

# **Loddon Garden Village**

## **Technical Appendix 11.8 – Freshwater Fish**

Prepared on behalf of

University of Reading

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# Loddon Garden Village

## Technical Appendix 11.8 – Freshwater Fish

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# **Loddon Garden Village**

## **Technical Appendix 11.8 – Freshwater Fish**

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# Loddon Garden Village

## Technical Appendix 11.8 – Freshwater Fish

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### 1. INTRODUCTION

#### Scope

1.1 This Technical Appendix supports **Chapter 11 (Ecology)** of the Environmental Statement (ES). It sets out the detailed methodologies and results of the survey work undertaken to inform:

- The baseline evaluation of the freshwater fish assemblage supported by the Zone of Influence of the Proposed Development;
- The assessment of likely impacts on the freshwater fish assemblage;
- The design of impact avoidance and mitigation measures; and
- The design of biodiversity enhancements for freshwater fish.

#### Site and Development Description

1.2 The Site is a large area of land to the west of Wokingham, between the villages of Shinfield, Arborfield and Sindlesham. It is located outside of the Green Belt and is largely made up of agricultural land and grasslands, with pockets of woodland and the River Loddon running through the centre of the Site.

1.3 The description of development for the application is as follows:

*“Application for the phased development of a new community at Loddon Garden Village, comprising, in outline:*

- *up to 2,800 residential units to include up to 100 custom and self-build plots;*
- *2 primary schools (up to 3 forms of entry) to include early years provision and 1 secondary school (up to 12 forms of entry);*
- *one District Centre, to incorporate up to 11,000m<sup>2</sup> of Class E (Commercial, business and Service, to include a food store of around 2,500m<sup>2</sup>), and Class F (Local Community and Learning);*
- *one Local Centre; to incorporate up to 2,400m<sup>2</sup> of Class E;*
- *a Sports Hub to include sports pitches and pavilion space;*
- *up to 4,250m<sup>2</sup> of further Class E, Class F, and *sui generis* development to include commercial, health care and public house;*
- *comprehensive green infrastructure including a Country Park, landscaping and public open space, and ecological enhancement measures;*
- *20 gypsy and traveller pitches;*

- *comprehensive drainage and flood alleviation measures to include Sustainable Urban Drainage Systems (SUDS) and engineering measures within Loddon Valley for the River Loddon;*
- *internal road network including spine road with pedestrian and cycle connections and associated supporting infrastructure;*
- *new and modified public rights of way;*
- *associated utilities, infrastructure, and engineering works, including the undergrounding of overhead lines;*
- *Ground reprofiling to accommodate infrastructure, flood alleviation and development parcels;*
- *Up to 0.5ha of land adjoining St Bartholomew's church for use as cemetery;*
- *Electricity substation (up to 1.5ha).*

*All matters reserved other than access, incorporating:*

- *a new pedestrian, cycle and vehicular access to Lower Earley Way via a new 4th arm to the Meldreth Way roundabout;*
- *a new pedestrian, cycle and vehicular bridge over the M4;*
- *a new pedestrian, cycle and vehicular bridge over the River Loddon;*
- *a new vehicular access to the A327 Reading Road, via a new arm to the Observer Way roundabout;*
- *a new pedestrian, cycle and vehicular access to Thames Valley Science Park;*
- *an initial phase of internal roads with associated drainage, landscape and engineering works and ground reprofiling, between the A327 and the south eastern boundary of the site.*

*Application includes full permission for the change of use of 40.4 hectares of agricultural land to Suitable Alternative Natural Greenspace (SANG), 18.35 hectares of SANG link, and provision of Biodiversity Net Gain measures, the demolition and clearance of 20,809 m<sup>2</sup> of buildings and structures at the Centre for Dairy Research (CEDAR) and at Hall Farm, the demolition of 3 existing dwellings on Carter's Hill Lane, and the retention of specified buildings at Hall Farm."*

## **Policy and Legislative Context**

### *Legislation*

1.4 Full details of the legislation of relevance to ecology and nature conservation are included in **Appendix 11.1**, however those of particular relevance to freshwater fish are summarised below.

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

1.5 The Wildlife and Countryside Act 1981 (as amended) protects certain species of fish, making it an offence to intentionally kill, injure or take them. Furthermore, it makes it an offence to intentionally, or recklessly, damage or destroy habitats used for shelter or protection.

*The Salmon and Freshwater Fisheries Act 1975*

1.6 The Salmon and Freshwater Fisheries Act 1975 protects freshwater fish, particularly salmon and trout. It prevents the destruction of spawning grounds and the obstruction of migratory passages through the building of weirs, dams etc.

*Eels (England and Wales) Regulations 2009 (as amended)*

1.7 The Eels Regulations 2009 (as amended) aim to combat the population decline of the European eel *Anguilla anguilla* through protection of migration routes and controls on the numbers of eels allowed to be taken. In order to protect migration routes, any structures which may prevent upstream or downstream migration of eels must be reported to the Environment Agency. Eel passages must be constructed where needed and maintained in a good condition.

*EU Habitats Directive 92/43/EEC*

1.8 The Habitats Directive provides the framework for the conservation and management of protected species and habitats in Europe. It requires the identification and classification of Special Areas of Conservation (SACs) for rare and vulnerable habitats and species listed under Annex I and II of the Directive respectively. Habitats listed under the Habitats Directive are protected from damage and destruction, whilst the species are protected from disturbance, killing and damage/disturbance to supporting habitats. In the UK, the provisions of the Directive are implemented through the Conservation of Habitats and Species Regulations 2017 (as amended), which provides for the designation of SACs, and the Wildlife and Countryside Act 1981 (as amended). This remains the case following the UK's exit from the European Union.

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

1.9 Section 40 of the NERC Act 2006 requires all public bodies, including Local Planning Authorities, to have regard to the conservation of biodiversity when carrying out their normal functions. Habitats and species listed under Section 41 of the Act, known as Habitats/Species of Principal Importance for Nature Conservation in England ('Section 41 species', previously referred to as 'BAP species') are a material consideration in the planning process. There are 35 species of fish on this list.

*Planning Policies and Biodiversity Strategies*

1.10 Full details of the planning policy of relevance to ecology and nature conservation are included in **Appendix 11.1**, however those of particular relevance to freshwater fish are summarised below.

*National Planning Policy Framework*

1.11 The National Planning Policy Framework (NPPF) (2024) sets out the Government's planning policies for England and how they should be applied. With regard to protecting the natural environment, Section 15 of the NPPF requires that planning decisions should enhance the natural environment and provide net gains for biodiversity.

*Local Planning Policy*

1.12 The Wokingham Borough Council Adopted Core Strategy: Development Plan Document (January 2010) sets out the framework for the development of the borough, through a series of policies and strategies. Of particular relevance to Badgers is Policy CP7 – Biodiversity.

1.13 The Wokingham Borough Local Plan Update 2023-2040 was submitted to the Secretary of State for examination by an independent Planning Inspector in February 2025. Whilst not currently

enforced, consideration has been given to these emerging policies during the course of the impact assessment, and design of mitigation, compensation and enhancement strategies.

*Berkshire Local Nature Recovery Strategy*

1.14 The draft Berkshire Local Nature Recovery Strategy was published in February 2025, with finalisation of the strategy anticipated in the summer of 2025. Formed as a requirement of The Environment Act 2021, Local Nature Recovery Strategies aim to identify priority actions for local biodiversity, including habitat and species, to create a collaborative landscape level approach to nature restoration. Two species of fish are included within the draft species list (Royal Borough of Windsor and Maidenhead, 2025).

## 2. SURVEY AND ASSESSMENT METHODOLOGY

2.1 The approach to ecological impact assessment taken in this report is in line with guidance from the Chartered Institute of Ecology and Environmental Management Guidelines for Ecological Impact Assessment (CIEEM, 2018), as set out in **Appendix 11.2**.

### Defining the Zone of Influence

2.2 The area over which the activities associated with the Proposed Development are considered to potentially affect the freshwater fish assemblage, the Zone of Influence (ZoI), has been predicted by considering the activities and resultant biophysical changes arising during the construction and operational phases, as summarised below.

### *Likely Biophysical Changes*

2.3 The predicted biophysical changes of relevance to the freshwater fish assemblage are as follows:

#### *Activities and Resultant Biophysical Changes During the Construction Phase*

- Noise, lighting and vibration which may cause disturbance to freshwater fish, altering their natural behaviours and impacting fitness;
- Dust generation and environmental incidents (e.g. spillages and pollution incidents) altering the water quality, impacting upon the health and survivability of freshwater fish; and
- Changes in levels of shading arising from construction of new structures and bankside vegetation clearance, impacting natural behaviours and food sources.

#### *Activities and Resultant Biophysical Changes During the Operational Phase*

- Increased levels of public access which may lead to increased levels of disturbance from people and dogs;
- Changes in water quality arising from run-off impacting upon the health and survivability of freshwater fish;
- Changes to water level and flow, impacting upon habitat suitability for freshwater fish; and
- Implementation of habitat management plans resulting in the enhancement of existing habitats for freshwater fish.

2.4 Some of the changes that could potentially affect the freshwater fish assemblage, such as water pollution, have effects beyond the construction footprint, whilst others are likely to affect the freshwater fish assemblage through localised habitats changes. With this in mind, the potential ZoI that has been considered within this Appendix includes the River Loddon and its downstream habitats.

## Desktop Study Methodology

2.5 A biological records search was commissioned from Thames Valley Environmental Records Centre (TVERC) in July 2024, in order to obtain existing records of protected and notable fish species within a 2km radius of the Site, thereby incorporating the potential Zol and providing context with other freshwater fish populations in the local area.

## Field Survey Methodology

2.6 Electrofishing was conducted to assess fish populations within the River Loddon, following standard protocols to ensure efficient, non-lethal sampling while minimising stress and harm to fish. This method involves the controlled use of an electrical current to temporarily immobilise fish, allowing them to be captured, identified, measured (if necessary), and recorded before being safely returned to the water.

2.7 The survey was conducted in accordance with guidelines set out in Environment Agency best practice protocols, as outlined in *Electric fishing operations: equipment and working practices* (Environment Agency, 2002) and adhered to all relevant licensing and ethical considerations.

2.8 Surveys were conducted between the 20<sup>th</sup> and 29<sup>th</sup> of May 2024 by Countryside Management Consultancy Services, with oversight by EPR ecologist Katrina Diedericks BSc (Hons). Metadata for the survey are detailed below in **Table 2.1**. The survey was conducted along a 2.3km stretch of the River Loddon and this survey area was split into 6 sub-sections, as illustrated in **Map 11.8.1**.

**Table 2.1. Summary of Metadata for the Electrofishing Surveys**

Date	Temperature	Cloud cover	Rain	Wind (BF)
20.05.24	20°C	No cloud	No rain	1-2
21.05.24	14 °C	50%	Light rain for short intervals	1-2
22.05.24	16 °C	70%	Light rain for short intervals	1-2
23.05.24	16 °C	40%	No rain	1-2
28.05.24	17 °C	50%	Drizzle for short intervals	1-2
29.05.24	18 °C	20%	No rain	1-2

2.9 The survey was carried out using a generator electrofishing unit, which generated a pulsed direct current (DC), creating an electric field that stimulates the fish's nervous system and induces taxis (swimming towards the anode). One operator controlled the electrofishing equipment, and two others used hand nets to collect stunned fish. A stop net was deployed at the downstream limit of each sampling section to prevent fish from escaping, ensuring an accurate population assessment.

2.10 Where possible each survey section was waded systematically and a boat was used in areas deemed too deep to wade, covering all habitat types, including riffles, pools, and marginal areas, to obtain a representative sample of the local fish assemblage. Captured fish were identified to species level before being released unharmed back into the river.

## **Survey Limitations and Constraints**

- 2.11 Light rain and drizzle were recorded on 21st, 22nd, and 28th May, potentially increasing water turbidity and reducing visibility and fish detection efficiency; however, as rainfall was intermittent and light, any impact was likely minimal.
- 2.12 Cloud cover ranged from 0% to 70%, with overcast conditions on 21st, 22nd, and 28th May, which may have influenced fish behaviour, particularly for species sensitive to light variation, though it was unlikely to have directly affected electrofishing efficiency. Despite these minor variations, the survey conditions were generally suitable for obtaining reliable electrofishing data.

## **Evaluation Methodology**

- 2.13 The evaluation of the freshwater fish assemblage has been undertaken in accordance with the Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Marine (CIEEM, 2018).
- 2.14 The importance of the receptor (i.e. the fish assemblage) has been determined with reference to its ecological value at a defined geographic scale (e.g. local, regional, national), based on factors such as species diversity, conservation status, habitat quality, rarity, and the presence of legally protected or priority species. The significance of potential ecological effects has been assessed by considering both the value of the receptor and the predicted magnitude of any impact (e.g. extent, duration, reversibility, and timing). Effects are considered significant where they are likely to result in a measurable change in the conservation status of the fish assemblage or the ecological integrity of the River Loddon.

### 3. ECOLOGICAL BASELINE

#### Desktop Study

3.1 The desktop study returned records of five species of freshwater fish. These comprised:

- Barbel *Barbus barbus*;
- Brown Trout *Salmo trutta*;
- Bullhead *Cottus gobio*;
- European Eel *Anguilla anguilla*; and
- Brook Lamprey *Lampetra planeri*.

3.2 Of these, all were found exclusively within the River Loddon, with the exception of Bullhead, which have also been recorded within Barkham Brook and around Dinton Pastures. All six species have been found within the stretch of the River Loddon within the Site.

#### Habitat Description

3.3 The River Loddon, a main river, runs south to north through the Site providing a mosaic of freshwater habitats. The immediate land surrounding the River largely comprises of woodlands and tree lines, whilst the wider habitats include agricultural land including grazed pasture and arable land.

3.4 At the southern end of the Site, the River comprises of shallow sections overlaying gravel beds, providing potential spawning and feeding grounds for freshwater fish species. Further downstream, the channel deepens and the water flow becomes more consistent providing thermal refuge, in-stream cover, and structured fish habitats

3.5 The River Corridor Survey (**Technical Appendix 11.4**) noted several challenges, including sedimentation, bank erosion, adjacent land use runoff, and hydrological modifications, which may affect fish populations and aquatic biodiversity.

#### Field Survey Results

##### Survey Summary

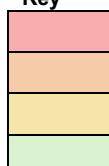
3.6 The electrofishing survey recorded a total of 14 different species of fish and detailed survey results are shown in **Table 3.1** below.

**Table 3.1. Summary of Fish Assemblage and Distribution in the River Loddon Survey**

Latin Name	Common Name	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Total no. of each species
<i>Alburnus alburnus</i>	Commo bleak					25		25
<i>Anguilla anguilla</i>	European eel		1			1		2
<i>Barbatula barbatula</i>	Stone loach						2	2
<i>Barbus barbus</i>	Barbel	2		1	4	1		8
<i>Blicca bjoerkna</i>	Silver bream			1	3		1	5

Latin Name	Common Name	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Total no. of each species
<i>Cottus gobio</i>	Bullhead	1	2		2		31	36
<i>Esox lucius</i>	Pike	2	6	3	3	1	1	16
<i>Gobio gobio</i>	Gudgeon	13						13
<i>Perca fluviatilis</i>	Perch	12	11	4	5		54	86
<i>Phoxinus phoxinus</i>	Minnow		140		24	5	95	264
<i>Rutilus rutilus</i>	Roach	5	4		6	4	2	21
<i>Salmo trutta</i>	Brown trout						3	3
<i>Squalius cephalus</i>	Chub	10	5	3		2	14	34
<b>Total no. species</b>		7	7	5	7	7	9	515
<b>Total no. individuals in area</b>		45	169	12	47	39	203	

#### Key



Light red: Eel Regulations 2009 (Critically Endangered by the IUCN, restricted fishing & trade)

Light orange: Annex II, EU Habitats Directive (Special Areas of Conservation required)

Light yellow: Annex V, EU Habitats Directive (Sustainable exploitation rules)

Light green: Not listed under specific UK conservation laws and is considered of "Least Concern" by the IUCN.

3.7 A total of 515 fish were counted across the survey areas, with Minnow *Phoxinus phoxinus* (264 individuals) being the most abundant species observed. In contrast, the European Eel (2 individuals) was the least frequently recorded species.

3.8 The survey also identified a variation in fish distribution across different areas of the river. Area 6 had the highest recorded fish population, with 203 individuals. Conversely, Area 3 had the lowest recorded fish population, within only 12 individuals.

#### Freshwater Fish Assemblage

3.9 The fish assemblage in the River Loddon is primarily composed of small-bodied species such as Minnow, Perch *Perca fluviatilis*, and Roach *Rutilus rutilus*, which are adaptable to a variety of environmental conditions.

3.10 Predatory species, including Pike *Esox lucius*, were recorded but in low numbers, suggesting limited top-down predation pressure within the surveyed stretch.

3.11 The presence of Barbel, Bullhead, and European Eel indicates that the river continues to support species dependent on good water quality and habitat complexity. However, the low numbers of Brown Trout and European Eel raise concerns about potential habitat fragmentation, water quality, or flow regulation, which may be impacting species with specific ecological requirements.

3.12 Notably, the high fish density in Area 6 suggests that this area provides the most favourable habitat conditions, likely due to better substrate composition, greater habitat complexity, and/or more stable flow regimes.

### *Protected Fish Species*

3.13 The presence of Bullhead, European Eel, and Brown Trout in the River Loddon is ecologically notable, as these protected species are indicators of water quality, habitat stability and broader ecosystem health. Their populations reflect the environmental conditions of the river, with each species requiring specific habitat characteristics for survival.

#### *Brown Trout*

3.14 Brown Trout are a cold-water species that require high dissolved oxygen levels, clean gravels for spawning, and varied riverbed morphology to support different life stages. Their presence in the River Loddon is a positive indicator of good water quality and habitat conditions, as this species is sensitive to environmental disturbances such as pollution, sedimentation, and increased water temperature.

3.15 Brown Trout were recorded in one of the six surveyed areas. A healthy wild population should consist of at least 20–50 individuals per kilometre and **Table 3.2** below provides a summary of Brown Trout population density in each surveyed area.

**Table 3.2. Summary of Brown trout population density in the River Loddon**

Area	Individuals per km	Comparison to Healthy Range (20-50 per km)	Assessment
1	No data	N/A	No recorded presence
2	No data	N/A	No recorded presence
3	No data	N/A	No recorded presence
4	No data	N/A	No recorded presence
5	No data	N/A	No recorded presence
6	3.333	Significantly below healthy range	Low population, potential habitat limitations

3.16 The survey results indicate that brown trout were recorded only in Area 6, with a total of three individuals observed over a 0.9 km stretch of river. This equates to a population density of 3.333 individuals per kilometre, which is significantly below the recommended healthy range of 20–50 individuals per kilometre for a sustainable wild brown trout population.

#### *Bullhead*

3.17 The Bullhead species is commonly associated with clean, well-oxygenated rivers with gravelly or stoney substrate that provides shelter and spawning sites. As bottom-dwelling fish, it is highly sensitive to habitat degradation, particularly siltation, water pollution and riverbed disturbance.

3.18 Bullhead were recorded in four of the six surveyed areas. A healthy population of Bullhead is usually estimated at 10-20 individuals per 100m<sup>2</sup> (0.1-0.2 individuals per m<sup>2</sup>) and **Table 3.3** below provides a summary of Bullhead population density in each surveyed area.

**Table 3.3. Summary of Bullhead population density in the River Loddon**

Area	Individuals per m <sup>2</sup>	Comparison to Healthy Range (0.1-0.2 per m <sup>2</sup> )	Assessment
1	0.100	At lower threshold	Minimal presence but within lower limit

Area	Individuals per m <sup>2</sup>	Comparison to Healthy Range (0.1-0.2 per m <sup>2</sup> )	Assessment
2	0.051	Below healthy range	Insufficient population density
3	No data	N/A	No recorded presence
4	0.031	Well below healthy range	Insufficient population density
5	No data	N/A	No recorded presence
6	0.608	Well above healthy range	Strong population, potential habitat preference

3.19 Area 6 recorded the strongest population of Bullheads suggesting that this area provides optimal habitat conditions for the species. This area was shallow in comparison to the remaining areas and comprised of a gravel substrate with ideal flow conditions. This area was located adjacent to a local angling club and the habitat is actively managed for species such as the Bullhead.

#### *European Eel*

3.20 The European Eel is of particular concern, as it is classified as critically endangered due to severe population declines caused by habitat loss, pollution, and barriers to migration. This species requires access to both freshwater and marine environments for its complex life cycle, making river connectivity and flow conditions crucial for its survival. Ideally, a strong juvenile recruitment rate should be observed, with at least 5–10 individuals per 100m of river stretch and **Table 3.4** below provides a summary of the European eel population density in each surveyed area.

**Table 3.4. Summary of European Eel population density in the River Loddon**

Area	Individuals per 100m	Comparison to Healthy Range (5-10 per 100m stretch)	Assessment
1	No data	N/A	No recorded presence
2	0.128	Extremely below health range	Critically low population density
3	No data	N/A	No recorded presence
4	No data	N/A	No recorded presence
5	0.085	Extremely below health range	Critically low population density
6	No data	N/A	No recorded presence

3.21 Only two areas (2 and 5) recorded European Eel, with densities significantly below the healthy range of 5–10 individuals per 100m. The critically low densities suggest that factors such as barriers to migration, habitat degradation, or poor recruitment rates may be restricting eel populations in the River Loddon. Furthermore, the absence of eels in Areas 1, 3, 4, and 6 highlights a limited distribution and potential fragmentation of suitable habitat, further exacerbating the challenges faced by this already endangered species.

#### *Fish Assemblage Distribution*

3.22 The variation in species diversity and abundance across the surveyed areas suggests habitat heterogeneity within the River Loddon. Area 6 recorded the highest species richness (9) and fish count (203 individuals), indicating that this section provides the most suitable habitat conditions for a diverse fish assemblage. In contrast, Areas 1, 2, and 4 recorded moderate fish numbers, but with a lower representation of key indicator species, suggesting some

environmental limitations that may be affecting habitat suitability. Area 3 had the lowest fish count (12 individuals) and the lowest species richness (5), which could indicate habitat degradation, poor water quality, or insufficient structural diversity, making it less favourable for sustaining a balanced fish community.

## 4. EVALUATION

4.1 The freshwater fish assemblage recorded within the River Loddon represents a moderately diverse community of ecological interest. A total of 14 fish species were identified across the 2.3 km survey stretch, including a mix of common generalist species (e.g. Minnow, Roach, and Perch) and species of elevated conservation concern, namely European Eel, Bullhead, and Brown Trout.

4.2 The assemblage reflects a moderately functional aquatic ecosystem with distinct spatial variation in species richness and abundance. Area 6 supported the highest species richness (9 species) and overall abundance (203 individuals), indicative of high-quality habitat features such as gravel substrate, flow heterogeneity, and marginal cover. In contrast, Area 3 showed the lowest fish diversity and density, likely due to habitat degradation, poor structural diversity, or water quality limitations.

4.3 The presence of protected and sensitive species highlights the ecological importance of this stretch of the River Loddon:

- Bullhead - listed under Annex II of the Habitats Directive, was present in four of six areas. While densities in most areas were below recommended thresholds, Area 6 supported a healthy and locally significant population, suggesting optimal habitat conditions.
- European Eel - a critically endangered species under IUCN and protected by the Eels Regulations 2009, was recorded in only two areas and at extremely low densities, raising concerns about habitat connectivity, potential migration barriers, and overall river health.
- Brown Trout - an important indicator of high-water quality and well-oxygenated conditions, was recorded only in Area 6, at a density well below the range considered viable for wild populations.

4.4 The survey findings indicate that while the River Loddon retains potential to support a diverse fish assemblage, sections of the river may be constrained by factors such as sedimentation, altered flow regimes, or channel modifications (e.g. weirs or culverts), which limit habitat suitability for more sensitive species.

4.5 The fish assemblage is considered to be of County level importance, based on the presence of protected and conservation-priority species (including European Eel, Bullhead, and Brown Trout) and the ecological value of certain river sections that offer favourable habitat conditions.

## 5. REFERENCES

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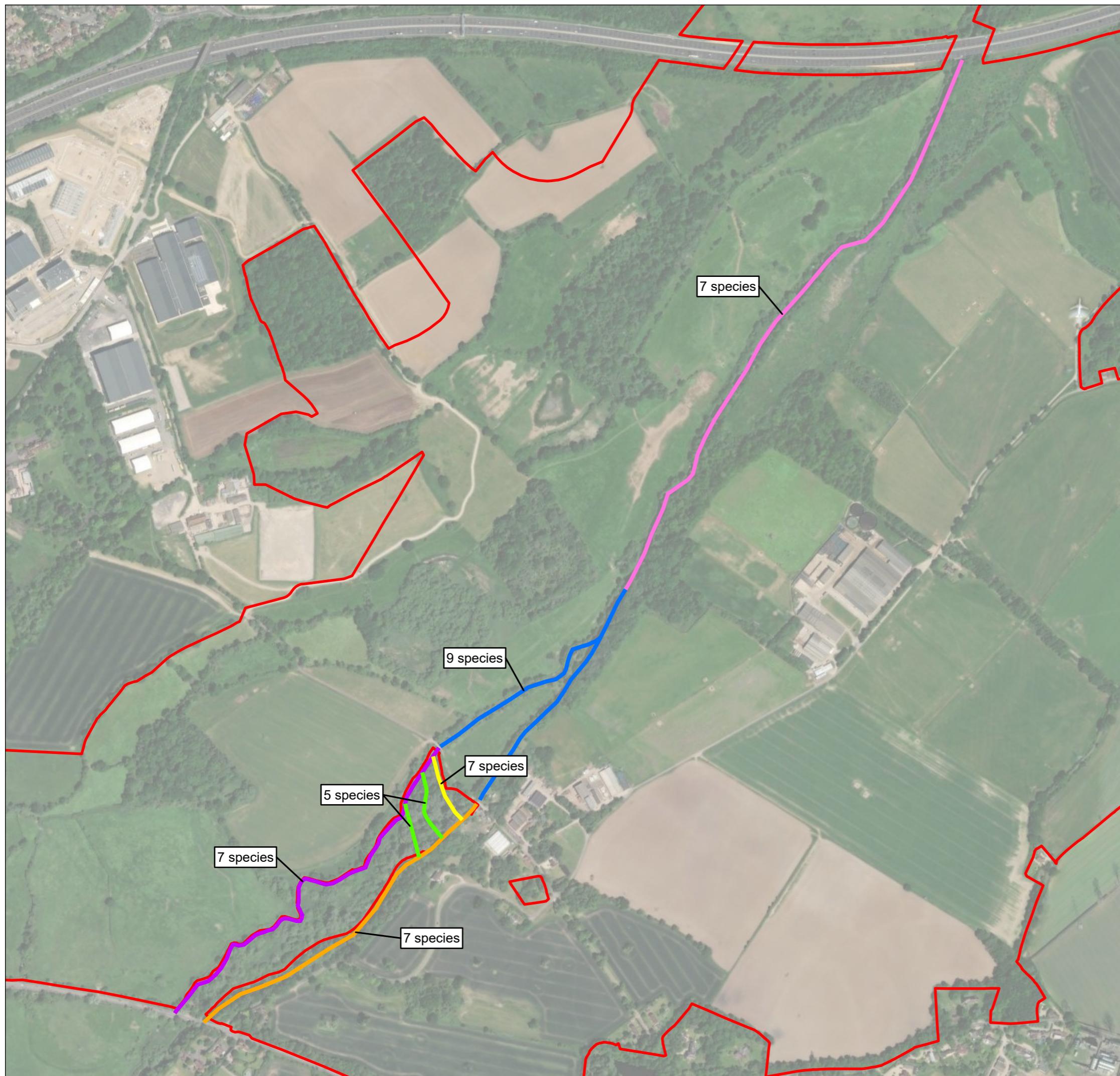
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