River Thames Scheme

Protecting our communities
Securing our economy
Enhancing our Thames

Preliminary Environmental Information Report

Volume 4
Appendix 5.1

Environmental Baseline Surveys to Date

Contents

Environmental Baseline Surveys to Date

1 Introduction

1.1.1 This document provides a description of the surveys for the River Thames Scheme (RTS) that have been completed (or at least commenced) up to August 2023.

2 Air Quality

Table 2-1: Air quality surveys

Survey Undertaken	Survey Description	Date Completed
Nitrogen dioxide survey	A six-month Nitrogen dioxide (NO_2) diffusion tube survey is being undertaken on roads at and around the project area, at nine monitoring locations. The monitoring locations were agreed following consultation with the relevant local planning authorities (LPAs). The survey commenced in June 2023 and will be completed in early December 2023.	Ongoing until December 2023

3 Biodiversity

Table 3-1: Habitat surveys

Survey Undertaken	Survey Description	Date Completed
Phase 1 Habitat Surveys	A range of Extended Phase 1 Habitat Surveys have been undertaken across the study area since 2014 and reported within Preliminary Ecological Appraisal (PEA) reports. Many of these had become invalid due to the time elapsed since the surveys were undertaken. Phase 1 Habitat Validation Surveys were therefore undertaken for the whole project area (as it was then) in 2020 with a range of habitats recorded across the study area. The purpose of the surveys was to identify any significant changes in habitat types or land management regimes since the original surveys were undertaken and inform the need for any additional survey requirements. Phase 1 Habitat surveys resulted in several recommendations for further habitat and protected species surveys as noted in rows below.	PEA and P1HS plans for weirs completed in September 2014 PEA and P1HS plans for channel sections and adjacent areas completed May-September 2015 PEA and P1HS plans for the Landscape Enhancement Areas and Laleham Golf Course/Desborough Island in 2018 PEA and P1HS of bed lowering downstream of Desborough Cut and Ankerwycke Validation surveys of whole project area in May-September 2020 (following trial validation survey of six areas in October 2019) P1HS were undertaken for the whole project boundary plus eleven originally shortlisted HCAs in 2020.
UKHab Survey (including hedgerows)	In summer 2020, UKHab polygon and linear habitats mapped for project red line area (as it was then, including 14 originally shortlisted potential HCAs). Condition of habitats was also assessed in order to inform	Summer 2020 and summer 2022 and summer 2023

Survey Undertaken	Survey Description	Date Completed
	Defra Biodiversity 3.0 Biodiversity Net Gain (BNG) calculations. Associated Maps produced and updated by Binnies. Surveys were repeated in summer 2022 to take account of all areas within the project boundary for EIA scoping to inform updated BNG calculations. Habitats surveyed were generally consistent with widespread broad habitats known within southern England. Validation surveys have been completed at certain sites in 2023.	
River Condition Assessment	This survey assesses the type and condition of all rivers and ditches present within the project boundary (as it was in 2019, including all rivers/ditches within 14 originally shortlisted potential HCAs). Condition scores were used to inform Defra BNG Metric 2.0 and Metric 3.0 and the WFD related surveys. Surveys were repeated for all relevant watercourses within the project boundary for EIA scoping in summer 2022.	Autumn 2019 and summer 2022

Table 3-2: Terrestrial species surveys

Survey Undertaken	Survey Description	Date Completed
Terrestrial INNS (JBA)	Terrestrial Invasive Non-Native Species (INNS) surveys were completed in 2017/18 and found to be widespread along the proposed flood channel corridor and downstream weir areas. Problem species present included Japanese knotweed, Himalayan balsam, American mink and giant hogweed. Other less problematic INNS were also identified that are either naturalised or restricted in their extent such that they are not considered to pose a risk to the project. Japanese knotweed and other notable INNS were subsequently surveyed across the main project area in autumn 2019 and summer 2020. Incidental finds of INNS were also reported if found during any other surveys. Various other terrestrial (and aquatic) INNS have been identified across the study area and records sent to the Environment Agency for inclusion in the Japanese knotweed eradication programme.	Surveys of main project areas (flood channels and weirs) in 2017/2018 Repeat surveys undertaken in autumn 2019 and summer 2020 for Japanese knotweed and other notable species.
Terrestrial INNS (Binnies)	Terrestrial INNS surveys were conducted at 10 of the originally shortlisted HCAs (note: Sheepwalk East was not surveyed specifically as INNS had been recorded as part of other aquatic surveys recently undertaken however, all results were reported together). Project boundary for EIA scoping surveyed in summer 2022. INNS found to be widespread across the project boundary for EIA Scoping including common species previously recorded.	July/August 2021 and 2022 Terrestrial and Aquatic INNS surveys carried out across the area within the project boundary for EIA scoping in 2022.
Bats	Main RTS channel corridor surveyed in 2017-18. Dusk/dawn activity surveys undertaken on all trees classified as having moderate or high bat roost potential. Transect surveys and remote bat detector surveys undertaken in Optimal Foraging Areas.	Scoping surveys undertaken April-May 2017 and dawn dusk surveys across project area August-September 2017.

Survey Undertaken	Survey Description	Date Completed
	Additional trees within the new green open spaces and the originally shortlisted HCAs that were not previously surveyed, and which have been highlighted as potentially requiring removal, were subject to suitability surveys and emergence surveys in late-summer 2018. Additional identified buildings and a small number of remaining trees were surveyed in 2019. Note: Two buildings and one tree were unable to be fully surveyed in 2021 due to landowner opposition and health and safety restrictions. Further surveys were scoped to be undertaken in 2022, including: • To assess two residential dwellings (not subject to survey previously due to lack of access, to assess for potential for roosting bats. • To assess approximately 6 bridges and 12 culverts for their suitability to support roosting bats (including hibernating bats). Additional bridges and culverts encountered that have not been identified within this scope should also be assessed if subject to impact. • Identify Potential Roost Features (PRFs) and potential ingress and egress points, upon all structures listed above. • Identify structures (as above) where dusk/dawn emergence and re-entry surveys are required. • Confirm presence or likely absence of roosting bats within identified PRFs. • To identify suitable locations for placement of static bat detectors within the woodland habitats identified above. • Obtain static monitoring data for all woodland habitats proposed to be lost to confirm which species of bats are using these habitats. • To confirm presence or likely absence of Bechstein bats in the RTS area using data from the static and transect surveys. Static detector, preliminary roost assessment and emergence/re-entry surveys are ongoing through the 2023 survey season.	Additional dawn/dusk surveys carried out August/September 2018 on trees missed in 2017. Buildings and a small number of additionally identified trees were surveyed in 2019. Daytime scoping assessments (including ground-based tree assessments and preliminary roost assessments of buildings and culverts) were undertaken in 2021 (BL Ecology). Subsequent tree climbing and dusk emergence/dawn re-entry surveys undertaken May-September 2021. Transect surveys were undertaken monthly from May-August. All previously re-confirmed roosts and structures were also re-surveyed in 2021 (if not already covered by the above). Further Bat Preliminary Roost Assessments were scoped to take place in 2022. Due to presence of other protected species and ongoing surveys, bat PRAs on a number of culverts and woodland areas are restricted until 2023. Further PRA, emergence and re-entry surveys have been undertaken in 2022 and 2023.
Bat Transect Surveys (11 x HCAs)	Bat activity transect surveys undertaken on 11 originally shortlisted HCAs to provide an overview of species diversity, activity and usage of specific habitat types within the individual HCAs.	Spring, Summer, Autumn 2021
Dormice	Dormouse nest tube surveys undertaken in suitable habitats located at: • Mead Lake Woodland • Woodland adjacent to Lake South of Norlands Lane (Thorpe Park) • Manor Farm • Funky Footprints Surveys were carried out in accordance with Bright (2006).	Spring, Summer, Autumn 2021

Survey Undertaken	Survey Description	Date Completed
Badger	The project boundary (as it was at the time) was surveyed (except for the new green open spaces, HCAs or construction access routes). Presence/Likely absence surveys were undertaken winter 2022/early 2023. Badger camera surveys carried out in Feb-Mar 2023.	May-September 2017 and October 2018 Winter 2022/2023 and February - March 2023
Otter	Previous surveys carried out in 2017 and 2018 on the main RTS channel alignment. Otter scoping surveys were undertaken in March/April 2022 where suitable habitats are present throughout the project boundary for EIA scoping. This found confirmed otter presence across the project area, therefore camera trapping was undertaken across the project boundary in June/July 2022. This found presence of otters and therefore holt searches were recommended and completed in October 2022. Otter camera surveys on holt locations were undertaken in January-February 2023.	June - August 2017 and October 2018 March/April 2022 and June/July 2022 October 2022 and February 2023
Water Vole	Surveys were undertaken at 15 suitable habitats across the study area, including the main project area and originally shortlisted HCAs. Due to survey limitations associated with the spring survey, water vole latrine raft surveys were carried out in August and September 2021. In 2022, surveys were updated to focus on The Cut, Abbey River, Pool End Ditch and Engine River, where these watercourses were considered potentially subject to impacts affecting the bank face, bank top and/or removal of any emergent/marginal vegetation	June-August 2017 May-September 2021 and 2022
Great Crested Newts (GCN)	Habitat suitability index (HSI) surveys were initially undertaken for all ponds within 500m of the RTS project boundary (plus the originally shortlisted HCAs) where ponds were previously assessed as ‘poor’, were dry or access was unavailable in 2017 (52 waterbodies in total). Where ponds included in the 2021 HSI survey show suitability of below average or above these were re-surveyed by eDNA in April 2021 (38 waterbodies in total). Further HSI and resultant eDNA surveys of 62 ponds were completed in April 2023.	June -August 2017 Repeat surveys undertaken in 2021 April 2023
Reptiles (AECOM)	Surveys undertaken spring 2021 at Location 1: Royal Hythe, Location 2: Area south of Thorpe Hay Meadow, Location 3: Abbey Meads, Location 4: Area south of Sheepwalk lakes, Location 5: Manor Farm, Location 6: Area west of Ferry Lane lake (also known as Ferris Meadow lake).	Surveys completed May-July 2017. Additional surveys carried out in 2019 to cover areas previously missed (including the new green open spaces and Desborough Island/Laleham Golf Course).
Reptiles (Binnies)	Reptile surveys were carried out across seven of the originally shortlisted HCA sites between May and September 2021. Four of the originally shortlisted HCAs were scoped out from the reptile surveys as no suitable habitat was present.	Repeat surveys of the area within the project boundary (including originally shortlisted HCAs) undertaken in 2021

Survey Undertaken	Survey Description	Date Completed
	Reptile surveys of accessible suitable habitat across the proposed RTS scheme boundary were undertaken in 2023.	Reptile surveys of accessible suitable habitat in 2023.
Terrestrial Invertebrates	The initial surveys were undertaken in two periods; the first in mid-July 2017, and the second in early August 2017. Each location was visited once during this period and consisted of recording biotopes (e.g. woodlands), habitats (e.g. deciduous woodland) and features (e.g. wood decay resource) likely to be of importance for terrestrial invertebrates, supplemented by active collecting and direct observation. A wide range of taxa were collected, primarily by aerial sweep-netting, direct observation and some vacuum sampling, given the need to visit many sub-sites; and the primary objective of identifying which sites would merit further, more detailed survey. This informed a preliminary evaluation of each location's potential value for terrestrial invertebrate assemblages with more detailed surveys completed between late April 2019 and late June 2019 at ten sub-sites and the three weir areas. Methods included aerial netting for mobile taxa such as flies, bees and wasps, but also vacuum sampling, beating vegetation, sweep-netting to collect beetles, bugs, spiders and other groups. Taxa that can be reliably identified in the field such as butterflies were recorded but not collected. An invertebrate survey of 15 sites within/close to the RTS project boundary was undertaken by Richard Jones in 2021. The purpose of the survey was to assess the invertebrate diversity of the site. An updated terrestrial invertebrate survey was undertaken at eight of the originally shortlisted HCAs from May-September 2021 by Richard Wilson, using a variety of methods including aerial netting, sweeping vegetation, vacuum sampling and direct observation. Surveys in 2023 are ongoing.	July to August 2017. Sub-sites were surveyed April-June 2019 to cover the whole survey season. Repeat surveys undertaken in 2021. Invertebrate surveys for notable species within areas of suitable foraging habitat as identified in the PEA were carried out in 2023.
Hairstreak Butterfly	Surveys were carried out in November and December 2020 and January 2021 by JBA consulting. 14 survey locations were identified within 200m of the of the flood relief channels. Survey methods included an egg search, habitat assessment and desk study search.	Specialist hairstreak butterfly egg survey in December 2018-January 2019. Follow up surveys undertaken April-June 2019. Repeat surveys undertaken in winter 2020-2021 Egg surveys undertaken in Nov-Dec 2022.
Stag Beetle	Stag beetle surveys were carried out in May 2021. Eight of the originally shortlisted HCA sites were selected for survey on the presence of houses with gardens and/or parkland in close proximity. Scoping and stag beetle surveys undertaken of suitable habitat in project boundary for PEIR in summer 2023.	Scoping survey of main project area in 2019. (JBA Consulting, 2021b). A scoping survey for stag beetle was undertaken in 2019 HCA surveys in 2021 Scoping and stag beetle surveys in summer 2023.

Survey Undertaken	Survey Description	Date Completed
Botany / NVC	Botany surveys were undertaken at Datchet water intake (1.36ha), Ham (Teddington) (10.29ha), Sunbury (4 sites) (9.65ha), Hurst Park (5.06ha), Thorpe Hay Meadow East (0.56ha), Thorpe Hay Meadow south (1.83ha). NVC surveys of habitats identified in the UK Habitats Classification survey as requiring more detailed classification were undertaken in summer 2023.	Main survey areas surveyed in July 2017 and additional survey of Royal Hythe new green open space in July 2018. NVC surveys in summer 2023
Galingale	Channel Section 1, which is no longer part of the project, was fully surveyed for galingale. The two native species, sweet galingale and brown galingale, were not found in Channel Section 1 and have not been seen anywhere else within the RTS corridor. A survey at Royal Hythe (Runnymede Channel) was also undertaken due to the potential for Brown Galingale to be present but none was identified. No other areas within the project boundary were considered to have the potential to support brown galingale.	October 2017

Table 3-3: Avian species surveys

Survey Undertaken	Survey Description	Date Completed
Breeding Birds (APEM/AECOM) (main project area)	APEM carried out breeding bird surveys in 2017. In 2019 additional surveys were carried out to target areas not previously covered. Bird species targeted as part of the survey were based on a combination of desk study including local records data and other surveys that have taken place (e.g. PEAs). This considered likelihood of species occurring and legislative protections, however all bird species recorded on the land and water were recorded as part of the survey. As part of the 2019 surveys, a series of 17 target areas for survey were selected based on the desk study and knowledge of the area based on previous surveys. Eight of these locations were within/near to the Runnymede or Spelthorne Channel areas (with the remainder forming part of the former Channel Section 1 area). Target locations include Thorpe Hay Meadow, St Ann's Lake, Abbey 1 north, Laleham Golf Course, Abbey Meads, Manor Farm, Desborough Island and an area to the south of Desborough Cut. Twelve sub-areas of habitat within the project boundary were covered and repeated by AECOM between April and June 2021.	Surveys completed May-June 2017 Additional surveys of areas within the project boundary (as it was at the time) that were not covered in 2017 were surveyed in April-June 2019 All habitats within the project boundary (as it was at the time) were covered and repeated by AECOM in 2021. APEM breeding bird surveys April – June 2023
Breeding Birds (APEM) (11 x HCAs)	Survey comprised six fortnightly visits to each of 11 shortlisted HCAs to undertake a census of birds present using the Common Bird Census (CBC) methodology.	April – July 2021
Breeding Birds (APEM) (area within project boundary for EIA	The project boundary for EIA Scoping, plus a 100m buffer, was re-surveyed in summer 2022 in areas deemed to have suitable breeding bird habitat. A census of the birds present was undertaken using the Common Bird Census (CBC) methodology with results subject to territory analysis to generate population estimates. Six	Summer 2022 Summer 2023 (ongoing for passage birds (July-Sept)

Survey Undertaken	Survey Description	Date Completed
Scoping plus a 100m buffer)	fortnightly visits were conducted between April and July 2022. All records were captured using GIS and territory analysis is currently being undertaken as part of the baseline reporting.	
Wintering / Non-breeding Birds	Wintering bird surveys were carried out in 2016 of the SPA and supporting sites adjacent to the main project area. Additional surveys of the SPA were undertaken in winter 2017-18. Channel sections 1-3 were surveyed December 2018 to February 2019. Scoping of target species was informed by a series of desk studies, including site specific bird surveys and assessments carried out for the RTS previously. Scoping of target locations was based on aquatic landscape features, Phase 1 Habitat maps and aerial photography to cover the full route. This survey used a total area count methodology over three visits based on the WeBS Core count method developed by the BTO. Survey work during the 2020-21 non-breeding season comprised monthly survey visits to 23 waterbodies undertaking a census of the waterbirds present on each waterbody. Particular emphasis was placed on the designated features of the South West London Waterbodies Special Protection Area (SPA); gadwall and shoveler. For four waterbodies included within this survey programme, that had not been part of previous studies associated with the RTS, survey effort was increased to twice monthly visits. Surveys of non-breeding birds were undertaken from December 2021 to February 2022 across the area within the project boundary (as it was then, including six originally shortlisted HCAs (with a 500m buffer). Survey work comprised of three visits to the survey area, undertaken at monthly intervals using an adapted version of the line transect methodology presented by Bibby et al. (2000), with the route approaching all areas of suitable habitat within the survey area. Surveys of non-breeding birds were undertaken from November 2022 to March 2023 2022 across all suitable habitats within the project boundary for EIA Scoping (as of July 2022) plus a 100 m survey buffer	Surveys by Environment Agency in 2016 for main lakes and SPA areas. JBA surveys November 2017 to March 2018 APEM surveys 2018/2019 and 2020/21 APEM surveys 2021/22 APEM surveys 2022/23

Table 3-4: Aquatic species surveys

Survey Undertaken	Survey Description	Date Completed
White Clawed Crayfish Scoping	Following initial results from the PEA surveys habitat suitability assessments for white-clawed crayfish were undertaken at 11 locations across the area within the project boundary (as it was then, including the originally shortlisted HCAs). Following this, two areas were recommended for trapping surveys; Abbey River and Ockwells Park. Trapping took place in late October 2021. No crayfish species were identified in either location and no other signs (e.g. burrows in the bank) were identified.	September-October 2021
Fish	Lakes: Surveys were undertaken on Abbey Lake and Fleet Lake in 2019 using electric fishing in the lake margins and a mixture of seine netting and overnight fyke netting in deeper water.	Lakes: eDNA hydro-acoustics and seine netting in 2016 and eDNA, seine netting, electric fishing and hydroacoustic surveys on lakes 2019.

Survey Undertaken	Survey Description	Date Completed
	Nature Metrics undertook eDNA sampling of 5 lakes (with samples taken from around each lakes perimeter). This consisted of Sunnymeads 3-6), Kingsmead 1 (s) and Sheepwalk West 3. Since this removal of Channel Section 1, only Sheepwalk West 1 is still considered relevant to the project. This work built upon the eDNA sampling undertaken by University of Hull in 2016 who did an initial survey of 35 lakes. On the River Thames, Environment Agency data has been utilised from annual electrofishing surveys and seine netting for juveniles at a number of sites within all three channel sections on the Thames from 2004 to 2015 (with some sampling including Desborough Cut and Loop). There has also been intermittent sampling at a few sites on some tributaries, which include: Wraysbury River (2003-2015), Colne Brook (2001-2015), River Ash (2010), River Colne (1986-2015), Chertsey Bourne (1989-2015), and Datchet Common Brook (sampled once in 2015). Site specific sampling has also been undertaken at Molesey, Sunbury and Teddington weirs (HIFI, 2016). Tributaries: Electric fishing surveys were undertaken on six tributaries of the River Thames in April and May 2019 (Horton Brook, Midridge Green Drain, Wraysbury Stream, Datchet Common Brook, Abbey River and Mead Lake Ditch). Attempts were made to survey three locations on each tributary in relation to the areas that may potentially be affected by the proposed construction project. These include sites upstream of, downstream of, and within (mid) the affected reaches. Horton Brook, Midridge Green Drain, Wraysbury Stream and Datchet Common Brook are all located in the former Channel Section 1 area and results no longer considered relevant. Electric fishing was undertaken by APEM at 4 locations on Datchet Common Brook in February 2019. These surveys are no longer considered relevant to the RTS project. The River Thames is regularly surveyed by the Environment Agency Fisheries team and the Hull Institute of Fisheries which provide a yearly picture of fish populations. The most recent of these surveys (2020, 2021 and 2022) have shown an increase in fish populations within the catchment with a larger than expected population in Mead Lake Ditch, reporting over 1,200 individual fish in 2022.	River Thames: Annual electrofishing surveys for adults and seine netting for juveniles 2004-2015; tributaries 1989-2015; site specific surveys at the weirs. (Environment Agency) Tributaries: Electric fishing surveys on tributaries Spring 2019. Electric fishing on Datchet Common Brook winter 2019/20. Fish surveys of all waterbodies to be affected are scheduled for 2023.
Fish INNS, pathogens and diseases	eDNA samples for Top Mouth Gudgeon (TMG) were taken in 2019.	eDNA surveys for Top Mouth Gudgeon – 2019 eDNA fish INNS surveys are scheduled for Aug/Sept 2023
Phytoplankton	Phytoplankton survey data were used to derive a WFD classification based on phytoplankton abundance and species each year. A range of species were recorded. Phytoplankton sampling locations included: Abbey, Fleet, Manor, Abbey 1, Abbey 2, Ferry Lane, Kingsmead Island Lake, Littleton East, Sheepwalk East, Sheepwalk West 2, St Ann's, Wraysbury 2 (N), Datchet 2, Datchet 3, Littleton North, Littleton South, Wraysbury 1 (S), Sunnymeads 1, 2 and 3. Further phytoplankton surveys were undertaken in July, August and September 2023 from the bank at 17 lake locations (Abbey, Fleet, Manor, Abbey 1, Abbey 2, Ferry Lane, Fleet Lake, Littleton East, Littleton North, Littleton South, Sheepwalk East, Sheepwalk West 2, St Anns, Manor Lake, Laleham Golf Course unnamed	Surveys in July, August and September 2012-2014 each year across the 20 lakes

Survey Undertaken	Survey Description	Date Completed
	lake, Manor Farm Lake, Datchet 2 (control site), Wraysbury 2 (N) (control site) and Wraysbury 2 (S) (control site).	
Zooplankton	Zooplankton survey data was collected every 2 months between July 2012 and May 2015, from a single site across the same 20 lakes listed for phytoplankton above. Further zooplankton surveys commenced in August 2023 from a single site at 15 lakes (Abbey, Fleet, Manor, Abbey 1, Abbey 2, Ferry Lane, Fleet Lake, Littleton East, Littleton North, Littleton South, Sheepwalk East, Sheepwalk West 2, St Anns, Manor Lake, Datchet 2 (control site), Wraysbury 2 (N) (control site) and Wraysbury 2 (S) (control site). Monitoring is to be undertaken in August and November 2023, and in Spring 2024 if a third survey is deemed necessary following data review.	Surveys were undertaken between July 2012 and May 2015 at a single site across the 20 lakes
Macrophytes	Macrophyte and walkover surveys were undertaken in August 2019 by the Environment Agency at the following locations: Datchet Common Brook, Horton Brook; Abbey River; and the River Thames (at Desborough Cut, upstream of Walton Bridge and upstream of Teddington Weir). Surveys were conducted using standard Environment Agency protocols from a 100m stretch of the watercourses with percentage cover noted. In summer 2022, all waterbodies within the project boundary for EIA Scoping were surveyed using WFD protocols, where potential for effects was identified.	Surveys taken place between summer 2012 and 2013 (19 lakes and 2 sites on the River Thames). Further surveys undertaken by AECOM in 2014-2015. Lakes surveyed and RTS route in 2015-2016 Tributary intersections and Desborough Cut in Summer 2019 and repeated by APEM 2021. Further surveys of 19 lakes and 20 locations associated within 5 watercourses completed in summer 2022.
Macrophytes INNS	APEM undertook macrophyte INNS surveys in September 2020 by foot and boat recording plants on distinct 100 m reaches on the River Thames, on tributaries (Chertsey Bourne, Mead Lake Ditch, Pool End Ditch and The Moat) or by walking the entire perimeter where feasible for lake locations. All plants growing in or immediately adjacent to the water were recorded. In summer 2022, all waterbodies within the project boundary for EIA Scoping were surveyed using WFD protocols, where potential for effects was identified.	Surveys as described previously for macrophytes. Also, 2017 surveys undertaken across the channel route (JBA, 2018) 2020 surveys undertaken across waterbodies directly or indirectly connected to proposed flood channel (APEM) 2022 surveys of 19 lakes and 20 locations associated with 5 watercourses undertaken by APEM.
Phytobenthos (diatoms)	Phytobenthic sampling was undertaken across the same 20 lakes as listed previously for phytoplankton. Sampling was undertaken from autumn 2012 to spring 2015. In autumn 2013 sampling was undertaken from 14 lake sites; in spring 2014 from all 20 lake sites; in autumn 2014 from 18 lake sites; and in spring 2015 from 14 sites. Sampling on the River Thames was also undertaken in the same seasons, commencing from autumn 2012 to spring 2014. Sampling was undertaken from five sites: Ham Island, Sunbury, Molesey, Hampton, and Teddington. Further phytobenthos sampling commenced in June 2023 and with a second round of sampling to be conducted in November 2023 at 23 lake and river locations (Abbey, Fleet, Manor, Abbey 1, Abbey 2, Ferry Lane, Fleet Lake, Littleton East, Littleton North, Littleton South, Sheepwalk East, Sheepwalk West 2, St Anns,	Surveys were undertaken in November (2012, 2013 and 2014) and May (2013, 2014 and 2015) each year across the 20 lakes and along five sites on the River Thames

Survey Undertaken	Survey Description	Date Completed
	Manor Lake, Laleham Golf Course unnamed lake, Manor Farm Lake, Datchet 2 (control site), Wraysbury 2 (N) (control site) and Wraysbury 2 (S) (control site), Sunbury (River Thames), Teddington (River Thames), Penton Hook (River Thames), Thames upstream of Platts Eyot and Thames Ditton (River Thames).	
Aquatic benthic macro-invertebrates	In the 2019 surveys, locations were selected at points of the proposed intersections of the flood channel and sites immediately up and downstream, where possible. Kick-sampling was undertaken on the tributaries and airlift sampling on the River Thames. A specialist survey for depressed river mussel was also undertaken at Desborough Cut and upstream of Walton Bridge. Sites surveyed were Horton Brook, Midridge Green Drain, Wraysbury Stream (all Channel Section 1), Mead Lake Ditch, Burway Ditch (CS2) and Ferry Lane Ditch (CS3). Burway Ditch and Ferry Lane Ditch were both dry upon survey visits and therefore not fully surveyed. The River Thames was also surveyed at Desborough Cut, upstream of Walton Bridge and upstream of Teddington Weir. Surveys undertaken by Binnies/APEM on tributary intersections and Desborough Cut in May and September 2021 including dedicated surveys for depressed river mussel in the River Thames (APEM – results pending). Environment Agency undertook surveys of benthic macro-invertebrates at Teddington Weir in 2020 and 2021. Surveys were completed in spring, summer and autumn 2022 for all waterbodies (including lakes, rivers and tributaries).	Surveys in November 2012 and 2013 (representing autumn) and May 2013 and 2014 (representing spring) Spring and autumn 2019 and 2021 Spring 2020 and summer 2021 (at Teddington Weir) Spring, summer and autumn 2022 (for all waterbodies)
Aquatic invertebrates	19 sites (divided into 45 sub-sites) were surveyed across area within the project boundary (as it was then). Seven of these sites, consisting of 20 sub-sites, were in the former Channel Section 1 area). The remaining 12 sites (25 sub-sites) were within the Runnymede/ Spelthorne channel portions of the project boundary. Samples were positioned in Lentic and Lotic waterbodies that would be intersected by the proposed flood channel, as well as upstream and downstream sites on the River Thames. Each site was sampled once using dredge and sweep techniques.	Surveys in October/ November 2017 and April/May 2018 Intertidal and subtidal surveys undertaken within proposed footprint of works at Teddington weir (February 2020). Macroinvertebrate surveys carried out in 2022 by APEM – reporting by end August 2023.
Aquatic invertebrate INNS (APEM and Environment Agency)	13 species of macroinvertebrate INNS were identified during surveys in September to October 2020. Twenty-eight freshwater locations comprising lakes, rivers and streams were surveyed during this time period. Sampling methods employed included airlift, multi-habitat sweep, dredge, kick and hand search, dependent on the type of water body and characteristics of each location. Reconnaissance surveys to inform additional survey requirements were undertaken in 2022.	2020 surveys undertaken across waterbodies directly or indirectly connected to proposed flood channel. (APEM) eDNA surveys for demon shrimp, killer shrimp, quagga mussel and zebra mussel – 2019 (Environment Agency) Invertebrate INNS surveys carried out in 2022 by APEM – reporting by end August 2023.

4 Climatic Factors

4.1.1 No baseline survey data has been collected to date for the project to inform the assessment of climatic factors.

5 Cultural Heritage, Archaeological and Built Heritage

Table 5-1: Cultural heritage, archaeological and built heritage surveys

Survey Undertaken	Survey Description	Date Completed
Stage 1: Geophysical (magnetometry) Survey	The aim was to establish the presence, or otherwise, of buried archaeological remains, and to inform and target any subsequent stages of archaeological evaluation in areas considered to be of high/moderate archaeological risk.	2016/2017
Stage 1: Field Survey	This comprised fieldwalking, metal detecting and earthwork survey, and aimed to establish the presence or otherwise of surface archaeological signatures and/or extant earthworks/topographic features at selected sites, and to inform and target any subsequent stages of archaeological evaluation.	2016/2017 2021 2023
Stage 1: Geoarchaeology Survey (stage 1a)	This had a dual function; to refine the existing geoarchaeological deposit model and to inform Stage 2 evaluations through providing targeted borehole and electromagnetic (EM) survey data in areas considered to be of high/moderate archaeological risk. Data was also obtained from analysis of cores obtained through borehole survey, and test pitting, supplemented by observation of ground investigation works (borehole survey and test pitting) carried out by other contractors.	2016/2017
Stage 1 and 2: Field Visits	Stage 1 and Stage 2 assessment of potential development impacts of the RTS project on the settings of designated heritage assets in the wider landscape of the proposed development area. Field visits to each designated heritage asset, group / cluster of assets or Conservation Area deemed to be potentially subject to impacts on setting, were carried out in 2017.	2017/2018
Stage 2: Archaeological Trail Trenching and Auger Boring	The extents and methodologies were agreed with County Archaeologists and Historic England through production and approval of Written Schemes of Investigation. The locations of Phase 2 evaluations were Datchet (Southlea Farm), Horton (Station Road), Chertsey (Abbey Meads), Desborough Island and Sunbury and Teddington Weirs.	2018/2019
Stage 1: Geophysical Survey	In early 2021, a Stage 1 geophysical survey was undertaken downstream of Desborough Cut in order to identify any riverbed or sub-bottom anomalies and assess their likely archaeological significance, as well as to identify any sediment horizons on the sub-bottom profiler data, specifically the sediments of the historic dredge surface. The survey comprised sidescan sonar and sub-bottom profiler (SBP) data.	2021

6 Flood Risk

6.1.1 No baseline survey data has been collected to date for the project to inform the flood risk assessment (FRA).

7 Health

7.1.1 No baseline survey data has been collected to date for the project to inform the assessment on health.

8 Landscape and Visual Amenity

Table 8-1: Landscape and visual amenity surveys

Survey Undertaken	Survey Description	Date Completed
Summer Views and Winter Views	These viewpoints have been selected to represent the baseline landscape context under consideration and to represent key views / receptors of the RTS in relation to visual effects. These require the capture of suitable quality baseline summer and winter images, of a size and resolution sufficient to match the perspective and, as far as possible, the detail of the same view within the field, and for the production of visualisations when required.	Summer Views: • September 2018 • Summer 2023 Winter Views: • March 2019 • Further winter view survey is planned for Winter 2023/24
Landscape Character Assessment	The process consisted of a combination of desk study and field study in order to provide landscape classifications. Field survey work involved working with the use of a standardised field survey sheet prepared specifically for the project to ensure that the data was captured in a methodical way.	2015
Landscape Character Assessment Walkover Survey	Due to the time that had elapsed since preparation of the 2015 assessment, and the change in the project boundary, the Landscape Character Assessment was updated by Binnies in 2022, which included an associated walkover survey.	2022
Tree Surveys	A Stage 1 Tree Survey was undertaken in 2019. This was a preliminary scoping exercise initiated to inform further survey requirements of trees and woodlands within the RTS project boundary (excluding the HCAs). This was done as the typical planning requirement to survey trees in accordance with BS3857 (Trees in relation to design, demolition and construction - recommendations) would have involved the survey of many thousands of trees, having a disproportionate time and cost burden with the likelihood that many of the trees would be unaffected by the works. As a result, a desk-study and site visits were carried out by SJA Trees in 2019. This resulted in plans being developed to identify areas where trees were likely to be affected within the project boundary (as it was at that time); identification of veteran, landmark and ancient trees, Tree Preservation Orders (TPOs) and Conservation Areas, and stands of trees that could more efficiently be surveyed as groups/numbered collections rather than individual trees.	2019 Further surveys are planned for later in 2023.

Survey Undertaken	Survey Description	Date Completed
	A summary of the Stage 1 Tree Survey was presented to each LPA to seek their agreement of the methodology proposed. This has resulted in ongoing discussions and a revised methodology adapting BS5837 approaches and consideration of how the associated topographic survey should be undertaken in conjunction with the Stage 2 Tree Survey. Stage 2 surveys are planned for later in 2023.	

9 Materials and Waste

9.1.1 For survey data collected to date in relation to Materials and Waste, please see Section 12 Soils and Land for further Information. Site investigation works undertaken to date have provided some detail with regards to waste currently present within parts of the project boundary.

10 Noise and Vibration

Table 10-1: Noise and vibration surveys

Survey Undertaken	Survey Description	Date Completed
Noise Surveys	Noise surveys were undertaken in four boroughs (Windsor and Maidenhead, Runnymede, Spelthorne and Elmbridge) at locations chosen to represent the noise climate at identified noise sensitive receptors. The survey locations were selected in consultation with the Environmental Health Officers (EHOs) at each of these LPAs. In total, attended noise measurements were taken at 28 locations in the LPA boroughs across the project area, from June to December 2019, including: • 4 locations within Royal Borough of Windsor and Maidenhead • 7 locations within Runnymede • 10 locations within Spelthorne • 7 locations within Elmbridge In addition, unattended measurements were taken at three further locations: • 2 locations within Runnymede • 1 location within Spelthorne No surveys (or engagement) were completed in adjoining London Borough of Richmond upon Thames. The 2019 baseline noise survey exercise was paused in early 2020 due to the Covid 19 pandemic. The pandemic caused atypical noise levels as a result of national lockdown measures and reduced activity from March 2020 onwards. The baseline noise surveys recommenced in 2023 and a further 33 attended surveys were carried out between April and May 2023.	June to December 2019 April-May 2023

11 Socio-Economic

Table 11-1: Socio-economic surveys

Survey Undertaken	Survey Description	Date Completed
Non-motorised User (NMU) Surveys	Non-motorised User (NMU) surveys within the project boundary for EIA Scoping were undertaken in 2022 to understand the effect of the RTS on use of PRoWs. A total of 17 locations on PRoWs and the Thames Path National Trail were surveyed in spring and autumn 2022 to inform the EIA. The aims of the surveys were to summarise and classify users of the pedestrian network and cycle routes in order to draw conclusions regarding how the network will be directly or indirectly affected by construction and operation of the project. In order to supplement the manual counts and classifications of users, surveyors sought to obtain additional information from PRoW users in the form of a short questionnaire. This will help inform the project design and equalities assessment as well as the health and socio-economic aspects of the EIA and help understand how, and why, people currently use the PRoW network. The questionnaires consisted of a combination of nominal (e.g. multiple choice) and Likert scale questions.	Spring and Autumn 2022

12 Soils and Land

Table 12-1: Soils and land surveys

Survey Undertaken	Survey Description	Date Completed
Ground Investigation surveys	These included tests for contaminants, soil conditions, moisture content and particle size.	2015/2016
In-Situ Gas Monitoring	In-situ gas monitoring was undertaken within the landfill sites twice a year in 2016-2017, with a single round of monitoring also taken in September 2018.	2016-2017 and September 2018
Ground investigation surveys including groundwater and ground gas installations	The ground gas installation areas consisted of the following works: • An initial Flame Ionisation Detector (FID) survey on each of the three sites to assist in informing ground gas installation locations, based on a 50 x 50m grids, prior to the intrusive works taking place. • 15 dynamic sampling boreholes using a multipurpose tracked rig (Camacho Geoline rig or similar) capable of drilling or coring locations at Royal Hythe to a maximum depth of 10m for geotechnical and geochemical sample recovery purposes (including Standard Penetration Testing (SPTs)). These boreholes are to determine whether there is a minimum of 1m of natural ground. • 20 dynamic sampling boreholes using a multipurpose tracked rig (as above) sample locations at Manor Farm to 10m maximum depth for geotechnical and geochemical sample recovery purposes (including SPTs). These boreholes are to determine whether there is a minimum of 1m of natural ground. • 21 dynamic sampling boreholes using a multipurpose tracked rig (as above) sample locations at the Chertsey Road Tip area to 10m maximum depth for geotechnical and geochemical sample recovery purposes (including SPTs). These boreholes are to determine whether there is a minimum of 1m of natural ground. • Installation of ground gas monitoring wells in all exploratory hole locations at all three sites. • Geo-environmental and geotechnical laboratory analysis.	2022

Survey Undertaken	Survey Description	Date Completed
	• Post fieldwork monitoring and sampling of all installations.	
Contaminated Sediment Sampling (Desborough Cut)	The works comprised 36 cable percussion boreholes (for geotechnical and geochemical sample recovery purposes), 36 vibrocore holes (15 vibrocore holes for sediment sample recovery for geo-environmental sampling) and associated laboratory testing requirements as detailed in an associated Contaminated Sediment DBA. In addition, six further vibrocore locations were proposed for archaeological monitoring purposes.	2022
Contaminated Sediment Sampling (Scheme Wide)	RTS wide contaminated sediment sampling commenced in 2022 and comprised 74 sampling locations (within the River Thames and wider area) (including the 15 noted above). This work compromised viborcoring and less intrusive methodologies such as Van Veen and hand excavated pits as a result of protected species and access constraints. The sediment sampling enabled associated geo-environmental sampling and laboratory testing, which is inclusive of emerging contaminants such as Persistent Organic Pollutants (POPs).	2022

13 Traffic and Transport

Table 13-1: Traffic and transport surveys

Survey Undertaken	Survey Description	Date Completed
Traffic Surveys	Traffic surveys have been undertaken at relevant locations where data from Local Highway Authorities (LHAs) was unavailable, in order to estimate the generation of LGV and HGV movements as a result of construction and operation of the RTS. The scope and methodology for the surveys was informed by formal pre-application meetings with the RBWM, SCC and the LBRuT.	February to March 2019
Traffic Survey Partners (TPS)	The surveys comprised: • Automatic Traffic Counts (ATCs) over a 7-day period in November 2019 across 25 locations in the project area. • Manual Classified Turning Counts (MCTC) by means of a video survey over a 12-hour period on 14th November 2019 across 32 locations in the project area. It should be noted that MCTC surveys near Thorpe Park were specified but not actually undertaken due to the theme park being closed in winter 2019/20 and then atypical traffic conditions that followed as a result of the Covid-19 pandemic. • Queue length surveys at the same locations as the MCTCs noted above. Queue lengths were measured in 5-minute intervals. • On-street and car parking surveys were carried out at 15-minute intervals over a 24-hour period on two neutral weekdays (13th and 14th November 2019). Surveys were undertaken at Teddington, namely Broom Road, Holmsdale Road, Langwood Chase, Tematon Place and Thameside (on street surveys) and Tremlock Way and Wallbrook Teddington Rowing Club Car Park.	November 2019

Survey Undertaken	Survey Description	Date Completed
Traffic Surveys (MCTC's)	The traffic surveys (MCTCs) were planned but not actually undertaken at four locations near Thorpe Park due to the theme park being closed for winter 2019/20 and then were not completed due to atypical traffic conditions resulting from the Covid-19 pandemic travel restrictions. These surveys were subsequently undertaken in Spring / Summer 2022. The locations of the junctions that were surveyed in 2022 are: • Heron Lake Road / A30 / M25 Roundabout J13 • M25 J14 / Horton Road Roundabout • A320 Chertsey Lane – Staines Road/ Norlands Lane • Staines Road / Mixnams Lane Thorpe Park Roundabout.	Spring / Summer 2022

14 Water Environment

Table 14-1: Surface water quality surveys

Survey Undertaken	Survey Description	Date Completed
River Thames and Lake water quality monitoring	The RTS Ecological Monitoring Project (2012-2015) included sampling for a range of physicochemical (temperature, dissolved oxygen, pH, nutrients (such as Nitrogen & Phosphorus), chlorophyll etc) and specific chemical pollutant determinants in the lakes potentially affected by the project. The frequency and spatial variation of the sampling was established to obtain a suitable baseline for subsequent stages of WFD compliance assessment and EIA. Whilst there is no specific guidance on the validity of water quality data, principles applied to the monitoring approach include the assumption that monitoring should be undertaken for at least one full year during each six-year RBMP cycle. The latest RBMP cycle runs from 2021 to 2027. Due to the age of this data and the range of determinands monitored, it is recommended that additional surveys are undertaken to ensure the baseline water quality data is valid for DCO submission. The existing data will still be used as part of the baseline to understand any long term changes in water quality.	2012 – 2015 (monthly to bi-annual)
Lake water quality monitoring	Monitoring from 24 lake locations on a bi-annual basis between 2016 and 2021. The monitoring undertaken since 2016 has been undertaken to provide validation checks for the 2012-2015 environmental monitoring programme but does not in itself provide a complete data set. PFAS (including PFOS and PFOA) were added to the list of determinands from September 2020 and going forward. Whilst there is no specific guidance on the validity of water quality data, principles applied to the monitoring include the assumption that monitoring should be undertaken for at least one full year during each six-year RBMP cycle. The latest RBMP cycle runs from 2021 to 2027.	2016 – 2023 (bi-annual)

Survey Undertaken	Survey Description	Date Completed
	Due to the age of some of this data and the range of determinands monitored, it is recommended that additional surveys are undertaken to ensure the baseline water quality data is valid for DCO submission. The existing data will still be used as part of the baseline to understand any long-term changes in water quality.	
Lake water quality monitoring (including microbial monitoring)	Monitoring on an up to monthly basis at 19 lakes across the study area, and at Wraysbury 2 and Datchet 2 (locations formerly associated with CS1). 55 determinands are monitored monthly, 87 quarterly and 11 biannually, including PFOS, PFOA and microbial monitoring. Determinands include those that have legislative requirements for monitoring and those recommended following source pathway receptor modelling. Monitoring will be reviewed on a bi-annual basis and the findings of HRA and WFD assessments will also be used to inform further monitoring for the pre-construction baseline. Additional monitoring to establish the water quality baseline for two additional lakes commenced in May 2023 at a monthly, quarterly and bi-annual frequency. These sites are an unnamed lake at Laleham Golf Course and Manor Farm Lake. Monitoring will be reviewed on a quarterly basis to inform any required changes to the determinands and sites monitored for subsequent quarters.	February 2022 – ongoing
River Thames and tributary water quality monitoring	Monitoring on a monthly basis from 27 locations on the River Thames and tributaries from across the study area, excluding HCAs. PFOS and PFOA were added to the list of determinands from September 2020. Laboratory analysis was completed for ammoniacal nitrogen, orthophosphate, PFOS and PFOA. Handheld probe measurements were collected in the field for a range of physio-chemical parameters including pH, dissolved oxygen, specific conductance and temperature (°C). Due to the age of this data and range of determinands monitored it is recommended that additional surveys are required to ensure the baseline water quality data is valid for DCO submission. The existing data will be used as part of the baseline to understand any long-term changes in water quality. Additional monitoring to establish the water quality baseline for five additional river sites commenced in April 2023 at a monthly, quarterly and bi-annual frequency. These sites are Penton Hook (River Thames), Sunbury-on-Thames, Pool End Ditch, Upstream of Platts Eyot (River Thames) and Thames Ditton (River Thames). Monitoring will be reviewed on a quarterly basis to inform any required changes to the determinands, and sites monitored for subsequent quarters.	April 2019 – 2023 (monthly)
River Thames and tributary water quality monitoring (including microbial monitoring)	Monitoring on an up to monthly basis at 14 locations on the River Thames and tributaries across the study area, excluding HCAs. 56 determinands are monitored monthly, 88 quarterly and 11 biannually, including PFOS, PFOA and microbial monitoring. Determinands include those that have legislative requirements for monitoring and those recommended following source pathway receptor modelling. Monitoring will be reviewed on a bi-annual basis and the findings of HRA and WFD assessments will also be used to inform further monitoring for the pre-construction baseline.	February 2022 – ongoing
Microbial monitoring of recreational areas of interest across the	The Project will connect the River Thames to several lake waterbodies that are currently used for recreational activities (e.g. open water swimming, sailing, windsurfing). Therefore, there may be a potential impact to recreational businesses and the health of bathers. It was decided that the project undertake sampling in line with	2019, and 2021 (weekly during the Bathing Water Season May – Sept). A full data set was collected in 2019, however some gaps have been identified in the 2021 data. Therefore, monthly monitoring was undertaken

Survey Undertaken	Survey Description	Date Completed
project (River Thames, tributaries and lakes)	Environment Agency guidance for Bathing Water Standards. There are no designated bathing waters within the study area however the microbial monitoring programme has adhered to this guidance as a precaution. The Bathing Water Guidance requires 20 samples for faecal coliforms (Intestinal enterococci and Escherichia coli) to be taken within the bathing season (May and September), with an additional baseline sample to be taken between the 1st and 14th May. The technical specialists advised Ammoniacal Nitrogen should be taken alongside these samples. Monitoring from 27 locations in lakes and rivers within the project boundary (as it was then) on a weekly basis between May and September 2019, 2021, and on a monthly basis in 2022 (this excluded HCAs). Locations were selected based on the presence or future recreational activities, or their potential future connection to a recreational activity. Laboratory analysis was completed for faecal coliforms and ammoniacal nitrogen. Handheld probe measurements were collected in the field for a range of physio-chemical parameters including pH, dissolved oxygen, specific conductance and temperature (°C). Out of season monthly microbial monitoring is ongoing in 2023 between February – April 2023 and from October – January 2024. This is to enable full assessment of the likelihood of microbial outbreaks when connecting lakes to create the flood channels and to improve accuracy of future RTS water quality modelling. Advice from Public Health England was sought to seek advice on the monitoring programme in 2019. However, they did not feel they had the capability to comment. The EA Bathing Waters group (as part of the RTS monitoring programme) was consulted on the scope. Whilst there is no specific guidance on the validity of microbial data, the Water Quality Monitoring Plan stipulates principles for monitoring, which includes verification by collecting two water samples (during the bathing season) for microbial monitoring within recreational waters.	in 2022 and weekly monitoring within the 2023 bathing waters season to verify the 2019 and 2021 results. Monitoring was due to be repeated in 2020, however, the monitoring was placed on hold due to Covid-19 and it was not possible to restart monitoring before the end of August 2020. Compounded through issues of lab availability, the decision was taken to resume monitoring in 2021.
Jubilee River Water Quality and Suspended Sediment monitoring (existing data and flow cytometry)	UKCEH have been undertaking weekly monitoring on the Jubilee River (Taplow and Pococks Lane) to investigate water quality and sediment changes through the system. Whilst there are distinct differences between the Jubilee River and the project, the Jubilee River is the most similar type of project to draw insights from for the design of the project.	2020 – 2021

Table 14-2: Surface water flow surveys

Survey Undertaken	Survey Description	Date Completed
Monthly Spot Flow Gauges	Monthly spot flow gauges from Datchet Common Brook; Horton Brook; Abbey River; and Wraysbury Stream (there is a data gap April-July 2020 due to Covid-19 restrictions). Monthly samples continue to be collected from August 2020 on Abbey River only by the Environment Agency. An additional 4 sites were added in February 2021 (Mead Lake Ditch, Chertsey Bourne, the Chap and Burway Ditch).	May 2019 – ongoing

Survey Undertaken	Survey Description	Date Completed
	From April 2023 monitoring continued at Chertsey Bourne, Abbey River, and a new site at Pool End Ditch. All other flow sites were removed from the flow monitoring programme due to absence of any discernible flow. This monitoring will continue at a monthly frequency. Whilst the validity of flow data is not expected to expire, regular data is recommended to ensure the most recent data is available and identify potential trends.	
Jubilee River Flow Monitoring	UKCEH have been undertaking flow monitoring on the Jubilee River to assess potential losses to groundwater. Thames Water noted a loss following the construction of the Jubilee River and are therefore highly concerned around the potential for losses in deployable output arising from the project's augmented flow.	2019

Table 14-3: Surface water level surveys

Survey Undertaken	Survey Description	Date Completed
Lake Level Monitoring	15-minute lake level data has been recorded between 2012 and 2021 for all lakes to be intersected by the project using Rugged TROLL loggers. Water quality has been sampled in the same locations as the level boards (except for the Thorpe Park lakes as there is only one board) under the assumption that the lakes are well mixed. Data has been downloaded from the loggers approximately every two months between 2012-2015, and bi-annually since 2016. Manual gauge board readings have been taken each time the data from loggers has been downloaded to enable correction of lake level data. 15-minute pressure data has also been collected across the project for this time period using barometric loggers, which has been used to correct the lake levels for barometric pressure. Generally, there is a good level data record, but some missing gaps are noted within the datasheets. Level data loggers have been replaced as necessary over the monitoring period.	2012 – ongoing (Data collection and manual gauge board readings taken monthly – bi-annually).

Table 14-4: Geomorphology surveys

Survey Undertaken	Survey Description	Date Completed
MultiMoRPH Surveys	MultiMoRPH (10xMoRPh) surveys at Datchet Common Brook, Horton Brook, Wraysbury Stream, Abbey River and Burway Ditch (upstream and downstream of intersections) were completed on two occasions (a winter survey (February) and a summer survey (May/June)).	2019
River Condition Assessment	Refer to Section 3 for further information.	Autumn 2019 and summer 2022

Survey Undertaken	Survey Description	Date Completed
Geomorphological baseline walkover	A geomorphological desk study and walkover and was completed in May 2023 of watercourses that have potential to be impacted directly or indirectly from the project. The methodology for this geomorphological baseline walkover employs similar methods to that used to undertake a fluvial audit.	2023

Table 14-5: Sediment quality surveys

Survey Undertaken	Survey Description	Date Completed
Sediment grab sampling in lakes (part of GI work)	These samples only obtained data from the surface of the lakebed and not sub-surface sediments which may be exposed during construction or operation of the project.	2015
Sediment sampling in lakes and in River Thames at area of proposed bed lowering	Ground Investigation and sample analysis ongoing to determine contaminants within bed sediments.	2022 – 2023
Sediment samples from River Thames dredged material	Sediment samples from dredged material taken from the River Thames in the project area were analysed in October 2014. These samples were taken as part of the Lower Thames Shoal Removal (dredging) in 2014, the samples were taken from the removed shoals to determine whether the material could be re-used elsewhere, however there is low confidence in how representative this data is due to limited details (such as locations, depths, sampling methods etc.).	2014
Suspended Sediment Surveys	Suspended sediment samples were captured at Penton Hook in 2016 during a 110cumecs flow event (below the proposed trigger level). Sampling throughout winter 2019/2020 River Thames at Taplow captured three high flow events. In addition, a single spot sample was also taken in December 2020. The monitoring captured data over four storms in Winter 2019/20. UKCEH was instructed to take samples using an autosampler throughout the duration of the events at their existing monitoring location at Taplow on the Jubilee River. An insufficient sample size was captured during the first event (18th-22nd October 2019) for particle size distribution analysis, water quality analysis was completed. Two further events (14th-21st November 2019) and (14th-17th January 2020) were successfully captured and analysed for both water quality and particle size distribution (PSD) analysis. A single sample was collected on the 19th December 2019 during the rising limb of the largest storm during the monitoring period. The full 24 samples were not collected for this storm, preventing full water quality analysis. Further monitoring was placed on hold due to Covid-19.	2016, 2019/2020 and 2023.

Survey Undertaken	Survey Description	Date Completed
	UKCEH noted a difference within the PSD of the storm events suggesting that i) there may be changes to suspended sediment concentration and PSD throughout an event (i.e. hysteresis) and ii) there may be seasonal changes and a seasonal flushing effect. Analysis was completed for PSD (two samples only), suspended solids, soluble reactive phosphorus, total phosphorus, dissolved ammonium, dissolved fluoride, dissolved chloride, dissolved nitrite, dissolved nitrate, dissolved sulphate. Three further suspended sediment surveys of the River Thames were planned at Penton Hook over winter 2021/22, but were not done due to flows not being high enough. Nevertheless, two surveys were completed during high flows in spring 2023. No long-term suspended sediment records exist but three months of monitoring was undertaken in 1987.	
Surface bed material	Nine river bed samples were taken (from channel centre, left bank toe, and right bank toe) at Bell Weir in 2000 of fine / medium gravel and course medium sand.	2000

Table 14-6: Sediment depth monitoring

Survey Undertaken	Survey Description	Date Completed
Lake Sediment Bathymetry Surveys	Lake sediment depth across each of the lakes potentially affected by the project has been measured as part of the programme of bathymetric surveys undertaken in 2015 and 2016.	2015-2016

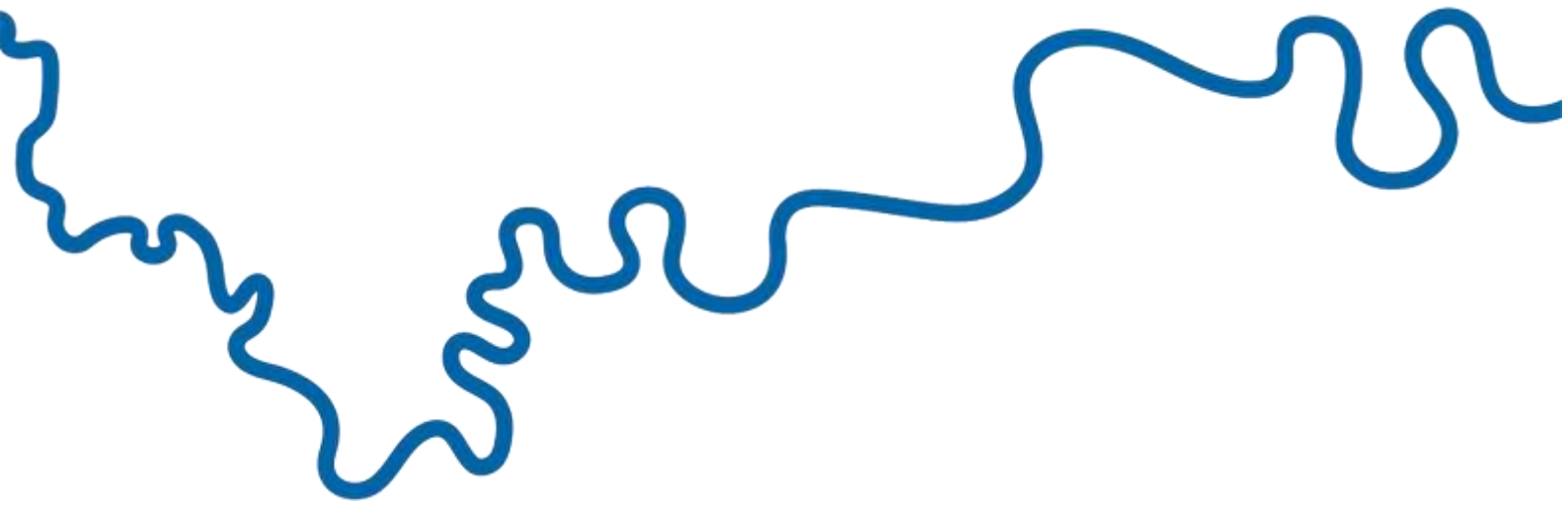
Table 14-7: Groundwater quality surveys

Survey Undertaken	Survey Description	Date Completed
Groundwater Quality Monitoring (Binnies)	Between 2012 and 2015, groundwater levels and quality monitoring was undertaken approximately every two months at 24 boreholes across the project area. This included recording of field parameters, pH, conductivity, dissolved oxygen and temperature, along with various analytes. Since 2016, bi-annual monitoring (twice per year) monitoring has typically been undertaken from up to 33 boreholes across the project area, 23 of which are within the Runnymede and Spelthorne Channel areas, proposed for further monitoring as per the Water Quality Monitoring Plan (GB, 2021). In September 2020, PFOS/PFOA were added to the list of determinands to be monitored due to concern of WFD failures within the study area. Whilst there is no specific guidance on the validity of microbial data, the Water Quality Monitoring Plan stipulates principles for monitoring, which includes a principle to review the spatial and temporal extent of the groundwater	2012 – 2021 (every two – six months)

Survey Undertaken	Survey Description	Date Completed
	quality monitoring programme and acknowledged that additional boreholes may be required with determinands to be monitored on a quarterly to bi-annual basis.	
Groundwater Quality Monitoring (Binnies / Environment Agency)	Monitoring at 23 locations across the study area (including two boreholes in the former Channel Section 1 area). 111 determinands are monitored quarterly and 31 determinands are monitored bi-annually. Determinands include those that have legislative requirements for monitoring and those recommended following source pathway receptor modelling. Monitoring will be reviewed on a bi-annual basis and the findings of HRA and WFD assessments will also be used to inform further monitoring for the pre-construction baseline.	February 2022 – ongoing

Table 14-8: Groundwater level surveys

Survey Undertaken	Survey Description	Date Completed
Groundwater Level Monitoring	15-minute groundwater level data has been recorded between 2012 and 2021, across 23 boreholes within the project extent, using Rugged TROLL loggers. Data has been downloaded from the loggers every two to six months. Manual level readings have been taken, using a borehole water level dip meter, each time the data from loggers has been downloaded to enable correction of level data. 15-minute pressure data has also been collected across the project for this time period using barometric loggers, which has been used to correct the groundwater levels for barometric pressure.	2012 – Ongoing (Data collection and manual level readings taken every two to six months).



SURREY COUNTY COUNCIL

Environment Agency

The River Thames Scheme represents a new landscape-based approach to creating healthier, more resilient and more sustainable communities by reducing the risk of flooding and creating high quality natural environments.

River Thames
Scheme