River Thames Scheme

**Protecting our communities
Securing our economy
Enhancing our Thames**

Preliminary Environmental Information Report

Volume 2

Chapter 5: Site Description

5 Site Description

5.1 Introduction

5.1.1.1 In this chapter we provide a summary of the key baseline elements for each of the topics scoped into this Preliminary Environmental Information Report (PEIR). It describes each topic's study area and existing and future baseline in relation to the updated design parameters and our project boundary for Environmental Impact Assessment (EIA) PEIR (as described in Section 2.4 of Chapter 2: Project Description) and refers to the River Thames Scheme (RTS) ('the project') EIA Scoping Report (Environment Agency and Surrey County Council, October 2022) ('our EIA Scoping Report') where further detail is provided.

5.1.1.2 A summary of the baseline environmental surveys we have undertaken for the project to date is provided in Appendix 5.1.

5.2 Air Quality

5.2.1 Existing Baseline

5.2.1.1 The air quality study areas largely remain as per our EIA Scoping Report (see Section 6.2.3). Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study areas have remained the same. The air quality study areas are shown on Figure 5.1.

5.2.1.2 Since our EIA Scoping Report was published, no changes to the size or number of air quality management areas have been made.

5.2.1.3 As detailed in our EIA Scoping Report (Section 6.3), annual mean nitrogen dioxide (NO_2) concentrations within the study areas are generally expected to comply with the annual mean NO_2 Air Quality Objective (AQO). Some isolated hotspots in the vicinity of roads may experience NO_2 concentrations breaching the AQO due to traffic emissions, and numerous Air Quality Management Areas (AQMAs) are in place across the area to address this (see Figure 5.2). Figure 5.3 shows the monitoring locations where the annual mean NO_2 AQO is either within 10 per cent of the AQO (in yellow); or at or above the AQO (in red). The areas where

annual mean NO_2 AQO may be breached will generally be located in the vicinity of major roads or other significant sources of pollution.

5.2.1.4   As per our EIA Scoping Report (Section 6.3), no exceedances (breaches) of the hourly mean NO_2 AQO, annual mean and 24-hour mean PM_{10} (particulate matter) AQO, or annual mean $PM_{2.5}$ AQO and Air Quality Standard (AQS) within the vehicle emissions study area have been identified.

5.2.1.5   Odour complaints records from relevant local authorities have been obtained. One odour complaint was raised during 2020 in Spelthorne Borough due to odorous fish carcasses in lakes and rivers caused by changes in water chemistry or oxygen levels as a result of very dry weather and then heavy rainfall. One relevant complaint being raised in recent years is not considered to indicate a significant number of existing odour sources that can be controlled by the project. If other sources of odour are identified within the study area, we will consider these in the Environmental Statement (ES).

5.2.1.6   Of the seven sites designated for ecological protection within 200 metres of the construction traffic routes (see Chapter 7: Air Quality and Chapter 17: Traffic and Transport of this PEIR), background concentrations of nitrogen or ammonia deposition (based on 2018 – 2020 concentrations from the Air Pollution Information System (APIS) website) did not exceed the critical loads for nitrogen deposition or ammonia. For acid deposition, there was an exceedance of the minimum critical load for nitrogen at grasslands at Thorpe Hay Meadow Site of Special Scientific Interest (SSSI) (which adjoins the project boundary), Dumsey Meadow SSSI and Staines Moor SSSI.

5.2.2   Future Baseline

5.2.2.1   As newer, cleaner vehicles are progressively sold and introduced into vehicle fleets, the traffic derived component of NO_2, PM_{10} and $PM_{2.5}$ concentrations is predicted to progressively decrease, as is evidenced in the UK Air Information Resource (UK-AIR) background maps (Defra, 2020a). In addition, part of the study area also falls within London's Ultra Low Emission Zone (ULEZ), which aims to improve air quality by reducing the most polluting vehicles using the area. It is therefore anticipated that

the future air quality baseline in the study area will largely improve over time.

5.2.2.2 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 set a legally binding target (LBTs) for fine particulate matter with a diameter of less than 2.5 micrometres ($PM_{2.5}$) of annual mean concentration target (AMCT) of 10µg/m^3, to be met by 2040. To consider this target value, we have reviewed background pollutant mapping data published by the Department for Environment, Food & Rural Affairs (Defra) at worst-case locations within our EIA study area for the latest available year of 2030. The estimated future background $PM_{2.5}$ concentrations at worst-case locations within the study area do not exceed 12 µg/m^3 for 2030.

5.2.2.3 The APIS website does not project changes in background ammonia, nitrogen and acid deposition over time, with the expectation that current deposition rates should be applied in future.

5.3 Biodiversity

5.3.1 Existing Baseline

5.3.1.1 The biodiversity study area largely remains as per our EIA Scoping Report (see Section 7.2.3). Some minor amendments have been made to account for updates to the PEIR design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study area has remained the same. The study area is shown on Figure 5.4.

5.3.1.2 The area within our project boundary for EIA PEIR is heavily disturbed by quarrying activities, which are still ongoing in places. The old quarries have been used for landfill or have been restored to a series of interconnected lakes. River and lake waterbodies contribute to much of the biodiversity of the area and provide important wildlife corridors.

5.3.1.3 In addition to the South West London Waterbodies Special Protection Area (SPA) and Ramsar site, there are three statutory designated sites within our project boundary for EIA PEIR; Dumsey Meadow SSSI; Thorpe Park No1 Gravel Pit SSSI and Ham Lands Local Nature Reserve (LNR). There are 17 non-statutory designated sites for nature conservation within our project boundary for EIA PEIR. Within the remainder of the study area there are 19 statutory (SSSI, Special Area of Conservation (SAC), SPA,

National Nature Reserve (NNR) and LNR) and 77 non-statutory designated sites for nature conservation.

5.3.1.4   Most of the study area falls within the Thames Valley Biodiversity Opportunity Area (Area TV04: Thorpe & Shepperton) identified for its potential to create 'bigger, better, more and more joined-up' nature-rich areas.

Habitats and Flora

5.3.1.5   A Preliminary Ecological Appraisal (PEA) was undertaken in 2022 which provides a full description of all habitats and flora within our project boundary for EIA PEIR. The PEA is appended in Appendix 7.2 and includes a UK Habitat Classification Map. A summary of the key habitats and flora within the study area is provided below:

- Lakes: All waterbodies are likely to support a diversity of aquatic life with margins supporting broadleaved semi-natural woodland with tall herb vegetation where there are breaks in the woodland.
- Watercourses: The majority of watercourses are in poor and fairly poor condition due to lack of riparian and marginal vegetation.
- Woodland and trees: There are a variety of woodland types and tree species present in the study area.
- Open mosaic on previously developed land: This habitat has high ecological value and areas are present across the study area.
- Modified grassland: Present in several locations, notably close to the proposed alignment of the Runnymede Channel.
- Neutral grassland: Areas of semi-improved and unimproved neutral grassland are located close to the proposed alignment of the Runnymede Channel.
- Other habitats of ecological value: Including ephemeral/short perennial vegetation, hedgerows, scrub and existing built structures, which provide suitable habitats for protected or notable species.

Protected and Notable Species

5.3.1.6   The following protected and notable species are known to be present or are likely to be present within the study area. They are detailed in the PEA and summarised here:

- Badgers: One potential main badger sett and several outlier setts are expected to be present.
- Bats: Suitable habitat for roosting, foraging and commuting bats is present, and we have found evidence of eight species of bat.
- Otters: Otter activity has been confirmed through our surveys, with potential holt areas identified and habitats present for commuting, foraging and resting.
- Water voles: We have not identified evidence of water voles from desk studies and site surveys, although suitable habitat is present. Presence of mink is likely to be a contributory factor to the absence of water vole.
- Amphibians: Great Crested Newt (GCN) has not been found from desk studies and surveys completed. Smooth newt and frogs are confirmed to be present.
- Reptiles: Breeding grass snakes are present, along with slow worms.
- Birds: There are numerous suitable habitats for breeding and wintering/non-breeding birds. Schedule 1 species and Birds of Conservation Concern (BoCC) have been recorded.
- Terrestrial invertebrates: There is an extensive array of terrestrial invertebrates, including notable species such as brown hairstreak butterfly.
- Terrestrial Invasive Non-Native Species (INNS): Plant and animal INNS are abundant within the study area. Eight terrestrial plant INNS have been recorded.
- Fish: Surveys have found a relatively low number of common species within the study area. Fish pathogens and INNS are known to be present.
- Aquatic macroinvertebrates and macrophytes: Notable charophyte (green algae) species are present within some lakes. Eight notable macroinvertebrate species have been recorded within some lakes. Nine notable macroinvertebrate species have been recorded in rivers, including one nationally rare mayfly.
- Aquatic invertebrate, macrophyte and fish INNS: In total, 38 aquatic INNS have been identified across many waterbodies within the study area. See 7.3.1.41 - 42 of the Scoping Report.

5.3.2   Future Baseline

5.3.2.1   Changes to the ecological baseline, in the absence of the project, have been considered and the predicted change is summarised within Section 7.3.2 of our EIA Scoping Report. As noted, there is anticipated to be overall improvement in biodiversity driven by various legislation and policies in place. In addition, there will be changes to the ecological baseline over time due to the effects of climate change. The ranges of migratory species are likely to change at a global scale as temperate and climatic patterns alter. River levels will increase as sea levels rise leading to changes in the distribution of marginal habitats and the spread of INNS as a result of increased flooding.

5.4   Climatic Factors

5.4.1   Existing Baseline

Climate Change Mitigation

5.4.1.1   The study area for both climate change mitigation and climate change resilience and adaption largely remains as described in paragraph 8.2.3.1 of our EIA Scoping Report. Some minor amendments have been made to account for updates to the PEIR design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study area has remained the same. This is illustrated in Figure 5.5.

5.4.1.2   The existing baseline for this assessment considers any land uses or activities within the study area that currently lead to material greenhouse gas (GHG) emissions, plus any ecosystem services and biogenic carbon sequestration that contribute to GHG removal. As the information on the maintenance activities of existing buildings and energy consumption data for the site are unknown, the baseline emissions are assumed to be zero for the purposes of this PEIR as a conservative assessment.

Climate Change Resilience and Adaptation

5.4.1.3   The project is located in the Met Office climate profile of Southern England, which is characterised as having a climate influenced by continental Europe which can be subject to continental weather influences that bring cold spells in winter and hot, humid weather in summer. Most of

Southern England is less than 100 metres (m) Above Ordnance Datum (mAOD), however, it contains hills and downland landscapes over 100 mAOD. The River Thames drains the northern half of Southern England and flows eastward.

5.4.1.4 Mean annual temperatures vary from about 11.5°C in central London and along the south coast to about 9.5°C over higher ground well inland. Much of Southern England is relatively distant from the route of many Atlantic depressions and towards the north-east of the region there is increasing shelter from rain-bearing southwest winds.

5.4.2 Future baseline

Climate Change Mitigation

5.4.2.1 To reflect the ongoing decarbonisation of grid energy and traffic, we will consider a future year of 2035 (to reflect targets associated with the sixth Carbon Budget where the recommended pathway requires a 78 per cent reduction in UK territorial emissions between 1990 and 2035), and will apply assumptions as to what this future baseline might look like in terms of GHG emissions during the operational phase.

Climate Change Resilience and Adaptation

5.4.2.2 Using a future assessment timeframe of 2081-2100 (the latest that projections currently extend to), over land there will be a move towards warmer, wetter winters and hotter, drier summers. However, natural variations mean that some cold winters, some dry winters, some cool summers and some wet summers will still occur (UK Climate Projections, 2018 (UKCP18)).

5.4.2.3 UK Climate Projections (UKCP) uses Representative Concentration Pathways (RCPs), which are named according to the concentration of GHG modelled to occur in the atmosphere in 2100. RCP 8.5 is the most conservative, highest-impact scenario and is therefore considered in this assessment. The detailed future baseline environment is quantified in Chapter 8: Climatic Factors (paragraphs 8.3.2.16 – 8.3.4.22).

5.5 Cultural Heritage, Archaeology and Built Heritage

5.5.1 Existing Baseline

5.5.1.1 For the PEIR assessment of Cultural Heritage, Archaeology and Built Heritage, the study areas remain largely as described in Section 9.2.3 of our EIA Scoping Report apart from the study area for effects on setting. This was updated in 2022 and is based on an additional one kilometre from the desk based assessment (DBA) study area. The study areas are shown on Figure 5.6.

5.5.1.2 The cultural heritage resource comprises archaeological remains, historic buildings and historic landscapes. The River Thames catchment is an area of high archaeological importance and has been the focus for human activity from the earliest humans to the present day. Archaeological excavations have confirmed the density and complexity of human occupation of the Thames gravels.

5.5.1.3 The earliest evidence of human activity recovered from the area dates back to the Palaeolithic and includes prehistoric remains such as flint scatters. The River Thames itself has produced numerous objects which have been deposited in the past and recovered as chance finds or by dredging to improve navigation. These range in date from the Palaeolithic to the Modern era. Such finds include weapons and human remains.

5.5.1.4 A significant multi-period site at Kingsmead Quarry near Wraysbury Reservoir (see Figure 5.6 (sheet 1)) uncovered evidence of Upper Palaeolithic and Mesolithic activity, Neolithic structures, a Bronze Age settlement, field system and cemetery, and evidence of Iron Age and Roman activity. Mesolithic and Bronze Age activity was also found during fieldwork at Abbey Meads along with wooden structures dated to the Iron Age and the late Medieval/early post-Medieval period. The surviving remains (after quarrying) of a late Roman or early medieval timber fish weir is located at Ferry Lane Lake (also known as Ferris Meadow Lake) in Spelthorne (see Figure 5.6 (sheet 2)).

5.5.1.5 Significant assets dating to the Medieval period include the Chertsey Abbey Scheduled Monument (SM), set within the Chertsey Conservation Area. Chertsey also contains several listed buildings. The surrounding

lands hold archaeological evidence of livestock and water management connected with the Abbey. The SM Earthworks on the former Laleham Golf Course may represent a stock enclosure associated with the Abbey. Designated heritage assets are illustrated on Figure 5.7.

5.5.1.6   Due to the long history of land use in the River Thames valley, areas of undisturbed ground could hold potential for archaeological and palaeoenvironmental remains stretching back to the Palaeolithic and covering all periods up to the present day. Areas where gravel extraction has removed archaeological deposits will have a negligible archaeological potential.

5.5.1.7   As well as archaeological remains, the study area also contains designated assets including SMs, Registered Parks & Gardens, Listed Buildings and Conservation Areas. Changes to the setting of assets can affect their significance, where setting contributes towards the value of an asset or an appreciation of that value. A full list of designated and non-designated heritage assets is included in Appendix G of our EIA Scoping Report.

5.5.2   Future Baseline

5.5.2.1   The future baseline for cultural heritage, archaeology and built heritage is likely to be broadly similar to the current baseline. Designated assets are protected through planning policy such that significant changes are unlikely to occur. Non-designated heritage assets are more likely to be subject to change, with some assets being altered or removed and new assets identified as a result of new development and/or any new mineral extraction within the study area. Environmental changes leading to more frequent inundation could negatively affect heritage assets through changes in hydrological conditions and potentially accelerated degradation.

5.6   Flood Risk

5.6.1   Existing Baseline

5.6.1.1   The study area for Flood Risk largely remains as described in Section 10.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study

area has remained the same. The Flood Risk study area is shown on Figure 5.8.

5.6.1.2   The project is located within the floodplain of the River Thames and its tributaries. The sources of flooding include fluvial, tidal, surface water (pluvial), groundwater, sewers and drainage and artificial sources, including reservoirs and canals. The inter-connectedness of flood sources, pathways and receptors, together with the specific hydraulic nature of the River Thames, results in a baseline of flood events that are slow to generate a peak amount of water and that remain for a long duration. Recent flood events, such as in 2013-14, have demonstrated that areas can remain inundated for several days or weeks.

5.6.1.3   The severity of surface water flooding varies greatly across the study area due to the complexity of existing infrastructure, topography, changes in permeability between areas and the interaction with watercourses and other drainage features. It is widespread within urban areas and can also contribute to additional flooding during fluvial events.

5.6.1.4   The potential for groundwater flooding in the study area is greatest in areas adjacent to the River Thames, particularly in Egham, Thorpe, Staines-upon-Thames and land to the north of Desborough Cut. This is attributed to the geology and low lying topography of these areas.

5.6.1.5   Within the study area, sewer flooding occurs where rainfall exceeds the capacity of the sewer / drainage system or drains get blocked and the system surcharges due to high water levels in receiving waterbodies.

5.6.1.6   There are a large number of reservoirs located within the study area, several of which were formed following gravel extraction. The operation and maintenance of the reservoirs is regulated by the Reservoirs Act (1975), which stipulates regular maintenance and frequent inspections by trained individuals. As a result, the chance of reservoir embankments breaching and giving rise to flooding is extremely unlikely.

5.6.1.7   The control of flow in canals via weirs and locks means that the levels should not be overtopped from a fluvial flood event. If there were to be a breach of the canal structures, the water would likely make its way into the fluvial network, eventually reaching the River Thames. Similar to reservoir flood risk, the probability of a breach is very small as there is a regime of

regular maintenance and inspections. In addition, the regular interval of locks along canals means a failure can be confined to localised sections.

5.6.1.8   In terms of the National Planning Policy Framework (NPPF) flood risk vulnerability classifications, within the study area there are approximately 45,000 "More Vulnerable" residential dwellings (with potential for some being "Highly Vulnerable" basement dwellings), numerous non-residential institutions including hotels, hostels and nurseries along with a wide array of social infrastructure including approximately 50 educational establishments (also "More Vulnerable"), 60 places of worship ("Less Vulnerable") and over 100 recreational facilities (mix of "Less Vulnerable" and "Water Compatible" uses). Sand and gravel workings cover a large area and are "Water Compatible" along with water based recreation uses.

5.6.1.9   There are also many landfill sites and sewage treatment works which are classed as "More Vulnerable" and a large quantum of commercial and retail areas which are "Less Vulnerable" uses. There are "Highly Vulnerable" uses including mobile home parks, Police / Fire Stations and telecommunication installations. There are a few uses that would be classified as "Essential Infrastructure" in the study area, including water treatment works and various utility installations."

5.6.1.10   Figures 5.9 to 5.13 illustrate different baseline flood risk scenarios, including an allowance for future climate change.

5.6.2   Future Baseline

5.6.2.1   The flood risk in the study area principally from fluvial / tidal, surface water and groundwater sources is predicted to increase as a result of climate change scenarios, irrespective of development, given the nature of the predicted increased frequency and severity of inputs to the system. The Environment Agency's UK climate change projections for peak rainfall intensity predict it will increase in the future, with wetter winters and more intense periods of rainfall resulting in increased surface water runoff.

5.6.2.2   The future baseline will also be influenced by developments that would alter the hydraulic pattern, general drainage routes and potentially modify surface water flow paths. There could also be a localised reduction in surface water flooding with the increase in Sustainable Drainage Systems.

5.7 Health

5.7.1.1 The study area for health largely remains as described in Section 11.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR.

5.7.1.2 Based on advice received from PINS in its EIA Scoping Opinion (dated 15 November 2022) ('the PINS Scoping Opinion'), we have undertaken the collection of baseline health information for the PEIR at Middle Layer Super Output Area (MSOA). The health study area is spread across parts of 23 MSOAs, over five relevant local planning authority areas. The study area is shown on Figure 5.14. The English Census wards covered by the study area are shown on Figure 5.15.

5.7.2 Existing Baseline

5.7.2.1 Existing baseline health conditions are derived from the 2021 Census, unless otherwise stated. Within the health study area, they are as follows:

- 19 per cent of residents were aged 65 or over, compared with 16 per cent in London and the Southeast and 18 per cent in England;
- 3.3 per cent of residents were reported as experiencing bad or very bad health, compared with 4.3 per cent in London and the Southeast and 5.2 per cent in England;
- 13.1 per cent of residents were classified as having disabilities which limited their day-to-day activities, compared with 14.7 per cent in London and the Southeast and 17.3 per cent in England;
- 25 per cent of households had one or more member classified as disabled, compared with 28 per cent in London and the Southeast and 32 per cent in England;
- 2.3 per cent of residents were reported as economically inactive due to long-term sickness or disability, compared with 3.3 per cent in London and the South East and 4.1 per cent in England;
- There were 19.6 per cent fewer cases of premature deaths (from all causes) compared with the general population in England; and
- Based on evidence from the English Indices of Deprivation 2019, the health study area is not deprived by national standards. The study area contains 23 MSOAs; 13 of these are in the least deprived 20 per cent of MSOAs in England.

5.7.3 Future Baseline

5.7.3.1 Based on the key themes emerging from the health-related policy documents considered in paragraphs 11.3.2.3 to 11.3.2.17 of our EIA Scoping Report, the future health baseline will reflect the following potential changes:

- Increased in-migration to the study area which could potentially increase demand for local healthcare services;
- Increase in the number of families and older residents within the study area could lead to an increase in the demand for local social care services (such as care homes and hospices);
- Increased demand in social infrastructure associated with health and wellbeing such as open space, access to nature, recreational and community facilities; and
- Increase in the number of people within the study area suffering from mental health issues could lead to increased demand for mental healthcare services.

5.8 Landscape and Visual Amenity

5.8.1 Existing Baseline

5.8.1.1 The study area for landscape character and visual amenity largely remains as described in Section 12.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study area has remained the same. It is shown on Figure 5.16.

5.8.1.2 There are no national landscape designations within the study area; although much of it lies within the Green Belt and Metropolitan Open Land. The Colne Valley Regional Park intercepts the study area just north of Staines and Egham. Part of Windsor Home Park and the Royal Estate are located to the west and Hampton Court Park to the northeast.

5.8.1.3 The underlying landscape of the Thames Valley National Character Area is an open floodplain of flat grazing lands with scattered historic parklands on the higher ground and distinctive urban influences alongside lakes left after mineral extraction, raised landfills and large-scale raised reservoirs

with steep embankments. The landscape has been heavily shaped by major infrastructure and extensive mineral workings leaving it fragmented, visually constrained and with existing open space not being used to its full potential. The River Thames' character is wide and meandering, with a mix of semi natural edges and the hard-edges of plotland development and moorings, and with areas of more intense activity at the weirs, locks and marinas (see Figures 5.18 and 5.19). There are many Public Rights of Way (PRoW) crossing the study area including the Colne Valley Way which is of regional significance, and the Thames Path National Trail that follows the route of the River Thames (see Figure 5.20). The study area contains several areas of open access land including Hurst Park and Desborough Island in addition to areas designated as Local Green Space (see Figure 5.17).

5.8.2   Future Baseline

5.8.2.1   As much of the study area is within the Green Belt, major changes due to built development are considered unlikely. Additionally, current landscape planning policies, strategies and restoration schemes are designed to protect and enhance the landscape.

5.8.2.2   There will likely be an increase in green infrastructure, in particular to meet the targets of Surrey County Council's New Tree Strategy (Surrey County Council, 2020c) for increased tree planting and to mitigate for issues such as tree disease and climate change. Much of this would likely be delivered through large-scale landscape focussed developments, much like the RTS.

5.8.2.3   Studies including the Elmbridge Borough Council Local Green Space Study (EBC, 2022a) and Runnymede 2035 Open Space Study 2016 (RBC, 2016, republished 2017) suggest provision for public amenity is also likely to improve with potentially more areas being opened up for public access, or areas of importance to the local community provided with increased protection e.g. designated as Local Green Space. As with tree planting, new public areas would likely be delivered as part of major landscape-focussed developments, much like the RTS.

5.9 Materials and Waste

5.9.1 Existing Baseline

5.9.1.1 The study area for minerals and waste largely remains as described in Section 13.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and project boundary for our EIA PEIR, however the criteria used to determine the study areas has remained the same. It is shown on Figure 5.21.

5.9.1.2 The River Thames floodplain has valuable reserves of aggregates and non-aggregates (such as silica sand and clay). Mineral extraction of sand and gravel is one of the primary industries in the study area, with several designated Mineral Safeguarding Areas present (see Figure 5.22).

5.9.1.3 The predominant minerals worked in Surrey are sands and gravels (Surrey County Council, 2011). The general trend between 2012 and 2019 has shown that sales are increasing (Surrey County Council, 2020b).

5.9.1.4 There are many voids created from the extraction of aggregates within the study area. The project crosses several of these voids, some of which are now filled with water including Fleet Lake, Abbey lakes, Littleton lakes, Sheepwalk lakes, and Ferry Lane lake (see Figure 2.1). Many further voids have been infilled with authorised and historic landfill (Figure 5.28). They contain a range of materials, some of which are likely to be sources of contamination and hazardous waste (see Chapter 16: Soils and Land).

5.9.1.5 We recently undertook a broad-scale review of landfill capacity, based on publicly available information, which has found sufficient landfill capacity in the region for the estimated types and volumes of waste that could be generated by the RTS during construction.

5.9.2 Future Baseline

5.9.2.1 The future demand for aggregates in the UK will depend upon construction expenditure in the future. We expect demand from the commercial construction sector will boost demand for stone over the next five years (IBIS, 2022). As with aggregates, we expect the future demand for steel and timber will directly link to construction sector demand (see Section 13.3.2 of our EIA Scoping Report for further details).

5.9.2.2   The Surrey Waste Local Plan (Surrey County Council, 2020a) outlines forecast total waste arisings in Surrey to increase from circa 3.7 million tonnes in 2017 to 4.1 million tonnes in 2035. There is not sufficient existing landfill capacity to meet the forecast future demand. This is due to there being a limited number of non-inert landfill facilities in the southeast of England (Surrey County Council, 2020b).

5.9.2.3   The Surrey Waste Local Plan has identified capacity for recovery of waste to land up to 2025. About six million tonnes of extra inert landfill / recovery to land capacity may be available from future mineral extraction. The mineral extractions would be from the preferred areas in the Surrey Minerals Plan (Surrey County Council, 2011). Currently there are no preferred areas within the study area.

5.10   Noise and Vibration

5.10.1   Existing Baseline

5.10.1.1   The study area for noise and vibration largely remains as described in Section 14.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study areas has remained the same.

5.10.1.2   Noise and vibration sensitive receptors relevant to the RTS are considered to be either residential receptors (i.e. dwellings) or non-residential receptors (including e.g. schools, hospitals, hotels or offices).

5.10.1.3   An overview of the noise and vibration study area and receptors is shown in Figure 5.23.

5.10.1.4   The noise climate within the study area is characterised by road noise from the surrounding major roads, railways and air traffic (primarily associated with Heathrow Airport).

5.10.1.5   The vibration baseline is generally assumed to be negligible at receptors due to their distance to sources which would have the potential to generate significant levels of vibration. There may however be noticeable vibration at some receptors that are particularly close to railway lines or roads.

5.10.2   Future Baseline

5.10.2.1   In general, it is assumed that environmental noise conditions determined during the noise surveys are representative of conditions in future baseline years, as set out in Section 14.3.2 of our EIA Scoping Report, as this is likely to be worst case for the assessment. However, there may be localised changes considered where, for example, changes in traffic flows or the introduction of committed developments would lead to significant changes in future baseline noise levels.

5.11   Socio-economics

5.11.1   Existing Baseline

5.11.1.1   The study area for socio-economics largely remains as described in Section 15.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study areas has remained the same. The socio-economics study area is shown on Figure 5.24.

5.11.1.2   The River Thames between Datchet and Teddington runs through the largest area of populated but undefended floodplain in England. The greatest risk of flooding to human populations (i.e. socio-economic receptors) is in the urban areas of Staines, Egham, Chertsey, Shepperton, Walton-on-Thames, East Molesey, Teddington and Kingston upon Thames, which have the greatest population densities, see Figure 15.25.

5.11.1.3   Most of the socio-economic study area is located in Surrey. The 2021 Census reports that 85.5 percent of the population of Surrey regard their ethnicity as White, 7.7 percent as Asian, Asian British or Asian, 3.4 percent as Mixed or Multiple ethnic groups, 1.7 percent as Black, Back British, Black Welsh, Caribbean or African and 1.7 percent as Other ethnic group. For further details of the ethnic composition of the study area and differences between boroughs see Section 15.3.1 of our EIA Scoping Report. We will fully update the baseline set out in our EIA Scoping Report for the ES using 2021 Census data.

5.11.1.4   Surrey is generally regarded as a wealthy county with a strong economy and low levels of deprivation and this is also reflected more broadly across the study area as a whole, however small pockets of more

deprived areas do exist. For further details of measures of relative deprivation, including differences between boroughs, see Section 15.3.1 of our EIA Scoping Report and Figure 5.27.

5.11.1.5   Within the study area there are approximately 45,000 residential dwellings and over 2,000 commercial/industrial properties. Commercial developments comprise of, for example, offices, hotels, retail and recreational businesses, including those associated with the lakes and the River Thames. Industrial development comprise of, for example, manufacturing, storage and wholesale distribution. Furthermore, there is a wide array of social infrastructure including educational establishments, places of worship and formal and informal community and recreational facilities.

5.11.1.6   The lakes within the project boundary are generally privately owned and many of them host various recreational activities including sailing (Littleton East, Sheepwalk lakes and Ferry Lane Lake), fishing (Littleton East and Sheepwalk lakes), open water swimming (Ferry Lane Lake) and water skiing (Littleton North) (see Figure 5.26).

5.11.1.7   Informal recreational facilities within the study area include a complex footpath network consisting of various PRoW, the Thames Path National Trail and National and Local Cycle Network routes, a variety of Public Open Spaces and amenity areas. Formal recreational facilities within the study area include Thorpe Park, Hampton Court and numerous water sport activities (fishing, open water swimming, sailing, canoeing and other water sports) (see Figure 5.26).

5.11.1.8   For further detail on land uses throughout the study area see Appendix 15.1.

5.11.2   Future Baseline

5.11.2.1   The population within the study area is anticipated to grow over time and will be an increasingly aging population (ONS 2020; ONS, 2022). Population growth is likely to increase demand for housing and social infrastructure in the area. See Section 15.3.2 of our EIA Scoping Report for further information on how populations and demographics are anticipated to change over time.

5.11.2.2 Future land use change is likely to occur in line with local and regional planning policy. Such policies have broad objectives to ensure that the management of development and infrastructure meets identified social, environmental and economic challenges.

5.11.2.3 Residential, commercial, industrial and recreational assets will remain at risk of flooding (in the absence of the RTS or any other flood relief scheme), and this risk will gradually increase over time as the effects of climate change become more significant. See Chapter 10 (Flood Risk) for further information.

5.12 Soils and Land

5.12.1 Existing Baseline

5.12.1.1 The soils and land study area largely remains as per Section 16.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study areas has remained the same. The soils and land study areas are shown on Figure 5.28.

5.12.1.2 The shallow geology below the study area is a combination of Alluvium (clay and silt), and the Shepperton Gravel Member (sandy gravel) (see Figure 5.29). The bedrock geology comprises London Clay, the London Claygate Member (sandy clay), and the Bagshot Formation (sand) (see Figure 5.30). The land does not suffer from any significant instability issues.

5.12.1.3 Made ground is soil or other materials (such as building demolition waste materials) that have been placed or altered by human activity. Made ground and landfill materials are known to be present throughout the soils and land study area based on publicly available Environment Agency historic and authorised landfill records and ground investigation information (see Scoping Report Sections 16.3.1.11 to 16.3.1.17 for further details). There are a total of 44 historic and authorised landfill sites in the study area containing:

- Undifferentiated material (reworked natural soils containing little to no human-derived waste);
- Construction and demolition waste; and

- Domestic waste.

5.12.1.4   There are three landfill sites within the study area that were detailed to receive special or hazardous waste, and a further eight landfills detailed to receive commercial or industrial waste (see Appendix I of our EIA Scoping Report). The RTS ground investigation surveys identified a further two landfill sites that contained elevated concentrations of contaminants. These landfills may contain hazardous materials that could pose a risk to humans and the environment. Contamination from sources such as the landfills, made ground, farming activities, or industrial land use has the potential to spread through the ground and groundwater. The contamination could cause significant effects to sensitive land and waters in the study area, as well as to humans.

5.12.1.5   Whilst much of the land use in the study area is urban, the relatively small areas of agricultural land are generally of high quality. The quality is determined by the approved Agricultural Land Classification (ALC) system (Natural England, 2012), which grades agricultural land between 1 and 5 (where 1 is excellent, and 5 is very poor). Figure 5.32 illustrates the ALC in the study area, with the majority classified as good to moderate (Grade 3) or very good (Grade 2). Soilscapes are illustrated in Figure 5.31.

5.12.2   Future Baseline

5.12.2.1   Future developments or activities may affect areas within the study area. This could have an effect on the soils, geology, or agricultural land use.

5.12.2.2   Agricultural land and soils as well as unsealed landfill and made ground will remain at the current risk of flooding in the short term. This risk will increase with time as the effects of climate change become more significant.

5.13   Traffic and Transport

5.13.1   Existing Baseline

5.13.1.1   The traffic and transport study area for the PEIR remains the same as that described in Section 17.2.4. of our EIA Scoping Report. This is due to the rationale of applying a 600 metre buffer from the main roads that are required to reach the Strategic Road Network (main 'A' roads, M3, M4, M25) from: the main RTS compounds; priority areas for habitat creation,

enhancement or mitigation; and new green open spaces (NGOS). The study area is shown on Figure 5.33.

5.13.1.2   There are 18 railway stations located within the study area that provide connections to important transport hubs such as London Waterloo and Reading.

5.13.1.3   The bus services within the study area provide links between the communities of Datchet, Wraysbury, Staines upon Thames, Chertsey, Shepperton, Walton-on-Thames, Surbiton and Kingston upon Thames.

5.13.1.4   Throughout the study area, there are footways and pedestrian crossings to support journeys by foot, as well as several signed cycle routes and routes used by equestrians.

5.13.1.5   Within the study area are nationally significant motorways, such as the M3, M4 and M25, and significant trunk roads and B roads.

5.13.1.6   The River Thames is a popular commercial navigation route from upstream Lechlade in Gloucestershire, through the study area to central London and downstream beyond Canvey Island to the North Sea.

5.13.2   Future Baseline

5.13.2.1   Traffic and transport use is anticipated to increase in the future in response to likely population growth and new infrastructure including:

- New residential development;
- Employment growth; and
- Planned infrastructure, including new roads and active travel improvements.

5.13.2.2   We will use Surrey County Council's existing Strategic Transport Model to inform the future baseline for the ES, discussions with Surrey County Council are ongoing regarding progress on Model updates.

5.14 Water Environment

5.14.1 Existing Baseline

5.14.1.1 The water environment study area largely remains as described in Section 18.2.3 of our EIA Scoping Report. Some minor amendments have been made to account for the updated design parameters and our project boundary for EIA PEIR, however the criteria used to determine the study areas has remained the same. The surface water study area is shown on Figure 5.34. Water bodies designated under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (hereafter referred to as the WFD Regulations) are shown on Figure 5.35. The groundwater study area is shown on Figure 5.36.

5.14.1.2 The main water body is the River Thames, however there are numerous tributaries of varying size and man-made lakes that are fed by a combination of surface water and groundwater. Approximately 14 per cent of the study area is made up of lakes or reservoirs. These water body types and specific receptors are detailed in Section 18.3.1 of our EIA Scoping Report and summarised in the following sections.

5.14.1.3 The tidal limit of the River Thames is located at Teddington Weir. However, the tidal influence can often be observed up to seven kilometres upstream of this. There are 29 named watercourses within the study area and numerous ordinary watercourses and land drains that feed into the named watercourses. There are also 72 lakes and reservoirs in the study area.

5.14.1.4 A total of 36 surface water WFD waterbodies (18 rivers and 18 lakes) are present within the study area. Five of the WFD river waterbodies lie upstream of the proposed flood channel and the other 13 river waterbodies would either intersect or are located near the proposed location of the flood channel, or close to Sunbury, Molesey and Teddington Weirs. In total, 15 of the 18 WFD river waterbodies are classified as artificial or heavily modified waterbodies, whilst all 18 WFD lake waterbodies are classified as artificial.

5.14.1.5 The River Thames displays characteristics of the lower reaches of a highly regulated and modified, mature, lowland river. Increased sediment supply has occurred because of urban development, agricultural drainage

and runoff, channel modification and boat wash erosion. Historically, weirs and locks have caused a build-up of coarse materials behind weirs and within deeper pool areas immediately downstream. Sediment supply in the River Thames also comes from all of its tributaries, which are affected by use for land drainage, water abstractions, flood control and navigation.

5.14.1.6   The study area includes a series of man-made lakes created from former gravel pits, some have islands while others are wide areas of open water allowing unhindered surface water movement.

5.14.1.7   The hydrogeology across the study area is varied as a result of the geology in the area. Overall, groundwater contributes only a relatively small proportion of the surface water flow due to a generally shallow hydraulic gradient and numerous flow barriers. However, our monitoring has identified seasonal responses to rainfall in groundwater levels, which is indicative of good hydraulic connection between the superficial aquifer and surface waters. At a regional scale, groundwater flow is generally from north-west to south-east, mostly parallel to the River Thames flow. Most of the study area is underlain by bedrock of the London Clay Formation which has low permeability and separates the principal Lower Thames Gravel aquifer from the minor aquifer below.

5.14.1.8   The Lower Thames Gravel aquifer is formed by river terrace sand/gravel deposits and is largely unconfined. The aquifer acts as a single aquifer unit and is a principal aquifer that supports water supplies at a strategic scale.

5.14.1.9   Sections of the flood channel are within a groundwater source protection zone (GSPZ), the Abbey Meads area of the Runnymede Channel is within a Source Protection Zone 1 (the highest level of protection).

5.14.1.10 There are two WFD groundwater bodies within the study area, both have a 'Poor Overall Status'.

5.14.1.11 There are multiple licensed abstractions from surface waters and groundwater in the study area, including 22 surface water abstraction points from the River Thames and its tributaries. Abstraction is managed under the Thames Catchment Abstraction Management Strategy (TCAMS) (Environment Agency, 2019a). The majority of surface water abstraction within the study area is used for potable water supply, with five sites used for irrigation and three used for heat pump supply.

Groundwater abstractions are predominately from the Lower Thames Gravels aquifer. There are 52 abstraction points, 18 of which are for public water supply. There is no capacity for additional consumptive licences without restrictions.

5.14.2 Future Baseline

5.14.2.1 Improvements to the local water environment may occur in the near future through the implementation of the Environment Agency's River Basin Management Plans, and from requirements placed on water companies through the Water Industry National Environment Programme.

5.14.2.2 River flows and groundwater levels are anticipated to be more variable in the long term as a result of more extreme weather conditions caused by climate change. Furthermore, baseline water supplies are forecast to decrease between present day and 2100 due to climate change.

5.14.2.3 Ground conditions and drainage pathways are not expected to change in the near future. However, there is the potential for changes if any mineral restoration or construction works are undertaken in the area. Similarly, new developments may alter existing surface and groundwater flow pathways, water quality, water quantity and hydromorphology.
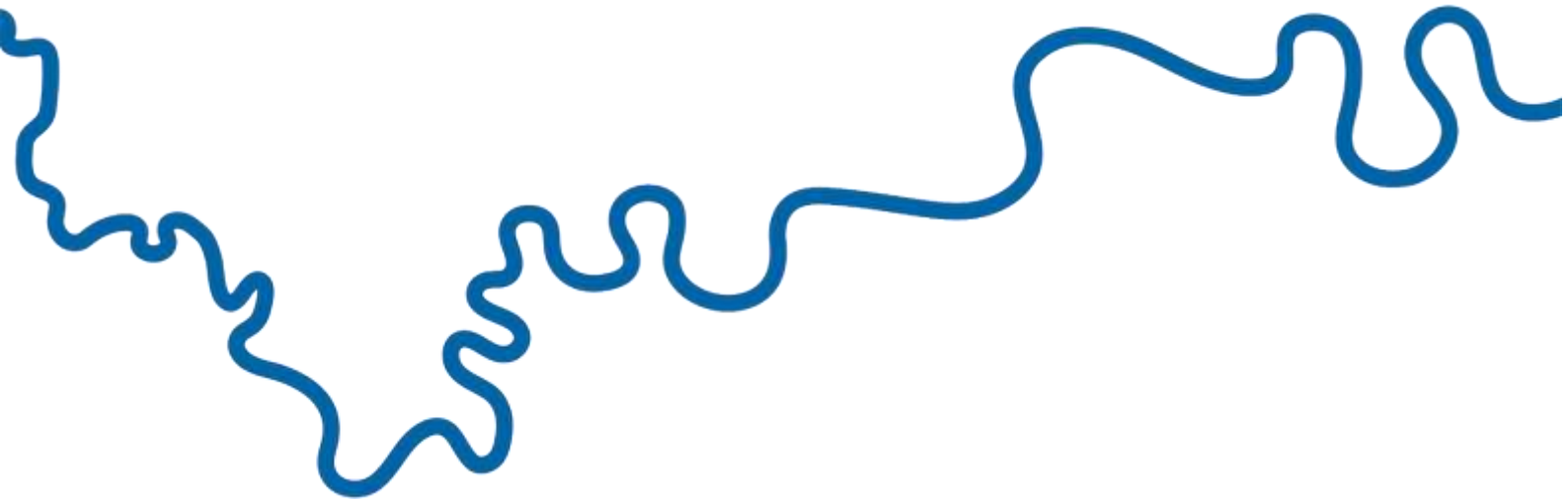
The River Thames Scheme represents a new landscape-based approach to creating healthier, more resilient and more sustainable communities by reducing the risk of flooding and creating high quality natural environments.

River Thames
Scheme