

Havant Thicket Reservoir Project

Environmental Statement Volume 4 – Appendices

Appendix 9 Biodiversity

Appendix A9.19: Pipeline Kingfisher Survey Report

Portsmouth Water Ltd.

21/05/24

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1. Introduction

1.1. Terms of reference

- 1.1.1. AtkinsRéalis (formerly Atkins Limited) was commissioned to undertake a breeding kingfisher survey in connection with the installation of a pipeline between the Bedhampton Springs at the Bedhampton pumping station and the Havant Thicket Reservoir.
- 1.1.2. The Pipeline Scheme is located near Havant, Portsmouth, as shown on Figure 9.6 in the Environmental Statement (ES) Volume 3 (hereafter referred to as the Site).
- 1.1.3. Suitable kingfisher habitat was identified, and a kingfisher observed, during an initial protected species habitat suitability assessment undertaken between January to March 2023, the results of which were presented within Appendix A9.16 Pipeline Ecological Update¹. Following these observations, further surveys to assess the potential for breeding kingfisher to be present within the Site were undertaken.
- 1.1.4. This report summarises the details of the kingfisher surveys undertaken, including the methods used, results of the surveys, and provides recommendations relating to kingfisher within the Site.

1.2. Kingfisher legislation

- 1.2.1. All wild birds, their nests and eggs are protected by law under Section 1 of the Wildlife and Countryside Act 1981 (as amended). It is an offence to:
 - Intentionally kill, injure or take any wild bird;
 - Intentionally take, damage or destroy the nest of any wild bird while that nest is in use or being built; and
 - Intentionally take or destroy an egg of any wild bird.
- 1.2.2. Kingfisher is also listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), and is therefore afforded additional protection against intentional or reckless disturbance whilst building a nest, or whilst in or near a nest containing eggs or young, or the disturbance of dependent young.

1.3. The pipeline scheme

- 1.3.1. The objective of the Havant Thicket Reservoir Scheme is to provide a new resource to supply drinking water in the water-stressed South East of England, while maximising the community and environmental benefits of a new raw water reservoir.
- 1.3.2. The reservoir, when constructed, will be filled with surplus water drawn from the Bedhampton Springs at the Bedhampton pumping station. This will be when flows are at their highest in winter via a new pipeline, and will provide water supplies to Portsmouth Water customers in the summer months as required. The Scheme will also enable additional water to be supplied to Southern Water. Southern Water has a forecast deficit in water resources in the Hampshire area, created by the reduction in abstraction from the internationally designated River Itchen and the nationally designated River Test, as agreed with the Environment Agency (EA).
- 1.3.3. As well as augmenting water supplies and increasing the resilience of water resource management in the South East, the reservoir would provide a new recreational resource adjacent to one of the more deprived areas in South East Hampshire, in a location which the community can access on foot, by bike, or through existing bus routes. It also offers further opportunities to improve the wider footpath, cycleway and bridleway networks in the area. More than 29,500 people live within reasonable walking distance of the Site (1.5 km) and 120,000 people live within reasonable cycling distance (4.5 km).
- 1.3.4. The Scheme would provide a new wetland habitat and associated area for nature conservation. The proximity of the reservoir to the internationally important Langstone and Chichester Harbour means that it may be used as a safe retreat for qualifying bird species when there is disturbance in the

¹ AtkinsRéalis (2024). Havant Thicket Reservoir: Appendix A9.17 Pipeline Ecological Update

Harbour Special Protection Area (SPA) and Ramsar site. The construction of the reservoir will result in substantial reductions in nutrient loads to the harbour.

- 1.3.5. The proposed pipeline would transfer water from Bedhampton Springs to fill the reservoir in the winter and draw water off for treatment and supply when needed in the summer. It would also be used for emergency drawdown should the reservoir levels need to be reduced in emergency conditions, in accordance with the Environment Agency safety guidance.
- 1.3.6. The Scheme is allocated in the adopted Havant Borough Council (HBC) and East Hampshire District Council (EHDC) Local Plans. Further information and details can be found in the Planning Statement, which accompanies the planning applications.
- 1.3.7. The details of the Scheme, as they are currently understood, are shown on Figure 9.6 Site location in ES Volume 3.

1.4. The site

- 1.4.1. The Pipeline Scheme extends from the Bedhampton pumping station, northwards through the Leigh Park housing estate in Havant under roads and open spaces. It runs north/north-east adjacent to Hermitage Stream and Riders Lane Stream before heading north-west through Staunton Country Park. The pipeline then crosses into the footprint of the reservoir itself..
- 1.4.2. The Pipeline Scheme comprises seven underground-only work locations (the drilled sections) and ten surface work locations, collectively referred to as 'the Site' in this report. The surface works comprise of eight Shafts, and two Sections where the pipeline will be installed via open-cut methodology. The location of each 'surface' work location is detailed in Table 1-1. The surface work location ID will be used to reference the specific surface works locations, where required, throughout the report.

Table 1-1 – Surface work locations along the Pipeline Scheme (numbered from south to north)

Surface work location ID	Central Ordnance Survey National Grid Reference (OSNGR)
Bedhampton site/Shaft 1	SU 70557 06332
Shaft 2	SU 70700 06893
Shaft 3	SU 70863 07175
Shaft 4	SU 71123 07331
Emergency Discharge Chamber	SU 71009 07562
Shaft 5	SU 71183 07793
Shaft 6	SU 71291 08166
Shaft 7	SU 71611 08293
Shaft 8	SU 71832 08741
Section 9	SU 71717 08900
Section 10 (reservoir site)	SU 71123 09746

- 1.4.3. The habitats present throughout the Site (surface works locations only) comprise broadleaved mixed and yew woodland, including wet woodland and lowland mixed deciduous woodland, other neutral and modified grassland, dense scrub and tree lines intersected by rivers and streams (Hermitage or Riders Lane Stream). At the northern end of the Pipeline Scheme, the Site intersects Staunton Country Park, which includes various designations within its boundary and continues into the reservoir site, which formerly comprised other neutral grassland, purple moor grass and rush pasture and lowland mixed deciduous woodland, but has since been replaced with an active construction site for the main Havant Thicket Reservoir scheme.

1.5. Scope of the assessment

1.5.1. This report presents ecological information relevant to kingfisher, obtained during the following:

- A desk-study undertaken on 15/02/2023;
- A habitat suitability assessment for protected species, including breeding birds, within and adjacent to the Site undertaken between January and March 2023; and
- Targeted surveys undertaken between May to July 2023, comprising an initial habitat suitability assessment for kingfisher and further kingfisher activity surveys.

2. Methods

2.1. AtkinsRéalis internal guidance

- 2.1.1. There is currently no standard kingfisher survey methodology and guidance available. Therefore, AtkinsRéalis have developed internal guidance to fully assess the potential for kingfisher presence within a site. The guidance is based on the survey methodologies provided in reports referred to in the following paragraph.
- 2.1.2. The British Trust for Ornithology (BTO) Waterways Breeding Bird Survey (WBBS)² is targeted at monitoring bird species associated with linear watercourses and uses a methodology adapted from the BTO Breeding Bird Survey (BBS). An assessment of the distribution and abundance of kingfisher on Special Area of Conservation (SAC) river systems in Ireland by Cummins et al.³ followed a similar methodology, but also incorporated a habitat assessment to determine the suitability of watercourses for kingfishers. The AtkinsRéalis survey methodology detailed below has been devised based on recognised methodologies such as that used for WBBS and Cummins et al. but has been adapted to meet the survey aim.

2.2. Desk study

- 2.2.1. The geographical area for obtaining ecological data through desk studies is based on the potential Ecological Zone of Influence (EZoI) of the Pipeline Scheme, and has been determined using professional judgement.
- 2.2.2. Baseline data has been gathered from a range of sources through data requests, and using online resources as outlined below. This included data gathering in relation to statutory and non-statutory designated sites and protected and notable⁴ wetland bird species⁵. For species records collected, only recent records, i.e. those within 10 years of the data collection date, have been considered within the assessment.
- 2.2.3. The Multi-Agency Geographic Information for the Countryside (MAGIC) website⁶ was reviewed to identify:
- Relevant statutory designated nature conservation sites within 1 km of the Pipeline Scheme or with a direct hydrological connection, and their associated qualifying bird species.
- 2.2.4. Hampshire Biodiversity Information Centre (HBIC) was contacted to obtain recent⁷ records of:
- Non-statutory designated nature conservation sites within 2 km of the Pipeline Scheme with birds as a qualifying feature; and
 - Kingfisher sightings, nest sites and potential nest sites within 1 km of the Pipeline Scheme.

2.3. Field surveys

- 2.3.1. The surveys were led by a surveyor who has been assessed as 'accomplished' in bird survey following the Chartered Institute of Ecology and Environmental Management (CIEEM) competency framework⁸.
- 2.3.2. The habitat suitability assessment for protected species conducted between January and March 2023 recorded habitat suitable to support kingfisher within the Site, as well as an individual

² BTO Waterways Breeding Bird Survey. Available at: <https://www.bto.org/volunteer-surveys/wbbs>

³ Cummins et al. (2010) Assessment of the distribution and abundance of Kingfisher *Alcedo atthis* and other riparian birds on six SAC river systems in Ireland.

⁴ Notable for their conservation concern status, as set out in Appendix E.

⁵ For the purposes of this assessment, wetland bird species comprise "birds ecologically dependent on wetlands". Bird families of relevance to the UK include divers, grebes, wetland-related cormorants and allies, herons, swans, geese and ducks (wildfowl), wetland related raptors, waders, gulls and terns.

⁶ Defra. Magic Map Application. [Online]. [Accessed 20th March 2022]. Available from: <https://magic.defra.gov.uk/MagicMap.aspx>

⁷ Defined as within the last 10 years.

⁸ <https://www.cieem.net/competency-framework>

kingfisher sighting at OSNGR SU 71065 07599⁹. Therefore, these areas were subject to further assessment.

- 2.3.3. The Survey Area comprised sections of two streams, Riders Lane Stream and Hermitage Stream, which flow between the Emergency Discharge Chamber (EDC) and Shaft 5. The original kingfisher sighting was recorded along Riders Lane Stream, adjacent to the EDC. Riders Lane Stream, as it flows through Shaft 8, was also subject to assessment based on previous observations of potentially suitable habitat for kingfisher between January and March 2023. No surveys were carried out in Section 10 as this area is part of the approved reservoir site which is now an active construction site.
- 2.3.4. A buffer of 500 m upstream and downstream of the surface works footprint (where suitable habitat exists) was surveyed. This serves to inform whether the Pipeline Scheme has the potential to prevent birds travelling between nesting sites and foraging habitat, which they may depend on for breeding.
- 2.3.5. The Survey Area is shown in Figure 9.19 in ES Volume 3.

2.4. Initial habitat assessment

- 2.4.1. Following AtkinsRéalis guidance (para 2.1.1 and 2.1.2 of this report), prior to undertaking surveys for kingfisher activity, an initial habitat suitability assessment for kingfisher of each watercourse was undertaken by a suitably competent ornithologist on 12/05/2023. Ideally, the initial habitat assessment should be undertaken during the winter or early spring prior to the banks becoming overgrown by vegetation. Therefore, whilst the assessment was largely conducted from the river banks, where suitable banks for nesting were identified and blocked by dense vegetation, access from the watercourse was used to assess the habitat suitability. This comprised sections of Riders Lane Stream within the EDC.
- 2.4.2. Figure 9.19 in ES Volume 3 details the walked route of the assessment throughout the Site.
- 2.4.3. Survey details, including survey date, times, and weather conditions were recorded. A kingfisher habitat assessment proforma was also used to record the following criteria:
 - Water conditions, including water level, water flow and water quality/clarity;
 - A summary of bank conditions, including bank profile/angle, height, substrate and vegetation cover;
 - Suitability for kingfisher, including presence of overhanging branches, likely presence of small fish and presence of suitable banks for nesting;
 - Agricultural improvement of bankside habitat;
 - Human (and dog) disturbance;
 - Signs of kingfisher, including presence of any potential nest sites¹⁰ and those indicative of nesting activity in previous years; and
 - Any kingfisher observations.
- 2.4.4. In total, three proformas were completed due to the contrasting habitat suitability for nesting kingfisher within the Survey Area. The proformas recorded the suitability of Hermitage Stream within the EDC, Riders Lane Stream within the EDC, and Riders Lane Stream within Shaft 8 and are presented in Figure A-1, Figure A-2, and Figure A-3 in Appendix A, respectively.
- 2.4.5. Photographs showing the habitat within each aquatic feature section for suitability for kingfisher and of any potentially suitable nesting banks or potential nest sites were also taken.

Activity surveys

- 2.4.6. Following the results of the initial habitat suitability assessment, four targeted activity surveys were scheduled on the following dates: 26/05/23, 02/06/23, 23/06/23, and 05/07/23. These surveys were undertaken during the breeding season (March to July) by a suitably competent ornithologist.

⁹ AtkinsRéalis (2024). Havant Thicket Reservoir. Appendix A9.16: Pipeline Ecological Update

¹⁰ Potential nest sites are defined as a hole within a bank that is considered to be characteristic of a kingfisher nest hole, but where no kingfisher behaviour was recorded to indicate that the nest site was active.

Ideally, the first visit should take place in late March to coincide with the period during which birds are establishing breeding territories and undertaking nest burrow excavations.

- 2.4.7. Surveyors positioned themselves at a vantage point which gave them good visibility of the potential nest bank (with the aid of binoculars), whilst remaining at a far enough distance as to avoid causing disturbance. Surveyors observed the potential nest bank and recorded any activity that may indicate an active nest site. Any kingfisher observations were recorded spatially using the same criteria used during habitat assessments.
- 2.4.8. In total, seven vantage points were identified along Riders Lane Stream, as presented in Figure 9.19 in ES Volume 3. The exact locations of each vantage point are detailed in Table 2-1 below.

Table 2-1 – Vantage point locations for kingfisher activity surveys

Target note	Vantage point ID	OSNGR
TN7	VP1	SU 71117 07669
TN8	VP2	SU 71114 07656
TN9	VP3	SU 71100 07636
TN10	VP4	SU 71090 07614
TN11	VP5	SU 71074 07609
TN12	VP6	SU 71039 07519
TN13	VP7	SU 71033 07510

- 2.4.9. One surveyor was stationed at six vantage points, and two surveyors were stationed at one vantage point, for 30 minutes within a two hour survey window. Each survey began within one hour of sunrise, the majority at sunrise or within 30 minutes of it.
- 2.4.10. The following information was recorded:
- Any kingfisher observations, including behaviour indicative of breeding. The behaviour observed is classified as:
 - Commuting (with direction);
 - Commuting carrying fish;
 - Hunting;
 - Food exchange from male to female;
 - Food exchange from adult to juvenile;
 - Carrying of eggshells;
 - Courtship behaviour (i.e. copulation or posturing);
 - Tunnel excavation;
 - Territorial behaviour;
 - Heard only; or
 - Other.
 - The location, extent and details of any banks that offer potential for nesting sites (ideally using digital mapping tools and applications such as ArcGIS FieldMaps or Collector if possible); and
 - Any confirmed or potential nest sites, including signs of use by kingfisher.

2.5. Limitations

- 2.5.1. This section identifies any limitations to the surveys or assessment and provides an explanation as to the effect of these on the appraisal.
- 2.5.2. The initial kingfisher habitat suitability assessment was undertaken in May 2023, as such the bankside vegetation had grown substantially in comparison to the initial habitat suitability assessment for protected species conducted between January and March 2023. Whilst surveyors

were able to view potentially suitable nesting banks from the watercourse during the initial habitat suitability assessment, the vegetation cover at certain vantage point locations largely restricted the view of the watercourse and suitable banks. This limitation was largely mitigated for, however, by the variation in vantage points and repeat surveys and the fact that kingfisher call frequently when commuting on a watercourse. As such, any kingfisher activity would have likely been detected at other vantage points within the survey period.

- 2.5.3. Whilst the first vantage point survey should have been undertaken in late March, as per survey guidance, no definitive excavations or nests were discovered during the initial habitat suitability assessment, although suspected rat and other small mammal burrows were noted. Therefore, it can reasonably be assumed that no nests had been constructed prior to the targeted breeding surveys.
- 2.5.4. AtkinsRéalis internal guidance states that breeding kingfisher surveys should ideally focus on the periods shortly after dawn and prior to dusk where possible, as this coincides with peak activity. The first activity survey was undertaken an hour after sunrise, however, health and safety concerns were raised regarding antisocial behaviour. Therefore, the remaining surveys commenced much earlier (within 30 minutes of sunrise) to avoid potential incidents. The level of residential disturbance also increased greatly towards the end of each survey period as residents awoke and started their working/ school days and, therefore, it is unlikely that kingfisher activity will have been missed by starting early.

3. Results

3.1. Desk study

Statutory and Non-Statutory Designated Sites of Relevance

- 3.1.1. There are six statutory designated sites within 2 km of the Pipeline Scheme including Langstone Harbour Special Site of Scientific Interest (SSSI) and Chichester and Langstone Harbours SPA and Ramsar site. None of these sites, however, have kingfisher listed as a qualifying species for the respective designations.
- 3.1.2. Of the 51 total non-statutory designated sites within 2 km of the Pipeline Scheme, there is one non-statutory designated site with birds listed as a feature of interest, being the Langstone Harbour Royal Society for the Protection of Birds (RSPB) reserve which is part of the SSSI.

HBIC records

- 3.1.3. HBIC provided 27 records of kingfisher within 1 km of the Site, no details regarding the breeding status of these individuals was provided. Four records are located within Shaft 1 and one record is present approximately 300 m north of Shaft 8. The remaining records are all associated with Brockhampton Stream which flows into Langstone Harbour, located approximately 500 m south of the Site.

3.2. Field surveys

Initial habitat assessment

- 3.2.1. The completed proformas for the initial habitat assessment are presented in Figure A-1, Figure A-2, and Figure A-3 in Appendix A.

Riders Lane stream: EDC to shaft 5

- 3.2.2. The total length of stream with potential suitability to support kingfisher was approximately 180 m, with the original kingfisher sighting located here. Steep exposed natural banks between 1 m to 2 m in height, slow-moving deeper backwaters and thick vegetation cover to provide screening were all recorded along this section (TN1, TN3). The bank substrate is suitable for the creation of nests, being earth, with multiple overhanging branches providing perching opportunity (TN2, TN3). The water has a medium to slow pace and is relatively clear, however, it appears to be of poor quality with an abundance of debris and rubbish present within the watercourse. Therefore, fish abundance may not be high enough to support breeding kingfisher.
- 3.2.3. Despite the potential limitations, this stretch of river was scheduled for a minimum of four further vantage point surveys to fully assess the potential presence, and activity, of breeding kingfisher.
- 3.2.4. Further north from this point, as the stream flows from Shaft 5, the habitat becomes much less suitable for kingfisher. There is an absence of exposed banks which prevents nest creation, and the watercourse is largely covered by dense vegetation (TN5).

Hermitage stream: EDC

- 3.2.5. This section of stream is lined with concrete-reinforced banks at a 45-degree angle with no cracks which could lead to natural substrate behind and, therefore, provides no opportunity for nesting (TN14). Further along the stream, the concrete banks fall away and give rise to earth banks less than 0.5 m tall (TN13). Again, this bank profile is unsuitable to support nesting kingfisher due to risk of flooding and predation. The stream itself may provide food sources for kingfisher, with multiple overhanging branches providing perching opportunities. As such, this section of stream may be utilised as a subsidiary fishing habitat, to support a potential breeding pair that may be nesting along Riders Lane Stream. However, due to the lack of nesting habitat this stream was scoped out from the activity survey.

Riders Lane stream: shaft 8

- 3.2.6. A single bank was identified at OSNGR SU 71757 08649 (Figure 9.19 in ES Volume 3) which provided suitability for nesting kingfisher (TN15). The bank was approximately 1.5 m tall with suitable burrowing substrate, however, a number of apparently disused rat burrows are also situated along this bank providing potential predation risk. The watercourse itself is of moderate to poor quality due to the quantity of domestic debris within the watercourse, and has a high turbidity as a result of outfall from the culvert stirring up sediment (TN15). The stream may, therefore, not support adequate numbers of fish to support breeding kingfisher despite having occasional perching spots throughout the Great Copse woodland.
- 3.2.7. This location was not subject to vantage point surveys due to the low suitability to support breeding kingfisher. However, the location was re-visited four times, at the end of each activity survey, to determine if any kingfisher burrows had been created.
- 3.2.8. Upstream from this location (Section 9 of Pipeline Scheme), where the river flows through Staunton Country Park, the habitat is largely unsuitable to support breeding kingfisher (TN16). The earth banks are 0.5 m tall, or less, with poor water quality resulting in low fish numbers. Much of the watercourse is congested with dense vegetation, this section was therefore scoped out from further survey. Section 10 (reservoir site) was not surveyed as this area is part of the approved reservoir site which is now an active construction site.

Activity surveys

- 3.2.9. The survey details for each vantage point survey are presented in Table C-1 in Appendix C.

Riders Lane stream: EDC to shaft 5

- 3.2.10. No active or disused kingfisher nests were identified before or after the vantage point surveys, and no kingfisher activity was recorded. Only a single small fish fry was observed during the vantage point surveys, during a total of 16 hours of observations.

Riders Lane stream: Shaft 8

- 3.2.11. No kingfisher nests were recorded on this stretch of Riders Lane Stream during the initial kingfisher habitat suitability assessment or activity surveys and, therefore, no vantage point surveys were undertaken at this location. No fish were observed in this stream.

Incidental observations

- 3.2.12. Cetti's warbler, also a Schedule 1 species, was heard singing during the initial habitat suitability assessment along Riders Lane Stream within the EDC. However, no further incidental records of Cetti's warbler were made throughout the activity surveys.
- 3.2.13. It is likely that the warbler was a young bird attempting to attract a mate and/ or claim a territory, however, it was unsuccessful and may have moved on subsequently. The behaviour is still indicative of breeding, due to the singing being heard amongst suitable nesting habitat, but not necessarily nesting.

4. Conclusion and Recommendations

4.1. Conclusion

- 4.1.1. Following an initial sighting of kingfisher, and observation of potentially suitable habitat during protected species walkover surveys between January and March 2023, sections of Hermitage Stream and Riders Lane Stream were subject to dedicated kingfisher surveys between May to July 2023. The surveys consisted of an initial habitat suitability assessment to assess the suitability of habitat to support breeding kingfisher. Following this, four activity surveys (comprising seven vantage point surveys within each activity survey) were undertaken along Riders Lane Stream, between the EDC and Shaft 5, to further determine the presence, and activity, of breeding kingfisher. Hermitage Stream was scoped out from activity survey following the results of the initial habitat suitability assessment. A supplementary check of a suitable bank located along Riders Lane Stream in Shaft 8 was also undertaken alongside these surveys.
- 4.1.2. No kingfisher nests, or kingfisher activity, were recorded throughout the survey period. Whilst there was habitat suitability along Riders Lane Stream connecting the EDC to Shaft 5, the poor water quality is likely to have deterred prospective kingfisher due to the lack of feeding opportunities, as evidenced by only a single fish sighting during the surveys. The area is also heavily residential and the habitat is susceptible to regular disturbance from humans and dogs as well as potential predation from rats and domestic cats.
- 4.1.3. It is concluded that the original kingfisher sighted was likely to have been an individual scouting the habitat for a potential nest site, and was deterred by the reasons aforementioned as well as a possible lack of a mate in the potential territory. It is not anticipated that a kingfisher will breed at any location along the Pipeline Scheme, particularly whilst the water remains of poor quality and the vegetation is particularly dense.

4.2. Recommendations

- 4.2.1. Whilst it is not anticipated that breeding kingfisher will be present along the Pipeline Scheme, if the water quality improves and provides adequate feeding opportunities for breeding kingfisher, it cannot be ruled out that breeding kingfisher may return to this location. Therefore, as construction for the Pipeline Scheme is not anticipated to commence until summer 2025, a pre-construction check for kingfisher nests, and presence of breeding Cetti's warbler, is recommended to be undertaken by a suitably experienced ornithologist. As the construction schedule may be subject to change, this will only be relevant where works are planned during the kingfisher breeding season (March to July), and Cetti's warbler breeding season (April to August).

4.3. Report validity

- 4.3.1. In the event of scope or programme changes or if works do not commence within 12 months of the date of this report, then updates to the surveys may be required to ensure the validity of the data, as per Chartered Institute of Ecology and Environmental Management (CIEEM) guidance¹¹.

¹¹ CIEEM (2019) Advice Note on the Lifespan of Ecological Reports and Surveys

Appendices



Appendix A. Kingfisher habitat assessment

Figure A-1 - Emergency Discharge Chamber to Shaft 5: Riders Lane Stream

Survey start location reference point:	SU 70856 07651 (EDC)
Survey end location reference point:	SU 71111 07660 (Shaft 5)

HABITAT ASSESSMENT CHARACTERISTICS (X where appropriate)

Abundance of suitable banks on stretch of river: ☐ Abundant ☒ Occasional ☐ Rare

General Bank profile: ☒ Vertical Slope (90° to water surface) ☐ Steep Slope (40-80°)
 ☐ Gentle Slope (20-40°) ☐ Slight Slope (0-20°)

Waterbody Type: ☐ Pond ☐ Lake ☐ River ☒ Stream/brook ☐ Canal
☐ Other (describe) _____

Depth: ☒ <0.5 m ☐ 0.5-1 m ☐ 1-2 m ☐ >2 m

Width: ☐ <1 m ☒ 1-2 m ☐ 2-5 m ☐ 5-10 m ☐ 10-20 m ☐ 20-40 m ☐ >40 m

Water Current: ☐ Rapid ☐ Fast ☐ Medium ☒ Slow ☐ Static

Water Quality: ☒ Clear ☐ Slightly silty (can see substrate) ☐ Silty (can't see substrate)
 ☐ Very silty ☐ Polluted

Bank Substrate: ☐ Loose earth ☒ Dry earth ☐ Wet earth ☐ Vegetated
 ☐ Gravel ☐ Stone ☐ Rock ☐ Other _____

Agricultural Improvement of Bankside Habitat: ☐ Highly improved ☐ Improved ☒ Slightly improved ☐ Unimproved

Bank Vegetation – DAFORN (Dominant, Abundant, Frequent, Occasional, Rare, None):
 Trees _A_ Shrubs _D_ Herbs _F_ Moss _O_ Reeds/sedges _O_ Tall grass _F_ Short grass _F_

Availability of Overhanging Branches and other suitable perches on watercourse
☐ Abundant Overhanging Perches ☒ Occasional Overhanging Perches ☐ None

Disturbance (Humans, Dogs etc.): ☐ No disturbance ☐ Slight disturbance ☒ Regular disturbance
☐ Anglers ☐ Other _____

Notes:

Key points:

- Suitable exposed earth, no burrows. SU 71103 07652;
- Large exposed earth banks on right hand side, up to 1.5 m height, fairly secluded. Lots of rat burrows, no kingfisher burrows. SU71103 07652;
- Suitable earth bank where kingfisher seen previously. SU 71073 07617;
- Steep exposed bank upstream of footbridge. SU 71040 07549; and
- Cats in vicinity of suitable banks.

Habitat:

- 1.5 m wide channel;
- Shallow, ~ 10 cm deep;
- Gravel substrate; and
- Meandering bends around earth banks.

Incidental records:

- Cetti's warbler SU 71094 07620 & further downstream; and
- Himalayan balsam SU 70930 07599 (pulled out & reported).

General comments

- Good foraging habitat with plenty of perches & slow backwater;
- Possible indirect disturbance from construction in the EDC; and
- Strip of riparian woodland/scrub provides screening from construction.

H&S

- Potential asbestos near VP4; and
- Potential antisocial behaviour.

Figure A-2 - Emergency Discharge Chamber: Hermitage Stream

Survey start location reference point:	SU 71020 07498
Survey end location reference point:	SU 70883 07663

HABITAT ASSESSMENT CHARACTERISTICS (X where appropriate)

Abundance of suitable banks on stretch of river: ☐ Abundant ☐ Occasional ☒ Rare

General Bank profile: ☐ Vertical Slope (90° to water surface) ☐ Steep Slope (40-80°)
 ☒ Gentle Slope (20-40°) ☐ Slight Slope (0-20°)

Waterbody Type: ☐ Pond ☐ Lake ☐ River ☒ Stream/brook ☐ Canal
 ☐ Other (describe) _____

Depth: ☒ <0.5 m ☐ 0.5-1 m ☐ 1-2 m ☐ >2 m

Width: ☐ <1 m ☒ 1-2 m ☐ 2-5 m ☐ 5-10 m ☐ 10-20 m ☐ 20-40 m ☐ >40 m

Water Current: ☐ Rapid ☐ Fast ☐ Medium ☒ Slow ☐ Static

Water Quality: ☐ Clear ☒ Slightly silty (can see substrate) ☐ Silty (can't see substrate)
 ☐ Very silty ☐ Polluted

Bank Substrate: ☐ Loose earth ☐ Dry earth ☐ Wet earth ☐ Vegetated
 ☐ Gravel ☐ Stone ☐ Rock ☒ Other: concrete

Agricultural Improvement of Bankside Habitat: ☐ Highly improved ☐ Improved ☒ Slightly improved ☐ Unimproved

Bank Vegetation – DAFORN (Dominant, Abundant, Frequent, Occasional, Rare, None):
 Trees _A_ Shrubs _D_ Herbs _O_ Moss _O_ Reeds/sedges _F_ Tall grass _F_ Short grass _F_

Availability of Overhanging Branches and other suitable perches on watercourse
☐ Abundant Overhanging Perches ☒ Occasional Overhanging Perches ☐ None

Disturbance (Humans, Dogs etc.): ☐ No disturbance ☐ Slight disturbance ☒ Regular disturbance
 ☐ Anglers ☐ Other _____

Notes:

Unsuitable for breeding kingfisher, no nesting opportunities due to reinforced concrete banks at 40-45°. Elsewhere along the river, the earth banks are < 20 cm so far too low to the watercourse for kingfisher suitability. May be utilised for foraging by kingfisher due to presence of perching branches.

Figure A-3 - Shaft 8: Riders Lane Stream

Survey start location reference point:	SU 71822 09079
Survey end location reference point:	SU 71623 08329

HABITAT ASSESSMENT CHARACTERISTICS (X where appropriate)

Abundance of suitable banks on stretch of river: ☐ Abundant ☒ Occasional ☐ Rare

General Bank profile: ☒ Vertical Slope (90° to water surface) ☐ Steep Slope (40-80°)
 ☐ Gentle Slope (20-40°) ☐ Slight Slope (0-20°)

Waterbody Type: ☐ Pond ☐ Lake ☐ River ☒ Stream/brook ☐ Canal
☐ Other (describe) _____

Depth: ☒ <0.5 m ☐ 0.5-1 m ☐ 1-2 m ☐ >2 m

Width: ☐ <1 m ☒ 1-2 m ☐ 2-5 m ☐ 5-10 m ☐ 10-20 m ☐ 20-40 m ☐ >40 m

Water Current: ☐ Rapid ☐ Fast ☐ Medium ☒ Slow ☐ Static

Water Quality: ☒ Clear ☐ Slightly silty (can see substrate) ☐ Silty (can't see substrate)
☐ Very silty ☐ Polluted

Bank Substrate: ☐ Loose earth ☒ Dry earth ☐ Wet earth ☐ Vegetated
☐ Gravel ☐ Stone ☐ Rock ☐ Other _____

Agricultural Improvement of Bankside Habitat: ☐ Highly improved ☐ Improved ☒ Slightly improved ☐ Unimproved

Bank Vegetation – DAFOREN (Dominant, Abundant, Frequent, Occasional, Rare, None):
Trees _A_ Shrubs _F_ Herbs _F_ Moss _O_ Reeds/sedges _R_ Tall grass _F_ Short grass _F_

Availability of Overhanging Branches and other suitable perches on watercourse
☐ Abundant Overhanging Perches ☒ Occasional Overhanging Perches ☐ None

Disturbance (Humans, Dogs etc.): ☐ No disturbance ☐ Slight disturbance ☒ Regular disturbance
☐ Anglers ☐ Other _____

Notes:**Habitat:**

- Exposed earth banks 1.5 m high near culvert outflow;
- 3-4 m wide channel, at least 30 cm deep;
- Quite turbid;
- Good feeding perch nearby; and
- Bank is suitable for ~ 10 m from culvert then degrades to 0.5 m high banks. Becoming unsuitable for kingfisher.

Key points:

- Exposed earth bank SU 71757 08649, rat burrows present in vicinity; and
- No burrow found, unlikely one will be built during breeding season window (too late).

Upstream (within Staunton Country Park):

- Vegetated earth banks;
- ~ 0.5 m height;
- Poor water quality;
- Rat burrows; and
- Unsuitable for kingfisher.

Appendix B. Survey details

Table B-1 - Kingfisher activity survey details

Date	Sunrise	Temperature (°C)	Wind speed (Beaufort) ¹²	Precipitation ¹³	Visibility ¹⁴	Cloud cover (Oktas) ¹⁵	Vantage Point (VP)	Survey start time	Survey end time
26/05/23	05:01	8	4	0	7	5	VP1	07:45	08:15
							VP2	07:45	08:15
							VP3	07:10	07:40
							VP4	07:10	07:40
							VP5	06:35	07:05
							VP6	06:00	06:30
							VP7	06:00	06:30
02/06/23	04:55	10	4	0	7	8	VP1	04:55	05:25
							VP2	04:55	05:25
							VP3	05:27	05:57
							VP4	05:27	05:57
							VP5	06:02	06:32
							VP6	06:34	07:04
							VP7	06:34	07:04
23/06/23	04:51	15	1	0	8	1	VP1	06:56	07:26

¹² Wind speed score of 0-12 against Beaufort scale: 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane

¹³ Precipitation intensity on scale of 0-5: 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.

¹⁴ Visibility on a scale of 0-9: 0 = dense fog, 4 = mist of fog, 6 = moderate visibility, 7 = good visibility, 9 = exceptional visibility.

¹⁵ Cloud cover on a scale of 0-8: 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy

Date	Sunrise	Temperature (°C)	Wind speed (Beaufort) ¹²	Precipitation ¹³	Visibility ¹⁴	Cloud cover (Oktas) ¹⁵	Vantage Point (VP)	Survey start time	Survey end time
							VP2	06:56	07:26
							VP3	06:23	06:53
							VP4	06:23	06:53
							VP5	05:50	06:20
							VP6	05:15	05:45
							VP7	05:15	05:45
05/07/23	04:57	11	1	0	7	8	VP1	04:57	05:27
							VP2	04:57	05:27
							VP3	05:30	06:00
							VP4	05:30	06:00
							VP5	06:05	06:35
							VP6	06:37	07:07
							VP7	06:37	07:07

Appendix C. Target notes

Table C-1 – Target notes

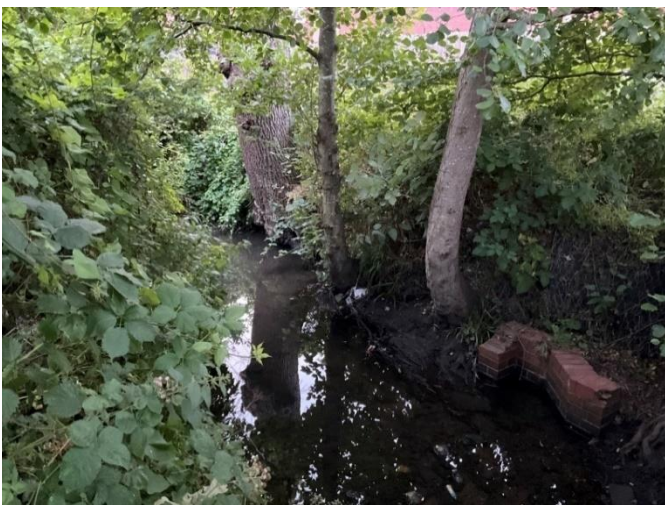
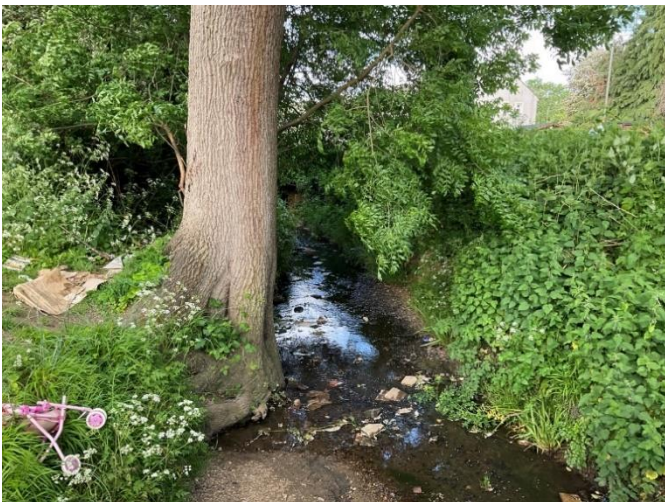
Target Note ID	Description	Evidence
Emergency Discharge Chamber to Shaft 5: Riders Lane Stream		
TN1	Dense scrub and a line of trees along the river banks provide potential screening from disturbance for any kingfisher.	 

Target Note ID	Description	Evidence
TN2	Mammal holes present along the bank showcase the suitability of the bank substrate for nest building. Rat burrows also present a risk of predation to kingfisher.	 

Target Note ID	Description	Evidence
TN3	Example of optimal kingfisher nesting habitat comprising: • Steep sided banks, between 1 m to 2 m height; • Slow-moving deeper backwater; • Feeding perches provided by overhanging branches; and • Screening from disturbance provided by dense, overhanging, vegetation. However, the poor water quality reduces the suitability of the habitat for breeding kingfisher due to a lack of fish.	 

Target Note ID	Description	Evidence
TN4	Publicly accessible bridge crossing Riders Lane Stream. This stretch of river is largely inaccessible to the general public due to the dense vegetation, however domestic dogs and cats are still able to reach the bankside.	
TN5	Suitability to the north of VP1, as the stream reaches Shaft 5, is generally of poor suitability for kingfisher due to a lack of exposed earth banks for burrowing, and limited feeding opportunity due to dense vegetation covering the waterway.	

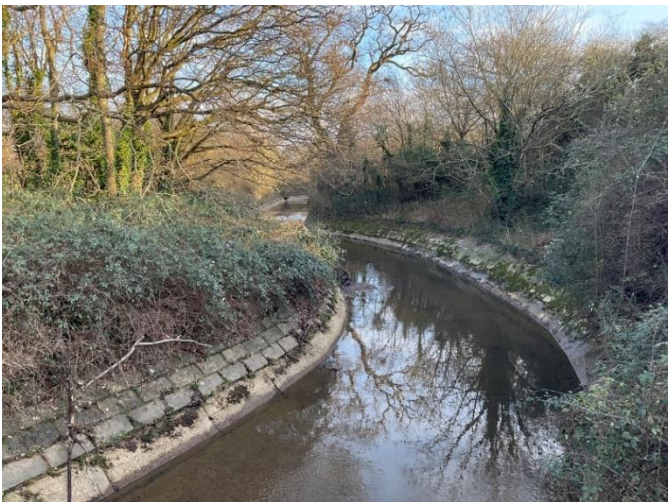
Vantage point positions

Target Note ID	Description	Evidence
TN6	Vantage point 1 (VP1) upstream (1 surveyor) Located at OSNGR SU 71117 07669	
TN7	VP2 downstream (1 surveyor) Located at OSNGR SU 71114 07656	
TN8	VP3 upstream (1 surveyor) Located at OSNGR SU 71100 07636	

Target Note ID	Description	Evidence
TN9	VP4 above most suitable bank (1 surveyor) Located at OSNGR SU 71090 07614	
TN10	VP5 upstream (2 surveyors) Located at OSNGR SU 71074 07609	
TN11	VP6 upstream (1 surveyor) Located at OSNGR SU 71039 07519	

Target Note ID	Description	Evidence
TN12	VP7 upstream (1 surveyor) Located at OSNGRSU 71033 07510	

Emergency Discharge Chamber: Hermitage Stream

TN13	This stretch of stream may be utilised as a subsidiary feeding habitat for kingfisher. The riverbanks are short (less than 0.5 m) therefore unsuitable to support kingfisher nests as they are susceptible to flooding and predation.	
TN14	Further along the stream, as it runs south towards Shaft 4, the bankside comprises concrete reinforcement and no gaps leading to natural substrate behind. As such, it is unsuitable to support nesting kingfisher but may still be utilised as a subsidiary feeding habitat. *This photo was taken in January, during the habitat suitability assessment for protected species.	

Shaft 8: Riders Lane Stream

Target Note ID	Description	Evidence
TN15	Stretch of bank suitable to support nesting kingfisher. The bank has already been burrowed into by rats, however they appear to be disused. Overhanging branches throughout Great Copse provide perching spots for foraging kingfisher. The water is of poor quality as a result of silt being stirred up from the adjacent culvert outflow and domestic debris along the watercourse.	 

Target Note ID	Description	Evidence
TN16	The absence of exposed banks and poor water quality renders the bankside habitat throughout Staunton Country Park as unsuitable to support breeding kingfisher.	



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