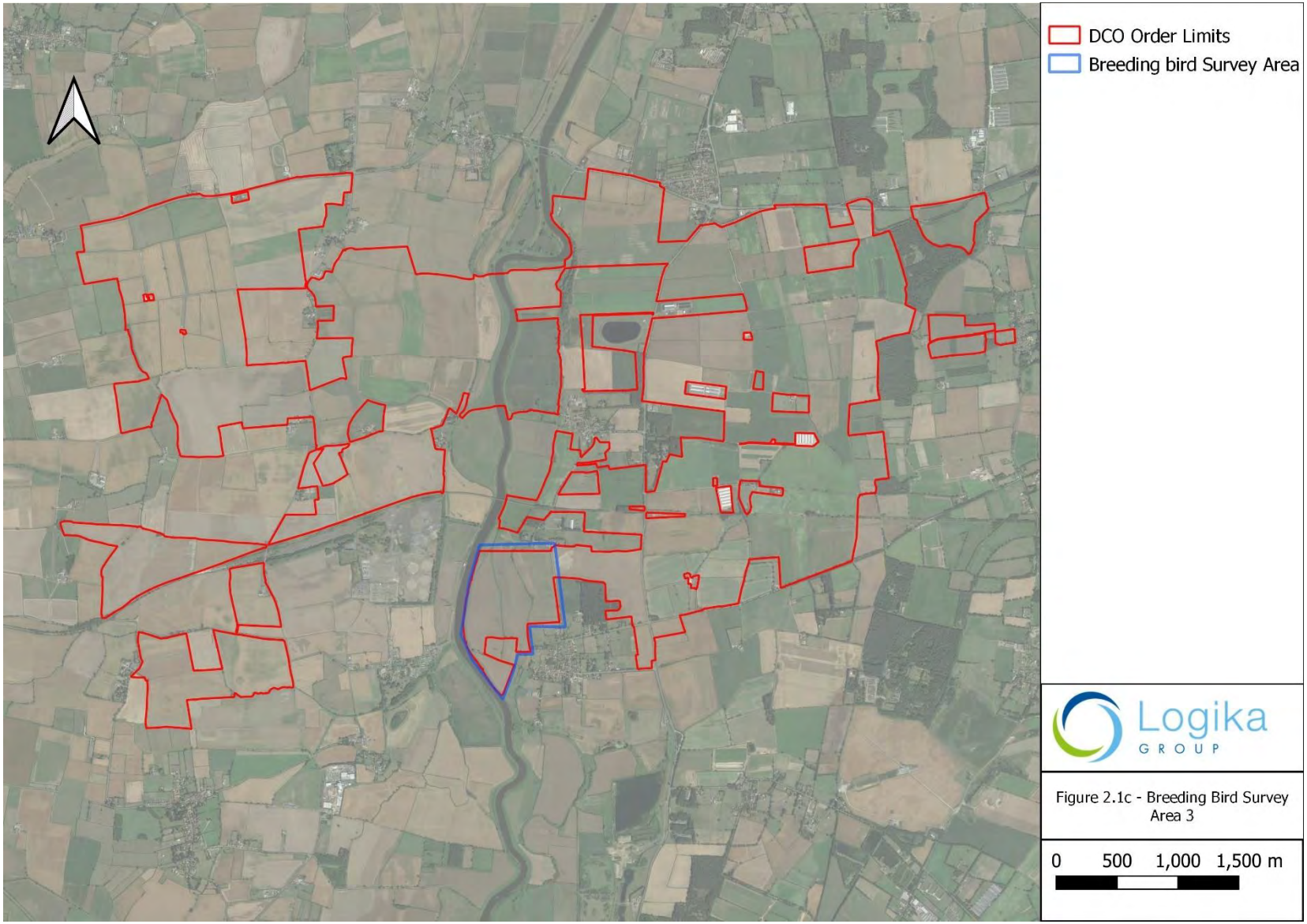
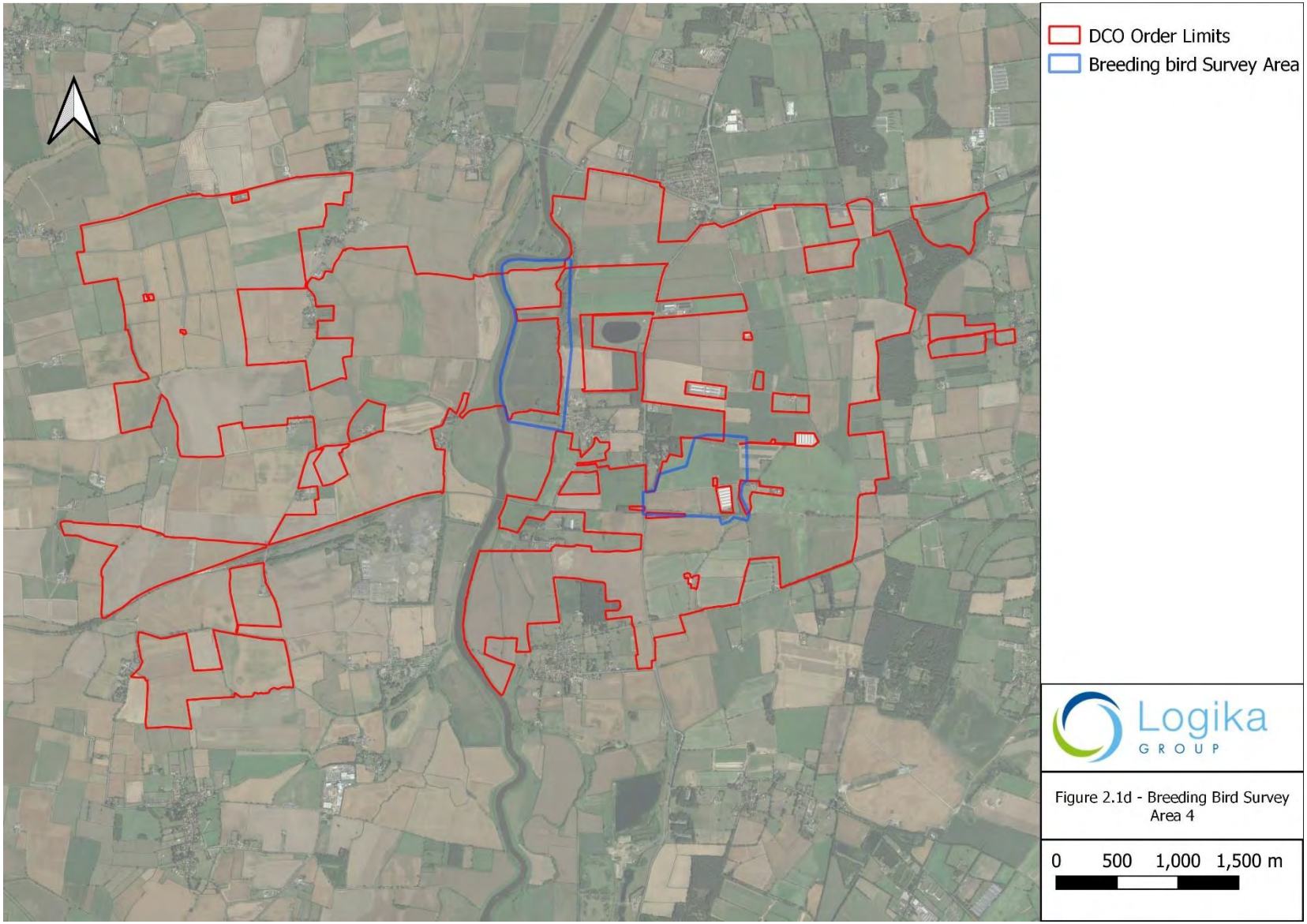
Annex A. – Figures


DCO Order Limits
Breeding bird Survey Area
Logika GROUP
Figure 2.1 - 2023 Breeding Bird Survey Areas
0 500 1,000 1,500 m


DCO Order Limits
Breeding bird Survey Area
Logika GROUP
Figure 2.1a - Breeding Bird Survey Area 1
0 500 1,000 1,500 m


DCO Order Limits
Breeding bird Survey Area
Logika GROUP
Figure 2.1b - Breeding Bird Survey Area 2
0 500 1,000 1,500 m


DCO Order Limits
Breeding bird Survey Area
Logika GROUP
Figure 2.1c - Breeding Bird Survey Area 3
0 500 1,000 1,500 m


DCO Order Limits
Breeding bird Survey Area
Logika GROUP
Figure 2.1d - Breeding Bird Survey Area 4
0 500 1,000 1,500 m

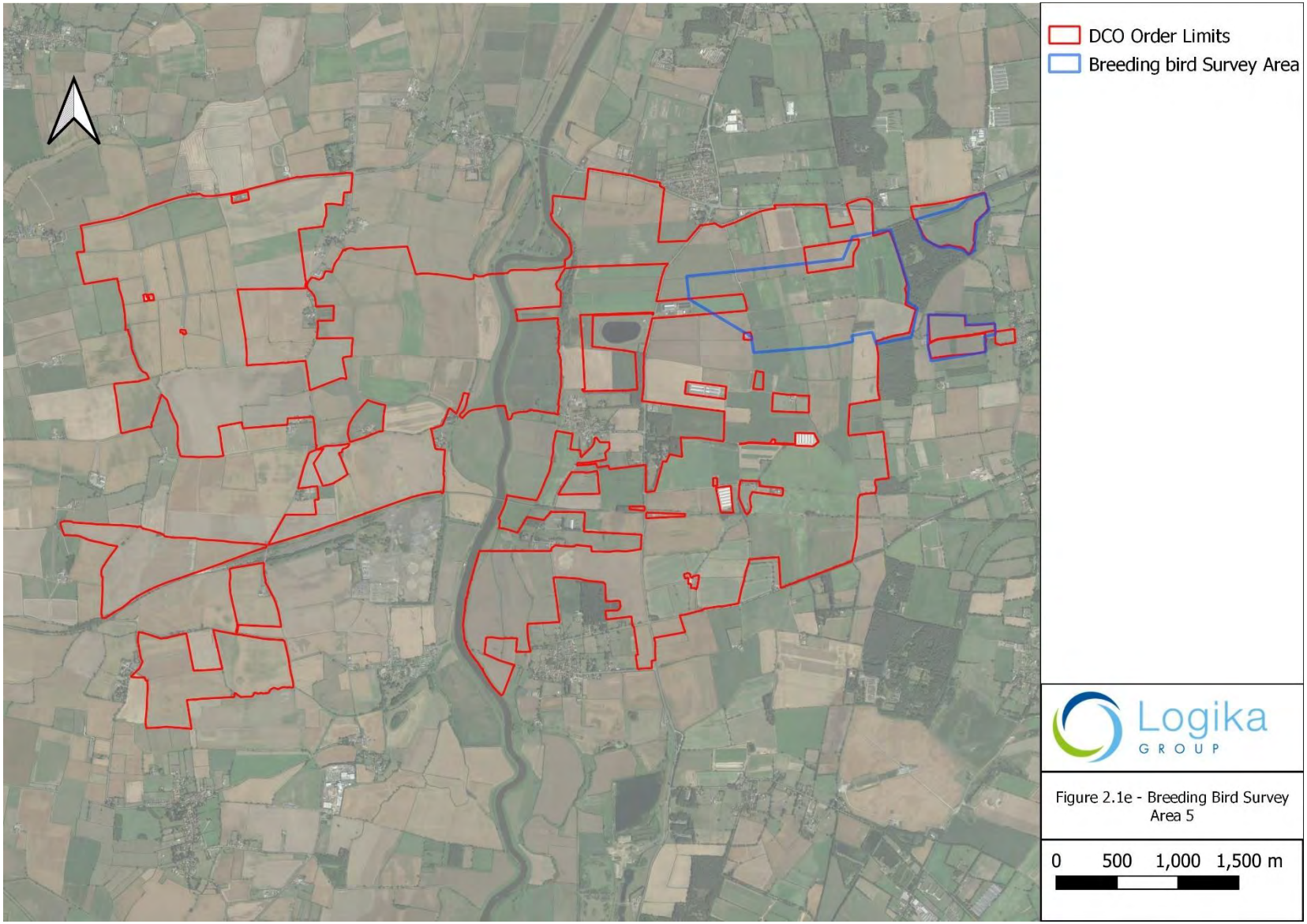
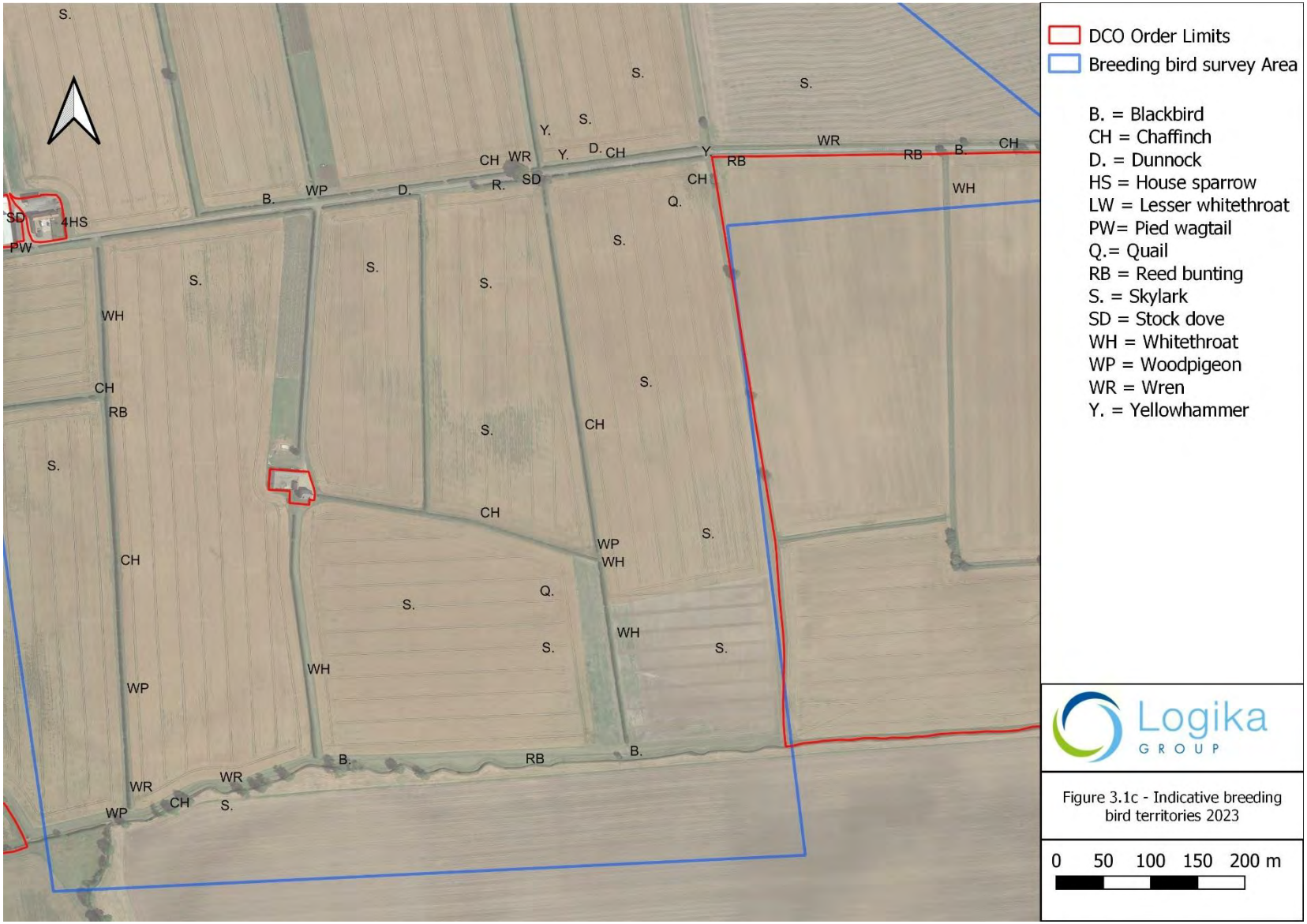
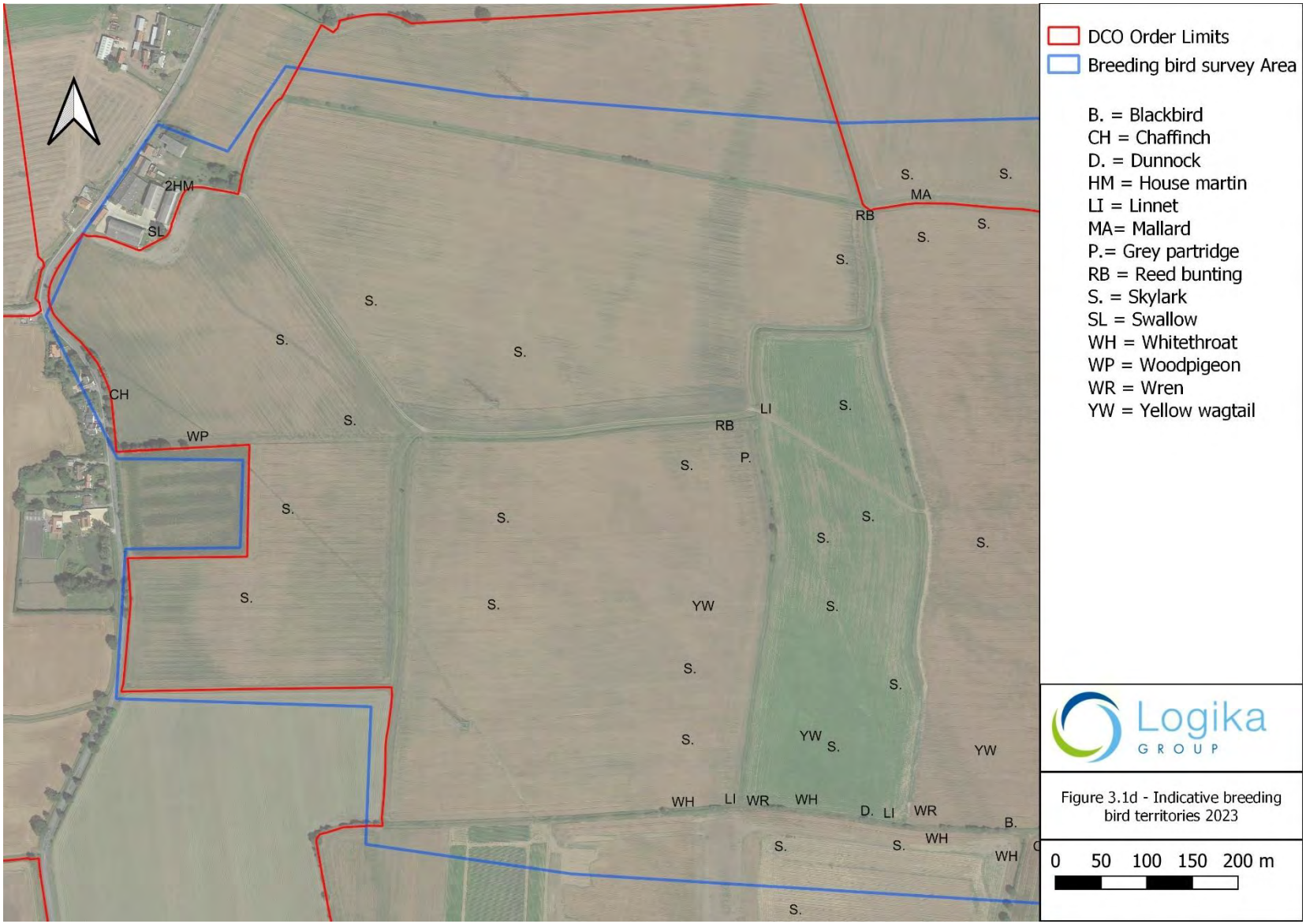
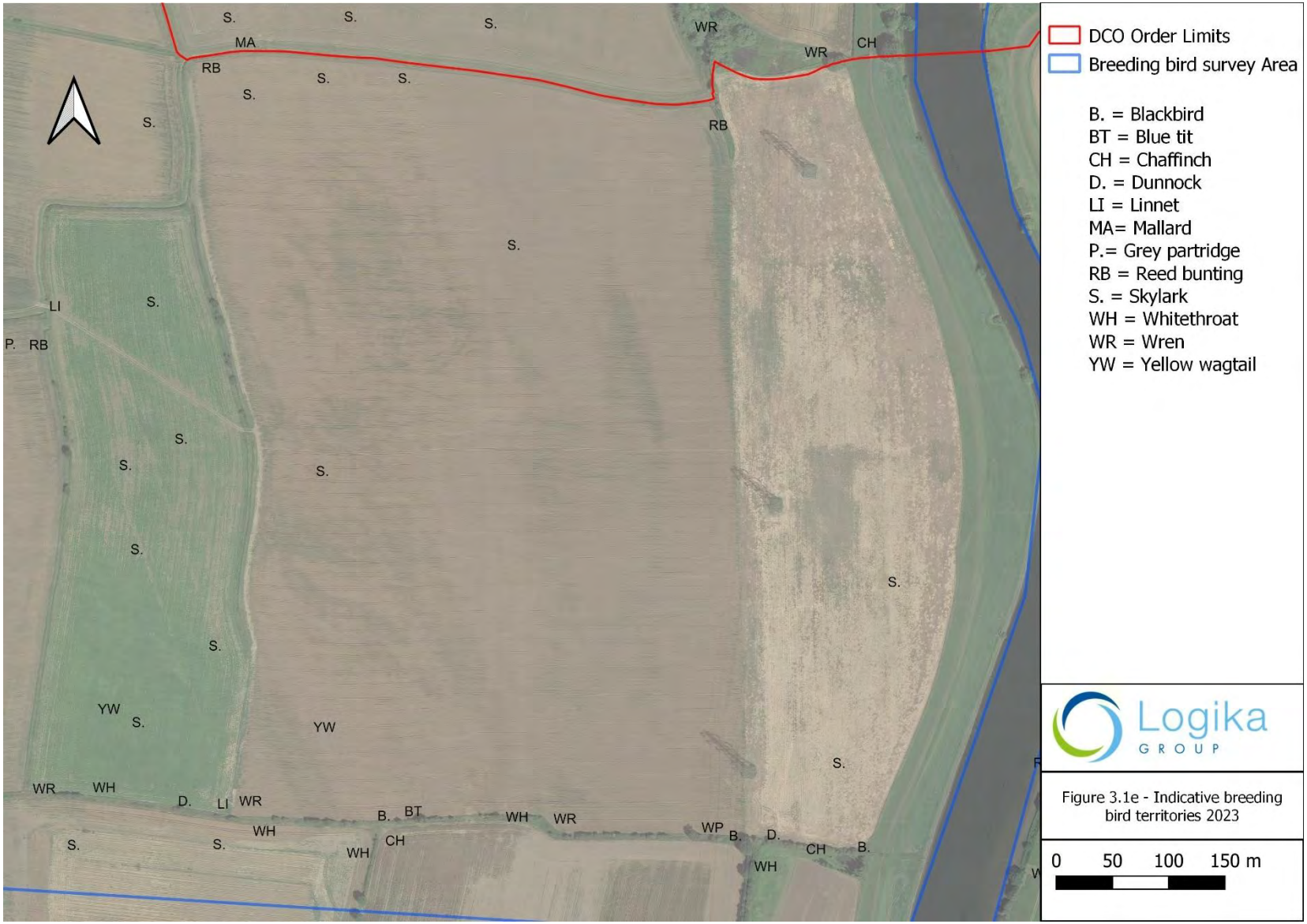

DCO Order Limits
Breeding bird Survey Area
Logika GROUP
Figure 2.1e - Breeding Bird Survey Area 5
0 500 1,000 1,500 m

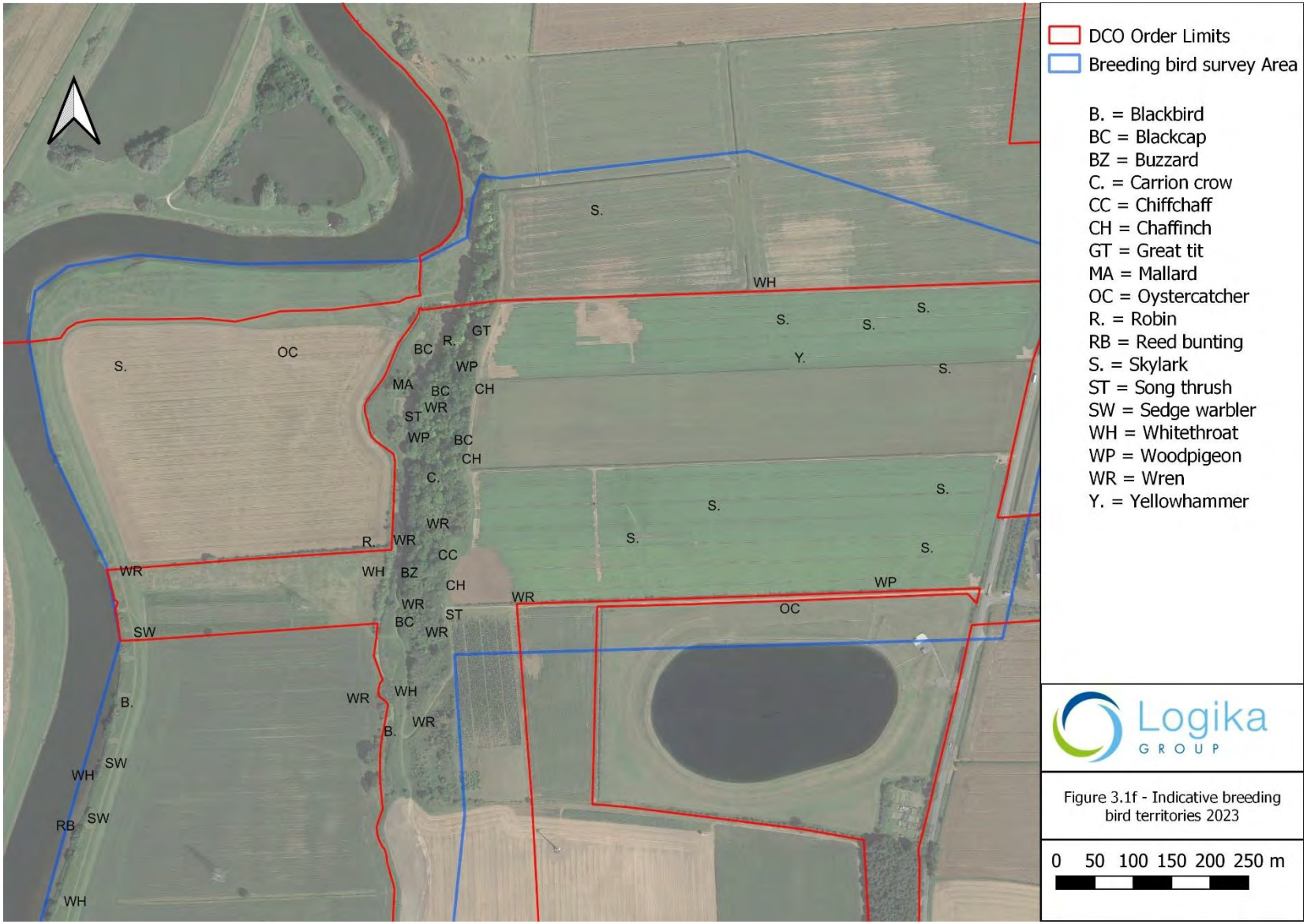
Figure 3.1b - Indicative breeding bird territories 2023

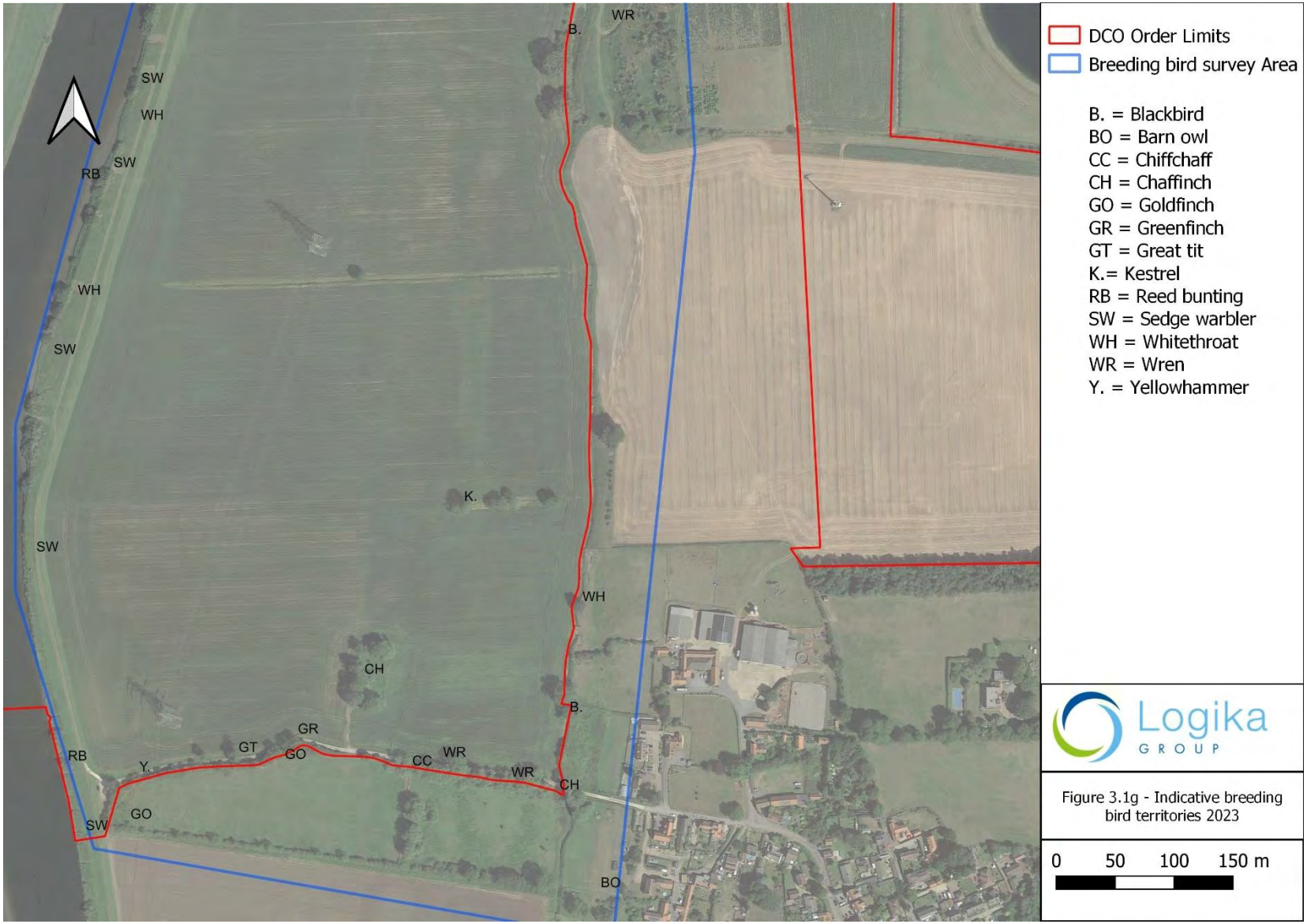

DCO Order Limits
Breeding bird survey Area
B. = Blackbird
CH = Chaffinch
D. = Dunnock
R. = Robin
RB = Reed bunting
S. = Skylark
SD = Stock dove
WR = Wren
Y. = Yellowhammer
YW = Yellow wagtail
Logika GROUP
Figure 3.1b - Indicative breeding bird territories 2023
0 50 100 m

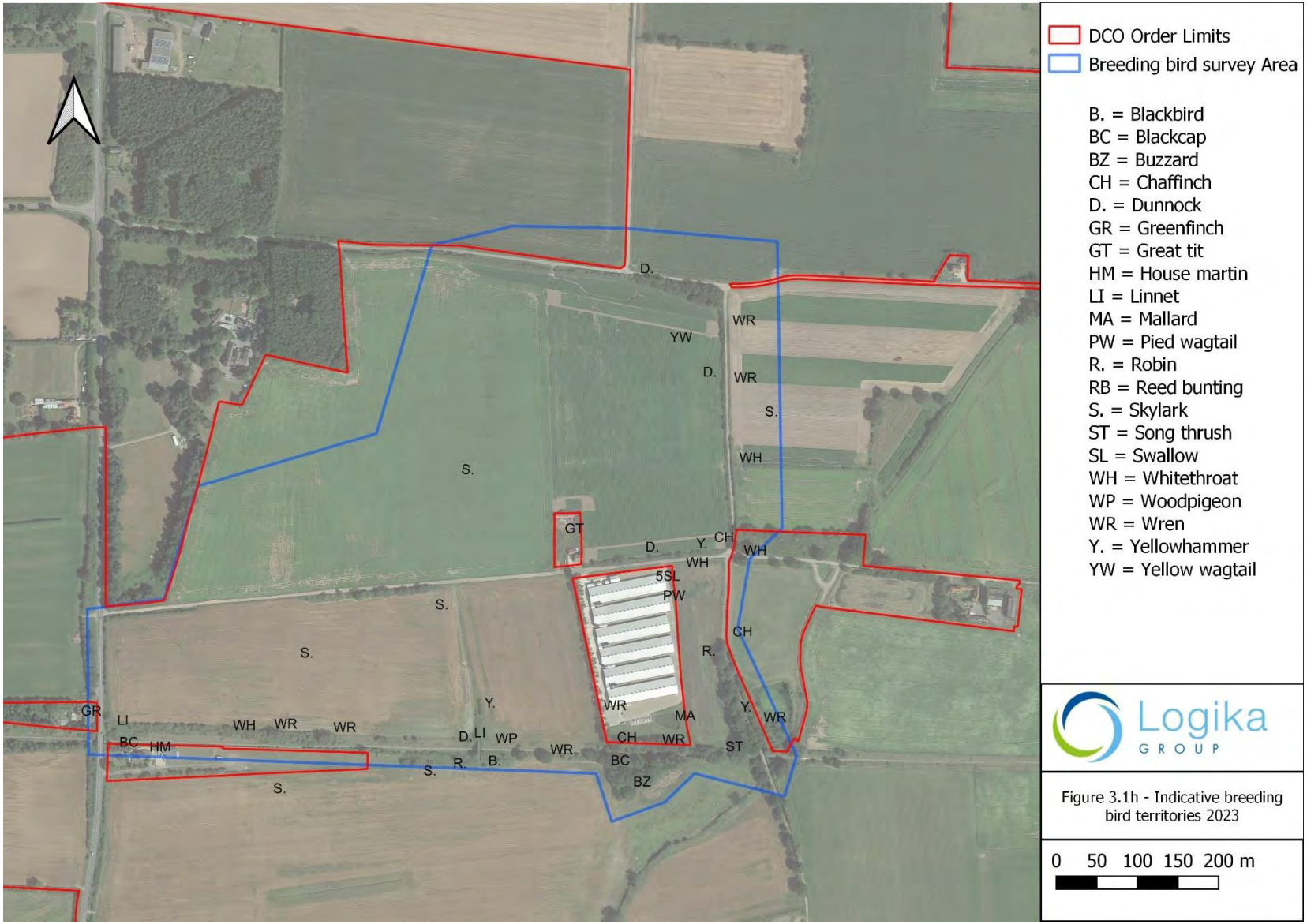

DCO Order Limits
Breeding bird survey Area
B. = Blackbird
CH = Chaffinch
D. = Dunnock
HS = House sparrow
LW = Lesser whitethroat
PW= Pied wagtail
Q.= Quail
RB = Reed bunting
S. = Skylark
SD = Stock dove
WH = Whitethroat
WP = Woodpigeon
WR = Wren
Y. = Yellowhammer
Logika GROUP
Figure 3.1c - Indicative breeding bird territories 2023
0 50 100 150 200 m

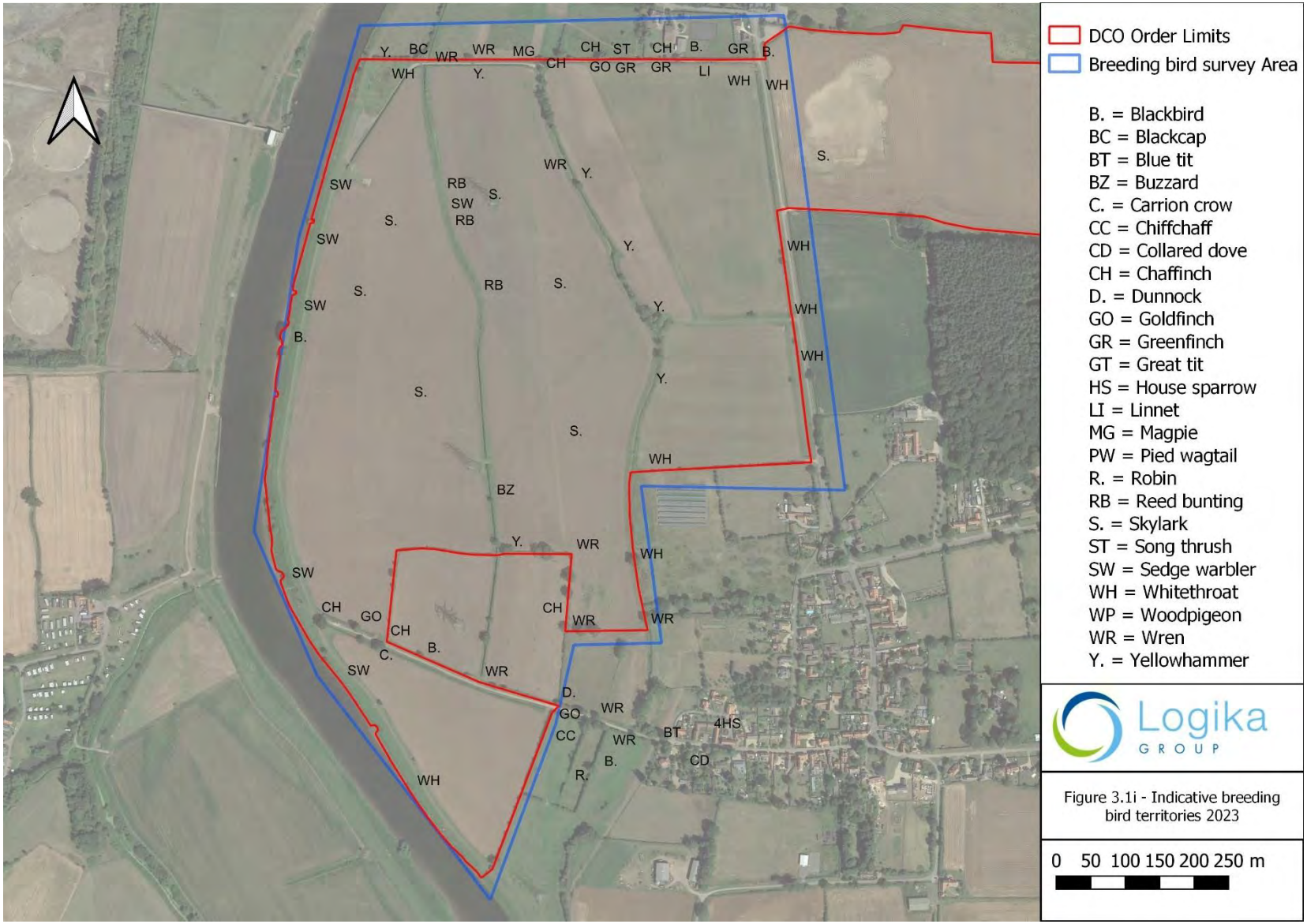

DCO Order Limits
Breeding bird survey Area
B. = Blackbird
CH = Chaffinch
D. = Dunnock
HM = House martin
LI = Linnet
MA= Mallard
P.= Grey partridge
RB = Reed bunting
S. = Skylark
SL = Swallow
WH = Whitethroat
WP = Woodpigeon
WR = Wren
YW = Yellow wagtail
Logika GROUP
Figure 3.1d - Indicative breeding bird territories 2023
0 50 100 150 200 m

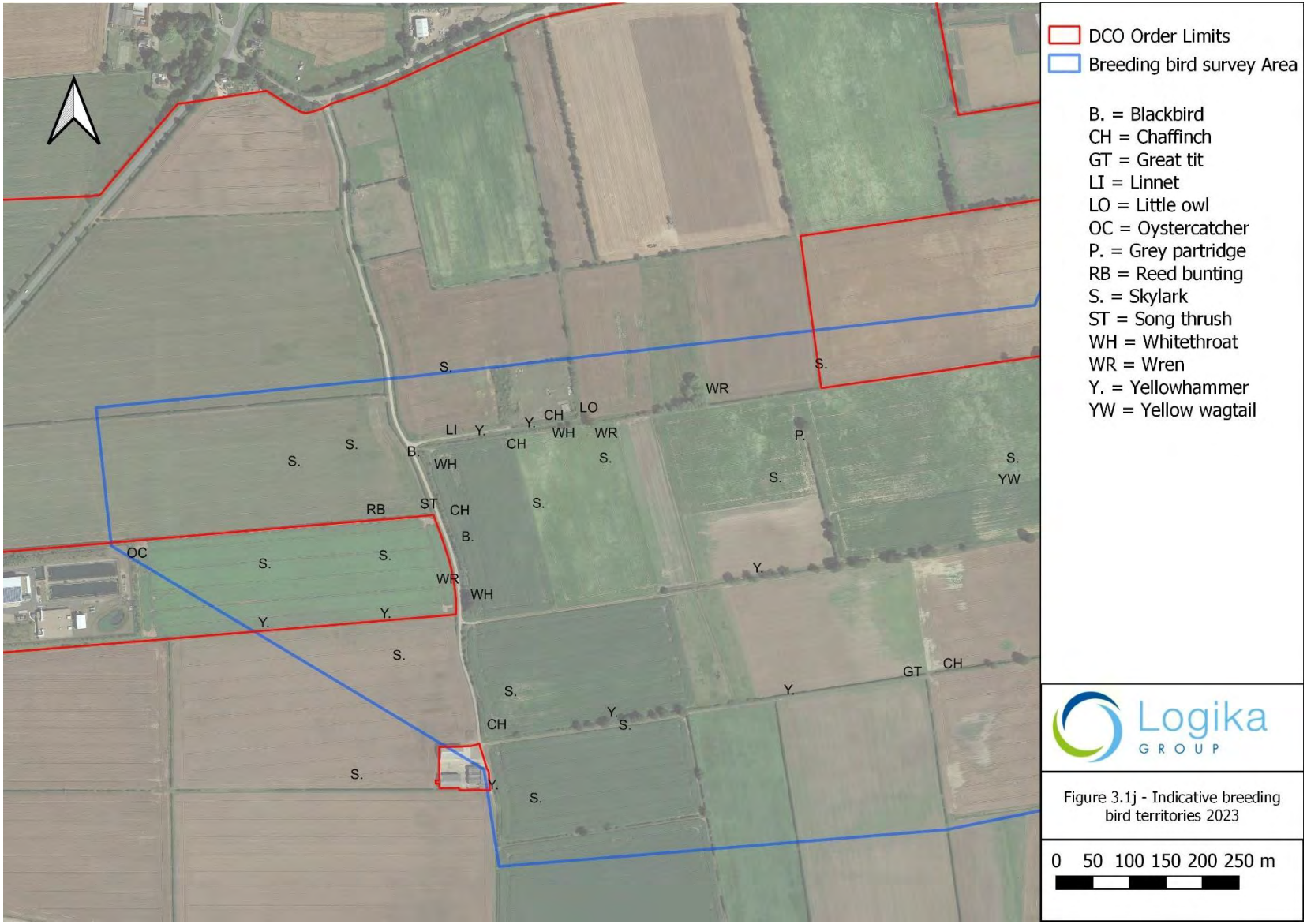

DCO Order Limits
Breeding bird survey Area
B. = Blackbird
BT = Blue tit
CH = Chaffinch
D. = Dunnock
LI = Linnet
MA= Mallard
P.= Grey partridge
RB = Reed bunting
S. = Skylark
WH = Whitethroat
WR = Wren
YW = Yellow wagtail
Logika GROUP
Figure 3.1e - Indicative breeding bird territories 2023
0 50 100 150 m

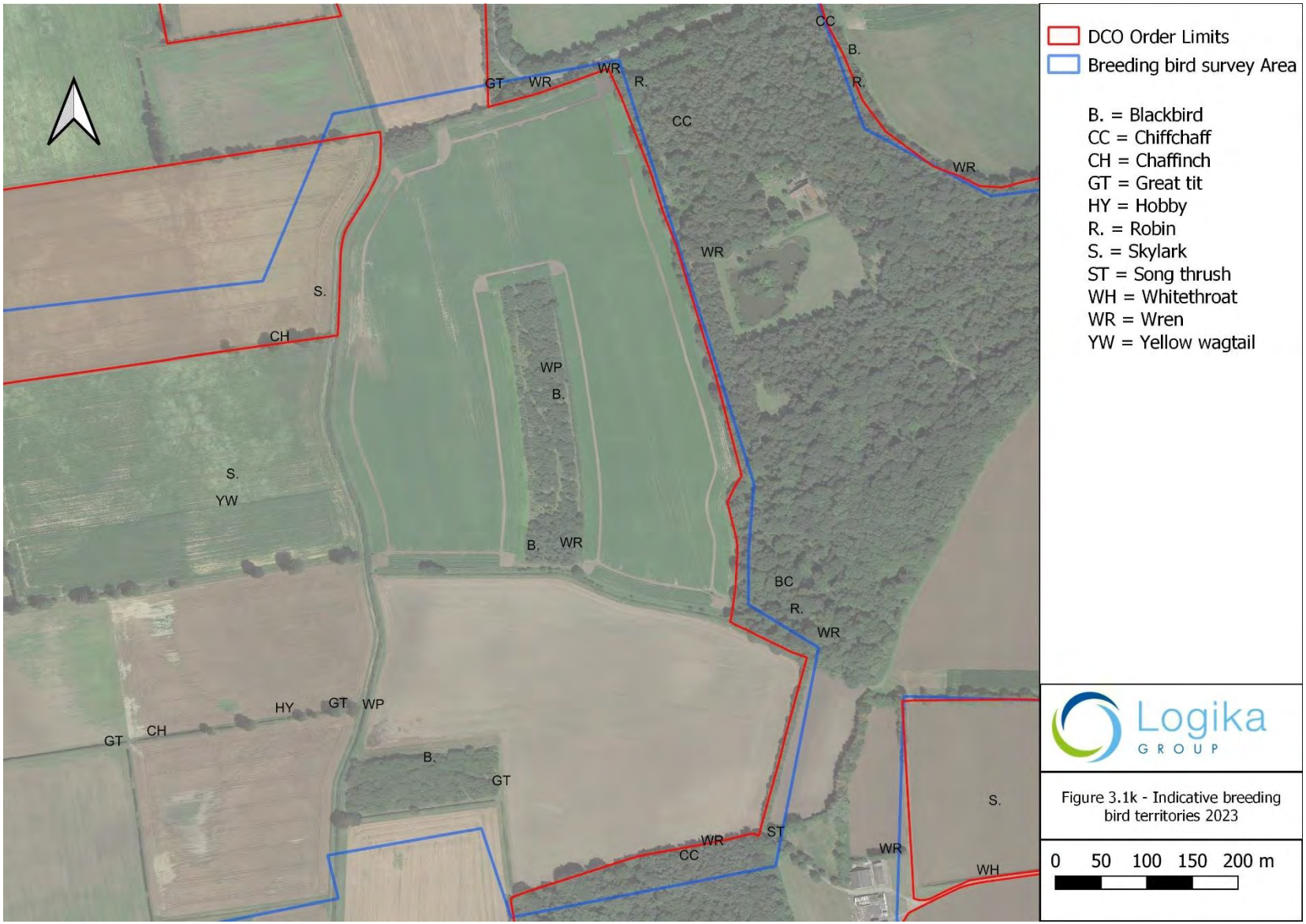

DCO Order Limits
Breeding bird survey Area
B. = Blackbird
BC = Blackcap
BZ = Buzzard
C. = Carrion crow
CC = Chiffchaff
CH = Chaffinch
GT = Great tit
MA = Mallard
OC = Oystercatcher
R. = Robin
RB = Reed bunting
S. = Skylark
ST = Song thrush
SW = Sedge warbler
WH = Whitethroat
WP = Woodpigeon
WR = Wren
Y. = Yellowhammer
Logika GROUP
Figure 3.1f - Indicative breeding bird territories 2023
0 50 100 150 200 250 m

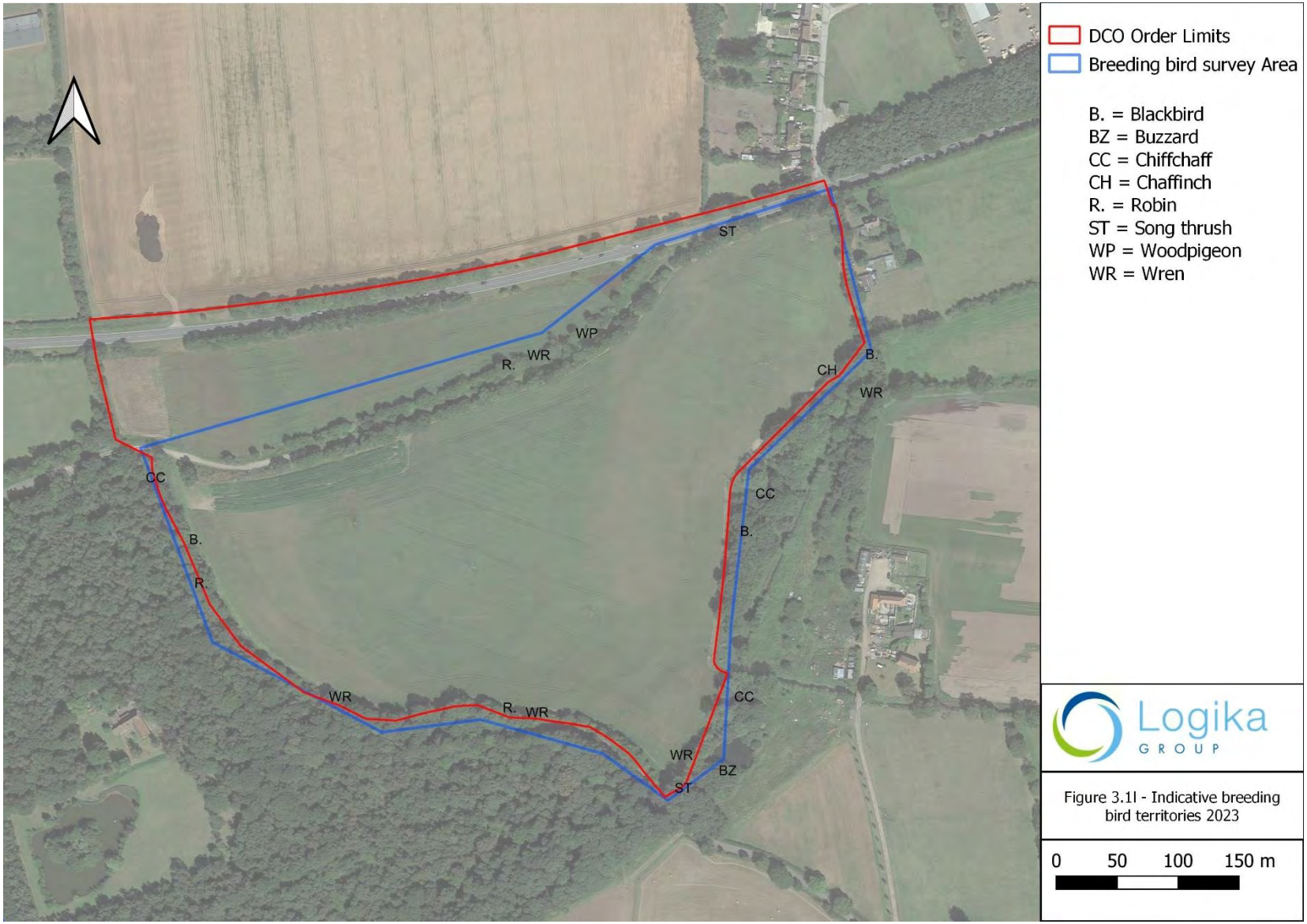

DCO Order Limits
Breeding bird survey Area
B. = Blackbird
BO = Barn owl
CC = Chiffchaff
CH = Chaffinch
GO = Goldfinch
GR = Greenfinch
GT = Great tit
K.= Kestrel
RB = Reed bunting
SW = Sedge warbler
WH = Whitethroat
WR = Wren
Y. = Yellowhammer
Logika GROUP
Figure 3.1g - Indicative breeding bird territories 2023
0 50 100 150 m

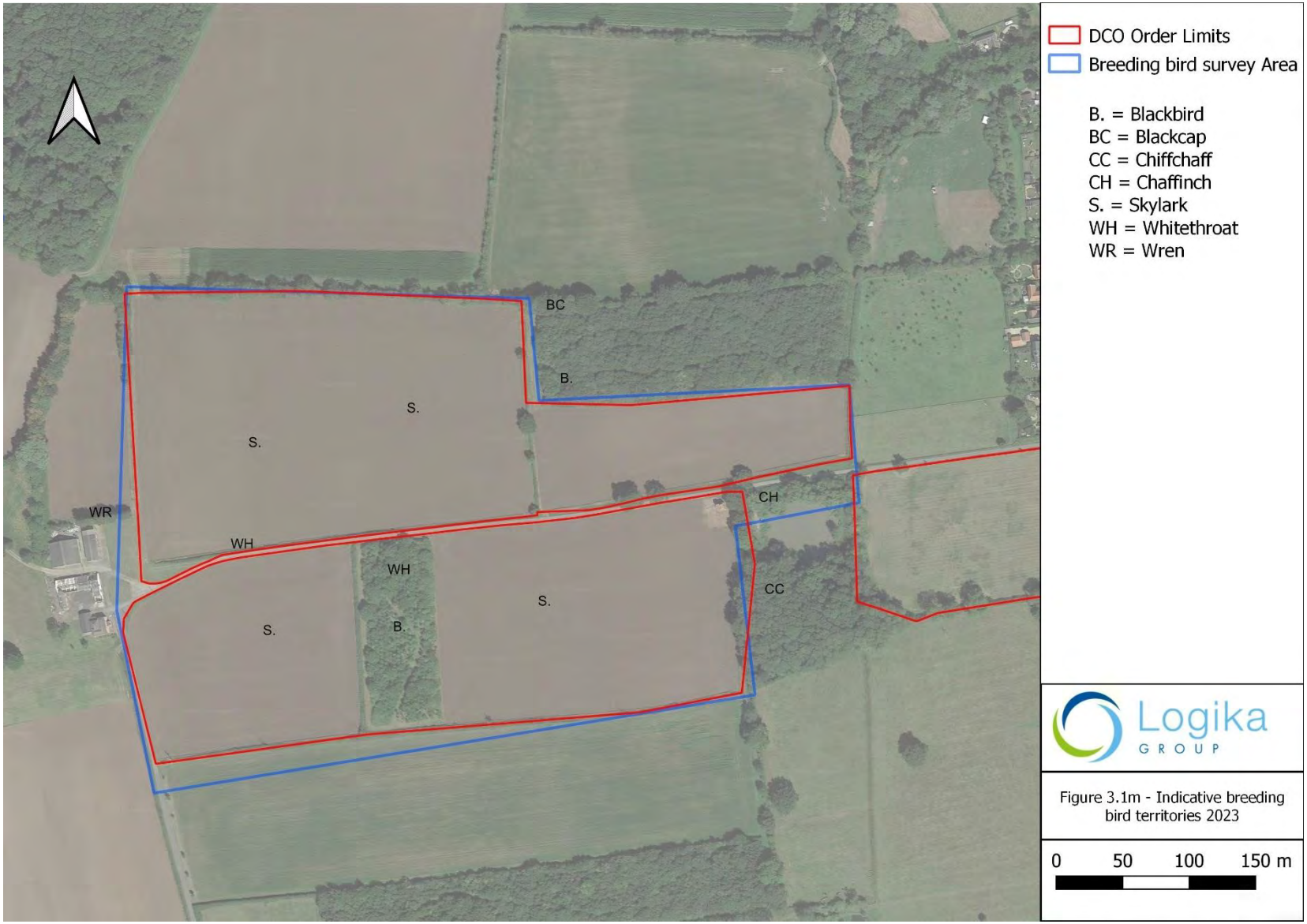

DCO Order Limits
Breeding bird survey Area
B. = Blackbird
BC = Blackcap
BZ = Buzzard
CH = Chaffinch
D. = Dunnock
GR = Greenfinch
GT = Great tit
HM = House martin
LI = Linnet
MA = Mallard
PW = Pied wagtail
R. = Robin
RB = Reed bunting
S. = Skylark
ST = Song thrush
SL = Swallow
WH = Whitethroat
WP = Woodpigeon
WR = Wren
Y. = Yellowhammer
YW = Yellow wagtail
Logika GROUP
Figure 3.1h - Indicative breeding bird territories 2023
0 50 100 150 200 m


DCO Order Limits
Breeding bird survey Area
B. = Blackbird
BC = Blackcap
BT = Blue tit
BZ = Buzzard
C. = Carrion crow
CC = Chiffchaff
CD = Collared dove
CH = Chaffinch
D. = Dunnock
GO = Goldfinch
GR = Greenfinch
GT = Great tit
HS = House sparrow
LI = Linnet
MG = Magpie
PW = Pied wagtail
R. = Robin
RB = Reed bunting
S. = Skylark
ST = Song thrush
SW = Sedge warbler
WH = Whitethroat
WP = Woodpigeon
WR = Wren
Y. = Yellowhammer
Logika GROUP
Figure 3.1i - Indicative breeding bird territories 2023
0 50 100 150 200 250 m


DCO Order Limits
Breeding bird survey Area
B. = Blackbird
CH = Chaffinch
GT = Great tit
LI = Linnet
LO = Little owl
OC = Oystercatcher
P. = Grey partridge
RB = Reed bunting
S. = Skylark
ST = Song thrush
WH = Whitethroat
WR = Wren
Y. = Yellowhammer
YW = Yellow wagtail
Logika GROUP
Figure 3.1j - Indicative breeding bird territories 2023
0 50 100 150 200 250 m


DCO Order Limits
Breeding bird survey Area
B. = Blackbird
CC = Chiffchaff
CH = Chaffinch
GT = Great tit
HY = Hobby
R. = Robin
S. = Skylark
ST = Song thrush
WH = Whitethroat
WR = Wren
YW = Yellow wagtail
Logika GROUP
Figure 3.1k - Indicative breeding bird territories 2023
0 50 100 150 200 m


DCO Order Limits
Breeding bird survey Area
B. = Blackbird
BZ = Buzzard
CC = Chiffchaff
CH = Chaffinch
R. = Robin
ST = Song thrush
WP = Woodpigeon
WR = Wren
ST
WP
WR
R.
B.
CH
WR
CC
B.
CC
B.
R.
WR
R.
WR
CC
WR
BZ
ST
Logika GROUP
Figure 3.1l - Indicative breeding bird territories 2023
0
50
100
150 m


DCO Order Limits
Breeding bird survey Area
B. = Blackbird
BC = Blackcap
CC = Chiffchaff
CH = Chaffinch
S. = Skylark
WH = Whitethroat
WR = Wren
BC
B.
S.
S.
WR
WH
WH
S.
S.
B.
CH
CC
Logika GROUP
Figure 3.1m - Indicative breeding bird territories 2023
0
50
100
150 m

Full species records

Table B-1 – Complete list of species recorded during breeding bird surveys.

Species	Scientific name
Barn owl	*Tyto alba*
Blackbird	*Turdus merula*
Blackcap	*Sylvia atricapilla*
Black-headed gull	*Chroicocephalus ridibundus*
Blue tit	*Cyanistes caeruleus*
Bullfinch	*Pyrrhula pyrrhula*
Buzzard	*Buteo buteo*
Canada goose	*Branta candensis*
Carrion crow	*Corvus corone*
Cetti's warbler	*Cettia cetti cetti*
Chaffinch	*Fringilla coelebs*
Chiffchaff	*Phylloscopus collybita*
Coal tit	*Periparus ater*
Collared dove	*Streptopelia decaocto*
Common tern	*Sterna hirundo*
Coot	*Fulica atra*
Cormorant	*Phalacrocorax carbo*
Corn bunting	*Emberiza calandra*
Cuckoo	*Cuculus canorus*
Dunnock	*Prunella modularis*
Goldcrest	*Regulus regulus*
Goldfinch	*Carduelis carduelis*

Species	Scientific name
Great spotted woodpecker	*Dendrocopos major*
Great tit	*Parus major*
Greenfinch	*Chloris chloris*
Green woodpecker	*Picus viridis*
Grey heron	*Ardea cinerea*
Greylag goose	*Anser anser*
Grey partridge	*Perdix perdix*
Grey wagtail	*Motacilla cinerea*
Herring gull	*Larus argentatus*
Hobby	*Falco subbuteo*
House martin	*Delichon urbicum*
House sparrow	*Passer domesticus*
Jackdaw	*Corvus monedula*
Jay	*Garrulus glandarius*
Kestrel	*Falco tinnunclus*
Lapwing	*Vanellus vanellus*
Lesser black-backed gull	*Larus fuscus*
Lesser whitethroat	*Curruca curruca*
Linnet	*Carduelis cannabina*
Little egret	*Egretta garzetta*
Little owl	*Athene noctua*
Magpie	*Pica pica*
Mallard	*Anas platyrhynchos*
Mandarin	*Aix galericulata*
Meadow pipit	*Anthus pratensis*
Mistle thrush	*Turdus viscivorus*
Moorhen	*Gallinula chloropus*

Species	Scientific name
Mute swan	*Cygnus olor*
Oystercatcher	*Haematopus ostralegus*
Peregrine	*Falco peregrinus*
Pheasant	*Phasianus colchicus*
Pied wagtail	*Motacilla alba yarrellii*
Quail	*Coturnix coturnix*
Red-legged partridge	*Alectoris rufa*
Reed bunting	*Emberiza schoeniclus*
Reeves pheasant	*Syrmaticus reevesii*
Robin	*Erithacus rubecula*
Rook	*Corvus frugilegus*
Sand martin	*Riparia riparia*
Sedge warbler	*Acrocephalus schoenobaenus*
Skylark	*Alauda arvensis*
Song thrush	*Turdus philomelos*
Sparrowhawk	*Accipiter nisus*
Starling	*Sturnus vulgaris*
Stock dove	*Columba oenas*
Swallow	*Hirundo rustica*
Swift	*Apus apus*
Tawny owl	*Strix aluco*
Treecreeper	*Certhia familiaris*
Turtle dove	*Streptopelia turtur*
Whitethroat	*Curruca communis*
Willow warbler	*Phylloscopus trochilus*
Woodpigeon	*Columba palumbus*
Wren	*Troglodytes troglodytes*

Species	Scientific name
Yellowhammer	*Emberiza citrinella*
Yellow wagtail	*Motacilla flava flavissima*

Annex B. – Full survey details

Full survey details of the breeding bird surveys are shown below in **Table C.1.**

Table C-1 Full survey details of breeding bird surveys.

Date	Visit number	Survey Area	Start time	End time	Weather conditions
10/05/2023	1	1,2	06:00	11:15	6/8 Oktas cloud, Beaufort 0 west-northwest, visibility > 3km, precipitation: none, 9°C
11/05/2023	1	2,3	06:00	10:45	5/8 Oktas cloud, Beaufort 2-3 north-west, visibility > 3km, precipitation: none, 9°C
18/05/2023	1	4,5	05:45	10:10	8/8 Oktas cloud, Beaufort 0 southwest, visibility > 3km, precipitation: none, 10°C
19/05/2023	1	5	05:50	09:20	1/8 Oktas cloud, Beaufort 2 west-south-west, visibility > 3km, precipitation: none, 14°C
24/05/2023	2	1			

Date	Visit number	Survey Area	Start time	End time	Weather conditions
24/05/2023	2	1	05:50	7:10	4/8 Oktas cloud, Beaufort 1 north-west, visibility > 3km, precipitation: none, 17°C
25/05/2023	2	2	05:50	09:45	0/8 Oktas cloud, Beaufort 0 north-west, visibility > 3km, precipitation: none, 11°C
01/06/2023	2	4	05:45	09:40	3/8 Oktas cloud, Beaufort 1 north-north-east, visibility > 3km, precipitation: none, 11°C
02/06/2023	2	5	05:45	09:40	1/8 Oktas cloud, Beaufort 1 north-west, visibility > 3km, precipitation: none, 13°C
14/06/2023	3	1,2	05:30	12:00	0/8 Oktas cloud, Beaufort 2 north-east, visibility > 3km, precipitation: none, 22°C
15/06/2023	3	3	06:15	08:20	5/8 Oktas cloud, Beaufort 2 north-east, visibility > 3km, precipitation: none, 12°C
21/06/2023	3	4	06:00	09:10	0/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 18°C

Date	Visit number	Survey Area	Start time	End time	Weather conditions
22/06/2023	3	5	06:00	09:30	5/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 19°C
28/06/2023	4	1,2	06:15	14:45	7/8 Oktas cloud, Beaufort 1 west, visibility 500m-1km, precipitation: none, 20°C
29/06/2023	4	4	06:00	10:20	5/8 Oktas cloud, Beaufort 1 north, visibility > 3km, precipitation: none, 15°C
30/06/2023	4	5	05:45	12:45	8/8 Oktas cloud, Beaufort 0, visibility 500m-3km, precipitation: light rain, 15°C
01/07/2023	4	3	05:45	08:55	6/8 Oktas cloud, Beaufort 1 north-north-west, visibility 500m-3km, precipitation: none, 16°C
06/07/2023	5	1,2	06:25	13:55	4/8 Oktas cloud, Beaufort 2 south, visibility > 3km, precipitation: none, 15°C
07/07/2023	5	3	07:25	10:40	0/8 Oktas cloud, Beaufort 0, visibility > 3km, precipitation: none, 17°C

Date	Visit number	Survey Area	Start time	End time	Weather conditions
11/07/2023	5	4	6:10	10:40	8/8 Oktas cloud, Beaufort 2 north-west, visibility 500m-3km, precipitation: light drizzle, 17°C
12/07/2023	5	5	05:15	11:45	4/8 Oktas cloud, Beaufort 1 north, visibility 500m- 3km, precipitation: none, 15°C
17/07/2023	6	1,2	06:15	13:30	8/8 Oktas cloud, Beaufort 1 south, visibility 500m-3km, precipitation: heavy rain, 15°C
18/07/2023	6	4	10:05	11:50	8/8 Oktas cloud, Beaufort 0, visibility 500m-3km, precipitation: light rain, 15°C
19/07/2023	6	3	05:40	08:55	8/8 Oktas cloud, Beaufort 0, visibility <500m, precipitation: light drizzle, 14°C
20/07/2023	6	5	05:30	11:25	5/8 Oktas cloud, Beaufort 1 south, visibility 500m-3km, precipitation: none, 12°C

Annex C. Territory Mapping Criteria

Territory mapping criteria has been taken from Amar *et al*. (2006). This paper adapted the original methodologies of Marchant, (1983) and Gilbert *et al*. (1998) to focus on how to attribute territories using fewer visits than the original methodology dictates. The paper attributes indicative territory locations based on four CBC visits, whereas during the fieldwork for this project six survey visits were undertaken in order to provide a more robust assessment:

At the end of the fieldwork all the registrations were transferred to 'species maps' on which the letter of the visit (A,B,C,D,E,F) was substituted for the species symbol, the registrations were plotted in exactly the same locations, and using exactly the same activity codes, as those on the original visit maps. The information on these maps was then used to make an assessment of numbers of breeding birds.

In view of the reduction of the number of visits from eight to 10 to six, modified criteria were used for analysing the census maps. The following principles were used to define territory clusters on the species maps:

1. The minimum number of visit registrations (from different visits) used to form a territory was two, although as many registrations as possible were placed into a single territory.

2. Registrations of songbirds alone and in song on two (or more) occasions could stand as a territory.

3. A lone bird alarm-calling or giving other vocalisations thought to have strong territorial significance was acceptable as a territory if there were previous or subsequent sightings within the same approximate area.

4. The presence of a nest in any state, including building, occupied, or recently (within the same season) used nest on just one visit, with no other registrations was acceptable as a territory.

5. A lone songbird not in song could not count as a territory, regardless of whether it was located toward the middle of the plot or near the edges.

6. A territory was not counted where there was just a single registration of a bird in mid-flight.

7. The presence of a family on a single visit (juvenile birds with attendant parents) was not permitted as a territory, since they may have moved into the area from outside the CBC plot. Unless it is apparent that the nest location is within the vicinity i.e. the young are 'branched' or grounded and flightless.

8. A lone pair was permitted as a territory, provided that the birds were not in mid-flight. In instances involving pairs of birds in flight, territories were only permitted when the pair was recorded taking off from a fixed point, e.g., a tree or the ground (but excluded when they had been seen in mid-flight). Such registrations were acceptable even if the sex of the individuals was not known, because this would follow the rationale already widely used and accepted in CBC territory analysis.

9. For species that are semi-colonial, or occur in large groups where it may be hard to define separate individual territories (e.g., house sparrow) the numbers of birds per visit were added up. The maximum count was then divided by two to give the number of territories.

All territories falling at least partly inside the survey area were included in the totals, even if some of the registrations forming the territory cluster fell outside the survey area boundaries.

Appendix 7-5: Great-Crested Newt Baseline

Report

One Earth Solar Farm

Appendix 7-5: Great Crested Newt Survey Report Template

For One Earth Solar Farm Ltd

17 May 2024

Document control

Project Title:	One Earth Solar Farm
Project Number:	14529A
Client:	One Earth Solar Farm Ltd
Document Title:	Appendix 7-5: Great Crested Newt Survey Report Template
Document Number:	14529A
Prepared By:	Alexandra Jackson
Reviewed By:	Craig Brookes

Revision History

01	16/05/2024

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Contents

Tables

Figures

1 Introduction

1.1 Background

1.2 This Appendix should be read in conjunction with Chapter 7 of the Environmental Information Report (PEIR) which is provided in support of the delivery of an Environmental Impact Assessment (EIA) associated with the One Earth Solar Farm, hereafter referred to as the 'Site'.

1.3 Purpose of this Appendix

1.3.1 This Appendix outlines the methodologies used and summarises the results of the GCN environmental DNA (eDNA) surveys conducted in 2023.

1.3.2 This report does not allude to any requirements for mitigation and/or compensation in respect of GCN, nor does it assess the potential impacts that proposals might have upon the species, as both issues will be covered in detail as part of an ES.

1.4 Structure of this Appendix

1.4.1 The remainder of this Appendix is structured as follows:

- **Section** Error! Reference source not found.**: Methods**
- **Section 0: Results**
- **Section 4: Summary**
- **Section 5: References**
- **Annex A: Details of ponds**
- **Annex B: SureScreen Scientifics GCN eDNA reports**

2 Methodology

2.1 Desk Study

2.1.1 A desk study was undertaken to identify waterbodies withing 250m of the Site using satellite imagery and Multi-Agency Geographic Information for the Countryside (MAGIC) website (an internet-based Geographic Information Systems database provided by the Department for Environment, Foods and Rural Affairs (DEFRA) (Defra, 2024)).

2.1.2 An environmental desk study was undertaken in September 2023 to identify records of GCN within 2km of the Site boundary, from Greater Lincolnshire Nature Partnership (GLNP) and Nottinghamshire Biological and Geological Records Centre (NBGRC) and for English Protected Species Licences (EPSL) from using MAGIC.

2.2 eDNA Sampling

2.2.1 All accessible waterbodies, containing water at the time of visit were surveyed to confirm the presence / likely absence of GCN using eDNA sampling techniques, following methods as set out in Biggs et al., (2014). This method requires one sampling visit by GCN licenced surveyors between 15 April and 30 June inclusive.

2.2.2 The samples were collected on 19th June 2023 by Alexandra Jackson MZool (Hons) (licence ref: 2021-54952-CLS-CLS) and Kelly Jones MSc MCIEEM (licence ref: 2015-18053-CLS-CLS).

2.2.3 All samples collected were sent to a Natural England accredited laboratory[1] for analysis. **Figure 2-1** shows all waterbodies that were surveyed using eDNA sampling.

2.3 Limitations

2.3.1 Not all waterbodies within 250m were surveyed, with only 10 out of 40 being subject to the eDNA sampling. Due to the majority of the ponds within 250m being on private land, only ponds on-Site or adjacent to the Site, were included to be surveyed. This originally identified 17 waterbodies, however due to the following, an additional seven could not be surveyed:

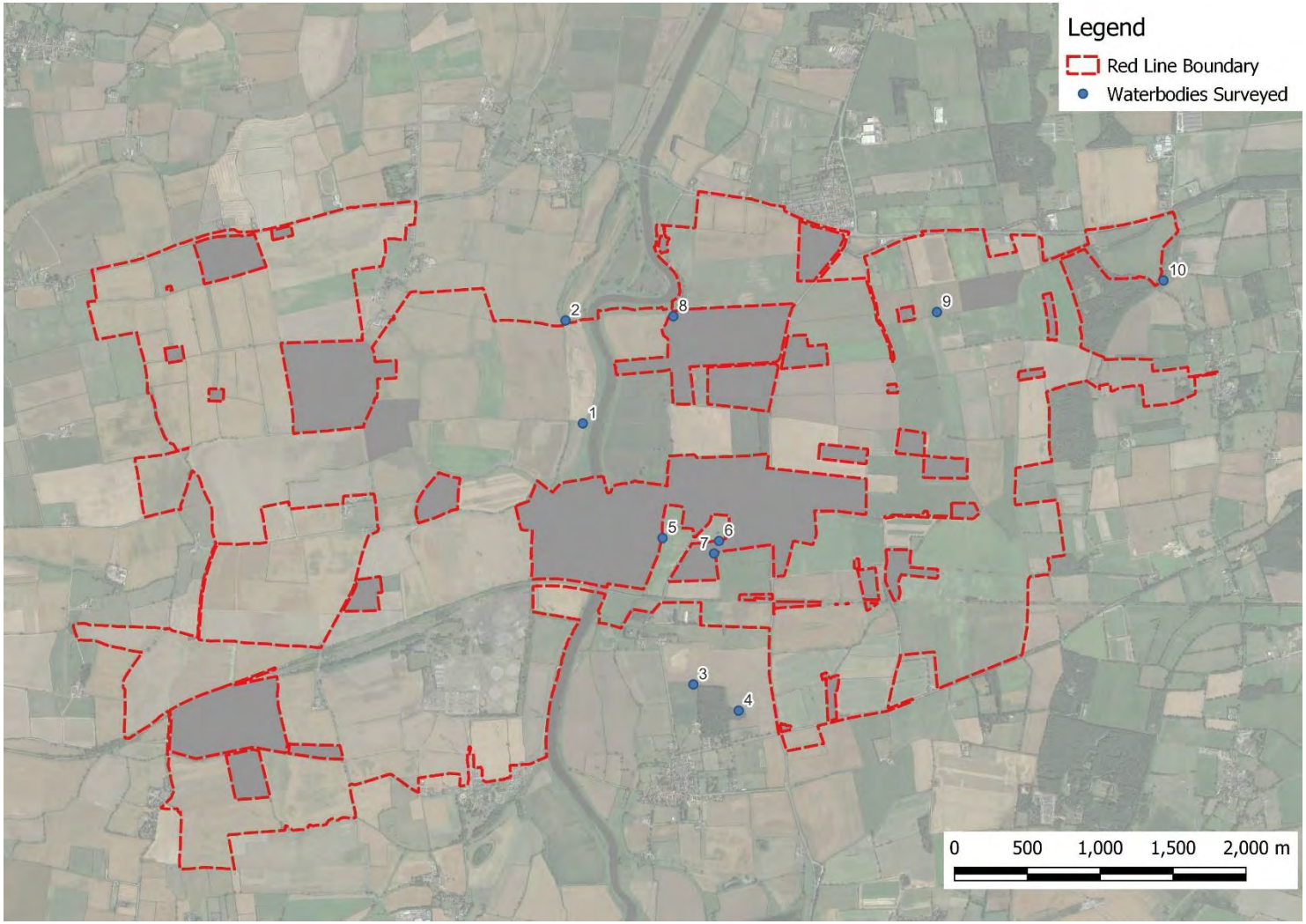
- Two ponds could not be accessed due to dense vegetation and/or steep, unsafe banks.
- One pond was dry at the time of the survey.
- Four ponds were on private land and were not surveyed.

2.3.2 Due to the red line boundary for the Site expanding, five ponds were only identified close to the boundary. As this was outside of the eDNA survey season, they were not surveyed.

2.3.3 Details of these ponds are within **Annex A.**

[1] Nature Metrics, DNA-Based Monitoring and Surescreen Scientific Ltd.

Figure 2-1: Locations of waterbodies surveyed on 19th June 2023



3 Results

3.1 Desk study

3.1.1 Satellite imagery showed that there were 40 waterbodies within 250m of the Site. Due to the size of the Site, only publicly accessible waterbodies on-Site or adjacent to the Site's boundary were included within the GCN eDNA survey. Details of these ponds are within **Annex A.**

3.1.2 The Lincolnshire data search returned a single record of great crested newts (GCN), recorded at 1.82km north-west of the Site boundary in 2014. The data search also returned a single GCN historic record at 1.49 km north to the Site boundary, recorded in 1997.

3.1.3 The Nottinghamshire data search only historic records from 1977 to 2010, which come from an area adjacent to the Site boundary in the east, near Thorney. In 2006, it was recorded that GCN were present within pond 11.

3.1.4 The MAGIC search identified no GCN European Protected Species Licence (EPSL) within 2 km of the Site.

3.2 eDNA Sampling

3.2.1 All 10 ponds surveyed came back with a negative eDNA result from the laboratory. Full results are shown within **Annex B**.

4 Summary

4.1.1 There are a total of four waterbodies on-Site, with a further 36 waterbodies within 250m.

4.1.2 Due to the large size of the Site, only publicly accessible ponds on-Site or adjacent to the Site boundary were included in the eDNA water sampling. Out of the 17 ponds to be surveyed, only 10 had water samples taken due to one pond being dry and access restrictions for the remaining six.

4.1.3 All 10 ponds surveyed came back with a negative GCN eDNA result.

5 References

Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffiths RA, Foster J, Wilkinson J, Arnett A, Williams P and Dunn F (2014). Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (Triturus cristatus) environmental DNA. Freshwater Habitats Trust, Oxford.

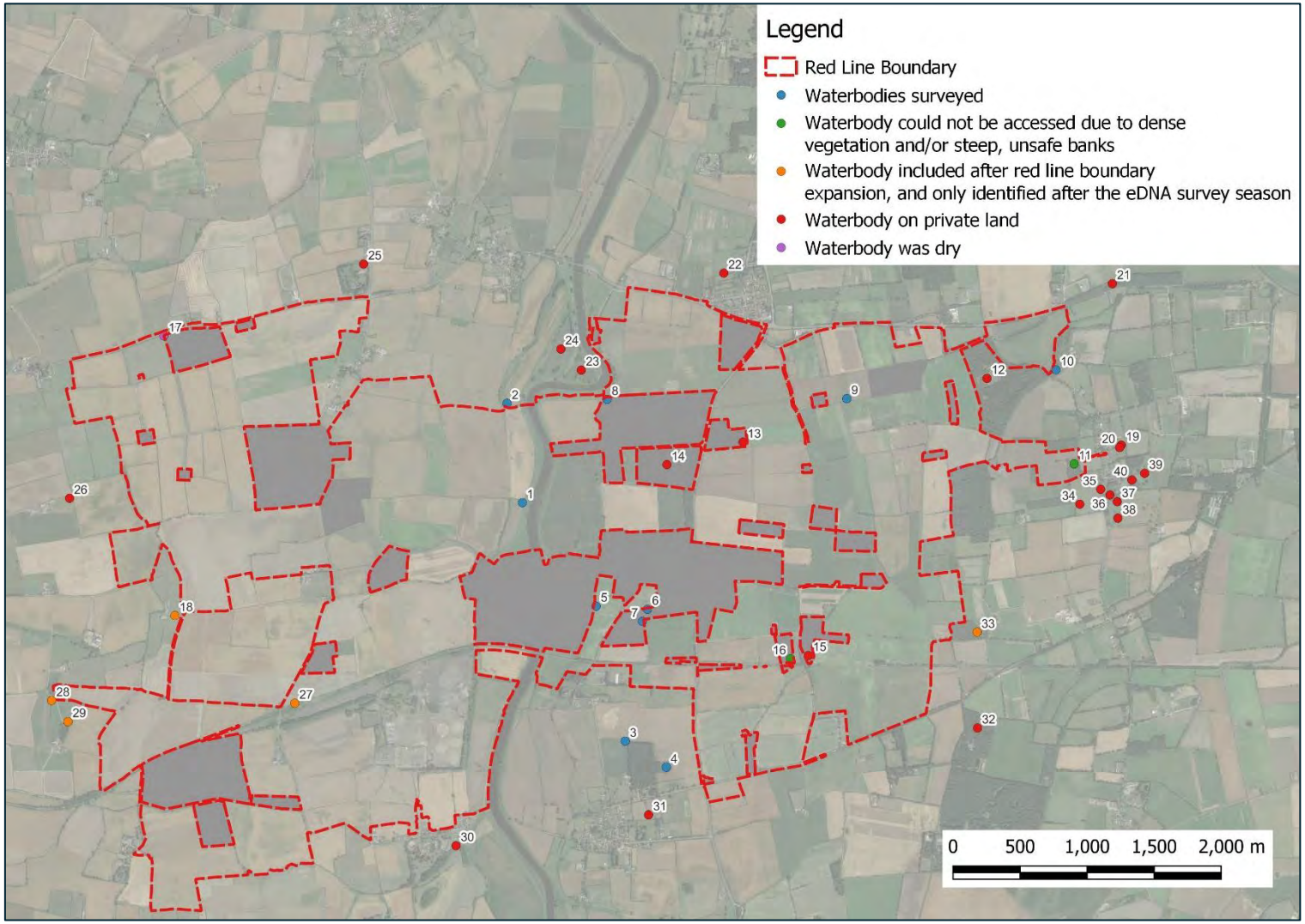
Department for Environment, Food and Rural Affairs (Defra), (n.d.). Multi Agency Geographic Information for the Countryside. [Online] Available at: https://magic.defra.gov.uk/home.htm.

A1 Annex A – Waterbody Details

Table 5-1: Details of waterbodies on-Site and within 250m.

Waterbody ID	Surveyed	Reasons for not surveying
1-10	✓	-
11	×	Dense vegetation so could not access pond.
12, 13, and 16	×	No access as located on private land.
14	×	No access as located on private land. This waterbody is also a reservoir which is unsuitable to support GCN.
15	×	Could not access due to steep banks and dense vegetation.
17	×	Was dry at time of survey.
18, 27, 28, 29 and 33.	×	Red line boundary for the Site expanded and ponds identified outside of the eDNA survey season.
19-26, 30-32 and 34-40	×	No access due to being on private land.

Figure A-5-1: Waterbody details



A2 SureScreen Scientifics GCN eDNA Reports

SureScreen Scientifics

Folio No: E18306
Report No: 1
Purchase Order: LCL2021
Client: Logika
Contact: Alex Jackson

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS (TRITURUS CRISTATUS)

SUMMARY

When great crested newts (GCN), *Triturus cristatus*, inhabit a pond, they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm GCN habitation or establish GCN absence.

RESULTS

Date sample received at Laboratory: 26/06/2023
Date Reported: 04/07/2023
Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
5806	Pond 9, One Earth Solar	SK 83954 73461	Pass	Pass	Pass	Negative	0
5807	Pond 8, One Earth Solar	SK 82146 73432	Pass	Pass	Pass	Negative	0
5810	Pond 10, One Earth Solar	SK 85304 73683	Pass	Pass	Pass	Negative	0
5812	Pond 6, One Earth Solar	SK 82459 71891	Pass	Pass	Pass	Negative	0
5813	Pond 7, One Earth Solar	SK 82425 71805	Pass	Pass	Pass	Negative	0
5815	Pond 5, One Earth Solar	SK 82072 71911	Pass	Pass	Pass	Negative	0
5814	Pond 3, One Earth Solar	SK 82283 70907	Pass	Pass	Pass	Negative	0

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Company Registration No. 08950940

Page 2 of

5816	Pond 2, One Earth Solar	SK 81406 73403	Pass	Pass	Pass	Negative	0
5817	Pond 4, One Earth Solar	SK 82594 70727	Pass	Pass	Pass	Negative	0
5818	Pond 1, One Earth Solar	SK 81525 72697	Pass	Pass	Pass	Negative	0

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Chris Troth **Approved by:** Chris Troth

METHODOLOGY

The samples detailed above have been analysed for the presence of GCN eDNA following the protocol stated in DEFRA WC1067 'Analytical and methodological development for improved surveillance of the Great Crested Newt, Appendix 5.' (Biggs et al. 2014). Each of the 6 sub-sample tubes are first centrifuged and pooled together into a single sample which then undergoes DNA extraction. The extracted sample is then analysed using real time PCR (qPCR), which uses species-specific molecular markers to amplify GCN DNA within a sample. These markers are unique to GCN DNA, meaning that there should be no detection of closely related species.

If GCN DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If GCN DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample between the date it was made to the date of analysis. Degradation of the spiked DNA marker may lead indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected,

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samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result:

Presence of GCN eDNA [Positive/Negative/Inconclusive]
Positive: GCN DNA was identified within the sample, indicative of GCN presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.
Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for GCN presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive. 0/12 indicates negative GCN presence.
Negative: GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of GCN absence, however, does not exclude the potential for GCN presence below the limit of detection.

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Appendix 7-6: Badger and Riparian Mammal Baseline

Report

One Earth Solar Farm

Appendix 7-6: Badger and Otter and Water Vole Mammals Survey

For One Earth Solar Farm Ltd

17 May 2024

Document control

Project Title:	One Earth Solar Farm
Project Number:	14529A
Client:	One Earth Solar Farm Ltd
Document Title:	Appendix 7-6: Badger and Otter and Water Vole Mammals Survey
Document Number:	14529A
Prepared By:	Alexandra Jackson
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Revision History

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Contents

Tables

Figures

1 Introduction

1.1 Background

1.2 This Appendix should be read in conjunction with Chapter 7 of the Preliminary Environmental Information Report (PEIR) which is provided in support of the delivery of an Environmental Impact Assessment (EIA) associated with the One Earth Solar Farm, hereafter referred to as the 'Site'.

1.3 Purpose of this Appendix

1.3.1 The proposed Development Consent Order (DCO) Order Limits include, and are adjacent to, habitats with the potential to support badger *Meles meles*, and riparian mammals, otter *Lutra lutra* and water vole *Arvicola amphibius*.

1.3.2 This Appendix outlines the methodologies used for desk study and field survey, and summarises the results gathered as part of an effort to determine the presence of these species.

1.3.3 This report does not allude to any requirements for mitigation and/or compensation in respect of above species, nor does it assess the potential impacts that proposals might have, as both issues will be covered in detail as part of an ES.

1.4 Structure of this Appendix

1.4.1 This Appendix is structured as follows:

- **Section 2: Methods;**
- **Section** Error! Reference source not found.**: Results;**
- **Section 4: Summary;**
- **Section 5: References;**
- **Appendix 1: Figures**

2 Methods

2.1 Desk study

2.1.1 An environmental desk study was undertaken in September 2023 to identify records of badger, otter and water vole within 2km of the Site boundary, from Greater Lincolnshire Nature Partnership (GLNP) and Nottinghamshire Biological and Geological Records Centre (NBGRC).

2.2 Badger

2.2.1 During the extended Phase 1 habitat survey (detailed in **Appendix 7-3: Extended Phase 1 Habitat Survey report** of the PEIR of the DCO Order Limits, a habitat-based assessment was undertaken to identify the suitability for resident, commuting and foraging badgers. Concurrently, signs of badger activity were searched for in accordance with '*Surveying for Badgers: Good Practice Guidelines*' (Scottish Badgers, 2018).

2.2.2 Where badger setts were identified during the extended Phase 1 habitat survey, these were further classified according to the criteria used in the National Badger Surveys (Cresswell *et al*., 1990 and Wilson *et al*., 1997). The current level of badger activity at each sett entrance hole was also classified.

2.2.3 Other distinctive field signs indicative of badger presence noted were:

- faeces in the form of dung pits or latrines (territorial markers comprising collections of numerous dung pits);
- foraging signs, such as snuffle holes;
- badger hair (hair often found on overhanging vegetation and low barbed wire fences);
- footprints, mammal paths and scratching marks – often on posts at the base of tree trunks; and
- push under, where badgers habitually dig or push under barriers such as fences and lift or displace them (often coinciding with the presence of mammal paths and badger hairs).

2.2.4 An assessment of the suitability of habitats to support badger groups (opportunities for sett formation, the presence of good foraging resources and access and egress for commuting) was also made.

2.3 Riparian mammal (otter and water vole)

2.3.1 The extended Phase 1 habitat survey encompassed potential habitats along watercourses, ponds and ditches and associated terrestrial habitat suitable for otter and water vole within DCO order limits. This area was assessed for suitable aquatic and terrestrial habitat for otter and water vole. The size, type, structure, and connectivity of all watercourses / waterbodies was recorded.

2.3.2 Field signs for otter were recorded during the extended Phase 1 habitat survey and included searching for faeces (spraints), holts, footprints and feeding remains. In addition, any holes in the bank-side (artificial and natural) and well-connected terrestrial habitats, such as scrub or woodland, were examined for otter holts and resting places. Surveys generally followed advice in 'Monitoring the Otter' (Chanin, 2003a).

2.3.3 Field signs for water vole were recorded, such as burrows, latrines, droppings, feeding remains, footprints and runs. In addition, foraging resources and burrowing substrate of waterbodies were also recorded. Surveys and assessments generally followed guidance in 'Water Vole Mitigation

Handbook' (Dean et al., 2016) and 'Water Vole Field Signs and Habitat Assessment' (Dean et al., 2021).

2.3.4 Where watercourses were not accessible, they were surveyed from the closest accessible point for their suitability to support riparian mammals, using binoculars to assist observation where necessary.

2.4 Limitations

2.4.1 Due to the red line boundary for the Site expanding after the extended Phase 1 habitat surveys, some areas have not been surveyed and as such their suitability to support badger, otter and water vole have not been fully assessed.

3 Results

3.1 Desk study

Badger

3.1.1 It is important to note, that due to welfare issues regarding this species, certain details about the record type (field observation/sett/individual) have sometimes been omitted by the record centre.

3.1.2 The Lincolnshire data search returned 29 records of badgers, with five being recorded on-site. The most recent on-site record is from 2022 and is around the fields surrounding the northern end of the A1133.

3.1.3 The Nottinghamshire data search returned 96 records of badger, which included 21 records relating to on-site setts. The majority of these are within the fields to the east of the village of Ragnall and withing fields to the north of North Clifton, with records ranging from 2010 to 2022.

Otter

3.1.4 GNLP returned five records of otter within 2km of the Site boundary, with no records being recorded on-site. The most recent sighting is from 2019, where a dead otter was recorded 1.6km east of the Site, off Foss Dyke near the village of Drinsey Nook. The other records returned by GLNP are considered to be historic (more than 10 years old), with records ranging from 1995 to 2005. The closest record is approximately 0.2km north of the Site.

3.1.5 NBGRC returned a single record for otter; located 1.6km east of the Site, near the Foss Dyke, Drinsey Nook in 2015.

Water vole

3.1.6 GNLP returned only historic records for water vole, with four records on-site. The most recent records were for an adult and latrine, in 2007, in the northern field, 0.3km to east of the River Trent.

3.1.7 Nottinghamshire have provided multiple records of water vole, with six sightings on-site. These records are from 2012-2017 and are located to the west of the Trent, along the Fledborough beck and associated ditches to the north.

3.2 Badger

3.2.1 Suitable habitat for sett creation, commuting and foraging was recorded throughout the Site. Suitable habitats include woodland, grasslands and arable fields, which dominate.

3.2.2 Badger setts were noted on 5 occasions, with two latrines also being recorded. These are detailed in **Table 3-1** below and locations shown on **Figure A1-1**.

Table 3-1: Details of badger evidence recorded on-Site

ID	Description
1	Latrine with fresh dung. Badger hairs found along fence line nearby.
2	A single sett entrance, approximately 5m in the field from the ditch, clear signs of activity and is likely an annexe sett, with further entrances disguised by crop growth. Clear paths in and out of the sett are present in multiple directions with

ID	Description
	sightings of badger cubs at this sett on at least two occasions during diurnal survey. Signs of fresh bedding and digging also recorded.
3	Annexe sett with at least three entrances located two or three metres from the bank top of a deep, water-filled ditch that separates the fields. Evidence of badger occupancy with a cub heard and seen returning to sett from within crop. One of the entrances has partially caved in on top and there were fox footprints present
4	A single sett entrance, located within the field margin of the field, surrounded by latrines, and is likely an outlier
5	Single sett entrance by pond, likely an outlier
6	Latrine
7	Multiple sett entrances within off Site woodland. Due to fencing, they couldn't be accessed to categorise the sett.

3.3 Riparian mammals (Otter and Water Vole)

3.3.1 Suitable foraging, commuting, resting, and holt/burrow habitat for water vole and otter were recorded within the DCO Order Limits, as shown on **Figure A1-2.**

3.3.2 In addition, both GNLP and NGBRC returned records for invasive American mink *Neovison vison*, with two records being recorded on-site in 2017, along the Fleborough beck, 0.35km west of the River Trent. In addition, an adult American mink was recorded in October 2023, near the River Trent, by St Gregory's Church, Fledborough by a surveyor. The presence of American mink in the UK is considered to be a contributing factor to water vole population declines due to direct predation (Aars *et al.*, 2001; Bonesi and Palazon, 2007).

3.3.3 All on-site ditches are associated to four large watercourses: The River Trent, Fledborough beck, the Old Trent, Sewer dyke and an unnamed drainage ditch in the east. A summary of these watercourses is presented below in **Table 3-2.**

Table 3-2: Watercourses suitable for riparian mammals

ID	Type	Shore/ bank	Bank modifications	Bordering land use	Presence of vegetation	Disturbance	Bank profile	Depth	Width	Water	Rat/ mink evidence	Water vole evidence	Otter evidence
River Trent	River	Earth	None	Floodplain grazing marsh	Short grass and scrub (bramble)	Low	Shallow <45°	~0.8-3m	~75m	Permanent – fast flowing	Mink	×	×
Fledborough beck	Ditch	Earth	None	Arable with narrow field margins	Submarginal vegetation (reed beds), Scrub (bramble)	High	Steep >45°	~1.5-5m	~0.5-1m	Permanent – sluggish flow	Mink	×	×
The Old Trent	Ditch	Earth	None	Arable with narrow field margin	Submarginal vegetation (reed beds), Scrub (bramble)	High	Steep >45°	~1.5-4m	~0.5-2m	Permanent – sluggish flow	×	×	×
Sewer dyke	Ditch	Earth	None	Arable with narrow field margins	Submarginal vegetation (reed beds), Scrub (bramble)	High	Steep >45°	~2-4m	~1-2m	Permanent – sluggish flow	×	×	×

ID	Type	Shore/ bank	Bank modifications	Bordering land use	Presence of vegetation	Disturbance	Bank profile	Depth	Width	Water	Rat/ mink evidence	Water vole evidence	Otter evidence
Unnamed drainage ditch	Ditch	Earth	None	Arable with narrow field margins	Submarginal vegetation (reed beds), Scrub (bramble)	High	Steep >45°	~2-3m	~1.5-2m	Permanent – sluggish flow	×	×	×

3.3.4 All five above watercourses are considered suitable foraging, commuting and resting opportunities for otter, although no evidence was found for this species during the surveys.

3.3.5 The Fledborough beck, the Old Trent, Sewer dyke and unnamed ditch are all considered to be optimal habitat for water vole, with the River Trent being considered 'suitable but poor' due to the large variation in water levels where the banks are regularly overtopped. No evidence of water vole was recorded during the surveys; however, an adult mink was recorded running from the Fleborough beck eastwards towards the River Trent.

4 Summary

4.1.1 Badger activity was recorded across the site, with the greatest level of activity recorded to the west of the River Trent, with both annex and outlier setts identified. East of the River Trent a potential main sett was identified, however the sett was inaccessible, being located on private land.

4.1.2 Suitable foraging, commuting, resting, and holt/burrow habitat for water vole and otter were recorded within on-Site. However no evidence of otter or water vole has been recorded during the ecological fieldwork to date.

5 References

Aars, J., Lambin, X., Denny, R. and Griffin, A.C., (2001). Water vole in the Scottish uplands: distribution patterns of disturbed and pristine populations ahead and behind the American mink invasion front. Animal Conservation forum (Vol. 4, No. 3, pp. 187-194). Cambridge University Press.

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A1 Figures

Figure A1-1: Location of badger activity

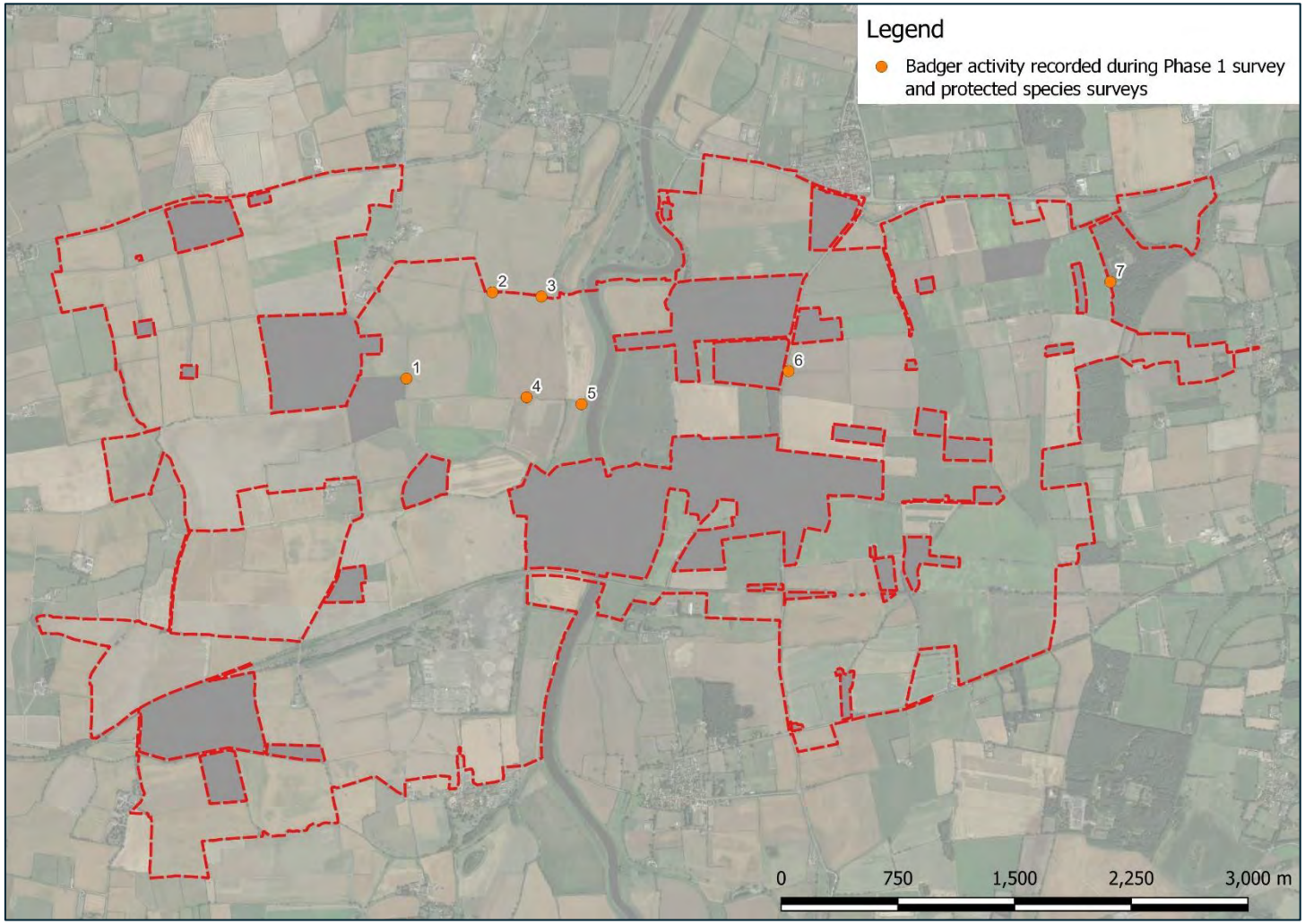
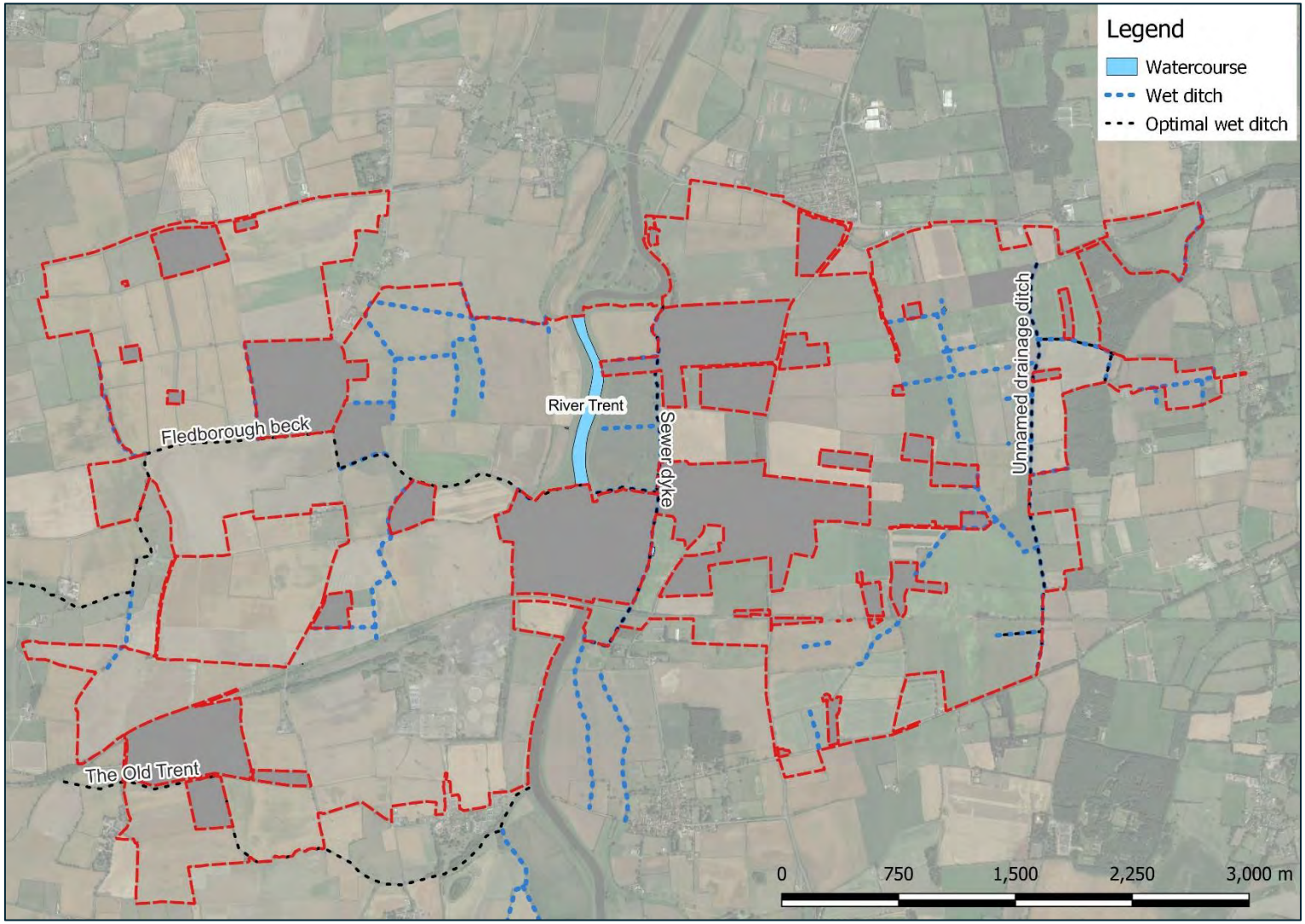


Figure A1-2: Suitable habitat for otter and water vole



Appendix 7-7: Wintering Bird Baseline

Report

One Earth Solar Farm

Appendix 7-7: Winter Bird Baseline

For One Earth Solar Farm Ltd

17 May 2024

Document control

Project Title:	One Earth Solar Farm
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Contents

Tables

1 Introduction

1.1 Background

1.1.1 This Appendix should be read in conjunction with Chapter 7 of the Preliminary Environmental Information Report (PEIR) associated with the One Earth Solar Farm, hereafter referred to as the 'Proposed Development' or 'One Earth'.

1.1.2 This Appendix described the survey methodologies used and summarised the results of the winter bird surveys undertaken between September 2023 and March 2024 within the proposed DCO Order Limits; with emphasis on open farmland habitats and floodplain grazing marsh within the river Trent corridor that have the potential to support important assemblages of non-breeding (wintering) birds.

1.2 Purpose of this appendix

1.2.1 The purpose of the Appendix is to present the results of the winter bird assessment which was undertaken to identify and assess the assemblage of wintering birds potentially impacted by the Proposed Development.

1.2.2 Surveys were completed between September 2023 and March 2024 (where passage and wintering species are most likely to be encountered) with surveyors following pre-defined transect routes to assess the overall winter bird assemblage within the area.

1.2.3 The winter bird surveys were designed to identify the distribution, density and activities of non-breeding birds within an appropriate sampling area within the DCO Order Limits. This sampling area targeted habitats representative of the DCO Order limits that are likely to support winter bird assemblages.

1.3 Structure of this appendix

1.3.1 This appendix is structured as follows:

- Section 2: Methods;
- Section 3: Results;
- Section 4: References;
- Annex A: Figures;
- Annex B: Species recorded during the breeding bird survey;
- Annex C: Full survey details; and
- Annex D: Territory mapping criteria

2 Methods

2.1 Desk Study

2.1.1 An environmental desk study was undertaken to identify statutory designated sites of international and national importance for ornithology within 10km of the proposed DCO Order Limits, and non-statutory designated sites of ornithological importance within 2km of it. The search for statutory sites was carried out using the Multi-Agency Geographic Information for the Countryside (MAGIC) website (an internet-based Geographic Information Systems database provided by the Department for Environment, Foods and Rural Affairs (DEFRA) (Defra, 2024)) and for non-statutory sites through a data request to Greater Lincolnshire Nature Partnership (GLNP). Information on statutory designated sites was gathered from the websites of Natural England (Natural England, 2024) and the Joint Nature Conservation Committee (JNCC) (JNCC, 2024).

2.1.2 In addition to information on designated sites, species specific data was gathered from GLNP within 2km of the proposed DCO Order Limits.

2.2 Winter bird surveys

2.2.1 Winter bird surveys were undertaken between September 2023 and March 2024 inclusive. The purpose of the winter bird survey was to collect data to confirm the typical distribution and assemblages of species present within the area surveyed (See **Section 3.1**)

Data collection locations

2.2.2 The survey adopted a sampling approach and focused on large areas of accessible land within which the breeding bird assemblage has the potential to be impacted by the proposed development. The survey area covered 633 hectares (ha) of the 1480 ha red-line boundary, at the time of survey. The survey area covered large areas of open farmland, ditch, and hedgerow complexes on both sides of the river Trent, woodland edge habitats (east of the river Trent) and linear features including the river Trent corridor and the embankment of the dismantled railway line that runs east-west through the Site serving as a functional Sustrans Route 647. The survey was undertaken based on the proposed DCO Order Limits, plus a 50m buffer, where the survey areas directly overlapped Order Limits, information was gathered for birds outside of the Order Limits.

2.2.3 For the purposes of the wintering bird surveys, this area was divided into ten transects. The transects were spread throughout to give full coverage on the site. Consideration was also given to include the range of habitats and areas of specific interest for breeding birds such as the floodplain along the river Trent. These survey areas received systematic coverage with surveys undertaken by a single surveyor to avoid duplication of counting or overlap of adjacent area recordings (Figures A1-A9, **Annex A**). Data from all survey areas was combined for reporting purposes.

2.2.4 Transect 1: lies within the northwest of the Site boundary and includes areas of open farmland (with predominantly large rectangular fields), divided in places by narrow hedgerows and ditches. This transect is dominated by winter stubble and bare ground.

2.2.5 Transects 2&3: abuts Transect 1 to the southeast and continues south- and eastwards from the hamlet of Ragnall toward Fledborough. This area consists of a large expanse of agricultural crop fields including examples of the largest agricultural fields within the DCO Order Limits. These large fields were predominantly winter stubble and bare ground with boundary features of hedgerows and overgrown ditches also present. The area includes agricultural land considered as coastal floodplain grassing marsh (on the priority habitat inventory) on the west of the river Trent.

2.2.6 Transect 4: lies to the north of the hamlet of skegby. The area consists of large agricultural fields of winter stubble and bare ground. A small patch of woodland was present just of Crabtree Lane and hedges and treelines separated the fields. The transect crossed over the abandoned railway, which was bordered by trees on both sides.

2.2.7 Transect 5: lies in the north of the site, just to the east of the Trent. The area is 50m about the level of the river and is bordered to the east by a steep bank that runs down to the trent. The fields just south of the A57 were left as winter stubble and bare ground in the winter. The fields closest to the river were grassland that was used sporadically for sheep grazing during the winter. Carefully managed hedges split the field.

2.2.8 Transect 6: lies immediately east of the river Trent on low-lying agricultural land used for crop production. This area includes fields north of Trent Lane between the river corridor escarpment to the east and the river to the west. This land is mostly left as bare earth over the winter and also had a set-aside or sacrificial crop used for game cover. Along the eastern side of these fields there is a large pond and ditch network (the Sewer Dyke) which forms a transitional habitat from low-lying agricultural land into a scrub / wooded escarpment.

2.2.9 Transect 7: Consists of agricultural fields directly east of the river Trent between the villages of South- and North Clifton. These large fields are bordered by linear features including hedgerows and ditches. To the immediate west of the Area is the river Trent, with Church Lane immediately east. These arable fields were made up of winter stubble, bare ground and sports turf during the winter bird survey period.

2.2.10 Transect 8: is located in the northeast of the site. The transect passes alongside patches of plantation woodland with fields of grass used for turf located in between. A large, deep ditch runs along the western edge of the transect.

2.2.11 Transect 9: lies within a large area of agricultural fields. The fields were mostly left as winter stubble and bare ground throughout the winter. Two areas of set-aside used for bird cover are also present within the fields as well as a releasing pen for red legged partridges. Hedges with trees set within are present along most field edges and several farm buildings were also spread around the area.

2.2.12 Transect 10: is located in the southeast of the site. The transect runs through agricultural fields of bare ground and winter stubble. The transect runs along part of the abandoned railway line with a field of beet to the north and grass being grown for turf to the south. A temporary scrape is also present within the fields south of the transect.

2.2.13 Full survey details, including surveyor names, visit dates and times, and weather conditions are available in **Table C-1**, Annex C.

Data collection methods

2.2.14 The surveys followed an adapted method based on the BTO's CBC methodology (Gilbert *et al*., 1998), whereby the observer undertakes a census of all species present. The location of each bird detected (visually and / or aurally) was mapped using the standard two-character BTO codes, and bird activity was recorded using standard behaviour codes (Marchant, 1983).

2.2.15 Survey visits were undertaken between September 2023 and March 2024.

2.2.16 Six survey visits were undertaken during the 2023-24 breeding season: one each month from September 2023 to March 2024.

2.2.17 All surveys were undertaken in favourable conditions, avoiding periods of heavy rain, or strong or cold winds, therefore minimising variation in bird activity levels due to weather conditions.

2.2.18 Visits started occurred during daylight hours within the winter starting at least half an hour after sunrise and finishing at least half an hour before sunset.

2.2.19 The transects were walked in different orders and at different times of day each month to account for a potential range in bird activity throughout the day.

Mapping

2.2.20 On completion of the field survey, results were collated and analysed. Bird records were located using field numbers that were previously finalised. Numbers and locations of target species, waders and waterfowl, were mapped to show distributions of the species.

Deviations, constraints and limitations

2.2.21 Surveys were conducted within a sampling area based on the potential for habitats within the DCO Order Limits to provide winter bird habitat. The sampling area focussed on areas with higher habitat diversity within the DCO Order Limits to assess greater quality habitats for wintering birds and form a baseline (worst case scenario) that can be used to assess the potential impacts of the proposed development. In undertaking these surveys during the early stages of the Scheme, areas subject to survey may no longer fall within the DCO Order Limits at submission, similarly additional areas outside of the current DCO Order Limits may be brought forwards for inclusion with the Scheme. This represents a limitation and constraint to the overall wintering bird assessment of the scheme as potential wintering bird information provided below may no longer be relevant at submission. This limitation, along with the solution to provide a robust assessment will be discussed further within the ES.

2.2.22 Areas that were due to be walked on transects 6 and 7 were flooded in December 2023 and January 2024. As result it was impossible to walk the full length of these transects during these months. The areas within these transects were able to be surveyed from other locations and vantage points such as across the river Trent. This allowed the majority of areas to still be fully surveyed however, it could have limited records of smaller, less conspicuous bird species that may have been located in these areas during December and January. Despite this, it is believed that the winter bird surveys on the transects in other months coupled with the vantage point surveys have given an accurate representation of the wintering bird assemblage in the area throughout the winter.

2.2.23 Despite the deviation, constraints and limitations describe above, the dataset is considered to provide a robust approximation of the wintering bird assemblage within the survey area. This conclusion can be drawn as constraints and limitations faced within the wintering bird assessment were not extensive enough to negatively impact the mapping exercise undertaken following the completion of the surveys. Further the areas sampled as part of this assessment include the areas most likely to present increased species diversity and density therefore using these areas to extrapolate potential impacts on the overall wintering bird assemblage will create a robust baseline. Expansive areas of open arable land which were not subject to wintering bird survey are considered to be of limited importance to wintering birds due to the homogeneity of the habitats and a lack of foraging and roosting habitat.

3 Results

3.1 Statutory designated sites of ornithological importance

3.1.1 There are no nationally or internationally statutory designated sites of ornithological importance within 10km of the DCO Order Limits.

3.2 Non-statutory designated sites of ornithological importance

3.2.1 There are no non-statutory designated sites of ornithological importance within 2km of the DCO Order Limits.

3.3 Species records

3.3.1 As part of the environmental desk study, species data for birds likely to be found within, or in proximity to the DCO Order Limits was gathered from GLNP. Species data was screened to include all records within the winter bird season (here considered to be 1st September – 31st March inclusive) from within the last ten years.

3.3.2 GLNP returned 830 records of 19 species considered to be notable[1] during the wintering season, including:

- Nine Schedule 1 listed species – kingfisher, marsh harrier, whooper swan, brambling, red kite, redwing, fieldfare, barn owl, bewick's swan.
- Seven Species of Principal Importance (SPI) (Natural Environment and Rural Communities Act (NERC), 2006) – bewick's swan, reed bunting, linnet, tree sparrow, bullfinch, starling, lapwing.
- Seven birds of conservation concern[2] (BoCC) Red-listed species – skylark, bewick's swan, linnet, tree sparrow, starling, fieldfare, lapwing.
- Six birds of conservation concern (BoCC) Amber-listed species – greylag goose, marsh harrier, whooper swan, reed bunting, bullfinch, redwing.

3.3.3 There is potential for schedule 1 species including, whooper swan, redwing and bewick's swan to overwinter within or in proximity to the site.

3.3.4 Further details of the GLNP records can be found within Appendix 7-2 (Document Reference: Ecology Desk Study).

[1] GLNP returned records of birds considered notable if listed as local priority species (Listed as UK Biodiversity Action Plan (UK BAP) species), protected by Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) or priority species listed on Birds of Conservation Concern 5 – Red List.
2 BoCC Red list = The background to the establishment of a 'traffic light system' of conservation concern for UK birds is discussed in Gregory et al. (2002). The updated criteria and lists are detailed in Stanbury et al. (2021). Broadly, 'Red-listed' species include those that are globally threatened, have suffered a historical population decline in the UK (between 1800 and 1995) or which have experienced rapid declines in their UK breeding population or contractions in their UK range of more than 50% over the past twenty-five years. Amber-listed' species include any species on the European Red List (Critically Endangered, Endangered or Vulnerable), these are detailed in Stanbury et al. (2021).

3.4 Winter bird survey

3.4.1 A total of forty-four species were recorded during the wintering bird survey (See Table C-1, **Annex C**), of which:

- Nine species listed as SPI: grey partridge, house sparrow, linnet, skylark, song thrush, lesser redpoll, starling, lapwing and yellowhammer.
- Ten species recorded as BoCC red-listed species: grey partridge, lapwing, mistle thrush, starling, house sparrow, lesser redpoll, linnet, skylark, yellowhammer, and fieldfare.

3.4.2 **Table 3.1**, below, presents the records of target species within the survey area, along with any legislative protection or conservation status.

Table 3-1 – Wintering bird records during the 2023-24 wintering bird surveys

BTO code	Species	Number of records	SPI[3]	BoCC[2]
B.	Black-Headed Gull	29		Amber
CM	Common Gull	12		Amber
FF	Fieldfare	18		Red
P.	Grey partridge	3	✓	Red
GP	Golden Plover	6		Green
GJ	Greylag Goose	7		Amber
HS	House sparrow	1	✓	Red
K.	Kestrel	22		Amber
L	Lapwing	11	✓	Red
LB	Lesser-Black Backed Gull	20		Amber
LR	Lesser redpoll	2	✓	Red
LI	Linnet	9	✓	Red
M	Mistle Thrush	3		Red
MA	Mallard	11		Amber
MP	Meadow Pipit	2		Amber
MH	Moorhen	2		Amber

[3] **SPI** = Species "of principal importance for the purpose of conserving biodiversity" covered under Section 41 (England) of the NERC Act (2006).

BTO code	Species	Number of records	SPI[3]	BoCC[2]
OC	Oystercatcher	2		Amber
RO	Rook	25		Amber
S.	Skylark	41	✓	Red
ST	Song thrush	6	✓	Amber
SD	Stock dove	6		Amber
SG	Starling	27	✓	Red
SH	Sparrowhawk	6		Amber
SN	Snipe	5		Amber
WN	Wigeon	4		Amber
WP	Woodpigeon	50		Amber
WR	Wren	4		Amber
WS	Whooper Swan	1		Amber
Y.	Yellowhammer	11	✓	Red

The winter bird assemblage recorded within the survey area is typical of open farmland habitats with limited vegetative cover (aside from seasonal crop). There were noticeable increases in species diversity and abundance within well established marginal features such as those found along the river Trent corridor, the escarpment along the east of the Trent and the woodland and scrub edges within the 50m buffer from the DCO Order Limits.

Waders

Golden Plover were recorded on six occasions during the wintering bird surveys. The maximum number recorded was approximately 400 birds that were flushed from a bare agricultural field in the southwest of the site in November 2023. The majority of records consisted of golden plover flying over the site or being flushed from fields alongside the river trent.

Lapwing were recorded on eleven occasions during the wintering bird surveys. The maximum number recorded was 400 birds that were foraging and loafing alongside a temporary scrape in the southeast of the site in December 2023. A large flock of lapwing was recorded on multiple occasions around the temporary scrape alongside T10 throughout the winter. Lapwing were also recorded in large numbers, roughly 200 individuals, in the flooded agricultural fields alongside the river Trent. Smaller flocks were also recorded commuting around the site on various occasions.

Snipe were recorded on five occasions during the wintering bird surveys. The maximum number recorded was four birds that were flushed from a winter stubble field on T9 in February 2024. All records of snipe were of birds flushed on winter stubble field on T9, the fields remained wet throughout the winter which provided foraging habitat for the snipe.

Oystercatcher were recorded on two occasions; Both sightings were of 3 birds recorded foraging along the banks of the river Trent in February and March 2024 respectively.

Waterfowl

Greylag geese were recorded on seven occasions during the winter bird surveys. The maximum number recorded was 200 birds seen foraging and loafing on the banks of the Trent in February 2024. All but one of the records involved flocks of birds flying over or foraging along the river Trent. The flooded fields to the east of the Trent provided foraging and roosting habitat for the greylags during the winter.

Wigeon were recorded on four occasions during the winter bird surveys. A maximum count of 75 birds was recorded in January 2024 on a flooded field to the east of the river Trent at the northern end of the site. The flock was recorded again the following month foraging and loafing in the flooded fields alongside the river.

Moorhen were recorded on two occasions during the winter bird surveys. A maximum count of 2 was recorded on a small pond within the farmland on T10 in February 2024. The other sighting involved a single moorhen being seen on the sewer dyke present on T6 in October 2023.

Mallard were recorded on eleven occasions during the winter bird surveys. A maximum count of ten birds were recorded on the River Trent in March 2024. All of the sightings involved birds using the river for foraging or loafing.

Whooper swans were recorded on one occasion; seven swans were recorded flying high over the site in January 2024.

Species of Principal Importance

Other than Lapwing which was discussed above, Eight species of principal importance were recorded during winter bird surveys:

- Grey Partridge were recorded on three occasions in the northwest of the site in, with a maximum count of two birds in February 2024.
- House Sparrow were recorded on one occasion in south Clifton, 15 birds were recorded in October 2023.
- Lesser Redpoll were recorded on two occasions in the southwest and southeast of the site, with a maximum count of 28 birds recorded in February 2024.
- Linnet were recorded on nine occasions, mostly in arable farmland in the northeast and centre of the site. A maximum count of 70 linnet was recorded in November 2023.
- Skylark were recorded 41 times spread throughout the site on arable farmland, a maximum count of nine birds was recorded in December 2023.
- Song Thrush were recorded on six occasions, mostly in the northeast and northwest of the site. A maximum count of five birds was recorded in November 2023.
- Starling were recorded on 27 occasions spread throughout the site, with a maximum count of 1000 birds in November 2023.
- Yellowhammer were recorded on eight occasions in areas of arable farmland around the site, with a maximum count of 14 birds in November 2023.

Red listed and large flocks

Other red listed or large flocks of birds:

- Fieldfare were recorded on 18 occasions with a maximum count of 35 in February 2024
- Mistle thrush were recorded on three occasions with a maximum count of 3 in December 2023
- Black-Headed Gull were recorded on 29 occasions with a maximum count of 160 in October 2023
- Common Gull were recorded on 12 occasions with a maximum count of 68 in February 2024
- Goldfinch were recorded on eight occasions with a maximum count of 150 in November 2023
- Stock Dove were recorded on six occasions with a maximum count of 60 in February 2024
- Woodpigeon were recorded on 50 occasions with a maximum count of 65 in January 2024

Other notable Species

Other notable species recorded during winter bird surveys include (with max counts):

- Goshawk (1)
- Kestrel (2)
- Kingfisher (2)
- Hobby (1)
- Sparrowhawk (1)

A full list of species observed during the breeding bird surveys is available in **Annex C.**

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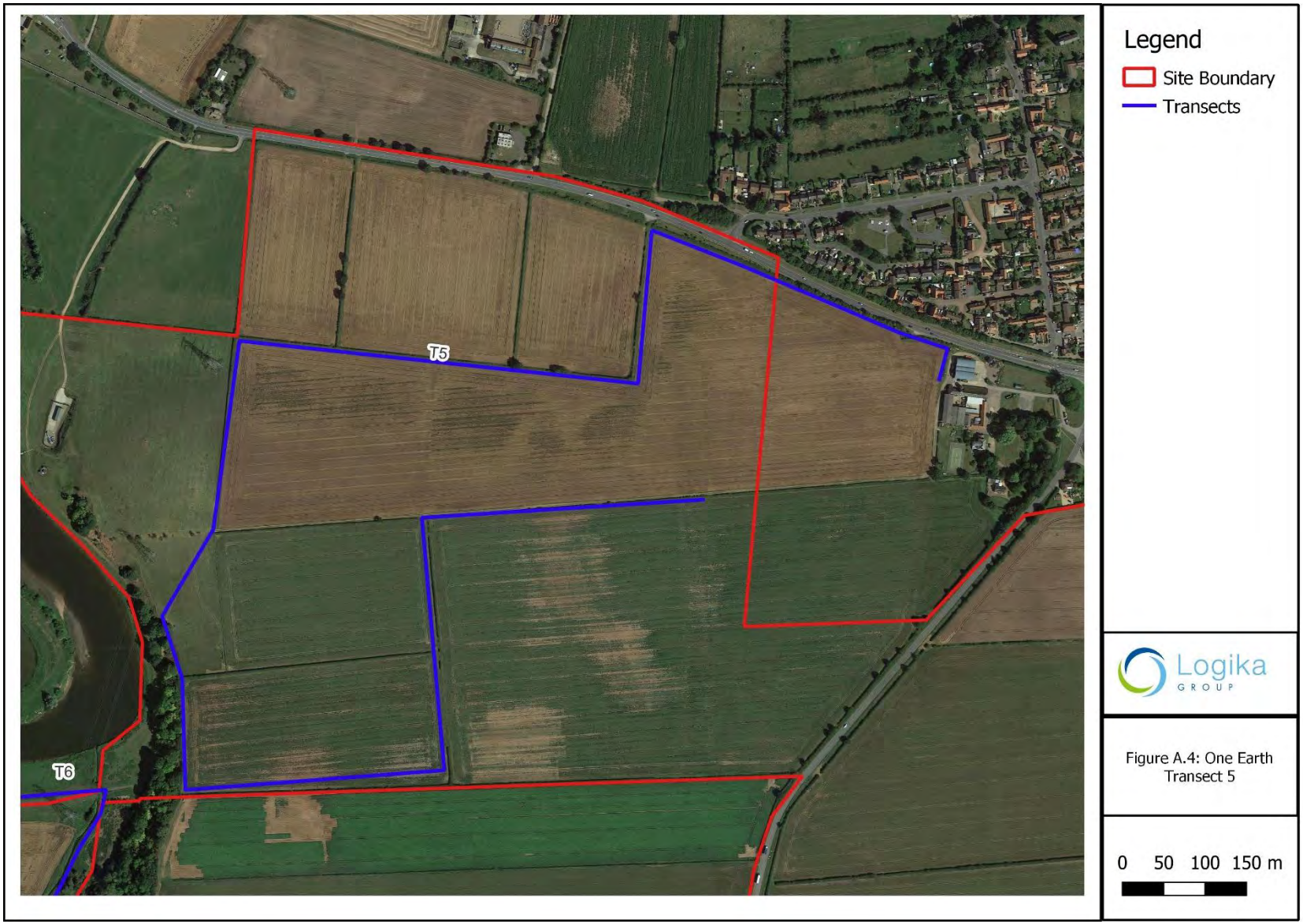
Annex A. – Transect Figures


T1
Legend
Site Boundary
Transects
Logika GROUP
Figure A.1: One Earth Transect 1
0 100 200 m


T2&3
T6
Legend
Site Boundary
Transects
Logika GROUP
Figure A.2: One Earth Transect 2&3
0 100 200 m


T4
Legend
Site Boundary
Transects
Logika GROUP
Figure A.3: One Earth Transect 4
0 100 200 m


T5
T6
Legend
Site Boundary
Transects
Logika GROUP
Figure A.4: One Earth Transect 5
0 50 100 150 m


T5
T6
T2&3
Legend
Site Boundary
Transects
Logika GROUP
Figure A.5: One Earth Transect 6
0 100 200 m


Legend
Site Boundary
Transects
T7
Logika
GROUP
Figure A.6: One Earth Transect 7
0
100
200 m

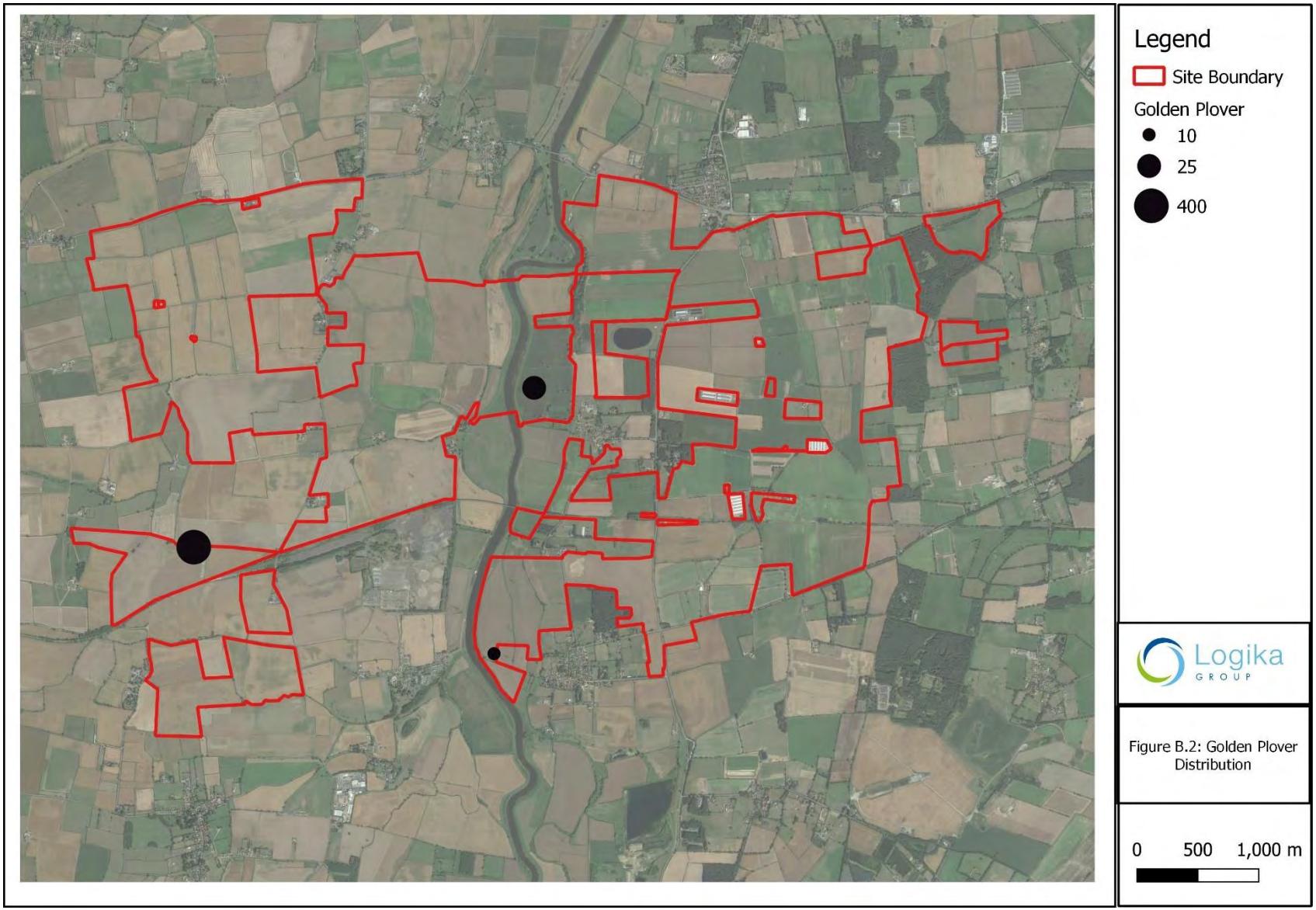

T8
Legend
Site Boundary
Transects
Logika
GROUP
Figure A.7: One Earth Transect 8
0
100
200 m

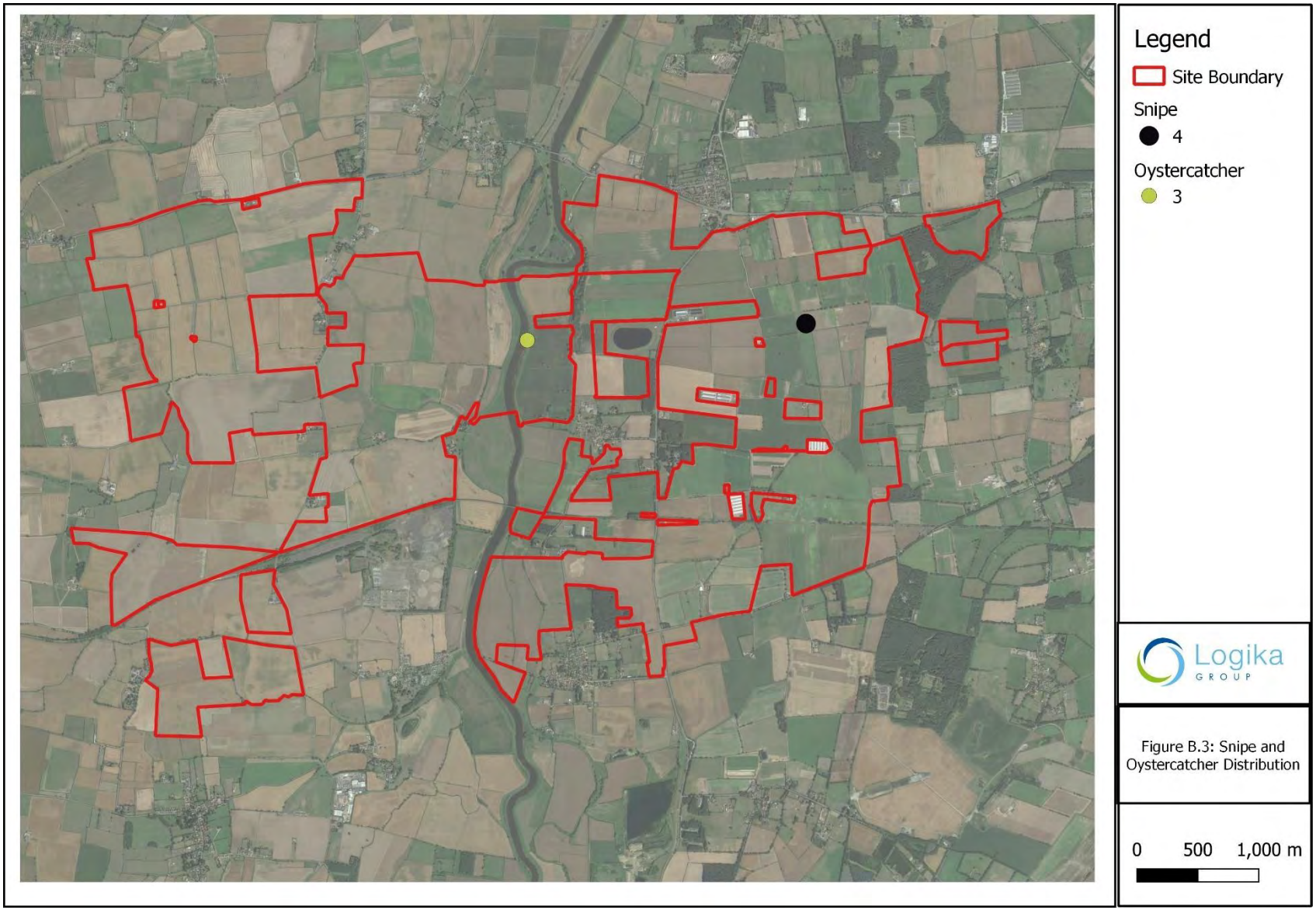

T8
T9
Legend
Site Boundary
Transects
Logika GROUP
Figure A.8: One Earth Transect 9
0 100 200 m

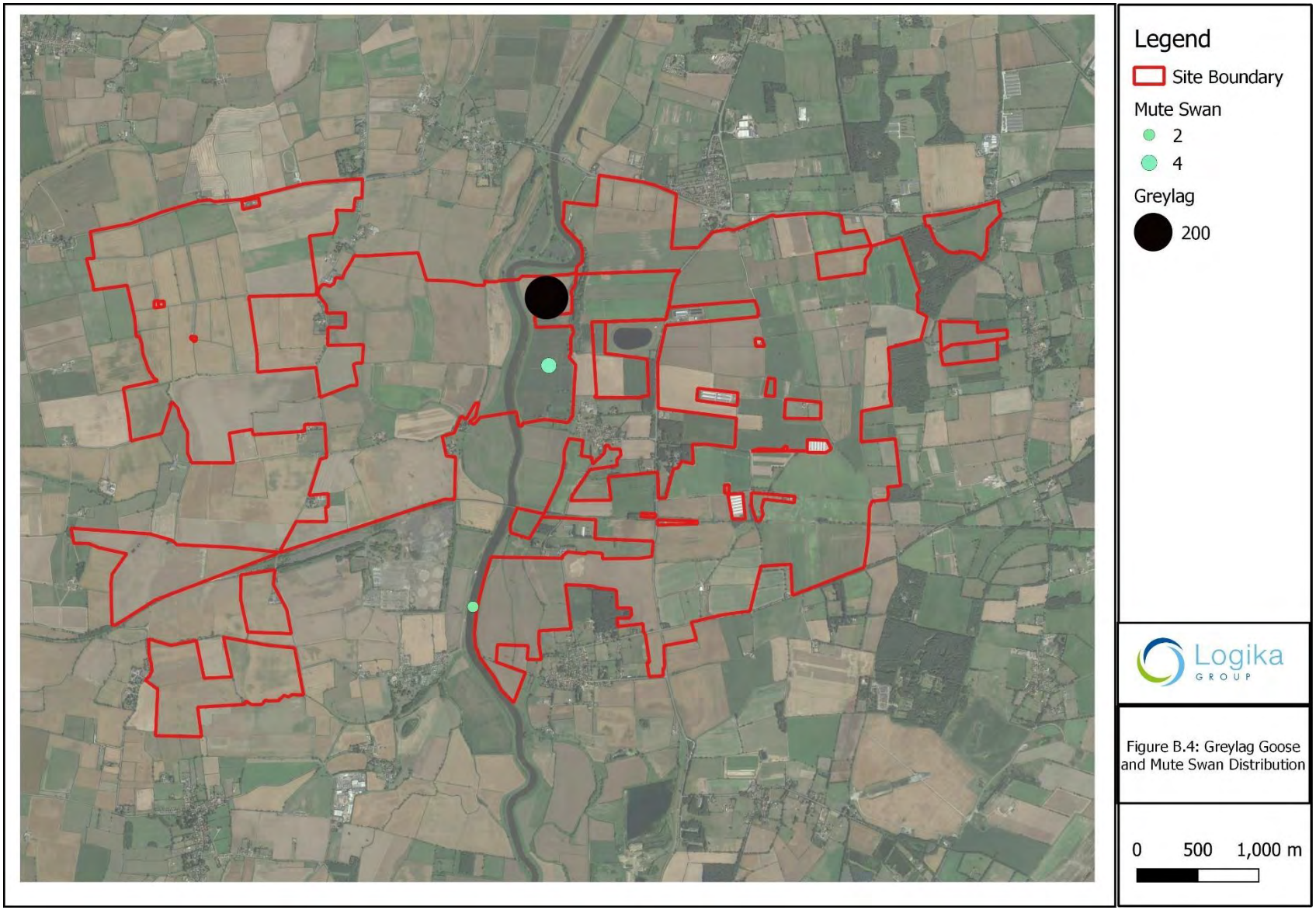

T10
Legend
Site Boundary
Transects
Logika GROUP
Figure A.9: One Earth Transect 10
0 100 200 m

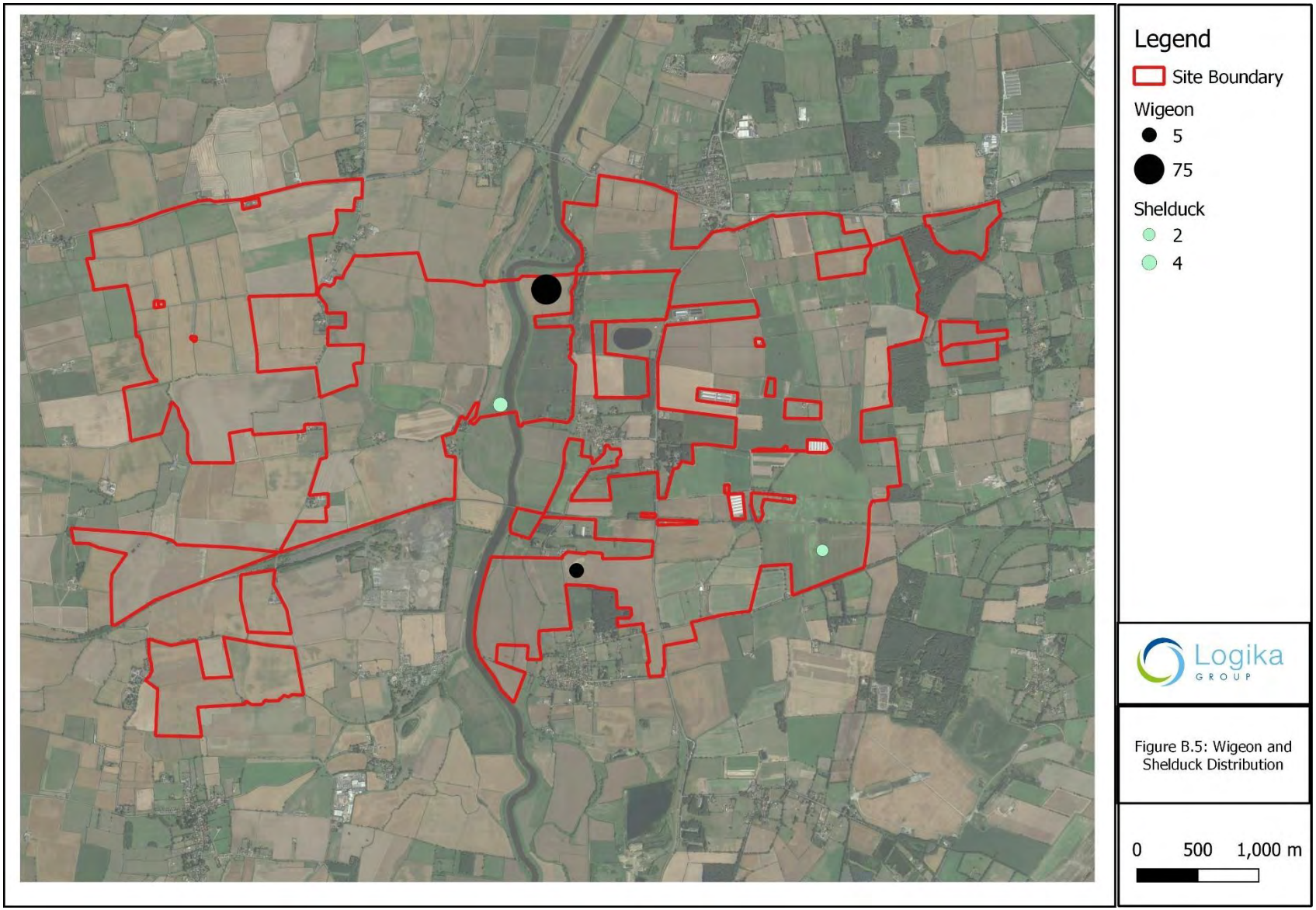
Annex B. – Abundance Figures

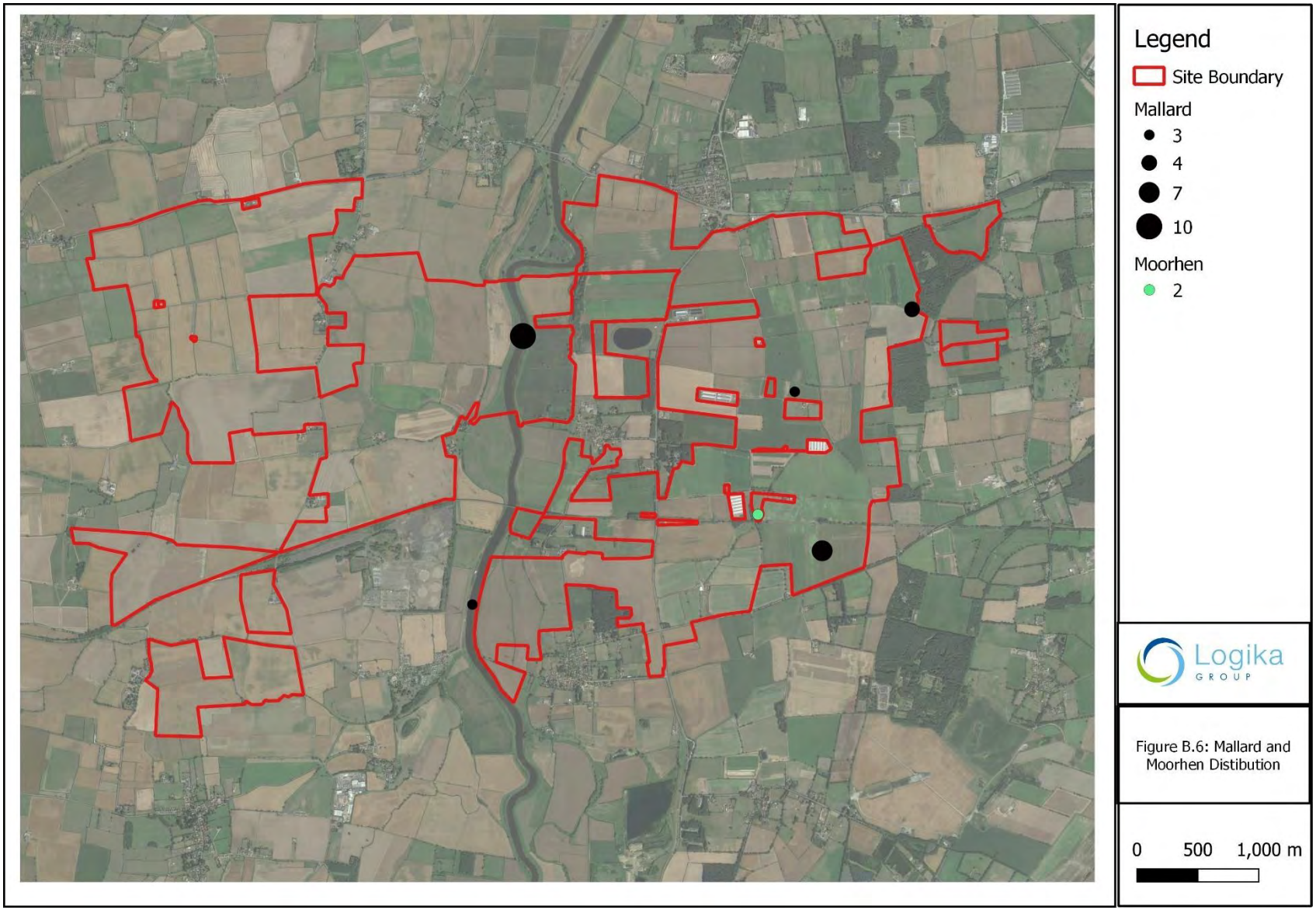

Legend
Site Boundary
Lapwing
50
200
400
Logika GROUP
Figure B.1: Lapwing Distribution
0
500
1,000 m


Legend
Site Boundary
Golden Plover
10
25
400
Logika GROUP
Figure B.2: Golden Plover Distribution
0
500
1,000 m


Legend
Site Boundary
Snipe
4
Oystercatcher
3
Logika GROUP
Figure B.3: Snipe and Oystercatcher Distribution
0
500
1,000 m


Legend
Site Boundary
Mute Swan
2
4
Greylag
200
Logika GROUP
Figure B.4: Greylag Goose and Mute Swan Distribution
0
500
1,000 m


Legend
Site Boundary
Wigeon
5
75
Shelduck
2
4
Logika GROUP
Figure B.5: Wigeon and Shelduck Distribution
0
500
1,000 m


Legend
Site Boundary
Mallard
3
4
7
10
Moorhen
2
Logika GROUP
Figure B.6: Mallard and Moorhen Distibution
0
500
1,000 m

Annex C. Full species records

Table C-1 – Complete list of species recorded during wintering bird surveys.

Species	Scientific name
Black-headed gull	*Chroicocephalus ridibundus*
Buzzard	*Buteo buteo*
Canada goose	*Branta canadensis*
Chaffinch	*Fringilla coelebs*
Common gull	*Larus canus*
Cormorant	*Phalacrocorax carbo*
Egyptian goose	*Alopochen aegyptiaca*
Fieldfare	*Turdus pilaris*
Golden plover	*Pluvialis apricaria*
Goldfinch	*Carduelis carduelis*
Goshawk	*Accipiter gentilis*
Grey heron	*Ardea cinerea*
Grey partridge	*Perdix perdix*
Greylag goose	*Anser anser*
Hobby	*Falco subbuteo*
House sparrow	*Passer domesticus*
Kestrel	*Falco tinnunculus*
Kingfisher	*Alcedo atthis*
Lapwing	*Vanellus vanellus*
Lesser Black-backed gull	*Larus fuscus*
Lesser redpoll	*Acanthis flammea*
Linnet	*Linaria cannabina*
Little egret	*Egretta garzetta*

Species	Scientific name
Mallard	*Anas platyrhynchos*
Meadow pipit	*Anthus pratensis*
Mistle thrush	*Turdus viscivorus*
Moorhen	*Gallinula chloropus*
Mute Swan	*Cygnus olor*
Oystercatcher	*Haematopus ostralegus*
Redwing	*Turdus iliacus*
Rook	*Corvus frugilegus*
Skylark	*Alauda arvensis*
Snipe	*Gallinago gallinago*
Song thrush	*Turdus philomelos*
Sparrowhawk	*Accipiter nisus*
Starling	*Sturnus vulgaris*
Stock dove	*Columba oenas*
Stonechat	*Saxicola rubicola*
Shelduck	*Tadorna tadorna*
Whooper swan	*Cygnus cygnus*
Wigeon	*Mareca penelope*
Woodpigeon	*Columba palumbus*
Wren	*Troglodytes troglodytes*
Yellowhammer	*Emberiza citrinella*

In addition to those species listed in **Table C-1**, the following species noted within the report are given here along with their full scientific name:

- Marsh harrier *Circus aeruginosus*
- Bewick's swan *Cygnus columbianus*
- Reed bunting *Emberiza schoeniclus*

- Brambling *Fringilla montifringilla*
- Red kite *Milvus milvus milvus*
- Tree sparrow *Passer montanus*
- Bullfinch *Pyrrhula pyrrhula*

Annex C. – Full survey details

Full survey details of the winter bird surveys are shown below in **Table C.2.**

Table C-2 Full survey details of winter bird surveys.

Date	*Visit number*	*Transect number*	*Start time*	*End time*	*Weather conditions*
09/10/2023	1	T1	12:52	14:17	0/8 Oktas cloud, Beaufort 1 west, visibility > 3km, precipitation: none, 21°C
09/10/2023	1	T2	14:34	16:05	0/8 Oktas cloud, Beaufort 1 west, visibility > 3km, precipitation: none, 21°C
10/10/2023	1	T9	09:05	10:40	8/8 Oktas cloud, Beaufort 2 west, visibility > 3km, precipitation: none, 16°C
10/10/2023	1	T6	11:02	12:20	4/8 Oktas cloud, Beaufort 2 west, visibility > 3km, precipitation: none, 17°C
10/10/2023	1	T7	12:48	14:27	4/8 Oktas cloud, Beaufort 2 west, visibility > 3km, precipitation: none, 17°C
11/10/2023	1	T8	08:52	10:11	8/8 Oktas cloud, Beaufort 2 south-west, visibility > 3km, precipitation: none,16°C
11/10/2023	1	T5	12:31	14:05	8/8 Oktas cloud, Beaufort 2 south-west, visibility > 3km, precipitation: none, 16°C

Date	*Visit number*	*Transect number*	*Start time*	*End time*	*Weather conditions*
11/10/2023	1	T10	10:32	12:05	8/8 Oktas cloud, Beaufort 2 south-west, visibility > 3km, precipitation: none, 16°C
12/10/2023	1	T3	08:11	09:15	2/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 9°C
12/10/2023	1	T4	09:32	10:53	2/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 11°C
13/11/2023	2	T4	13:29	14:49	1/8 Oktas cloud, Beaufort 4 south-west, visibility > 3km, precipitation: none, 13°C
13/11/2023	2	T1	15:03	16:25	1/8 Oktas cloud, Beaufort 4 south-west, visibility > 3km, precipitation: none, 13°C
14/11/2023	2	T5	12:45	14:03	6/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 11°C
14/11/2023	2	T9	09:25	10:48	6/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 11°C
14/11/2023	2	T6	11:12	12:15	6/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 12°C
15/11/2023	2	T10	11:07	12:28	1/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 8°C
15/11/2023	2	T7	12:55	14:12	1/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 12°C

Date	*Visit number*	*Transect number*	*Start time*	*End time*	*Weather conditions*
15/11/2023	2	T8	09:19	10:34	1/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 8°C
16/11/2023	2	T2&3	08:04	10:23	8/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 5°C
11/12/2023	3	T9	12:48	14:24	8/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: drizzle, 5°C, Drizzle
11/12/2023	3	T6	14:45	15:32	8/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 5°C
12/12/2023	3	T5	09:35	10:56	8/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: light drizzle, 5°C
12/12/2023	3	T7	11:15	12:26	8/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 6°C
13/12/2023	3	T1	09:37	11:08	8/8 Oktas cloud, Beaufort 3 south-west, visibility > 3km, precipitation: drizzle, 2°C
13/12/2023	3	T2&3	11:25	13:23	8/8 Oktas cloud, Beaufort 3 south-west, visibility > 3km, precipitation: drizzle, 2°C
14/12/2023	3	T8	08:11	09:06	8/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 2°C

Date	*Visit number*	*Transect number*	*Start time*	*End time*	*Weather conditions*
14/12/2023	3	T10	09:32	11:13	8/8 Oktas cloud, Beaufort 1 south-west, visibility 500m - 3km, precipitation: drizzle, 2°C
12/12/2023	3	T4	13:05	14:26	8/8 Oktas cloud, Beaufort 1 south-west, visibility > 3km, precipitation: none, 6°C
08/01/2024	4	T4	12:33	13:55	7/8 Oktas cloud, Beaufort 2 north-east, visibility 500m - 3km, precipitation: none, 3°C
08/01/2024	4	T1	14:18	15:38	7/8 Oktas cloud, Beaufort 2 north-east, visibility 500m - 3km, precipitation: none, 3°C
09/01/2024	4	T10	11:46	13:05	1/8 Oktas cloud, Beaufort 2 north-east, visibility 500m - 3km, precipitation: none, 3°C
11/01/2024	4	T2&3	08:13	10:15	8/8 Oktas cloud, Beaufort 1 north-east, visibility 500m - 3km, precipitation: none, 3°C
10/01/2024	4	T7	12:59	14:04	6/8 Oktas cloud, Beaufort 1 north-east, visibility 500m - 3km, precipitation: none, 3°C
10/01/2024	4	T6	12:12	12:38	6/8 Oktas cloud, Beaufort 1 north-east, visibility 500m - 3km, precipitation: none, 3°C

Date	*Visit number*	*Transect number*	*Start time*	*End time*	*Weather conditions*
10/01/2024	4	T9	10:12	11:41	6/8 Oktas cloud, Beaufort 1 north-east, visibility 500m - 3km, precipitation: none, 2°C
09/01/2024	5	T5	13:32	14:57	2/8 Oktas cloud, Beaufort 2 north-east, visibility 500m - 3km, precipitation: none, 2°C
09/01/2024	5	T8	10:03	11:17	1/8 Oktas cloud, Beaufort 2 north-east, visibility 500m - 3km, precipitation: none, 2°C
12/02/2024	5	T9	14:45	16:00	4/8 Oktas cloud, Beaufort 2 west, visibility 500m - 3km, precipitation: none, 8°C
12/02/2024	5	T7	12:50	14:25	4/8 Oktas cloud, Beaufort 2 west, visibility 500m - 3km, precipitation: none, 8°C
13/02/2024	5	T6	13:40	15:15	8/8 Oktas cloud, Beaufort 2 south-west, visibility 500m - 3km, precipitation: none, 8°C
13/02/2024	5	T10	12:00	13:25	8/8 Oktas cloud, Beaufort 2 south-west, visibility 500m - 3km, precipitation: none, 8°C
13/02/2024	5	T1	10:05	11:35	8/8 Oktas cloud, Beaufort 2 south-west, visibility 500m - 3km, precipitation: none, 8°C

Date	*Visit number*	*Transect number*	*Start time*	*End time*	*Weather conditions*
14/02/2024	5	T2&3	11:35	13:55	8/8 Oktas cloud, Beaufort 1 south-west, visibility 500m - 3km, precipitation: none, 8°C
14/02/2024	5	T4	09:45	11:15	7/8 Oktas cloud, Beaufort 1 south-west, visibility 500m - 3km, precipitation: none, 8°C
15/02/2024	5	T8	10:30	11:55	8/8 Oktas cloud, Beaufort 2 south-west, visibility 500m - 3km, precipitation: none, 8°C
15/02/2024	5	T5	08:25	10:05	8/8 Oktas cloud, Beaufort 2 south-west, visibility 500m - 3km, precipitation: none, 8°C
11/03/2024	6	T8	14:35	16:02	8/8 Oktas cloud, Beaufort 2 north, visibility 500m - 3km, precipitation: none, 9°C
11/03/2024	6	T10	12:28	14:05	8/8 Oktas cloud, Beaufort 2 north, visibility 500m - 3km, precipitation: none, 9°C
12/03/2024	6	T1	09:58	11:23	8/8 cloud, Beaufort 2 south-east, visibility 500m - 3km, precipitation: rain showers, 7°C
12/03/2024	6	T2&3	11:54	14:12	8/8 cloud, Beaufort 2 south-east, visibility 500m - 3km, precipitation: rain showers, 7°C

Date	*Visit number*	*Transect number*	*Start time*	*End time*	*Weather conditions*
13/03/2024	6	T4	12:23	14:09	88/8 cloud, Beaufort 2 south-east, visibility 500m - 3km, precipitation: rain showers, 7°C
13/03/2024	6	T5	11:02	12:19	8/8 Oktas cloud, Beaufort 3 south-east, visibility 500m - 3km, precipitation: none, 7°C
13/03/2024	6	T9	08:58	10:35	8/8 Oktas cloud, Beaufort 3 south-east, visibility 500m - 3km, precipitation: none, 7°C
14/03/2024	6	T7	07:56	09:34	8/8 Oktas cloud, Beaufort 1 south-east, visibility 500m - 3km, precipitation: none 10°C
14/03/2024	6	T6	09:58	11:23	8/8 Oktas cloud, Beaufort 1 south-east, visibility 500m - 3km, precipitation: none 10°C

Appendix 7-8: List of Species with Scientific names

Common Name	*Scientific name*
Common pipistrelle	*Pipistrellus pipistrellus*
Leisler's bat	*Nyctalus leisleri*
Myotis	*Myotis spp*
Brown long-eared bat	*Plecotus auritus*
Soprano pipistrelle	*Pipistrellus pygmaeus*
Barbastelle	*Barbastella barbastellus*
Noctule	*Nyctalus noctula*
Whiskered bat	*Myotis mystacinus*
Oak	*Quercus spp*
Ash	*Fraxinus excelsior*
Beech	*Fagus spp*
Willow	*Salix spp*
Poplar	*Populus spp*
Nathusius' pipistrelle	*Pipistrellus nathusii*
Barn owl	*Tyto alba*
Quail	*Coturnix coturnix*
Hobby	*Falco subbuteo*
Skylark	*Alauda arvensis*

Common Name	Scientific name
Yellowhammer	*Emberiza citrinella*
House sparrow	*Passer domesticus*
Yellow wagtail	*Motacilla flava*
Linnet	*Linaria cannabina*
Greenfinch	*Chloris chloris*
Grey patridge	*Perdix perdix*
House martin	*Delichon urbicum*
Turtle dove	*Streptopelia turtur*
Wren	*Troglodytes troglodytes*
Whitethroat	*Sylvia communis*
Reed bunting	*Emberiza schoeniclus*
Woodpigeon	*Columba palumbus*
Sedge warbler	*Acrocephalus schoenobaenus*
Dunnock	*Prunella modularis*
Song thrush	*Turdus philomelos*
Mallard	*Anas platyrhynchos*
Oystercatcher	*Haematopus ostralegus*
Kestrel	*Falco tinnunculus*
Greylag goose	*Anser anser*
Lapwing	*Vanellus vanellus*

Common Name	Scientific name
Black headed gull	*Chroicocephalus ridibundus*
Wigeon	*Anas penelope*
Common gull	*Larus canus*
Starling	*Sturnus vulgaris*
Golden plover	*Pluvialis apricaria*
West European hedgehog	*Erinaceus europaeus*
Brown hare	*Lepus europaeus*
European eel	*Anguila penilla*
rye brome	*Bromus secalinus*
common cudweed	*Filago vulgaris*
frogbit	*Hydrocharis morsus-ranae*
hoary cinquefoil	*Potentilla argentea*
bird cherry	*Prunus padus*
Water fern	*Azolla filiculoides*
Parrot's feather	*Myriophyllum aquaticum*
Himalayan balsam	*Impatiens glandulifera*
Floating pennywort	*Hydrocotyle ranunculoides*
New Zealand pygmyweed	*Crassula helmsii*
Wall cotoneaster	*Cotoneaster horizontalis*
Japanese knotweed	*Reynoutria japonica*

Common Name	Scientific name
Chinese mitten crab	*Eriocheir sinensis*
American mink	*Neovison vison*
Hawthorn	*Crataegus monogyna*
Blackthorn	*Prunus spinosa*
Hazel	*Corylus avellana*
Privet rose	*Ligustrum vulgare*
Guelder-rose	*Viburnum opulus*
Willow scrub	*Baccharis salicifolia*
Bramble	*Rubus fruticosus*
Common reed	*Phragmites australis*
millet	*Panicum miliaceum*
Harvest mouse	*Micromys minutus*
river lamprey	*Lampetra fluviatilis*

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