Teddington Direct River Abstraction

Preliminary Environmental Information Report

Chapter 2 – Project Description

Volume: 1

Date: June 2025

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2. Project Description

2.1 Introduction

2.1.1 This chapter provides a description of the Teddington Direct River Abstraction (TDRA) Project (hereafter referred to as 'the Project'), the works required to construct it and any operational and maintenance requirements, such that potential environmental, social and economic impact pathways can be identified. It presents the current proposals, which have been developed through ongoing engineering design, environmental assessment and regulator responses, and informed by feedback received during the autumn 2023 non-statutory public consultation.

2.1.2 The design will continue to evolve based on the feedback received during the statutory consultation and further ongoing environmental and design work. The final assessed design will be presented in the application for development consent.

2.1.3 This chapter should be read alongside the following volume and appendices associated with this chapter:

a. Volume 2 Preliminary Environmental Information (PEI) Report Figures

b. Appendix 1.1: National Planning Policy and Legislation Context

2.2 Description of the Project

2.2.1 The Project is a vital drought resilience scheme designed to provide additional water capacity to London under drought conditions. It would operate intermittently, supplying up to 75 million litres per day (Ml/d) of water when required. Modelling scenarios indicate that the Project would typically function during low river water flow periods in the River Thames, averaging once every two years, primarily between August and November.

2.2.2 The Project involves establishing a new abstraction intake on the River Thames approximately 350m upstream of Teddington Weir. The abstracted water would be transferred to Lockwood Pumping Station, part of Thames Water's Lee Valley reservoir system in north-east London, via the Thames Lee Tunnel (TLT). The abstracted water would be replaced through a new outfall structure on the River Thames approximately 180m upstream of Teddington Weir. The replacement water would be recycled water from a new tertiary treatment plant (TTP) within the existing Mogden Sewage Treatment Works (STW). A schematic diagram of the Project and principal components is shown in Plate 2.1.

2.2.3 The Project incorporates a conveyance tunnel from Mogden STW to the outfall location upstream of Teddington Weir. The conveyance tunnel transfers recycled water along a generally southerly alignment from the east side of Mogden STW to a reception shaft at the Burnell Avenue site, crossing the

A316, railway, river and via Ham Playing Fields where an intermediate shaft is proposed.

2.2.4 The Project comprises the following principal components:

a. A new TTP constructed on a platform above some of the existing storm tanks at Mogden STW to process a portion of the final effluent with an output of up to 75Ml/d of recycled water (shown as point 3 in Plate 2.1)

b. A tunnel boring machine (TBM) drive shaft and recycled water interception shaft at Mogden STW site

c. A new recycled water conveyance tunnel with an approximate 3.5m internal diameter, between Mogden STW and the Burnell Avenue site for the transfer of up to 75Ml/d of recycled water between the TTP and the outfall discharge infrastructure (shown as point 4 in Plate 2.1)

d. An intermediate shaft at Ham Playing Fields site

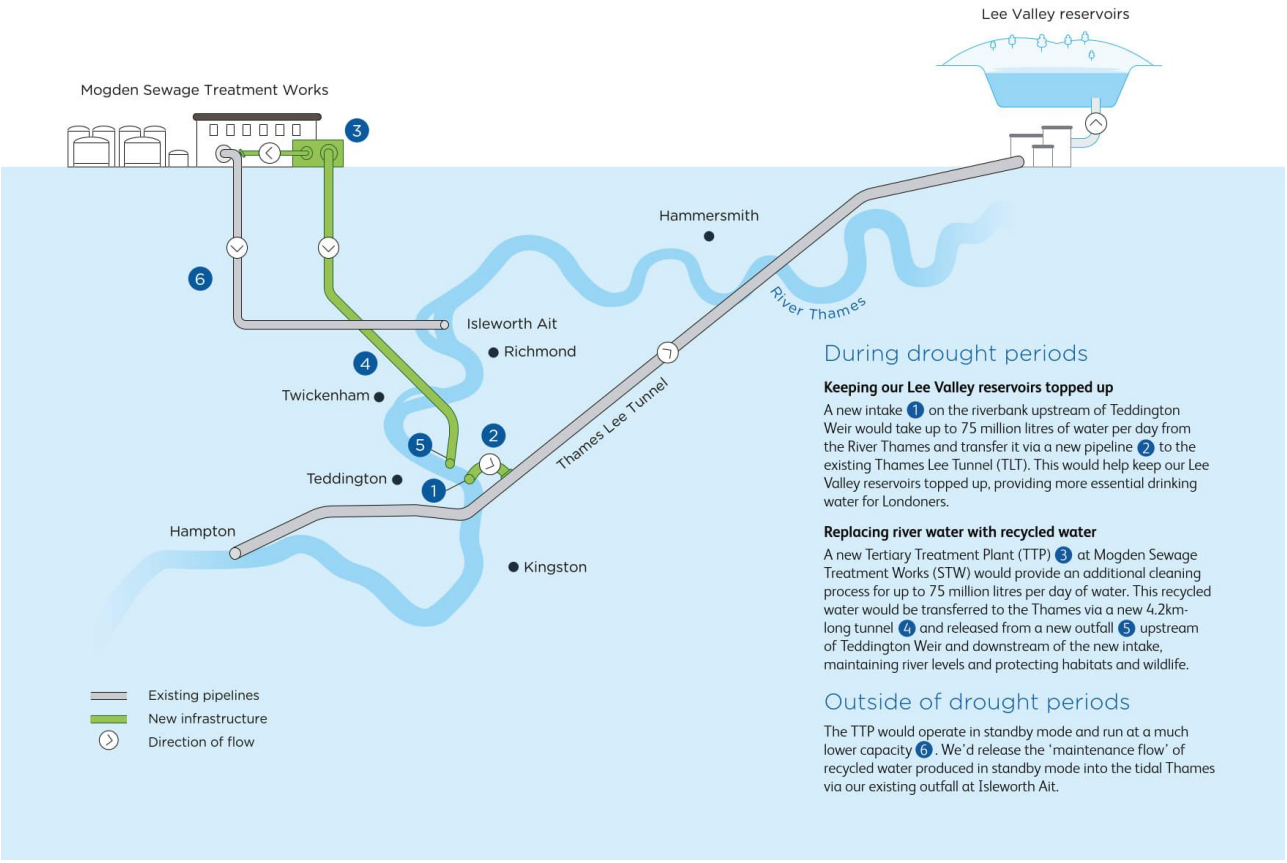
e. A recycled water conveyance tunnel reception shaft and connecting conveyance pipe to the outfall structure for the discharge, located on land to the south of the Burnell Avenue site

f. A new outfall structure for discharging up to 75Ml/d of recycled water, located either on the bankside or near the bankside in the River Thames upstream of Teddington Weir (shown as point 5 in Plate 2.1)

g. A new abstraction intake and associated infrastructure, which will take up to 75Ml/d of raw water from the River Thames. This is located on the bankside of the River Thames, approximately 180m upstream of the new outfall structure (shown as point 1 in Plate 2.1)

h. A new abstraction connection shaft and raw water conveyance pipeline connecting to the existing TLT. Two options are considered for the TLT connection, see paragraph 2.6.54 (shown as point 2 in Plate 2.1)

Plate 2.1 Schematic of the Project and principal components



2.3 Development Consent Order limits and parameters for assessment

Development Consent Order limits

2.3.1 Order limits represent the extent of the area within which a project authorised by development consent may be carried out, including the required permanent and temporary land needed for construction, operation, maintenance and decommissioning activities. The Order limits will be shown on the works plans submitted with the Development Consent Order (DCO) application. At this stage the Order limits are draft and referred to as 'draft Order limits' in this PEI Report.

2.3.2 The draft Order limits are drawn to provide sufficient flexibility for further project design and development following publication of this PEI Report and the statutory consultation on the Project. Works to utilities and public rights of way (PRoW) diversions are included within the extent as well as temporary or remedial highway works related to vehicle movements such as Ham Street, Beaufort Road, Burnell Avenue and Dysart Avenue. The full scope of these works are subject to further surveys, assessments, consultation feedback, designs and agreements with and by the statutory undertakers.

2.3.3 The recycled water conveyance tunnel corridor is wider than the tunnel would end up being. Ground investigations (GI) and other surveys have been

undertaken to establish the preferred alignment for the tunnel and the locations of the associated shafts. Opportunity to refine the tunnel corridor will be explored and shared in the updated Order limits on submission of DCO application.

2.3.4 The draft Order limits include the necessary area required for the installation and removal of cofferdams for both the outfall and intake construction activities with allowance for river freight and river working. Further details on potential river freight are provided under Section 2.7: Transport. The working areas within the River Thames vary according to the construction activities, with the maximum area needed being during the cofferdam installation and removal periods.

2.3.5 It should be noted that, at some locations, the draft Order limits are larger than what may ultimately be required for the final Project. For example, the draft Order limits currently consider two alternative connection points to the TLT. This allows flexibility whilst surveys and assessment works are ongoing such as GI works. Allowances for enhancement and mitigation measures to be implemented by the Project are also incorporated within the draft Order limits unless they are enhancements to be secured by other agreements or legislative means or provided by external parties.

2.3.6 The draft Order limits also include temporary compensatory residential parking south of Riverside Drive Playground along Riverside Drive. Temporary compensatory residential parking may be necessary to ensure the safe movement of heavy goods vehicles (HGVs) along Riverside Drive during peak construction periods at the Ham Playing Fields site. This is particularly important where the road narrows between the junction with the lane to Stuart Road and the junction with Ham Street.

Parameters for assessment

Spatial scope of assessment

2.3.7 The assessments within this PEI Report are based on the draft Order limits, as shown in Plate 1.1 in Chapter 1: Introduction. Study areas identified for each PEI Report aspect chapter can cover a wider area than the draft Order limits to ensure potential impacts are fully identified and enable a robust preliminary assessment of likely significant effects. The study area for each aspect is based on aspect-specific guidance, and specific receptors or resources under consideration. The study areas also comply with relevant legislation, policy, and guidance, as well as commentary in the Environmental Impact Assessment (EIA) Scoping Opinion (Planning Inspectorate (PINS), 2024) and take into account feedback from technical engagement with relevant stakeholders.

2.3.8 Assessments within this PEI Report are typically presented considering below ground works where relevant and by individual site or group of all sites collectively referred to as 'above ground sites'. The above ground sites (see Plate 2.2) within the draft Order limits include the following:

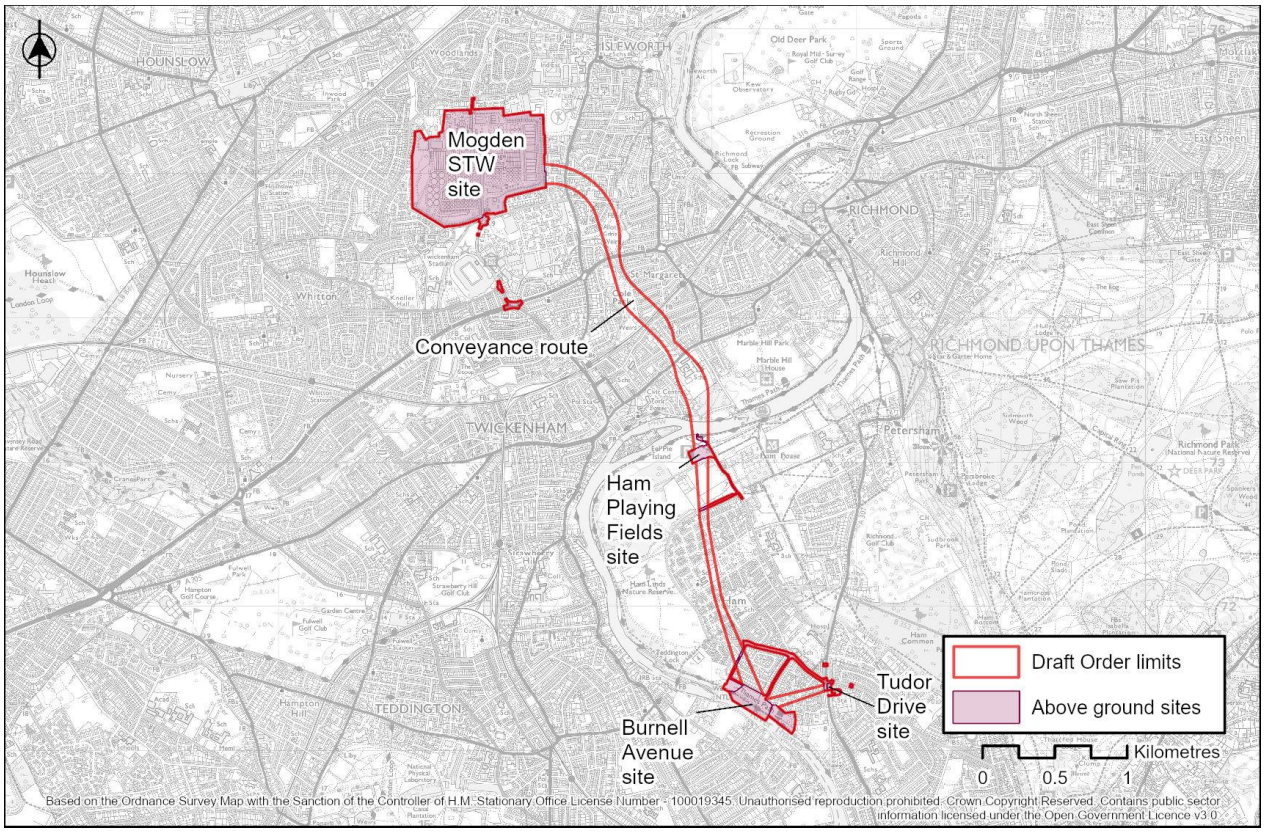
a. Mogden STW site
b. Ham Playing Fields site

c. Burnell Avenue site

d. Tudor Drive site (alternative option for the TLT connection)

2.3.9 The spatial scope and extent of the assessments in this PEI Report are discussed in Section 4.3.

Plate 2.2 Above ground sites of the Project



Temporal scope of assessment

2.3.10 The following timeframes as set out in the list below have been adopted for the design life of the Project. Although the Project's operational life is understood to be indefinite for its defined purpose, some elements and assets will require maintenance, repair or replacement at some point. For the purpose of the assessment within this PEI Report the Applicant has adopted a conservative approach using the 60 years design life as this draws on current reliable model data for flood risk and climate change (See Chapter 5: Water Resources and Flood Risk and Chapter 18: Climate Change).

2.3.11 The design life of assets shall be as follows:

a.	Tunnel and shafts	120 years
b.	Civil structures and building structural elements	60 years
c.	Pipelines	50 years
d.	Mechanical and electrical plant	20 years
e.	Control and instrumentation systems	7 years

f.	Computer systems	7 years
g.	Analytical and process instruments	10 years

2.4 Description of the site and surroundings

Geographical context

2.4.1 The Project is located in south-west London and falls within the administrative areas of three local planning authorities (LPAs), which all lie within the Greater London Authority: the London Borough of Hounslow (LBH), the London Borough of Richmond upon Thames (LBR) and the Royal Borough of Kingston upon Thames (RBK) (see Figure 1.1 in Volume 2 PEI Report Figures for the LPAs' administrative boundaries).

2.4.2 The setting of the LPAs varies significantly from the heavily urbanised residential areas within LBH, to LBR and RBK characterised by a variety of built urban centres such as Teddington and Twickenham, and historic and natural environments with landmarks such as Richmond Park, Hampton Court Palace, Ham House and Ham Lands and Bushy Park. There are a range of services including shops, schools, religious centres, supermarkets, sports facilities and restaurants. Allianz Stadium Twickenham is a prominent feature of the area, being an important sporting asset and regular host for international sports fixtures, music concerts and conferences. The River Thames passes through all three boroughs and is important for navigation, water supply, ecology, leisure and townscape character.

2.4.3 There are a number of public transport networks in proximity to the Project, including overground and National Rail lines, two London Underground lines (District and Piccadilly) and numerous bus routes. The Project is also a short distance from Heathrow Airport, a global hub for international air travel. The area is well connected to the highways network, including major arterial roads (A316, A315, A305, A307, A4, A406, A3) and trunk roads (M25, M3 and M4) in and out of London.

Environmental context

2.4.4 The following receptors are located within the draft Order limits of the Project and are shown on Figures 2.1 to 2.4 in Volume 2 PEI Report Figures. These designated and sensitive receptors could potentially be directly impacted by the Project's development if they fall within the above ground site boundaries. Therefore, careful consideration has and will be given to mitigating any potential adverse environmental effects.

a. Ham Lands Local Nature Reserve

b. Sites of Importance for Nature Conservation (SINCs):

   i. Mogden Sewage Works SINC

   ii. Moormead Recreation Ground SINC

   iii. Ham Lands SINC

iv. River Thames and Tidal Tributaries SINC

v. River Crane at Margarets (Richmond Site) SINC

vi. Royal Park Gate Open Space SINC

c. Ham House Registered Parks and Gardens

d. Listed Buildings: Mogden House (Grade II); Riverside House (Grade II); and Orleans House (Grade I)

e. Conservation Areas:

i. Twickenham Riverside Conservation Area

ii. Ham House Conservation Area

iii. Amyand Park Road Conservation Area

iv. Riverside North Conservation Area

v. Teddington Lock Conservation Area

vi. Parkleys Estate Conservation Area

f. Archaeological Priority Areas (APAs):

i. Crane Valley APA

ii. Ham Fields APA

iii. Ham APA

iv. Kingston Thames Riverside APA

g. Metropolitan Open Land

i. River Crane

ii. Moormead Park

iii. Marble Hall, Orleans Gardens, Cambridge Gardens, Trowlock Island, Melbourne, Radnor Gardens, Lensbury Club, Teddington School, Manor Road Recreation Ground

iv. Ham House, Douglas House, Richmond, Hill Rise, Ham Common, Ham Polo, Buccleuch Gardens, Grey Court School, Petersham Lodge, Petersham Meadows

h. Trails and Networks: Thames Path National Trail and National Cycle Network (NCN) (Route 4)/EuroVelo 2 – Capitals Coast Route

i. Tree Preservation Orders

j. Flood Risk Zones 1 to 3

2.5 Description of Project components and construction methodology

2.5.1 This section presents the current proposals for key components of the Project and the construction methodology, which have been developed as described in paragraph 2.1.1 and will evolve as described in paragraph 2.1.2. Further details are provided in the environmental aspect chapters, where applicable, to aid assessment.

Compounds and site set up

2.5.2 All temporary site compounds will be suitably sized, but their dimensions will vary between sites due to the size of the shafts and the construction activities required. Common infrastructure and facilities required across all sites are as follows:

a. Cranage
b. Welfare accommodation and site offices
c. Vehicle parking
d. Traffic management
e. Materials storage
f. Plant and equipment storage
g. Power and utilities
h. Wheel cleaning facilities

2.5.3 All above ground sites will be established with hoarding or appropriate security fencing, typically 2.4m high; however, this height will depend on the site activities and mitigation measures. Topsoil will be stripped with the preference for this material to be retained and stockpiled within the site. Site lighting will be provided to ensure safe working conditions and to maintain security on construction sites, having regard to sensitive ecological receptors or occupied residential properties. An illustration of the indicative site compound layouts are provided in Plate 2.3, Plate 2.4 An indicative illustration of the Ham Playing Fields temporary site compound layout Plate 2.4, Plate 2.5 and Plate 2.6.

Plate 2.3 An indicative illustration of the Mogden STW temporary site compound layout at the Western and Eastern Work Area

Plate 2.4 An indicative illustration of the Ham Playing Fields temporary site compound layout

Plate 2.5 An indicative illustration of the Burnell Avenue temporary site compound layout

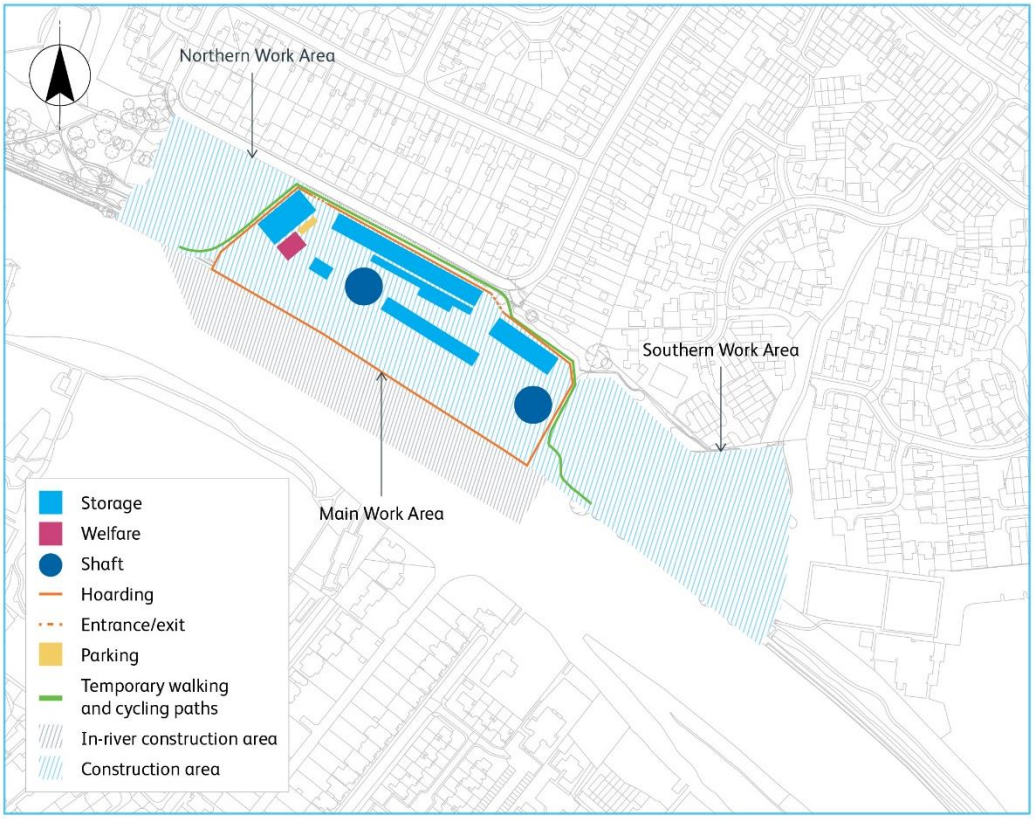


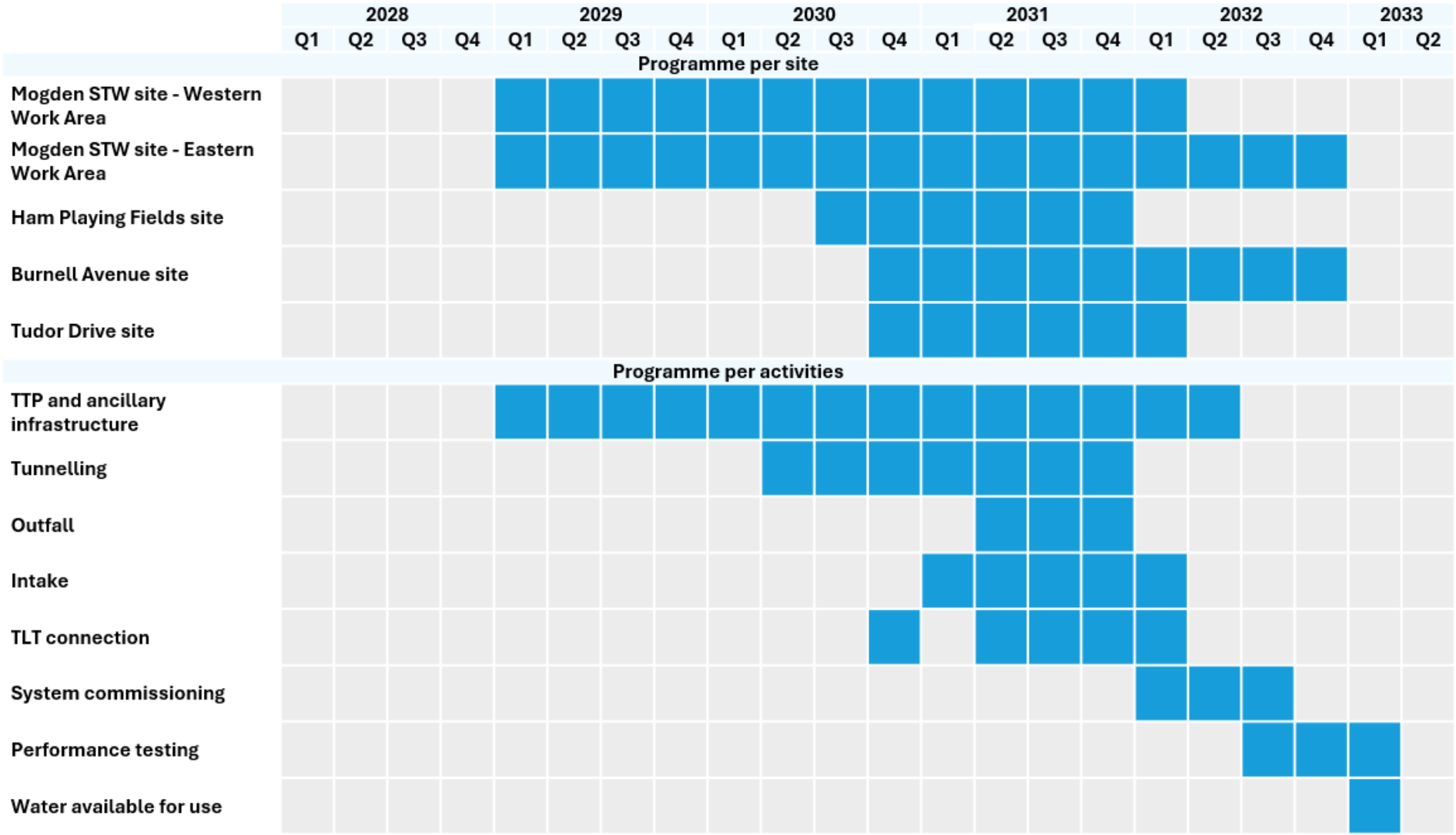
Plate 2.6 An indicative illustration of the Tudor Drive temporary site compound layout

2.6 Construction logistics

Programme

2.6.1 Construction of the Project is expected to take nearly four years commencing in 2029 and completing in autumn 2032, with some activities to discharge DCO Requirements such as protected species management and archaeological surveys as necessary, taking place beforehand in 2028. The Project would not be in operation immediately after construction as there will be a period of approximately 15 months of system commissioning and performance testing. This period would begin prior to the end of the construction phase. The Project is anticipated to become operational in 2033. See Plate 2.7 for the indicative construction programme.

Plate 2.7 Indicative construction programme



Working hours and workforce

2.6.2 Construction works will be programmed, to adhere to standard working hours of the host local authorities:

a. Monday to Friday
    i. All three LPAs: 08:00 to 18:00
b. Saturday
    i. LBH: 09:00 to 13:00
    ii. LBR and RBK: 08:00 to 13:00

2.6.3 Some works will be required to be undertaken outside of these core hours. Examples of such works are as follows but not limited to:

a. Shaft sinking will require a 12-hour working day to provide adequate time to safely complete the excavation and lining sequence
b. Tunnelling work at the Western Work Area as well as access to the interception and intermediate shafts for health and safety reasons will require a 24-hour, seven days a week operation. Once the TBM starts, it should not be stopped for extended periods to prevent issues such as ground squeezing around the TBM leading to it becoming trapped
c. TLT connection activities at the Tudor Drive and Burnell Avenue sites will require 24/7 construction working as per the TBM above where activities should not be stopped
d. Long duration concrete pours associated with the storm tanks and the TTP
e. Utility diversion works subject to the requirements of the provider
f. Construction site and equipment maintenance and upkeep including replacement of plant and equipment
g. Emergency response

2.6.4 Additional works may also need to be undertaken outside of the standard working hours and would be developed in consultation with the LPA depending on the location and nature of the activity.

2.6.5 Deliveries of construction materials and removal of excavated materials to and from all above ground sites will not occur 24/7. Due to the proximity of some shaft locations to residential areas, night-time work and workforce travel would be carefully considered and restricted as far as possible.

2.6.6 Consideration of other specific local traffic movement restrictions (i.e. coinciding with school drop off and pick up times) will be addressed through consultation with local authorities and stakeholders.

2.6.7 Information on potential peak workforce numbers during construction are provided in Chapter 12: Traffic and Transport. Further details of the logistics of this will be captured in the Construction Logistics Plan to be submitted with the DCO application.

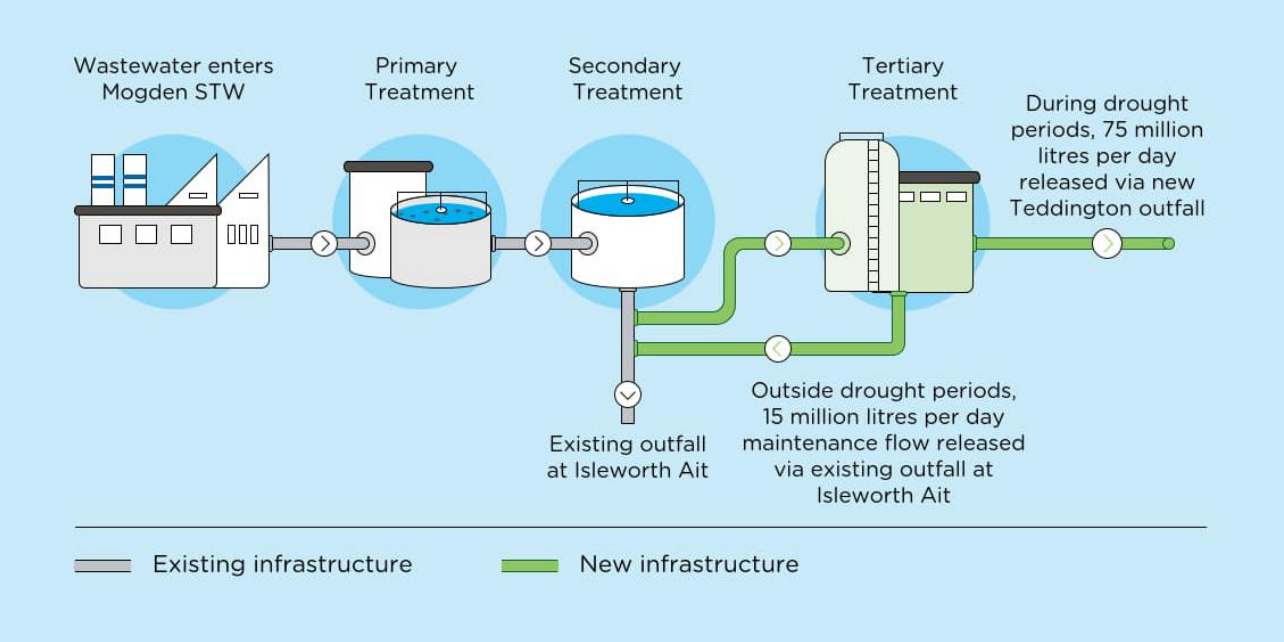
Mogden STW site

2.6.8 Mogden STW, located in Isleworth, West London, is one of the largest sewage treatment plants in the UK. It serves eight London boroughs, with a catchment area extending south to Sunbury and Staines and north to Edgware. Originally built between 1931 and 1936 by Middlesex County Council, it is now owned and operated by Thames Water. The plant spans 55 hectares and serves a population equivalent to approximately two million people.

2.6.9 The site is surrounded by an embankment with trees and other lower mixed vegetation to the north, east, south and south-west, undeveloped land to the west and industrial and business land uses to the north-west. Residential properties are located in close proximity around the boundary of the entire site.

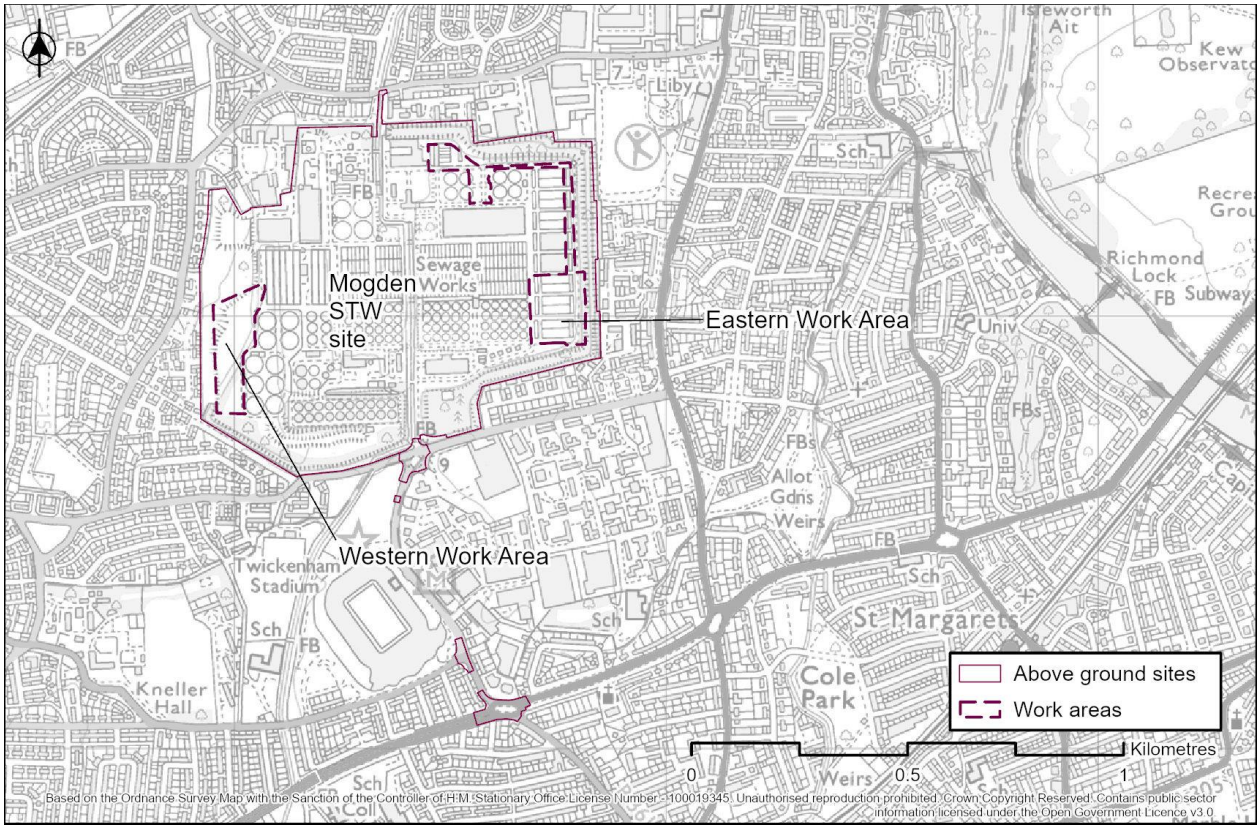
2.6.10 Plate 2.8 demonstrates the existing infrastructure at Mogden STW and the proposed infrastructure to be constructed as part of the Project. There will be two main working areas within the Mogden STW site associated with the Project: the Western Work Area and the Eastern Work Area (see Plate 2.9).

Plate 2.8 Illustration of existing and proposed infrastructure at Mogden STW



2.6.11 Access to the Western and Eastern Work Areas during construction would primarily be from the southern access gate of the Mogden STW site, from the Mogden Lane/Whitton Dene roundabout and then through the site following existing internal roads. The site can also be accessed from a northern access gate via Oak Lane and Worton Road although it is anticipated this would only be used occasionally, such as during road closures implemented by others impacting the southern access gate.

Plate 2.9 Mogden STW site



Western Work Area

2.6.12 The Western Work Area is located on an engineered and vegetated embankment on the western side of Mogden STW. The embankment, which is approximately 8m high from ground level outside the site and 13m to 16m high from the ground level within the STW site, comprises mixed woodland and grass habitats. The Western Work Area is proposed to site the drive shaft for the TBM and to provide the storage for tunnel spoil and segments, welfare units and offices as well as construction personnel vehicle parking.

2.6.13 The Western Work Area will also be used for storage of tools, materials and equipment. This may include materials required for the construction of the tunnel and some of the works proposed for the Eastern Work Area, such as the TTP, recycled water interception shaft and associated ancillary infrastructure. Storing these materials in the Western Work Area will provide a less constricted working area on the eastern side of Mogden STW. The Western Work Area will be large enough to stockpile excavated materials from the TBM for up to five days.

2.6.14 Prior to works commencing in the Western Work Area, some earthworks may be required to facilitate a safe and level works area. During construction, crawler and/or gantry cranes will be required to support the proposed works at the Western Work Area.

Eastern Work Area

2.6.15 The Eastern Work Area is located predominantly in the south-eastern corner of the Mogden STW, with some extension along the east and north-east of the Mogden STW site. An embankment approximately 155m wide, 11m high from ground level outside the site, and approximately 12m high from ground level inside the site and, with vegetation including mature trees on the slopes and crest for additional screening, is established around the eastern edge of the Mogden STW site with continuation to the southern and norther boundaries.

2.6.16 The new TTP will be located in the Eastern Work Area, on a newly constructed platform above some of the existing storm tanks in the south-eastern corner of the Mogden STW site. See Figure 2.5: Preliminary Townscape and Environmental Master Plan on Sheet 1 of 5, in Volume 2 PEI Report Figures. Construction in the Eastern Work Area must be sequenced appropriately to maintain safe working conditions and to enable continued operation of the Mogden STW. The embankment in this area of Mogden STW will be cut back approximately 15–20m from the existing site road for about 150m in distance along the embankment. It will be stabilised by permanent retaining walls to create space for the TTP ancillary infrastructures and the interception shaft. This approach ensures all temporary and permanent works remain within the existing Mogden STW footprint, retaining the crest and external face of the embankment, while the internal face of the embankment is cut back, and some vegetation is removed.

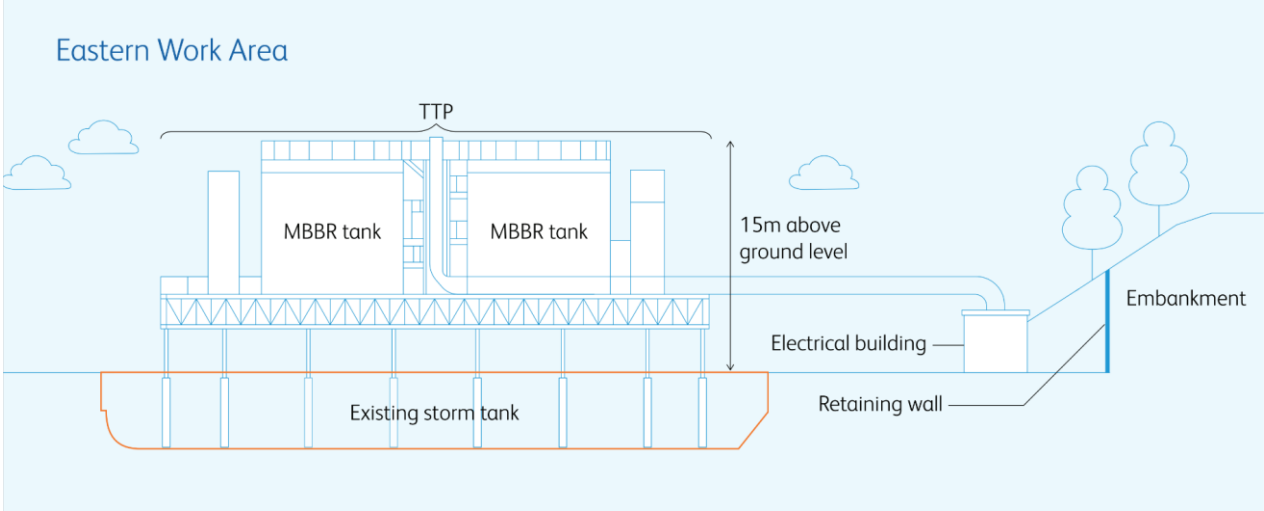
2.6.17 During construction, two tower cranes (approximately 95m high) will be required to support the proposed works at the Eastern Work Area. In addition to the main TTP process units mentioned above, the Eastern Work Area is expected to include the following permanent infrastructure located at ground level close to the existing storm tanks:

a. The recycled water interception shaft, which would provide the connection from the TTP to the recycled water conveyance tunnel
b. An electrical building to support TTP operation
c. An administration building
d. Chemical storage tanks
e. Associated ancillary infrastructure
f. Air blower building
g. Transformer compound
h. Ring main unit
i. Wastewater return pumping station
j. Recycled water equalisation tank

2.6.18 Potential construction methods and designs of the retaining walls are to be confirmed and will be informed by ongoing GI works. Potential construction methods include employing a secant or contiguous piled wall or using sheet piles with anchors/props or counterforts. Once the retaining wall is constructed, the slope of the embankment will be excavated to create a flat area for the interception shaft and parts of the TTP and ancillary infrastructures. For the construction methodology of the shafts, refer to paragraphs 2.6.30 and 2.6.31 below.

2.6.19 The platform for the TTP process units is expected to cover approximately 5,000m^2 above two pairs of existing storm tanks, currently anticipated to be storm tanks 6A to 7B. Each storm tank is divided into pairs, a tank A and a tank B. However, allowance has been made to use two pairs of storm tanks between numbers 6 to 8 if necessary. The maximum height of the TTP would be approximately 15m above ground level within the site, subject to further hydraulic analysis, pilot plant testing, structural design work, and operational, health, and safety requirements. The main TTP process units would include moving bed biofilm reactor (MBBR) tanks (see Plate 2.10), flocculation tanks and mechanical filters along with associated chemical dosing.

Plate 2.10 Indicative TTP within Eastern Work Area



2.6.20 To construct the platform and TTP above the storm tanks, the floor slab of the affected storm tanks may be removed and reinstated. Piling works will support columns on which a platform is constructed above the tanks to support the plant. The extent of remedial works to the existing structures as well as piling and platform design will depend on a structural survey and further TTP design development. The works to construct the TTP will be carried out while maintaining the required volume under the Environmental Permit within the storm tank provision, on the Mogden STW site, with only one pair of storm tanks removed from operation at a time. The current Mogden STW permit requires seven pairs of storm tanks out of the eight pairs of storm tanks to be in operation to meet permit storm storage within the Mogden STW site. Use of the

storm tanks to construct the TTP will be conducted in accordance with this permit.

2.6.21 Once the new platform is constructed the process equipment for the new TTP will be erected on top of the platform. Modular installation will facilitate off-site manufacture for most of the process elements. For the waste stream from the TTP, a wastewater return pipe with approximately 0.3m internal diameter will be installed along the existing site perimeter road from the new TTP to the existing inlet works or primary settlement tank (PST) inlet culvert, where it will go back through the STW to be retreated. Trenched installation is proposed at this stage for the construction of the wastewater return pipe, although some above ground sections may be required (located within the existing Mogden STW site).

2.6.22 Connections to the existing below ground final effluent culvert, which is located on the south and east sides of the existing storm tanks, will be constructed to abstract the Mogden STW final effluent for further treatment in the new TTP. It will also be used to discharge recycled water back to the final effluent channel when drought conditions are not experienced and recycled water is not being discharged via the new recycled water conveyance tunnel and discharge structure upstream of Teddington Weir. The discharged recycled water during periods when drought conditions are not experienced will be mixed with the existing final effluent from Mogden STW and discharged into the Tideway at Isleworth Ait. Further details on the operation of the TTP are provided later in Section 2.9.

2.6.23 Construction materials for the TTP, interception shaft and associated ancillary infrastructure would be transferred from the Western Work Area using existing roads within Mogden STW. Any excavated materials or arisings from the shaft and TTP construction in the Eastern Work Area would either be transferred to the Western Work Area for temporary storage prior to removal from the Mogden STW site or removed directly out of the southern or northern part of Mogden STW site via the existing access from the Eastern Work Area. On completion, the TTP would go through a period of commissioning and performance testing prior to operation.

Recycled water conveyance tunnel

2.6.24 A new recycled water conveyance tunnel is required to transfer the recycled water between the new TTP and the proposed outfall on the freshwater River Thames. The length of the tunnel from the Mogden STW site to the reception shaft within the Burnell Avenue site is approximately 4.2km. During the operation of the Project, the recycled water from the TTP enters the recycled water conveyance tunnel through the interception shaft adjacent to the TTP. The recycled water then flows to the reception shaft to be constructed at the Burnell Avenue site, and then into the outfall connection pipe before being discharged through the new outfall structure into the freshwater River Thames.

2.6.25 The tunnel is designed to be within the London Clay band, the most suitable tunnelling medium, and has been designed at a constant positive grade to allow

the conveyance tunnel to drain recycled water back to Mogden STW when not in use. The tunnel would have an internal diameter of approximately 3.5m and will be constructed using a TBM at a depth of approximately 20m to 40m below ground level outside of Mogden STW. Within Mogden STW, the depth is greater as the western part of Mogden STW is raised and the tunnel needs to pass under existing piled structures. The base of the drive shaft in the Mogden STW Western Work Area is the deepest point (up to approximately 60m below ground level), while the tunnel will be at its shallowest at Burnell Avenue (approximately 20m below ground level). The final depth profile will be adjusted based on GI results and further detailed information to ensure clearance under the foundations of existing facilities in Mogden STW. For further detail on the depth profile, refer to Map Book 2: Tunnel Plans and Profile Drawings (Thames Water, 2025).

2.6.26 The TBM will be launched at the drive shaft in the Western Work Area of the Mogden STW site and will be removed at the reception shaft at the Burnell Avenue site. All tunnelling excavated materials will be removed via the drive shaft, while all segments and tunnelling consumables would enter the tunnel at this location. For details on construction activities within the Western Work Area, refer to paragraphs 2.6.12 to 2.6.14.

2.6.27 To control the flow of water in the recycled water conveyance tunnel, the tunnel will be sealed to enable it to be filled to a low pressure, which will create a hydraulic gradient that pushes the water to the outfall structure. Two methods to seal the tunnel are being considered and assessed within this PEI Report:

a. A bulkhead placed at the base of the shaft which seals the shaft from the tunnel

b. A bulkhead fixed near the top of the shaft with a bolted cover

2.6.28 Further hydraulic assessments and confirmation of the recycled water conveyance tunnel horizontal and vertical alignments will be needed for confirmation of the preferred option for sealing the tunnel.

Shafts

2.6.29 There is a requirement for up to six shafts to be constructed as part of the Project, as set out in Table 2.1.

Table 2.1 Location and description of six shafts

Name	Location	Approx. internal diameter (m)	Description
Drive shaft	Mogden STW site – Western Work Area	15.0	The TBM will be launched here, and all of the conveyance route tunnelling excavated materials will be removed from this shaft.
Interception shaft	Mogden STW site – Eastern Work Area	10.5	Provides the connection to convey recycled water from the new TTP to the new recycled water conveyance tunnel.
Intermediate shaft	Ham Playing Fields site – Main Work Area	10.5	An access shaft for health and safety, maintenance and ventilation during construction, and for inspection during operation for the recycled water conveyance tunnel. The shaft provides access spacing between Mogden STW and the reception shaft when undertaking future inspections and maintenance to support the health and safety of operatives.
Reception shaft	Burnell Avenue site – Main Work Area	12.5	The TBM will be removed from this shaft and it would connect to the discharge outfall via a pipe.
Connection shaft	Burnell Avenue site – Main Work Area	10.5	Connects the abstracted water from the intake to the new raw water conveyance pipeline. The shaft will also be used to either construct the adit to connect to the TLT or drive the pipe jack for the conveyance pipeline to the Tudor Drive site. See paragraph 2.6.54 for these two options.
TLT connection shaft	Tudor Drive site	7.0	Connects the pipe-jacked conveyance pipeline to the TLT. This shaft will only be required for the Tudor Drive connection option and if the existing shaft on the TLT is not wide enough for the removal of the pipe-jacking equipment.

2.6.30 All of the shafts will be constructed using segmental lining, employing either caisson jacking or underpinning, depending on the ground conditions. Once within the London Clay formation, the construction methodology could switch to sprayed concrete lining. All of these methods are considered within the assessments in this PEI Report. The proposed method would be confirmed in

the Environmental Statement (ES). All excavated materials from the construction of the shafts will be removed from the individual shaft sites.

2.6.31 To construct the shafts to depth and for any excavations below the water table, groundwater controls may be required, which may include a degree of dewatering. For any dewatering activities, the abstraction and subsequent discharge of water will be undertaken in accordance with any relevant licence or permitting regulations, in agreement with the licence granting body and the relevant Regulators. Any water generated through dewatering measures may contain levels of sediment or suspended solids, which may require settlement or other treatment prior to discharge. In order to meet the requirements of any discharge licence or permit, it is assumed that regular sampling and testing will also be required to confirm compliance with any conditions relating to water quality.

2.6.32 At the work sites at Mogden STW, the intention is to dispose of any water generated by the works directly to the STW. For all other sites where excavation works may generate water requiring disposal, and if the Mogden STW cannot accept the groundwater directly, alternative measures for disposal will be sought. As such, a hierarchy of disposal routes and receptors will be considered, from direct recharge to ground, direct discharge to a suitable surface watercourse, disposal to sewer (combined or foul) or tankering from site.

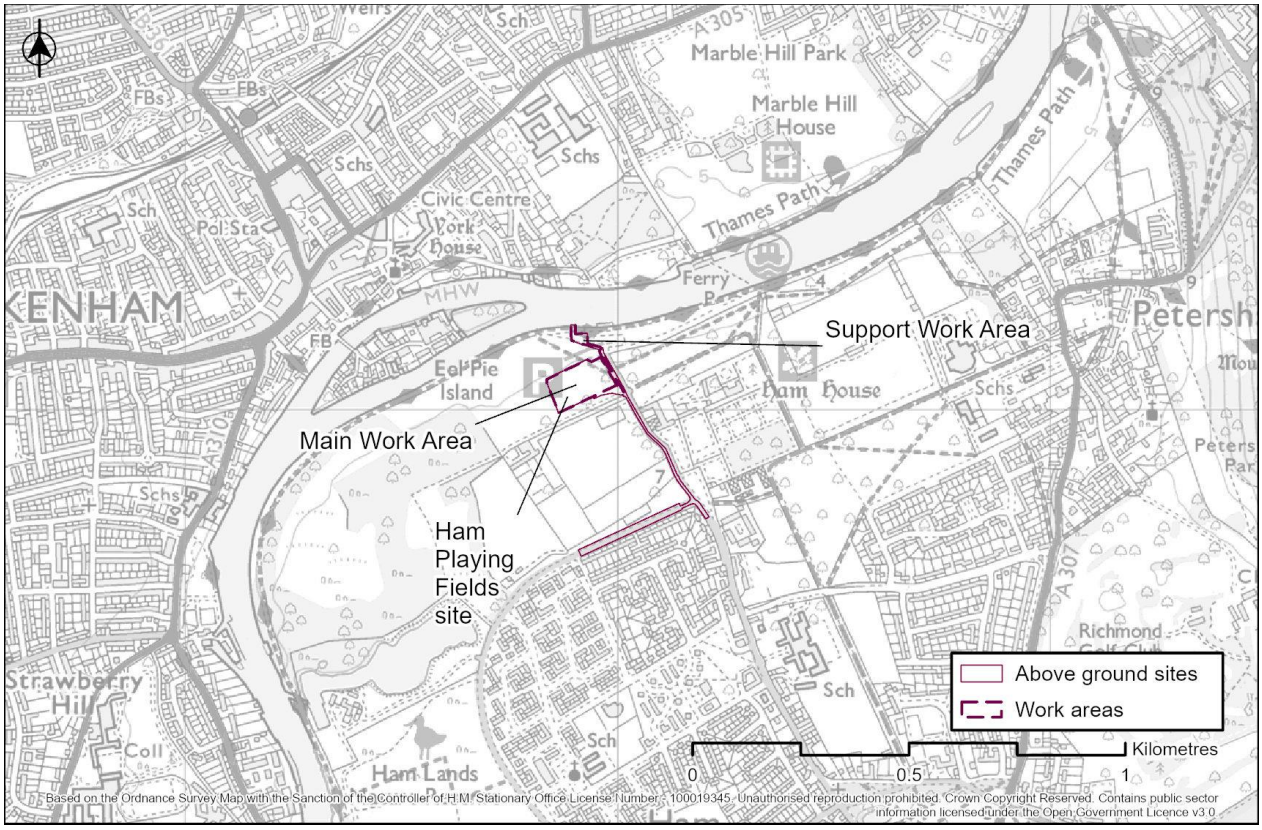
Ham Playing Fields site

2.6.33 The Ham Playing Fields site includes a Main Work Area where the intermediate shaft and main compound are situated (see Plate 2.11). The Main Work Area is situated west of Ham House and Garden in the LBR, within the Ham Playing Fields. These fields are used for informal recreational activities such as dog walking, football, cycling, walking and jogging. The layout of the Main Work Area has been designed to protect an existing Thames Water twin rising main sewer asset located beneath the work area, thereby limiting heavy equipment movements and storage in the vicinity.

2.6.34 An additional work area, for additional storage, welfare and contractor parking known as the Support Work Area, is part of the Ham Playing Fields site. This includes a small area adjacent to Ham Street Car Park, previously identified through the site options appraisal and part of the EIA Scoping Boundary. Additionally, an area along Ham Street connecting the Main Work Area to the road for surface water discharge connection has been included in the Support Work Area (see Plate 2.11).

2.6.35 Table 2.1 provides a description of the intermediate shaft and its purpose during construction and operation phases.

Plate 2.11 Ham Playing Fields site



Burnell Avenue site

2.6.36 The Burnell Avenue site is located on the Ham side of the River Thames within LBR and RBK. The site is adjacent to and includes parts of the Thames Path National Trail and NCN Route 4/EuroVelo 2 – Capitals Coast Route. The site comprises maintained grass open space and areas of woodland and trees, including trees protected by Tree Preservation Orders (TPOs). Parts of Teddington Lock Conservation Area and Riverside North Conservation Area are included in the Burnell Avenue site to the north and south, respectively. Across the river from the site, there is the Lensbury Hotel and Watersports Centre, as well as residential properties within the Broom Water Conservation Area.

2.6.37 There are three working areas within the Burnell Avenue site associated with the Project: the Northern Work Area; the Main Work Area; and the Southern Work Area (see Plate 2.12). The Northern and Southern Work Areas include limited works and are included in the draft Order limits for utilities and PRoW diversions (see paragraphs 2.6.61 to 2.6.65). The Main Work Area includes the construction of the following infrastructure:

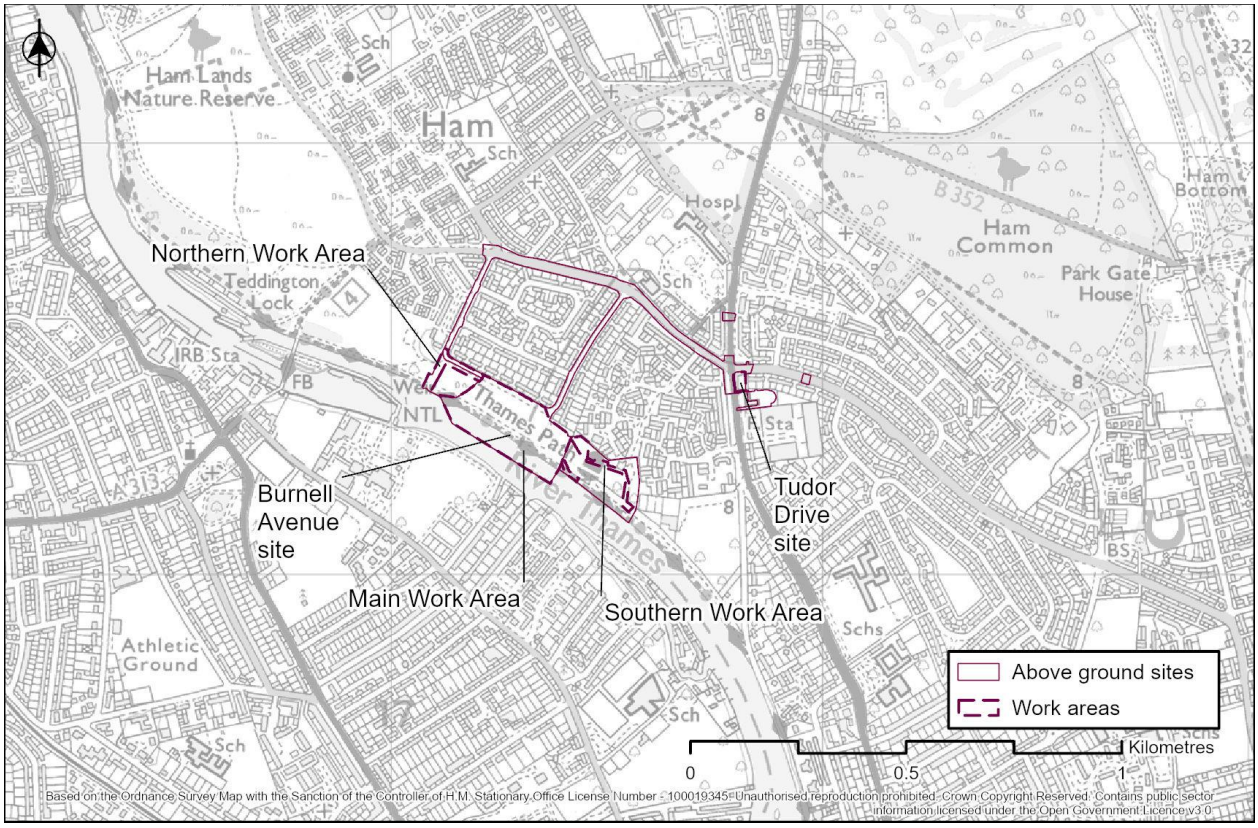
a. Outfall

b. Intake

c. Reception and connection shafts (see Table 2.1) and associated TLT connection (see paragraphs 2.6.53 to 2.6.57)

d. Temporary cofferdams

Plate 2.12 Burnell Avenue and Tudor Drive sites



Outfall

2.6.38 Recycled water will be discharged into the freshwater River Thames via a new outfall structure, approximately 180m upstream of Teddington Weir. Two design options are considered and assessed within this PEI Report:

a. Bankside structure

b. Near bankside in-river structure

2.6.39 To address environmental concerns raised by the Environment Agency, the development of a near bankside in-river structure solution that moves the outfall away from the river edge and marginal habitat is also being explored. Both options are being consulted on to ensure that the views of communities and stakeholders form part of the decision-making process.

2.6.40 Both options include chambers and connection to the reception shaft at the riverbank within the Burnell Avenue site. Additionally, both options would likely require a cofferdam to be temporarily installed to enable a safe working area within the river. It is anticipated that the cofferdam for the outfall would extend approximately 20m into the river from the bank. Further details regarding cofferdam installation are provided in paragraphs 2.6.50 to 2.6.52.

Bankside structure

2.6.41 A bankside structure, as shown indicatively in Plate 2.13, would be buried into the riverbank, and access covers and covers for the control equipment will be

fitted flush to ground level to minimise impacts on the landscape and recreational users. The recycled water will be discharged into the freshwater River Thames at river surface level. The riverbank at the location of the discharge outfall would extend over the river edge as a vertical wharf measuring approximately 4m wide. Vertical bars would be fitted under the wharf structure to prevent unauthorised access and a concrete pad would be included on the river bed to prevent erosion. An internal weir would also form part of the design of the bankside outfall to prevent fish and eels from entering the conveyance tunnel beyond the outfall.

Plate 2.13 An indicative image showing bankside outfall structure

Near bankside in-river structure

2.6.42 The near bankside in-river option would comprise one or more pipes extending approximately six to eight metres from the riverbank. The initial length of the pipes would be laid beneath the riverbed, while the remaining sections of the pipes would be supported just above the riverbed. The end of the pipes would have diffusers to limit sediment from entering the pipes. Plate 2.14 provides an indicative image of the near bankside in-river outfall structure.

2.6.43 Since the near bankside in-river structure would protrude into the river, protection measures will be designed to ensure the safety of both the structure, that lies just above the riverbed, and river users. These measures may include wooden piles with ropes and buoys or similar solutions to create a protective area extending roughly 15m from the riverbank. Ongoing discussions with the Environment Agency Waterways Team and engagement with other recreational river user groups will be undertaken to determine the most appropriate protection measures if this option is chosen.

Plate 2.14 An indicative image showing near bankside in-river outfall structure

Intake

2.6.44 The river intake structure would be located approximately 180m upstream of the proposed new outfall and 350m upstream of Teddington Weir. The proposed distance between the two structures has been established based on modelling work and through discussions with the Environment Agency to ensure no risk of recirculation of discharged recycled water into the intake, and to minimise the potential for reduced river flow between the intake and outfall to result in potential effects on the environment. An indicative image of the intake structure is shown in Plate 2.15.

Plate 2.15 An indicative image showing the intake structure

2.6.45 The design of the intake will adhere to existing regulations to protect fish, including the European eel *Anguilla anguilla*, and will comply with The Eels (England and Wales) Regulations 2009. The intake would include screens to reduce the risks of entrainment and impingement of eels and fish. Intake screen design and operational protocol would be designed to comply with the existing regulations and relevant guidance.

2.6.46 The new intake structure will likely be constructed from reinforced concrete to ensure its integrity with its interaction with the river and would measure up to 38m wide including its proposed reinforced concrete wing walls. The main intake apparatus would sit in the middle of the structure measuring approximately 12m wide, made up from a series of screens. The top of the intake structure may extend within a range from 7m Above Ordnance Datum (AOD) up to 10mAOD. For comparison, the elevation of the existing Thames Path National Trail is 5.6mAOD and the NCN Route 4/EuroVelo 2 – Capitals Coast Route is 7mAOD. The maximum structure height represents a worst-case parameter allowing for outcomes from the flood risk assessment and the detailed design of the specialist intake structure. It is anticipated that the final height and width of the structure will be refined through continued engagement with stakeholders as part of the design development process. These refined parameters will then be included in the DCO submission documents.

2.6.47 The foundations of the structure will be below river level, and any temporary cofferdam would need to be built out approximately 15m from the riverbank for the intake construction. See paragraphs 2.6.50 to 2.6.52 for information regarding the cofferdam.

2.6.48 On completion of the intake, the excavation would be backfilled around the structure, and the mechanical and electrical equipment would be installed and secured. The permanent works would also include installation of electrical power supply, telemetry and buried connection pipework to the connection shaft within the Burnell Avenue site which may be accommodated within a single storey kiosk which would be approximately 5.5m by 5m (as shown in Plate 2.16).

Plate 2.16 An indicative intake structure and kiosk

2.6.49 The proposed intake would provide water for the Lee Valley reservoirs, which in turn feeds Coppermills Water Treatment Works, which is a critical part of Thames Water's infrastructure, providing millions of customers with safe drinking water. The Applicant will continue to work with stakeholders using National Protective Security guidelines to establish if there is a requirement for any additional security measures to protect the intake, which could include lockable hatches, additional fencing and CCTV.

Temporary cofferdams

2.6.50 The construction methods for installing the cofferdams will be applicable for both the outfall and intake. Outfall and intake construction durations presented in Plate 2.7 indicate periods during which cofferdams are required. A typical construction sequence for installing a sheet piled cofferdam is:

a. Drive temporary support piles into place
b. Install bracing frames to the support piles
c. Drive sheet piles into place

d. Pump out the river water from inside the cofferdam, and install internal bracing as required

2.6.51 The piling method may potentially include percussion piling, vibro piling or press-in piling methods. The preference is to use press-in piling methods; however, vibro and percussion piling methods cannot be discounted at this stage. The selected method will depend on the results of the undergoing GI works and consequent cofferdam design considering site constraints. These factors will be further explored and assessed in the ES. The feasibility of operating a piling plant on the riverbank, as opposed to using a water-based plant, or both, is also under consideration.

2.6.52 Following construction of the intake and outfall structures, the cofferdam sheet piles will be removed. If this is not possible then they will be cut to a depth below the existing river bed agreed with the environmental regulators.

TLT connection

2.6.53 The final component of the Project would enable the transfer of abstracted water into the existing TLT. The existing TLT abstracts raw water from the freshwater River Thames at the Hampton Water Treatment Works intake and conveys it to the Lockwood Pumping Station, part of Thames Water's Lee Valley reservoir systems in the north-east of London. The depth of the TLT near the River Thames is approximately 40m below ground level and at an elevation of approximately −25mAOD.

2.6.54 The abstracted water will be conveyed from the intake into a connection shaft. From there, it will gravitate to the TLT via a raw water conveyance pipeline. Assessments undertaken in this PEI Report assume two potential options for the TLT connection:

a. Burnell Avenue adit – Connection to the TLT directly from the connection shaft via a Sprayed Concrete Lining adit, excavated from the base of the shaft, extending for about 70m in a south-easterly direction. The adit would have an internal diameter of approximately 3.5m and have a pipe within it to connect with the TLT.

b. Tudor Drive connection – This is an alternative option for the TLT connection. This option would involve pipe-jacking a raw water conveyance pipeline approximately 500m in length with an internal diameter of 2.2m from the connection shaft at the Burnell Avenue site to the Tudor Drive site. At the Tudor Drive site there is potential to either directly connect to the existing TLT shaft or connect via a new TLT connection shaft.

2.6.55 The existing TLT was constructed with wedge block segments. The connection either via the Burnell Avenue adit option or the Tudor Drive connection option will be designed to ensure structural integrity of the tunnel is maintained. In order to maintain stability of the existing lining during shaft excavation and connection works, a temporary support system would be installed within the TLT.

2.6.56 It is proposed to undertake the works required in the TLT and connection to the TLT during periodic inspection and maintenance of the TLT. It is assumed that

TLT connection would be undertaken during two shut down periods. During the first shut down, preparatory works to reinforce the inside of the TLT to allow for a safe connection below ground will be undertaken. The second shut down will enable the TLT connection to be formed. The selected method of construction to intercept the existing tunnel will be determined according to operational limitations of the TLT and the contractor's preferences.

2.6.57 Site clearance works will be required for the TLT connection construction at the Tudor Drive site. The Tudor Drive site is constrained such that the development of this site option would require supplementary laydown/storage area and site cabins at the Burnell Avenue site and/or within the adjacent Kingston London Fire Brigade Station land ensuring no impediment to their operation. Access to the TLT connection site on Tudor Drive will be off Tudor Drive and the A307. Vehicle movements in and out of the site would require traffic management and careful liaison with the adjacent fire station. The site is bounded by public footpaths alongside the roads, and banksman and traffic control will be adopted to manage deliveries whilst limiting disruption and allowing safe passage for pedestrians. The provision of temporary alternative safe crossing points are identified within the draft Order limits on Tudor Drive.

2.6.58 A smaller works area at the Tudor Drive site would be required should the Burnell Avenue adit connection option be chosen. This would be to allow access into the TLT to install the tunnel reinforcement measures to enable the safe connection below ground. These activities would comprise apparatus for lifting the covers and lowering and raising equipment and materials in the existing shaft, along with necessary storage and welfare areas.

Enabling works

2.6.59 Enabling works activities are required to facilitate the execution of main works construction activities. These include but are not limited to underground utility connections, diversion or protection works; diversion of existing footways and cycleways; works to improve access to work locations for construction vehicles; vegetation clearance and installation of secure construction site establishment areas with hoardings/fencing; and appropriate ground surfacing and/or office and welfare facilities, along with storage for materials, construction plant and equipment.

2.6.60 Enabling works activities required for the Project are likely to cause short periods of disruption to local road users as traffic management would be required to temporarily close parts of the local road network. Short-term closures to established pedestrian and cycle routes would also be required to enable diversion works to be undertaken.

Ancillary works

2.6.61 A number of additional activities will need to be undertaken to enable the construction and to ensure the safety and movement of the public and contractor personnel. These mainly comprise but are not limited to the following sections.

Utilities diversions

2.6.62 Some utilities such as high and low voltage cables, surface drainage pipes and telecoms, are known to be in and around the proposed works areas and some will need temporarily or permanently diverting or protecting to maintain the statutory undertakers service provision. In addition, connections to utilities will be needed at some sites to facilitate construction activities. Discussions with the identified statutory undertakers and utilities owners have started and will continue, to determine necessary connection points, and enable appropriate measures and alternative routes to be agreed.

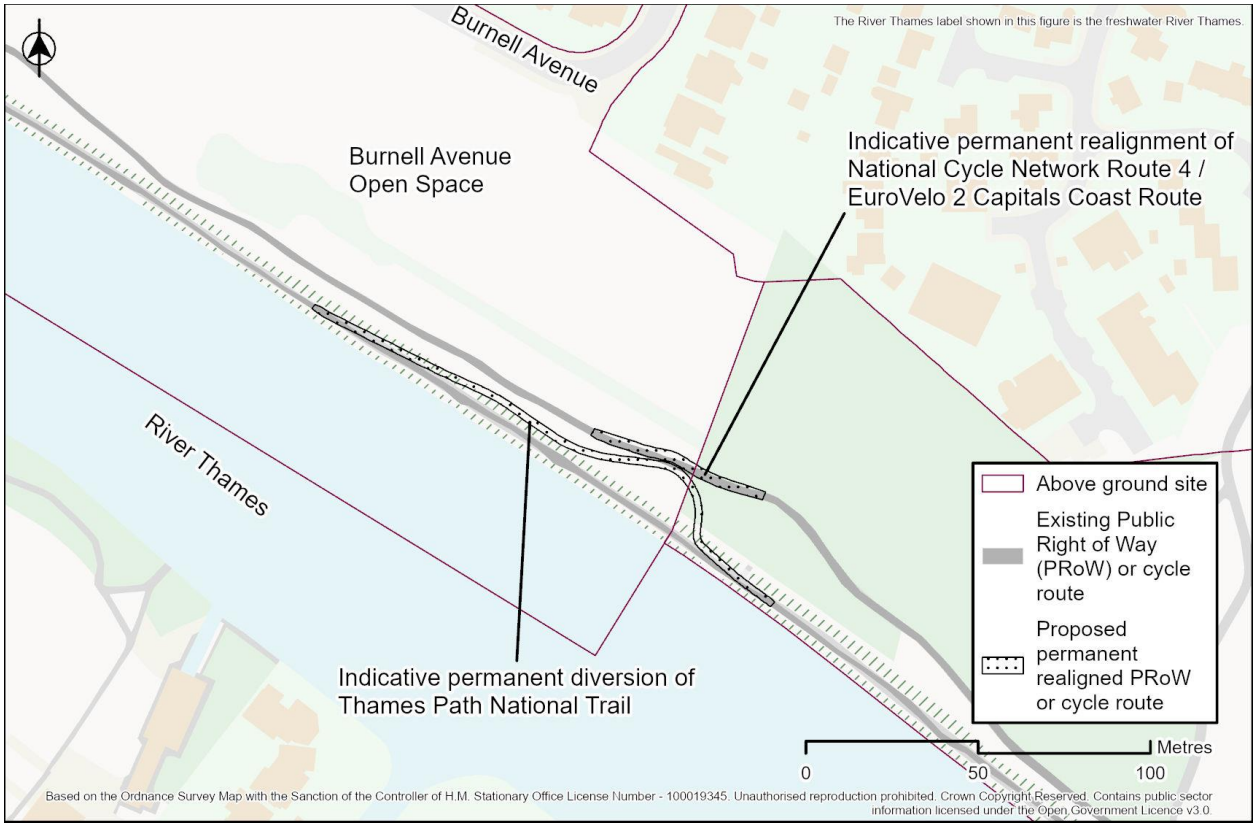
Temporary and permanent PRoW diversions

2.6.63 Diversions of PRoW are required at the Burnell Avenue site and possibly at the Ham Playing Fields site. Temporary diversions to PRoW (Thames Path National Trail and NCN Route 4/EuroVelo 2 – Capitals Coast Route) at the Burnell Avenue site, will need to be established to ensure the safe passage of pedestrians and other users and to manage interactions with active construction sites. Additionally, permanent diversions will be necessary where the new intake structure is proposed to be located. A short duration minor diversion of the Thames Path National Trail at the Support Work Area next to Ham Street Car Park would be required in the event that contingency temporary dewatering pipework would need to be installed from the intermediate shaft.

2.6.64 The Applicant will engage with local authorities and regulators (Natural England for the National Trail) to discuss and finalise the temporary and permanent diversion and realignment of PRoW. The intention will be to provide a common diversion route for the National Trail and cycle path, although they will be segregated paths. The intended route takes pedestrians and other users from the existing rights of way and up to Burnell Avenue. Current options include establishing a route on the southern side of the Burnell Avenue site which would need control measures for vehicles accessing and egressing from the construction site, or to use the existing pavement on the northern side of Burnell Avenue, which would require suitable pedestrian crossings.

2.6.65 Proposed permanent diversion of the Thames Path National Trail and realignment of NCN Route 4/EuroVelo 2 – Capitals Coast Route is shown in Plate 2.17. The Applicant recognises the need to maintain the connection with the River Thames and continuity of the National Trail, whilst ensuring user safety. Current designs keep users away from the river edge for as short a length as possible whilst maintaining a safe distance from the intake structure. The Applicant will continue to engage with the LPAs, Natural England and other stakeholders to agree the final diverted routes.

Plate 2.17 Indicative permanent diversion of Thames Path National Trail and realignment of NCN Route 4/EuroVelo 2 – Capitals Coast Route



Minor highways amendments

2.6.66 To allow for the safe passage of certain vehicles, such as the lorries needed to deliver the sections of the TBM to Mogden STW, minor activities such as temporary removal of street furniture and signage and tree pruning may be required to ensure the route is clear for the vehicle to pass. These amendments will generally include but are not limited to: fence, signal and hazard signs removal, and kerb dropping.

2.7 Transport

2.7.1 The use of differing transport modes as alternatives to road use only, has been appraised within this PEI Report. Further information on this modal options review is provided in Chapter 3: Consideration of Alternatives, Section 3.7 and in Chapter 12: Traffic and Transport.

2.7.2 The preliminary assessment in Chapter 12: Traffic and Transport does not incorporate the use of river freight. The assessment describes the worst-case scenario for traffic and transport impacts on the ARN but does not preclude the use of river transport should it be demonstrated to be viable.

2.7.3 Similarly direct rail freight is scoped out of the EIA due to the absence of suitable railway lines adjacent to the construction sites both north and south of the river. However, the use of railheads for the import of construction materials

and export of excavation arisings is scoped in for consideration to source materials with last-mile/first-mile deliveries by HGVs.

2.7.4 The likely primary transport mode for the movement of materials, waste, equipment and plant to and from the sites would be via the road network using heavy goods vehicles.

2.7.5 Construction workers will be encouraged to travel from their places of residence to the closest rail stations to the construction sites.

2.7.6 Journey times between the nearest railway stations and the sites by various modes have been identified in Chapter 12: Traffic and Transport. This includes car journey times to allow the feasibility of shuttle bus routes between stations and the construction sites to be considered.

2.7.7 Further information on the conditions of road transport and the proposed routes to be used by HGVs for the Project are provided below from

Road Transport

2.7.8 Routes have been developed for construction vehicle traffic to access the proposed above ground sites from the strategic road network (SRN), namely from the M25 as it is an interregional pathway to access material suppliers from across the country. These routes aim to use the Permitted Routes as identified in the LLCS. The Transport for London Road Network intersects and shares most of the LLCS Permitted Routes between the sites and the SRN, namely the A316 and A3 corridors. These were segmented into sections and baseline traffic flows were extracted from key Department for Transport counter points located on these sections.

2.7.9 HGV movements are restricted where sections of construction routes within Greater London fall outside of the Permitted Routes. The restricted hours are Monday to Friday from 21:00–07:00 including bank holidays, and from Saturday (after 13:00) to Monday (before 07:00). Unless permission is obtained from London Councils when registered to the LLCS, HGVs are prohibited from using these sections during these hours. It is expected that HGV traffic from the Project will not occur during these restricted hours.

2.7.10 Construction workforce travel would include journeys to the sites via cars and light goods vehicles with some outside of stipulated local authorities' working hours to facilitate activities such as TBM operation. However, a Construction Workforce Travel Plan would be produced ahead of construction starting. This would aim to control the number of commuting vehicle trips by promoting the use of sustainable modes and encouraging lift-sharing.

2.7.11 Abnormal Indivisible Loads (AILs) would be required for transport of large plant and equipment to and from the sites. The components of a TBM would be delivered to the Mogden STW site for assembly on-site, while the TBM would be disassembled on the Burnell Avenue site and transported off-site. This would

comprise several AILs as well as any other large plant and equipment required for construction.

2.7.12 PRoW that intersect any site boundaries would need to be diverted to ensure that active travel access remains available to non-motorised users. It is anticipated that this would occur at the Burnell Avenue site, which concerns Footpath 47 in RBK, which links to PRoW 133 in LBR. This will be considered in Chapter 15: Socioeconomics, Community, Access and Recreation.

Mogden STW site

2.7.13 Access to the public highway network is anticipated to be obtained from the construction sites within Mogden STW (Western Work Area and Eastern Work Area) via the southern access gate, which is accessed from the northern arm of the roundabout which meets with Mogden Lane, Rugby Road and Whitton Dene (see Figure 12.2 in Volume 2 PEI Report Figures).

2.7.14 Thereafter, it is likely that vehicles would travel west along the A316 corridor to join the M3, where the SRN starts (referred to as Option A in Chapter 12: Traffic and Transport). There is the possibility that some construction materials may be exported from the Brentford railhead using the A310 Twickenham Road. Routing options from Mogden STW's main access to A310 Twickenham Road include:

2.7.15 East via Mogden Lane and then north (left turn) onto A310 Twickenham Road (referred to as Option B in Chapter 12: Traffic and Transport)

2.7.16 South via Rugby Road and B361 Whitton Road, then east along A316 Chertsey Road, then north along A310 London Road to access A310 Twickenham Road (referred to as Option C in Chapter 12: Traffic and Transport)

2.7.17 On very limited occasions when access to the southern access gate is restricted, all construction vehicles, except AILs may need to use the northern access gate on Oak Lane and then travel east along Worton Road towards the A310 Twickenham Road and follow the routes identified above.

2.7.18 The maximum demand on each road link on the ARN generated by the three routing options and the use of the northern access gate is considered in the preliminary assessment in Chapter 12: Traffic and Transport.

Ham Playing Fields, Burnell Avenue and Tudor Drive sites

2.7.19 For the Ham Playing Fields site, access is obtained from the public highway network from the north of Ham Street. For HGVs travelling from the access point, the A307 corridor could be used to access the nearest LLCS Permitted Routes. Access can be obtained to this corridor via Riverside Drive and Dukes Avenue (see Figure 12.2 in Volume 2 PEI Report Figures).

2.7.20 HGVs travelling to the Burnell Avenue site would use Dukes Avenue from the A307 corridor and thereafter be routed along Dysart Avenue, Burnell Avenue, Beaufort Road and approximately 320m of Dukes Avenue in a gyratory manner.

2.7.21 Entry to the Tudor Drive site would be from Tudor Drive to the north of the site, where HGVs would travel westbound on Tudor Drive and turn left (south) into the site. This access is obtained from the A307 corridor in Kingston, whereby the route branches to the east onto A308 London Road, then north along Park Road and then west along Tudor Drive. HGVs would exit the site via A307 Richmond Road, making a left turn only to the south to share the remainder of the ARN for the other sites south of the River Thames.

2.7.22 Thereafter, HGVs would travel south along the A307 corridor through Kingston upon Thames to meet the A243 Brighton Road (LLCS Permitted Route) and thereafter the A3 (SRN).

2.7.23 Construction HGVs exporting excavated material or importing regular deliveries will be discouraged from using the northern section of the A307 corridor through Richmond. This routing will only be permitted for irregular deliveries of materials that demonstrate a significant vehicle kilometre saving.

2.8 Post-construction

2.8.1 Once construction of the recycled water conveyance tunnel is complete, the shafts would be covered with permanent concrete caps. These caps would be positioned below ground surface where practicable to minimise impacts on current use of the land. Reinstatement would be done to match the existing site as far as practicable, with access hatches for future maintenance. Typical shaft access hatches would be similar to that shown in Plate 2.18, representing Ham Playing Fields site. The dimensions of these will be approximately 2m by 2m each.

2.8.2 It is anticipated that access to the new recycled water conveyance tunnel at the shaft sites for inspections and maintenance will be carried out once every ten years with more regular visits as required. Tunnel inspection frequency in Thames Water asset standards for tunnels refers to ten-yearly inspections (Thames Water, 2016), which follows the legislation under the Health and Safety at Work etc. Act 1974 and agreed inspection frequency between Thames Water and the Health and Safety Executive.

Plate 2.18 Typical shaft access hatches after completion at Ham Playing Fields site

Preliminary Townscape and Environmental Master Plan

2.8.3 A Townscape and Environmental Master Plan is being developed for the above ground sites for the Project. A holistic approach is being taken to this design development, as part of the iterative process of design and assessment by the multidisciplinary Project team. The design development is based upon a good understanding of the surrounding townscape and environmental context and seeks to sensitively integrate the proposed infrastructure into this context. The Townscape and Environmental Master Plan design development is being informed by the Project Vision and Principles (Thames Water, 2024), as well as the National Policy Statement for Water Resources Infrastructure (Department for Environment, Food and Rural Affairs (Defra), 2023) and local planning policy and guidance.

2.8.4 The Preliminary Townscape and Environmental Master Plan is illustrated on Figure 2.5 in Volume 2 PEI Report Figures. This figure provides an indication of the proposed reinstatement and embedded mitigation for the Project, and is subject to consultation, stakeholder engagement and further iterative design development leading up to the DCO application. An overview of the indicative proposals is set out from 2.8.5 to 2.8.12. As the Project progresses, recreational and biodiversity opportunities will continue to be considered as part of the design development, taking on board comments received from the statutory consultation and other stakeholder feedback.

Mogden STW site

2.8.5 Following completion of the construction works at Mogden STW, the only remaining infrastructure above ground at the Western Work Area would be the drive shaft cover. It is therefore proposed to reinstate the existing relatively recent woodland planting and grasslands in this area, surrounding the shaft access cover.

2.8.6 Within the Eastern Work Area, the introduction of the TTP and associated infrastructure, whilst mainly located within the existing STW infrastructure footprint, would slightly encroach upon the vegetated bund around Mogden STW to the east. The western face of the bund would be retained by a new wall next to the TTP. On the bund, behind the retaining wall, woodland planting and management is proposed.

Ham Playing Fields site

2.8.7 Following completion of the construction works at the Ham Playing Fields site, it is proposed that the playing field grassland surrounding the shaft access cover, within the Main Work Area, would be reinstated, along with any other areas of grassland disturbed within the Support Work Area. If required, any areas of hardstanding within the work areas, would also be reinstated.

2.8.8 Following the potential installation of a surface water discharge connection at the Support Work Area, the Thames Path National Trail would be reinstated, as soon as reasonably practicable post construction, in order to return the path to a condition equivalent to its original state.

Burnell Avenue site

2.8.9 Following construction of the intake and outfall, it is proposed to integrate the new infrastructure into the townscape with sensitive earthworks and native tree and shrub planting along the riverbank, along with reinstatement of the grassland within the open space. The proposed planting would maintain the existing character of the open space and will be designed to align with the Thames Landscape Strategy and LPA tree planting aspirations, as well as mitigating the unavoidable loss of some trees in line with local planning policy. Work is ongoing to understand any loss of open space that may result from the installation of the permanent infrastructure.

2.8.10 At the end of construction, the temporary diversion of the Thames Path National Trail would be amended to form the permanent diversion of the route around the proposed intake. The diversion is proposed to maintain the close relationship and views to the River Thames and to be as short in length as practicable, whilst also ensuring that it is on a safe and accessible gradient, and that it is aligned to reduce the impact on existing trees within the Riverside North Conservation Area and trees with TPOs. Minor realignment of the NCN Route 4/EuroVelo 2 – Capitals Coast Route is also proposed to facilitate the permanent Thames Path National Trail diversion. Furthermore, beyond the proposed diversion and realignment, the full extent of both the Thames Path

National Trail and the NCN Route 4/EuroVelo 2 – Capitals Coast Route within the Main Work Area, would be reinstated with a similar surface to the existing as a minimum.

Tudor Drive site

2.8.11 Following construction of the Tudor Drive TLT connection (if taken forward), surrounding the proposed shaft access cover, the work area would be reinstated to its existing use, including all hard and soft landscape features. This would include reinstatement of the grassland next to the Fire Station, as well as reinstatement of planting and seeding within the adjacent public green space with ornamental trees and shrubs. Hard landscape features to be reinstated include paving, walls and the brick arch adjacent to Tudor Drive.

Ancillary works

2.8.12 Following completion of any required ancillary utility diversions and highway amendments, adjacent verges and other soft landscape areas would be reinstated as and where required. Such reinstatement would generally be to return areas back to the condition equivalent to their original state, except where guidance associated with utility easements would preclude this or where only limited pruning of trees or shrubs would have been undertaken to facilitate the construction works or access, in which case the existing vegetation would be left to naturally regrow.

2.9 Operation and maintenance

Operation

Operating pattern

2.9.1 The water recycling component of the Project is expected to operate intermittently as required during periods of drought. The operational utilisation rate is once every two years on average. The late summer and autumn months are expected to be the most frequent periods of operation, with August and September having the highest frequency.

2.9.2 The trigger for operation of the Project will be the same as for the strategic drought schemes in Thames Water's current Drought Plan (Thames Water, 2022). The Drought Plan explains when to start using special drought measures. This happens when London's reservoirs begin to lose water during a serious drought. The rules for using these measures are in the Lower Thames Operating Agreement (LTOA). The LTOA is an agreement between Thames Water and the Environment Agency. It requires Thames Water to keep a certain amount of water flowing over the Teddington Weir.

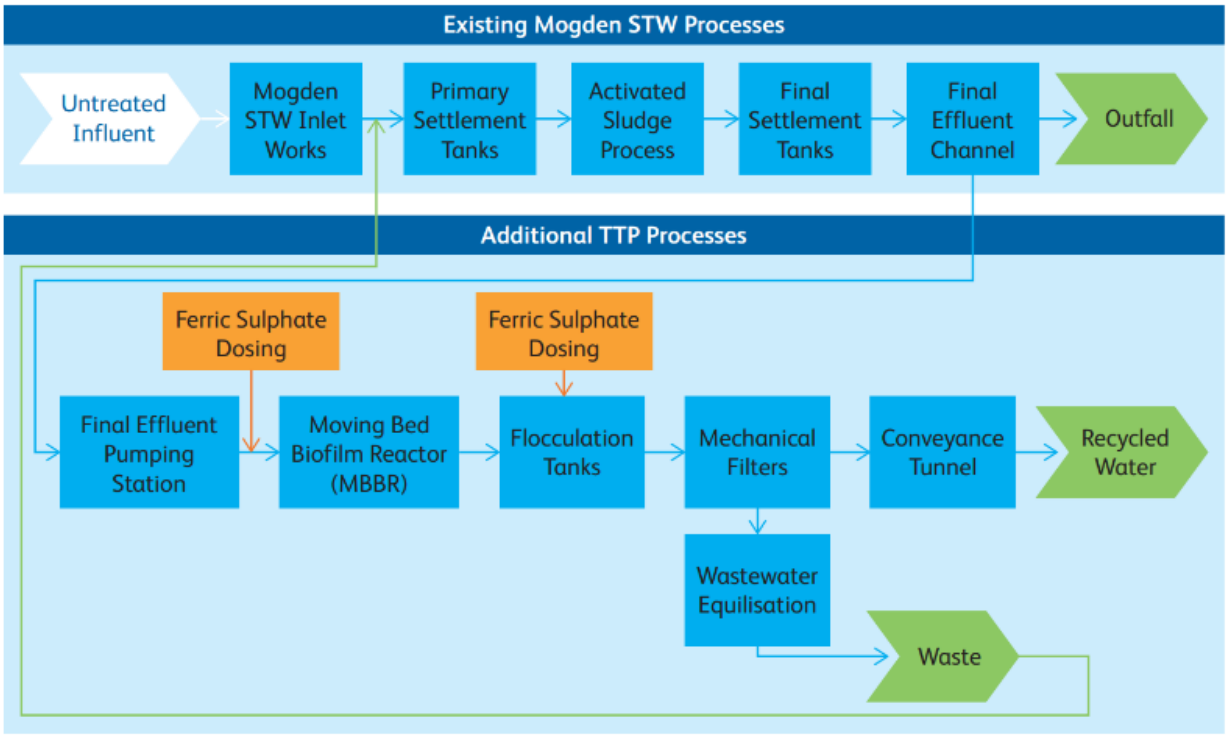
Mogden STW

2.9.3 During peak operation in drought conditions, the TTP would treat a portion of final effluent from the Mogden STW to produce up to 75Ml/d recycled water to

be discharged at the new outfall structure. Some wastewater would return from the TTP via a return pipe to the existing inlet works or PST inlet culvert along the site perimeter road. The exact location of the wastewater return connection will be determined through process modelling of the existing Mogden STW facilities to ensure adequate treatment of the wastewater without compromising the effectiveness of the existing STW. This approach also ensures that the waste flow from the TTP will be subject to the full STW treatment processes prior to discharge.

2.9.4 The TTP process includes a MBBR and mechanical filter treatment processes. Plate 2.19 shows the high-level process flow diagram of the proposed TTP.

Plate 2.19 High-level process flow diagram of the proposed TTP in Mogden STW



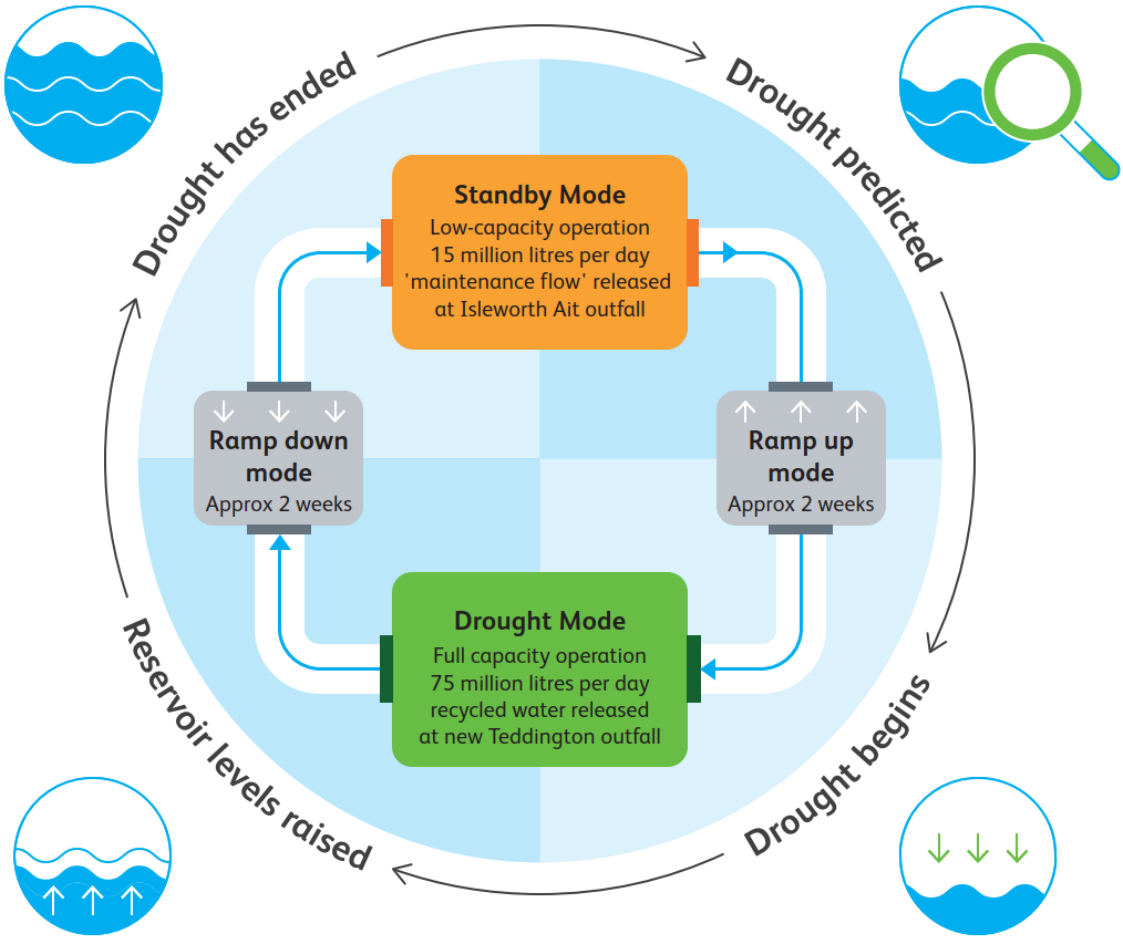
2.9.5 The design of the TTP will have regard to the results of the ongoing pilot plant testing. The pilot plant replicates the proposed process facilities and technology on a smaller scale to observe and confirm the performance of the proposed treatment process. The proposed process technologies will also be reviewed once the requirements for the discharge permit for the Project have been agreed with the Environment Agency. The testing started in September 2024 and is ongoing until November 2025. The results of these tests will continue to inform the design which will be applied for in the DCO submission and assessed in the ES. It is not expected to materially deviate from the details provided in this PEI Report.

2.9.6 During times when the Project is not required to operate (see paragraphs 2.9.1 and 2.9.2 for the normal operation period), there will be a requirement to continue running the TTP at reduced levels to maintain its operability (known as

Standby Mode, see Plate 2.20). If operation is stopped completely during non-drought periods, the TTP would require six to eight weeks or more to re-establish biomass in the MBBR, which would delay the Project operating at peak during droughts. Consequently, the TTP would operate continually in Standby Mode, outside of the normal operating period, at approximately 15Ml/d to maintain biomass within the MBBR. The recycled water produced during this period will be added to the final effluent channel and discharged at Isleworth Ait combined with the existing output from Mogden STW.

2.9.7 It is anticipated that it would take approximately two weeks (Ramp Up mode) for the TTP to ramp up to full capacity (Normal Operation mode or the normal operating period of up to 75Ml/d) after Standby Mode (also known as the sweetening or maintenance mode). This is for the biomass in the MBBR to acclimatise and stabilise to the new loading conditions and also for testing the systems and water quality. The recycled water at this stage would not enter into the recycled water conveyance tunnel but would be directed to the final effluent channel to be discharged at Isleworth Ait, until it meets the specification and is compliant (Normal Operation mode) and then can be discharged at the new outfall structure at up to 75Ml/d.

Plate 2.20 TTP operation cycle



Recycled water conveyance tunnel

2.9.8 During the normal operation period of the Project (see paragraphs 2.9.1 and 2.9.2), the recycled water conveyance tunnel from Mogden STW to the outfall would operate with the shafts at either end acting as balancing tanks. When in operation, the TTP fills the recycled water conveyance tunnel at the interception shaft, and it flows along the tunnel to the reception shaft, then into the outfall pipeline before being discharged through the outfall into the freshwater River Thames. As a result, the water would not require pumping. The flow will be controlled by hydraulic head and flow control valves/regulators. This involves recycled water entering the recycled water conveyance tunnel and filling it to a low pressure, creating a hydraulic gradient that pushes the water to the outfall. The recycled water conveyance tunnel will be kept dry when not in use. During ramp down mode, the recycled water conveyance tunnel will be emptied when put into Standby Mode by pumping the recycled water conveyance tunnel dry by returning the volume of water back into the Mogden STW processes.

Outfall, intake and TLT connection

2.9.9 The intake and outfall would require a structure for control equipment and motor control centres. This would accommodate telemetry, control equipment and motor control centres for the outfall such as level sensors and valve actuators and the intake (screen backwash pumps, valve actuators, flow meters, etc.) and could be encapsulated within the design of the intake structure.

2.9.10 The abstraction of raw water from the intake to the TLT will be controlled from the intake structure by valves. There will be an inline flowmeter and control interfaces with the discharge flow meter to manage abstraction to match the discharge. The valves will be isolated, preventing raw water intake and recycled water discharge in the event of telemetry notification of quality issues. The abstraction would only take place when the required trigger levels are met (see paragraph 2.9.2), such as when river levels are low and allowable abstraction rates are insufficient to maintain water levels in London's storage reservoirs.

Maintenance

Mogden STW

2.9.11 TTP maintenance will consist of regular visual checks of the storage tanks, chemical delivery and bunded area as required at the TTP. The MBBR relies on maintaining biomass; therefore, would not be left dormant for extended periods. Regular inspections and maintenance of the air blowers will be required in accordance with the manufacturer's manual. Other maintenance may be needed to enhance biological treatment capacity if necessary. The mechanical filters would require regular visual inspections in accordance with the manufacturer's manual on ancillary assets to ensure they are working effectively. Telemetry and auto sensors will be used to alert the operators of specific faults and maintenance requirements.

Recycled water conveyance tunnel and shafts

2.9.12 The bulkheads would require a bolted cover for future maintenance access (see paragraph 2.6.27 for the two bulkhead methods). Approximately every ten years or when necessary, periodic maintenance inspections will be undertaken, requiring access to all of the shafts. This would consist of condition surveys and clearing out any settled materials or organic matter. Modern tunnels experience very little groundwater ingress; therefore, the recycled water conveyance tunnel can remain drained during times when the Project is not required to operate.

2.9.13 The intermediate shaft at the Ham Playing Fields site would serve as a future inspection point for the conveyance tunnel during operation. The shaft is located and designed to provide acceptable access spacing between Mogden STW and the reception shaft when undertaking future inspections and maintenance to ensure the health and safety of operatives.

Outfall, intake and TLT connection

2.9.14 The outfall and the river intake screen on the abstraction structure will be visited once a week during operation or as necessary when not in use by operations staff on foot to visually check the condition of all structures and equipment. In the event of a security alert, staff would visit the site to confirm any damage. Periodic maintenance of screens and mechanical equipment is required in line with manufacturers requirements and the Applicant's standard procedures. On-site maintenance would occur once a year on average. Should vehicles be needed to bring equipment and parts to the facilities then the Applicant will use appropriate methodology to cross the grass areas to access the facilities.

2.10 Decommissioning

2.10.1 The TDRA is a vital drought resilience project that provides for the distribution of water for public supply. It is assumed that the need for the Project will be indefinite. As such there are no plans to decommission the Project and the assessment of decommissioning was scoped out of the assessment (Ref 2.2.7 of the Scoping Opinion (PINS, 2024)).

2.10.2 While decommissioning has been scoped out of the ES, the consideration of dismantling and replacing equipment, along with the relevant maintenance inspections and surveys, will be included as part of the operation and maintenance of the Project for components such as pumps and filters. However, it is assumed that the impact of these maintenance works would be similar or less than effects identified in the assessment of the construction phase.

2.10.3 If it is decided that the infrastructure will be decommissioned in the future, this will be subject to further environmental assessment and consents.

2.11 References

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