Annex B2.6: Terrestrial Ecology Assessment Report

Standard Gate two submission for London Water Recycling SRO

Notice – Position Statement

This document has been produced as the part of the process set out by RAPID for the development of the Strategic Resource Options (SROs). This is a regulatory gated process allowing there to be control and appropriate scrutiny on the activities that are undertaken by the water companies to investigate and develop efficient solutions on behalf of customers to meet future drought resilience challenges.

This report forms part of suite of documents that make up the 'Gate 2 submission.' That submission details all the work undertaken by Thames Water in the ongoing development of the proposed SRO. The intention at this stage is to provide RAPID with an update on the concept design, feasibility, cost estimates and programme for the schemes, allowing decisions to be made on their progress.

Should a scheme be selected and confirmed in the Thames Water final Water Resources Management Plan (WRMP), in most cases it would need to enter a separate process to gain permission to build and run the final solution. That could be through either the Town and Country Planning Act 1990 or the Planning Act 2008 development consent order process. Both options require the designs to be fully appraised and, in most cases, an environmental statement to be produced. Where required that statement sets out the likely environmental impacts and what mitigation is required.

Community and stakeholder engagement is crucial to the development of the SROs. Some high-level activity has been undertaken to date. Much more detailed community engagement and formal consultation is required on all the schemes at the appropriate point. Before applying for permission Thames Water will need to demonstrate that they have presented information about the proposals to the community, gathered feedback and considered the views of stakeholders. We will have regard to that feedback and, where possible, make changes to the designs as a result.

The SROs are at a very early stage of development, despite some options having been considered for several years. The details set out in the Gate 2 documents are still at a formative stage.

Disclaimer

This document has been written in line with the requirements of the RAPID Gate 2 Guidance and to comply with the regulatory process pursuant to Thames Water's statutory duties. The information presented relates to material or data which is still in the course of completion. Should the solutions presented in this document be taken forward, Thames Water will be subject to the statutory duties pursuant to the necessary consenting process, including environmental assessment and consultation as required. This document should be read with those duties in mind.

LONDON EFFLUENT REUSE SRO

Annex B.2.6. Terrestrial Ecology Assessment Report

Report for: Thames Water Utilities Ltd

Ref. **4700399659**

Ricardo ref. ED13591 Issue: 1.2 12/10/2022

Ricardo Energy & Environment, Gemini Building, Fermi Avenue, Harwell, Oxfordshire, OX11 0QR, UK | +44(0)1235 75 3000 | ee.ricardo.com
Registered company no. 08229264 | VAT no. GB 212 8365 24

Version Control

Version 1.0 – 27/07/2022		First Draft
Version 1.1 – 26/09/2022		Incorporation of L2 Assurance Comments Incorporation of NAU Comments
Version 1.2 – 10/10/2022		Incorporation of L2 second round queries

Customer:
Thames Water Utilities Ltd

Customer reference:
4700399659

CONTENTS

APPENDICES

1 INTRODUCTION

This report is part of series of Environmental Assessment Reports which record the set of environmental assessments of the London Effluent Reuse Strategic Resource Option (SRO) through RAPID Gate 2: *Detailed feasibility, concept design and multi-solution decision making* and onward to RAPID Gate 3: *Developed design, finalised feasibility, pre-planning investigations and planning applications*. The reports set out the environmental assessments, which will in turn support regulatory assessment requirements proportionate to RAPID Gate 2 and onward to RAPID Gate 3. The scope and approach to the environmental assessment provided in these reports was set out in the Annex B.1. Gate 2 Scoping Report and consulted on with the National Appraisal Unit (NAU) in November 2021.

This document has been produced as the part of the process set out by RAPID for the development of the Strategic Resource Options (SROs). This is a regulatory gated process allowing there to be control and appropriate scrutiny on the activities that are undertaken by the water companies to investigate and develop efficient solutions on behalf of customers to meet future drought resilience challenges.

This report forms part of suite of documents that make up the 'Gate 2 submission'. That submission details all the work undertaken by Thames Water (TWUL) in the ongoing development of the proposed SRO. The intention at this stage is to provide RAPID with an update on the concept design, feasibility, cost estimates and programme for the schemes, allowing decisions to be made on their progress.

Should a scheme be selected and confirmed in the TWUL final Water Resources Management Plan (WRMP), in most cases it would need to enter a separate process to gain permission to build and run the final solution. That could be through either the Town and Country Planning Act 1990 or the Planning Act 2008 development consent order process. Both options require the designs to be fully appraised and, in most cases, an environmental statement to be produced. Where required that statement sets out the likely environmental impacts and what mitigation is required.

Community and stakeholder engagement is crucial to the development of the SROs. Some high-level activity has been undertaken to date. Much more detailed community engagement and formal consultation is required on all the schemes at the appropriate point. Before applying for permission TWUL will need to demonstrate that they have presented information about the proposals to the community, gathered feedback and considered the views of stakeholders. We will have regard to that feedback and, where possible, make changes to the designs as a result.

The SROs are at a very early stage of development, despite some options having been considered for several years. The details set out in the Gate 2 documents are still at a formative stage.

1.1 OPTION DESCRIPTIONS

For Gate 2, the London Effluent Reuse SRO is set out as four source options and a range of sizes. One option is in east London, utilising final effluent from Beckton sewage treatment works (STW). The other three options are in west London, utilising crude sewage or final effluent from Mogden STW, with differing London Effluent Reuse scheme discharge locations in the freshwater River Thames.

High level summaries of each option are provided below and Figure 1-1 shows the location of each option. As the volume of water transfer has a limited effect on the magnitude of impact on terrestrial habitats and species, the assessments have considered each scheme based on the highest volume proposed.

1.1.1 Beckton water recycling scheme

Final effluent from Beckton Sewage Treatment Works (STW) would be treated at a new Advanced Water Recycling Plant (AWRP) within Beckton STW for advanced treatment. Recycled water would be conveyed via a new tunnel from the Beckton AWRP to Lockwood Pumping Station and then a Thames Lee Tunnel (TLT) extension from Lockwood Pumping Station to a proposed new outfall located on a side channel of the freshwater Lee Diversion, known as the Enfield Island Loop, upstream of the existing Thames Water Enfield intake to the King George V Reservoir. Additional abstraction for public water supply on a put/take basis would be through existing intakes in the lower Lee, to supplement the raw water supply to the Lee Valley reservoirs.

The Beckton water recycling scheme includes scheme sizes of 100 Ml/d, 200 Ml/d and 300 Ml/d.

1.1.2 Mogden water recycling scheme

Final effluent from Mogden Sewage Treatment Works (STW) would be pumped in a new pipeline to a new reuse water recycling plant, located at a site near Kempton Water Treatment Works (WTW)) for advanced treatment via a new Advanced Water Recycling Plant (AWRP). Recycled water would be transferred in a new pipeline for discharge into the freshwater River Thames at a new outfall upstream of the existing Thames Water Walton intake. Additional abstraction for public water supply on a likely put-take basis would be through existing downstream intakes on the River Thames. AWRP wastewater and reverse osmosis (RO) concentrate would be conveyed back to Mogden STW inlet works via a return pipeline(s). The option reduces the final effluent at the extant Mogden STW outfall to the estuarine Thames Tideway.

The Mogden effluent reuse scheme includes scheme sizes of 50 Ml/d, 100 Ml/d, 150 Ml/d and 200 Ml/d.

1.1.1 Mogden South Sewer Scheme

Crude sewage would be diverted from the South Sewer of the sewerage catchment of Mogden STW. The South Sewer runs close to Kempton Park WTW, and the diverted sewage would be pumped to a new AWRP located at a site near Kempton WTW for advanced treatment. Recycled water would be transferred in a new pipeline for discharge into the freshwater River Thames at an outfall upstream of the existing Thames Water Walton intake. Additional abstraction for public water supply on a put-take basis would be through existing downstream intakes on the freshwater River Thames. Waste streams from the AWRP would be conveyed by a new pipeline and treated at Mogden STW. The scheme reduces the final effluent at the extant Mogden STW outfall to the estuarine Thames Tideway.

During Gate 2, Thames Water took the decision to pause development of the Mogden South Sewer scheme due to limitations on available flow within the sewer, cost of the scheme and regional modelling not selecting the scheme under any water resources planning horizon scenario. The Gate 1 concept design is therefore used in Gate 2, with the exception where scheme elements are shared with the Mogden water recycling scheme (certain conveyance routes, AWRP and discharge location) which have been further developed through Gate 2.

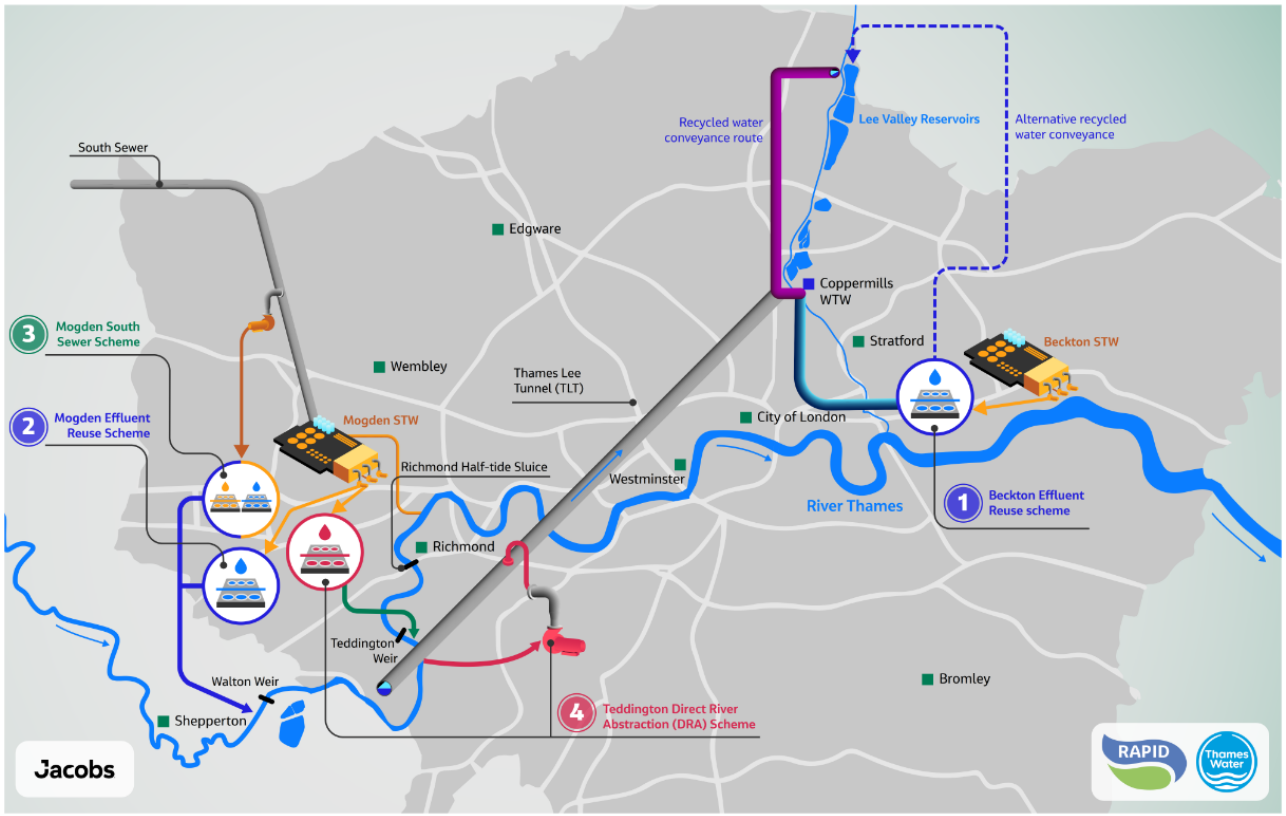
The Mogden South Sewer scheme has not been progressed through Gate 2 environmental assessments, and so a dedicated assessment section is not included within this report. However, due to the similarities with the 50 Ml/d Mogden water recycling scheme (AWRP, discharge location and volume), the outcomes of that assessment can be considered representative (at a high-level) of an assessment of a 50 Ml/d Mogden South Sewer scheme.

1.1.3 Teddington Direct River Abstraction scheme

Final effluent from Mogden STW would be subject to further treatment at a tertiary treatment plant (TTP) at Mogden STW. The treated water would be transferred in a new pipe-jacked tunnel for discharge into the freshwater River Thames at a new outfall upstream of the tidal limit at Teddington Weir. Additional abstraction for public water supply on a take-put basis would be through a new intake from the freshwater River Thames, upstream of the new outfall. Abstracted water would be pumped into the nearby Thames-Lee Tunnel for transfer to Lockwood Pumping Station, part of Thames Water's Lee Valley reservoirs in North London.

The Teddington Direct River Abstraction (DRA) scheme includes scheme sizes of 50 Ml/d, 75 Ml/d, 100 Ml/d and 150 Ml/d.

Figure 1-1 London Effluent Reuse Strategic Resource Option (SRO) overview schematic.



1.2 SCOPE OF REPORT

This Gate 2 report assesses the potential impacts of London Effluent Reuse schemes on terrestrial ecology. The report will consider the following key receptors:

- Terrestrial habitats within the footprint of proposed construction works;
- Statutory (e.g. Sites of Special Scientific Interest (SSSI), Local Nature Reserves (LNRs))[1] and non-statutory designated sites (e.g. Sites of Importance for Nature Conservation (SINC)) and priority habitats;
- Protected, notable and/ or invasive terrestrial species including riparian mammals; and
- Birds.

The report will consider the baseline condition of each receptor gleaned from data requests and site-specific surveys and assess the potential impact of London Effluent Reuse schemes using information from the Annex A Concept Design Reports[2] for construction phases and the Annex B.2.1. Physical Environment Assessment Report[3] and Annex B.2.2. Water Quality Assessment Report[4] for operation.

This report excludes the potential impacts on any protected fish, aquatic macroinvertebrates, and macrophyte species. Impacts on these features have been considered in the Annex B.2.3. Fish Assessment Report[5], and Annex B.2.4. Aquatic Ecology Assessment Report[6].

[1] The potential impacts to Special Areas of Conservation (SAC), Special Protection Areas (SPA), and Ramsar sites are assessed as part of the Gate 2 Habitat Regulations Assessment (HRA)[1] so have been excluded from this assessment report.

[2] Jacobs (2022) London Effluent Reuse SRO, Gate 2 Conceptual Design Reports.

[3] Ricardo (2022) London Effluent Reuse SRO, Gate 2 Physical Environment Assessment Report. Report For: Thames Water Utilities Ltd

[4] Ricardo (2022) London Effluent Reuse SRO, Gate 2 Water Quality Assessment Report. Report For: Thames Water Utilities Ltd

[5] Ricardo (2022) London Effluent Reuse SRO, Gate 2 Fisheries Assessment Report. Report For: Thames Water Utilities Ltd

[6] Ricardo Energy and Environment (2022). London Effluent Reuse SRO Aquatic Ecology Assessment Report. Report For: Thames Water Utilities Ltd

1.3 LEGISLATION

Legislation relating to terrestrial ecology that has been considered in this assessment, based on the habitat character and/or likelihood or confirmed presence of species on-site, is detailed in Appendix A.

1.4 METHODOLOGY

The assessment and baseline data collection methodologies are presented in the London Effluent Reuse SRO Gate 2 Terrestrial Ecology Evidence Report[7]. The terrestrial ecology assessment covers potential impacts to terrestrial habitats, and terrestrial protected and notable species (including birds), within and immediately adjacent to the footprint of the scheme components, working areas and impacted river reaches. The assessment of operational impacts to water courses in this report covers the assessments of impacts to riparian mammals and supporting habitats for bird communities only.

[7] Ricardo (2021) London Effluent Reuse SRO, Gate 2 Terrestrial Ecology Evidence Report. Report For: Thames Water Utilities Ltd

2 BASELINE CONDITIONS

2.1 UKHAB SURVEY RESULTS

2.1.1 Overview

The UKHab survey results summarised in this section were undertaken to inform the assessment of potential impacts to terrestrial habitats within and immediately adjacent to the footprint of the scheme components, and working areas.

2.1.2 Beckton water recycling scheme

2.1.2.1 Baseline survey summary

The summary of the baseline UK Habitat Classification (UKHab) surveys[8,9] undertaken to inform the Gate 2 assessment are shown Table 2-1. UKHab surveys were not undertaken at Shaft Compounds 0, 5 and 6.

The UKHab surveys undertaken in Gate 2 identified that the habitats within the site compounds required for the construction of the conveyance route and Beckton STW Final effluent pumping station (southern section of UKHab survey) were typically dominated by lower distinctiveness habitats such as other neutral grassland, modified grassland, scrub, and urban habitats (e.g. developed land sealed surface). However, priority habitats were present in two of the shaft compounds; the priority habitats wet woodland and reedbeds at Shaft Compound 4 and priority river habitat at Lockwood Reservoir Pumping Station.

The proposed area for the AWRP at Beckton STW (Northern Section of UKHab survey) consisted of grassland, woodland, scrub, buildings, and hardstanding and the priority habitats rivers, coastal saltmarsh and mudflats.

[8] Jacobs (2021). London Effluent Reuse SRO, Beckton UK Habitat Classification Survey Report. Report for Thames Water Utilities Ltd, 1 – 26. B22849BM/REP/ECO/001

[9] Jacobs (2021) London Effluent Reuse SRO Lockwood UK Habitat Classification Survey Report. Report for Thames Water Utilities Ltd, 1 – 17. B22849BM/REP/ECO/002

Table 2-1 Beckton water recycling scheme baseline UKHab surveys.

Site Name	Site info	Survey date/ Proposed survey date	UKHab and condition survey summary	Priority habitats
Beckton STW – Northern Section AWRP	Single site	29th September 2021	The UKHab survey identified the following habitats: other neutral grassland: tall herb g3c16 (moderate condition), other neutral grassland g3c (poor condition), modified grassland g4 (moderate condition), other woodland: broadleaved w1g (poor condition), line of trees w1g6 (moderate condition), dense scrub: scattered trees h311 (moderate condition), mixed scrub h3h (moderate condition), developed land: sealed surface u1b, buildings u1b5, rivers r2a (Modular River Physical Habitat field survey [MoRPh] required for condition), other rivers and streams r2b (moderate condition), coastal saltmarsh t2a, mudflats t2d.	Two priority habitats were identified; (River Roding) and coastal saltmarsh.
Beckton STW – Southern Section Final effluent pumping station	Single site	29th September 2021	The UKHab survey identified the following habitats: modified grassland g4 (moderate condition), developed land; sealed surface u1b, building u1b5.	No priority habitats were identified.
Lockwood Reservoir Pumping Station	Single site	30th September 2021	Six UKHab habitat types were recorded during the site visit including other neutral grassland: tall herb g3c16 (good condition), other neutral grassland gc3 (moderate condition), modified grassland g4 (moderate condition), bramble scrub h3d (moderate condition), rivers r2a (MoRPh survey required), developed land: sealed surface ub1and buildings u1b5.	One priority habitat was identified: rivers.
Shaft 1	Single site	18th and 19th January 2022	The UKHab survey identified the following habitats: other neutral grassland g3c (poor condition), bramble scrub h3d (poor condition), other developed land u1b6 (moderate condition), mixed scrub h3h (moderate condition), line of trees w1g6 (poor condition), developed land, sealed surface u1b, buildings u1b5 and built-up areas and gardens u1.	No priority habitats were identified.
Shaft 2	Single site	18th and 19th January 2022	The UKHab survey identified the following habitats: modified grassland g4 (poor condition), other woodland: broadleaved w1g (poor condition), other neutral grassland g3c (moderate condition), buildings u1b5 and developed land: sealed surface u1b.	No priority habitats were identified.
Shaft 3	Single site	18th and 19th January 2022	The UKHab survey identified the following habitats: modified grassland g4 (poor condition), other neutral grassland g3c (moderate condition), gorse scrub h3e (moderate condition), mixed scrub h3h (moderate condition), wetland f (moderate condition), line of trees w1g6 (moderate condition), developed land: sealed surface u1b and standing open water and canals r1 (poor condition).	No priority habitats were identified.

Site Name	Site info	Survey date/ Proposed survey date	UKHab and condition survey summary	Priority habitats
Shaft 4	Single site	18th and 19th January 2022	The UKHab survey identified the following habitats: bramble scrub h3d (poor condition), mixed scrub h3h (moderate condition), modified grassland g4 (poor condition), other neutral grassland g3c (moderate condition), line of trees w1g6 (poor condition), wet woodland w1d (moderate condition), reedbed f2e (moderate condition), rivers and streams r2 (moderate condition), artificial unvegetated, unsealed surface u1c, developed land: sealed surface u1b and building u1b5.	Wet woodland and reedbed priority habitats present at the site
Shaft 7	Single site	18th and 19th January 2022	The UKHab survey identified the following habitats: modified grassland g4 (poor condition), mixed scrub h3h (poor condition), line of trees w1g6 (poor condition), developed land: sealed surface u1b and building u1b5.	No priority habitats were identified.
Shaft 8 Deephams STW	Single site	No Access Available	-	-
Shaft 9	Single site	18th and 19th January 2022	The UKHab survey identified the following habitats: other neutral grassland g3c (moderate condition), line of trees w1g6 (poor condition), mixed scrub h3h (poor condition), developed land: sealed surface, buildings u1b5 and an inaccessible area (unknown condition).	No priority habitats were identified.
Shaft 10 River Lea Valley, King George V Reservoir	Single site	18th and 19th January 2022	The UKHab survey identified the following habitats: other neutral grassland g3c (moderate condition), other developed land u1b6 (moderate condition), bramble scrub h3d (moderate condition), line of trees w1g6 (poor condition), rivers and lakes r2 (moderate condition), other developed land u1b6, modified grassland g4 (poor condition), developed land: sealed surface u1b, built-up areas and gardens u1 and inaccessible area (unknown condition).	No priority habitats were identified.

2.1.3 Mogden water recycling scheme

2.1.3.1 Baseline survey summary

The details of the baseline UKHab surveys[10,11,12,13] undertaken to inform the Gate 2 assessment are shown Table 2-2. UKHab surveys were not completed at Shafts 3, 7, 17, 18 and 19 at Gate 2.

The habitats identified at the Mogden water recycling discharge location included other neutral grassland, other woodland; broadleaved, bramble scrub, and built linear features. No priority habitats were identified within the survey area for the proposed discharge location.

The UKHab surveys undertaken in Gate 2 identified that the habitats within the site compounds required for the construction of the conveyance route were typically dominated by low and moderate distinctiveness habitats such as other neutral grassland, modified grassland, other broadleaved woodland, scrub, hedgerows (non priority), and urban habitats (e.g. developed land sealed surface). However, priority habitats were present at one shaft compound, Mogden Shaft 6 included the priority habitat reedbeds.

[10] Jacobs (2022). London Effluent Reuse SRO, Mogden Conveyance Route Shafts: UK Habitat Classification Survey Report. Report for Thames Water Utilities Ltd, 1 – 43. B22849BM/REP/ECO/012

[11] Jacobs (2021). London Effluent Reuse SRO, Mogden Discharge Location: UK Habitat Classification Survey Report. Report for Thames Water Utilities Ltd, 1 – 14. B22849BM/REP/ECO/003

[12] Jacobs (2022). London Effluent Reuse SRO, Mogden Sewage Treatment Works: UK Habitat Classification Survey Report. Report for Thames Water Utilities Ltd, 1 – 15. B22849BM/REP/ECO/010

[13] Jacobs (2021). London Effluent Reuse SRO, Hydes Field: UK Habitat Classification Survey Report. Report for Thames Water Utilities Ltd, 1 – 16. B22849BM/REP/ECO/005

Table 2-2 Mogden water recycling scheme baseline UK Habitat (UKHab) surveys.

Site Name	Site info	Survey date	UKHab and condition survey summary	Priority habitats present
Mogden Discharge: Location 1 (Walton Bridge)	Single site	28 September 2021	The UKHab survey identified the following habitats: Other neutral grassland g3c (Poor condition), Other woodland: broadleaved w1g (Moderate condition), Bramble scrub h3d (Poor condition), Built linear features u1e (condition not applicable to this habitat type),	None identified
Mogden Discharge alternative location	Single site - potential alternative location	24th, 25th and 26th of January 2022	The UKHab survey identified the following habitats: Neutral grassland g3c (condition: poor), Bramble scrub h3d (condition: poor), Built up areas and gardens u1 (condition not applicable to this habitat type), Developed land sealed surface u1b (condition: poor), Rivers and streams r2 (condition: not applicable to this assessment), Other woodland broadleaved; plantation (condition: poor).	None identified
AWRP site	Single site	2nd and 3rd of November 2021	The UKHab survey identified the following habitats: lowland calcareous grassland g2a (moderate condition), lowland mixed deciduous woodland w1f (moderate condition), mixed scrub h3h (moderate condition), eutrophic standing water r1a (moderate condition), other eutrophic standing water r1a6 (poor condition).	Two priority habitats were identified during the UKHab survey: lowland calcareous grassland and lowland mixed deciduous woodland
Mogden Shaft 4:	Single sites - UKHab survey of 50m radius around proposed shaft location and proposed compound.	24th. 25th and 26th of January 2022	The UKHab survey identified the following habitats: Mixed scrub h3h (condition: good), neutral grassland g3 (condition: moderate), other developed land ruderal u1b6 17 (condition: condition not applicable to this habitat type), other broadleaved woodland w1g (condition: poor), bramble scrub h3d (condition: good), developed land, sealed surface u1b (condition not applicable to this habitat type), rivers and streams r1 (MoRPh survey required for condition)	None identified
Mogden Shaft 5:			The UKHab survey identified the following habitats: neutral grassland g3 (condition: poor), other hedgerow non-native h2b 48 (condition: poor), other developed land (condition not applicable to this habitat type), Line of trees w1g6 (condition poor), rivers and streams r1 (MoRPh survey required for condition)	None identified
Mogden Shaft 6:			The UKHab survey identified the following habitats: Reedbeds f2e (condition: moderate), mixed scrub h3h (condition: moderate), bramble scrub h3d (condition: moderate), rivers and streams r1 (MoRPh survey required for condition), other neutral grassland g3c rivers and streams r1 (condition: poor), hedgerow h2 (not priority) (condition: poor), developed land sealed surface (condition not applicable to this habitat type condition not applicable to this habitat type), line of trees w1g6 (condition: poor).	One priority habitat identified: reedbeds
Mogden Shaft 8:			The UKHab survey identified the following habitats: mixed scrub secondary ruderal h3d 17 (condition: moderate), other neutral grassland g3c (condition: moderate), developed	None identified

Site Name	Site info	Survey date	UKHab and condition survey summary	Priority habitats present
			land sealed surface (condition not applicable to this habitat type), other broadleaved woodland w1g (condition: poor).	
Mogden Shaft 9:			The UKHab survey identified the following habitats: neutral grassland g3 (condition: poor), modified grassland g4 (condition: poor), hedgerow h2 (not priority) (condition: poor), developed land sealed surface (condition not applicable to this habitat type), rivers and streams r2 (MoRPh survey required for condition), other broadleaved woodland w1g (condition: poor).	None identified
Mogden Shaft 10:			The UKHab survey identified the following habitats: modified grassland g4 (condition: poor), mixed scrub h3h (condition: poor), developed land sealed surface u1b (condition not applicable to this habitat type), other broadleaved woodland; plantation w1g 36 (condition: poor).	None identified
Open Cut Trenched Section Between Shaft 10 and Shaft 11			The UKHab survey identified the following habitats: modified grassland g4 (condition: poor), line of trees w1g6 (condition: poor), developed land sealed surface u1b (condition not applicable to this habitat type), other woodland broadleaved; plantation w1g 36 (condition: poor).	None identified
Mogden Shaft 11:			The UKHab survey identified the following habitats: modified grassland g4 (condition: poor), developed land sealed surface; child's play area u1b 610 (condition not applicable to this habitat type), developed land sealed surface u1b (condition not applicable to this habitat type), line of trees w1g6 (condition: poor).	None identified
Mogden Shaft 12:			The UKHab survey identified the following habitats: modified grassland; frequently mown g4 60 (condition: poor), mixed scrub unmanaged / accessible natural greenspace h3h 80/86 (condition: poor), neutral grassland g3 (condition not recorded in UKHab survey report).	None identified
Open Cut Trenched Section Between Shaft 12 and 13			The UKHab survey identified the following habitats: neutral grassland; sward type mosaic g3 160 (condition: poor), mixed scrub; unmanaged/accessible natural greenspace h3h 80/86 (condition: poor), mixed scrub; tall herb h3h 16 (condition: no condition provided in UKHab report), neutral grassland g3 (condition: poor), mixed scrub; unmanaged h3h 80 (condition: poor), other broadleaved woodland w1g (condition: poor).	None identified
Mogden Shaft 13:			The UKHab survey identified the following habitats: neutral grassland g3 (condition: poor), mixed scrub; unmanaged h3h 80 (condition: poor), other broadleaved woodland w1g (condition: poor).	None identified
Mogden Shaft 16:			The UKHab survey identified the following habitats: built up areas and gardens u1 (condition: no access to undertake condition assessment), modified grassland g4 (condition: poor), bramble scrub h3d (condition: poor), developed land sealed surface u1b (condition not applicable to this habitat type), line of trees; plantation w1g6 36 (condition: poor).	None identified

2.1.4 Teddington DRA scheme

2.1.4.1 Baseline survey summary

The baseline UKHab surveys[14] undertaken to inform the Gate 2 assessment are summarised in Table 2-3. All shaft compounds for the Teddington DRA conveyance route were subject to UKHab surveys.

The UKHab surveys undertaken in Gate 2 identified that the habitats within the site compounds required for the construction of the conveyance route were typically dominated by lower distinctiveness habitats such as other neutral grassland, modified grassland, scrub, and urban habitats (e.g., developed land sealed surface). However, priority habitats were present at four of the shaft compounds. Hedgerows (priority habitat) were recorded at Shaft Compound 4, Shaft Compound 5, and Shaft Compound 6. The priority habitat lowland mixed deciduous woodland was identified at Shaft Compound 4, Shaft Compound 6, and Shaft Compound 7.

The habitats identified at the Teddington discharge location included other neutral grassland, other woodland; broadleaved, bramble scrub, and built linear features. No priority habitats were identified within the survey area for the proposed discharge location.

[14] Jacobs (2021). London Effluent Reuse, Teddington DRA (Burnell Avenue) UK Habitat Classification Survey Report. Report for Thames Water Utilities Ltd, 1 – 17. B22849BM/REP/ECO/004

Table 2-3 Teddington DRA scheme baseline UK Habitat (UKHab) surveys.

Site Name	Site info	Survey date/ Proposed survey date	UKHab and condition survey summary	Priority habitats
Teddington DRA conveyance route	Single site	29th September 2021	The UKHab survey identified the following habitats: other woodland; broadleaved w1g (moderate condition), other neutral grassland g3c (moderate condition), modified grassland g4 (moderate condition), mixed scrub h3h (poor condition),	None identified on site
Tertiary treatment plant site at Mogden STW	Single site	10th December 2021	The UKHab survey identified the following habitats: Other broadleaved woodland types w1g7 (Poor condition), Developed land, sealed surface u1b (condition not applicable to this habitat type),	None identified
Shaft Compound 1 - Mogden STW	Single site	10th December 2021	The UKHab survey identified the following habitats: other broadleaved woodland types w1g7 (poor) and developed land, sealed surface u1b.	None identified on site.
Shaft Compound 2	Single site	3rd February 2022	The UKHab survey identified the following habitats: rivers and lakes; rivers and streams r2, modified grassland g4 (moderate condition), bramble scrub h3d (poor condition), buildings u1b5 and developed land; sealed surface u1b.	None identified on site.
Shaft Compound 3	Single site	3rd February 2022	The UKHab survey identified the following habitats: modified grassland g4, built-up areas and gardens u1, hard standing footpath u1b, suburban mosaic of developed/natural surfaces u1d.	None identified on site.
Shaft Compound 4	Single site	4th May 2022	The UKHab survey identified the following habitats: rivers and streams r2, modified grassland g4 (poor condition), modified grassland g4 (moderate condition), modified grassland g4 (good condition), developed land; sealed surface ub1, line of trees w1g6 (poor condition), hedgerow h2a (good condition), lowland mixed deciduous woodland w1f (poor condition), fen f2a (moderate condition), other neutral grassland g3c (good condition).	Three priority habitats were identified: lowland mixed deciduous woodland w1f, native hedgerows h2a and fen f2a.
Alternative Shaft Compound 4	Single site	4th May 2022	The UKHab survey identified the following habitats: modified grassland g4, developed land; sealed surface ub1, line of trees w1g6 (moderate condition), other hedgerows h2b, built up areas and gardens u1.	None identified on site.
Shaft Compound 5	Single site	4th May 2022	The UKHab survey identified the following habitats: modified grassland g4 (moderate condition), modified grassland g4 (poor condition), built up areas and gardens u1 secondary code: 910, line of trees w1g6 (moderate condition), developed land; sealed surface ub1, hedgerow (priority habitat) h2a (moderate condition), suburban mosaic of developed/natural surfaces u1d.	Hedgerow priority habitat was recorded at this site.
Shaft Compound 6	Single site	4th May 2022	The UKHab survey identified the following habitats: modified grassland g4 secondary code 11, developed land; sealed surface ub1, standing open water and canals r1, lowland mixed deciduous woodland w1f, hedgerow (priority habitat) h2a (moderate condition), lowland mixed deciduous woodland w1f (moderate condition), other neutral grassland g3c (moderate condition).	Lowland mixed deciduous woodland and hedgerow were recorded on site, which are both priority habitats.

Site Name	Site info	Survey date/ Proposed survey date	UKHab and condition survey summary	Priority habitats
Shaft Compound 7	Single site	4th May 2022	The UKHab survey identified the following habitats: modified grassland g4 (good condition), other developed land u1b6, lowland mixed deciduous woodland w1f (moderate condition), other neutral grassland g3c secondary code 11 (good condition), suburban/ mosaic of developed/ natural surface u1d.	One priority habitat, lowland mixed deciduous woodland was recorded on this site.
Outfall Site	Single site	4th May 2022	The UKHab survey identified the following habitats: modified grassland g4 (poor condition), other neutral grassland g3c (moderate condition), rivers and lakes r2, suburban mosaic of developed/ natural surfaces u1d, developed land sealed surface u1b, other developed land u1b6, other deciduous woodland w1g (poor condition).	None identified on site.
Intake Site and Shaft Compound 8	Single site	4th May 2022	The UKHab survey identified the following habitats: other woodland; broadleaved w1g (moderate condition), other neutral grassland g3c (moderate condition), modified grassland g4 (moderate condition), mixed scrub h3h (poor condition), other developed land u1b6, suburban mosaic of developed/ natural surfaces u1d, developed land sealed surface u1b, rivers and lakes r2, line of trees w1g6.	None identified on site.

2.2 DESIGNATED SITES

2.2.1 Overview

The Gate 1 assessment identified the requirement for additional surveys to inform the assessment of the potential impacts of operation of the Mogden water recycling and Teddington DRA schemes on three locally and nationally designated sites: Ham Lands LNR, Isleworth Ait LNR, and Syon Park SSSI.

The potential impacts to Special Areas of Conservation (SAC), Special Protection Areas (SPA), and Ramsar sites are assessed as part of the Gate 2 Habitats Regulations Assessment (HRA)[15] so have been excluded from this assessment report. Likely significant effects have been identified for Lee Valley SPA and Ramsar site, South West London Waterbodies SPA and Ramsar site, Epping Forest SAC and Thames Estuary and Marshes SPA and Ramsar site.

2.2.2 Beckton water recycling scheme

The relevant statutory and non-statutory designated sites within 2 km of each Beckton water recycling scheme component, as identified by the desk study undertaken as part of the Preliminary Ecological Appraisals (PEA) of Beckton STW[16] and the conveyance route[17], are shown in Table 2-4.

The desk study returned no non-statutory designated sites located within 500 m of the shaft locations[17].

[15] Ricardo Energy and Environment (2022). London Effluent Reuse Habitats Regulations Assessment. Report for Thames Water Utilities Ltd.

[16] Jacobs (2022). Beckton Sewage Treatment Works Preliminary Ecological Appraisal. Report for Thames Water Utilities Ltd, 1 – 36. B22849BM/REP/PEA/001.

[17] Jacobs (2022). Beckton Tunnel Conveyance Route: Preliminary Ecological Appraisal. Report for Thames Water Utilities, 1 – 85. B22849BM/REP/PEA/002.

Table 2-4 Statutory and non-statutory designated sites associated with the Beckton water recycling scheme components

Designated site	Scheme component	Distance to scheme component	Reason for designation	Potential impact pathways
Ripple LNR	Beckton STW	1.49 km east	The reserve has a tapestry of birch *Betula* sp. woodland, scrub and grassland. Grey partridge *Perdix perdix* and water vole *Arvicola amphibius* have been recorded here.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
Beckton STW northern settling lagoon Site of Importance for Nature Conservation (SINC)	Beckton STW	0.00 km Scheme within site	Northern area of the site containing habitats summarised in Table 2-1 and detailed in Section 3.3.1 of the Beckton STW PEA[18].	Habitat loss/damage Pollution (sediment mobilisation, hydrocarbons, dust) Noise disturbance
River Thames and tidal tributaries SINC	Beckton STW	Adjacent to site boundary	The mudflats, shingle beach, inter-tidal vegetation, islands and river channel itself support many species from freshwater, estuarine and marine communities which are rare in London.	Pollution (sediment mobilisation, hydrocarbons, dust) Noise disturbance
Gascoigne Road Pumping Station Rough SINC	Beckton STW	0.15 km	Open mosaic habitat, providing connectivity to surrounding habitats, on the other side of the River Roding.	Pollution (sediment mobilisation, hydrocarbons, dust) Noise disturbance
Mayes Brook and Associated Watercourses SINC	Beckton STW	0.33 km	A section of brook and adjacent scrub habitats.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
Cuckold's Haven Nature Reserve SINC	Beckton STW	0.39 km	The mix of scrub, tall wildflowers and grassland supports a diverse plant community. The site is important for various species of bees and wasps typically occurring around the Thames estuary.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
Beckton Meadows South SINC	Beckton STW	0.48 km	Open mosaic habitat south of the STW, rich in wildflowers.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.

[18] Jacobs (2022). Beckton Sewage Treatment Works Preliminary Ecological Appraisal. Report for Thames Water Utilities Ltd, 1 – 36. B22849BM/REP/PEA/001.

Designated site	Scheme component	Distance to scheme component	Reason for designation	Potential impact pathways
Epping Forest SSSI	Shaft 2	0.70 km	Epping Forest is one of only a few remaining large-scale examples of ancient wood-pasture in lowland Britain and has retained habitats of high nature conservation value including ancient semi-natural woodland, old grassland plains and scattered wetland. The seminatural woodland is particularly extensive, forming one of the largest coherent blocks in the country.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
	Shaft 3	0.04 km		Disturbance (noise) Pollution and associated habitat degradation from dust during construction.
	Shaft 9	1.62 km		No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
Chingford Reservoirs SSSI	Shaft 9	0.51 km	The Chingford Reservoirs are one of the major wintering grounds for wildfowl and wetland birds in the London area and hold nationally important numbers of some species including goldeneye *Bucephala clangula*, tufted duck *Aythya fuligula* and goosander *Mergus merganser*.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
	Shaft 10	0.17 km		Pollution (sediment mobilisation, hydrocarbons, dust) Noise disturbance
Walthamstow Reservoir SSSI	Shaft 7	0.98 km	The Walthamstow Reservoirs contain one of the country's major heronries and a particularly large concentration of breeding wildfowl. They are also an important gathering area for moulting tufted duck and in winter attract nationally significant populations of wildfowl and other wetland birds.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
Walthamstow Marshes SSSI	Shaft 4	1.73 km	Walthamstow Marshes are one of the last remaining examples of semi-natural wetland in Greater London. They contain a variety of plant communities typical of a former flood plain location.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.

2.2.3 Mogden water recycling scheme

No PEA of Mogden STW or the conveyance route has been completed. Therefore, any relevant statutory and non-statutory designated sites within 2 km of the Mogden water recycling scheme have been identified as part of this assessment and shown in Table 2-5. See the Terrestrial Ecology Evidence Report for further details.

Table 2-5 Statutory and non-statutory designated sites associated with the Mogden water recycling scheme components.

Designated site	Scheme component	Distance to scheme component	Reason for designation	Potential impact pathways
Kempton Park Reservoirs Site of Special Scientific Interest (SSSI)/ Kempton Nature Reserves LNR	Shaft/ Compound 7	1.6 km	Kempton Park Reservoirs comprises two artificially embanked basins to the northeast of Kempton Park Racecourse near Hampton. The site consists of Kempton Park East Reservoir and Red House Reservoir. Kempton Park Reservoirs are of national importance for wintering gadwall *Anas strepera*. In addition to the nationally important numbers of gadwall, the site also supports significant numbers of wintering shoveler *Anas clypeata* Regular breeding waders on the East Reservoir include lapwing *Vanellus vanellus* redshank *Tringa totanus* ringed plover *Charadrius hiaticula* and little ringed plover *Charadrius dubius*.	Noise, vibration and visual disturbance and exposure to pollution (air, dust and fuel). Potential for AWRP site to impact on bird movement between functionally linked habitats for roosting and feeding. Intermittent noise and visual disturbance during operation, particularly at AWRP site.
	Shaft/ Compound 8	1.2 km		
	Shaft/ Compound 9	0.3 km		
	Shaft/ Compound 10	0.26 km		
	Shaft/ Compound 11	0.2 km		
	Shaft/ Compound 13	1 km		
	Shaft/ Compound 14	1 km		
	AWRP near Kempton WTW	0.3 km		
Syon Park SSSI	Mogden Sewage Treatment Works (STW)	1.5 km	Syon Park SSSI is one of the very few areas beside the Thames which still floods regularly with the tide. In the flood meadows and wet woodlands, there are several rare plants, snails and insects including blue water-speedwell *Veronica anagallis-aquatica*, Thames/ two-lipped door snail *Balia biplicata* and the peacock moth *Macaria notata*.	No impacts during construction identified. Potential changes to hydrological regime of the site during operation of the scheme. Refer to Aquatic Ecology Assessment Report for further assessment.
Isleworth Ait Local Nature Reserve (LNR)	Mogden STW	0.45 km	The Isleworth Ait LNR is an undisturbed sanctuary for a variety of birds including treecreeper *Certhia familiaris*, kingfisher *Alcedo atthis* and grey heron *Ardea cinerea*. Among its other important residents are several rare beetles and two rare species of mollusc, the two-lipped door snail *Alinda biplicata* and the German hairy snail *Pseudotrichia rubiginosa*.	Noise, and vibration disturbance and exposure to air pollution and dust. Potential changes to hydrological regime of the site during operation of the scheme. Refer to Aquatic Ecology Assessment Report for further assessment.
Ham Lands LNR	Shaft/ Compound 4	1.4 km	Ham Lands LNR supports a diverse flora, including dropwort *Filipendula vulgaris* which is rare in London, and more typical species such as false fox-sedge *Carex otrubae* and cuckooflower *Cardamine pratensis*. Breeding birds include spotted flycatcher *Muscicapa*	No impacts during construction identified. Potential changes to hydrological regime of the site during operation of the scheme. Refer to Aquatic Ecology Assessment Report for further assessment.
	Shaft/ Compound 5	1.6 km		
	Shaft/ Compound 3	1.7 km		
	Shaft/ Compound 2	1.9 km		

Designated site	Scheme component	Distance to scheme component	Reason for designation	Potential impact pathways
			striata, lesser whitethroat *Sylvia curruca* and tawny owl *Strix aluco*.	
Crane Park Island LNR	Shaft/ Compound 6	0.73 km	Crane Park Island has several habitats such as grassland and areas of concrete and brickwork which are being colonised by wasteland type species. The site contains woodland, reedbed, ditches, ponds, and river habitats. The main habitat types are tall herb and secondary woodland. The breeding birds include kingfisher, grey wagtail *Motacilla cinerea* and reed warbler *Acrocephalus scirpaceus*.	Due to the proximity of multiple shafts to the River Crane, potential for sediment input into the river during construction which could smother marginal tall herb vegetation or alter nutrient availability. Refer to Aquatic Ecology Assessment Report for further assessment. No impacts during operation identified.
	Shaft/ Compound 7	0.89 km		
	Shaft/ Compound 8	0.88 km		
	Shaft/ Compound 9	1.6 km		
	Shaft/ Compound 5	1.8 km		
Pevensey Road LNR	Shaft/ Compound 6 and 7	1.4 km	Pevensey Road LNR site supports a remarkably diverse range of fauna and flora for an urban location. It supports a wide range of breeding birds especially warblers and locally important populations of Lepidoptera, Orthoptera, Odonata, Reptilia and riparian/ aquatic flora.	No direct impact pathways identified; however, construction of shafts/ compounds could result in the loss of functionally linked habitats (scrub, hedgerows, woodland, grassland, and steams) for breeding birds, Lepidoptera, Orthoptera, and Odonata. Scoped out of the assessment due to the relatively small area of impact associated with Shaft Compounds 6, 8, and 9 and distance to the LNR. No discernible effects on the LNR are anticipated. No potential impacts during operation identified due to absence of potential impact pathways.
	Shaft/ Compound 8	1.3 km		
	Shaft/ Compound 9	1.8 km		
Hounslow Heath LNR	Shaft/ Compound 6	1.5 km	Hounslow Heath LNR has rare plants of heathland and acid grassland include bell heather *Erica cinerea*, dwarf gorse *Ulex minor*, petty whin *Genista anglica*, Dyer's greenweed *Genista tinctoria*, heath rush *Juncus squarrosus*, heath-grass *Danthonia decumbens* and mat-grass *Nardus stricta*. There are also important moss and lichen communities. Breeding birds include linnet *Linaria cannabina*, skylark *Alauda arvensis*, reed bunting *Emberiza schoeniclus* and whitethroat *Sylvia communis*, and a variety of passage and wintering species are also regularly recorded. This is also an important site for protected reptiles, with four species present.	No direct impact pathways identified, however, construction of shafts/ compounds could result in the loss of functionally linked habitat for birds. Scoped out of the assessment due to the relatively small area of impact, no discernible effects on the LNR are anticipated. No potential impacts during operation identified.
	Shaft/ Compound 7	2 km		
	Shaft/ Compound 8	2 km		
	Shaft/ Compound 9	0.37 km		

Designated site	Scheme component	Distance to scheme component	Reason for designation	Potential impact pathways
Oak Avenue Hampton LNR	Shaft/ Compound 10	0.28 km	Oak Avenue Hampton LNR comprises of an area of wasteland with developing habitat including a native species hedgerow, woodland, pond with marsh area, a butterfly-attracting glade and ephemeral communities.	Potential for exposure to pollution (air, dust and fuel) during construction. No impacts during operation identified.
	Shaft/ Compound 11	0.78 km		
	Shaft/ Compound 13	1.7 km		
	Shaft/ Compound 14	1.8 km		
	Shaft/ Compound 8	0.86 km		
	Shaft/ Compound 7	1.2 km		
	AWRP near Kempton WTW	1.1 km		
Duke of Northumberland's River North of Kneller Road SINC	Shaft/ Compound 1	0.57 km	The SINC has woodland of sycamore *Acer pseudoplatanus*, oak *Quercus* sp. and willow *Salix* sp. that clothes the north side, while the south side is parkland with some fine mature sweet chestnut *Castanea sativa*, oak and yew *Taxus baccata* trees. Both kingfisher and grey wagtail can be seen on this part of the river. The river has good water quality and supports aquatic vegetation, including fennel pondweed *Potamogeton pectinatus* and water crowfoot *Ranunculus* sp., which are scarce in London. A footpath and hedge run alongside the river.	Due to the proximity of multiple shafts to the River Crane, potential for sediment input into the river during construction which could smother macrophytes present. Refer to Aquatic Ecology Assessment Report for further assessment. No impacts during operation identified.
	Shaft/ Compound 2	Adjacent		
	Shaft/ Compound 3	Adjacent		
	Shaft/ Compound 4	0.07 km		
	Shaft/ Compound 5	0.3 km		
Crane Corridor SINC	Shaft/ Compound 3	0.8 km	Crane corridor contains the River Crane, reservoirs, pasture, woodland and heathland. The site is a stronghold for uncommon aquatic plants such as arrowhead *Sagittaria sagittifolia*, unbranched bur-reed *Sparganium emersum*, river water-crowfoot and rigid hornwort *Ceratophyllum demersum*. The breeding birds includes kingfisher, grey wagtail and reed warbler. The protected water vole *Arvicola amphibius* is also present.	Direct loss of habitat within the footprint of Shaft/ Compound 6. Noise, vibration and visual disturbance and exposure to pollution (air, dust and fuel). Due to the proximity of multiple shafts to the River Crane, potential for sediment input into the river during construction which could smother macrophytes present. Refer to Aquatic Ecology Assessment Report for further assessment. No impacts during operation identified.
	Shaft/ Compound 4	0.03 km		
	Shaft/ Compound 5	0.03 km		
	Shaft/ Compound 6	0.00 km Scheme within site		
	Shaft/ Compound 7	0.69 km		

Designated site	Scheme component	Distance to scheme component	Reason for designation	Potential impact pathways
	Shaft/ Compound 8	1 km		
	Shaft/ Compound 9	1.9 km		
Fulwell and Twickenham Golf Courses SINC	Shaft/ Compound 4	1.3 km	The citation for the site identifies that these two adjacent golf courses contain some "fine acid grassland", with small areas of woodland and scrub, several wet ditches and a pond. It contains many fine hawthorns *Crataegus monogyna* as well as ash *Fraxinus excelsior*, elder *Sambucus nigra*, holly *Ilex aquilifolium*, Norway maple *Acer platanoides*, sycamore and beech *Fagus sylvatica*.	Direct loss of habitat within the footprint of Shaft/ Compound 7.
	Shaft/ Compound 5	1.1 km		
	Shaft/ Compound 6	0.35 km		
	Shaft/ Compound 7	0.00 km Scheme within site		
	Shaft/ Compound 8	0.22 km		
	Shaft/ Compound 9	1 km		
	Shaft/ Compound 10	1.5 km		
	Shaft/ Compound 11	1.9 km		
Longford River in Richmond SINC	Shaft/ Compound 6	1.2 km	The Longford River runs through Hanworth Park. The channel contains unbranched bur-reed *Sparganium emersum*, while a few plants of water dock *Rumex hydrolapathum* and other marginals cling to the steep banks.	Potential for sediment input into the river during construction which could smother macrophytes present. Refer to Aquatic Ecology Assessment Report for further assessment. Potential for pipeline installation to cause instability of river bank via vibrations and water level changes due to interaction with groundwater which could impact on wetland plants. No impacts during operation identified.
	Shaft/ Compound 7	0.49 km		
	Shaft/ Compound 8	0.02 km		
	Shaft/ Compound 9	0.78 km		
	Shaft/ Compound 10	1.2 km		
	Shaft/ Compound 11	1.7 km		
	AWRP near Kempton WTW	1.9 km		
Hampton Common SINC	Shaft/ Compound 6	1.6 km	Hampton Common SINC supports a diverse range of vegetation including hemlock water-dropwort *Oenanthe crocata* and marsh woundwort *Stachys palustris.* Adjacent ditches support further wetland plants including hemp-agrimony *Eupatorium cannabinum*, celery-leaved buttercup *Ranunculus sceleratus*, remote sedge *Carex remota* and	No direct impact pathways identified during construction. Potential for exposure to pollution (air, dust and fuel). No impact pathways identified during operation.
	Shaft/ Compound 7	0.8 km		
	Shaft/ Compound 8	0.41 km		
	Shaft/ Compound 9	0.01 km		
	Shaft/ Compound 10	0.48 km		

Designated site	Scheme component	Distance to scheme component	Reason for designation	Potential impact pathways
	Shaft/ Compound 11	1 km	meadowsweet *Filipendula ulmaria*. Adjacent rough grassland and hedges provide additional habitats.	
	AWRP near Kempton WTW	1.2 km		
Oak Avenue Local Nature Reserve SINC	Shaft/ Compound 6	2 km	The diverse and colourful 'wasteland' vegetation, which has established naturally on the site, includes some unusual plants, such as Greek dock *Rumex cristatus* and cotton thistle *Onopordum acanthium*, and supports diverse communities of butterflies and other invertebrates. The self-established vegetation has been supplemented with other habitats, including scrub, meadows, and a small pond.	No direct impact pathways identified during construction. Potential for exposure to pollution (air, dust and fuel). No impact pathways identified during operation.
	Shaft/ Compound 7	1.2 km		
	Shaft/ Compound 8	0.86 km		
	Shaft/ Compound 9	0.01 km		
	Shaft/ Compound 10	0.28 km		
	Shaft/ Compound 11	0.78 km		
	AWRP near Kempton WTW	1 km		
Kempton Waterworks SINC	Shaft/ Compound 7	1.53 km	This site forms part of the Kempton Park Reservoirs SSSI/ LNR.	Noise, vibration and visual disturbance and exposure to pollution (air, dust and fuel). Potential for AWRP site near Kempton WTW to impact on bird movement between functionally linked habitats for roosting and feeding. Intermittent noise and visual disturbance during operation, particularly at the AWRP site near Kempton WTW.
	Shaft/ Compound 8	1.14 km		
	Shaft/ Compound 9	0.29 km		
	Shaft/ Compound 10	0.019 km		
	Shaft/ Compound 11	0.37 km		
	AWRP near Kempton WTW	0.64 km		
	Shaft/ Compound 13	1.17 km		
	Shaft/ Compound 14	1.3 km		
Hatherop Park SINC	Shaft/ Compound 7	1.9 km	Among the many colourful, common wildflowers are several species which are scarce in London including balm *Melissa officinalis*, hare's-foot clover *Trifolium arvense*, Greek dock and spotted medick *Medicago arabica*. On hot days the site is swarming with butterflies and grasshoppers, and many bird species use the site including whitethroat, goldfinch *Carduelis*,	No direct impact pathways identified, however, construction of shafts/ compounds and AWRP site near Kempton WTW could result in the loss of functionally linked habitat for birds and insects. Potential for noise, vibration and visual disturbance and exposure to pollution (air, dust and fuel) during construction. Intermittent noise and visual
	Shaft/ Compound 8	1.56 km		
	Shaft/ Compound 9	0.79 km		
	Shaft/ Compound 10	0.27 km		
	Shaft/ Compound 11	0.07 km		

Designated site	Scheme component	Distance to scheme component	Reason for designation	Potential impact pathways
	AWRP near Kempton WTW	0.30 km	stock dove *Columba oenas* and green woodpecker *Picus viridis*.	disturbance during operation, particularly at the AWRP site near Kempton WTW.
	Shaft/ Compound 13	1.17 km		
	Shaft/ Compound 14	1.3 km		
Hydes Field SINC	Shaft/ Compound 8	1.73 km	Hydes Field is a large area of open land with a range of habitats. Locally scarce plants found here include vervain *Verbena officinalis* and common centaury *Centaurium erythraea*. The great variety of habitats on the site is likely to support a diverse community of invertebrates.	Direct loss of woodland and scrub habitat within footprint of AWRP site which could support breeding birds and a diversity of invertebrates. Compensation habitat will need to be identified as part of Biodiversity Net Gain (BNG). Noise, vibration and visual disturbance and exposure to pollution (air, dust and fuel) during construction. Intermittent noise and visual disturbance during operation.
	Shaft/ Compound 9	1 km		
	Shaft/ Compound 10	0.48 km		
	Shaft/ Compound 11	Adjacent		
	AWRP near Kempton WTW	<1 km Scheme within site		
	Shaft/ Compound 13	1.1 km		
	Shaft/ Compound 14	1 km		
Stain Hill and Sunnyside Reservoirs SINC	Shaft/ Compound 9	1.6 km	Stain Hill and Sunnyside Reservoirs support important populations of moulting and wintering waterfowl, particularly the two Stain Hill Reservoirs, where the water is shallow and marginal vegetation has developed. These hold nationally significant numbers of shoveler and gadwall in late winter. The dry concrete banks of Stain Hill Reservoirs support one of the UK's largest populations of the nationally scarce plant tower mustard *Arabis glabra*, a UK Biodiversity Action Plan Priority species.	No direct impacts during construction. Potential for noise, vibration and visual disturbance and exposure to pollution (air, dust and fuel). In addition, potential for AWRP site near Kempton WTW to impact on bird movement between functionally linked habitats (waterbodies) for roosting and feeding. Intermittent noise and visual disturbance during operation.
	Shaft/ Compound 10	1 km		
	Shaft/ Compound 11	0.57 km		
	AWRP near Kempton WTW	0.08 km		
	Shaft/ Compound 13	0.91 km		
	Shaft/ Compound 14	0.85 km		
Portlane Brook and Meadow SINC	Shaft/ Compound 9	1.7 km	The site information provided by GIGL identifies that Portlane Brook and Meadow has a mixture of running water, scrub and grassland which provides excellent habitat for common birds. Hawthorn is the predominant species, but oak, ash, elm and sycamore are also present. Patches of grassland interspersed with the scrub are reasonably herb-rich and contain a "curious	No direct impacts during construction. Potential for noise, vibration and visual disturbance and exposure to pollution (air, dust and fuel). Intermittent noise and visual disturbance during operation.
	Shaft/ Compound 10	1.1 km		
	Shaft/ Compound 11	0.58 km		
	AWRP near Kempton WTW	0.19 km		
	Shaft/ Compound 13	0.81 km		

Designated site	Scheme component	Distance to scheme component	Reason for designation	Potential impact pathways
	Shaft/ Compound 14	0.75 km	mixture" of species typical of acid, alkaline and neutral grasslands.	
Hampton Water Treatment Works SINC	Shaft/ Compound 9	1.6 km	Hampton Water Treatment Works hosts grassland which is among the most herb-rich grasslands in the Borough. A large population of the London rarity wild clary *Salvia verbenaca* is present throughout the grassland.	No direct impacts during construction. Potential for noise, vibration and visual disturbance and exposure to pollution (air, dust and fuel). In addition, potential for AWRP site near Kempton WTW to impact on bird movement between functionally linked habitats (waterbodies) for roosting and feeding. Intermittent noise and visual disturbance during operation.
	Shaft/ Compound 10	1 km		
	Shaft/ Compound 11	0.57 km		
	AWRP near Kempton WTW	0.08 km		
	Shaft/ Compound 13	1.3 km		
	Shaft/ Compound 14	1.2 km		

2.2.4 Teddington DRA

The relevant statutory and non-statutory designated sites within 2 km each Teddington DRA scheme components as identified by the desk study undertaken as part of the PEA of the Teddington DRA scheme[19] are shown in Table 2-6.

[19] Jacobs (2022). London Effluent Reuse SRO, Teddington DRA Conveyance Route: Preliminary Ecological Appraisal. Report for Thames Water Utilities Ltd, 1 – 90. B22849BM/REP/PEA/003.

Table 2-6 Statutory and non-statutory designated sites associated with the Teddington DRA scheme components.

Designated site	Scheme component	Distance to scheme component	Reason for designation	Potential impact pathways
Ham Lands LNR	Shaft Compound 3	0.7 km	Ham Lands is an area of infilled gravel pits, some old water meadows and a narrow belt of woodland. The area has developed into a mosaic of different ecological zones. The site is of considerable value for informal recreation and is well used by local people and children. It is also used by local schools and for educational projects by students and nature groups.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
	Shaft Compound 4	0.013 km		Disturbance (noise) Pollution and associated habitat degradation from dust during construction
	Alternative Shaft Compound 4	0.15 km		No identified impact pathways from construction activities due to the distance to the site, separation by the River Thames and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
	Shaft Compound 5	0.17 km		No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
	Shaft Compound 6	0.015 km		Disturbance (noise) Pollution and associated habitat degradation from dust during construction.
	Shaft Compound 7	0.01 km		Disturbance (noise) Pollution and associated habitat degradation from dust during construction.
	Outfall Site	0.47 km		No identified impact pathways from construction activities due to the distance to the site and small scale of the above ground works at this scheme component. Site scoped out of assessment.
Isleworth Ait LNR	Shaft Compound 1 – Mogden STW	0.89 km	This site is a small island located in the middle of the River Thames. The site benefits from its isolation from people and has a very tall canopy of mixed woodland which is regularly inundated by high tides. This creates a rare habitat which supports a variety of bird and rare mollusc species.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
	Shaft Compound 2	0.7 km		Pollution – e.g., sediment mobilisation, or fuel spills – hydrological connectivity to the LNR
Ham Common LNR	Shaft Compound 7	0.95 km	Birch and oak woodland with wet hollows and acid grassland. Notable species include	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.

Designated site	Scheme component	Distance to scheme component	Reason for designation	Potential impact pathways
	Outfall Site	0.76 km	remote sedge, cow-wheat and purple hairstreak butterfly.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above ground works at this scheme component. Site scoped out of assessment.
Ham Lands (SINC)	Shaft Compound 4	0.01 km	This site consists of an area of restored gravel pits beside the River Thames and contains a mosaic of habitats, including herb-rich grassland, scrub and woodland. In the north-west is a low-lying area of original flood meadow, though this floods only rarely. It supports a diverse flora, including dropwort *Filipendula vulgaris* which is rare in London.	Disturbance (noise) Pollution and associated habitat degradation from dust during construction.
	Alternative Shaft Compound 4	0.15 km		No identified impact pathways from construction activities due to the distance to the site, separation by the River Thames and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
	Shaft Compound 5	0.17 km		No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
	Shaft Compound 6	compound within the SINC		Disturbance (noise) pollution and associated habitat degradation from dust during construction.
	Shaft Compound 7	0 km		Habitat loss and degradation Disturbance (noise) Pollution and associated habitat degradation e.g., from dust during construction
	Outfall Site	Outfall site within the SINC		Habitat loss and degradation Disturbance (noise) Pollution and associated habitat degradation from dust during construction.
Churchyard of St Mary's with St Alban, Teddington (SINC)	Shaft Compound 7	0.42 km	This attractive churchyard is a blend of formal and semi-natural landscapes. Areas of grass are allowed to grow long, with an annual hay cut in late summer. These areas support "wildflowers including rosy garlic *Allium roseum*, honesty *Lunaria annua* and wood avens *Geum urbanum*. Foxgloves *Digitalis purpurea* and sweet violets *Viola odorata* grow in the shade cast by a group of yew *Taxus baccata* and lime *Tilia* sp. trees".	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
Duke of Northumberlands River at	Shaft Compound 1 – Mogden STW	0.44 km	A 400m section of the river, just before its junction with the River Thames, with an excellent flora. Cyperus sedge *Carex*	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component, site scoped out of assessment for terrestrial ecology.

Designated site	Scheme component	Distance to scheme component	Reason for designation	Potential impact pathways
Woodlands (SINC)			*pseudocyperus* and sea club-rush *Bolboschoenus maritimus*, both scarce in London, occur.	Refer to Annex B.2.4. Aquatic Ecology Assessment Report[20] for assessment of operational impacts.
Marble Hill Park and Orleans House Gardens (SINC)	Shaft Compound 4	0.25 km	This site contains the landscaped grounds of two 18th century houses and therefore has historical significance. The site contains areas of meadows, planted shrubs and woodland-contained veteran trees. The woodland is developing structure with more saplings and young trees present suggesting the habitat will continue to improve into the future.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
	Alternative Shaft Compound 4	0.005 km		Disturbance, Pollution (e.g., dust during construction) and associated habitat degradation.
Mogden Sewage Works (SINC)	Shaft Compound 1	Compound within the SINC	Large sewage treatment works with thick margin of trees bordering the south and east of the sewage works and an area of grassland bordering the works to the west.	Habitat loss and degradation Disturbance (noise) Pollution and associated habitat degradation e.g., from dust during construction.
	Shaft Compound 2	0.49 km		No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
Moor Mead Recreation Ground (SINC)	Shaft Compound 2	0.50 km	A large park consisting of mostly heavily managed amenity grassland. The River Crane boarders the site to the west and may act as a commuting route for wildlife across London.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
	Shaft Compound 3	Compound within the SINC		Habitat loss and degradation Disturbance (noise) Pollution and associated habitat degradation e.g., from dust during construction.
Petersham Lodge Wood and Ham House Meadows (SINC)	Shaft Compound 4	0.045 km	This site contains a small wood and two grassy fields beside the River Thames, which flood on high spring tides, introducing a wetland element to the plants at this site. The site supports the nationally scarce yellow vetchling *Lathyrus aphaca* to the west of the site.	Disturbance (noise) Pollution and associated habitat degradation e.g., from dust during construction.
	Alternative Shaft Compound 4	0.13 km		No identified impact pathways from construction activities due to the distance to the site, separation by the River Thames and small scale of the above-ground works at this scheme component. Site scoped out of assessment.

[20] Ricardo Energy and Environment (2022) London Effluent Reuse SRO Annex B.2.4. Aquatic Ecology Assessment Report. Report for: Thames Water Utilities Ltd. Ref. 4700399659. Ricardo ref. ED13591

Designated site	Scheme component	Distance to scheme component	Reason for designation	Potential impact pathways
	Shaft Compound 5	0.31 km		No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
River Crane at St Margaret's (Richmond side) (SINC)	Shaft Compound 2	0.40 km	This site includes the River Crane between Chertsey Road and the tidal limit at Northcote Road (below which the river is included in the River Thames and tidal tributaries Metropolitan site, and an adjacent area of largely disused allotments. The river is divided into two channels and is lined with trees and shrubs. Kingfishers *Alcedo atthis* are frequently seen.	Disturbance (noise) Pollution and associated habitat degradation e.g., from dust during construction. Compound downstream of the SINC no direct hydrological connectivity.
	Shaft Compound 3	0.012 km		Pollution and associated habitat degradation e.g., from sediment mobilisation, dust or hydrocarbon spills during construction. Refer to Aquatic Ecology Assessment Report for further assessment.
River Crane at St Margarets (SINC)	Shaft Compound 1 – Mogden STW	0.50 km	This area of the River Crane is situated between Chertsey Road and the tidal limit of Northcote Road. This section of river runs alongside a large area of allotments many of which are abandoned providing extra habitat for wildlife.	Disturbance (noise) Pollution and associated habitat degradation e.g., from dust during construction. Compound downstream of the SINC no direct hydrological connectivity.
	Shaft Compound 2	0.50 km		Pollution and associated habitat degradation e.g., from sediment mobilisation, dust or hydrocarbon spills during construction. Refer to Aquatic Ecology Assessment Report for further assessment.
River Thames and Tidal Tributaries (SINC)	Shaft Compound 2	0.50 km	The River Thames is home to many fish and birds, creating a wildlife corridor running right across the city of London.	Disturbance (noise) Pollution and associated habitat degradation e.g., from sediment mobilisation, dust or hydrocarbon spills during construction. Refer to Aquatic Ecology Assessment Report for further assessment.
	Shaft Compound 4	0.012 km		Disturbance (noise) Pollution and associated habitat degradation e.g., from sediment mobilisation, dust or hydrocarbon spills during construction. Refer to Aquatic Ecology Assessment Report for further assessment.
	Alternative Shaft Compound 4	0.01 km		Disturbance (noise) Pollution and associated habitat degradation e.g., from sediment mobilisation, dust or hydrocarbon spills during construction. Refer to Aquatic Ecology Assessment Report for further assessment.
	Shaft Compound 5	0.48 km		No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
	Shaft Compound 6	0.32 km		Hydrological connectivity to the river Thames via Ham Lake.

Designated site	Scheme component	Distance to scheme component	Reason for designation	Potential impact pathways
				Pollution and associated habitat degradation e.g., from sediment mobilisation, dust or hydrocarbon spills during construction. Refer to Aquatic Ecology Assessment Report for further assessment.
	Shaft Compound 7	0.12 km		Pollution and associated habitat degradation e.g., from dust during construction
	Outfall Site	Outfall site within the SINC		Habitat loss Disturbance (noise) Pollution and associated habitat degradation e.g., from sediment mobilisation, dust, or hydrocarbon spills during construction. Refer to Aquatic Ecology Assessment Report for further assessment.
Royal Park Gate Open Space (SINC)	Outfall Site	0.15 km	The site consists of scrub, trees, and a significant area of semi-improved neutral grassland, where patches of rough grassland are interspersed with frequently mown grass paths. The site is significantly different from the neighbouring Ham Lands site due to its heavy management. This creates an important contrast in habitats between the two sites.	Habitat loss Disturbance (noise) Pollution and associated habitat degradation e.g., from dust during construction
The Copse, Holly Hedge Field and Ham Avenues (SINC)	Shaft Compound 4	0.45 km	This site contains a flowery meadow with a stand of ancient oaks and an avenue of lime trees which provide a variety of habitat for wildlife.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
	Alternative Shaft Compound 4	0.22 km		No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
	Shaft Compound 5	0.37 km		No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.
Twickenham Junction Rough (SINC)	Shaft Compound 3	0.49 km	This site is just west of Twickenham Station; the railway lines divide and cross over one another, leaving an 'island' of undisturbed wildlife habitat. The site contains a typical mix of rough grassland, tall herbs, scrub, and young woodland.	No identified impact pathways from construction activities due to the distance to the site and small scale of the above-ground works at this scheme component. Site scoped out of assessment.

2.3 PROTECTED, NOTABLE AND/ OR INVASIVE SPECIES

2.3.1 Overview

The protected and notable species assessment considers the potential impact of London Effluent Reuse SRO during construction and operation on terrestrial protected, notable, and invasive species recorded within a 2 km buffer of the proposed infrastructure locations and affected reaches of watercourses (riparian mammals only). Existing records of protected, notable, and invasive species have been requested from Surrey Biodiversity Information Centre (SBIC), Greenspace Information for Greater London (GiGL), Essex Field Club and Herts Environmental Records Centre from within 2 km of the proposed infrastructure and affected reaches, from 2012 - 2022. Records of bats were requested from with 5 km of the proposed infrastructure. The presence of/potential for protected, notable and invasive species at each of the infrastructure locations will also be informed by incidental records and habitat suitability recorded during the UKHab surveys outlined in Section 2.1. The Baseline data relating to bird communities associated with the London Effluent Reuse SRO options are presented separately in Section 2.4.

The protected, notable, and invasive species assessment will be based on the presence and abundance of species, nature of the identified impact (direct, indirect, duration, magnitude, etc.) and ecological requirements of the species identified.

2.3.2 Beckton water recycling scheme

2.3.2.1 Other protected, notable and/or invasive species

Jacobs were commissioned by Thames Water to undertake two PEAs[21,22] to assess the construction sites' potential to support protected and notable species or habitats and discuss the legal and planning policy issues related to the proposed works.

The desk study search of local environmental records centres' (GIGL and EFC) data, undertaken as part of the PEAs (summarised in Table 2-7), returned records of bats, badgers, stag beetle *Lucanus cervus* and other notable terrestrial invertebrates, reptiles, water vole *Arvicola amphibius*, European hedgehog *Erinaceus europaeus*, protected/notable amphibians, and protected and notable plant species. Outcomes from the PEAs conducted by Jacobs are summarised in Table 2-8.

Table 2-7 Summary of protected and notable species local environmental record centre records for Beckton water recycling scheme components.

Species	Species records associated with each scheme component	
	Beckton Tunnel Conveyance Route – Shaft Compounds 1 – 10	**Beckton Sewage Treatment Works**
Bats	Species identified from GIGL and EFC records from within 2km of the scheme: Daubenton's *Myotis daubentonii*, noctule *Nyctalus noctula*, Leisler's *N. leisleri*, Nathusius' pipistrelle *Pipistrellus nathusii*, common pipistrelle *P. pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, and brown long-eared *Plecotus auritus*.	No records of bat species were identified from GIGL and EFC records from within 2km of the STW site.
Badgers	No records of badgers were identified within 2 km of the Beckton water recycling scheme	No records of badgers were identified within 2 km of the Beckton water recycling scheme.
Stag beetle and other notable terrestrial invertebrates	Records of stag beetles (Schedule 5 of the Wildlife and Countryside Act (WCA) 1981) were identified within 2 km of the Beckton water recycling scheme. Records of stag beetle were within the compound footprint at Shaft Compounds 2 and 3.	Records of four rare or notable invertebrate species were identified from within 2 km of the scheme. No European protected species or species listed under the Wildlife and Countryside Act Schedule 5 were identified.

[21] Jacobs (2022). Beckton Tunnel Conveyance Route: Preliminary Ecological Appraisal. Report for Thames Water Utilities, 1 – 85. B22849BM/REP/PEA/002.

[22] Jacobs (2022). Beckton Sewage Treatment Works Preliminary Ecological Appraisal. Report for Thames Water Utilities Ltd, 1 – 36. B22849BM/REP/PEA/001.

Species	Species records associated with each scheme component	
	Beckton Tunnel Conveyance Route – Shaft Compounds 1 – 10	**Beckton Sewage Treatment Works**
	Records of an additional 283 rare or notable invertebrate species were identified from within 2 km of the scheme.	
Reptiles	Records of barred grass snake (Shaft Compounds 1, 2, 3, 4, 5, and 10), slow worm (Shaft Compounds 2 and 9), and common lizard (Shaft Compounds 1 and 9) were identified within 2 km of the Beckton water recycling Shaft Compounds.	Records of common lizard were identified within 2 km of the Beckton STW site.
Water vole	Records were received from within 2 km of Shaft Compounds 1 and 10. No records of American mink *Neogale vison* (a non-native predator of water voles) were received from within 2 km.	No records were received from within 2 km of the STW. No records of American mink (a non-native predator of water voles) were received from within 2 km.
Eurasian otter	No records of otters were identified within 2 km of the Beckton water recycling scheme	No records were received from within 2 km of the Beckton STW.
European hedgehog	Records of European hedgehog were only identified within 2 km of Shaft Compound 1.	Records of European hedgehog were identified within 2 km of the STW.
Amphibians	Records of common toad (Shaft Compounds 1, 2, 3, and 7) and great crested newts (Shaft Compounds 2 and 3) were identified within 2 km of the Beckton water recycling conveyance route Shaft Compounds.	No records of protected or notable amphibian species were received from within 2 km of the STW.
Protected and notable plant species	A total of 10 protected or notable plant species were identified within 2 km of the conveyance route including two species listed under the Wildlife and Countryside act Schedule 8: bluebell (*Hyacinthoides non-scripta*) and Jersey cudweed (*Gnaphalium luteoalbum*). The full list of the protected and notable plant species identified within 2 km is presented in Appendix B.	Recorded of two protected and notable plant species were identified from within 2 km of the STW: bluebell, and Jersey cudweed. Both species are listed on Schedule 8 of the Wildlife and Countryside act 1981 (as amended).

The Jacobs' PEA of the Beckton water recycling conveyance routes and the Beckton STW site identified:

- The habitats at the Beckton STW site were found to be suitable for protected and notable species including bats, badger *Meles meles*, barn owl *Tyto alba*, common and Schedule 1 birds, common mammals, riparian mammals, reptiles, and priority invertebrate species.
- The habitats at the Beckton Tunnel Conveyance Route site were found to be suitable to support protected and notable species including great crested newts *Triturus cristatus*, bats, birds (including Schedule 1 species), badger, European hedgehog, riparian mammals (Eurasian otter *Lutra lutra* and water vole) and common species of reptiles.
- No protected or notable plant species were identified during the surveys of the Beckton water recycling conveyance routes and the Beckton STW site although Buddleja/butterfly bush *Buddleja davidii*[23] was recorded at the Beckton STW and at Shaft compounds 4, 7, and 9.

[23] Buddleja/butterfly bush *Buddleja davidii* is identified as a 'species of concern' in the London Invasive Species Initiative

Table 2-8 Beckton Preliminary Ecological Appraisal (PEA) summary outcomes.

Site Name	Site info	Survey date/ Proposed survey date	PEA survey summary	Protected species survey recommendations
Beckton Sewage Treatment Works	Single site	No survey date provided – report submitted 27th April 2022	Within and immediately adjacent to the site boundary are three types of priority habitat namely coastal saltmarsh, intertidal mudflats, and the River Roding. Within 0.5km of the site, parcels of deciduous woodland were recorded. The woodland and scrub habitat are suitable for badger *Meles meles* to excavate setts. Woodland, scattered trees and buildings could have potential to support roosting, commuting and foraging bats. Grassland, scrub, and woodland habitats provide good potential habitat for nesting birds, including ground nesting birds and barn owl *Tyto alba*. Nine Schedule 1 bird species have been recorded within the boundary of the site within the last 10 years. Grassland, particularly the area south of the ditch, has the potential to support priority butterfly and moth species The ditch, the River Roding, the coastal saltmarsh, and intertidal mudflats, may provide optimal foraging and resting habitat for Eurasian otter *Lutra lutra*. Additionally, the banks of the ditch and River Roding may provide suitable burrowing opportunities for water vole *Arvicola amphibius*. The rough grassland and scrub on site provide good quality habitat for foraging and basking reptiles. Rough grassland, scrubland and woodland and the ditch have potential to support notable amphibians such as great crested newts and common toad (this is not identified in the Jacobs PEA report).	• **Badger:** It is recommended that a full badger survey be conducted within the footprint of the works and within a 30-metre buffer zone. • **Bats:** It is recommended that a ground-based bat roost assessment (GBBRA) is performed on all the buildings and trees on site and within a 20-30m survey area buffer to assess their potential to support roosting bats. • **Breeding birds:** Cetti's warbler *Cettia cetti* surveys and kingfisher surveys should be undertaken. • **Riparian mammals:** Further riparian mammal surveys (Eurasian otter and water vole) should be conducted along the watercourses within and adjacent to the site boundary. Recommendations not included in the PEA: • **Amphibians:** At the STW site, it is recommended that a great crested newt eDNA survey and Habitat Suitability Index (HSI) assessment are undertaken to assess the suitability of the ditch and waterbodies within 250 m to support the species and to ascertain presence or likely absence of great crested newts.
Beckton Tunnel Conveyance Route	Multiple sites (shafts)	No survey date provided – report submitted 29th May 2022	No records for protected and notable species were returned within the boundaries of the shaft compound locations. Numerous records for invertebrate species including stag beetle *Lucanus cervus* at Shafts 2 and 3 were returned. The protected species and potential presence within each shaft site are as follows; • **Shaft 1:** There is potential for bats to be present in some of the private houses. The dense bramble scrub and western line of trees could offer suitable habitat for breeding birds. The dense scrub earth bank present on site offers sub-optimal habitat for badgers to excavate their setts. The	• **Amphibians:** At the Shaft sites 3, 4, and 10, it is recommended that a great crested newts eDNA survey and Habitat Suitability Index (HSI) assessment are undertaken to assess the ditch's suitability to support the species and to ascertain presence or likely absence of great crested newts. • **Badger:** The habitats present on site at Shaft 1 and Shaft 10 provide suitable habitat for

Site Name	Site info	Survey date/ Proposed survey date	PEA survey summary	Protected species survey recommendations
			grassland within the survey area offers good terrestrial habitat for common species of reptiles. • **Shaft 2:** The large area of mature woodland offers suitable roosting opportunities for bats. These habitats also have potential to support great crested newts, common toad, reptiles, hazel dormice *Muscardinus avellanarius*, and badgers but this was not identified in the Jacobs PEA. • **Shaft 3:** There are suitable foraging and commuting habitats for bats. The dense scrub and line of trees within the survey area have the potential to support breeding birds. The grassland, marsh grassland, dense scrub and presence of water offer suitable habitat for common species of reptiles. These habitats also have potential to support great crested newts, common toad, hazel dormice, and badgers but this was not identified in the Jacobs PEA. • **Shaft 4:** Habitats present provide suitable habitat for foraging and commuting bats. The dense scrub and woodland offer potential habitat for breeding birds. The grassland and presence of standing water offers suitable habitat for reptiles such as slowworm and grass snake. The slow flowing brook, standing water and terrestrial habitat offers suitable breeding habitat for great crested newts and common toad. The dense scrub along Dagenham Brook provides suitable foraging and burrowing opportunities for water vole. • **Shaft 7:** no potential to support protected species. • **Shaft 9:** no potential to support protected species. • **Shaft 10 River Lea Valley, King George V Reservoir:** The mature trees recorded within the survey area provide potentially suitable locations for roosting bats. The areas of dense scrub, lines of trees and river provide suitable habitat for breeding birds including kingfishers. The inaccessible areas of the site could offer potential sett building and foraging habitat for badgers. The grassland and associated water features provide suitable habitat for reptiles including slow worm and grass snake and amphibians (not identified in the PEA report) such as great crested newts or common toad. The earth banks of the River Lea, which is located directly adjacent to the eastern boundary of the site, offers suitable burrowing opportunities for water vole. There are historic records of water vole located approximately 480m to the east of the shaft.	badgers, primarily for foraging and commuting. It is therefore recommended that a full badger survey be conducted within the footprint of the works and within a 30-metre buffer zone. • **Bats:** At Shaft 1, 2, 3, 4 and 10 it is recommended that a targeted ground-based bat roost assessment (GBBRA) is performed on all the trees and structures within a 30m survey area buffer of the proposed shaft compounds. • **Breeding birds:** It is recommended that a Schedule 1 bird survey for kingfisher be undertaken to determine whether or not the species is present in the vicinity of Shaft 10 and whether there are any breeding tunnels present within the banks which will require protection. • **Riparian mammals:** Further riparian mammal surveys should be conducted along the watercourses within and adjacent to the site boundary. Two surveys will be required, one during April to June and one during July to September to search for evidence of recent Eurasian otter and water vole activity such as burrows, holts, prints, feeding remains, latrines and spraint sites.

2.3.3 Mogden water recycling scheme

2.3.3.1 Other protected, notable and/or invasive species

No PEA was completed for the Mogden water recycling sites; however, the Jacobs UK Habs reports for the sites show a number of suitable habitats and some observations of the likely presence of protected species.

The GIGL data request records of protected and notable species within 2 km of all infrastructure and construction locations associated with the Mogden water recycling are summarised in Table 2-9. The exact locations of the records were not provided by the LERC so where a species is identified within 2 km using a precautionary approach it is assumed to be relevant to all construction locations.

Table 2-9 Summary of protected and notable species LERC records for Mogden water recycling scheme components

Site name	Mogden STW, AWRP (Hyde's Field) and Mogden water recycling conveyance route (Shaft Compounds 1 – 19) and discharge location
Bats	Species identified from GIGL records from within 2km of the scheme: serotine *Eptesicus serotinus*, Daubenton's *Myotis daubentonii*, whiskered bat *M. mystacinus*, Natter's bat M. *natteri*, Leisler's *N. leisleri*, noctule *Nyctalus noctula*, Nathusius' pipistrelle *Pipistrellus nathusii*, common pipistrelle *P. pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, and brown long-eared *Plecotus auritus*.
Badgers	No records of badgers were identified within 2 km of the Mogden water recycling scheme, but suitable habitats were identified within or immediately adjacent to the conveyance route or Mogden STW.
Stag beetle	Records of stag beetles were identified within 2 km of the Mogden water recycling scheme
Other notable terrestrial invertebrates	Records of large heath *Coenonympha tullia*, marsh fritillary *Euphydryas aurinia*, white-letter hairstreak *Satyrium w-album*, and brown hair streak *Thecla betulae* were identified within 2 km of the Mogden water recycling scheme[24]
Reptiles	Records of barred grass snake, slow worm, and common lizard were identified within 2 km of the Mogden water recycling scheme
European hedgehog	Records of European hedgehog were identified within 2 km of the Mogden water recycling scheme.
Eurasian otter	No records were identified within 2 km of the Mogden water recycling scheme
Water vole	No records of water voles were identified within 2 km of the Mogden water recycling scheme. No records of American mink (a non-native predator of water voles) were received within 2 km of Mogden STW and conveyance route.
Amphibians	Records of common toad and great crested newts were identified within 2 km of the Mogden water recycling option scheme
Hazel dormouse	Historic (most recent record 2004) records of hazel dormouse were identified within 2 km of the Mogden Re-use scheme, no records were identified from between 2012 and 2022
Protected and notable plant species	A total of 12 protected and notable plant species were identified within 2 km of the Mogden water recycling scheme including bluebell and meadow clary (*Salvia pratensis*) which are listed under Schedule 8 of the Wildlife and Countryside act and three NERC act Section 41 Priority species: True Fox-sedge (*Carex vulpina*), Cornflower (*Centaurea cyanus*), Northern Hawk's-beard (*Crepis mollis*), and Greater Water-parsnip (*Sium latifolium*). The full list of the protected and notable plant species identified within 2 km is presented in Appendix B.

The Jacobs UKHab reports for the indicative Mogden conveyance routes identified that habitats at indicative sites were considered to be suitable for protected and notable species including bats, great crested newts, breeding birds, badger, riparian mammals (Eurasian otter and water vole), terrestrial invertebrates, and common species of reptiles. The habitats are also considered to be potentially suitable for hazel dormouse *Muscardinus avellanarius* and common toad *Bufo bufo* which are not identified in the Jacobs UKHab reports. The protected and notable species across the Mogden STW and Conveyance route sites are described below:

[24] The limited GIGL records for large heath, marsh fritillary and brown hairstreak are likely to be miss-identifications or vagrants outside of their natural range and not a species likely to be dependent on the habitats present within the footprint of the scheme

- Conveyance route compounds:
  - Bats: mature trees within the woodlands at multiple conveyance compounds were identified as having potential roosting opportunities for bats. Many of the habitats such as woodlands, open grassland fields, water features and linear habitat features such as hedgerows and tree-lines offer suitable commuting and foraging habitat for bats.
  - Amphibians: the conveyance route compounds contained suitable habitat for great crested newts and common toad during the terrestrial phase of their life cycle. An assessment of waterbodies which offer suitable aquatic habitat for the species, located within 250m of the sites, was not conducted as part of the UK Habs surveys.
  - Breeding birds: Bird species listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), may use the woodland, scrub, and hedgerow habitats identified across the conveyance route compounds and Mogden STW to nest.
  - Hazel dormouse: Species listed under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), may use the woodland, scrub, and hedgerow habitats identified across the conveyance route compounds and Mogden STW to nest
  - Badgers: No badger setts were recorded during the surveys. However, evidence of potential badger activity in the form of dig and snuffle holes, was recorded within the survey area of at Shaft Compounds 4 and 10. Suitable habitats including woodland, scrub, hedgerows, and grassland were identified at multiple Shaft Compounds.
  - Reptiles: The grassland habitats recorded at Shaft Compound 6, 8, 12 and 13 and open cut trenches section between 12 and 13 provided suitable habitat for foraging and basking reptiles, and may also use the edge habitats associated with woodland and scrub recorded across the conveyance route.
  - Terrestrial invertebrates: The grassland, scrub, hedgerows and mature trees/woodland habitats recorded at multiple Shaft Compounds may also offer suitable habitat for notable terrestrial invertebrates. Deadwood habitat such as that recorded at Shaft 5 may provide suitable habitat for species such as stag beetle.
  - Riparian Mammals: Waterbodies including wet ditches and rivers were recorded within 50m of shaft location 4, 5, 6, 9 and the alternative outfall. These habitats may provide suitable habitat for riparian mammals namely water vole and Eurasian otter. It was also noted that the information boards at the Mereway Nature Reserve near Shaft 4 highlighted the presence of water vole in the area. No records of Eurasian otter were returned from the local environmental records centres from within 2 km of the proposed locations of new infrastructure and construction compounds associated with the Mogden STW or conveyance route.
  - European hedgehog: The woodland, scrub and grassland recorded across the conveyance route, discharge location, and Mogden STW are suitable habitats for hedgehog.
- The Mogden Alternative Discharge site survey area was found to support grassland, woodland, scrub and hardstanding. No protected species were recorded during the field survey, but the habitats recorded have the potential to support reptiles, notable amphibians, nesting birds, badgers, Eurasian otter, European hedgehog and roosting and foraging bats. Buddleja/butterfly bush, which is listed on the LISI, was identified within the site during the PEA.
- The woodland within the Mogden STW site contained woodland which has potential to support roosting bats, nesting birds, European hedgehogs, badgers, great crested newts, common toad, and reptiles along woodland edges. The structure and species composition indicate it is unlikely to support hazel dormice.
- AWRP site:
  - Bats: Woodland at the site was found to be of a suitable age and structure to provide suitable habitat for roosting bats. The woodland, ponds and nearby reservoir also offer suitable foraging habitat for bats.
  - Hazel dormouse: good understorey structure in parts and supports tree and shrub species suitable for foraging and breeding hazel dormouse.
  - Badger: woodland, scrub and grassland provide suitable locations for setts building for badger, no field signs were identified during the Jacobs UKHab survey.

- European hedgehog: woodland, scrub and grassland provide suitable habitat for European hedgehog
- Breeding birds: woodland and scrub within the AWRP site provide suitable nesting location for a range of breeding birds.
- Amphibians: two ponds and the wet ditch recorded during the Jacobs UKHab survey provide suitable habitat for great crested newt during the aquatic stages of their life cycle. The surrounding woodland and scrub habitat provides suitable terrestrial habitat for the species.
- Reptiles: the woodland, scrub, grassland, and rubble piles identified within the site boundary provide suitable habitat for common reptiles.
- No protected or notable plants species were identified within the AWRP site but the non-native species: false acacia *Robinia pseudoacacia* trees were recorded in woodland within the AWRP site. This species is listed by the LISI as a Category 4 Species of Concern.

Additional anecdotal records of protected and notable species recorded during the UKHab surveys including:

- Shaft 4: Mereway Nature Park: visitor information boards identified the nature reserve supports the following protected and notable species: soprano pipistrelle *Pipistrellus pygmaeus*, water vole, European eel *Anguilla anguilla*, song thrush *Turdus philomelos*).

2.3.4 Teddington DRA

2.3.4.1 Other protected, notable and/or invasive species

The GIGL data request records of protected and notable species within 2 km of all infrastructure and construction locations associated with the Mogden water recycling are summarised in Table 2-10. Locations (National Grid References) of records in the GIGL were only provided for London invasive non-native species. The exact locations of the protected and notable species records were not provided by the LERC so where a species is identified within 2 km using a precautionary approach it is assumed to be relevant to all construction locations.

No protected or notable plant species were identified during the PEA/UKHab surveys of the Teddington DRA Scheme although non-native buddleja/butterfly bush and the invasive non-native species giant hogweed *Heracleum mantegazzianum* were present at Shaft compound 4.

Table 2-10 Summary of protected and notable species LERC records for Teddington DRA scheme components

Species	Species records summary
Bats	Species identified from GIGL records from within 2km of the scheme serotine, Daubenton's, whiskered bat, Natter's bat, Leisler's, noctule, Nathusius' pipistrelle Pipistrellus nathusii, common pipistrelle, soprano pipistrelle, and brown long-eared bats.
Badgers	No records of badgers were identified within 2 km of the Teddington DRA scheme, but suitable habitats were identified during the PEA surveys undertaken in 2021/2022.
Stag beetle	Records of stag beetles were identified within 2 km of the Teddington DRA scheme
Other notable terrestrial invertebrates	Records of large heath[25], marsh fritillary, white-letter hairstreak, and brown hairstreak were identified within 2 km of the Teddington DRA scheme
Reptiles	Records of barred grass snake, slow worm, and common lizard were identified within 2 km of the Teddington DRA scheme
European hedgehog	Records of European hedgehog were identified within 2 km of the Teddington DRA scheme
Water vole	No records were identified within 2 km of the Teddington DRA scheme. American mink (a non-native predator of water voles) were identified within 2 km of Shaft Compound 4, Alternative Site Compound 4, and Shaft Compound 5.
Eurasian otter	No records were identified within 2 km of the Teddington DRA scheme

[25] GIGL dataset provided a single record of this species from 2019. This is likely to be a miss-identification or vagrant outside of its natural range and not a species likely to be dependent on the habitats present within the footprint of the scheme

Amphibians	Records of common toad and great crested newts were identified within 2 km of the Teddington DRA scheme
Protected and notable plant species	A total of 12 protected and notable plant species were identified within 2 km of the Mogden Water Re-cycling scheme including bluebell and meadow clary (*Salvia pratensis*) which are listed under Schedule 8 of the Wildlife and Countryside act and three NERC act Section 41 Priority species: True Fox-sedge(*Carex vulpina*), Cornflower (*Centaurea cyanus*), Northern Hawk's-beard (*Crepis mollis*), and Greater Water-parsnip (*Sium latifolium*). The full list of the protected and notable plant species identified within 2 km is presented in Appendix B.

A summary of the protected and notable species identified during the desk study and Jacobs PEA surveys undertaken for the Teddington DRA scheme components is shown in Table 2-11. A full assessment of INNS is provided in Annex B.2.5. INNS Assessment Report.

Table 2-11 Teddington DRA scheme Preliminary Ecological Appraisal (PEA) summary outcomes.

Site Name	Site info	Survey date/ Proposed survey date	PEA survey summary	Protected species survey recommendations
Shaft Compounds 1-7 of the Teddington DRA Gate 2	Multiple sites (shaft compounds)	4th May 2022	• **Shaft 1:** The mature trees present within the broadleaved woodland provide suitable habitat for roosting bat species. The mature trees and dense undergrowth within the woodland area offer suitable habitat for breeding birds. No evidence of Schedule 1 species was recorded during the survey. The habitats identified also have potential to support protected amphibians, reptiles (woodland edges), hedgehog, and hazel dormouse but these species were not identified in the PEA. • **Shaft 2:** suitable bat foraging habitats and potential roosting locations in the nearby buildings. There is suitable nesting bird habitat on site in the trees and bramble scrub identified. The site has an artificial insect wall and rubble piles which may provide habitat and refuge for hibernating amphibians, reptiles, or European hedgehogs. Artificial stag beetle habitat was identified at the site. The grassland has potential to support priority butterfly and moth species. The grassland on site offers good quality habitat for foraging and basking reptiles. • **Shaft 3:** The River Crane runs to the west of the site which may be used by bats for commuting and foraging. The river crane has potential to support Eurasian otter The site has some suitable breeding habitat for birds in the trees and other vegetated areas present. • **Shaft 4:** The woodland and hedgerow surrounding the site is suitable for badger to excavate setts and forage. The site contains several wooded areas potentially suitable for roosting bats and notable terrestrial invertebrates such as stag beetle. Linear features such as hedgerows and the River Thames and therefore may support foraging and roosting bats. Bird species may use the hedgerow and mature trees on site to nest. • **Shaft 5:** The site contains a hedgerow and line of mature trees and is in proximity to the River Thames and multiple large, wooded areas. Bats may use these habitats for roosting, foraging and commuting. There are large mature trees and a hedgerow in or adjacent to the grassland habitat which provide potential habitat for breeding birds. The grassland on site, if allowed to grow taller, could provide suitable habitat for common reptile and protected or notable amphibian species,	**Badgers:** A full badger survey should be conducted within the footprint of Shaft Compound 1, 4, 6, 7 within an additional 30-metre buffer zone of the sites. **Bats:** It is recommended that a ground-based bat roost assessment is conducted on all the trees and structures located within 20-30m of any works areas. The aim of the survey will be to assess their potential to support roosting bats. **Breeding birds:** A breeding bird assessment should be conducted to determine the likely presence/ absence of red kites (Schedule 1) at Shaft Compound 5, 7, Alternative Shaft Compound 4 and the Intake. Schedule 1 assessment for red kite prior to works commencing. **Reptiles:** survey to determine presence/likely absence to inform the required mitigation at Shaft Compounds with suitable habitats. **Amphibians**: HSI survey of waterbodies within 250 m of the conveyance route compounds to determine the requirements for further surveys for great crested newts and to inform the requirements for mitigation during construction relating common toad and great crested newts.

			particularly as the site is located close to an allotment which is good habitat for reptiles notably slow worms (*Anguis fragilis*). • **Shaft 6:** Bats may use the site and surrounding habitats to forage and commute. Suitable bat roosting habitat in the woodland and hedgerow was present in this area. The site provided potential foraging and commuting habitat for badgers including the woodland and hedgerow; these habitats are also potential locations for badgers to excavate their setts. The site contains areas of grassland, scrub and woodland habitat which provide suitable nesting habitat for breeding birds. The hedgerow, woodland edges, and grasslands on site provide suitable habitat for common species of reptile, protected/notable amphibians, and European hedgehog. • **Shaft 7:** The woodland on site provides suitable habitat for badgers to excavate their setts. Potential sett building habitat is particularly apparent to the south of the site. The site contains woodland that could provide bat roosting habitat and grassland suitable for foraging bats. The large mature trees within the survey area could well provide features for roosting bats and notable terrestrial invertebrates such as stag beetle. The site contains areas of woodland habitat which could be used as nesting sites for breeding birds. The grassland and woodland edges on site are suitable for common reptile species, protected/notable amphibians, and European hedgehog.	
Alternative Shaft Compound 4	Single site	3rd February 2022.	• The site contains wooded areas with several mature and (potentially) veteran trees which contained features potentially suitable for roosting bats. The site is located in close proximity to the River Thames and multiple large, wooded areas, so bats may roost in the trees on site and then forage and commute within the surrounding area. • Woodland and mature trees provide suitable nesting locations for a range of breeding birds. • The site contained several log piles along its western edge which could provide suitable habitat for the larval stage of stag beetle hibernating amphibians, reptiles, or European hedgehogs. • Eurasian otters: are suitable for commuting and foraging otter, but no otter holts or evidence of otter activity was recorded during the Jacobs PEA survey.	**Bats:** It is recommended that a ground-based bat roost assessment is conducted on all the trees and structures located within 20-30m of any works areas. The aim of the survey will be to assess their potential to support roosting bats. **Breeding birds:** A breeding bird assessment should be conducted to determine the likely presence/ absence of red kites (Schedule 1) at Shaft Compound 5, 7, Alternative Shaft Compound 4 and the Intake. Schedule 1 assessment for red kite prior to works commencing. **Reptiles:** survey to determine presence/likely absence to inform the required mitigation at Shaft Compounds with suitable habitats. **Amphibians**: HSI survey of waterbodies within 250 m of the conveyance route

				compounds to determine the requirements for further surveys for great crested newts and to inform the requirements for mitigation during construction relating to common toad and great crested newts
Intake and Outfall sites	Multiple sites (intake and outfall sites)	4th May 2022	**Outfall site:** The woodland habitat and rough grassland areas close to the river provide suitable habitat for badger foraging and European hedgehogs. The site contains small areas of woodland and some mature trees which could contain features suitable for roosting bats. The site contains suitable nesting habitat for birds particularly the areas of woodland and trees near the riverbank. Grassland and scrub edge habitat could provide potential habitat for common reptiles and protected and notable amphibians. **Intake site:** The woodland which makes up the majority of this site is considered suitable badger habitat including for sett building. The site contains areas of woodland with many mature trees which could contain features suitable for roosting bats. The site contains areas of grassland, scrub and woodland habitat which could be used as nesting sites for birds. Grassland and scrub habitat could provide potential habitat for common reptiles and protected /notable amphibians. The site contained some log piles along its western edge which could provide suitable habitat for the larval stage of stag beetle, hibernating amphibians, reptiles, or European hedgehogs.	**Badgers:** A full badger survey should be conducted within the footprint of the Intake and within an additional 30-metre buffer zone of the sites. **Bats:** It is recommended that a ground-based bat roost assessment is conducted on all the trees and structures located within 20-30m of any works areas. The aim of the survey will be to assess their potential to support roosting bats. **Breeding birds:** A breeding bird assessment should be conducted to determine the likely presence/ absence of red kites (Schedule 1) at Shaft Compound 5, 7, Alternative Shaft Compound 4 and the Intake. Schedule 1 assessment for red kite prior to works commencing. **Reptiles:** survey to determine presence/likely absence to inform the required mitigation at Shaft Compounds with suitable habitats. **Amphibians**: HSI survey of waterbodies within 250 m of the conveyance route compounds to determine the requirements for further surveys for great crested newts and to inform the requirements for mitigation during construction relating to common toad and great crested newts

2.3.5 Riparian mammals – hydrologically impacted watercourses associated with London Effluent Reuse scheme

2.3.5.1 Freshwater River Thames

No records of Eurasian otter or water vole were received from SBIC within the freshwater River Thames from 2012 - 2022. One record of a Eurasian otter was received from GiGL in 2019 within 2 km of impacted reaches of the freshwater River Thames and no records of water voles were received. Further details are provided in Table 2-12. Recent Eurasian otter activity around the lower Thames has been reported, but records have not yet been published within the GiGL data received. Lack of records is not assumed to prove absence of a species, so otters will be considered as a receptor for any activities that around the riparian zone.

Table 2-12 Greenspace Information for Greater London (GiGL) records of riparian mammals within 2 km of impacted reaches of the freshwater River Thames.

Taxon Name	Common Name	Total number of occurrences	Distance (m) of nearest record	Bearing of nearest record	Date of nearest record	Distance (m) of most recent record	Bearing of most recent record	Date of most recent record
Lutra lutra	Eurasian otter	1	Within 2 km of impacted reaches	North	10/03/2019	Within 2 km of impacted reaches	N	10/03/2019
Neovison vison	American Mink	12	Within 2 km of impacted reaches	Not supplied	28/01/2019	Within 2 km of impacted reaches	Not supplied	04/09/2019

2.3.5.2 Estuarine Thames Tideway

Two records of a Eurasian otter were received from GiGL in 2015 and 2017, from within 2 km of the impacted reaches of the estuarine Thames tideway. A total of 305 occurrences of water vole was received from GiGL from 2002 – 2022[26]. A total of three occurrences of American mink *Neovison vison* was recorded in 2007. Further details are provided in Table 2-13.

Table 2-13 Greenspace Information for Greater London (GiGL) records of riparian mammals within 2 km of impacted reaches of the estuarine Thames tideway.

Taxon Name	Common Name	Total number of occurrences	Distance (m) of nearest record	Bearing of nearest record	Date of nearest record	Distance (m) of most recent record	Bearing of most recent record	Date of most recent record
Lutra lutra	Eurasian otter	1	Within 2 km of impacted reaches	South	29/08/2017	Within 2 km of impacted reaches	South	29/08/2017
Lutra lutra	Eurasian otter	1	Within 2 km of impacted reaches	West	18/08/2015	Within 2 km of impacted reaches	West	18/08/2015
Arvicola amphibius	Water vole	145	Within 2 km of impacted reaches	West	09/11/2002	Within 2 km of impacted reaches	North-east	13/12/2016
Arvicola amphibius	Water vole	160	Within 2 km of impacted reaches	East	04/03/2021	Within 2 km of impacted reaches	East	04/03/2021

[26] GIGL data was not provided in a format which could separate which records occurred within the study period 2012 to 2022

Taxon Name	Common Name	Total number of occurrences	Distance (m) of nearest record	Bearing of nearest record	Date of nearest record	Distance (m) of most recent record	Bearing of most recent record	Date of most recent record
Neovison vison	American Mink	3	Within 2 km of impacted reaches	Not supplied	01/03/2007	Within 2 km of impacted reaches	Not supplied	08/03/2007

2.3.5.3 Freshwater River Lee

One record of water vole was received from Essex Field Club in 2005, from within 2 km of the impacted reaches of the freshwater River Lee. It is noted that the record is located upstream of the proposed discharge point on the River Lee. No records of Eurasian otter or American mink were received. Further details are provided in Table 2-14.

Table 2-14 Essex Field Club records of riparian mammals within 2 km of impacted reaches of the freshwater River Lee.

Taxon Name	Common Name	Total number of occurrences	Distance (m) of nearest record	Bearing of nearest record	Date of nearest record	Distance (m) of most recent record	Bearing of most recent record	Date of most recent record
Arvicola amphibius	Water vole	4	Within 2 km of impacted reaches	North-east	2005	Within 2 km of impacted reaches	North-east	2005

2.4 BIRDS

2.4.1 Overview

Data have been requested from SBIC, Essex Field Club, Herts Environmental Records Centre, GiGL and the Wetland Bird Survey (WeBS) from British Trust for Ornithology (BTO) where required. WeBS core count data includes peak monthly counts of wetland birds over a five-year period and the International and National importance of the site for each species. The bird assessment will be based on the presence and abundance of birds, considering legislative protections, Birds of Conservation Concern (BoCC) red listed, and NERC Section 41 priority species, nature of the identified impact (direct, indirect, duration, frequency, magnitude, etc.) and ecological requirements of the species which is season dependent (breeding and wintering).

2.4.2 Beckton water recycling scheme

2.4.2.1 Environmental records centre data

The coverage of two environmental records centres overlapped with the proposed footprint of Beckton water recycling scheme: Essex Field Club and Herts Environmental Records Centre.

A total of 236 bird species has been recorded within 2 km of Beckton water recycling scheme to Essex Field Club from 2000 – 2021 with the latest record in 2020. Of the 236 species recorded, 88 are 'notable' species and the remaining are protected under local plans and local species of conservation concern or invasive species. Of the 88 'notable' species, 51 are WCA Schedule 1 species, 52 are BoCC red listed and 26 are NERC Section 41 species. Peak counts of > 200 individuals were recorded for the following 'notable' species: herring gull *Larus argentatus*, pochard *Aythya ferina*, redwing *Turdus Iliacus*, fieldfare *Turdus pilaris*, house sparrow *Passer domesicus*, skylark *Alauda arvensis*, greylag goose *Anser anser*, reed bunting *Emberiza schoeniclus*, linnet *Linaria cannabina* and whinchat *Saxicola rubetra*.

A total of 72 bird species has been recorded within 2 km of Beckton water recycling scheme to Herts Environmental Records Centre from 2000 – 2022, with the latest record submitted in 2018. Herts Environmental Records Centre covers the Lee Valley SPA. Of those 72 species recorded, 22 are 'notable' species and the remaining 50 are protected under local plans and local species of conservation concern. Of the 22 'notable' species, 17 are BoCC red listed, six are WCA Schedule 1 species and seven are NERC

Section 41 species. Peak counts of >50 individuals were recorded for the following 'notable' species: fieldfare, lapwing *Vanellus vanellus* and greylag goose.

2.4.2.2 WeBS core count data

WeBS core count data were requested where impact pathways have been identified at reservoirs associated with the Lee Valley SPA and Ramsar site. The sites include King George V Reservoirs (24152), Banbury Reservoir (24108), Walthamstow Reservoirs excluding Banbury (24107), William Girling Reservoir (24151) and Wanstead Flats (24077). A summary of the data is provided in Table 2-15 - Table 2-19.

A total of 42 species has been recorded at King George V Reservoir from 2015 – 2020 including wildfowl, gulls and waders. Of those species, 13 are classed as 'notable'. This includes scaup *Aythya marila*, goldeneye *Bucephala clangula*, lapwing, Slavonian grebe *Podiceps auritus*, and herring gull. On average, peak counts have been highest in autumn. King George V Reservoir WeBS survey site is approximately 210 m from the closest proposed infrastructure (above ground).

Table 2-15 Five-year summary for King George V Reservoir showing peak monthly count of all species combined within each year and seasonal peaks[27].

Year	Peak Monthly Total	Autumn Peak	Winter Peak	Spring Peak
15/16	1480 (JAN)	1391	1736	281
16/17	2171 (SEP)	2171	773	N/C
17/18	2355 (DEC)	1901	2482	468
18/19	2502 (OCT)	2609	2315	N/C
19/20	3088 (SEP)	4352	2185	N/C
MEAN	2319	2485	1898	375

A total of 21 species has been recorded at Banbury Reservoir from 2009 – 2014 including waterfowl and gulls. Of those species, three are classed as 'notable'. These include pochard, goldeneye and herring gull. On average, peak counts have been highest in autumn. Banbury WeBS survey site is approximately 680 m from the closest proposed infrastructure (above ground).

Table 2-16 Five-year summary for Banbury Reservoir showing peak monthly count of all species combined within each year and seasonal peaks[28].

Year	Peak Monthly Total	Autumn Peak	Winter Peak	Spring Peak
09/10	N/C	N/C	N/C	N/C
10/11	734 (SEP)	734	N/C	N/C
11/12	N/C	N/C	N/C	N/C
12/13	75 (FEB)	N/C	75	47
13/14	300 (OCT)	300	141	N/C
MEAN	370	517	108	47

A total of 43 species has been recorded at Walthamstow Reservoirs excluding Banbury from 2015 - 2020 including waterfowl, waders and gulls. Of those species, 10 are classed as 'notable'. These include scaup, goldeneye, black-tailed godwit *Limosa limosa* Slavonian grebe, herring gull, garganey *Anas querquedula* and dunlin *Calidris alpina*. On average, peak counts have been highest in autumn. Proposed construction works is within the boundary of Walthamstow Reservoirs excluding Banbury WeBS survey site.

[27] WeBS Bird Survey Data.
[28] WeBS Bird Survey Data.

Table 2-17 Five-year summary for Walthamstow Reservoir excluding Banbury showing peak monthly count of all species combined within each year and seasonal peaks.

Year	Peak Monthly Total	Autumn Peak	Winter Peak	Spring Peak
15/16	3071 (JUL)	3580	1909	1251
16/17	1521 (NOV)	1533	1895	1401
17/18	3302 (AUG)	4037	2418	854
18/19	2110 (JUL)	2110	1911	1143
19/20	1980 (SEP)	2725	1185	N/C
MEAN	2397	2797	1864	1162

A total of 43 species has been recorded at William Girling Reservoir from 2015 - 2020 including waterfowl, waders and gulls. Of those species, 13 are classed as 'notable'. These include common scoter *Melanitta nigra*, scaup, goldeneye, Slavonian grebe, lapwing and herring gull. On average, peak counts have been highest in winter. William Girling Reservoir WeBS survey site is approximately 670 m from the closest proposed infrastructure (above ground).

Table 2-18 Five-year summary for William Girling Reservoir showing peak monthly count of all species combined within each year and seasonal peaks.

Year	Peak Monthly Total	Autumn Peak	Winter Peak	Spring Peak
15/16	6546 (FEB)	1661	7283	291
16/17	2937 (FEB)	N/C	3011	N/C
17/18	3785 (DEC)	751	3921	195
18/19	4073 (JUL)	4396	2229	N/C
19/20	4920 (JAN)	1175	5180	N/C
MEAN	4452	1996	4325	243

A total of 20 species has been recorded at Wanstead Flats from 2016 – 2021 including waterfowl, waders and gulls. Of those species, two are classed as 'notable'. These are herring gull and pochard. On average peak counts were the highest in winter. Wanstead Flats WeBS survey site is approximately 70 m from the closest proposed infrastructure (above ground).

Table 2-19 Five-year summary for Wanstead Flats showing peak monthly count for all species combined within each year and seasonal peaks.

Year	Peak Monthly Total	Autumn Peak	Winter Peak	Spring Peak
16/17	1429 (JAN)	N/C	N/C	N/C
17/18	878 (NOV)	N/C	1336	472
18/19	N/C	N/C	N/C	N/C
19/20	N/C	N/C	N/C	N/C
20/21	1488 (NOV)	N/C	1488	N/C
MEAN	1265	654	1329	N/C

WeBS core count was requested for the River Thames – Barking (24903) where impact pathways have been identified for potential functionally linked habitat for qualifying features of the Thames Estuary and Marshes SPA and Ramsar site. A total of 32 species has been recorded at River Thames – Barking from 2016 – 2021

including waterfowl, waders, gulls and terns. Of these species, seven are classed as 'notable'. These are black-tailed godwit, brent goose *Branta bernicla*, curlew *Numenius arquata*, dunlin, herring gull, lapwing and ruff *Calidris pugnax*. On average, peak counts were the highest in autumn. A summary of the data is provided in Table 2-20. River Thames - Barking WeBS survey site is approximately 2 km from the closest proposed infrastructure (above ground) and is within the operational reach of the scheme.

Table 2-20 Five-year summary for River Thames – Barking showing peak monthly count for all species combined within each year and seasonal peaks.

Year	Peak Monthly Total	Autumn Peak	Winter Peak	Spring Peak
16/17	N/A	N/C	N/C	N/C
17/18	1062 (FEB)	N/C	1336	472
18/19	1861 (JAN)	2027	2269	267
19/20	1332 (DEC)	1372	1697	N/C
20/21	2739 (SEP)	3109	N/C	N/C
MEAN	Not provided	2169	1767	370

2.4.2.3 Field Surveys

A Preliminary Ecological Appraisal (PEA) and UKHab surveys were conducted at Beckton STW and along the conveyance route by Jacobs. The following observations were made in relation to habitats present and potential to support breeding birds:

- Beckton STW: Grassland, scrub and woodland habitats provide good potential habitat for nesting birds including ground nesting birds and barn owl*;*
- Beckton STW: Two pole-mounted barn owl boxes were recorded and an old barn owl pellet;
- Beckton STW: The banks of the ditch running through the site could offer suitable burrowing opportunities for kingfisher *Alcedo atthis* and breeding habitat for Cetti's warbler *Cettia cetti*;
- Beckton STW: Mature trees present could provide suitable habitat for breeding red kite *Milvus milvus,* and buildings could provide suitable breeding habitat for peregrine falcon *Falco peregrinus*;
- Compound/ Shaft 1: Dense bramble-scrub and trees present provides suitable habitat for breeding birds;
- Compound/ Shaft 3: Dense scrub and trees provides suitable habitat for breeding birds;
- Compound/ Shaft 4: Dense scrub and trees provides suitable habitat for breeding birds;
- Compound/ Shaft 6: Grassland and scrub provides suitable habitat for nesting birds including ground nesting; and
- Compound/ Shaft 10: Dense scrub and trees provides suitable habitat for breeding birds and the River Lea could also provide suitable burrowing habitat for kingfisher.

2.4.3 Mogden water recycling scheme

2.4.3.1 Environmental records centre data

The coverage of two environmental records centres overlapped with the proposed footprint of Mogden water recycling scheme: GiGL and SBIC.

A total of 98 bird species have has been recorded to GiGL within 2 km of Mogden water recycling and Teddington DRA scheme from 2000 – 2022. This includes 38 waterfowl (waders, wildfowl and divers, plus kingfisher,12 gull and tern species and 8 birds of prey. The remaining 40 species are associated with woodland, parkland, wetland, scrub and heathland habitats. Of those species, 61 are 'notable' species (as defined above) and 37 are protected under local plans and local species of conservation concern. Of the 561 'notable' species, 42 are WCA Schedule 1, 20 NERC Section 41 species and 12 BoCC red listed species. Note that some species will have multiple legislative protections status listings. Peak counts of > 100 individuals were recorded for the following 'notable' species: skylark, reed bunting, herring gull , house sparrow, redwing, fieldfare and lapwing.

A total of 59 bird species have been recorded to SBIC from 2000 – 2022, with the latest record submitted in 2020. SBIC covers Mogden from the discharge point in Walton-on-Thames to Surbiton, 8.3 km downstream. Of those 59 species recorded, 30 are 'notable' species and the remining 29 are protected under local plans and local species of conservation concern. Of the 30 'notable' species, 23 are BoCC red listed, eight are NERC Section 41 species and 10 are WCA Schedule 1 species. Abundance values were not provided per record; however, the highest number of records within this area included black-headed gull *Chroicocephalus ridibundus*, mallard *Anas platyrhynchos* and mute swan *Cygnus olor*.

2.4.3.2 WeBS core count data

WeBS core count data was requested where impact pathways have been identified at reservoirs associated with South West London Waterbodies SPA and Ramsar site. The sites include Kempton Local Nature Reserve (24103) and Red House Reservoir (24104).

A total of 28 species has been recorded at Kempton Local Nature Reserve from 2015 - 2020 including waterfowl and waders. Of those species, four are classed as 'notable'. These include green sandpiper *Tringa ochropus*, kingfisher, lapwing and little ringed plover *Charadrius dubius*. On average, peak counts have been highest in winter. Kempton Local Nature Reserve WeBS survey site is approximately 30 m from the closest proposed infrastructure (above ground).

Table 2-21 Five-year summary for Kempton Local Nature Reserve showing peak monthly count of all species combined within each year and seasonal peaks.

Year	Peak Monthly Total	Autumn Peak	Winter Peak	Spring Peak
15/16	113 (SEP)	166	109	72
16/17	156 (SEP)	212	236	94
17/18	216 (JAN)	176	320	78
18/19	164 (AUG)	222	197	114
19/20	106 (JAN)	186	156	54
MEAN	151	192	204	82

A total of 21 species has been recorded at Red House Reservoir from 2015 - 2020 including waterfowl and waders. Of those species, three are classed as 'notable'. These include pochard, green sandpiper and kingfisher. On average, peak counts have been highest in winter. Red House Reservoir WeBS survey site is approximately 30 m from the closest proposed infrastructure (above ground).

Table 2-22 Five-year summary for Red House Reservoir showing peak monthly count of all species combined within each year and seasonal peaks.

Year	Peak Monthly Total	Autumn Peak	Winter Peak	Spring Peak
15/16	218 (OCT)	250	200	70
16/17	144 (SEP)	183	132	124
17/18	203 (DEC)	209	223	113
18/19	368 (NOV)	293	409	98
19/20	217 (NOV)	238	242	44
MEAN	230	235	241	90

2.4.3.3 Field surveys

UKHab surveys have been conducted at Mogden STW, AWRP site near Kempton WTW and along the conveyance route. The following observations were made in relation to habitats present and potential to support breeding birds:

- Mogden STW: Woodland and scrub provides suitable habitat for breeding birds;
- AWRP site near Kempton WTW: Woodland and scrub provides suitable habitat for breeding birds. The exposed underside of a fallen tree root-ball had burrows excavated into it, which may be used by a nesting kingfisher;
- Mogden discharge point: Woodland provides suitable habitat for breeding birds; and
- Mogden conveyance route: Woodland, hedgerows and scrub provides suitable habitat for breeding birds.

2.4.4 Teddington DRA

2.4.4.1 Environmental records centre data

The coverage of one environmental records centre overlapped with the proposed footprint of Teddington DRA: GiGL. For bird records within the boundaries of GiGL, refer to Section 2.4.3.1.

No WeBS core count data was requested for Teddington DRA as no relevant sites with impact pathways within the construction and operational footprint of the works were identified.

2.4.4.2 Field surveys

A PEA and UKHab surveys were conducted along the conveyance route. The following observations were made in relation to habitats present and potential to support breeding birds:

- Compound/ Shaft 1: Mature trees and dense undergrowth within the woodland provides suitable habitat for breeding birds, although no evidence of Schedule 1 species was recorded during the survey;
- Compound/ Shaft 2: Three bird boxes found within the site and tree and scrub habitat present provides suitable breeding bird habitat;
- Compound/ Shaft 3: Trees and vegetated areas provides suitable breeding bird habitat;
- Compound/ Shaft 4: Hedgerows and mature trees present provides suitable breeding bird habitat. As the riverbank was reinforced, no suitable nesting habitat for kingfisher was found;
- Compound/ Shaft 5: Mature trees and hedgerow provides suitable breeding bird habitat. Large mature trees to the north of the site could potentially provide nesting habitat for raptors such as red kite, although no nests were identified during the survey;
- Compound/ Shaft 6: Grassland, scrub and woodland provides suitable habitat for breeding birds;
- Compound/ Shaft 7: Mature trees provides suitable breeding bird habitat. Large mature trees to the north of the site could potentially provide nesting habitat for raptors such as red kite although no nests were identified during the survey;
- Teddington outfall: The site contains suitable nesting habitat for birds particularly the areas of woodland and trees near the riverbank. There is no reedbed habitat or earth cliffs in this area making it unsuitable for Cetti's warbler and kingfisher nesting;
- Teddington intake: Grassland, scrub and woodland provides suitable nesting sites for birds. No suitable earth cliff or reedbed habitat was identified close to the water; therefore, the area was considered to be unsuitable for nesting Schedule 1 birds such as Cetti's warbler and kingfisher. However, the larger mature trees on site could provide suitable nesting habitat for red kite.

3 TERRESTRIAL ECOLOGY ASSESSMENT OF BECKTON WATER RECYCLING SCHEME

The construction activities associated with the 300 Ml/d Beckton water recycling scheme would include the following activities that have potential to result in biophysical changes to important terrestrial ecological features:

- Construction of AWRP at Beckton STW (north of existing site) which includes removal of vegetation, earthworks and associated drainage.
- Construction of temporary site compounds and permanent reception shafts at Beckton STW and permanent intermediate shafts along the conveyance route (including vegetation removal, earthworks, provision for compound drainage and SuDS, and creating areas of hardstanding to provide a working area for construction phase activities).
- Construction of temporary access routes (including vegetation removal, earthworks, and associated drainage).
- Construction of discharge/outfall location along the River Lee Diversion Channel.
- Fencing (comprising taller 'heras' type around compounds and lay-down areas).

The activities listed above have the potential to result in the following effects:

- Habitat loss (both temporary and permanent) - It is assumed that all areas of temporary habitat loss will be re-instated to the current baseline condition following completion of the construction phase of the scheme.
- Habitat fragmentation (temporary).
- Management changes to habitats (leading to habitat degradation).
- Disturbance of individuals or groups of animals via noise, vibration and visual disturbance.
- Direct injury or mortality of individual animals and plants.
- Pollution e.g., sediment mobilisation, dust, hydrocarbons (habitat degradation and indirect injury/mortality to species).

The operational activities associated with the 300 Ml/d Beckton water recycling scheme would include the following activities that have potential to result in biophysical changes to important terrestrial ecological features:

- Operational changes to flow regime in the River Lee Diversion Channel.
- Operation and maintenance of new infrastructure including the conveyance route and within the existing Beckton STW site.

The activities listed above have the potential to result in the following effects:

- Management changes to habitats (leading to habitat degradation).
- Disturbance of individuals or groups of animals via noise, vibration and visual disturbance.
- Direct injury or mortality of individual animals and plants.
- Impacts from water level changes (a cause of habitat loss, degradation and/or indirect injury/mortality to species).

The potential effects on terrestrial habitats, protected and notable species (excluding birds) and birds are assessed in Section 3.1.1, 3.2.1 and 3.3.1 respectively.

3.1 HABITAT IMPACTS

3.1.1 Construction impacts

3.1.1.1 Permanent above ground infrastructure

There would be the permanent loss of all habitats identified within the footprint of the proposed new above-ground infrastructure associated with proposed infrastructure at Beckton STW and the conveyance route, see Table 3-1. The impacts to the habitats in these locations will be permanent and irreversible due to being

replaced by the new proposed above ground infrastructure. No areas of priority habitats are within the areas of permanent loss associated with the Beckton water recycling (see Table 2-1 in Section 2.1.2).

Table 3-1 Habitats present within areas of permanent habitat loss for the Beckton water recycling scheme

Habitat type	Area (ha)	Impacts
Artificial unvegetated, unsealed surface	0.005	Permanent loss of man-made habitats, no impact as the new infrastructure as no natural or seminatural habitats present.
Bramble scrub	0.746	Permanent loss of habitats within site footprints
Developed land; sealed surface	0.576	Permanent loss of habitats within site footprints
Mixed scrub	3.13	Permanent loss of habitats within site footprints
Modified grassland	0.345	Permanent loss of habitat within site footprints
Other neutral grassland	1.263	Permanent loss of habitats within site footprint
Other woodland; broadleaved	0.079	Permanent loss of habitats within site footprint
Total	**6.143**	Permanent loss of habitats within site footprint

3.1.1.2 Temporary construction compounds

Potential impacts to terrestrial habitats during construction of the Beckton water recycling scheme would include:

- Physical loss of habitats. Using a precautionary approach, it is assumed this would include:
  - temporary land take requiring loss of all habitat areas from within all temporary construction compounds, excluding boundary features which it is assumed would be retained with appropriate buffer areas following construction best practice.
- Damage, degradation, or modification of retained habitats including:
  - Encroachment into retained habitats by personnel, vehicle, or plant movements during construction
  - Pollution during construction from dust generation, changes in hydrology (surface and ground waters quality or pathways), water quality changes resulting from sediment mobilisation into connecting water courses leading to sedimentation or increase in nutrient availability in wetland habitats (see aquatic ecology assessment).
  - Spread or introduction of invasive non-native species
- Fragmentation and isolation of retained habitats/network:
  - temporary impacts due to period between habitat planting/reinstatement and such habitat (hedgerows, grassland, woodland, etc.) becoming established and suitably mature.

The total area of the habitats present within the footprint of the Beckton water recycling scheme's temporary construction compounds associated with the conveyance route and Beckton STW are shown in Table 3-2. The temporary construction compounds will result in a total of 8.049 ha of temporary habitat loss including 0.03 ha of the priority habitat saltmarsh and saline reedbeds.

Table 3-2 Area of temporary habitat loss for Beckton water recycling option construction (all scheme components)

Habitat type	Area (ha)
Bramble scrub	0.076
Developed land; sealed surface	3.406
Felled	0.013
Mixed scrub	0.091
Modified grassland	2.839

Habitat type	Area (ha)
Other neutral grassland	1.355
Other woodland; broadleaved	0.239
Saltmarshes and saline reedbeds	0.03
Total	**8.049**

The potential impacts to terrestrial habitats from creation of temporary construction compounds to facilitate the creation of the required infrastructure for the Beckton water recycling scheme are shown in Table 3-3.

Table 3-3 Habitats present and potential impacts within areas of temporary habitat loss for Beckton water recycling scheme

Site Name	Impacts
Beckton STW	Temporary loss of common low-value modified habitats including grassland, scrub and developed land sealed surface. The majority of habitats identified within the site compound have short regeneration times reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. However, there is the potential for the loss of the priority saltmarsh habitat during site clearance to create the compound. The site compounds are bordered on the east the priority habitats saltmarsh, mudflats, and the river Roding. There is potential for damage or degradation of these habitats, in the absence of suitable mitigation, through physical damage from encroachment of vehicles and personnel, introduction of invasive non-native species from plant machinery or footwear, dust and/or pollution from spillages during construction.
Shaft compound 1	Temporary loss of common low-value modified habitats including neutral and modified grassland, bramble scrub, and urban habitats. The habitats identified within the site compound have short regeneration times reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. No priority habitats were identified within or immediately adjacent to the compound.
Shaft Compound 2	Temporary loss of common low-value modified habitats including modified grassland and urban habitats. The habitats identified within the site compound have short regeneration times reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. No priority habitats were identified within or immediately adjacent to the compound. Other broadleaf woodland was recorded to the west of the compound, which could be subject to potential damage or degradation, in the absence of suitable mitigation, through physical damage from encroachment of vehicles and personnel, introduction of invasive non-native species from plant machinery or footwear, dust and/or pollution from spillages during construction.
Shaft Compound 3	Temporary loss of common low-value modified habitats including modified grassland and developed land sealed surface. The habitats identified within the site compound have short regeneration times reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. No priority habitats were identified within or immediately adjacent to the compound. Wetland was identified to the north of the compound there is potential for damage or degradation of this habitat, in the absence of suitable mitigation, through physical damage from encroachment of vehicles and personnel, introduction of invasive non-native species from plant machinery or footwear, dust and/or pollution from spillages during construction.
Shaft Compound 4	Temporary loss of common low-value modified habitats including other neutral grassland, modified grassland, dense scrub, bramble scrub, mixed scrub, developed land; sealed surface buildings and other developed land. The majority of these habitats identified within the site compound have short regeneration times reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. No priority habitats were identified within or immediately adjacent to the compound. However, clearance to create the compound will also result in the loss of high value reedbed and wet woodland priority habitats. Due to the sensitivity of these habitats and duration required to restore them the impacts of temporary loss will be long term. There is potential for damage or degradation of the retained areas of these habitats adjacent to the compound, in the absence of suitable mitigation, through physical damage from encroachment of vehicles and personnel, introduction of invasive non-native species from plant machinery or footwear, dust and/or pollution from spillages during construction.
Shaft Compound 6	Temporary loss of common low-value modified habitats including other neutral grassland, modified grassland, bramble scrub, and developed land; sealed surface. The habitats identified within the site compound have short regeneration times reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. No priority habitats were identified within or immediately adjacent to the compound.

Site Name	Impacts
Shaft Compound 7	Temporary loss of common low-value modified habitats including dense scrub, mixed scrub, and developed land; sealed surface. The habitats identified within the site compound have short regeneration times reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. No priority habitats were identified within or immediately adjacent to the compound.
Shaft Compound 9	Temporary loss of common low-value modified habitats including other neutral grassland and developed land; sealed surface. The habitats identified within the site compound have short regeneration times reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. No priority habitats were identified within or immediately adjacent to the compound.
Shaft Compound 10	Temporary loss of common low-value modified habitats including other neutral grassland, other developed land, and developed land; sealed surface. The habitats identified within the site compound have short regeneration times reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. No priority habitats were identified within or immediately adjacent to the compound.

3.1.2 Operational impacts

Retained habitats adjacent to the permanent infrastructure associated with the conveyance route and AWRP at Beckton STW would be subject to routine maintenance and plant operation activities which would require access by foot or light vehicle. Access within the Beckton STW would be via existing access points and routes.

Maintenance events are likely to be short term. Temporary disturbance effects that might occur to terrestrial habitats would be no greater than experienced during existing land use due to the location of the sites in urban areas or the current operation activities within the existing Beckton STW site. Potential ecological effects on terrestrial habitats arising from routine maintenance of new above-ground structures associated with Beckton water recycling scheme are therefore unlikely to be of a scale, duration or nature that would give rise to significant ecological effects above the baseline conditions.

3.2 PROTECTED, NOTABLE AND OR INVASIVE SPECIES IMPACTS

3.2.1 Construction

The main impact pathways from the construction of the Beckton water recycling scheme on populations of protected and notable terrestrial species are direct habitat loss and fragmentation (temporary and permanent), noise, visual and vibration disturbance, and indirect deterioration of habitat due to air pollution, dust and pollution incidents. Species records and likely species presence have been assessed based on habitat surveys outputs to determine potential impact pathways at each element of the Beckton water recycling scheme in Table 3-4 .

Table 3-4 Assessment of potential impact pathways to protected and notable species populations during construction of Beckton water recycling.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
Beckton Tunnel Conveyance Route – Shaft Compounds 1 – 10 No habitats with suitability to support protected species were identified at Shaft Compound 7 and 9	Bats: - Species identified from GIGL and EFC records from within 2km of the scheme: Daubenton's *Myotis daubentonii*, noctule *Nyctalus noctula*, Leisler's *N. leisleri*, Nathusius' pipistrelle *Pipistrellus nathusii*, common pipistrelle *P. pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, and brown long-eared *Plecotus auritus*. - Suitable habitats to support roosting bats (woodland or mature trees) were identified at Shaft Compounds 1, 2, 3, 4, and 10. - Suitable habitats for foraging bats are present at all Shaft Compounds excluding Shaft Compounds 7 and 9.	Direct impacts: - Loss, damage and/or disturbance of potential bat roosts (Shaft Compounds 1, 2, 3, 4, and 10). - Temporary and permanent loss of foraging or commuting habitats within site compound and permanent infrastructure. Indirect impacts: - Disturbance of foraging bats through noise and/or lighting during construction activities.	- It is recommended that a ground-based bat roost assessment is conducted on all the trees and structures located within 20-30m of any works areas. The aim of the survey will be to assess their potential to support roosting bats. - Construction best practice relating to control of dust and pollution prevention. - - Avoidance of night-time working adjacent to bat roosts (where identified through further surveys) and high value foraging habitats. - Lighting of shaft compounds should be designed to minimise light spill on to adjacent high value habitats.
	Badgers: - No records of badgers were identified within 2 km of the Beckton water recycling scheme but - Suitable habitats were identified during the PEA surveys at Shaft Compound 1 and Shaft Compound 10.	Direct impacts: - Damage or disturbance of badger setts during construction works. - Accidental injury or mortality due to presence of excavations and/or plant/ vehicle movements.	- A full badger survey should be conducted within the footprint of Shaft Compounds 1 and 10 and within an additional 30-metre buffer zone of these sites. - Fencing of site compounds to prevent badger access to exposed excavations and encroachment of works into retained habitats
	Stag beetle: - Records of stag beetles (Schedule 5 of the Wildlife and Countryside act 1981) were identified within 2 km of the Beckton water recycling scheme. Records of stag beetle were within the compound footprint at Shaft Compounds 2 and 3. - Suitable habitats (woodland, mature trees, hedgerows) were identified at Shaft Compounds 1, 2, 3, 4, and 10.	Direct impacts: - loss or disturbance of larval habitats which include rotting standing trees, stumps or logs. - Injury or mortality of larvae and/or adults ((May to September) during site clearance. - temporary and permanent loss of supporting habitats within site compound and permanent infrastructure footprint.	- Avoidance of mature trees, woodland, and hedgerows through scheme design where possible to minimise potential impacts. - Shaft Compound 4: Deadwood suitable for priority invertebrate species should be translocated to retained habitats, and habitats within the areas of temporary loss re-instated on a like-for-like basis. - Fencing of retained adjacent habitats to reduce the potential for works encroachment.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	Other notable terrestrial invertebrates: - Records of three other invertebrate species listed under Schedule 5 of the Wildlife and Countryside act were identified within 2 km of the Beckton water recycling scheme compounds: purple emperor *Apatura iris* (Shaft Compound 9), white-letter hairstreak *Satyrium w-album* (Shaft Compounds 2, 3, 7 and 10), brown hairstreak *Thecla betulae*. (shaft compounds 5 and 6) - Suitable habitats including woodland (purple emperor and white letter hairstreak), mature trees, and scrub and hedgerows (brown hairstreak) were identified at Shaft Compounds 1, 2, 3, 4, and 10. - Although records of brown hairstreak were identified within 2 km of the scheme this specie's distribution is restricted to the north and west of the UK so the records received are likely to be erroneous, captive release or rare migrant. Consequently, the species is unlikely to be present within the scheme footprint and are not considered further in the assessment. - Records of an additional 283 rare or notable invertebrate species were identified from within 2 km of the scheme.	Indirect impacts: - disturbance of populations through additional artificial lighting attracting night flying insects such as moths. - Habitat degradation from pollution including accidental spills and dust.	- Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats. - Lighting of shaft compounds should be designed to minimise light spill on to adjacent high value habitats.
	Protected, notable, and invasive plant species: - Two species listed under Schedule 8 of the Wildlife and Countryside act: bluebell (woodland habitats) and Jersey cudweed (meadows, wastelands, and edges of forests) identified within 2 km of the conveyance route but not identified on site during UKHab surveys.	Direct impacts: - Loss or disturbance of supporting habitats - Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of woodland identified for other species would limit potential for impacts to/loss of bluebells if present - Construction best practice relating to control of dust and pollution prevention. - Fencing of retained adjacent habitats to reduce the potential for works encroachment

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	- Butterfly bush/Buddleja was identified at Shaft compounds 4, 7, and 9	- Habitat degradation from spread of invasive and non-native species	- Construction Environmental Management Plan to include measure to control and reduce the risk of spreading non-native species.
	Reptiles: - Records of barred grass snake (Shaft Compounds 1, 2, 3, 4, 5, and 10), slow worm (Shaft Compounds 2 and 9), and common lizard (Shaft Compounds 1 and 9) were identified within 2 km of the Beckton water recycling Shaft Compounds. - Suitable habitats (woodland, rough grassland, scrub, hedgerows) were identified at Shaft Compounds 1, 2, 3, 4, and 10.	Direct impacts: - Loss or disturbance of supporting habitats - Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of tall grassland, scrub, woodland, wetland and hedgerows through scheme design where possible to minimise potential impacts. - Site clearance in areas containing suitable reptile hibernation features should not be undertaken during the hibernation period (October to March inclusive). The clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS). - Fencing of retained adjacent habitats to reduce the potential for works encroachment. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	Water vole: - Records were received from within 2 km of Shaft Compounds 1 and 10. - Suitable habitats (ditches/slow moving water bodies) were identified at Shaft Compound 4– Dagenham Brook.	Direct impacts: - Loss or disturbance of supporting habitats. - Injury or mortality during site clearance. Indirect impacts: - Habitat degradation from pollution including accidental spills.	- Shaft compound 4: Pre-construction surveys to determine the presence/absence of water voles along waterbodies within or adjacent to shaft compound location. - Avoidance of watercourses through scheme design where possible to minimise potential impacts. - Fencing of retained adjacent habitats to reduce the potential for works encroachment. - Construction best practice relating to pollution prevention.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	European hedgehog: - Records of European hedgehog were only identified within 2 km of Shaft Compound 1. - Suitable habitats (woodland, rough grassland, scrub, hedgerows and parkland) were identified at Shaft Compounds 1, 2, 3, 4, 5 and 10.	Direct impacts: - Loss or disturbance of supporting habitats (e.g. grassland, scrub, woodland, parkland). - Injury or mortality during site clearance Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of woodland, rough grassland, scrub, hedgerows and parkland through scheme design where possible to minimise potential impacts. - Site clearance should be undertaken under supervision of an Ecological clerk of Works (ECoW). In areas containing suitable hibernation features should not be undertaken during the hibernation period (October to March inclusive). - fencing of retained adjacent habitats to reduce the potential for works encroachment. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	Amphibians: - Records of common toad (Shaft Compounds 1, 2, 3, and 7) and great crested newts (Shaft Compounds 2 and 3) were identified within 2 km of the Beckton water recycling conveyance route Shaft Compounds. - Suitable terrestrial habitats (woodland, rough grassland, scrub, hedgerows, and marsh) were identified at Shaft Compounds 1, 2, 3, 4, and 10). - A potentially suitable breeding waterbody was identified at Shaft Compound 4 – Dagenham Brook.	Direct impacts: - Loss or disturbance of supporting terrestrial habitats - Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Shaft 4 site: it is recommended that a great crested newts eDNA survey and Habitat Suitability Index (HSI) assessment are undertaken to assess the ditch's suitability to support the species and to ascertain presence or likely absence of great crested newts. - HSI and eDNA surveys to determine the presence/absence of protected or notable amphibian species within or adjacent to shaft compound locations. - Avoidance of woodland, rough grassland, scrub, hedgerows, and marsh through scheme design where possible to minimise potential impacts. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
Beckton Sewage Treatment Works	Bats: - No records of bat species were identified from GIGL and EFC records from within 2km of the STW site. - Woodland, scattered trees and buildings could have potential to support roosting, commuting and foraging bats.	Direct impacts: - Loss, damage and/or disturbance of potential of bat roosts. - Temporary and permanent loss of foraging or commuting habitats within site compound and new permanent infrastructure. Indirect impacts: - Disturbance of foraging bats through noise and/or lighting during construction activities.	- It is recommended that a ground-based bat roost assessment is conducted on all trees and structures located within 20-30m of any works areas. The aim of the survey will be to assess their potential to support roosting bats. - Construction best practice relating to control of dust and pollution prevention. - - Avoidance of night-time working adjacent to bat roosts (where identified through further surveys) and high value foraging habitats. - Construction lighting should be designed to minimise light spill on to adjacent high value habitats.
	Badgers - No records of badgers were identified within 2 km of the Beckton water recycling scheme. - Suitable habitats (e.g. woodland and scrub) were identified during the PEA surveys at the STW site.	Direct impacts: - Damage or disturbance of badger setts during construction works. - Accidental injury or mortality due to presence of excavations and/or plant/ vehicle movements.	- A full badger survey should be conducted within the footprint of the construction areas in Beckton STW with an additional 30-metre buffer zone of the construction area. - Fencing of site compounds to prevent badger access to exposed excavations and works encroachment into retained habitats.
	Notable terrestrial invertebrates - Records of four rare or notable invertebrate species were identified from within 2 km of the scheme. No European protected species or species listed under the Wildlife and Countryside Act Schedule 5 were identified. - Suitable habitats including grassland and woodland with suitability to support notable moth and butterfly species.	Direct impacts: - Temporary and permanent loss of supporting habitats within site compound and permanent infrastructure footprint. Indirect impacts: - Disturbance of populations through additional artificial lighting attracting night flying insects such as moths. - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of mature trees, woodland and hedgerows through scheme design where possible to minimise potential impacts. - Fencing of retained adjacent habitats to reduce the potential for encroachment. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	Protected, notable, and invasive plant species: - Two species listed under Schedule 8 of the Wildlife and Countryside act: bluebell (woodland habitats) and Jersey cudweed	Direct impacts: - Loss or disturbance of supporting habitats	- Avoidance of woodland where possible to avoid loss of bluebells if present

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	(meadows, wastelands, and edges of forests) identified within 2 km of the STW site but not identified on site during UKHab surveys. - Butterfly bush/Buddleja was identified at the STW site during the PEA	- Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust. - Habitat degradation from spread of invasive and non-native species	- Construction best practice relating to control of dust and pollution prevention. - Fencing of retained adjacent habitats to reduce the potential for works encroachment - Construction Environmental Management Plan to include measure to control and reduce the risk of spreading non-native species.
	Reptiles - Records of common lizard were identified within 2 km of the Beckton STW site. - Rough grassland, scrub, woodland edge and wetland habitats within and adjacent to the site provide good quality habitat for foraging and basking reptiles.	Direct impacts: - Loss or disturbance of supporting habitats - Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Pre-construction surveys to determine the presence/absence of reptiles, within construction areas with high value habitats to inform mitigation requirements. - Avoidance of woodland and reedbeds through scheme design where possible to minimise duration of potential impacts. - Site clearance in areas containing suitable reptile hibernation features should not be undertaken during the hibernation period (October to March inclusive). The clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS). - Fencing of retained adjacent habitats to reduce the potential for works encroachment. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	Water vole - No records were received from within 2 km of the STW. - The banks of the ditch and River Roding may provide suitable burrowing opportunities for water vole.	Direct impacts: - Loss, damage or disturbance of supporting habitats. - Injury or mortality during site clearance and construction. Indirect impacts:	- Pre-construction surveys to determine the presence/absence of water voles along waterbodies within or adjacent to construction areas. - Avoidance of watercourses (5m buffer) through scheme design where possible to minimise potential impacts.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
		- Habitat degradation from pollution including accidental spills.	- Fencing of retained adjacent habitats to reduce the potential for works encroachment. - Construction best practice relating to control of dust and pollution prevention.
	European hedgehog - Records of European hedgehog were identified within 2 km of the STW. - Suitable habitats (woodland, rough grassland, and scrub) were identified within the Beckton STW site.	Direct impacts: - Loss, damage or disturbance of supporting habitats (e.g. woodland, rough grassland, and scrub). - Injury or mortality during site clearance. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of, woodland, scrub and hedgerows through scheme design where possible to minimise potential impacts. - Site clearance in areas containing suitable hibernation features should not be undertaken during the hibernation period (October to March inclusive). - fencing of retained adjacent habitats to reduce the potential for works encroachment - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	Eurasian Otter - No records were received from within 2 km of the Beckton STW. - The ditch, the River Roding, the coastal saltmarsh and intertidal mudflats may provide optimal foraging and resting habitat for Eurasian otter.	Direct impacts: - Loss or damage of supporting habitats. - Disturbance. - Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust	- Pre-construction surveys to determine the presence/absence of otter resting places along waterbodies within or adjacent to construction site. - Avoidance of watercourses through scheme design where possible to minimise potential impacts. - Fencing of retained adjacent habitats to reduce the potential for works encroachment. - Construction best practice relating to control of dust and pollution prevention.
	Amphibians - No records of protected or notable amphibian species were received from within 2 km of the STW.	- No evidence to indicate that protected or notable amphibian species are present within the STW due to the absence of suitable breeding ponds with proximity to the site.	- No further surveys or mitigation required.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	- Suitable terrestrial habitats (woodland, rough grassland, and scrub,) were identified at the STW site. - No evidence of waterbodies with the potential to support great crested newts during the aquatic stages of their life cycle located within 250m of the STW.		

3.2.2 Operation

Increase flow level and velocity in the Lee Diversion Channel has the potential to reduce the suitability for foraging and commuting otter through reduction in suitability for prey species and increased flow increasing effort required to travel up stream. However due to the large size of otter home range and limited length of affected reach, their ability to travel on land, and the presence of additional connecting water courses (e.g., Lee Navigation) the potential impacts to otter during operation of the Beckton water recycling scheme are considered to be negligible. The Lee Diversion channel is predominantly a man-made concrete channel with negligible suitability to support water voles therefore no significant impacts to water vole are anticipated in the Lee Diversion Channel from operation of the Beckton water recycling scheme. No discernible impacts from the Beckton water recycling scheme have been identified during operation of the scheme as no changes in water level have been identified along the estuarine Thames Tideway (see Annex B.2.1. Physical Environment Assessment Report). Localised changes in wetted width of habitat present (mudflats) where wastewater is to be diverted may impact on habitat suitability for Eurasian otter if present; however, no discernible impacts on Eurasian otter populations have been identified.

Retained habitats which could support protected and or notable species (identified above in Table 3-4) adjacent to the permanent infrastructure associated with the Beckton water recycling scheme would be subject to routine maintenance and plant operation activities which would require access by foot or light vehicle.

Maintenance events are likely to be short term and infrequent, so temporary disturbance effects that might occur to terrestrial and riparian species would be no greater than experienced during existing land use due to the location of the sites in urban areas or the current operation activities within the existing TWUL sites. Potential ecological effects on terrestrial and riparian species arising from routine maintenance of new above-ground structures associated with Beckton water recycling scheme are therefore unlikely to be of a scale to result in discernible ecological effects above the existing baseline conditions.

3.3 BIRD IMPACTS

3.3.1 Construction

The main impact pathways from the construction of the Beckton water recycling scheme on bird populations are direct habitat loss, noise, visual and vibration disturbance and indirect deterioration of habitat due to air pollution, dust and pollution incidents. Each element of the Beckton water recycling scheme has been assessed in Table 3-5 below using species records (Environmental Records Centre, WeBS peak counts and statutory) data and likely species presence based on habitat surveys outputs to determine potential impact pathways, within 500 m of the conveyance route. WCA Schedule 1 species and any ‘notable’ species likely to be present based on habitat type have been assessed. In Table 3-5 it should be noted that species records were provided with four figure National Grid references and therefore, locations will not be exact. As the citations for SINCs were not provided by EFC, non-statutory sites were not screened in, apart from River Thames and tidal tributaries SINC where the citation was provided by GiGL.

Table 3-5 Assessment of potential impact pathways to bird populations during construction of the Beckton water recycling scheme.

Site name	Bird records	Potential impact pathway	Survey requirements and mitigation measures
Beckton Sewage Treatment Works (STW)	- Within the boundary of Beckton STW there are a number of species records including the following WCA Schedule 1 species: black tailed godwit *Limosa limosa*, greenshank *Tringa nebularia*, whimbrel *Numenius phaeopus*, redwing *Turdus iliacus*, fieldfare *Turdus pilaris*, Cetti's warbler *Cettia cetti*, bearded tit *Panurus biarmicus*, kingfisher *Alcedo atthis*, peregrine *Falco peregrinus*, hen harrier *Circus cyaneus*, red kite *Milvus milvus*, black tern *Chlidonias niger*, common scoter *Melanitta nigra*, brambling *Fringilla montifringilla*, linnet *Linaria cannabina* and black redstart *Phoenicurus ochruros*. Based on habitats present, other 'notable' species that have been recorded and likely to be present at lagoons, woodland, scrub and grassland within the boundaries of the site include pochard *Aythya ferina*, grey wagtail *Motacilla cinerea*, yellow wagtail *Motacilla flava*, spotted flycatcher *Muscicapa striata*, lesser redpoll *Carduelis cabaret*, skylark *Alauda arvensis*, hawfinch *Coccothraustes coccothraustes*, cuckoo *Cuculus canorus*, nightingale *Luscinia megarhynchos*, song thrush *Turdus philomelos* and house sparrow *Passer domesticus*. The adjacent saltmarsh, mudflat, wetland and estuarine habitat also are likely to support the following 'notable' species recorded: curlew *Numenius arquata*, woodcock *Scolopax rusticola*, little tern *Sternula albifrons*, ringed plover *Charadrius hiaticula*, herring gull *Larus argentatus* and reed bunting *Emberiza schoeniclus*. - River Thames and tidal tributaries SINC includes mudflats, shingle beach, intertidal vegetation, islands and river channel. Site is of particular importance for wildfowl and wading birds (no species-specific information provided).	Direct – Permanent loss of grassland, scrub and woodland habitat within the footprint of Beckton STW expansion. Indirect – Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- Any vegetation clearance required should be undertaken outside of the breeding bird season (March – August inclusive). - If not possible, vegetation must be checked by a suitably experienced ecologist within 24 hours prior to commencement of vegetation clearance. - If bird's nest is discovered, works may be suspended and suitable work exclusion buffer installed around the nest (buffer size is species dependent). - Works may only re-commence once the chicks have fledged and the supervising ecologist confirms that is nest is no longer in use. - Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - Measures will be taken to protect any temporary exposure of bare soil from runoff during heavy rainfall events. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution within supporting habitat

Site name	Bird records	Potential impact pathway	Survey requirements and mitigation measures
Beckton conveyance route	- Compound/ Shaft 1: No bird species records within 500 m.	Direct – Permanent loss of supporting habitat within the footprint of the shaft. No habitat survey completed at proposed site due to access constraints. Indirect – Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel) if birds present.	- Any vegetation clearance required should be undertaken outside of the breeding bird season (March – August inclusive). - If not possible, vegetation must be checked by a suitably experienced ecologist within 24 hours prior to commencement of vegetation clearance. - If bird's nest is discovered, works may be suspended and suitable work exclusion buffer installed around the nest (buffer size is species dependent). - Works may only re-commence once the chicks have fledged and the supervising ecologist confirms that is nest is no longer in use.
	- Compound/ Shaft 2: WCA Schedule 1 species records within the footprint of the compound include redwing, fieldfare and Lapland bunting *Calcarius lapponicus*. Other 'notable' species records that may be present on the grassland habitat associated with Compound/ Shaft 2 includes herring gull, skylark, house sparrow, yellow wagtail, linnet, spotted flycatcher and song thrush.	Direct – Permanent loss of semi-improved grassland habitat within the footprint of Shaft 2. However, due to the size of the site and low nesting potential of habitats within the footprint, no discernible effects are anticipated on birds. Indirect – Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution within supporting habitat
	- Compound/ Shaft 3: WCA Schedule 1 species records within 390 - 430 m include kingfisher, Cetti's warbler, little ringed plover, black-tailed godwit *Limosa limosa*, wryneck *Jynx torquilla*, crossbill *Loxia curvirostra* (deemed unlikely), common scoter, barn owl *Tyto alba*, merlin *Falco columbarius*, peregrine, red kite, hobby *Falco subbuteo*, woodlark *Lullula arborea*, brambling, black redstart and firecrest *Regulus ignicapilla*. Other 'notable' species that have been recorded and could be associated with the grassland, scrub, woodland and small pond habitat to the south of the Compound/ Shaft 3 include	Direct – Permanent loss of semi-improved grassland habitat within the footprint of Shaft 2. However, due to the size of the site and low nesting potential of habitats within the footprint, no discernible effects are anticipated on birds. Indirect – Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution within supporting habitat

Site name	Bird records	Potential impact pathway	Survey requirements and mitigation measures
	herring gull, house sparrow, wood warbler *Phylloscopus sibilatrix*, lesser redpoll, skylark, white-fronted goose *Anser albifrons*, tree pipit *Anthus trivialis*, pochard, yellowhammer *Emberiza citrinella*, nightingale and turtle dove *Streptopelia turtur*. - Compound/ Shaft 3: Construction works approximately 30 m from Epping Forest SSSI. Site consists of ancient wood-pasture, old grassland plains and scattered wetland and supports a diversity of breeding birds (at least 48) including nightingale, sparrowhawk *Accipiter nisus*, woodcock, wood warbler and tree pipit.		
	- Compound/ Shaft 4: WCA Schedule 1 species recorded within 190 m of Compound/ Shaft 4 includes Cetti's warbler, redwing and fieldfare. Other 'notable' species recorded that could be present in the watercourse, woodland, scrub and grassland habitat within and adjacent to the site include herring gull, grey wagtail, house sparrow and song thrush.	Direct – Permanent loss of supporting habitat within the footprint of the shaft. Indirect – Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- As above for Beckton STW.
	- Compound/ Shaft 5 (Coppermills): WCA Schedule 1 species recorded within 340 – 360 m of the Compound/ Shaft 5 include scaup *Aythya marila*, avocet *Recurvirostra avosetta*, bearded tit, greenshank, whimbrel, little ringed plover, black tailed godwit, whimbrel, Slavonian grebe *Podiceps auritus*, great northern diver *Gavia immer*, woodcock, black tern, little gull, fieldfare, redwing, firecrest, kingfisher, hobby, peregrine, merlin and red kite. Other 'notable' species recorded in the area that could be associated with the Walthamstow reservoirs and wetland habitat include pochard, ringed plover, curlew, lapwing, grey wagtail, yellow wagtail, lapwing, woodcock, common tern, herring gull. Within the footprint of Compound/ Shaft 5 'notable' species such as skylark, lesser redpoll, tree pipit, hawfinch, house sparrow, brambling, whinchat *Saxicola rubetra*, linnet, spotted flycatcher, song thrush, serin *Serinus serinus* and yellowhammer that have been recorded may be present in grassland, woodland and scrub habitat.	Direct – Permanent loss of supporting habitat within the footprint of the shaft. No habitat survey completed at proposed site due to access constraints. Indirect – Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution within supporting habitat.
	- Compound/ Shaft 6 (primary and secondary): Within the boundaries of Walthamstow Reservoirs SSSI and Lea Valley SINC. The former supports a major heronry and large concentration of breeding	Direct – Permanent loss of grassland habitat within the footprint of Compound/ Shaft 6. Limited value for waterfowl, potential for ground nesting birds.	- As above for Beckton STW. - Although the permanent shaft will result in a small area of habitat loss, sites for enhancement/

Site name	Bird records	Potential impact pathway	Survey requirements and mitigation measures
	wildfowl. Tufted duck *Aythya fuligula* also gather here for moulting and nationally significant populations of overwintering birds. - WCA Schedule 1 species recorded within 250 – 460 m include kingfisher, scaup, ruff *Calidris pugnax*, long-tailed duck, avocet, common scoter, little gull, little ringed plover, black-tailed godwit, whimbrel, avocet, greenshank, woodcock, avocet, black tern, fieldfare, redwing, merlin, peregrine, hobby, barn owl, red kite, brambling, bearded tit, firecrest and black redstart - 'Notable' waterbirds recorded include white fronted goose pochard, ringed plover, curlew, common tern, lapwing, kittiwake *Rissa tridactyla* and herring gull. Other species include cuckoo, skylark, lesser redpoll, grasshopper warbler *Locustella naevia*, house sparrow, spotted flycatcher, reed bunting, whinchat and song thrush.	Indirect – Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	compensation may need to be considered.
	- Compound/ Shaft 7: WCA Schedule 1 species recorded within 280 – 420 m from the site include kingfisher and peregrine. Other 'notable' species recorded include herring gull, linnet, grey wagtail, curlew and house sparrow.	Direct – No direct impacts identified as construction works proposed on hard standing in an IKEA carpark. Indirect – Noise, vibration and visual disturbance.	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions.
	- Compound/ Shaft 8: The following WCA Schedule 1 species have been recorded within 295 m of Compound/ Shaft 8: Cetti's warbler, black tern, long-tailed duck, peregrine, common scoter, Slavonian grebe, redwing and fieldfare. 'Notable' species such as herring gull, house sparrow, grey and yellow wagtail, linnet and song thrush have also been recorded.	Direct – No direct impacts identified, as construction works proposed on hard standing in Deephams STW. Indirect – Noise, vibration and visual disturbance.	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions.
	- Compound/ Shaft 9: Cetti's warbler has been recorded within 425 m of the construction site (WCA Schedule 1 species), plus the following 'notable' species have been recorded within 210 m: pochard, herring gull and grey wagtail.	Direct – No direct impacts identified as construction works proposed on hard standing in a carpark for The Range. Indirect – Noise, vibration and visual disturbance.	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions.
	- Compound/ Shaft 10: Construction 150 m from Chingford Reservoirs SSSI and within the boundary of Lea Valley SINC. The former site supports nationally important wintering populations of Northern shoveler *Anas clypeata* and great crested grebe *Podiceps cristatus*. Other species present during winter include goldeneye *Bucephala*	Direct – Permanent loss of grassland habitat within the footprint of Compound/ Shaft 10. Limited value for waterfowl, potential for ground nesting birds.	- As above for Beckton STW. - Although the permanent shaft will result in a small area of habitat loss, sites for enhancement/

Site name	Bird records	Potential impact pathway	Survey requirements and mitigation measures
	clangula, tufted duck and goosander *Mergus merganser*. Large winter gull roosts occur at the reservoir of over 70,000 individuals combined of black-headed gull *Chroicocephalus ridibundus*, common gull *Larus canus*, lesser black-backed gull *Larus fuscus* and herring gull. During the breeding season they support populations of yellow wagtail and a number of migrants/ passage birds (Arctic terns *Sterna paradisaea*, common sandpiper *Actitis hypoleucos* and greenshank). - WCA Schedule 1 species recorded within 270 - 410 m of the construction site include kingfisher, Cetti's warbler, hobby, red kite, peregrine, little ringed plover, common scoter, whimbrel, woodcock, greenshank, barn owl, brambling, little gull, red kite, woodcock, redwing and fieldfare. Other notable species recorded include lesser redpoll, herring gull, cuckoo, reed bunting, grasshopper warbler, pochard, spotted flycatcher, yellow wagtail, linnet, grey wagtail, house sparrow, whinchat, song thrush and lapwing.	Indirect – Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	compensation may need to be considered.
Beckton outfall	- Construction 150 m from Chingford Reservoirs SSSI and within the boundary of Lea Valley SINC. The former site supports nationally important wintering populations of northern shoveler and great crested grebe. Other species present during winter include goldeneye, tufted duck and goosander. Large winter gull roosts occur at the reservoir of over 70,000 individuals combined of black-headed gull, common gull, lesser black-backed gull and herring gull. During the breeding season they support populations of yellow wagtail and a number of migrants/ passage birds (Arctic terns, common sandpiper and greenshank). - WCA Schedule 1 species recorded within 270 - 410 m of the construction site include kingfisher, Cetti's warbler, hobby, red kite, peregrine, little ringed plover, common scoter, whimbrel, woodcock, greenshank, barn owl, brambling, little gull, red kite, woodcock, redwing and fieldfare. Other notable species recorded include lesser redpoll, herring gull, cuckoo, reed bunting, grasshopper warbler, pochard, spotted flycatcher, yellow wagtail, linnet, grey wagtail, house sparrow, whinchat, song thrush and lapwing.	Direct – Permanent loss of grassland and riparian habitat. Potential impacts on riverbank stability on the River Lea and increased sediment input into the river potentially smothering supporting habitat for waterbirds. Indirect – Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- Minimise removal of riparian vegetation to avoid damage to bank stability and sediment loading in the river. If necessary to remove, reinstate riparian vegetation. - Minimise duration of any necessary in-channel working to avoid compaction, disruption of flow processes and bank erosion. - As above for Beckton STW.

3.3.2 Operation

The increase flow within the Lee Diversion Channel is unlikely to significantly affect bird communities due to the limited suitable habitats within the watercourse as it is predominantly a concrete lined man-made channel. Therefore, due to the lack of suitable supporting habitats, no discernible impacts have been identified for bird populations in the Lee Diversion Channel during operation of the Beckton water recycling scheme.

No discernible impacts to bird populations from the Beckton water recycling scheme have been identified during operation of the scheme as no changes in water level have been identified along the estuarine Thames Tideway (see Physical Environment Assessment Report). Localised changes in wetted width of habitat present (mudflats) where wastewater is to be diverted may impact on habitat availability for waders, wildfowl and gulls if present however, no discernible impacts on bird populations have been identified.

3.4 SUMMARY OF TERRESTRIAL ECOLOGY ASSESSMENT OF BECKTON WATER RECYCLING SCHEME

The construction of the Beckton water recycling scheme including the AWRP at Beckton STW, conveyance route and discharge location will result in the direct loss of grassland, woodland and scrub habitat including lowland dry acid grassland, wet woodland and reedbed priority habitat at Shaft/ Compound 3 and 4 respectively. This includes the permanent loss of other neutral grassland g3c within the boundary of Lee Valley SPA and Ramsar site, Walthamstow Reservoirs SSSI and Lea Valley SINC. Permanent loss of mixed/ dense scrub and other neutral grassland was identified in the boundaries of Beckton STW northern settling lagoon SINC and grassland within Epping Forest South SINC. Two SSSIs (Epping Forest SSSI and Chingford Reservoirs SSSI) were identified within 2 km of the scheme, plus seven additional non-statutory sites (SINCs). Species records received within 2 km of the Beckton water recycling scheme included bats, reptiles, breeding and wintering birds, amphibians, stag beetle, water vole, and protected or notable plant species. At Beckton STW, the expansion could result in the direct loss of supporting habitat for bats, breeding birds, amphibians, reptiles, protected and notable terrestrial invertebrates, otter, water vole, hedgehog, and badger. Additional surveys are recommended to determine presence of protected species and identification of compensation sites will need to be considered.

Where adjacent supporting habitat has been identified, indirect impacts from the scheme include noise, visual and vibration disturbance and pollution (e.g., via vehicle emissions, dust, and hydrocarbons). This includes at Beckton STW (due to the proximity to Barking Creek and associated saltmarsh and mudflat priority habitat), Shaft/ Compound 3 (due to Epping Forest SSSI and stag beetle), Shaft/ Compound 6 and Shaft/ Compound 10 (due to proximity to Lee Valley SPA, Ramsar and Walthamstow Reservoirs SSSI and qualifying birds). Additional surveys are recommended to determine presence/ spatial distribution of protected species.

During operation of the Beckton water recycling scheme, no discernible impacts were identified on habitats present in estuarine Thames Tideway, the Lee Diversion Channel or adjacent habitats as a result of intermittent disturbance from anthropogenic activity at Beckton STW, shaft/ compounds and the intake/ outfall sites.

4 TERRESTRIAL ECOLOGY ASSESSMENT OF MOGDEN WATER RECYCLING SCHEME

The construction activities associated with the 200 Ml/d Mogden water recycling scheme would include the following activities that have potential to result in biophysical changes to important terrestrial ecological features:

- Construction of Advanced Water Recycling Plant (AWRP) near Kempton WTW, approximately 6 km south-west of Mogden STW. Note that the water transfer route from Mogden STW to the new AWRP will be primarily constructed using straight pipe jacked tunnels.
- Conveyance from Mogden STW to the AWRP site will be tunnelled via pipe-jack. From the AWRP to the River Thames discharge location will include trenched/ open cut pipeline and trenchless/ tunnelled where required to avoid watercourses. Where trenched/ open cut pipeline is proposed, vegetation removal, earthworks and associated drainage will be required.
- Construction of temporary site compounds and permanent reception shafts at Mogden STW, AWRP site near Kempton WTW and along conveyance route (including vegetation removal, earthworks, provision for compound drainage and SuDS, and creating areas of hardstanding to provide a working area for construction phase activities).
- Construction of temporary access routes (including vegetation removal, earthworks, and associated drainage)
- Construction of discharge/outfall location upstream of the Thames Water Walton Intake on the River Thames
- Permanent fencing including security gates and cameras at AWRP site near Kempton WTW

The activities listed above have the potential to result in the following effects:

- Habitat loss or degradation (both temporary and permanent) - It is assumed that all areas of temporary habitat loss will be re-instated to the current baseline condition following completion of the construction phase of the scheme.
- Habitat fragmentation (temporary)
- Management changes to habitats (leading to habitat degradation)
- Disturbance of individuals or groups of animals
- Direct injury or mortality of individual animals and plants
- Pollution e.g. sediment mobilisation, dust, hydrocarbons (habitat degradation and injury/mortality to species)
- Impacts from water level changes (a cause of habitat loss, degradation and/or injury/mortality to species)

The potential effects on terrestrial habitats, protected and notable species (excluding birds), and birds are assessed in Section 4.1.1, 4.2.1, and 4.2.1 respectively.

The operational activities associated with the Mogden water recycling would include the following activities that have potential to result in biophysical changes to important terrestrial ecological features:

- Operational changes to flow regime in the River Thames
- Operation and maintenance of new infrastructure including the conveyance route and within the existing Mogden STW site

The activities listed above have the potential to result in the following effects:

- Management changes to habitats (leading to habitat degradation)
- Disturbance of individuals or groups of animals via noise, vibration and visual disturbance
- Direct injury or mortality of individual animals and plants
- Impacts from water level changes (a cause of habitat loss, degradation and/or indirect injury/mortality to species)

4.1 HABITAT IMPACTS

4.1.1 Construction impacts

4.1.1.1 Permanent above-ground infrastructure

There would be the permanent loss of all habitats identified within the footprint of the proposed new above-ground infrastructure associated with proposed infrastructure at Mogden STW, the AWRP site and the conveyance route, see Table 4-1. There would be the permanent loss of 4.499 ha of the habitats identified within the footprint of the proposed new above-ground infrastructure associated with the conveyance route and new AWRP near Kempton WTW. The impacts to the habitats in these locations will be a permanent and irreversible loss of all habitats within the footprint of new infrastructure. None of the priority habitats identified by the UKHab surveys (see Table 2-2 in Section 2.1.3.1) were present within the areas of permanent habitat loss for the Mogden to AWRP conveyance routes, however, creation of the AWRP near Kempton WTW will result in the permanent loss of two areas of priority habitat: lowland mixed deciduous woodland (0.37 ha) and lowland calcareous grassland (0.12 ha).

Table 4-1 Habitats present within areas of permanent habitat loss for the Mogden water recycling scheme

Habitat type	Area (ha)
Artificial unvegetated, unsealed surface	0.037
Developed land; sealed surface	0.039
Lowland calcareous grassland	0.116
Lowland mixed deciduous woodland	0.369
Mixed scrub	0.936
Modified grassland	0.03
Other neutral grassland	0.02
Other woodland; broadleaved	2.946
Other woodland; mixed	0.006
Total	**4.499**

4.1.1.2 Temporary construction compounds

In the absence of mitigation, potential to impact terrestrial habitats during construction of the Mogden water recycling scheme would include:

- Physical loss of habitats. Using a precautionary approach, it is assumed this would include:
  - temporary land take requiring loss of all habitat areas from within all temporary construction compounds, excluding boundary features which it is assumed would be retained with appropriate buffer areas following construction best practice
- Damage, degradation, or modification of retained habitats including:
  - Pollution during construction from dust generation, changes in hydrology (surface and ground waters quality or pathways), water quality changes resulting from sediment mobilisation into connecting water courses leading to sedimentation.
  - Spread or introduction of invasive non-native species
- Fragmentation and isolation of retained habitats/network:
  - temporary impacts due to period between habitat planting/reinstatement and such habitat (hedgerows, grassland, woodland, etc.) becoming established and reaching maturity

The total area of the habitats present within the footprint of the Mogden water recycling temporary construction compounds associated with the conveyance route and the new AWRP site near Kempton WTW are shown in Table 4-2. The temporary construction compounds will result in the temporary loss during construction of a

total of 32.4 ha habitats including three priority habitats: lowland calcareous grassland (0.026 ha), lowland mixed deciduous woodland (0.161 ha), and traditional orchards (0.059 ha)[29].

Temporary loss of common low-value modified habitats including modified grassland, scrub and developed land. The majority of habitats identified within the site compounds have short regeneration times reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction.

However, the loss of lowland mixed deciduous woodland, other woodland; broadleaved, traditional orchards, and other woodland; mixed represents a long-term impact due to the sensitivity of the habitats particularly for lowland mixed deciduous woodland and the long duration required to reinstate the loss of mature trees.

There is potential for damage or degradation of retained habitats, including the priority habitats reedbeds (shaft compound 6) and lowland mixed deciduous woodland (AWRP site) and lowland calcareous grassland (AWRP site), outside of the compounds in the absence of suitable mitigation through physical damage from encroachment of vehicles and personnel, introduction of invasive non-native species from plant machinery or footwear, dust and/or pollution from spillages during construction.

Table 4-2 Area of temporary habitat loss for Mogden water recycling scheme construction (all scheme components)

Habitat type	Priority habitat?	Area (ha)
Artificial unvegetated, unsealed surface		5.553
Bramble scrub		0.285
Built linear features		0.158
Developed land; sealed surface		11.626
Lowland calcareous grassland	Yes	0.026
Lowland mixed deciduous woodland	Yes	0.161
Modified grassland		6.655
Other neutral grassland		0.423
Other woodland; broadleaved		6.235
Other woodland; mixed		1.218
Traditional orchards[30]	Yes	0.059
Total		**32.399**

4.1.2 Operational impacts

Retained habitats adjacent to the permanent infrastructure associated with the conveyance route would be subject to routine maintenance and plant operation activities which would require access by foot or light vehicle. Operation of the new AWRP near Kempton WTW will involve standard operational activities within the site boundary and the created permanent access road therefore there will be no additional impacts to the retained adjacent habitats above those identified during the construction phase.

Maintenance events are likely to be short term. Temporary disturbance effects that might occur to terrestrial habitats would be no greater than experienced during existing land use due to the location of the sites in urban areas or the current operation activities within the existing Mogden STW site. Potential ecological effects on terrestrial habitats arising from routine maintenance of new above-ground structures associated with Mogden water recycling scheme are therefore unlikely to be of a scale, duration or nature that would give rise to significant ecological effects above the baseline conditions.

[29] This habitat was identified, in areas not subject to UKHab surveys, using the BNG land cover model the full methodology is presented in the Ricardo (2022) London Effluent Reuse SRO Biodiversity Net Gain and Natural Capital Assessment Report

[30] This habitat was identified through the BNG land cover model, the full methodology is presented in the Ricardo (2022) London Effluent Reuse SRO Biodiversity Net Gain and Natural Capital Assessment Report

4.2 PROTECTED, NOTABLE AND OR INVASIVE SPECIES

4.2.1 Construction

The main impact pathways from the construction of Mogden water recycling scheme on populations of protected and notable terrestrial species are direct habitat loss and damage (temporary and permanent), noise, visual and vibration disturbance, and indirect deterioration of habitat due to air pollution, dust and pollution incidents. Each element of the Mogden water recycling scheme has been assessed in Table 4-3 below using species records and likely species presence based on habitat surveys outputs to determine potential impact pathways. The locations of species records were not provided by GIGL, the search areas for the Teddington DRA and Mogden water recycling options overlapped so it is not possible to determine which option the records are in relation to. Consequently, as a precautionary approach, where species records occur within the search area it is assumed they are within 2 km of the Mogden water recycling infrastructure and construction compounds.

Table 4-3 Assessment of potential impact pathways to protected and notable species populations during construction of the Mogden water recycling scheme.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
Mogden water recycling conveyance route (Shaft Compounds 1 – 19) and discharge location	Bats: - Species identified from GIGL records from within 2km of the scheme: serotine, Daubenton's , whiskered bat , Natter's bat, Leisler's, noctule, Nathusius' pipistrelle, common pipistrelle , soprano pipistrelle, and brown long-eared. - Woodlands and mature trees which may have potential to support roosting bats were identified within or immediately adjacent to Shaft Compounds 4, 5, 8, 9, 10,11, 13, 16, alternative shaft site 14, open cut section between Shafts 12 and 13, and discharge location. - Habitats such as woodlands, open grassland fields, waterbodies, and linear habitat features such as hedgerows and tree-lines offer suitable commuting and foraging habitat for bats – all conveyance route compounds and discharge location.	Direct impacts: - Loss, damage and/or disturbance of potential bat roosts where woodland or mature trees are present within or immediately adjacent to proposed compounds - Temporary and permanent loss of foraging or commuting habitats within site compound and permanent infrastructure Indirect impacts: - Disturbance of foraging bats through noise and/or lighting during construction activities	- It is recommended that a ground-based bat roost assessment is conducted on all the trees and structures located within 20-30m of any works areas. The aim of the survey will be to assess their potential to support roosting bats. - Avoidance of mature trees, woodland (priority habitats), and hedgerows through scheme design where possible to minimise potential impacts. - Construction best practice relating to control of dust and pollution prevention - - Avoidance of night-time working adjacent to bat roosts (where identified through further surveys) and high value foraging habitats - Lighting of shaft compounds should be designed to minimise light spill on to adjacent high value habitats.
	Badgers: - No records of badgers were identified within 2 km of the Mogden water recycling scheme, but suitable habitats were identified within or immediately adjacent to Shaft Compounds 4, 5, 8, 9, 10, 11, 12, 13, 16, alternative shaft site 14, and open cut section between Shafts 12 and 13, and discharge location. - evidence of recent badger activity in the form of dig and snuffle holes was recorded within the survey area of Shaft Compound 10.	Direct impacts: - Damage or disturbance of badger setts during construction works - Accidental injury or mortality due to presence of excavations and/or plant/ vehicle movements	- A full badger survey should be conducted within the footprint of the Shaft Compounds and within an additional 30-metre buffer zone of the sites. - Fencing of site compounds to prevent badger access to exposed excavations and works encroachment into retained habitats

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	Stag beetle: - Records of stag beetles were identified within 2 km of the Mogden water recycling scheme - Suitable habitats (woodland, mature trees, hedgerows) were identified within or immediately adjacent to Shaft Compounds 4, 5, 8, 9, 10,11, 13, 16, alternative shaft site 14, open cut section between Shafts 12 and 13, and discharge location. - Deadwood suitable for supporting larval stag beetles was identified at Shaft Compound 5. Other notable terrestrial invertebrates: - Records of large heath (*Coenonympha tullia*), marsh fritillary (*Euphydryas aurinia*), white-letter hairstreak (*Satyrium w-album*), and brown hair streak (*Thecla betulae*) were identified within 2 km of the Mogden water recycling scheme. - Suitable habitats including woodland (large heath and white letter hairstreak), mature trees, and scrub and hedgerows (brown hair streak) were identified within or immediately adjacent to Shaft Compounds 4, 5, 6, 8, 9, 10,12, 13, 16, alternative shaft site 14, open cut section between Shafts 12 and 13, and discharge location. - Although records of brown hairstreak, large heath, and marsh fritillary were identified within 2 km of the scheme these species are restricted to the north and west of the UK so the records received are likely to be erroneous, captive release or rare migrant. Consequently, these species are unlikely to be present within the scheme footprint and are not considered further in the assessment.	Direct impacts: - Loss or disturbance of larval habitats which include rotting standing trees, stumps or logs - Injury or mortality of larvae and/or adults (May to September) during site clearance and construction Indirect impacts: - Habitat degradation from pollution including accidental spills and dust	- Avoidance of mature trees, woodland (priority habitats), and hedgerows through scheme design where possible to minimise potential impacts. - Deadwood suitable for priority invertebrate species should be translocated to retained habitats, and habitats within the areas of temporary loss re-instated on a like-for-like basis. - Fencing of retained adjacent habitats to reduce the potential for works encroachment - Construction best practice relating to control of dust and pollution prevention - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	Protected, notable, and invasive plant species: - Records of two species, bluebell and meadow clary (grassland) are listed under Schedule 8 of the Wildlife and Countryside act and three NERC act Section 41 Priority species: True Fox-sedge (wetland habitats), cornflower (grassland), Northern Hawk's-beard, and Greater Water-parsnip (wetland) - None of these species were identified during the UKHab surveys but suitable habitats (woodland and grassland,) were identified within or immediately adjacent to Shaft Compounds 4, 5, 8, 9, 10,11, 12, 13, 16, alternative shaft site 14, open cut section between Shafts 12 and 13, and the discharge location. - Waterbodies including wet ditches and rivers were recorded within 5m of shaft Compounds 4, 5, 6, 9, the discharge location and the alternative outfall location.	Direct impacts: - Loss or disturbance of supporting habitats - Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of woodland where possible to avoid loss of bluebells if present - Construction best practice relating to control of dust and pollution prevention. - Fencing of retained adjacent habitats to reduce the potential for works encroachment
	Reptiles: - Records of barred grass snake, slow worm, and common lizard were identified within 2 km of the Mogden water recycling scheme. - The grassland habitats recorded at shaft location 6, 8, 12 and 13 and open cut trenches section between 12 and 13 provided suitable habitat for foraging and basking reptiles.	Direct impacts: - Loss or disturbance of supporting habitats. - Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of rough grassland, scrub, woodland, and hedgerows through scheme design where possible to minimise potential impacts. - The clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS). Phased site clearance using gradually reduced vegetation cuts to allow dispersal of reptiles if present. - Site clearance in areas containing suitable reptile hibernation features should not be undertaken during the hibernation period (October to March inclusive). - Fencing of retained adjacent habitats to reduce the potential for works encroachment.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
			- Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	European hedgehog: - Records of European hedgehog were identified within 2 km of the Mogden water recycling scheme. - Suitable habitats (woodland, scrub, grassland, and hedgerows) were identified within or immediately adjacent to Shaft Compounds 4, 5, 8, 9, 10,11, 12, 13, 16, alternative shaft site 14, open cut section between Shafts 12 and 13, and the discharge location.	Direct impacts: - Loss or disturbance of supporting habitats. - Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of scrub, woodland, and hedgerows through scheme design where possible to minimise potential impacts. - Site clearance in areas containing suitable hibernation features should not be undertaken during the hibernation period (October to March inclusive). - The site clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS). - Fencing of retained adjacent habitats to reduce the potential for works encroachment. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	Eurasian otter: - No records were identified within 2 km of the Mogden water recycling scheme, but suitable habitats were identified during the PEA surveys. - Waterbodies including wet ditches and rivers were recorded within 50m of shaft Compounds 4, 5, 6, 9, the discharge location and the alternative outfall location.	Direct impacts: - Damage or disturbance of Eurasian otter holts during construction works. Indirect impacts: - Disturbance of foraging or commuting Eurasian otter due to construction noise or lighting. - Habitat degradation through pollution during construction activities.	- Pre-construction surveys to determine the presence/absence of Eurasian otter holts prior to construction works - Fencing of retained adjacent habitats to reduce the potential for works encroachment - Construction best practice relating to control of dust and pollution prevention - Avoidance of night-time working adjacent to water courses - Lighting of compounds should be designed to minimise light spill on to adjacent riparian habitats.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	Water vole: - No records of water voles were identified within 2 km of the Mogden water recycling scheme. - Waterbodies including wet ditches and rivers were recorded within 5m of shaft Compounds 4, 5, 6, 9, the discharge location and the alternative outfall location.	Direct impacts: - Loss, damage or disturbance of supporting habitats. - Injury or mortality during site clearance Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Pre-construction surveys to determine the presence/absence of water voles along waterbodies within or adjacent to construction compounds - Avoidance of watercourses through scheme design where possible to minimise potential impacts (minimum 5m buffer). - Fencing of retained adjacent habitats to reduce the potential for works encroachment - Construction best practice relating to control of dust and pollution prevention
	Amphibians: - Records of common toad and great crested newts were identified within 2 km of the Mogden water recycling scheme. - Suitable terrestrial habitats (woodland, rough grassland, scrub, and hedgerows) were identified at Shaft Compounds 4, 5, 8, 9, 10,11, 12, 13, 16, alternative shaft site 14, open cut section between Shafts 12 and 13, and the discharge location.	Direct impacts: - Loss, damage or disturbance of supporting terrestrial habitats (e.g. grassland, scrub, and woodland). - Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Desk study to identify ponds within 250m of shaft compounds. - Pre-construction surveys to determine the presence/absence of protected or notable amphibian species within or adjacent to shaft compound locations - Avoidance of rough grassland, scrub, woodland, and hedgerows through scheme design where possible to minimise potential impacts. - Construction best practice relating to control of dust and pollution prevention - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
AWRP site	Bats: - Species identified from GIGL records from within 2km of the scheme: serotine, Daubenton's, whiskered bat, Natter's bat noctule, Nathusius' pipistrelle, common pipistrelle, soprano pipistrelle, and brown long-eared. - Woodlands and mature trees which may have potential to support roosting bats were	Direct impacts: - Loss, damage and/or disturbance of potential of bat roosts where woodland or mature trees are present within or immediately adjacent to proposed compound - Temporary and permanent loss of potential foraging or commuting habitats	- It is recommended that a ground-based bat roost assessment is conducted on all the trees and structures located within 20-30m of any works areas. The aim of the survey will be to assess their potential to support roosting bats. - Avoidance of mature trees, woodland through scheme design where possible to minimise potential impacts.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	identified in areas of permanent and temporary loss at Hyde's field. he woodland, ponds and nearby reservoir also offer suitable foraging habitat for bats.	within site compound and permanent infrastructure Indirect impacts: - Disturbance of foraging bats through noise and/or lighting during construction activities.	- Construction best practice relating to control of dust and pollution prevention - Avoidance of night-time working adjacent to bat roosts (where identified through further surveys) and high value foraging habitats - Lighting of construction site should be designed to minimise light spill on to adjacent high value habitats.
	Badgers: - No records of badgers were identified within 2 km of the Mogden water recycling scheme, but suitable habitat (woodland and scrub) was identified within areas of permanent and temporary loss at Hyde's field.	Direct impacts: - Damage or disturbance of badger setts during construction works - Accidental injury or mortality due to presence of excavations and/or plant/ vehicle movements	- A full badger survey should be conducted within the affected area of the broadleaved woodland habitats and within an additional 30-metre buffer zone of the works area. - Fencing of construction site to prevent access by badgers to exposed excavations and works encroachment into retained habitats
	Stag beetle: - Records of stag beetles were identified within 2 km of the Mogden water recycling scheme - Suitable habitat (woodland) was identified within and immediately adjacent to the construction compound within Mogden STW Other notable terrestrial invertebrates: - Records of large heath (*Coenonympha tullia*), marsh fritillary (*Euphydryas aurinia*), white-letter hairstreak (*Satyrium w-album*), and brown hairstreak (*Thecla betulae*) were identified within 2 km of the Mogden water recycling scheme. - Suitable habitats including woodland (large heath and white letter hairstreak), mature trees (brown hairstreak) were identified within or immediately adjacent to the construction compound.	Direct impacts: - Loss or disturbance of larval habitats which include rotting standing trees, stumps or partially buried logs - Injury or mortality of larvae and/or adults (May to September) during site clearance Indirect impacts: - Habitat degradation from pollution including accidental spills and dust	- Avoidance of mature trees, woodland, and hedgerows through scheme design where possible to minimise potential impacts. - Deadwood suitable for priority invertebrate species should be translocated to retained habitats and habitats within the areas of temporary loss re-instated on a like-for-like basis. - Fencing of retained adjacent habitats to reduce the potential for works encroachment - Construction best practice relating to control of dust and pollution prevention - Retention of felled trees on site to be used to create partially-buried log piles in suitable locations within the restored habitats.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	- Although records of brown hairstreak, large heath, and marsh fritillary were identified within 2 km of the scheme these species are restricted to the north and west of the UK so the records received are likely to be erroneous, captive release or rare migrant. Consequently, these species are unlikely to be present within the scheme footprint and are not considered further in the assessment.		
	Protected, notable, and invasive plant species: - Records of two species, bluebell and meadow clary (grassland) are listed under Schedule 8 of the Wildlife and Countryside act and three NERC act Section 41 Priority species: True Fox-sedge (wetland habitats), cornflower (grassland), Northern Hawk's-beard (grassland), and Greater Water-parsnip (wetland). - None of these species were identified during the UKHab survey of the AWRP site but suitable habitats (woodland and grassland,) were identified within or immediately adjacent to the proposed construction compound - The LISI species of concern (Category 4) false acacia was identified within the woodland at the SWRP site during the PEA	Direct impacts: - Loss or disturbance of supporting habitats - Injury or mortality during site clearance and construction. Indirect impacts: Habitat degradation from pollution including accidental spills and dust. - Habitat degradation from spreading non-native species	- Avoidance of woodland identified for other species would limit potential for impacts to/loss of bluebells if present - Construction best practice relating to control of dust and pollution prevention. - Fencing of retained adjacent habitats to reduce the potential for works encroachment - Construction Environmental Management Plan to include measure to control and reduce the risk of spreading non-native species.
	Reptiles: - Records of barred grass snake, slow worm, and common lizard were identified within 2 km of the Mogden water recycling scheme - The woodland habitats recorded within the STW could provide suitable habitat for slow worm.	Direct impacts: - Loss, damage or disturbance of supporting habitats - Injury or mortality during site clearance and construction Indirect impacts: - Habitat degradation from pollution including accidental spills and dust	- Avoidance of woodland through scheme design where possible to minimise potential impacts. - Survey to determine the presence/likely absence of reptiles within suitable habitats in and immediately adjacent to areas of temporary and permanent habitat loss - The vegetation clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS). Phased site clearance using gradually reduced

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
			vegetation cuts to allow dispersal of reptiles if present. - Site clearance in areas containing suitable reptile hibernation features should not be undertaken during the hibernation period (October to March inclusive). - Fencing of retained adjacent habitats to reduce the potential for works encroachment. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	Amphibians: - Records of common toad and great crested newts were identified within 2 km of the Mogden water recycling scheme. - Suitable breeding habitats (ponds and ditches) was identified at Hyde's field during the UKHab survey - Suitable terrestrial habitats (woodland, scrub, and grassland) were identified at during the UKHab survey.	Direct impacts: - Loss, damage or disturbance of supporting terrestrial habitats - Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Desk study to identify ponds within 250m of shaft compounds. - Surveys to determine the presence/absence of protected or notable amphibian species within or adjacent to shaft compound locations - Avoidance of woodland through scheme design where possible to minimise potential impacts. - The vegetation clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS). - Construction best practice relating to control of dust and pollution prevention - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	Hazel Dormouse: - Historic records of hazel dormouse were identified within 2 km of the Mogden water recycling scheme.	Direct impacts: - Loss, damage, fragmentation or disturbance of supporting terrestrial habitats	- Avoidance of woodland and scrub through scheme design where possible to minimise potential impacts. - Surveys to determine the presence/absence of hazel dormouse within or adjacent to shaft compound locations

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	- The woodland identified at AWRP site had good understorey structure in parts and supports tree and shrub species suitable for foraging and breeding hazel dormouse.	- Injury or mortality during site clearance and construction. Indirect impacts: - Disturbance through noise and/or lighting during construction activities. - Habitat degradation from encroachment, pollution including accidental spills and dust.	- The vegetation clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS). - Construction best practice relating to control of dust and pollution prevention - Lighting of construction site should be designed to minimise light spill on to adjacent high value habitats.
	European hedgehog: - Records of European hedgehog were identified within 2 km of the Mogden water recycling scheme - Suitable habitat (woodland, scrub , and grassland) was identified within areas of temporary and permanent habitat loss.	Direct impacts: - Loss, damage or disturbance of supporting habitats. - Injury or mortality during site clearance Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of mature trees, woodland, and hedgerows through scheme design where possible to minimise potential impacts. - The vegetation clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS). - Site clearance in areas containing suitable hibernation features should not be undertaken during the hibernation period (October to March inclusive) - fencing of retained adjacent habitats to reduce the potential for encroachment - Construction best practice relating to control of dust and pollution prevention - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.

4.2.2 Operation

No discernible impacts from the Mogden water recycling scheme have been identified during operation of the scheme as no changes in water level have been identified along the River Thames and only negligible level changes in the Thames Tideway (see Physical Environment Assessment Report). Localised changes in river flow/ velocity may impact on feeding success of Eurasian otters if present however, no discernible impacts have been identified.

Retained habitats which could support protected and or notable species (identified above in Table 4-3) adjacent to the permanent infrastructure associated with the conveyance route would be subject to routine maintenance and plant operation activities which would require access by foot or light vehicle. Maintenance events are likely to be short term and infrequent, so temporary disturbance effects that might occur to terrestrial habitats would be no greater than experienced during existing land use due to the location of the sites in urban areas or the current operation activities within the existing Mogden STW site. Potential ecological effects on terrestrial habitats arising from routine maintenance of new above-ground structures associated with the Mogden water recycling scheme are therefore unlikely to be of a scale to result in discernible ecological effects above the existing baseline conditions.

Operation of the new AWRP near Kempton WTW will reduce the suitability of the surrounding habitats through increased noise and lighting. This has potential to reduce the suitability and have adverse impacts on local populations of bats, dormouse, badger, and protected and notable terrestrial invertebrates where present through reduced habitat suitability and has potential for fragmentation of habitats for light/noise sensitive species.

4.3 BIRD ASSESSMENT

4.3.1 Construction

The main impact pathways from the construction of the Mogden water recycling scheme on bird populations are direct habitat loss, habitat damage, noise, visual and vibration disturbance and indirect deterioration of habitat due to air pollution, dust and pollution incidents. Each element of the Mogden water recycling scheme has been assessed in Table 4-4 below using species records (Environmental Records Centre, WeBS peak counts and statutory and non-statutory site information) and likely species presence based on habitat surveys outputs to determine potential impact pathways.

Table 4-4 Assessment of potential impact pathways to bird populations during construction of the Mogden water recycling scheme.

Site name	Bird records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
Mogden Sewage Treatment Works (STW)	- Greenspace Information for Greater London (GiGL) records locations not provided. - Construction works proposed within the boundary of Mogden Sewage Works Site of Importance for Nature Conservation (SINC) which provides habitat for birds including warblers, finches, pipits, wagtails and waders in the woodland, scrub, grassland and riparian habitat present in the site.	Direct - Although works at Mogden STW do not directly overlap with woodland/ scrub habitat present, some clearance may be required during construction. Therefore, loss of potential breeding habitat could occur and destruction of nests if present. Indirect – Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- Any vegetation clearance required should be undertaken outside of the breeding bird season (March –August inclusive). - If not possible, vegetation must be checked by a suitably experienced ecologist within 24 hours prior to commencement of vegetation clearance. - If an active bird's nest is discovered, works may be suspended and suitable work exclusion buffer installed around the nest (buffer size is species dependent). - Works may only re-commence once the chicks have fledged and the supervising ecologist confirms that is nest is no longer in use. - Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - Measures will be taken to protect any temporary exposure of bare soil from runoff during heavy rainfall events. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution of groundwater or watercourses.
Mogden conveyance route	- GiGL records locations not provided.	N/A	N/A
	- Compound/ Shaft 2 and 3: Construction directly adjacent to Duke of Northumberland's River north of Kneller Road SINC which consists of wetland/ riverine habitat which supports birds. Trenchless/ tunnelled sections of pipeline proposed underneath river. Limited information provided in citation for the SINC, however, waterbirds and potentially kingfisher could use the river for foraging and breeding.	Direct – Permanent loss of potential supporting habitat within the footprint of the shaft. No direct impacts identified. Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel). Excess sediment into the river during construction could smother supporting habitat	- As above for Mogden STW.

Site name	Bird records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	- Compound/ Shaft 4, 5 and 6: Construction works proposed 50 m from Crane Corridor SINC at Compound/ Shaft 4, <50 m from Compound/ Shaft 5 and Compound/ Shaft 6 proposed within the boundary of the site. SINC includes the River Crane, woodland, pasture and heathland. The SINC supports breeding kingfisher *Alcedo atthis*, grey wagtail *Motacilla cinerea* and reed warbler *Arcocephalus scirpaceus*.	Direct - Permanent loss of habitat within the footprint of Crane Corridor SINC at Compound 6. Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- As above for Mogden STW.
	- Compound/ Shaft 7: Fulwell and Twickenham Golf Courses SINC which includes grassland habitat that is regularly cut with several wet ditches, a pond and adjacent woodland and scrub. Waterbirds use the pond and ditches and potential for breeding birds in the surrounding woodland and scrub habitat. Green woodpecker *Picus viridis* noted in citation.	Direct - Permanent loss of grassland habitat within the footprint of Fulwell and Twickenham Golf Courses at Compound 7. Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- As above for Mogden STW.
	- Compound/ Shaft 8: Construction works proposed approximately <50 m from Longford River in Richmond SINC which supports a diversity of aquatic plants and fish. No birds mentioned in citation; however, has potential to support waterbirds.	Direct – Permanent loss of other neutral grassland within the footprint of the shaft. However, due to the small area of habitat to be lost and lack of nesting opportunities, no discernible impacts on birds are anticipated from habitat loss. Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution within supporting habitat.
	- Compound/ Shaft 9: Construction works proposed <50 m from Hampton Common SINC which consists of woodland and scrub which support birds (no species-specific information provided). Construction work also proposed <50 m from Oak Avenue Local Nature Reserve (LNR) which includes scrub, meadows and a small pond. No birds mentioned in citation, however, has potential to support breeding birds and waterbirds.	Direct – Permanent loss of modified grassland within the footprint of the shaft. However, due to the small area of habitat to be lost and lack of nesting opportunities, no discernible impacts on birds are anticipated from habitat loss. Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution within supporting habitat.

	- Compound/ Shaft 10: Construction works proposed approximately <50 m from Kempton Waterworks SINC and Kempton Park Reservoirs Site of Special Scientific Interest (SSSI) which supports nationally significant populations of teal and mallard *Anas platyrhynchos*. Breeding birds recorded at the site include grey heron *Ardea cinerea*, ringed plover *Charadrius hiaticula*, little ringed plover *Charadrius dubius*, lapwing *Vanellus vanellus*, redshank *Tringa totanus* and avocet *Recurvirostra avosetta* (although noted that avocet record is from 1996). Nationally rare passage species including spoonbill *Platalea leucorodia*, black-winged stilt *Himantopus himantopus*, spotted crake *Porzana porzana* and Temminck's stint *Calidris temminckii* have been recorded at the site. South West London Waterbodies Special Protection Area (SPA) overlaps with the sites which is designated for internationally important populations of gadwall *Anas strepera* and Northern shoveler *Anas clypeata*. - Note that little ringed plover, avocet, spoonbill, black-winged stilt, spotted crake and Temminck's stint are Wildlife and Countryside Act Schedule 1 species, protected from disturbance. - As qualifying species of Kempton Park Reservoirs SSSI and South West London Waterbodies SPA, gadwall and Northern shoveler are also protected from disturbance during the overwintering season. - 'Notable' species from Wetland Bird Survey (WeBS) data at Kempton Local Nature Reserve included green sandpiper *Tringa ochropus*, kingfisher, lapwing and little ringed plover. - 'Notable' species from WeBS data at Red House Reservoir included pochard *Aythya ferina*, green sandpiper and kingfisher. - Compound/ Shaft 10: Construction works within >400 m of Kempton Lake Half Moon Convert SINC. Site consists of a eutrophic lake with marginal vegetation in Kempton Racecourse, isolated by an area of broad-leaved woodland. The lake and surrounding grassland support a large number of wintering teal.	Direct – Permanent loss of modified grassland within the footprint of the shaft. However, due to the small area of habitat to be lost and lack of nesting opportunities, no discernible impacts on birds are anticipated from habitat loss. Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- Noise impact assessment outputs will determine the zone of influence of construction works proposed. - Wintering bird surveys are recommended to understand the distribution of waterbirds at Kempton Waterworks SINC/ Kempton Park Reservoirs SSSI/ Kempton Lake Half Moon Convert SINC. - Where possible, construction works should avoid the overwintering period (October – March inclusive) to prevent disturbance impacts to internationally and nationally significant species. - If not possible, a suitably experienced ornithologist must be present during construction works to ensure a buffer is maintained between protected waterbirds and construction. The buffer distance will be informed by noise impact assessment outputs. - Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution within supporting habitat.

Site name	Bird records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	- Compound/ Shaft 11: Construction works >50 m from Hatherop Park SINC which consists of 'wasteland' habitat, a pond, elm scrub and nettles. Site supports species such as whitethroat *Sylvia communis*, goldfinch *Carduelis carduelis*, stock dove *Columba oenas* and green woodpecker *Picus viridis*. - Compound/ Shaft 11: Construction works within the boundary of Red House Reservoir SINC which consists of a lake surrounded by grassland and small area of semi-natural woodland with large heronry present.	Direct – Permanent loss of woodland and scrub habitat within boundary of Red House Reservoir SINC. Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- As above for Mogden STW and Compound/ Shaft 10 for conveyance route. - Although the permanent shaft will result in a small area of habitat loss, sites for enhancement/ compensation will need to be identified for habitat loss associated with AWRP site near Kempton WTW and Compound/ Shaft 11 combined.
	- Compound/ Shaft 13 and 14: Construction works at closest point are >400 m from River Thames – Spelthorne SINC and River Thames – Elmbridge SINC, >500 m from Molesey Reservoir SINC and >600 m from Sunbury Park SINC. - River Thames – Elmbridge and Spelthorne SINCs include part of the Thames running through Surrey. The Thames provides an important corridor for migratory birds. - Molesey Reservoir SINC was historically used by a diversity of birds including lapwing, breeding little ringed plover and marsh warbler *Acrocephalus palustris* although species diversity has declined in recent years. Sunbury Park SINC consists of wood pasture, woodland, scrub and grassland. No bird species are mentioned in the citation. - Compound/ Shaft 13: Construction works >500 m from Kempton Lake Moon Covert SINC (see description in Compound/ Shaft 10).	Direct – Permanent loss of modified grassland within the footprint of the shaft. However, due to the small area of habitat to be lost and lack of nesting opportunities, no discernible impacts on birds are anticipated from habitat loss. The operation of the scheme will impact on flow rates in the River Thames. No impacts on water level identified. Indirect – Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution within supporting habitat.
	- Compound/ Shaft 16: Construction works overlap with River Ash: Gaston Bridge to Watersplash Farm SINC, >300 m from River Thames – Elmbridge SINC and River Thames - Spelthorne SINC (see description of two latter sites in Compound/ Shaft 13 and 14). - River Ash supports priority species European eel *Anguilla anguilla*, diversity of macrophytes and water crowfoot *Ranunculus aquatillis*. No birds mentioned in	Direct – Permanent loss of modified and neutral grassland within the footprint of the shaft. However, due to the small area of habitat to be lost and lack of nesting opportunities, no discernible impacts on birds are anticipated from habitat loss. The operation of the scheme will impact on flow rates in the River Thames. No impacts on water level identified.	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution within supporting habitat. Measures will be taken to protect any temporary

Site name	Bird records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	citation; however, it has potential to support waterbirds and kingfisher.	Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel). Excess sediment into the river during construction could smother supporting habitat such as water crowfoot.	exposure of bare soil from runoff during heavy rainfall events
AWRP site near Kempton WTW	- GiGL records location not provided.	N/A	N/A
	- Construction works proposed approximately 300 m from Hatherop Park SINC (see description for Compound/ Shaft 11 above).	Direct – No direct impacts identified. Indirect – Noise, vibration and visual disturbance.	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions.
	- Potential direct loss within a non-statutory designated site of local importance depending on the exact location of the AWRP which consists of a mosaic of grassland, scrub, tall herbaceous vegetation and ruderal communities. No birds specifically mentioned in citation; however, site has potential to support breeding birds.	Direct – Potential permanent loss of habitat within a non-statutory designated site of local importance depending on the exact location of the AWRP. Indirect – Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- As above for Mogden STW. - Breeding bird surveys recommended for footprint of AWRP site near Kempton WTW. - Due to the large area of habitat loss, sites for enhancement/ compensation will need to be identified as part of Biodiversity Net Gain (BNG) legislation.
	- Construction works proposed approximately >50 m from Stain Hill and Sunnyside Reservoirs SINC which consists of disused reservoirs that support nationally significant numbers of shoveler and gadwall during the winter plus other wintering waterfowl.	Direct – No direct impacts identified. Indirect – Noise, vibration and visual disturbance and exposure to pollution (air and dust).	- Noise impact assessment outputs will determine the zone of influence of construction works proposed. - Likely that local roads will provide a buffer from construction works at AWRP site near Kempton WTW; however, where possible, construction works should avoid the overwintering period (October – March inclusive) to prevent disturbance impacts to internationally and nationally significant species. - If not possible, a suitably experienced ornithologist must be present during construction works to ensure a buffer is maintained between protected waterbirds and construction. The buffer distance will be informed by noise impact assessment outputs.

Site name	Bird records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
			- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution within supporting habitat.
	- Construction works proposed 200 m from Portlane Brook and Meadow SINC which consists of a watercourse, scrub and grassland habitat which supports common birds (no species-specific information provided).	Direct – No direct impacts identified. Indirect – Noise, vibration and visual disturbance.	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions.
	- Construction works proposed >80 m from Hampton Water Treatment Works SINC which consists of filter beds, large water storage beds, herb rich grassland, bare ground and wasteland. Wintering birds use the large areas of open water, particularly Grand Junction Reservoir to the north-west of the site.	Direct – No direct impacts identified. Indirect – Noise, vibration and visual disturbance and exposure to pollution (air and dust).	- Noise impact assessment outputs will determine the zone of influence of construction works proposed. - Likely that local roads will provide a buffer from construction works at AWRP site near Kempton WTW; however, where possible, construction works should avoid the overwintering period (October – March inclusive) to prevent disturbance impacts to internationally and nationally significant species. - If not possible, a suitably experienced ornithologist must be present during construction works to ensure a buffer is maintained between protected waterbirds and construction. The buffer distance will be informed by noise impact assessment outputs. - Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution within supporting habitat.

Site name	Bird records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	- Construction works proposed 200 m from Kempton Waterworks SINC and Kempton Park Reservoirs SSSI (see descriptions for Compound/ Shaft 10 above). - 'Notable' species from WeBS Red House Reservoir - Construction works >500 m of Kempton Lake Half Moon Convert SINC (see description in Compound/ Shaft 10).	Direct – No direct impacts identified. Indirect – Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- As above for Compound/ Shaft 10 for conveyance route.
	- Construction works within the boundary of Red House Reservoir SINC (see description for Compound/ Shaft 10).	Direct – Permanent loss of woodland and scrub habitat within boundary of Red House Reservoir SINC. Indirect – Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- As above for Mogden STW and Compound/ Shaft 10 for conveyance route. - Due to the large area of habitat loss, sites for enhancement/ compensation will need to be identified as part of BNG legislation.
Mogden water recycling discharge point	- Kingfisher (0.45 km) and kestrel (1.1 km) record within proximity of discharge point (Surrey Biological Records Centre, SBIC). - Desborough Island SINC is 880 m upstream from the proposed intake location and consists of a large area of neutral grassland. No species are mentioned in the citation.	Direct – Permanent loss of riparian habitat that supports kingfisher Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- As above for Mogden STW. - Minimise removal of riparian vegetation to avoid damage to bank stability and sediment loading in the river. If necessary to remove, reinstate riparian vegetation. - Minimise duration of any necessary in-channel working to avoid compaction, disruption of flow processes and bank erosion. - A kingfisher survey of the potential nest-burrow sites along the River Thames within proximity of the proposed outfall is recommended.

4.3.2 Operation

No discernible impacts from the Mogden water recycling scheme have been identified during operation of the scheme, as no changes in water level have been identified along the River Thames and only negligible level changes in the Thames Tideway (see Physical Environment Assessment Report). Localised changes in river flow/ velocity may impact on feeding success of divers and dabbling ducks if present; however, no discernible impacts have been identified.

4.4 SUMMARY OF TERRESTRIAL ECOLOGY ASESSMENT OF THE MOGDEN WATER RECYCLING SCHEME

The construction of the Mogden water recycling scheme including Mogden STW, AWRP near Kempton WTW and conveyance routes will result in the direct loss of grassland, scrub and woodland habitat. No direct impact pathways were identified to statutory designated sites; however, a total of 16 non-statutory sites were identified within 2 km of the scheme which included SINCs and an LNR. This potentially includes an area of habitat loss in a non-statutory designated site of local importance depending on the exact location of the AWRP, which consists of lowland calcareous grassland priority habitat and deciduous woodland priority habitat. Further surveys are recommended at the AWRP site for badger, hazel dormouse, great crested newt, bats and breeding birds to determine present/ spatial distribution and to aid identification of a compensation site for the purposes of BNG.

Species records received within 2 km of the Mogden water recycling scheme included bats, birds, reptiles, amphibians, hedgehog and stag beetle. As the locations of species records were not provided by GiGL, the search areas for the Teddington DRA and Mogden water recycling scheme overlapped so it is not possible to determine which options the records are in relation to.

Where adjacent habitats haves been identified, indirect impacts from the scheme include noise, visual and vibration disturbance and pollution via vehicle emissions, dust and hydrocarbons. This is specifically concerning South West London Waterbodies SPA and Ramsar, Kempton Park Reservoirs SSSI, Kempton LNR and Kempton Lake Half Moon Convert SINC and associated qualifying bird populations (largely overwintering). Further survey work is recommended for overwintering birds to determine distribution and mitigation measures to reduce anthropogenic disturbance will need to be considered.

Temporary and permanent habitat loss would occur within the footprint of the AWRP and conveyance route compounds and shafts including the priority habitats lowland mixed deciduous woodland and lowland calcareous grassland. Where possible, the removal of woodland and scrub should be avoided when considering the footprint of compounds and shafts. Hard standing and modified grassland is present in the footprint of a number of compounds and shafts, which has low ecological value. However, where compounds and shafts are located close to ecological receptors, additional mitigation measures should be implemented to avoid impact pathways to supporting habitat. Construction and operation of the AWRP has potential for impacts to protected and notable species including bats, hazel dormouse, badger, European hedgehog, amphibians, reptiles, breeding birds, and protected or notable plant species.

During operation of the Mogden water recycling scheme, no discernible impacts were identified on habitats present in freshwater River Thames or adjacent habitats as a result of intermittent disturbance from anthropogenic activity at Shaft/ Compounds and the intake/ outfall sites.

5 TERRESTRIAL ECOLOGY ASSESSMENT OF TEDDINGTON DRA SCHEME

The construction activities associated with the 150 Ml/d Teddington DRA would include the following activities that have potential to result in biophysical changes to important terrestrial ecological features:

- Construction of Tertiary Treatment Plant (TTP) at Mogden STW. Note that the TTP is proposed for construction within the footprint of existing storm tanks in Mogden STW.
- Construction of temporary site compounds (2500 m²) and permanent reception shafts at Mogden STW and temporary site compounds and intermediate shafts along conveyance route (including vegetation removal, earthworks, provision for compound drainage and SuDS, and creating areas of hardstanding). Note that pipe jacking will be used to install the 1.8 m internal diameter pipeline.
- Construction of temporary access routes (including vegetation removal, earthworks, and associated drainage)
- Construction discharge/ outfall upstream of Teddington Weir and abstraction/ intake upstream of the treated effluent discharge location along the River Thames (including removal of bank vegetation, earthworks and associated drainage).
- Permanent fencing and enclosed kiosk at the new intake to enclose mechanical and electrical equipment increasing the footprint of the proposed intake.

The activities listed above have the potential to result in the following effects:

- Habitat loss or degradation (both temporary and permanent) - It is assumed that all areas of temporary habitat loss will be re-instated to the current baseline condition following completion of the construction phase of the scheme.
- Habitat fragmentation (temporary).
- Management changes to habitats (leading to habitat degradation).
- Disturbance of individuals or groups of animals via noise, vibration and visual disturbance.
- Direct injury or mortality of individual animals and plants.
- Pollution e.g., sediment mobilisation, dust, hydrocarbons (habitat degradation and injury/mortality to species).
- Impacts from water level changes (a cause of habitat loss, degradation and/or injury/mortality to species).

The potential effects on terrestrial habitats, protected and notable species (excluding birds), and birds (separately) are assessed in Section 5.1.1, 5.2.1 and 5.2.1 respectively.

The operational activities associated with the Teddington DRA would include the following activities that have potential to result in biophysical changes to important terrestrial ecological features:

- Operational changes to flow regime in the River Thames.
- Operation and maintenance of new infrastructure including the conveyance route and within the existing Mogden STW site

The activities listed above have the potential to result in the following effects:

- Management changes to habitats (leading to habitat degradation)
- Disturbance of individuals or groups of animals via noise, vibration, and visual disturbance
- Direct injury or mortality of individual animals and plants
- Impacts from water level changes (a cause of habitat loss, degradation and/or indirect injury/mortality to species)

5.1 HABITAT IMPACTS

5.1.1 Construction impacts

5.1.1.1 Permanent above-ground infrastructure

The construction of the TTP at Mogden STW will only result in the permanent loss of man-made land types, no impacts to habitats are anticipated as the new infrastructure will be constructed within existing filter beds and no natural or seminatural habitats were present within the footprint.

There would be the permanent loss of all habitats identified within the footprint of the proposed, above-ground infrastructure associated with the conveyance route (noting this is limited to the footprint of the shaft site chambers), see Table 5-1. The impacts to the habitats in these locations will be permanent and irreversible. Construction of the proposed new infrastructure for the Teddington DRA scheme will result in the loss of 0.039 ha of the priority habitat lowland mixed deciduous woodland.

Design changes since the UKHab survey at Mogden STW site was undertaken have resulted in Site compound 1 being outside of the surveyed area, and so no baseline habitat data was available. Aerial imagery and the results of adjacent habitat surveys indicate that the area of permanent habitat loss is likely to comprise developed land sealed surface and/or modified grassland. Further surveys are required to determine the type of habitat present within the area of permanent loss prior to the Gate 3 assessment.

Table 5-1 Habitats present within areas of permanent habitat loss for Teddington DRA

Habitat type	Area (ha)
Artificial unvegetated, unsealed surface	0.0003
Developed land; sealed surface	1.623
Lowland mixed deciduous woodland	0.039
Mixed scrub	0.014
Modified grassland	0.174
Other neutral grassland	0.056
Other woodland; broadleaved	0.03
Total	**1.937**

5.1.1.2 Temporary construction compounds

In the absence of mitigation, potential to impact terrestrial habitats during construction of the Teddington DRA scheme would include:

- Physical loss of habitats. Using a precautionary approach, it is assumed this would include:
  - temporary land take requiring loss of all habitat areas from within all temporary construction compounds, excluding boundary features which it is assumed would be retained with appropriate buffer areas following construction best practice
- Damage, degradation, or modification of retained habitats including:
  - Pollution during construction from spills (e.g., fuel/hydrocarbons), dust generation, changes in hydrology (surface and ground waters quality or pathways), water quality changes resulting from sediment mobilisation into connecting water courses leading to sedimentation.
  - Spread or introduction of invasive non-native species
- Fragmentation and isolation of retained habitats/network:
  - temporary impacts due to period between habitat reinstatement/planting and habitat (hedgerows, grassland, woodland, etc.) becoming established and mature.

The total area of the habitats present within the footprint of the Teddington DRA temporary construction compounds associated with the conveyance route and Mogden STW are shown in Table 5-2. The temporary construction compounds will result in a total of 5.128 ha of temporary habitat loss including 0.249 ha of the priority habitat lowland mixed deciduous woodland.

Table 5-2 Area of temporary habitat loss for Teddington DRA option construction (all scheme components)

Habitat type	Area (ha)
Artificial unvegetated, unsealed surface	0.0004
Bramble scrub	0.002
Developed land; sealed surface	3.071
Lowland mixed deciduous woodland	0.249
Modified grassland	1.41
Other neutral grassland	0.259
Other woodland; broadleaved	0.136
Total	**5.128**

The potential impacts to terrestrial habitats from creation of temporary construction compounds to facilitate the creation of the required infrastructure for the Teddington DRA are shown in Table 5-3.

Table 5-3 Habitats present and potential impacts within areas of temporary habitat loss for Teddington DRA scheme

Name	Impacts
Shaft compound 1 (within Mogden STW)	Temporary loss of common low or moderate value modified habitats including modified grassland, developed land sealed surface, and other broadleaved woodland. The majority of habitats identified within the site compound are of low ecological value and have relatively short regeneration time following reinstatement thereby reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. The other broadleaved woodland forms landscaping for the STW and contains a number of non-native species lowering its ecological value. Due to the time for regeneration of woodland habitat following reinstatement there will be long term loss of this habitat within the compound footprint. There is potential for damage or degradation of this habitat outside of the compound in the absence of suitable mitigation through physical damage from encroachment of vehicles and personnel, introduction of invasive non-native species from plant machinery or footwear, dust and/or pollution from spillages during construction.
Shaft Compound 2	Temporary loss of common low-value modified habitats including grassland, bramble scrub and developed land sealed surface. The habitats identified within the site compound have short regeneration times reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. No habitats were recorded outside of the site compound; however, they are assumed to be comparable to the habitats within the site so are likely to have low sensitivity to impacts from dust and pollution.
Shaft Compound 3	Temporary loss of common low-value modified habitats including modified grassland and built up areas and gardens. The habitats identified within the site compound are of low ecological value and have relatively short regeneration time following reinstatement thereby reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. Habitats adjacent to the site compound comprised modified grassland, built up areas and gardens and urban habitats, these habitats have low sensitivity to impacts from dust and pollution.
Shaft Compound 4	The proposed compound location is within an existing hard standing car park and road which is of low ecological value but also includes hedgerows and lines of tress. The line of trees bordering the site compound comprises immature ash trees and should be retained where possible through site design to reduce the potential ecological impacts. The native species hedgerow on the southern boundary of the site compound was identified as priority habitat and should be retained where possible through site design to reduce the potential ecological impacts. There is the potential for the loss of the priority hedgerow habitat during site clearance to create the compound. The south of the site compound is bordered by lowland mixed deciduous woodland priority habitat. There is potential for damage or degradation of this habitat, in the absence of suitable mitigation, through physical damage from encroachment of vehicles and personnel, introduction of invasive non-native species from plant machinery or footwear, dust and/or pollution from spillages during construction.
Shaft Compound 5	Temporary loss of common low-value modified habitats including modified grassland and developed land sealed surface, and other developed land. The habitats identified within the site compound are of low ecological value and have relatively short regeneration time following reinstatement thereby reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. Habitats adjacent to the site compound comprised modified grassland, line of trees, built up areas and gardens and developed land sealed surface, these habitats have low sensitivity to impacts from dust and pollution and introduction of invasive non-native species from plant machinery or footwear.

Name	Impacts
	Hedgerow (priority habitat) was also present north of the proposed compound. There is potential for damage or degradation of this habitat in the absence of suitable mitigation through physical damage from encroachment of vehicles and personnel, introduction of invasive non-native species from plant machinery or footwear dust and/or pollution from spillages during construction
Shaft Compound 6	Temporary loss of common low value modified habitats including modified grassland and built up areas and gardens and an area of high-value lowland mixed deciduous woodland priority habitat. The majority of habitats identified within the site compound are of low ecological value and have relatively short regeneration time following reinstatement, thereby reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. However, creation of the compound will result in the loss of lowland mixed deciduous woods and priority habitat. Due to the time for regeneration of the habitat following completion of the works and risk to disturbance of the soil and ground flora, the impacts would be long term and or permanent loss of this habitat within the site boundary. The north of the site compound is bordered by lowland mixed deciduous woodland priority habitat, a continuation of the habitat within the compound. There is potential for damage or degradation of this habitat in the absence of suitable mitigation through physical damage from encroachment of vehicles and personnel, introduction of invasive non-native species from plant machinery or footwear, dust and/or pollution from spillages during construction. Habitats adjacent to the site compound to the east, south and west comprised modified grassland, built up areas and developed land sealed surface. These habitats have low sensitivity to impacts from dust and pollution.
Shaft Compound 7	Temporary loss of common moderate and high value habitats including other neutral grassland and lowland mixed deciduous woodland priority habitat. The majority of the compound comprises other neutral grassland which has a relatively short regeneration time following reinstatement and is common on previously disturbed ground thereby reducing the duration of impacts and of habitat fragmentation following reinstatement of habitats after construction. However, creation of the compound will result in the loss of lowland mixed deciduous woodland priority habitat. Due to the time for regeneration of the habitat following completion of the works and risk to disturbance of the soil and ground flora, the impacts would be long term and or permanent loss of this habitat within the site boundary The south-west of the site compound is bordered by lowland mixed deciduous woodland priority habitat, a continuation of the habitat within the compound. There is potential for damage or degradation of this habitat in the absence of suitable mitigation through physical damage from encroachment of vehicles and personnel, introduction of invasive non-native species from plant machinery or footwear, dust and/or pollution from spillages during construction.

5.1.2 Operational impacts

Retained habitats adjacent to the permanent infrastructure associated with the conveyance route and TTP at Mogden STW would be subject to routine maintenance and plant operation activities which would require access by foot or light vehicle. Access within the Mogden STW would be via existing access points and routes.

Maintenance events are likely to be short term. Temporary disturbance effects that might occur to terrestrial habitats would be no greater than experienced during existing land use due to the location of the sites in urban areas or the current operation activities within the existing Mogden STW site. Potential ecological effects on terrestrial habitats arising from routine maintenance of new above-ground structures associated with Teddington DRA are therefore unlikely to be of a scale, duration or nature that would give rise to significant ecological effects above the baseline conditions.

5.2 PROTECTED, NOTABLE AND OR INVASIVE SPECIES

5.2.1 Construction

The main impact pathways from the construction of the Teddington DRA scheme on populations of protected and notable terrestrial species are direct habitat loss and/or damage (temporary and permanent), noise, visual and vibration disturbance, and indirect deterioration of habitat due to air pollution, dust and pollution incidents. Each element of the Teddington DRA scheme has been assessed in Table 5-4 below using species records and likely species presence based on habitat surveys outputs to determine potential impact pathways. The locations of species records were not provided by GIGL, the search areas for the Teddington DRA and Mogden water recycling schemes overlapped so it is not possible to determine which options the records are in relation to. Consequently, as a precautionary approach, where species records occur within the search area it is assumed that they are within 2 km of the Teddington DRA infrastructure and construction compounds.

Table 5-4 Assessment of potential impact pathways to protected and notable species populations during construction of the Teddington DRA scheme.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
Teddington conveyance route Shaft Compounds 1-7 and alternative shaft compound 4 of the Teddington DRA Gate 2	Bats: - Species identified from GIGL records from within 2km of the scheme: serotine, Daubenton's, whiskered bat, Natter's bat, Leisler's noctule, Nathusius' pipistrelle, common pipistrelle, soprano pipistrelle, and brown long-eared.	Direct impacts: - loss, damage and/or disturbance of potential of bat roosts (Shaft 1, Shaft 2, Shaft 4, Shaft 5, Shaft 6, Shaft 7, and alternative Shaft Compound 4). - temporary and permanent loss of foraging or commuting habitats within site compound and permanent infrastructure (Shaft 1, Shaft 2, Shaft 3, Shaft 4, Shaft 5, Shaft 6, Shaft 7, and alternative Shaft Compound 4). Indirect impacts: - disturbance of foraging bats through noise and/or lighting during construction activities (Shaft 1, Shaft 2, Shaft 3, Shaft 4, Shaft 5, Shaft 6, Shaft 7, and alternative Shaft Compound 4).	- It is recommended that a ground-based bat roost assessment is conducted on all the trees and structures located within 20-30 m of any works areas. The aim of the survey will be to assess their potential to support roosting bats. - Avoidance of mature trees, woodland and hedgerows through scheme design where possible to minimise potential impacts. - Construction best practice relating to control of dust and pollution prevention. - - Avoidance of night-time working adjacent to bat roosts (where identified through further surveys) and high value foraging habitats. - Lighting of shaft compounds should be designed to minimise light spill on to adjacent high value habitats.
	Badgers: - no records of badgers were identified within 2 km of the Teddington DRA scheme, but suitable habitats were identified during the PEA surveys undertaken in 2021/2022.	Direct impacts: - Damage or disturbance of badger setts during construction works (Shaft Compound 1, 4, 6, 7) - Accidental injury or mortality due to presence of excavations and/or plant/ vehicle movements.	- A full badger survey should be conducted within the footprint of Shaft Compound 1, 4, 6, 7 and within an additional 30-metre buffer zone of the sites. - Fencing of site compounds to prevent access by badgers to exposed excavations and works encroachment into retained habitats.
	Stag beetle: - Records of stag beetles were identified within 2 km of the Teddington DRA scheme. - Suitable habitats (woodland, mature trees, hedgerows) were identified at Shaft Compounds 1, 2, 6, 7, and alternative Shaft Compound 4.	Direct impacts: - Loss or disturbance of stag beetle larval habitats which include rotting standing trees, stumps or logs. - Injury or mortality of larvae and/or adults (May to September) during site clearance. Indirect impacts:	- Avoidance of mature trees, standing deadwood/stumps, woodland, and hedgerows through scheme design where possible to minimise potential impacts. - Deadwood suitable for priority invertebrate species should be translocated to retained habitats and

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	Other notable terrestrial invertebrates: - Records of large heath, marsh fritillary, white-letter hairstreak, and brown hairstreak were identified within 2 km of the Teddington DRA scheme. - Suitable habitats including woodland (large heath and white letter hairstreak), mature trees, and scrub and hedgerows (brown hairstreak) were identified at Shaft Compounds 1, 2, 6, 7, and Alternative Shaft compound 4. - Although records of brown hairstreak, large heath, and marsh fritillary were identified within 2 km of the scheme these species are restricted to the north and west of the UK so the records received are likely to be erroneous, captive release or rare migrant. Consequently, the species is unlikely to be present within the scheme footprint and are not considered further in the assessment.	- Habitat degradation from pollution including accidental spills and dust.	habitats within the areas of temporary loss re-instated on a like-for-like basis. - Fencing of retained adjacent habitats to reduce the potential for works encroachment. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create partially-buried log piles in suitable locations within the restored habitats.
	Protected, notable, and invasive plant species: - Records of two species, bluebell, and meadow clary (grassland) are listed under Schedule 8 of the Wildlife and Countryside act and three NERC act Section 41 Priority species: True Fox-sedge (wetland habitats), cornflower (grassland), Northern Hawk's-beard, and Greater Water-parsnip (wetland) - None of these species were identified during the UKHab surveys but suitable habitats (woodland and grassland,) were identified within or immediately adjacent to Shaft Compounds 1, 2, 6, 7, and alternative Shaft Compound 4.	Direct impacts: - Loss or disturbance of supporting habitats - Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust. - Habitat degradation from spread on invasive and non-native species	- Avoidance of woodland identified for other species would limit potential for impacts to/loss of bluebells if present - Construction best practice relating to control of dust and pollution prevention. - Fencing of retained adjacent habitats to reduce the potential for works encroachment. - Construction Environmental Management Plan to include measure to control and reduce the risk of spreading non-native species.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	- No ponds or suitable waterbodies which could support greater water parsnip were identified within the Shaft Compounds. - Buddleja/butterfly bush and giant hogweed were identified at Shaft compound 4		
	Reptiles: - Records of barred grass snake, slow worm, and common lizard were identified within 2 km of the Teddington DRA scheme. - Suitable habitats (woodland, rough grassland, scrub, hedgerows) were identified at Shaft Compounds 1, 2, 6, 7, and alternative Shaft Compound 4.	Direct impacts: - Loss or disturbance of supporting habitats - Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust	- Avoidance of scrub, rough grassland, woodland, and hedgerows through scheme design where possible to minimise potential impacts. - The clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS). Phased site clearance using gradually reduced vegetation cuts to allow dispersal of reptiles if present. - Site clearance in areas containing suitable reptile hibernation features should not be undertaken during the hibernation period (October to March inclusive). - Fencing of retained adjacent habitats to reduce the potential for encroachment. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	European hedgehog: - Records of European hedgehog were identified within 2 km of the Teddington DRA scheme. - Suitable habitats (woodland, rough grassland, scrub, hedgerows and parkland) were identified at Shaft Compounds 1, 2, 6, and 7.	Direct impacts: - Loss, damage or disturbance of supporting habitats. - Injury or mortality during site clearance. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust	- Avoidance of woodland and hedgerows through scheme design where possible to minimise potential impacts. - Site clearance in areas containing suitable hibernation features should not be undertaken during the hibernation period (October to March inclusive). - The vegetation clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS).

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
			- Fencing of retained adjacent habitats to reduce the potential for works encroachment. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	Amphibians: - Records of common toad and great crested newts were identified within 2 km of the Teddington DRA scheme. - Suitable habitats (woodland, rough grassland, scrub, hedgerows and parkland) were identified at Shaft Compounds 1, 2, 5, 6, and 7. - No ponds or suitable breeding waterbodies were identified within the Shaft Compounds.	Direct impacts: - Loss, damage or disturbance of supporting terrestrial habitats. - Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- HSI and eDNA surveys (where required) to determine the presence/absence of protected or notable amphibian species within or adjacent to shaft compound locations. - The vegetation clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS). - Avoidance of woodland, and hedgerows through scheme design where possible to minimise duration of potential impacts. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
Teddington intake point	Bats: - Species identified from GIGL records from within 2 km of the scheme: serotine, Daubenton's, whiskered bat, Natter's bat, Leisler's, noctule, Nathusius' pipistrelle, common pipistrelle, soprano pipistrelle, and brown long-eared. - Suitable habitat that could support roosting and foraging bats was identified on site including woodland, grassland, and scrub	Direct impacts: - Loss, damage and/or disturbance of potential of bat roosts - temporary and permanent loss of foraging or commuting habitats within site compound and permanent infrastructure Indirect impacts: - disturbance of foraging bats through noise and/or lighting during construction activities	- It is recommended that a ground-based bat roost assessment is conducted on all the trees and structures located within 20-30m of any works areas. The aim of the survey will be to assess their potential to support roosting bats. - Construction best practice relating to control of dust and pollution prevention. - - Avoidance of night-time working adjacent to bat roosts (where identified through further surveys) and high value foraging habitats.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
			- Lighting of shaft compounds should be designed to minimise light spill on to adjacent high value habitats.
	Badgers: - No records of badgers were identified within 2 km of the Teddington DRA scheme but suitable habitats to support badger setts were identified during the PEA survey.	Direct impacts: - Damage or disturbance of badger setts during construction works. - Accidental injury or mortality due to presence of excavations and/or plant/ vehicle movements.	- A full badger survey should be conducted within the footprint of the compound and within an additional 30-metre buffer zone of the site. - Fencing of construction area to prevent access by badgers to exposed excavations and encroachment of works into retained habitats.
	Stag beetle: - Records of stag beetles were identified within 2 km of the Teddington DRA scheme. - Suitable habitats (woodland, mature trees, hedgerows) and log piles along its western edge which could provide suitable habitat for the larval stage of stag beetle were identified during the PEA survey. Other notable terrestrial invertebrates: - Records of large heath, marsh fritillary, white-letter hairstreak, and brown hairstreak were identified within 2 km of the Teddington DRA scheme. - Suitable habitats including woodland (large heath and white letter hairstreak), mature trees, and scrub and hedgerows (brown hairstreak) were identified within the proposed compound. - Although records of brown hairstreak, large heath, and marsh fritillary were identified within 2 km of the scheme these species are restricted to the north and west of the UK so the records received are likely to be erroneous, captive release or rare migrant. Consequently, the species is unlikely to be present within the	Direct impacts: - Loss or disturbance of larval habitats which include rotting standing trees, stumps or logs. - Injury or mortality of larvae and/or adults (May to September) during site clearance. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of mature trees, standing deadwood/stumps, woodland, and hedgerows through scheme design where possible to minimise potential impacts. - Deadwood suitable for priority invertebrate species should be translocated to retained habitats and habitats within the areas of temporary loss re-instated on a like-for-like basis. - Fencing of retained adjacent habitats to reduce the potential for works encroachment. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create partially-buried log piles in suitable locations within the restored habitats.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	scheme footprint and are not considered further in the assessment.		
	Protected, notable, and invasive plant species: - Records of two species, bluebell and meadow clary (grassland) are listed under Schedule 8 of the Wildlife and Countryside act and three NERC act Section 41 Priority species: True Fox-sedge (wetland habitats), cornflower (grassland), Northern Hawk's-beard, and Greater Water-parsnip (wetland) - None of these species were identified during the UKHab surveys but suitable habitats (woodland, grassland, and waterbodies) were identified within the works footprint	Direct impacts: - Loss or disturbance of supporting habitats - Injury or mortality during site clearance and construction. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of woodland identified for other species would limit potential for impacts to/loss of bluebells if present - Construction best practice relating to control of dust and pollution prevention. - Fencing of retained adjacent habitats to reduce the potential for works encroachment
	Reptiles: - Records of barred grass snake, slow worm, and common lizard were identified within 2 km of the Teddington DRA scheme. - Suitable habitats (woodland, rough grassland, hedgerows and scrub) were identified within the works footprint.	Direct impacts: - Loss, damage or disturbance of supporting habitats. - Injury or mortality during site clearance. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of rough grassland, scrub, woodland, and hedgerows through scheme design where possible to minimise potential impacts. - The vegetation clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS). Phased site clearance using gradually reduced vegetation cuts to allow dispersal of reptiles if present. - Site clearance in areas containing suitable reptile hibernation features should not be undertaken during the hibernation period (October to March inclusive). - Fencing of retained adjacent habitats to reduce the potential for works encroachment - Construction best practice relating to control of dust and pollution prevention - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	European hedgehog: - Records of European hedgehog were identified within 2 km of the Teddington DRA scheme. - Suitable habitats (woodland, rough grassland, hedgerows and scrub) were present within the site footprint.	Direct impacts: - Loss, damage or disturbance of supporting habitats. - Injury or mortality during site clearance. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of scrub, woodland, and hedgerows through scheme design where possible to minimise potential impacts. - The vegetation clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS). - Site clearance in areas containing suitable hibernation features should not be undertaken during the hibernation period (October to March inclusive) - Fencing of retained adjacent habitats to reduce the potential for works encroachment - Construction best practice relating to control of dust and pollution prevention - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	Amphibians: - Records of common toad and great crested newts were identified within 2 km of the Teddington DRA scheme - Suitable habitats (woodland, rough grassland, and scrub) were identified within the works footprint. - No ponds or suitable breeding waterbodies were identified within the works footprint	Direct impacts: - Loss, damage or disturbance of supporting terrestrial habitats - Injury or mortality during site clearance Indirect impacts: - Habitat degradation from pollution including accidental spills and dust	- Pre-construction surveys to determine the presence/absence of protected or notable amphibian species within or adjacent to construction locations - Avoidance woodland, through scheme design where possible to minimise potential impacts - Construction best practice relating to control of dust and pollution prevention - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	Eurasian otter: - No records were identified within 2 km of the Teddington DRA scheme, but suitable habitats were identified during the PEA surveys	Direct impacts: - Damage or disturbance of Eurasian otter holts during construction works Indirect impacts:	- Pre-construction surveys to determine the presence/absence of Eurasian otter holts prior to construction works - Fencing of retained adjacent habitats to reduce the potential for works encroachment

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
		- Disturbance of foraging or commuting Eurasian otter due to construction noise or lighting - Habitat degradation through pollution during construction activities	- Construction best practice relating to control of dust and pollution prevention - Avoidance of night-time working adjacent to water courses bat roosts and high value foraging habitats - Lighting of construction site should be designed to minimise light spill on to adjacent riparian habitats
Teddington outfall site	Bats: - Species identified from GIGL records from within 2km of the scheme: serotine, Daubenton's, whiskered bat, Natter's bat, Leisler's, noctule, Nathusius' pipistrelle, common pipistrelle, soprano pipistrelle and brown long-eared - Suitable habitat that could support roosting and foraging bats were identified on site including woodland mature trees, and grassland	Direct impacts: - loss and/or disturbance of potential of bat roosts. - temporary and permanent loss of foraging or commuting habitats within site compound and permanent infrastructure. Indirect impacts: - Disturbance of foraging bats through noise and/or lighting during construction activities.	- It is recommended that a ground-based bat roost assessment is conducted on all the trees and structures located within 20-30m of any works areas. The aim of the survey will be to assess their potential to support roosting bats. - Construction best practice relating to control of dust and pollution prevention - Avoidance of night time working adjacent to bat roosts and high value foraging habitats - Lighting of shaft compounds should be designed to minimise light spill on to adjacent high value habitats.
	Stag beetle: - Records of stag beetles were identified within 2 km of the Teddington DRA scheme - Suitable habitats (woodland, mature trees, hedgerows) and log piles along its western edge which could provide suitable habitat for the larval stage of stag beetle were identified during the PEA survey. Other notable terrestrial invertebrates: - Records of large heath, marsh fritillary, white-letter hairstreak, and brown hair streak were identified within 2 km of the Teddington DRA scheme - Suitable habitats including woodland (large heath and white letter hairstreak), mature	Direct impacts: - Loss or disturbance of larval habitats which include rotting standing trees or logs. - Injury or mortality of larvae and/or adults (May to September) during site clearance. Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of mature trees, woodland, and hedgerows through scheme design where possible to minimise potential impacts. - Deadwood suitable for priority invertebrate species should be translocated to retained habitats and habitats within the areas of temporary loss re-instated on a like for like basis. - fencing of retained adjacent habitats to reduce the potential for encroachment. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
	trees, and scrub and hedgerows (brown hair streak) were identified within the proposed compound		
	Reptiles: - Records of barred grass snake, slow worm, and common lizard were identified within 2 km of the Teddington DRA scheme - Suitable habitats (woodland, grassland, and scrub) were identified within the compound footprint	Direct impacts: - Loss or disturbance of supporting habitats - Injury or mortality during site clearance Indirect impacts: - Habitat degradation from pollution including accidental spills and dust	- Pre-construction surveys to determine the presence/absence of reptiles, particularly slowworm, within shaft compounds with high value habitats e.g. woodland edges, scrub, rough grassland. - Avoidance of mature trees, woodland, and hedgerows through scheme design where possible to minimise duration of potential impacts from fragmentation and habitat loss. - The clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS). Phased site clearance using gradually reduced vegetation cuts to allow dispersal of reptiles if present. - Site clearance in areas containing suitable reptile hibernation features should not be undertaken during the hibernation period (October to March inclusive). - Fencing of retained adjacent habitats to reduce the potential for encroachment. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	European hedgehog: - Records of European hedgehog were identified within 2 km of the Teddington DRA scheme. - Suitable habitats (woodland, grassland, and scrub) were present within the site footprint.	Direct impacts: - Loss or disturbance of supporting habitats. - Injury or mortality during site clearance Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- Avoidance of mature trees, woodland, and hedgerows through scheme design where possible to minimise potential impacts. - The vegetation clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS).

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
			- Site clearance in areas containing suitable hibernation features should not be undertaken during the hibernation period (October to March inclusive). - fencing of retained adjacent habitats to reduce the potential for encroachment. - Construction best practice relating to control of dust and pollution prevention. - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	Amphibians: - Records of common toad and great crested newts were identified within 2 km of the Teddington DRA scheme. - Suitable habitats (woodland, grassland, and scrub) were identified within the compound footprint. - No ponds or suitable breeding waterbodies were identified within the compound footprint.	Direct impacts: - Loss or disturbance of supporting terrestrial habitats. - Injury or mortality during site clearance Indirect impacts: - Habitat degradation from pollution including accidental spills and dust.	- HSI surveys and eDNA of suitable waterbodies within 250 m to determine the presence/absence of protected or notable amphibian species within or adjacent to shaft compound locations. - Avoidance of mature trees, woodland, and hedgerows through scheme design where possible to minimise potential impacts. - The vegetation clearance should be supervised by a suitably experienced ecologist following a precautionary working method statement (PWMS). - Construction best practice relating to control of dust and pollution prevention - Retention of felled trees on site to be used to create log piles in suitable locations within the restored habitats.
	Eurasian otter: No records of were identified within 2 km of the Teddington DRA scheme but suitable habitats were identified during the PEA surveys.	Direct impacts: - Damage or disturbance of Eurasian otter holts during construction works. Indirect impacts: - Disturbance of foraging or commuting Eurasian otter due to construction noise or lighting.	- Pre-construction surveys to determine the presence/absence of Eurasian otter holts prior to construction works. - fencing of retained adjacent habitats to reduce the potential for encroachment. - Construction best practice relating to control of dust and pollution prevention.

Site name	Species records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
		- Habitat degradation through pollution during construction activities.	- Avoidance of night time working adjacent to water courses bat roosts and high value foraging habitats. - Lighting of compounds should be designed to minimise light spill on to adjacent riparian habitats.

5.2.2 Operation

No discernible impacts from the Teddington DRA scheme have been identified during operation of the scheme as no changes in water level have been identified along the River Thames and only negligible level changes in the Thames Tideway (see Annex B.2.1. Physical Environment Assessment Report). Localised changes in river flow/ velocity may impact on feeding success of Eurasian otters if present however, no discernible impacts have been identified.

Retained habitats which could support protected and or notable species (identified above in Table 5-4) adjacent to the permanent infrastructure associated with the conveyance route and TTP at Mogden STW would be subject to routine maintenance and plant operation activities which would require access by foot or light vehicle. Access within the Mogden STW would be via existing access points and routes.

Maintenance events are likely to be short term and infrequent so temporary disturbance effects that might occur to terrestrial habitats would be no greater than experienced during existing land use due to the location of the sites in urban areas or the current operation activities within the existing Mogden STW site. Potential ecological effects on terrestrial habitats arising from routine maintenance of new above-ground structures associated with Teddington DRA are therefore unlikely to be of a scale to result in discernible ecological effects above the existing baseline conditions.

5.3 BIRD ASSESSMENT

5.3.1 Construction

The main impact pathways from the construction of the Teddington DRA scheme on bird populations are direct habitat loss, noise, visual and vibration disturbance and indirect deterioration of habitat due to air pollution, dust and pollution incidents. Each element of the Teddington DRA scheme has been assessed in Table 5-5 below using species records (Environmental Records Centre, WeBS peak counts and statutory and non-statutory site information) and likely species presence based on habitat surveys outputs to determine potential impact pathways.

Table 5-5 Assessment of potential impact pathways to bird populations during construction of Teddington DRA.

Site name	Bird records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
Mogden Sewage Treatment Works (STW) TTP site	- Greenspace Information for Greater London (GiGL) records location not provided. - Construction proposed within the boundary of Mogden STW of Importance for Nature Conservation (SINC) which provides habitat for birds including warblers, finches, pipits, wagtails and waders in the woodland, scrub, grassland and riparian habitat present in the site.	Direct - Although works at Mogden STW do not directly overlap with woodland/ scrub habitat present some clearance may be required during construction. Therefore, loss of potential breeding habitat could occur and destruction of nests if present. Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- Any vegetation clearance required should be undertaken outside of the breeding bird season (March – early August inclusive). - If not possible, vegetation must be checked by a suitably experienced ecologist at least 24 hours prior to commencement of vegetation clearance. - If birds nest discovered, works may be suspended and suitable work exclusion buffer installed around the nest (buffer size is species dependent). - Works may only re-commence once the chicks have fledged and the supervising ecologist confirms that is nest is no longer in use. - Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - Measures will be taken to protect any temporary exposure of bare soil from runoff during heavy rainfall events. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution of groundwater or watercourses.
Teddington DRA conveyance route	- GiGL records location not provided.	N/A	N/A
	- Compound/ Shaft 2: Directly adjacent to River Thames and tidal tributaries SINC which broadly includes mudflats, shingle beach, intertidal vegetation, islands and river channel. Site is of particular importance for wildfowl and wading birds (no species-specific information provided). Construction proposed approximately 50 m from River Crane at St Margarets SINC and River Crane at St Margarets (Richmond side) SINC which is lined with trees and shrubs and kingfisher *Alcedo atthis* are frequently observed.	Direct – Permanent loss of modified grassland within the footprint of the shaft. However, due to the small area of habitat to be lost and lack of nesting opportunities, no discernible impacts on birds are anticipated from habitat loss. Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel). Potential for increased sediment input	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution of groundwater or watercourses. - Measures will be taken to protect any temporary exposure of bare soil from runoff during heavy rainfall events.

Site name	Bird records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
		during earthworks into the River Thames and tidal tributaries SINC.	
	- Compound/ Shaft 3: Construction proposed within boundary of Moor Mead Recreation Ground SINC which consists of woodland and managed short grass. Birds such as blackbird *Turdus merula*, collared dove *Streptopelia decaocto*, blue tit *Cyanistes caeruleus*, chaffinch *Fringilla coelebs* and rose-ringed parakeet *Psittacula krameria* have been recorded at the site. River Crane at St Margaret's SINC is approximately 7 m from construction works proposed (Richmond side, see description for Compound 2).	Direct – Loss of habitat within footprint of Compound 3 at Moor Mead Recreation Ground. As short sward grassland present and high anthropogenic activity in the area, limited nesting potential identified. Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution of groundwater or watercourses.
	- Compound/ Shaft 4: Construction directly adjacent to the River Thames and tidal tributaries SINC (see description for Compound 2) and Ham Lands Local Nature Reserve (LNR) which consists of an infilled gravel pit, old water meadow and woodland. Birds are not mentioned in citation, however, Ham Lake has been identified as an open waterbody that could support nationally important populations of gadwall and shoveler associated with the South West London Waterbodies SPA. Construction approximately 30 m from Petersham Lodge Wood and Ham House Meadows SINC is a diverse wet woodland that floods on high spring tides. Birds are not mentioned in citation, however, it is likely to support breeding bird populations.	Direct – Permanent loss of modified grassland within the footprint of the shaft. However, due to the small area of habitat to be lost and lack of nesting opportunities, no discernible impacts on birds are anticipated from habitat loss. Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- Screening and noise dampening equipment should be used to minimise noise disturbance and dust emissions. - All vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution of groundwater or watercourses.
	- Compound/ Shaft 6 and 7: Construction of Compound/ Shaft 6 approximately 170 m from Ham Lands LNR (see description for Compound/ Shaft 4) and Compound/ Shaft 7 within the site boundary.	Direct – Permanent loss of neutral grassland, within footprint of shaft 6 and 7 at Ham Lands LNR. Temporary loss of scattered scrub and possibly trees (if reinstated). Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- As above for Mogden STW.

Site name	Bird records and relevant statutory/ non-statutory sites	Potential impact pathway	Survey requirements and mitigation measures
Teddington intake point	- GiGL records location not provided. - Construction within the site boundary of Ham Lands LNR (see description for Compound/ Shaft 4).	Direct - Permanent loss of woodland, grassland and riparian habitat within the footprint of Ham Lands LNR at Teddington intake point. Potential impacts on river bank stability and increased sediment input into the river potentially smothering supporting habitat for waterbirds. Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- As above for Mogden STW. - Minimise removal of riparian vegetation to avoid damage to bank stability and sediment loading in the river. If necessary to remove, reinstate riparian vegetation. - Minimise duration of any necessary in-channel working to avoid compaction, disruption of flow processes and bank erosion.
Teddington discharge point	- GiGL records location not provided. - Construction within the site boundary Ham Lands LNR (see description for Compound/ Shaft 4).	Direct - Permanent loss of woodland, grassland and riparian habitat within the footprint of Ham Lands LNR at Teddington discharge point. Potential impacts on river bank stability and increased sediment input into the river potentially smothering supporting habitat for waterbirds. Indirect - Noise, vibration and visual disturbance and exposure to pollution (air, dust, lubricants, detergents, cement, fuel).	- As above for Mogden STW. - Minimise removal of riparian vegetation to avoid damage to bank stability and sediment loading in the river. If necessary to remove, reinstate riparian vegetation. - Minimise duration of any necessary in-channel working to avoid compaction, disruption of flow processes and bank erosion.

5.3.2 Operation

No discernible impacts from the Teddington DRA scheme have been identified during operation of the scheme as no changes in water level have been identified along the River Thames and only negligible level changes in the Thames Tideway (see Annex B.2.1. Physical Environment Assessment Report). Localised changes in river flow/ velocity may impact on feeding success of divers and dabbling ducks if present however, no discernible impacts have been identified.

5.4 SUMMARY OF TERRESTRIAL ECOLOGY ASSESSMENT OF THE TEDDINGTON DRA SCHEME

The construction of the Teddington DRA scheme including the construction of a TTP at Mogden STW, conveyance route and intake and outfall will result in the direct loss of lower distinctiveness habitats including neutral grassland, modified grassland, scrub and urban habitats. No direct impact pathways were identified to statutory designated sites; however, a number of non-statutory sites were identified within 2 km of the scheme. These included Mogden Sewage Works SINC, River Thames and Tidal Tributaries SINC, River Crane at St Margaret's SINC and Ham Lands LNR. Hedgerow priority habitat was also recorded at Shaft/ Compound 4, Shaft/ Compound 5, and Shaft/ Compound 6 and lowland mixed deciduous woodland priority habitat was identified at Shaft/ Compound 4, Shaft/ Compound 6 and Shaft/ Compound 7. Hedgerows and deciduous woodland could support birds and bats as foraging, roosting and nesting habitat, plus provide commuter routes through the landscape. Species records received within 2 km of the Teddington DRA scheme include bats, birds, reptiles, amphibians, hedgehog, stag beetle, and protected or notable plant species. As the locations of species records were not provided by GiGL, the search areas for the Teddington DRA scheme and Mogden water recycling scheme overlapped, so it is not possible to determine which options the records are in relation to.

Temporary and permanent habitat loss would occur within the footprint of compounds and shafts respectively. Where possible, the removal of woodland and scrub should be avoided when considering the footprint of compounds and shafts. Hard standing and modified grassland is present in the footprint of a number of compounds and shafts, which has low ecological value. However, where compounds and shafts are located close to ecological receptors, additional mitigation measures should be implemented to avoid impact pathways to supporting habitat.

6 CURRENT KNOWLEDGE GAPS AND FUTURE INVESTIGATIONS AT GATE 3

6.1 OVERALL SUMMARY

The habitats, designated sites (statutory and non-statutory) and protected, notable and invasive species including riparian mammals and birds have been assessed to determine the potential construction and operational impacts of the Beckton water recycling, Mogden water recycling and Teddington DRA schemes on the terrestrial environment. Both desk-based data searches and field survey outputs have informed the assessment and identification of data gaps and future recommendations for Gate 3.

6.2 DATA GAPS

The following data gaps have been identified during completion of the terrestrial assessment of Beckton water recycling, Mogden water recycling and Teddington DRA schemes:

- GiGL protected species data for Teddington DRA and Mogden were merged, and no spatial information provided. This limited the ability to assess species presence within close proximity of each option.
- A PEA was not completed for Mogden water recycling scheme components (due to the longer proposed scheme delivery programme).
- Some UKHab surveys were not completed during the optimal time of year to assess annual flowering plants. Therefore, repeat surveys are recommended during spring and summer.
- No WeBS data is available for Barking Creek, adjacent to Beckton STW.
- Design changes since the UKHab survey at Mogden STW site were undertaken meant that Shaft/ Compound 1 is now outside of the surveyed area and so, no baseline habitat data was available.
- The need for more detailed species surveys has been identified for certain taxa at certain sites.

6.3 RECOMMENDATIONS

6.3.1 Beckton water recycling scheme

Based on the data gaps identified above, the following data requests and additional surveys are recommended at Gate 3:

- For the works to be compliant with the legislation and planning policy relating to the findings of the PEA, it is recommended that further surveys are conducted for great crested newts, badger, bats, kingfisher and riparian mammals on site following current best practice guidelines. Supporting habitat for breeding Cetti's warbler and kingfisher has been identified within the footprint of the works, for example, and both are WCA Schedule 1 species protected from disturbance.
- Wintering bird surveys are also recommended at Barking Creek where there is potential functionally linked mudflat and saltmarsh habitat for the Thames Estuary and Marshes SPA and Ramsar site qualifying features, plus at reservoirs associated with the Lee Valley SPA. Vantage point surveys should be positioned within close proximity of proposed construction works (where possible) and should cover the extent of the habitat where noise levels are predicted to increase significantly above ambient noise conditions. Distributional data overlayed with noise impact assessment outputs will enable quantification of potential impacts due to construction disturbance. See the Habitats Regulations Assessment Report[31] for more detail.

6.3.2 Mogden water recycling scheme

Based on the data gaps identified above, the following data requests and additional surveys are recommended at Gate 3:

[31] Ricardo Energy and Environment (2022). London Effluent Reuse SRO, Habitats Regulations Assessment. Report for Thames Water Utilities Ltd.

- Protected species data request with specific 2 km and 5 km buffers around the footprint of Mogden water recycling scheme and grid references from GiGL.
- Ground-based bat roost assessment, hazel dormouse, great crested newts, reptile, bird, water vole, otter, and badger surveys at AWRP and Shaft/ Compound sites where supporting habitat has been identified.
- Wintering bird surveys are recommended at South West London Waterbodies SPA and Ramsar site to determine the distribution of qualifying features (gadwall and northern shoveler). Vantage point surveys should be positioned within close proximity of proposed construction works (where possible) and should cover the extent of the habitat where noise levels are predicted to increase significantly above ambient noise conditions. This can be overlayed with noise impact assessment outputs to enable quantification of potential impacts due to construction disturbance. See the Habitats Regulations Assessment Report[32] for more detail.
- A PEA to be completed for Mogden water recycling.
- UKHab survey required at Shaft/ Compound 1 to determine the type of habitat present within the area of permanent loss.

6.3.3 Teddington DRA

Based on the data gaps identified above, the following data requests and additional surveys are recommended at Gate 3:

- Protected species data request with specific 2 km and 5 km buffers around the footprint of Teddington DRA and grid references from GiGL.
- Badger, ground-based bat roost assessment, reptile, great crested newt, otter, and breeding bird surveys (with particular interest in red kite) at Mogden STW and Shaft/ Compound sites where supporting habitat has been identified.
- Site walkover at Ham Lake to determine if there is potential to support qualifying gadwall and northern shoveler of the South West London Waterbodies SPA.
- UKHab survey required at Shaft/ Compound 1 to determine the type of habitat present within the area of permanent loss.

[32] Ricardo Energy and Environment (2022). London Effluent Reuse SRO, Habitats Regulations Assessment. Report for Thames Water Utilities Ltd.

APPENDIX A – NATIONAL LEGISLATION

The Wildlife & Countryside Act 1981 (as amended)

Provides for **designation** and protection of Sites of Special Scientific Interest (SSSI), which are areas that represent the most valuable habitats in the UK for nature conservation.

The Act creates the following **offences:**

- To intentionally kill, injure, or take any wild bird or their eggs or nests (with exception to species listed in Schedule 2). Special penalties are available for offences related to birds listed on Schedule 1, for which there are additional offences of disturbing these birds at their nests, or their dependent young.
- To intentionally or recklessly kill, injure, or take, possess, or trade in any wild animal listed in Schedule 5, and intentionally or recklessly interfere with places used for shelter or protection, or disturb animals occupying such places.
- Certain methods of killing, injuring, or taking wild animals listed in Schedule 6.
- To pick, uproot, trade in, or possess (for the purposes of trade) any wild plant listed in Schedule 8, and prohibits the unauthorised intentional uprooting of such plants.
- The release of certain non-native animals and planting of plants listed in Schedule 9.

It also provides a mechanism making any of the above offences legal through the granting of licences by the appropriate authorities.

Conservation of Habitats and Species Regulations 2017 (as amended)

The principal means by which the European Habitats Directive is transposed in England and Wales. The 2017 Regulations were amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations in 2019.

Provide for the **designation** and protection of a network of 'European Sites' (also termed Natura 2000), including Special Areas of Conservation (SAC) and Special Protection Areas (SPA).

Regulation 43 creates the following offences relating to European Protected Species (EPS):

- deliberately capture, injure or kill any wild animal of a European Protected Species;
- deliberately disturb animals of any such species in such a way as to be likely to:
    - impair their ability to survive, breed, rear or nurture their young, hibernate or migrate, or
    - significantly affect the local distribution or abundance of the species to which they belong;
- deliberately take or destroy the eggs of such an animal; or
- damage or destroy a breeding site or resting place of such an animal.

The Regulations also make it an offence (subject to exceptions) to deliberately pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 5.

However, the actions listed above can be made lawful through the granting of licences (European Protected Species Licence) by the appropriate authorities (Natural England in England). Licences may be granted for a number of purposes, but only after the appropriate authority has determined that the following regulations are satisfied:

- the works under the licence are being carried out for the purposes of ‘preserving public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment’.
- there is ‘no satisfactory alternative’
- the action 'will not be detrimental to the maintenance of the population of the species concerned at favourable conservation status in their natural range'.

To apply for a licence, the following information is required:

- The species concerned.
- The relative size of the population at the site (note this may require a survey to be carried out at a particular time of the year).
- The impact(s) (if any) that the development is likely to have upon the populations.
- What measures will be conducted to mitigate for the impact(s).

The Protection of Badgers Act 1992

This makes it an offence to wilfully kill, injure, take, possess or cruelly ill-treat a badger, or to attempt to do so and to intentionally or recklessly interfere with a sett. Sett interference includes disturbing badgers whilst they are occupying a sett, as well as damaging or destroying a sett or obstructing access to it.

Under Section 10 (1)(d) of the Protection of Badgers Act 1992, a licence may be granted by Natural England to interfere with a badger sett for the purpose of development, as defined by Section 55(1) of the Town & Country Planning Act 1990.

The Wild Mammals (Protection) Act 1996

The Wild Mammals (Protection) Act 1996 makes it an offence for any person to mutilate, kick, beat, nail or otherwise impale, stab, burn, stone, crush, drown, drag or asphyxiate any wild mammal with intent to inflict unnecessary suffering.

The Animal Welfare Act 2006

This imposes a duty of care on anyone responsible for an animal to take reasonable steps to ensure that the animal's needs are met. This means that a person has to look after the animal's welfare and ensure that it does not suffer. The Act says that an animal's welfare needs include:

- a suitable environment;
- a suitable diet;
- the ability to exhibit normal behaviour patterns;
- any need it has to be housed with, or apart from, other animals; and
- protection from pain, suffering, injury and disease.

With regards to development, this may have implications when capture and translocations of animals are proposed.

Nature Environmental and Rural Communities (NERC) Act 2006

Section 40 of the NERC Act 2006 requires public bodies "to have regard to" the importance of conserving biodiversity in England when undertaking their functions. Local planning authorities should use the list of species and habitats of principal importance (section 41) to identify those that require special consideration when making decisions.

The NERC Act 2006 also imposes a duty to conserve biodiversity and Section 41 (S41) of the Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The list (including 56 habitats and 943 species) has been drawn up in consultation with Natural England and draws upon the UK BAP List of Priority Species and Habitats. The Section 41 list should be used to guide decision-makers such as local and regional authorities when implementing their duty: to have regard to the conservation of biodiversity in the exercise of their normal functions – as required under Section 40 of the NERC Act 2006.

Natural Environment White Paper

The Natural Environment White Paper "The Natural Choice: securing the value of nature" (Her Majesty's Government, June 2011) sets out the direction to establish an institutional framework to achieve the recovery of nature, including through:

- Establishing Local Nature Partnerships to strengthen local action and raise awareness about the services and benefits of a healthy natural environment.
- Creation of Nature Improvement Areas (NIAs) to enhance and reconnect nature on a landscape scale. Note that no NIA applies to the study area covered in this report.
- Reforms of the planning system to take a strategic approach to planning for nature within and across local areas. This approach will guide development to the best locations, encourage greener design and enable development to enhance natural networks.

National Planning Policy Framework (2021)

This framework replaces the previous National Planning Policy Framework (NPPF) published in March 2012, revised in July 2018 and updated in February 2019 and sets out the government's planning policies for England.

The NPPF states that development plan policies and planning decisions should be based upon up-to-date information about the environmental characteristics of their areas, including biodiversity. It also states that the aim of planning decisions should be to prevent harm to biodiversity conservation interests and to 'promote the preservation, restoration and re-creation of priority habitats, ecological networks and the recovery of priority species'. All plans should promote a sustainable pattern of development that seeks to: meet the development needs of their area; align growth and infrastructure; improve the environment; mitigate climate change (including by making effective use of land in urban areas) and adapt to its effects.

Where determining planning applications, local planning authorities should aim to conserve and enhance biodiversity by applying the following principals; 'if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused'; and, 'planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss'.

This means that full ecological surveys should be carried out and suitable mitigation measures proposed prior to any planning application being submitted.

Circular 06/05 on Biodiversity and Geological Conservation - Statutory Obligations and Their Impact Within the Planning System provides administrative guidance on the application of the law relating to planning and nature conservation as it applies in England. It complements NPPF.

Biodiversity 2020: A strategy for England's wildlife and ecosystem services

This biodiversity strategy for England builds on the Natural Environment White Paper and the earlier UK Biodiversity Action Plan. It provides a comprehensive picture of how Government is implementing our international and EU commitments and sets out the strategic direction for biodiversity policy up to 2020. Its mission is to:

"*halt overall biodiversity loss, support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people*."

In relation to planning and development its priority is to:

"*take a strategic approach to planning for nature within and across local areas. This approach will guide development to the best locations, encourage greener design and enable development to enhance natural networks. We will retain the protection and improvement of the natural environment as core objectives of the planning system*."

Environment Act 2021

The Environment Bill has been given Royal Assent to become the Environment Act 2021 in November 2021. The Act includes a target to halt the decline of nature by 2030, and mandates a 10% Biodiversity Net Gain for developments.

Biodiversity elements in the Act include:

- Strengthened biodiversity duty.
- Biodiversity net gain to ensure developments deliver at least 10% increase in biodiversity.
- Local Nature Recovery Strategies to support a Nature Recovery Network.
- Duty upon Local Authorities to consult on street tree felling.
- Strengthen woodland protection enforcement measures.
- Conservation Covenants.
- Protected Site Strategies and Species Conservation Strategies to support the design and delivery of strategic approaches to deliver better outcomes for nature.
- Prohibit larger UK businesses from using commodities associated with wide-scale deforestation.

Requires regulated businesses to establish a system of due diligence for each regulated commodity used in their supply chain, requires regulated businesses to report on their due diligence, introduces a due diligence enforcement system.

APPENDIX B – NOTABLE AND DESIGNATED PLANT RECORDS

Protected and notable plant species identified within 2 km of the Beckton Water recycling Scheme conveyance route

Common name	Scientific name	Designation	Recorded within 2 km of conveyance route?
Bluebell	*Hyacinthoides non-scripta*	W&CA Sch8	Yes
Golden dock	*Rumex maritimus*	RedList_GB_post2001-LC	Yes
Chicory	*Cichorium intybus*	RedList_GB_post2001-LC	Yes
Hoary cinquefoil	*Potentilla argentea*	Local Spp of Cons Conc RedList_GB-Lr(NT)	Yes
Jersey cudweed	*Gnaphalium luteoalbum*	W&CA Sch8	Yes
Musk stork's-bill	*Erodium moschatum*	RedList_GB_post2001-LC	Yes
Wild pansy	*Viola tricolor*	Local Spp of Cons Conc RedList_GB-Lr(NT)	Yes
Round-fruited rush	*Juncus compressus*	Local Spp of Cons Conc RedList_GB-VU	Yes
Wild clary	*Salvia verbenaca*	RedList_GB_post2001-LC	Yes

Protected and notable plant species identified within 2 km of the Mogden Water recycling and Teddington DRA schemes received from GIGL with the most recent records occurring between 2012 and 2022.

Taxon Name	Common Name	Designation	Total number of occurrences	Date of most recent record
Carex vulpina	True Fox-sedge	NERC Act Section 41 RedList_GB-VU Nationally Rare	1	21/07/2012
Centaurea cyanus	Cornflower	NERC Act Section 41 LPS Local Spp of Cons Conc	5	Mar 2017-Jun 2017
Cerastium cerastoides	Starwort Mouse-ear	Nationally Scarce	1	12/05/2014
Crepis mollis	Northern Hawk's-beard	NERC Act Section 41 RedList_GB-EN Nationally Rare	1	21/07/2012
Cyperus longus	Galingale	Local Spp of Cons Conc RedList_GB-Lr(NT) Nationally Scarce	5	10/07/2012
Glebionis segetum	Corn Marigold	Local Spp of Cons Conc RedList_GB-VU	2	10/07/2012
Hyacinthoides non-scripta	Bluebell	W&CA Sch8	46	Mar 2017-Jun 2017
Marrubium vulgare	White Horehound	Local Spp of Cons Conc Nationally Scarce	2	28/06/2017
Salvia pratensis	Meadow Clary	W&CA Sch8 Local Spp of Cons Conc RedList_GB-Lr(NT) Nationally Scarce	2	13/06/2012
Sium latifolium	Greater Water-parsnip	NERC Act Section 41 LPS Local Spp of Cons Conc RedList_GB-EN Nationally Scarce	1	10/07/2012
Tilia platyphyllos	Large-leaved Lime	Nationally Scarce	188	01/01/2020
Trifolium glomeratum	Clustered Clover	Local Spp of Cons Conc Nationally Scarce	2	01/07/2014

T: +44 (0) 1235 75 3000
E: enquiry@ricardo.com
W: ee.ricardo.com