



Thames to Affinity Transfer Strategic Regional Option

Options Appraisal Methodology Report

February 2022

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Notice

Position Statement

- This document has been produced as the part of the process set out by RAPID for the development of the Strategic Resource Options (SROs). This is a regulatory gated process allowing there to be control and appropriate scrutiny on the activities that are undertaken by the water companies to investigate and develop efficient solutions on behalf of customers to meet future drought resilience challenges.
- This report forms part of suite of documents that make up the 'Gate 2 submission.' That submission details all the work undertaken by Thames Water and Affinity Water in the ongoing development of the proposed SROs. The intention of this stage is to provide RAPID with an update on the concept design, feasibility, cost estimates and programme for the schemes, allowing decisions to be made on their progress and future funding requirements.
- Should a scheme be selected and confirmed in the companies' final Water Resources Management Plan, in most cases it would need to enter a separate process to gain permission to build and run the final solution. That could be through either the Town and Country Planning Act 1990 or the Planning Act 2008 development consent order process. Both options require the designs to be fully appraised and in most cases, an environmental statement to be produced. Where required that statement sets out the likely environmental impacts and what mitigation is required.
- Community and stakeholder engagement is crucial to the development of the SROs. Some high level activity has been undertaken to date. Much more detailed community engagement and formal consultation is required on all the schemes at the appropriate point. Before applying for permission Thames Water and Affinity Water will need to demonstrate that they have presented information about the proposals to the community, gathered feedback and considered the views of stakeholders. We will have regard to that feedback and, where possible, make changes to the designs as a result.
- The SROs are at a very early stage of development, despite some options having been considered for several years. The details set out in the Gate 2 documents are still at a formative stage and consideration should be given to that when reviewing the proposals. They are for the purposes of allocating further funding not seeking permission.

Disclaimer

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

Information class: Standard

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Abbreviations

Abbreviation	Definition
ACWG	All Company Working Group
AFW	Affinity Water
AIC	Average Incremental Cost
AMP	Asset Management Plan
Capex	Capital Expenditure
CDR	Concept Design Report
CSF	Chalk Streams First
D/A/S	Duty/Assist/Standby
DCO	Development Consent Order
DO	Deployable Output
DPC	Direct Procurement for Customers
DRA	Direct River Abstraction
DWI	Drinking Water Inspectorate
EA	Environment Agency
EAR	Environmental Assessment Report
FTE	Full Time Equivalent
fWRMP19	Final Water Resources Management Plan for PR19
GAC	Granular Activated Carbon
H&S	Health and Safety
HRA	Habitats Regulation Assessment
HS2	High Speed 2
IBC	Intermediate Bulk Containers
INNS	Invasive Non-Native Species
LNR	Local Nature Reserves
LRMC	Long Run Marginal Cost
MI/d	Megalitres per Day
NNR	National Nature Reserves
NPV	Net Present Value
OB	Optimism Bias
Opex	Operational Expenditure
PR19, PR24	Price Review 2019, Price Review 2024
PS	Pumping Station
QCRA	Quantified Costed Risk Assessment
RAPID	Regulators' Alliance for Progressing Infrastructure Development
RGF	Rapid Gravity Filtration
RSS	Regional System Simulation
SAC	Special Areas of Conservation
SEA	Strategic Environmental Assessment

Abbreviation	Definition
SESRO	South East Strategic Reservoir Option
SPA	Special Protection Areas
SR	Service Reservoir (drinking water storage)
SRO	Strategic Regional Option
SSSI	Site of Special Scientific Interest
STT	Severn Thames Transfer
STW	Sewage Treatment Works
T2AT	Thames to Affinity Transfer
TOC	Total Organic Carbon
TW or TWUL	Thames Water
UV	Ultraviolet
WFD	Water Framework Directive
WRMP19	Water Resource Management Plan for PR19
WRMP24	Water Resource Management Plan for PR24
WRPG	Water Resources Planning Guidelines
WRSE	Water Resources South East
WTW	Water Treatment Works
WRZ	Water Resource Zone
WQRA	(Drinking) Water Quality Risk Assessment

Executive summary

The Thames to Affinity Transfer (T2AT) scheme was identified by Ofwat as one of seventeen Strategic Regional Options (SROs) for securing the future supply of drinking water to customers in England and Wales. The background to the SROs is described in Ofwat's Price Review 2019 final determination of cross-company strategic water resource solutions¹. Development of the SROs by the water companies is being undertaken through a gated process which is overseen by the Regulators' Alliance for Progressing Infrastructure Development (RAPID). Gate 1 of the process occurred in July 2021 and the SROs are now being developed towards Gate 2 which is scheduled for November 2022.

Chapters 2, 3 and 4 of this report provide an overview of the systematic process by which the eight options for T2AT presented at Gate 1 were derived. It brings together the regulatory background against which selection and refinement took place, commencing with the identification of 33 potential alternatives on an unconstrained list and screening them down to the list of eight options which were included in the Gate 1 submission.

Each of the eight options was refined to identify indicative pipeline routes and locations for the above ground components. The refinement process considered technical feasibility, environmental considerations, impacts on the community and planning constraints. These indicative locations were used to develop the Gate 1 concept designs for each option, which in turn were used to derive estimates of cost and carbon footprint, and to assess the characteristic environmental and amenity impact of each option.

These features have also been included in a database of metrics which are being used by Water Resources South East (WRSE); the water companies' regional planning group, alongside similar data from the other SROs, in a regional supply-demand balance model to determine the best value combination of SROs for development and later implementation. The initial outcome from the WRSE regional model is that two of the eight T2AT options are likely to be selected for inclusion in the regional best value plan. These options are:

- The Lower Thames Reservoir (LTR) option, which entails connecting into an existing tunnel from the Queen Mother and Wraysbury reservoirs to Affinity Water's Iver Water Treatment Works (WTW), transferring raw water to a new WTW near to Iver, and pumping drinking water from there to an existing service reservoir (SR) at Harefield. The ultimate source of water for this option would be the proposed South East Strategic Reservoir Option (SESRO), or possibly a Severn to Thames Transfer (STT) scheme.
- The Beckton Reuse Indirect (BRI) option, which entails abstracting raw water from the River Lee flood relief channel near Enfield, pumping it to a new WTW and delivering drinking water into the Affinity Water network near to North Mymms. The source of water for this option would be the proposed water recycling plant at Beckton and conveyance to the River Lee.

¹ PR19 Final Determinations Strategic Regional Water Resource Solutions Appendix – Ofwat – December 2019

The second part of this report goes beyond the derivation of the eight options presented at Gate 1. Chapters 5, 6 and 7 present a comparison of the options in the light of their performance against technical, environmental, and planning themes.

The LTR compares well under all the themes and hence this would be a favourable option for development to Gate 2.

The BRI option also compares well to the other transfer options, and in particular the other two options which rely on reuse water. This is the most favourable reuse option for development to Gate 2 and is the only T2AT option which feeds directly into the eastern side of Affinity Water's Supply area.

It is not unexpected that the theme-based comparison between the options should come to the same conclusion as the initial results of the regional modelling; the factors which contribute to the cost of each option, and hence influence the regional model output, are the same factors which contribute to technical difficulty, environmental impact and planning risk.

There are four important points to note while reading this report:

- The buried pipeline routes and the above ground component sites described in this report are indicative and selected for the purpose of developing and characterising the options for comparative purposes. If any of the options are selected for further development, then the actual routes and site locations will be determined through further consideration and consultation with stakeholders.
- The characterisation of each option applies to the T2AT transfer scheme on its own. Each option requires enabling infrastructure to be built both upstream and downstream to create a complete system. To determine the actual value associated with each option it will be necessary to determine the benefit that can be derived from each option in combination with its enabling infrastructure. This is one of the reasons why the best value set of solutions can only be arrived at through a region-wide modelling process.
- The indicative solution for each of the T2AT options has been developed for the purpose of characterising and comparing them with each other. Each of the options will need to be refined and developed further during Gate 2 and beyond to ensure that the scheme is optimised at an increasing level of both granularity and depth.
- This report does not aim to present the technical detail of the options or the in-depth environmental assessments, and therefore it should not be considered to be a fully comprehensive, stand-alone record. Detailed information is available in the Gate 1 submission documents, including the concept design report and environmental assessment annexes, amongst others. However, the Gate 1 documents did not set out to provide a side-by-side appraisal of the technical feasibility, environmental impact and planning risk of the eight options in a format that allowed ready comparison of the merits of each one, and were not intended to facilitate the determination of an overall preference.

1 Introduction and Background

1.1 Purpose

This document explains the methodology that was used within the T2AT SRO project to select indicative pipeline routes and sites for the above ground components. The indicative routes and sites were used as the basis for developing the concept design of options, and hence their associated cost, carbon and environmental attributes.

The reason for producing the report is to provide an in-depth record of the appraisal methodology which was used to assess the eight options against technical, environmental, and planning themes and the results of that appraisal. The report concludes with a comparison of the options indicating why two in particular have been favoured for development to Gate 2.

This report forms part of a suite of technical documents that support the main T2AT RAPID Gate 2 report. The list of documents that make up the submission, along with a short synopsis of the contents, may be found in the main T2AT RAPID Gate 2 report. The ongoing option refinement process for the two options favoured for development to Gate 2 is described in Technical Supporting Document A5, Options Refinement Report.

The report does not aim to be completely “stand-alone”; descriptive information regarding the overall scheme and the concept design of the selected options is included in the Gate 1 submission documents² and associated Concept Design Report (CDR)³.

The ongoing option refinement process builds upon and backchecks the work undertaken previously, in order to identify the preferential option(s) and ensure indicative solution are technically practical, achieve the objective of the scheme, are compatible with local planning policy, and minimise adverse environmental and community impacts. The results of which will underpin development of the concept design, environmental appraisals, drinking water quality assessments, and the planning and consent strategy, all of which will be presented to RAPID at future Gateways.

Readers are asked to bear the following points in mind:

- The options are used for the purposes of modelling and assessing the scheme for the RAPID gated process; there are alternatives to the selected corridors and sites which are available to be consulted upon at a later stage in the project life.
- Consultation with stakeholders will be key to finalising the option(s).
- There are still numerous studies that will have to be undertaken prior to finalising option decisions if the T2AT scheme is to be implemented.

² Strategic Regional Water Resource Solutions: Preliminary Feasibility Assessment Gate 1 Submission for Thames to Affinity Transfer – Affinity Water – July 2021

³ 420176-MMD-T2-00-Z-RP-0100 Concept Design Report – Mott MacDonald – July 2021

1.2 Report Outline

This chapter of the report provides a brief “problem statement” describing the potential shortfall of water in the Affinity Water supply area if no action is taken and the Strategic Resource Option (SRO) approach that Ofwat has taken to ensuring that adequate investment is made to prevent such shortfalls occurring across all the English water companies.

Chapter 2 outlines the obligations placed on the SRO development teams to ensure that the requirements of regulators are met and are met consistently across the SRO programme. A description is also provided of the information required for regional modelling and how the regional model will be used to arrive at a flexible and resilient best-value water resource plan for the south east of England.

Chapter 3 summarises the process followed to identify an unconstrained list of alternative means of achieving the aims of T2AT and to screen that list of 33 alternatives down to a constrained list of eight options for further development.

Chapter 4 describes how, for each of the shortlisted options, an indicative site was selected for the abstraction point, the pumping stations, and the water treatment works and how an indicative route was identified for the connecting raw water and drinking water pipelines. These were the sites and routes used to develop the concept designs for the purpose of estimating capital cost, operating cost, and carbon footprint for each option and also the initial environmental impact characterisation.

Chapter 5 explains the environmental appraisal process which was applied to the eight shortlisted options in the context of the key environmental legislation and planning policy drivers. The chapter also provides an option-by-option summary of the environmental appraisal results and the main feedback points received from the environmental regulators.

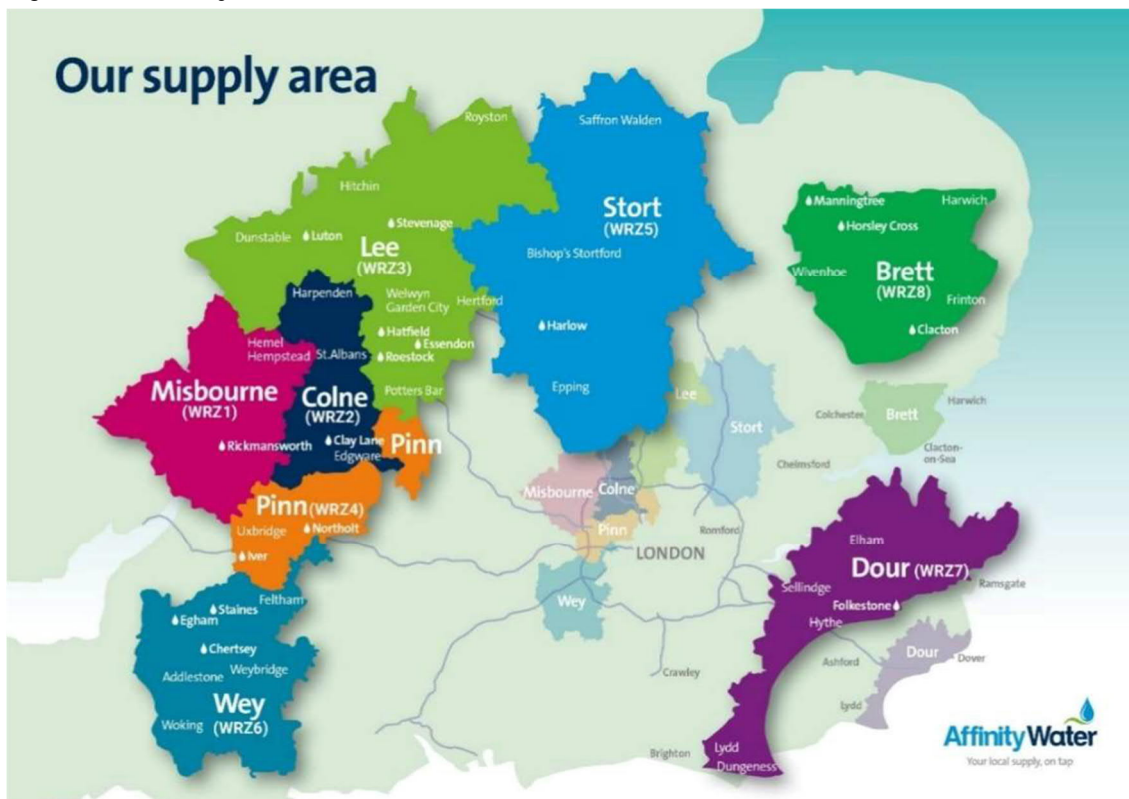
Chapter 6 presents an option-by-option appraisal of the planning risks and constraints likely to be encountered should that option go ahead.

Chapter 7 provides a summary of the option identification, screening, refinement, and appraisal process. The report concludes with a comparative overview of the selected options, stating which is more or less likely to be favoured for further development to Gate 2, based on the appraisal process.

1.3 Forecast Supply Deficits in the Affinity Water Central Region

Affinity Water’s central region covers a population of approximately 3.2 million in the area to the west and north of central London. The area is shown as water resource zones WRZ1 to WRZ6 in Figure 1.1.

Figure 1.1: Affinity Water's Water Resource Zones (WRZs)



Source: Affinity Water fWRMP19

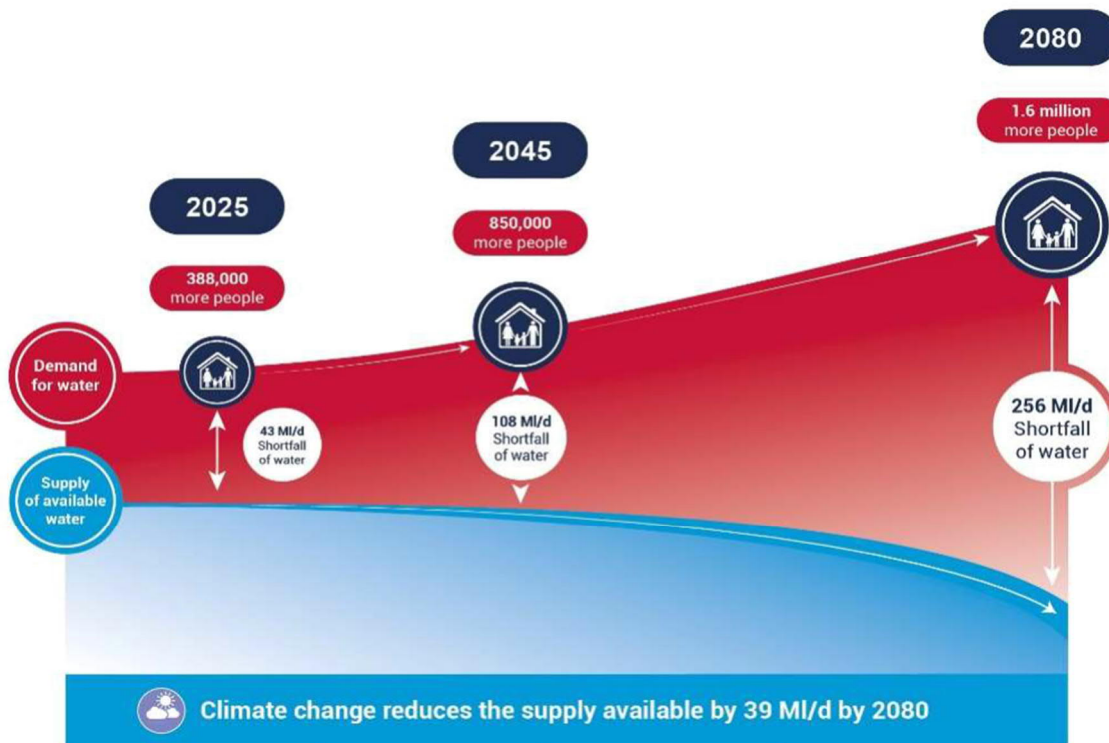
The forecast deficits in water supply across all of Affinity Water's resource zones are described in Affinity Water's water resource management plan for the period 2020 to 2080 (fWRMP19) published in April 2020^{4 5}.

The forecast supply-demand balance for the central region, if no supply interventions are made, is illustrated in Figure 1.2 below:

⁴ Final Water Resources Management Plan - Affinity Water - 2020

⁵ Note that water demand and deficit forecasts have been updated as part of the WRSE regional modelling process and will be revised for WRMP24. The text and figures in this section are based on the fWRMP19 information which was available at Gate 1.

Figure 1.2: Forecast Supply-Demand Balance in Affinity Water Central Region



MI/d = Million Litres per day

Source: Affinity Water fWRMP19

The increase in demand arises from expected population growth across the region. The anticipated decrease in available supply from existing sources is largely due to climate change and reduction in groundwater abstraction. Action is required to ensure that customer demand is met over the coming years. Part of the increase can be offset by demand side measures to reduce consumption. The following have been considered, but not all will be taken forward:

- Leakage – reducing the amount of water lost from the network.
- Metering – improving measurement of water used to enable customers to better understand and control their usage and allow us to identify leaks more easily.
- Reuse – small scale reuse of grey water, which is water from baths, showers and washing.
- Water efficiency – reducing the amount of water that customers use.
- Tariff – adjusting the price customers pay for water to provide an incentive to reduce use.

These measures will not be sufficient to close the deficit and so supply-side interventions, such as those listed below, will be required:

- Surface water – increasing the amount of water available from surface water sources, including reservoirs, and river augmentation schemes where the flow in a watercourse is supported (for example by a release of water from a reservoir) enabling more water to be abstracted.

- Groundwater - constructing new boreholes, improving the performance of existing boreholes and drought options, temporarily increasing abstraction during times of drought.
- Transfers and trading – transfers within a WRZ, transfers between our WRZs and transfers from our neighbouring water companies, known as bulk supplies.
- Treatment – improving the treatment of water (e.g. new treatment processes or reducing the losses of water during the treatment process) so that more of the water abstracted can be used for public water supply (e.g. new treatment works and process losses).
- Effluent reuse – making use of treated effluent from sewage treatment works (STW).
- Third party options – transfer of water rights from third parties or trading of abstraction licences. An abstraction licence is granted by the EA and fixes the amount of water that the holder may abstract from the environment. The holder of an abstraction licence can choose to transfer all or part of its licence to another person subject to satisfying the EA that this will not adversely affect the environment.
- Outage – reducing the amount of time that an existing source is unavailable.
- Catchment management – addressing issues with the quality of the raw water in the environment to make it suitable for abstraction and treatment for drinking water supply.
- Desalination – treating seawater or tidal water to make it suitable for drinking.

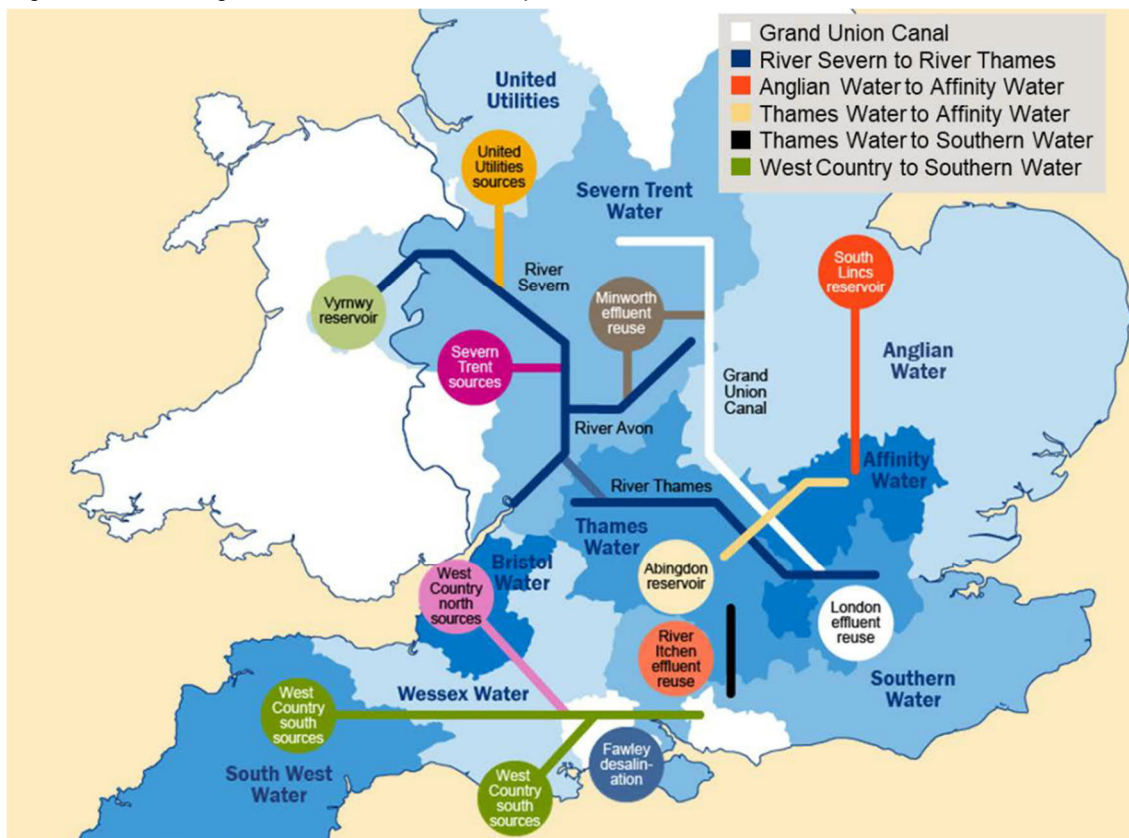
The T2AT scheme falls primarily into the transfer and trading category, although it also contains elements of the surface water supply category, the third-party options category and, for three of the options, the effluent reuse category.

1.4 Strategic Resource Solutions and Ofwat's PR19 Final Determination

The forecast supply and demand balance issues being faced by Affinity Water are not unique; all the water companies in the South of England, and elsewhere, are seeking solutions to their own, similar problem, and since all are looking beyond their own catchment areas for additional water to meet demand, they are all potentially in competition for the same water resources. As a result, the water regulator, Ofwat, challenged the water companies to work together to identify Strategic Water Resource Options (SROs) to secure long-term resilience on behalf of customers while protecting the environment and benefiting wider society.

Based on company submissions, Ofwat identified seventeen SROs for consideration in their PR19 final determination, with development funding divided between the nine water companies who are expected to collaborate with each other, and with third parties, to advance the potential schemes. There are eleven source-type SROs, which include reservoirs and effluent reuse, and six transfer-type SROs, utilising river, canal and pipeline transfer routes as shown in Figure 1.3.

Figure 1.3: Strategic Resource Solution Map



Source: Ofwat PR19 Final Determinations

Progressing multiple solutions in parallel enables flexibility to meet changing circumstances and the resilience challenges of the future. The additional water provided by these regional solutions could be over 1,500MI/d which exceeds the needs identified in the 2018 report ‘Preparing for a drier future’ by the National Infrastructure Commission.

1.5 T2AT Work to Date

The T2AT scheme is one of the seventeen SROs. It is a joint scheme between Thames Water and Affinity Water to transfer water from the Thames Water supply area to Affinity Water’s water resource zones. It is reliant on source water being provided by at least one of the following:

- the South East Strategic Reservoir (shown as Abingdon Reservoir in Figure 1.3 and now known as SESRO);
- the London Effluent Reuse SRO; or
- the River Severn to River Thames Transfer SRO (STT), which in turn is reliant on one, or more, of several source SROs being implemented.

Eight options were developed for submission at Gate 1. These were selected from an unconstrained list of 33 solutions that could potentially have met the objective of the scheme as described in Chapter 3.

The option development activities associated with Gate 1 are listed in Figure 1.4.

Figure 1.4: Gate 1 Activities

Final determination - gate one activities	<p>Initial concept design and decision making</p> <ul style="list-style-type: none">• Preliminary solution feasibility and data collection presented in a conceptual design report, using comparable methodologies and consistent assumptions:<ul style="list-style-type: none">○ Initial configuration/sub-option solution designs○ Initial costing and estimating report supported by benchmarking evidence○ Initial water resource benefit○ Initial data available and provided to regional groups to support high-level assessment of regional water resource benefit○ Initial option-level Strategic Environmental Assessment and Habitat Risks Assessments, including consideration of in-combination effects and identification of environmental risks that need mitigating through the solution design and costing○ Initial environmental, social and economic valuations (or metric benefits) consistent with principles in the National Planning Statement and Water Resources Planning Guidelines○ Initial drinking water quality considerations• Initial outline of the solution procurement strategy• Initial considerations of planning application route (high level view of process and timelines)• Initial comparison of solutions' costs and benefits in early draft regional plans with consideration given to inter-regional supply options and systems impacts• External assurance of data and approaches supported by Board statement• Regional stakeholder engagement including customer preferences to identify any issues that need further investigation• Details of efficient spend to gate submission on gate one activities, including a breakdown of costs against activities, evidence of efficiency of spend (benchmarking or tenders) and assurance.• Assessment of key risks to identify potential regulatory barriers, guidance or changes required for the solution to progress• Identify impacts of solution on current supply-demand balance delivery plan with simple comparison to current programme solutions.• Identification of any changes in solution partner (other water company) or solution substitutions• Develop solution programme plan to determine the activities that need to be undertaken prior to each subsequent gate• Proposals for gate two activity and outcomes, and penalty scale, assessment criteria and contributions
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Source: Ofwat PR19 Final Determinations

Completion of the above activities culminated in the comprehensive Gate 1 submission to RAPID in July 2021.

2 External Requirements

2.1 Background

Each of the SROs is being developed within the context of guidelines provided by the statutory regulators and by working groups convened to ensure consistency and a coordinated approach across the SROs and the water companies. These bodies are:

- RAPID - the Regulators' Alliance for Progressing Infrastructure Development
- ACWG - the All Company Working Group
- WRSE - the Water Resources South East group of water companies convened to coordinate regional planning in the south east of England.

The role of each of these bodies and an outline of the guidance provided is summarised in this chapter.

2.2 RAPID

RAPID was formed to help accelerate the development of the SROs by having a single body responsible for overseeing the advancement of the programme by the water companies. It is a collaboration between Ofwat, the Environment Agency (EA) and the Drinking Water Inspectorate (DWI).

Delivery of the SROs is subject to a formal gated process. There are four gateways between 2020 and 2025 where RAPID will review progress and determine how and whether solutions should proceed to the next gate, and whether the original funding allowance needs to be adjusted.

RAPID encourage the SRO teams to interact with them during the development process to ensure that the gate submissions are compliant. In particular the EA, Natural England and the DWI, who are working together as a National Appraisal Unit (NAU) to review the interim results of environmental and water quality studies and provide guidance whilst there is still time to implement any recommendations within the gate period.

2.3 ACWG

The nine water companies involved in the development of the SROs are listed below and are represented in the ACWG:

- Affinity Water
- Anglian Water
- Bristol Water
- Severn Trent Water
- South West Water
- Southern Water
- Thames Water

- United Utilities
- Wessex Water

To promote consistency between the SROs, the ACWG has provided guidance on the following topics:

- Option identification, screening and development⁶
- Cost consistency methodology⁷
- Potential yields and deployable outputs (DOs) of SROs⁸
- Drinking water quality risk⁹
- Water framework directive¹⁰
- Consistency in criteria for investment modelling¹¹

2.3.1 Option Identification, Screening and Development

The guidance on option identification, screening and development⁶ brings together the guidance related to the options appraisal workstream, which comprises the following five main tasks:

Task 1 – Options gap analysis and rejection register review

Task 2 – Consistency in option screening

Task 3 – Options information management

Task 4 – Consistency across option development

Task 5 – New option identification

The guidance recommends building on the option identification and screening work carried out at WRMP19, to arrive at a new unconstrained list. It suggests that the unconstrained list should be subjected to a two-stage screening process, which is consistent with the usual approach taken by many water companies in developing their WRMPs.

A robust rejection register is required to ensure that all rejected options have a coherent reason for rejection. The register should clearly set out why each option has been rejected, ideally in a way that is self-evident and does not require reference to other sources.

Development of options should be carried out in a way which will allow information to be included into an Options Database Template. The information stored on the database will then be used for regional investment modelling, water resource modelling and determining the associated environmental assessment metrics. It is therefore important that the naming, classification and structure of options is understood and adhered to.

The above guidance has been followed in the screening and selection process described in Section 3.

⁶ Options Appraisal - Guidance on option identification, screening and development – ACWG - October 2020

⁷ Cost Consistency Methodology - Technical Note and Methodology – ACWG - August 2020

⁸ Scheme benefits: Potential yields and DOs of strategic schemes – ACWG - June 2020

⁹ Strategic WQ Risk Framework Report – ACWG – January 2021

¹⁰ WRMP environmental assessment guidance and applicability with SROs – ACWG - October 2020

¹¹ Option development consistency in criteria used for investment modelling – ACWG - August 2020

2.4 Water Resources South East (WRSE)

WRSE is the regional water resource planning alliance that covers the South East of England and comprises the six water companies that operate in this region:

- Affinity Water
- Portsmouth Water
- South East Water
- Southern Water
- Sutton & East Surrey Water and
- Thames Water

WRSE is working closely with the SRO development teams, advisory members, RAPID, and a range of other stakeholders in the region.

2.4.1 WRSE's Best Value Regional Resilience Plan

Previous water resources programmes have been developed with an objective to select the least cost portfolio of options. However, it's now recognised that it's vital to also consider the potential additional value of a plan to people and places.

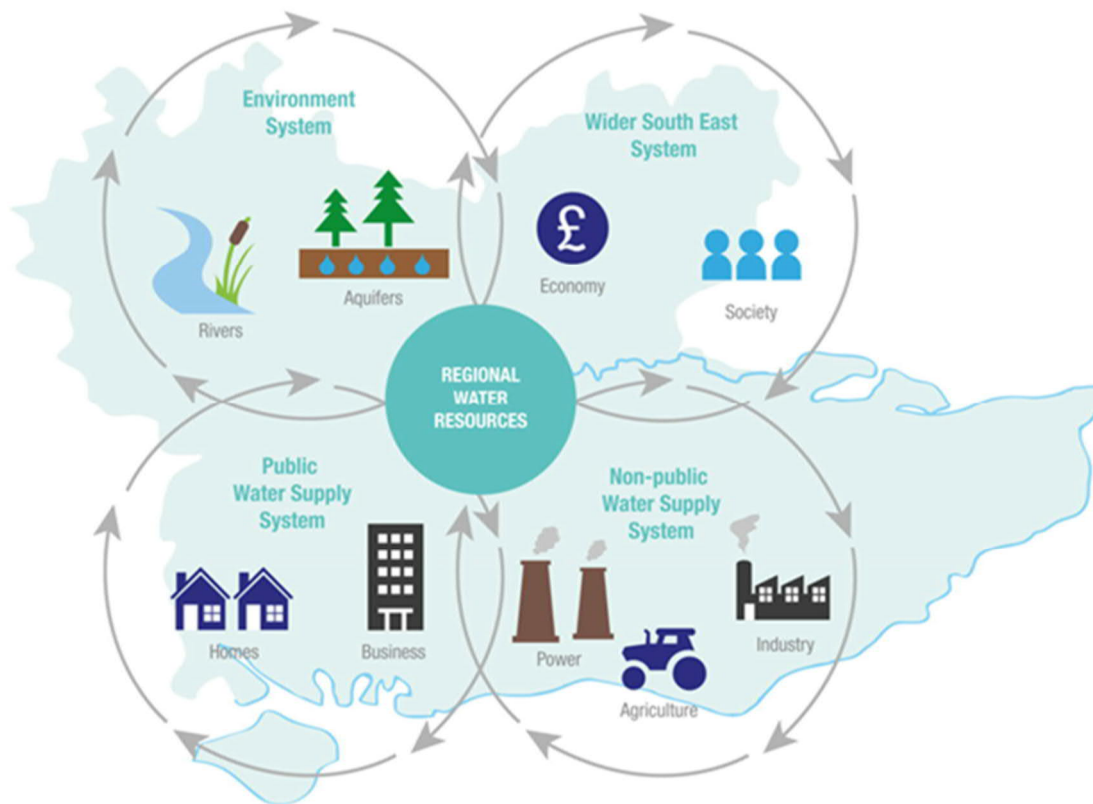
WRSE's ambition is to deliver a multi-sector, long-term, flexible, regional resilience plan that provides additional value in the areas that matter most to the people of the south east of England. It will be a water resource programme that is chosen not necessarily because it is the cheapest, but because it will deliver much wider benefits to society, hence it being referred to as a 'Best Value' plan.

WRSE have developed a set of criteria and metrics that are being used to assess the extra value resulting from the different water resource options identified.

The framework comprises four inter-dependent systems as indicated in Figure 2.1.

- The public water supply (core system)
- The non-public water supply (core system, which is also referred to as the multi-sector system)
- The environmental system (core system)
- The wider south east system, which includes society and economy (not a core system and not well defined).

Figure 2.1: WRSE Best Value Planning Framework



Source: WRSE

The 'Best Value' objectives of the regional plan are to:

- Deliver a secure and wholesome supply of water to customers and other users to 2100
- Be deliverable at a cost that is acceptable to customers
- Deliver long-term environmental improvement and social benefits
- Increase the resilience of the region's water systems.

WRSE will not be appraising and selecting individual options in isolation. They propose to appraise a series of programmes, each comprising options that in combination meet the objectives and value criteria and deliver 'Best Value'.

Further information on WRSE's 'Best Value' planning process can be found in their consultation document on the topic¹².

2.4.2 Option Appraisal Methodology

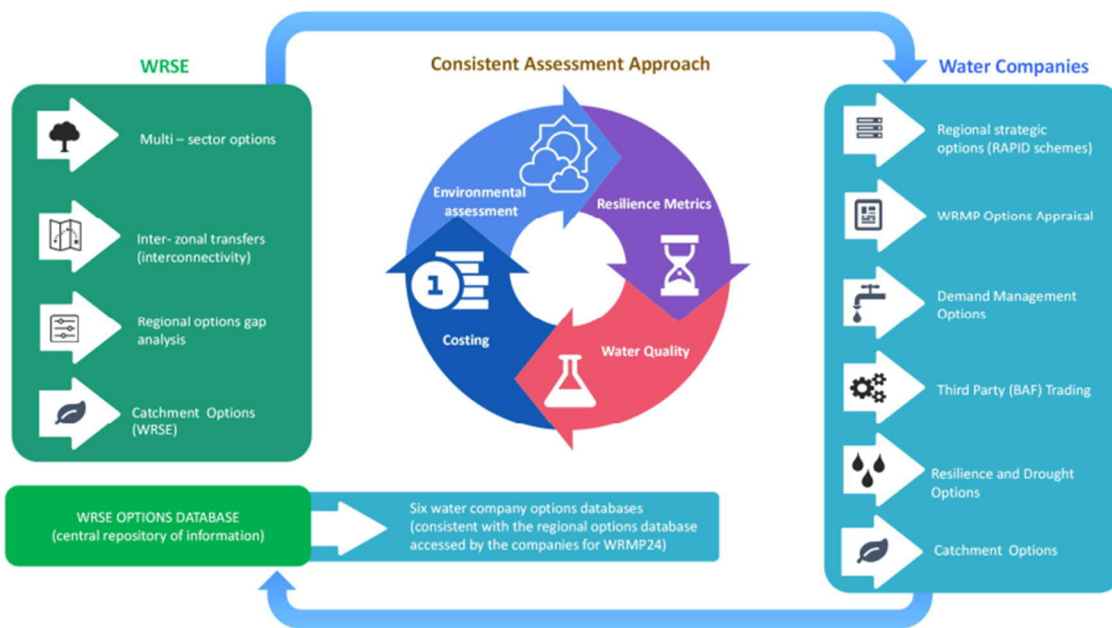
The T2AT SRO forms a set of options within the WRSE water resources planning process. The WRSE screening process and investment modelling will be completed in time to cascade into the companies' WRMPs, the draft of which will be consulted upon in August 2022.

¹² Developing our 'Best Value' Multi-Sector Regional Resilience Plan: A Consultation on our Objectives, Value Criteria and Metrics – WRSE – February 2021

Figure 2.2 shows how the WRSE options appraisal is integrated with the water companies' WRMP option appraisal and the wider programme requirements for environmental, resilience and water quality assessments. The methodology¹³ has been developed in this way to:

- promote improvements in approach across the companies
- ensure that material options are not overlooked and
- drive consistency in the inputs to the investment model.

Figure 2.2: WRSE Integrated Options Appraisal Methodology

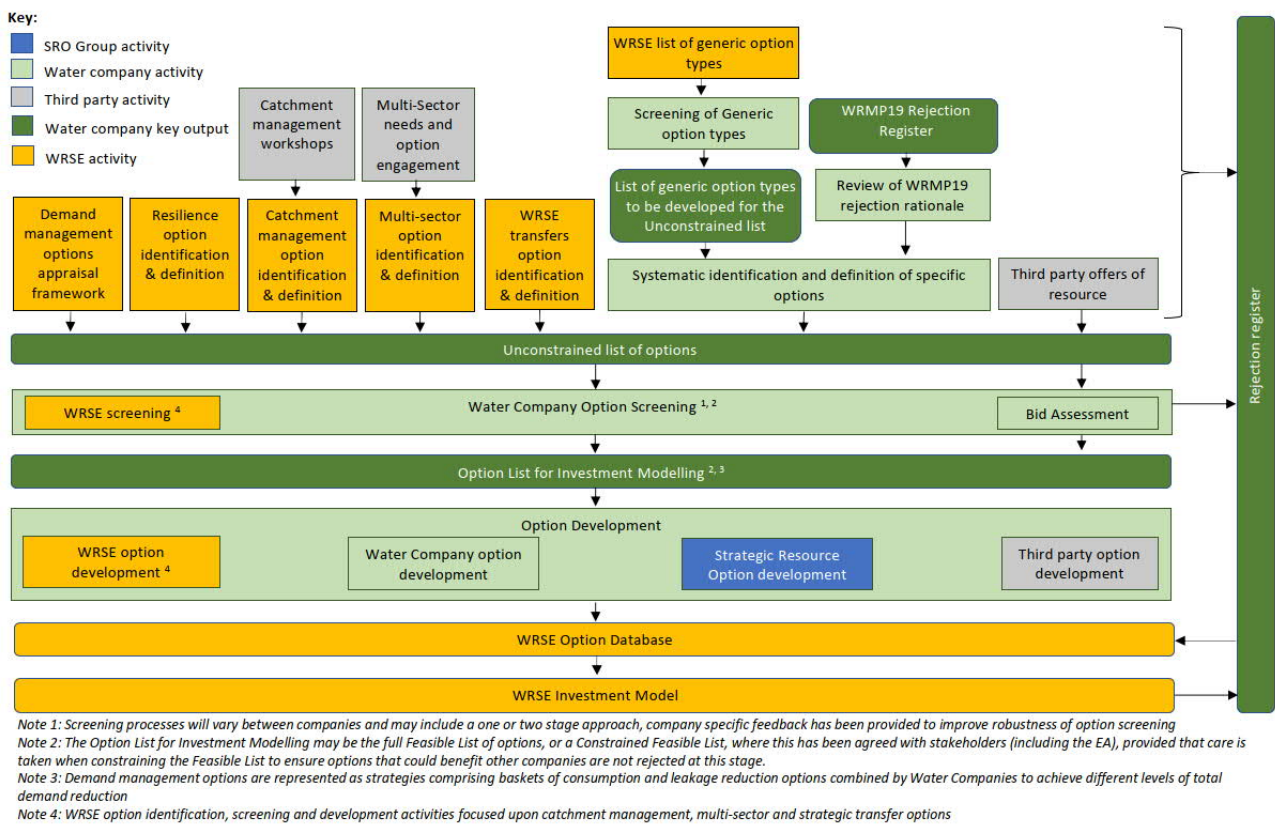


Source: WRSE

Figure 2.3 below shows the stepped process for option appraisal. It identifies those activities undertaken by WRSE at a regional level and those activities conducted by individual water companies.

¹³ Method Statement: Options Appraisal – WRSE - September 2021

Figure 2.3: An Overview of the Process for Identifying and Screening Options from WRSE’s Perspective



Source: WRSE

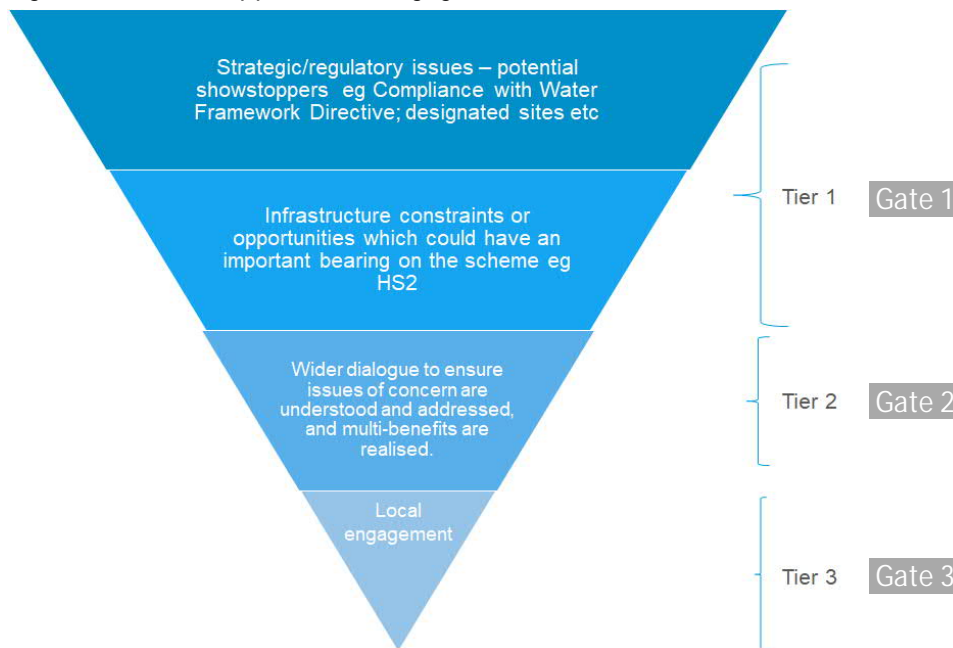
Information on the options which have passed through water company screening is provided to WRSE using a standard template. The information is then uploaded to an options database which is then used by the regional model to simulate the outcome of implementing combinations of SRO options, and hence derive the best value regional plan.

2.4.3 Stakeholder Engagement and Regional Plan Development

Once the initial results of the ‘Best Value’ planning process have been compiled, they will be presented to stakeholders for consultation¹⁴. As well as RAPID and its sub-groups such as the NAU, there are several tiers of stakeholders as shown in Figure 2.4. As the SROs progress through the RAPID stage gates, the type of organisation which holds a stake in the scheme will become more localised.

¹⁴ Futureproofing our water supplies: A Consultation on our Emerging Regional Plan for South East England – WRSE – January 2022

Figure 2.4: Tiered approach to engagement



Source: Affinity Water

During the development of the T2AT options, discussions have taken place with the Tier 1 stakeholders, initially with regard to the strategic direction of the SROs and later with regard to a review of the selected options and draft submission documents for Gate 1.

T2AT also participated in WRSE-coordinated, collaborative research to examine customers' priorities and preferences for planning future water supply and potential options to manage demand for water and increase supply, including regional solutions. Feedback on the scope and the approach was sought from a coalition of representatives from the participating water company's Customer Challenge Groups, the Consumer Council for Water and RAPID.

Further detail is available in the stakeholder engagement annex of the Gate 1 submission¹⁵.

During the course of Gate 2, the engagement process has been extended to include Tier 2 stakeholders, firstly through a presentation of the selected T2AT options, which took place in December 2021, and subsequently through consultation on the initial WRSE regional plan which started in January 2022.

Feedback from the Gate 2 engagement activities, together with further output from the regional investment model, will be used to refine the best value' regional water resources plan. This will then be coordinated with the individual water companies' other supply-demand balancing solutions and compiled into their draft and final WRMP24 submissions.

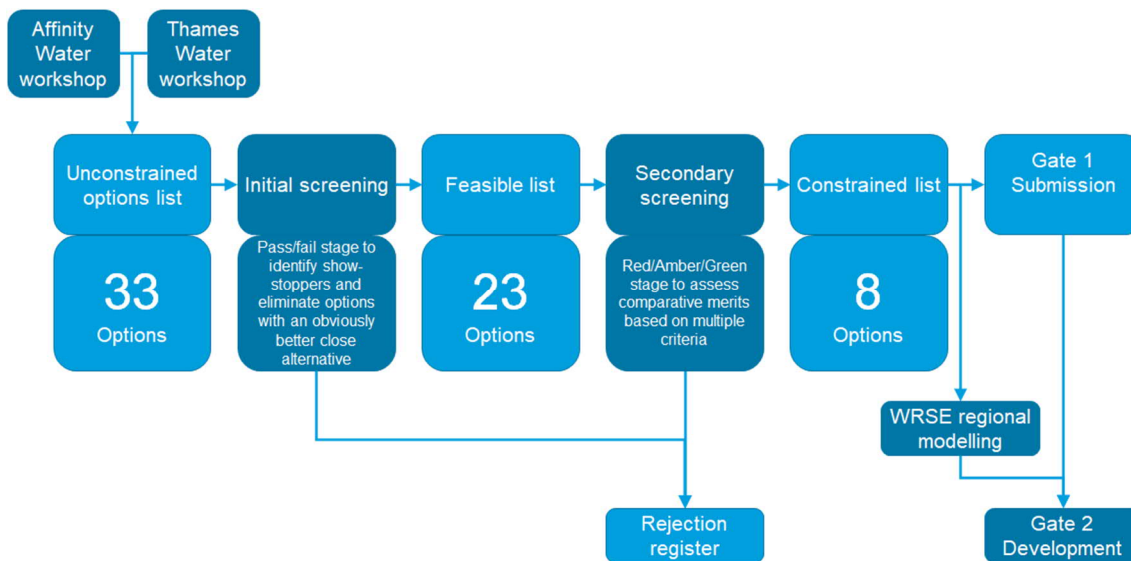
¹⁵ T2AT Gate 1 Supporting Report: Customer and Stakeholder Engagement – Affinity Water - June 2020

3 Option Identification and Screening

3.1 Screening Process

The option identification and screening process was carried out in line with the ACWG guidance as described in Section 2.3.1. The process is shown in summary in Figure 3.1

Figure 3.1: T2AT Option Screening Process



3.2 Option Identification

The unconstrained option list was compiled in consultation with Affinity Water and Thames Water, developed from the document *Initial Assessment of Alternative Scheme Concepts Report*¹⁶. The full, list of unconstrained options is laid out below in Table 3.1 and is shown on an overview map in Appendix A.

Table 3.1: Unconstrained Options

Option name	Option description
Sunnymeads 1	Abstraction of water at Sunnymeads to an expanded Harefield treatment works and then conveyed to the Harefield service reservoir
Sunnymeads 2a	Abstraction of water at Sunnymeads to a new Iver treatment works site and then conveyed to the Harefield service reservoir
Sunnymeads 2b	Abstraction of water at Sunnymeads to a new Iver treatment works site and then conveyed to the Harrow service reservoir
Sunnymeads GUC a	Abstraction of water at Sunnymeads via the Grand Union canal corridor to a new Iver treatment works site and then conveyed to the Harrow service reservoir
Sunnymeads GUC b	Abstraction of water at Sunnymeads via the Grand union canal corridor to anew Iver treatment works site and then conveyed to the Harefield service reservoir

¹⁶ Initial Assessment of Alternative Scheme Concepts Report - Affinity Water - June 2020

Option name	Option description
Sunnymeads GUC c	Abstraction of water at Sunnymeads via the Grand union canal corridor to anew Harefield treatment works site and then conveyed to the Harrow service reservoir
Egham 1	Abstraction of raw water at Egham to an expanded Egham treatment works and then to Egham service reservoir
Egham 2a	Abstraction of raw water at Egham to new Iver treatment works and then to Harrow service reservoir
Egham 2b	Abstraction of raw water at Egham to new Iver treatment works and then to Harefield service reservoir
Chertsey 1	Abstraction of raw water at Chertsey to an expanded Egham treatment works and then to Egham service reservoir
Chertsey 2a	Abstraction of raw water at Chertsey to new Iver treatment works and then to Harrow service reservoir
Chertsey 2b	Abstraction of raw water at Chertsey to new Iver treatment works and then to Harefield service reservoir
Walton 1	Abstraction of raw water at Walton to an expanded Egham treatment works and then to Egham service reservoir
Walton 2a	Abstraction of raw water at Walton to new Iver treatment works and then to Harrow service reservoir
Walton 2b	Abstraction of raw water at Walton to new Iver treatment works and then to Harefield service reservoir
Medmenham	Abstraction of raw water at Medmenham to an expanded Amersham treatment works to Harefield service reservoir
Maidenhead	Abstraction of raw water at Maidenhead to an expanded Amersham treatment works to Harefield service reservoir
Mogden Reuse Direct	Direct transfer of reuse water from Mogden treatment works to Harrow service reservoir
Mogden Reuse Indirect 1a	Transfer of Mogden Reuse water for abstraction of raw water at Egham to an expanded Egham treatment works and then to Egham service reservoir
Mogden Reuse Indirect 1b	Transfer of Mogden Reuse water for abstraction of raw water at Walton to new Iver treatment works and then to Harrow service reservoir
Mogden Reuse Indirect 1c	Transfer of Mogden Reuse water for abstraction of raw water at Walton to new Iver treatment works and then to Harefield service reservoir
Mogden Reuse Indirect 2a	Indirect transfer of Mogden Reuse water to the River Thames at Teddington with abstraction a short distance upstream and transfer to Iver 2 then onto Harrow service reservoir
Teddington DRA (formerly Mogden Reuse Indirect 2b)	Indirect transfer of Mogden Reuse water to the River Thames at Teddington with abstraction a short distance upstream and transfer to Harefield for treatment and then to the service reservoir
Mogden Reuse Indirect 3	Indirect transfer from Mogden reuse water to Kempton Park WTWs (Thames Water) for treatment and then onto Harefield service reservoir.
Deephams Reuse Direct	Direct transfer of reuse water from Deephams treatment works to North Mimms service reservoir
Deephams Reuse Indirect	Indirect transfer of Deephams reuse water from William Girling reservoir to North Mimms Treatment works (New site) to the North Mimms Service reservoir
Beckton Reuse Direct	Direct transfer of reuse water from Beckton treatment works to North Mimms service reservoir
Beckton Reuse Indirect	Indirect transfer of Beckton reuse water from William Girling reservoir to North Mimms Treatment works (New site) to the North Mimms Service reservoir
Abingdon Transfer	Transfer direct from the Abingdon reservoir (now renamed as SESRO) to treatment works at Amersham and then to Harefield service reservoir
Lower Thames Reservoir Transfer 1a	Transfer direct from Thames owned reservoir to treatment works at Egham and then to Egham service reservoir

Option name	Option description
Lower Thames Reservoir Transfer 1b	Transfer direct from Thames owned reservoir to treatment works at Egham and then to Harrow service reservoir
Lower Thames Reservoir Transfer 2a	Transfer direct from Thames owned reservoir to treatment works at Iwer and then to Harefield service reservoir
Lower Thames Reservoir Transfer 2b	Transfer direct from Thames owned reservoir to treatment works at Iwer and then to Harrow service reservoir

3.3 Initial Screening

3.3.1 Criteria

Table 3.2 sets out the initial screening assessment criteria. It should be noted that the assessment scoring was applied to the transfer option independently of the resource; for example, the process did not differentiate between transfers supplied by SESRO or STT.

Table 3.2: Initial Screening Stage Criteria

Ref	Criteria	Description for Fail	Evidence for audit
1	Delivery underway	Option already delivered/delivery is underway, and option under delivery cannot be scaled up in any way	Reference to show delivery underway. (Business plan reference, confirmation by name, role, date etc.
2	Duplication	Option is duplicated with another on the unconstrained list.	Duplicate option reference, name, type, and capacity. Reference to which named option is removed/which kept in.
3	Comparative rejection	There are multiple mutually exclusive options, and it is clear, even at this early stage, and without any further investigation being needed that a significantly better value option variant is available. Assessment for transfers to include a comparison of length of transfer 'as the crow flies'.	Preferred feasible option reference and evidence that the preferred option is clearly better value in terms of appraisal metrics (cost, yield, resilience, etc)
4	Superseded	Option has been superseded by another to make it no longer relevant.	Superseded feasible option reference and clear evidence for why this option is no longer valid
5	Low flow availability	Option would require abstraction beyond current licensed limits at times of low flow AND relevant CAMS specifies water not available for licensing OR relevant source subject to sustainability reductions which would make any further increase in abstraction unviable	Abstraction licence volume v proposed volume. CAMS document and water body name. WINEP status (for sustainability reductions).
6	CAMS resource reliability	Option would require abstraction beyond current (or potential future) licensed limits when flows are above a certain threshold AND CAMS resource reliability at the required threshold insufficient for the option to be feasible.	Reference to abstraction licence volumes. CAMS document and water body name
7	3rd party water availability	Third party constraints make the option completely unviable AND there is no scope to develop a shared option which would overcome the third-party constraints.	Specify the constraints and why they are insurmountable, e.g. CAMS resource reliability, low flow availability, water required locally, customer acceptability etc. Cost unlikely to be a legitimate reason.

Ref	Criteria	Description for Fail	Evidence for audit
8	SEA Criteria	Option has a direct or likely impact, (Footprint or associated impact are within 100m) on: - Special Area of conservation - Sites of special scientific interest (SSSI) - Special protected areas - Ramsar Sites - Scheduled Monuments AND impact(s) cannot be mitigated sufficiently to make the option viable.	ArcGIS ATLAS tool outputs/maps: reference to SEA criteria and why mitigation not possible.

3.3.2 Initial Screening Results

Initial screening was undertaken on the unconstrained list of options. There were three main reasons why options failed to pass through initial screening:

- Comparative failure – there is a demonstrably better alternative sub option (Criterion #3 above)
- No source – there is insufficient or no confirmed available source of water (Criteria #5 and #6)
- Direct reuse – direct reuse is not considered in Thames Water’s London Effluent Reuse SRO. This is partially due to the associated water quality risk; primarily, that if there was a catastrophic failure of the reuse plant, it could result in effluent being discharged directly into the drinking water supply, and secondly due to customer perception and unwillingness to accept the principle of direct reuse. Therefore, these options were screened out. (Criterion #7)

A summary of the initial (and secondary) screening results is given in Table 3.4. A full list showing the initial screening assessment and results (including rejection rationale) is available in Appendix B. The options which passed initial screening are illustrated on the map provided in Appendix C.

3.4 Secondary Screening

3.4.1 Criteria

At the secondary screening stage, a list of screening criteria common with the Affinity Water WRMP24 criteria was applied; the definitions of which are laid out below in Table 3.3. The “A”, “E” and “R” references relate to the WRSE resilience metrics and stand for adaptability, evolvability, and reliability respectively. “S” (screening) and WRMP references are criteria that are used in the WRMP screening process. Additionally, there were a number of SRO-specific criteria included to assess the transfer options (SRO criteria).

The assessment criteria for this stage ensured consistency with relevant assessment criteria required later in the option appraisal process by the statutory SEA, Habitats Regulations Assessment (HRA) and Water Framework Directive (WFD) regimes that underpin the overall environmental assessment consistent with the approach for WRMP24.

Table 3.3: Secondary Screening Stage Criteria

Ref	Criterion	Question for screening	Evidence for audit	Pass/fail or RAG	Green	Amber	Red
A5	Operational complexity	Would the option increase the complexity of operation of the abstraction, treatment, or distribution infrastructure?	Explanation for the expected change in complexity	RAG	No increase in complexity	Some increase in complexity	Significant increase in complexity
E1	Modularity and scalability	Can the option be implemented on a modular or scalable basis?	Clear explanation for why/why not scalable	RAG	Option has potential for flexibility in capacity	Option capacity is largely fixed	N/a
R1 ⁽²⁾	Uncertainty of option's supply/demand benefit	What is the uncertainty in DO of the option?	Explanation for cause of the uncertainty and why it cannot be resolved	RAG	<50% uncertainty	50% to 100% uncertainty	>100% uncertainty
R3	Vulnerability of infrastructure to asset failure other hazards	Is the option particularly vulnerable to asset failures during shock events?	Clear explanation for expected impact	RAG	Option no more vulnerable to asset failures than average for the WRZ	Option more vulnerable to asset failures than average for the WRZ	Option highly vulnerable to asset failures
R5	Catchment & raw water quality risks	Would the option be likely to increase WRZ outage associated with transient catchment water quality events?	Clear explanation for expected impact	RAG	Transient catchment water quality risks no higher than average for the WRZ	Option may increase WRZ outage associated with catchment raw water quality risks	Option likely to significantly increase WRZ outage from catchment raw water quality risks
S2	Regulatory approval	Are there significant risks associated with regulatory approval of the option?	Regulatory correspondence or reference to regulatory guidance	RAG	Regulatory risks can be mitigated/managed	Regulators have suggested licensing or approval may not be possible	Regulators have suggested licensing or approval unlikely to be granted
S3	Customer preference	What is the customer preference for this option type	Reference to customer surveys, specifying survey details (numbers surveyed, dates, results, etc)	RAG	Customers indicated a preference for this option type and will be straightforward to promote	Customers were generally neutral, or perception is uncertain/mixed; some mitigation may be required to improve acceptability of option	Customers indicated other option types were preferred and the option will be difficult to promote.

Ref	Criterion	Question for screening	Evidence for audit	Pass/fail or RAG	Green	Amber	Red
S4	Stakeholder Promotability	Are there risks associated with non-regulatory stakeholder support for the option?	Evidence to show stakeholders oppose this option type and that it would be difficult to mitigate that opposition	RAG	No reason to expect significant local opposition to this option	Evidence to suggest stakeholders may actively oppose the option	Stakeholders likely to significantly oppose this option
S5	Planning	Is the option at risk of being blocked by unalterable planning constraints?	Reference to planning guidance/law	RAG	No high-profile planning constraints	Planning constraints that can be over come	Planning constraints that are high profile and unlikely to be overcome. E.g. Heathrow third runway or HS2
WRMP3	Excessive Cost and carbon	Are the option cost and carbon emissions likely to be excessively high?	Quantitative assessment of option characteristics (e.g. length of route and pumping head)	RAG	Quantitative assessment clearly indicates least cost option for addressing need, or would clearly be part of least cost programme for addressing anticipated needs	Due to estimating uncertainties option has potential to become least cost, or potential to be part of the least cost programme for addressing anticipated needs	Quantitative assessment clearly indicates substantially more costly than other options for addressing need
WRMP5	Option status with respect to environmental designations and features	Does the option have a direct or likely impact (Footprint or associated impact are within 100m) on: Special Areas of conservation; Sites of Special Scientific Interest; Special Protected Areas; Ramsar Sites; Scheduled Monuments; National Nature Reserve; Registered Parks and gardens; current or historic landfills; Grade 1 Agricultural Land; Flood Zone 3; Ancient Woodland; Marine conservation zones; and Areas of Natural Beauty (AONB)	Route optimiser tool outputs and maps	RAG	No designations within 100m of proposed option footprint	Pipeline/transfer route located within statutory sites; mitigation may be required but option still feasible	Significant overlap with designated site boundaries makes option unlikely to be feasible

Ref	Criterion	Question for screening	Evidence for audit	Pass/fail or RAG	Green	Amber	Red
WRMP6	Option status with respect to overall SEA screening (sustainability)	Consideration of full SEA screening results and identification of key issues	Route optimiser tool outputs and maps	RAG	No significant risks identified	Some concerns owing to SEA screening	Significant risks identified under the SEA
WRMP7	Natural Capital	Is the proposed option likely to impact Natural Capital Stocks including: soils (agricultural land, geological SSSIs); air quality (AQMA); freshwater (main rivers, flood zones); grasslands (priority grasslands); and woodland (ancient woodland and OS woodland)?	TBC	RAG	The option is likely to cause an overall gain in Natural Capital Stocks	The option is likely to have neutral effects or cause an overall loss in Natural Capital Stocks	The option is likely to cause an unacceptable loss of Natural Capital
WRMP8	Water framework directive assessment and/or urban wastewater directive	Is the option likely to impact upon WFD no-deterioration objectives?	TBC	RAG	No likely impacts on WFD no-deterioration objectives	Risk of deterioration but mitigation possible or not enough information available currently	Likely impacts on WFD no-deterioration objectives
WRMP9	European Designated Sites	Does the option have an impact or likely impact on European designated sites	Route optimiser tool outputs and maps	RAG	No European designated sites within 500m	One or more European designated sites within 500m or not enough information available currently	Direct land take or likely impacts on a European designated site

Ref	Criterion	Question for screening	Evidence for audit	Pass/fail or RAG	Green	Amber	Red
SRO1	Construction complexity	Detailed review of construction requirements: are there adverse ground conditions / large number of major crossings? How will these conditions affect the construction timeline?	Route of transfer pipeline, using route optimiser tool.	RAG	No major crossings required or contaminated land risks identified. Construction complexity is anticipated to have no significant impacts on construction programme and cost.	1-10 major crossings required or contaminated land risks identified. Construction complexity is anticipated to have minor impacts on construction programme and cost.	> 10 major crossings required or significant contaminated land risks identified. Construction complexity is anticipated to have major impacts on construction programme and cost.
					(Major crossings are defined as Rail, Motorways, A Roads, Rivers, and Canals)	(Major crossings are defined as Rail, Motorways, A Roads, Rivers, and Canals)	(Major crossings are defined as Rail, Motorways, A Roads, Rivers, and Canals)
SRO2	Impact from construction	Non-traffic impact of construction on local residents - the impact of dust and noise. Will construction activities result in the loss of residential dwellings? Will construction traffic affect local roads /built up areas?	Shape file of the construction site and 100m radius around the site to determine impact on residential dwellings, and construction shape outline to determine loss of dwellings	RAG	Less than 100 residential properties likely to be affected during construction by noise and dust. No residential dwellings located within the site. Route largely not through built up areas and / or likely to have limited impacts on local traffic. No constraint posed	Between 100 and 299 residential properties likely to be affected by construction by noise and dust. Up to 10 residential dwellings located within the site. Route partly through built up areas and / or likely to have moderate impacts on local traffic. Issue or constraint can be overcome	More than 300 residential properties likely to be affected during construction by noise and dust. More than 10 residential dwellings located within the site. Route predominantly through built up areas and / or likely to have substantial impacts on local traffic. These impacts cannot be mitigated

Ref	Criterion	Question for screening	Evidence for audit	Pass/fail or RAG	Green	Amber	Red
SRO3	Opportunities	Are there any opportunities for biodiversity improvement and/or chalk stream enhancement?	Footprint of options and its proximity to possible opportunities	RAG	Site with a watercourse and surrounding woodlands. Option is directed at chalk stream enhancement. Option will provide recreational benefit.	Site with a watercourse or surrounding woodlands. Option will bring some indirect improvement to the chalk stream. Option will provide minimal recreational benefit.	Not applicable
SRO4	Environmental considerations	Can any of the flags that were identified at the secondary stage be mitigated?	List of considerations where mitigation can be undertaken, and the level of mitigation required	RAG	No flags identified no mitigation required	Mitigation required but not at a high cost	Significant mitigation required at a high cost

Notes:

- (1) Secondary screening criteria S1 (Option type excessive), WRMP1 (Provision of a DO benefit), and WRMP2 (Provision of surplus into a WRZ) are not applicable for SRO screening and so are not listed here. WRMP4 (WRSE selection) is not relevant at this stage as WRSE modelling is still in progress.
- (2) Transfer options are only viable as combined solutions with an upstream source SRO. Uncertainty of source is linked to the source SRO and therefore it was agreed subsequently that criteria R1 (Uncertainty of option's supply/demand benefit) was outside of the scope of this SRO and would be included within screening of the source SRO to avoid duplication.

3.4.2 Secondary Screening Results

The secondary screening criteria were applied to the options which had passed the initial screening process. The results were refined following challenge meetings with Affinity Water, Thames Water, and ACWG, as well as with the London Reuse SRO team to ensure consistency with the London Effluent Reuse SRO options.

The main conclusions / amendments from the challenge meetings were:

- Options that finish at Egham water treatment works (WTW) / service reservoir were screened out as system DO would be zero due to site constraints preventing expansion. This removed all the remaining Egham, Chertsey, and Walton options (with one exception – see item 5 below).
- The Sunnymeads GUC b option was screened out due to space constraints along sections of the Grand Union Canal (GUC); the option was originally proposed because of the possibility that the GUC might offer a useful corridor for the pipeline. If following the GUC corridor does offer genuine benefits, then this would be identified in the process of route optimisation for the Sunnymeads 2a option.
- The Maidenhead option is to go directly from the Maidenhead abstraction point to a new WTW at Harefield, rather than detouring via a new WTW in the location of the existing service reservoir at Amersham. This will reduce the length and environmental impact of the pipeline route.
- The SESRO direct transfer (originally referred to as Abingdon transfer) option was reverted to fail status, due to the length of the pipeline route. It had been reinstated despite failing initial screening to ensure that a direct transfer route was maintained. Note that even after failing secondary screening it might have been reintroduced later if other options had been found to have higher than expected water quality or storage risks. However, subsequent concept design development has confirmed that this is not the case, and therefore the SESRO transfer option remains as screened out.
- An option should be retained which is compatible with future potential increases in flows in the Colne and Lee catchments, i.e. abstraction at Egham, Chertsey, or Walton. The potential increases in flow would arise from reductions in the current level of groundwater abstractions such as those proposed by Chalk Streams First (CSF). Following the meeting with the London Effluent Reuse SRO team, Walton 2b was selected as the most suitable of these options. Although it has a longer pipeline route than the Chertsey or Egham options, it is compatible with the Mogden effluent reuse option within the London Effluent Reuse SRO, which gives this option greater resilience.

The full secondary screening spreadsheet, incorporating the above adjustments, can be found in Appendix D. The options which passed secondary screening are illustrated on an overview map and individual maps for each option / group of options. These are provided in Appendix E. Table 3.4 below summarizes the screening results of both the initial and secondary screening stages, and the rejection rationales for the screened-out options.

Table 3.4: Initial and Secondary Screening Summary

Option name	Option description	Water source / SRO dependencies	Screening Outcome		Rejection Rationale
			Initial	Secondary	
Sunnymeads 1	Abstraction of raw water at the existing Affinity Water Sunnymeads intake; conveyance to a water treatment works (WTW) at the existing Harefield service reservoir site; and utilisation of the available storage capacity at the existing Harefield service reservoir.	SESRO or STT	✓	✓	N/A - Proceeded to next stage.
Sunnymeads 2a	Abstraction of raw water at the existing Affinity Water Sunnymeads intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield service reservoir.	SESRO or STT	✓	✓	N/A - Proceeded to next stage.
Sunnymeads 2b	Abstraction of raw water at the existing Affinity Water Sunnymeads intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow service reservoir.	SESRO or STT	✓	✗	Rejected as there is limited scope for expansion at Harrow. The route to Harrow is also longer than the route to Harefield and it passes through a more densely populated area, which will result in a greater level of disruption to adjacent communities.
Sunnymeads GUC a	Abstraction of raw water at the existing Affinity Water Sunnymeads intake and conveyance via the Grand Union Canal (GUC) corridor to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow service reservoir.	SESRO or STT	✓	✗	Rejected as sections of the GUC corridor are too narrow for efficient pipeline construction; making this option impractical. The route to Harrow is also longer than the route to Harefield and it passes through a more densely populated area, which will result in a greater level of disruption to adjacent communities. There is also limited scope for expansion at Harrow.

Option name	Option description	Water source / SRO dependencies	Screening Outcome		Rejection Rationale
			Initial	Secondary	
Sunnymeads GUC b	Abstraction of raw water at the existing Affinity Water Sunnymeads intake and conveyance via the GUC corridor to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harefield service reservoir.	SESRO or STT	✓	✗	GUC corridor constraints make this option unviable. Sunnymeads GUC b has the same abstraction, treatment, and storage locations as Sunnymeads 2a, but a different route. Further analysis will be undertaken on Sunnymeads 2a using route optimiser tools to select the best route between those points. If there are benefits to be gained from having sections of pipeline along the canal corridor, this will be identified at that stage.
Sunnymeads GUC c	Abstraction of raw water at the existing Affinity Water Sunnymeads intake and conveyance to a WTW at the existing Harefield service reservoir site. The drinking water is then conveyed to the existing Harrow service reservoir.	SESRO or STT	✗	✗	Rejected in comparison with Sunnymeads GUC a and b as its conveyance length is similar but the route passes through a SSSI and the conveyance length will only increase to mitigate passing through this area. Therefore, this option did not pass through to the secondary stage.
Egham 1	Abstraction of raw water at the existing Egham intake and conveyance to an expanded Egham WTW. The drinking water is then conveyed to the existing Egham service reservoir.	SESRO or STT but would also be compatible with the Chalk Stream First (CSF) proposal (increased flows in lower reaches of the Thames as a result of reduced abstraction within the upstream chalk streams).	✓	✗	The options delivering water to Egham are not viable. Scheme requirements cannot be met due to capacity constraints at the existing WTW.
Egham 2a	Abstraction of raw water at the existing Egham intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow service reservoir.	SESRO or STT, but would also be compatible with CSF	✓	✗	Rejected due to construction complexity (Approximately 24 major crossings and passes through 16 landfill sites).

Option name	Option description	Water source / SRO dependencies	Screening Outcome		Rejection Rationale
			Initial	Secondary	
Egham 2b	Abstraction of raw water at the existing Egham intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield service reservoir.	SESRO or STT, but would also be compatible with CSF	✗	✗	Rejected in comparison with the other Egham options as its conveyance length is similar but the route passes through more protected areas and the conveyance length will only increase to mitigate passing through these.
Chertsey 1	Abstraction of raw water at the existing Chertsey intake and conveyance to an expanded Egham WTW. The drinking water is then conveyed to the existing Egham service reservoir.	SESRO or STT, but would also be compatible with CSF	✓	✗	The options delivering water to Egham are not viable. Scheme requirements cannot be met due to capacity constraints at the existing WTW.
Chertsey 2a	Abstraction of raw water at the existing Chertsey intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow service reservoir.	SESRO or STT, but would also be compatible with CSF	✓	✗	Rejected due to construction complexity (approximately 28 major crossings and 16 landfill sites). The route to Harrow is also longer than the route to Harefield and it passes through a more densely populated area, which will result in a greater level of disruption to adjacent communities. There is also limited scope for expansion at Harrow.
Chertsey 2b	Abstraction of raw water at the existing Chertsey intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield service reservoir.	SESRO or STT, but would also be compatible with CSF	✓	✗	Rejected due to construction complexity (approximately 27 major crossings and 16 landfill sites).

Option name	Option description	Water source / SRO dependencies	Screening Outcome		Rejection Rationale
			Initial	Secondary	
Walton 1	Abstraction of raw water at the existing Affinity Water Walton intake and conveyance to an expanded Egham WTW. The drinking water is then conveyed to the existing Egham service reservoir.	SESRO or STT, but would also be compatible with CSF	✓	✗	The options delivering water to Egham are not viable. Scheme requirements cannot be met due to capacity constraints at the existing WTW.
Walton 2a	Abstraction of raw water at the existing Affinity Water Walton intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow service reservoir.	SESRO or STT, but would also be compatible with CSF	✓	✗	Rejected due to construction complexity (approximately 30 major crossings and 18 landfill sites). The route to Harrow is also longer than the route to Harefield and it passes through a more densely populated area, which will result in a greater level of disruption to adjacent communities. There is also limited scope for expansion at Harrow.
Walton 2b	Abstraction of raw water at the existing Affinity Water Walton intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield service reservoir.	SESRO or STT, but would also be compatible with CSF	✓	✓	N/A - Proceeded to next stage.
Medmenham	Abstraction of raw water at a new Medmenham intake and conveyance to a new WTW at Amersham. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield service reservoir.	SESRO or STT	✓	✗	Rejected on a comparative basis to Maidenhead due to increased length of pipeline. This could be reintroduced should there be benefit of sharing intake location with Thames Water.
Maidenhead	Abstraction of raw water at a new Maidenhead intake, conveyance to a new WTW at Harefield service reservoir, and utilisation of available storage capacity at the existing Harefield service reservoir (route initially went via a proposed new WTW at Amersham).	SESRO or STT	✓	✓	N/A - Proceeded to next stage.

Option name	Option description	Water source / SRO dependencies	Screening Outcome		Rejection Rationale
			Initial	Secondary	
Mogden Reuse Direct	Direct transfer of recycled water from Mogden STW to Harrow service reservoir.	London Effluent Reuse SRO	×	×	Rejected at the initial stage as direct reuse would result in unacceptable water quality risk (confirmed Affinity Water and Thames Water water quality scientists)
Mogden Reuse Indirect 1a	Transfer of Teddington DRA water for abstraction at the existing Egham intake and conveyance to an expanded Egham WTW. The drinking water is then conveyed to the existing Egham service reservoir. Routed as a tunnel from Teddington finishing immediately upstream of the Egham intake (opposite bank).	Teddington DRA option within London Effluent Reuse SRO (Raw water is abstracted from the River Thames and replaced immediately downstream by recycled water from Mogden STW)	✓	×	The options delivering water to Egham are not viable. Scheme requirements cannot be met due to capacity constraints at the existing WTW.
Mogden Reuse Indirect 1b	Transfer of Teddington DRA water for abstraction at the existing Affinity Water Walton intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow service reservoir. Routed as a tunnel from Teddington finishing immediately upstream of the Affinity Water Walton intake (opposite bank).	Teddington DRA option within London Effluent Reuse SRO	×	×	Rejected based on increased cost and carbon associated with the long conveyance length, compared to other options.
Mogden Reuse Indirect 1c	Transfer of Teddington DRA water for abstraction at the existing Affinity Water Walton intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield service reservoir. Routed as a tunnel from Teddington finishing immediately upstream of the Affinity Water Walton intake (opposite bank).	Teddington DRA option within London Effluent Reuse SRO	✓	×	Rejected on construction complexity of constructing a tunnel from Teddington DRA to the Walton intake, in addition to the 30 major crossings from Walton to Harefield.

Option name	Option description	Water source / SRO dependencies	Screening Outcome		Rejection Rationale
			Initial	Secondary	
Mogden Reuse Indirect 2a	Piped route from the Teddington DRA abstraction point at Teddington to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow service reservoir.	Teddington DRA option within London Effluent Reuse SRO	×	×	Rejected based on increased cost and carbon associated with the long conveyance length, compared to other options.
Teddington DRA (formerly Mogden Reuse Indirect 2b)	Abstraction of raw water at a new intake at Teddington, upstream of Teddington weir and upstream of the proposed outfall from the London Effluent Reuse SRO, Teddington DRA option; conveyance to a new WTW at Harefield; and utilisation of the available storage capacity at the existing Harefield service reservoir.	Teddington DRA option within London Effluent Reuse SRO	✓	✓	N/A - Proceeded to next stage.
Mogden Reuse Indirect 3	This option comprises the same infrastructure as Walton 2b but utilises water from the proposed London Effluent Reuse SRO, Mogden effluent reuse option (effluent from Mogden STW is treated at a new tertiary treatment works and then discharged upstream of the Thames Water Walton intake. An extension would be required to take the discharge to the same reach of the river as the Affinity Water Walton intake).	Mogden effluent reuse option within the London Effluent Reuse SRO	✓	✓	N/A - Proceeded to next stage.
Deephams Reuse Direct	Direct transfer of recycled water from the existing Deephams STW to a new WTW and service reservoir near the location of the existing North Mymms Affinity Water site.	London Effluent Reuse SRO	×	×	Rejected at the initial stage as the potential resource for option development is already fully allocated to Thames Water. Also rejected at the initial stage as direct reuse would result in unacceptable water quality risk (confirmed by Affinity Water and Thames Water water quality scientists).

Option name	Option description	Water source / SRO dependencies	Screening Outcome		Rejection Rationale
			Initial	Secondary	
Deephams Reuse Indirect	Indirect transfer of Deephams recycled water from the existing William Girling reservoir to a new WTW and service reservoir near the location of the existing North Mymms Affinity Water site.	London Effluent Reuse SRO	×	×	Rejected at the initial stage as the potential resource for option development is already fully allocated to Thames Water.
Beckton Reuse Direct	Direct transfer of recycled water from the existing Beckton STW to a new WTW and service reservoir near the location of the existing North Mymms Affinity Water site.	Beckton effluent reuse option within the London Effluent Reuse SRO	×	×	Rejected at the initial stage as direct reuse would result in unacceptable water quality risk (confirmed Affinity Water and Thames Water water quality scientists).
Beckton Reuse Indirect	Indirect transfer of recycled water from Beckton STW to a new WTW and service reservoir near North Mymms. The proposed abstraction point would be located on the River Lee, downstream of the outfall from the proposed Beckton effluent reuse option, within the London Effluent Reuse SRO.	Beckton effluent reuse option within the London Effluent Reuse SRO, including extension from Lockwood shaft to River Lee.	✓	✓	N/A - Proceeded to next stage.
SESRO Transfer	Direct transfer from the SESRO reservoir to a new WTW at Amersham. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield service reservoir.	SESRO	×	×	Rejected on increased cost and carbon associated with the long conveyance length, compared to other options. Could be reintroduced if other options end up showing water quality or storage risks or if this option has a genuine resilience benefit, potentially related to discharge from SESRO to River Thames.
Lower Thames Reservoir Transfer 1a	Transfer direct from Thames Water owned reservoir to an expanded Egham WTW. The drinking water is then conveyed to the existing Egham service reservoir.	SESRO	✓	×	The options delivering water to Egham are not viable. Scheme requirements cannot be met due to capacity constraints at the existing WTW.

Option name	Option description	Water source / SRO dependencies	Screening Outcome		Rejection Rationale
			Initial	Secondary	
Lower Thames Reservoir Transfer 1b	Transfer direct from Thames Water owned reservoir to an expanded WTW at Egham. The drinking water is then conveyed to the existing Harrow service reservoir.	SESRO (possibly STT)	×	×	Rejected in comparison with the other Lower Thames Reservoir Transfer options as its conveyance length is similar but this route passes through protected areas and the conveyance length will only increase to mitigate passing through these areas. This option has therefore not passed through to the secondary stage.
Lower Thames Reservoir Transfer 2a	Water from Thames Water's Wraysbury and Queen Mother reservoirs is abstracted via a proposed connection into Affinity Water's existing Wraysbury (100" inch) tunnel at the existing Iver WTW site. This raw water is then diverted to the proposed Iver 2 WTW. The drinking water is subsequently conveyed to Harefield to utilise the available storage capacity at the existing Harefield service reservoir.	SESRO (possibly STT)	✓	✓	N/A - Proceeded to next stage.
Lower Thames Reservoir Transfer 2b	Transfer direct from Thames Water owned reservoir to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow service reservoir.	SESRO (possibly STT)	✓	×	Rejected on construction complexity (approximately 21 major crossings and 13 landfill sites). The route to Harrow is also longer than the route to Harefield and it passes through a more densely populated area, which will result in a greater level of disruption to adjacent communities. There is also limited scope for expansion at Harrow.

The options that passed secondary screening are listed in Table 4.1 in the following chapter and shown as maps in Appendix E.

4 Option Refinement

4.1 Overview of Selected Options

The eight options remaining after screening are described in Table 4.1 and shown geographically in Appendix E. Each of the selected options draw on one or more of the different water sources that are being developed under other SROs.

For the purposes of optioneering of the Lower Thames Reservoir Transfer 2a option, it has been assumed that this option could only go ahead if the SESRO scheme was selected; without SESRO the option would result in an unacceptable re-allocation of raw water storage capacity from Thames Water to Affinity Water. However, it is also possible that the Severn Thames Transfer (STT) SRO could provide this additional water resource as detailed in Table 4.1.

Walton 2b and Mogden Reuse Indirect 3 options utilise the same proposed infrastructure, but different source water. For the WRSE modelling submission, these two options have been input as a single conveyance component from near the existing Walton intake to the proposed Iver 2 WTW, with the scope to model supply from either source in the investment model. Similarly, the environmental assessment work has considered this as one option.

Options which abstract water from the River Thames are consistent with the concept proposed by the CSF group (which is to reduce groundwater abstraction in the upper catchment of chalk streams, thus enhancing flow down the streams into the River Thames, and then substitute the resulting loss of supply by abstracting that water once it has reached the Thames). The further downstream the abstraction point is, the greater the direct benefit that can be derived from the additional flow to the Thames from catchments such as the River Colne, as a result of reduced groundwater abstraction.

Table 4.1: Option Descriptions

Option name	Option description	Potential Source	Hub and WRZ supplied
Sunnymeads 1	Abstraction of raw water at the existing Affinity Water Sunnymeads intake, conveyance to a new WTW at the existing Harefield service reservoir site, and utilisation of the available storage capacity at the existing Harefield service reservoir	STT SESRO	Harefield WRZ4 (Pinn)
Maidenhead	Abstraction of raw water at a new Maidenhead intake, conveyance to a new WTW at Harefield service reservoir, and utilisation of available storage capacity at the existing Harefield service reservoir.	STT SESRO	Harefield WRZ4 (Pinn)
Teddington DRA	Abstraction of raw water at a new intake at Teddington, upstream of Teddington weir and upstream of the proposed London Effluent Reuse SRO Teddington DRA option outfall (treated effluent from Mogden STW); conveyance to a new WTW at Harefield; and utilisation of the available storage capacity at the existing Harefield service reservoir.	STT SESRO Teddington DRA (CSF)	Harefield WRZ4 (Pinn)

Option name	Option description	Potential Source	Hub and WRZ supplied
Sunnymeads 2a	Abstraction of raw water at the existing Affinity Water Sunnymeads intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield service reservoir.	STT SESRO	Harefield WRZ4 (Pinn)
Walton 2b	Abstraction of raw water via an extension to the existing Affinity Water Walton intake and conveyance to the proposed Iver 2 WTW. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield service reservoir.	STT SESRO (CSF)	Harefield WRZ4 (Pinn)
Mogden Reuse Indirect 3	This option comprises the same infrastructure as Walton 2b, but utilises water from the proposed London Effluent Reuse SRO Mogden effluent reuse option. For the Mogden Reuse Indirect 3 option in T2AT, an extension of the London Effluent Reuse SRO Mogden effluent reuse option outfall pipeline is required from the reach containing the Thames Water Walton intake, to the reach containing the Affinity Water Walton intake i.e. to a point upstream of Sunbury weirs.	STT SESRO Mogden effluent reuse option (CSF)	Harefield WRZ4 (Pinn)
Lower Thames Reservoir Transfer 2a	Water from Thames Water's Wraysbury and Queen Mother reservoirs is abstracted via a proposed connection into Affinity Water's existing Wraysbury (100" inch) tunnel at the existing Iver WTW site. This raw water is then diverted to the proposed Iver 2 WTW. The drinking water is subsequently conveyed to Harefield to utilise the available storage capacity at the existing Harefield service reservoir.	STT SESRO (prerequisite for this option) (CSF)	Harefield WRZ4 (Pinn)
Beckton Reuse Indirect	<p>Indirect transfer of recycled water from Beckton STW to a new WTW and new service reservoir near North Mymms. The proposed abstraction point would be located on the River Lee, downstream of the outfall from the proposed Beckton effluent reuse option (including extension from Lockwood shaft), within the London Effluent Reuse SRO.</p> <p>Another potential source for this option is water abstracted as part of the London Effluent Reuse SRO Teddington DRA option, which abstracts river water upstream of the recycled water discharge from Mogden STW and utilises the existing Thames-Lee Tunnel (with an extension), which would discharge in a similar location to the proposed Beckton effluent reuse option (London Effluent Reuse SRO).</p> <p>* Note: In the period since option selection, modelling by both WRSE and Affinity Water has identified a constraint in the distribution network between the proposed import point at North Mymms and Brookmans Park service reservoir in WRZ3. This option has therefore been extended to include a drinking water conveyance component from North Mymms to Brookmans Park.</p>	<p>Beckton reuse option</p> <p>Teddington DRA</p>	<p>North Mymms * WRZ3 (Lee)</p> <p>* Updated to Brookmans Park WRZ3 (Lee)</p>

Key: STT = Severn to Thames Transfer SRO
SESRO = South East Strategic Reservoir Option SRO
Teddington DRA = Teddington Direct River Abstraction (one of the London reuse SRO options)
(CSF) = Option is consistent with the objectives of the Chalk Streams First proposal. This is not an SRO and it is uncertain whether the CSF proposal would release sufficient water to fully support the T2AT scheme requirement

In addition to the sources, all options are dependent on the upgrading of downstream infrastructure to distribute the transferred water from the delivery hub into the recipient WRZ. The required distribution upgrades are included in Affinity Water's option list for WRMP24 and also included in the WRSE regional model.

As shown in Table 4.2, each of the T2AT options consists of a number of components, generally including a river intake, a raw water pumping station, a raw water conveyance pipeline and a drinking WTW. A number of the components are common to several options.

Options which include the WTW at Iver 2 also include a drinking water pumping station at the WTW and a drinking water conveyance pipeline to Harefield service reservoir. The Lower Thames Reservoir Transfer 2 does not include a river intake as it connects into the existing raw water tunnel close to the existing Iver WTW.

Since Gate 1, the Beckton Reuse option has been extended to feed Brookman's Park Reservoir due to the limited existing transfer capacity from North Myms to Brookmans Park.

Table 4.2: Option Component Summary

	Components																	
	Source water abstraction and raw water pumping station						Raw water conveyance (pumping station and pipeline)							WTW			Drinking water conveyance (pumping station and pipeline)	
Options	Existing Sunnymeads river intake	New Maidenhead River intake	New Teddington River intake	Extended Walton River intake	Wraysbury Tunnel Connection	New River Lee River intake	Sunnymeads to Harefield	Maidenhead to Harefield	Teddington to Harefield	Sunnymeads to Iver 2	Walton to Iver 2	Lower Thames Reservoir to Iver 2	Beckton Reuse Indirect (River Lee to North Mymms)	New Harefield WTW	New Iver 2 WTW and service reservoir	New North Mymms WTW and service reservoir	Iver 2 to Harefield	North Mymms to Brookmans Park (Added since Gate 1)
Sunnymeads 1	✓						✓							✓				
Maidenhead		✓						✓						✓				
Teddington DRA			✓					✓						✓				
Sunnymeads 2a	✓								✓						✓		✓	
Walton 2b/Mogden Reuse Indirect 3				✓						✓					✓		✓	
Lower Thames Reservoir Transfer 2a					✓							✓			✓		✓	
Beckton Reuse Indirect						✓							✓			✓		✓

4.2 Criteria for Indicative Site and Route Selection

Having identified the eight most appropriate options through the screening process described in Chapter 3, the next stage was to identify indicative sites for the intakes, pumping stations, and WTWs and indicative routes for the conveyance pipelines.

The criteria for siting and routing of the components fall into two closely interrelated categories:

- Criteria in the first category relate to the fact that the scheme must meet the objectives of the water companies and their customers; in other words, it must be effective in doing what it is intended to do. This means that the option should be designed in accordance with the latest technical best practice and comply with regulatory requirements; they must be safe to build and operate; and they must be efficient in terms of capital cost, operating cost, energy use, and carbon footprint. All of these technical aspects have a bearing on detailed site and route selection and mean that some locations are not practical.
- Criteria in the second category aim to ensure that the scheme has an acceptably low impact on the environment and the community and makes the most of opportunities to provide benefits in these areas wherever possible. Components should be sited or routed in a way which is consistent with local plans, designated areas and other development proposals.

Environment, community and planning considerations are discussed in detail in chapters 5 and 6. However, in order to arrive at the indicative sites and routes to assess these aspects in detail, it was necessary to identify which specific sites for the above ground components would satisfy the technical criteria and then find the optimum practical pipeline route to connect them.

Technical siting and routing considerations which are specific to each type of component are discussed in the following sections. However, there are some universal criteria which apply to all types of component as listed in Table 4.3 below:

Table 4.3: Universal Technical Criteria for Siting and Routing

Criterion	Rating Guidance		
	Red	Amber	Green
Design			
There must be sufficient space for permanent works and environmental mitigation measures	Insufficient space	Restricted space	Adequate space
There must be sufficient space for planned future expansion and/or process enhancement	No space for expansion	No space for future expansion but unlikely to be required	Adequate space for envisaged expansion
Plant must be outside Flood Zones 2 and 3 to allow maintenance and continuous operation during flood events. Note: Flood Zone 3 is land having a 1 in 100 or more frequent annual probability of river flooding and Flood Zone 2 is land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding. Flood Zone 1 is land having an annual probability of flooding of less than 1 in 1,000.	Site is within Flood Zone 2 or 3	Site is within Flood Zone 2 or 3 but can be designed to avoid damage	Site is outside of Flood Zones 2 and 3. (Flood Zone 1)
Where possible, site should be near existing assets to allow for operational efficiencies.	N/a	Site is not adjacent to existing asset	Site is adjacent to existing asset

Criterion	Rating Guidance		
	Red	Amber	Green
Where possible, component should use or reuse existing assets	N/a	Component does not make use of existing assets	Component makes use of existing assets
Where possible, works should be built on land already owned by the water company	Site cannot be acquired by Thames Water or Affinity Water	Site not already owned by Thames Water or Affinity Water	Site already owned by Thames Water or Affinity Water
Where possible, the site should be selected such that the topography minimises the requirement for earthworks and engineered slopes.	N/a	Terrain is unfavourable to design of asset	Terrain is favourable to design of asset
Within a reasonable distance of a suitable watercourse to accept emergency overflow, drain down and commissioning discharges	No suitable watercourse available	Suitable watercourse is available but more than 500m from site.	Suitable watercourse is available within 500m
Power supply can be brought to site within a reasonable distance and without major network enhancements Note: This would not be a differentiator between sites in the same locality, and so is not considered at this level of indicative site selection.	N/a	Power supply can be brought to site but requires extensive work on network	Power supply can be brought to site without extensive work on network
Construction			
Site must allow works to be constructed without endangering construction workers, operational staff, visitors or members of the public	Works cannot be constructed safely	Works can be constructed safely but abnormal control measures required	Works can be constructed safely without abnormal control measures
Sufficient space can be made available for construction and materials storage	Insufficient space	Restricted site	Adequate space
Suitable access for construction workers, deliveries and waste removal	Suitable access cannot be provided	Restricted access	Adequate access
Operation			
Site allows works to be operated without endangering construction workers, operational staff, visitors or members of the public	Works cannot be operated safely or abnormal control measures required	N/a	Works can be operated safely without unusual control measures
Suitable access for operation including deliveries and waste removal	Suitable access cannot be provided	N/a	Adequate access

Note that for these technical criteria, the RAG scoring is set up such that a “red” assessment against any of the criteria is effectively a blocker excluding that location or route and therefore the assessment against the remaining criteria is not relevant. Potential locations which were not excluded on technical grounds were then assessed against the environment, community and planning criteria listed in Table 4.4 below to select a preferred indicative location.

Table 4.4: Environment, Community and Planning Criteria for Siting and Routing

Criterion	Rating Guidance		
	Red	Amber	Green
Environment			
Minimise direct impacts on statutory designated sites (Special Area of Conservation, Special Protection Area, Ramsar, Site of Special Scientific Interest (SSSI), National Nature Reserve, Local Nature Reserve) and Ancient Woodland.	Significant overlap with statutory designated site boundaries makes option unlikely to be feasible.	Pipeline/transfer route located within statutory sites; mitigation may be required but option still feasible.	No statutory designated sites within 100m of proposed option footprint
Minimise impacts on designated heritage assets (scheduled monuments, listed buildings, Registered Parks and Gardens, Registered Battlefields, World Heritage Sites, and conservation areas) which could result in loss of significance.	Above ground component likely to result in loss of significance of heritage asset with mitigation unlikely. Pipeline/transfer route results in loss of designated heritage asset.	Above ground component within 500m of designated heritage asset with potential for setting effects. Pipeline/transfer route located within designated heritage asset; mitigation may be required but option still feasible.	Above ground component more than 500m from designated heritage asset and/or no likely setting effects. Pipeline/transfer route not located within 100m of designated heritage asset.
Minimise permanent loss of best and most versatile agricultural land (Grades 1, 2 and 3a) ¹⁷ .	Results in permanent loss of Grade 1 or 2 agricultural land (or 3a where detailed ALC data is available)	Results in permanent loss of Grade 3 agricultural land (or 3b where detailed ALC data is available)	Does not result in permanent loss of Grade 3 agricultural land or within Grade 4 or 5 agricultural land, non-agricultural or urban land.
Minimise loss of flood storage within Flood Zone 2 or 3. Note: Flood Zone 3 is land having a 1 in 100 or more frequent annual probability of river flooding and Flood Zone 2 is land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding. Flood Zone 1 is land having an annual probability of flooding of less than 1 in 1,000.	Site is within Flood Zone 2 and replacement flood storage is required but not available.	Site is within Flood Zone 2 but loss of storage is minor or mitigation is available	Site is outside Flood Zone 3. (Flood Zone 1)
Minimise disturbance of potentially contaminated land (in relation to authorised and historic landfills)	Within authorised or historic landfill.	Within 500m of historic or authorised landfill.	Not within 500m of authorised or historic landfill.
Minimise loss of priority habitat.	N/A	Priority habitat directly impacted	No priority habitat directly impacted by proposed option footprint
Community			
Avoid loss of property and community assets due to construction.	Permanent and unacceptable loss of property and community assets.	Partial loss of open space community assets or temporary loss of community assets during construction.	No permanent or temporary loss of property and community assets.

¹⁷ Provisional Agricultural Land Classification (ALC) data does not subdivide Grade 3 into 3a (representing best and most versatile land) and 3b (not representing best and most versatile land). Where detailed ALC survey is available and grade 3a and 3b are subdivided, grade 3a was scored red whereas 3b was scored amber. Where only provisional ALC data was available, grade 3 was scored as amber.

Criterion	Rating Guidance		
	Red	Amber	Green
Minimise impact on local community during operation, in particular due to above ground component (including noise, visual amenity etc).	More than 300 residential properties likely to be affected during operation.	"Between 100 and 299 residential properties likely to be affected during operation.	Less than 100 residential properties likely to be affected during operation. No community assets within 500m.
Minimise impact on local community during construction (including noise, visual amenity, temporary disturbance of community assets such as Country Parks and disruption to recreation).	More than 300 residential properties likely to be affected during construction of above ground component. Pipeline route predominantly through built up areas and / or likely to have substantial impacts on local traffic.	Between 100 and 299 residential properties likely to be affected during construction of above ground component. Pipeline route partly through built up areas and / or likely to have moderate impacts on local traffic.	Less than 100 residential properties likely to be affected during construction of above ground component. Pipeline route largely not through built up areas and / or likely to have limited impacts on local traffic.
Planning			
Aim for consistency with published Local Plan land use allocations	Cannot be reconciled with Local Plans	Negotiation required with LPA to accommodate scheme within Local Plan	Low or no impact
Avoid development of above ground components within designated areas (Green Belt, Chilterns AONB)	Requires major development of above ground component within AONB	Requires development of minor above ground components within AONB that are sympathetic with surroundings.	Does not require development of above ground component within AONB
Ability to integrate with existing infrastructure and proposed Nationally Significant Infrastructure Projects (NSIP) (such as those operated by Highways England, EA, Network Rail, Heathrow, HS2)	Cannot be reconciled with existing or proposed NSIP	Negotiation required with owner/promoter to accommodate scheme	Low or no interaction with existing or proposed NSIP

The indicative pipeline routes and above ground component sites were developed without ground verification or local consultation as this would not have been an appropriate level of investigatory detail at such an early stage of scheme concept development. For the constrained options submitted to the WRSE regional modelling process, the concept design was developed to a stage where the comparative costs and environmental implications were sufficiently characterised to enable regional modelling by WRSE and for the most suitable option to be selected for further development.

The routes and sites will require further refinement and may undergo quite radical alteration in the light of design development, back-checking earlier assessments in the light of more detailed information, further desktop studies, field survey work, site walkovers and consultation with stakeholders.

4.3 Intake and Raw Water Pumping Station Siting

4.3.1 Technical Criteria

The approximate intake location for each option forms part of the option’s definition; for instance, the Teddington DRA option clearly requires an intake to be sited in the reach of the River Thames just upstream of Teddington Lock. The approximate locations are listed in Table 4.5 below, together with the original rationale for choosing that vicinity.

Table 4.5: Initial Intake Sites

Option	Approximate location	Rationale
Sunnymeads 1 and 2a	Existing Affinity Water Sunnymeads intake	Reduced infrastructure requirements and associated cost, carbon, environmental impact, visual impact, safety risks, and disruption, compared to constructing a new intake structure. It would also provide operational efficiencies.
Maidenhead	River Thames between Marlow and Taplow	Closest stretch of the River Thames to Harefield upstream of Slough, Windsor and Maidenhead.
Teddington DRA	Immediately upstream of discharge from London Effluent Reuse SRO Teddington DRA option	The London Effluent Reuse SRO Teddington DRA option proposal involves discharging treated effluent from Mogden STW upstream of Teddington weir to enable river water to be abstracted upstream without reducing flows over the weir. Locating the abstraction point close to the discharge point minimises the stretch of river in between with reduced flows.
Walton 2b/Mogden Reuse Indirect 3	In the vicinity of the existing Affinity Water Walton works.	Reduced infrastructure requirements and associated cost, carbon, environmental impact, visual impact, safety risks, and disruption, compared to constructing a completely new intake structure. It would also provide operational efficiencies.
Lower Thames Reservoir Transfer 2a	Connection into existing Affinity Water tunnel at existing Iver WTW	No new intake or works required to Thames Water reservoirs. Within Affinity Water land. Operational efficiencies. Avoids 8km of new pipeline.
Beckton Reuse Indirect	Immediately downstream of discharge from London Effluent Reuse SRO Beckton effluent reuse option	In this case the intake must be downstream of the discharge to avoid reverse flow when the natural river flow is less than the amount abstracted. Shortest distance from available source water to the proposed North Mymms WTW (near existing Affinity Water North Mymms hub).

The above approximate locations were reviewed against preferable physical conditions, as listed below, and the considerations described in Section 4.2 above, to identify the site within the general location that best meets the criteria overall. These indicative sites have been used to develop the option costs and characterisation for comparison with other options both within this SRO and in the wider context of regional modelling. If any of the options are selected for further development, then the actual site locations will need to be determined through further consideration and consultation with stakeholders.

In addition to the universal criteria listed in Table 4.3, the following physical conditions for siting river intakes are preferred:

Table 4.6: Preferred Physical Siting Conditions for River Intakes

Criterion	Rating Guidance		
	Red	Amber	Green
Specific River Intake Criteria			
On the outside of a bend, as this reduces siltation and the amount of sediment drawn in,	N/a	On the inside of a sharp bend	On straight section or outside of bend
Preferably on the main channel of the river, where the flow is greater and more reliable,	N/a	On a side channel where flow is regulated	On main channel
Downstream of the confluence with major tributaries to maximise the flow available.	Upstream of confluence providing flow contribution which is necessary to meet abstraction required.	Upstream of confluence providing significant inflow relative to offtake and main channel flow.	Downstream of confluence
A location where there is sufficient riverbank frontage (taken as at least 30m in the case of T2AT) and enough space to construct the intake;	Insufficient river frontage	Available frontage restricts choice of intake location	No restriction on choice of intake location

Note that for these technical criteria, the RAG scoring is set up such that a “red” assessment against any of the criteria is effectively a blocker excluding that intake location and therefore the assessment against the remaining criteria is not relevant. Potential locations which were not excluded on technical grounds were then assessed against the environment, community and planning criteria listed in Table 4.4 to select a preferred indicative location.

The other factor which is linked to the siting of the abstraction point is the type of intake to be installed. Three main types were considered:

- Conventional screens
- Passive wedge-wire screens
- Riverbed intakes

Most of the existing intakes on the River Thames are conventional screens built into the riverbank. The front of the screen is perpendicular to the flow in the river with vertical or near-vertical bars. This type of screen has a significant visual impact but does not intrude into the river channel.

Passive wedge wire screens are submerged screens. The area around the screens needs to be segregated from river traffic to prevent boat impact on the screen and smaller craft from being affected by back-flushing. Nevertheless, the visual intrusion is low and the building containing the plant which serves the screen can be built away from the riverbank. An example is shown in Figure 4.1

Figure 4.1: Passive Wedge Wire Screen



Source: Mott MacDonald

Riverbed intakes are suited to fast flowing rivers with rock, gravel, or boulder beds. This type of intake is not suitable for the River Thames or River Lee as it would rapidly become silted up.

Table 4.7 provides the proposed intake arrangements for each option.

Table 4.7: Intake Selection by Option

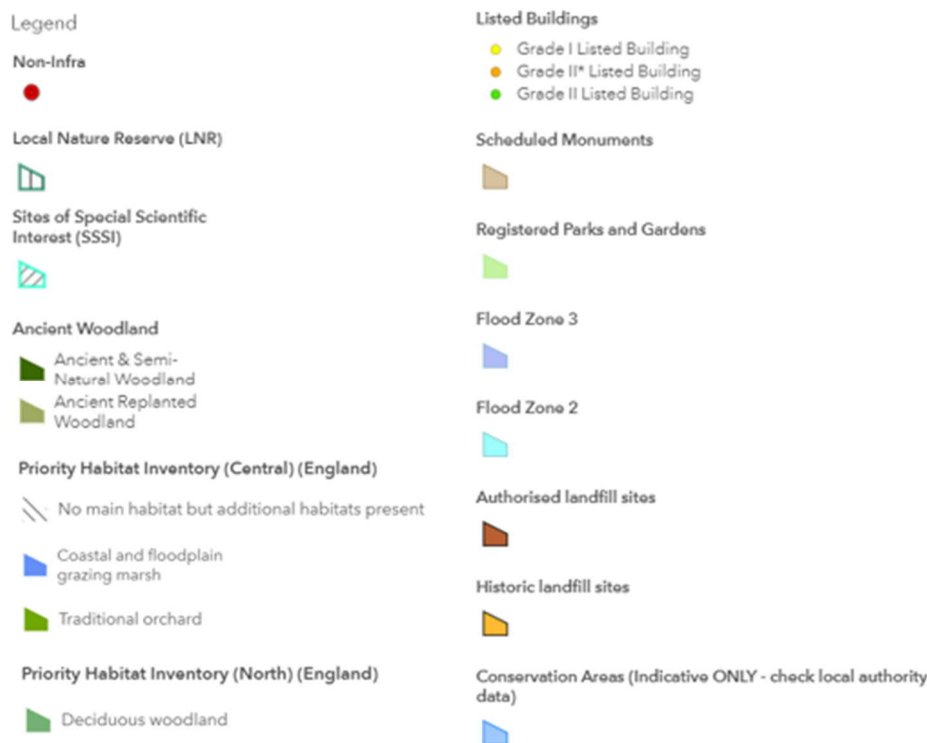
Option	Proposed intake type	Rationale
Sunnymeads options (Sunnymeads 1 and 2a)	Conventional screens (Existing)	Adequate spare bays available to provide the required capacity at the existing intake
Maidenhead	Passive wedge wire screen intake within the river and a gravity pipe to an offset pumping station.	Sufficient river width, less visual intrusion, and ability to offset the ancillary works outside of the flood zone.
Teddington DRA	Passive wedge wire screen intake within the river and a gravity pipe to an offset pumping station.	Sufficient river width, less visual intrusion, and ability to offset the ancillary works outside of the flood zone.
Walton options (Walton 2b/Mogden Reuse Indirect 3)	Conventional screens	Extension to the current arrangement at the existing intake
Lower Thames Reservoir Transfer 2a	Proposed shaft into existing Wraysbury tunnel, with supplementary works on the Laleham intake to enable Thames Water to compensate for lost abstraction at Datchet.	Avoids the need for a new intake or works on the Thames Water reservoirs. Also minimises length of new pipeline required.
Beckton Reuse Indirect	<ol style="list-style-type: none"> Passive wedge wire screen and gravity pipe to a pumping station or a channel to an offset conventional screen and pumping station. 	If it is possible to guarantee a minimum water depth over the screen, a passive wedge wire screen could be utilised to minimise visual impact and minimise impact on surrounding priority habitat. If not, then a channel to an offset conventional screen and pumping station could be constructed.

Each river intake requires an associated pumping station to transfer the raw water to the treatment works location. For the intakes on the River Thames, it was considered inappropriate to construct a large WTW close to the river, given the likely visual impact. Hence for these options, raw water has to be pumped a considerable distance to the proposed WTW locations. For the Beckton Reuse Indirect option, the WTW has been placed close to North

Mymms connection point as this is within the Affinity Water supply area. If this option is to be taken forward, then consideration should be given to locating the WTW close to the intake and transferring drinking water to the connection point.

Specific siting considerations for each intake location are described in the following sections. Where a map is given of the selected site location the following legend applies:

Figure 4.2: Legend



Source: Mott MacDonald, ArcGIS Online

Note: Flood Zone 3 is land having a 1 in 100 or more frequent annual probability of river flooding and Flood Zone 2 is Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding¹⁸.

4.3.2 Siting Results

4.3.2.1 Sunnymeads River Intake and Pumping Station

This intake location applies to the Sunnymeads 1 and Sunnymeads 2a options.

There is an existing Affinity Water abstraction point at Sunnymeads, which takes water from the River Thames to the existing Iver WTW via a gravity tunnel. The intake and tunnel have a design capacity of 320MI/d and the current abstraction license is for 227MI/d, hence there is sufficient spare capacity for the additional throughput of 50MI/d, or for 100MI/d with the shortfall being made up using the abstraction facility from Wraysbury Reservoir¹⁹.

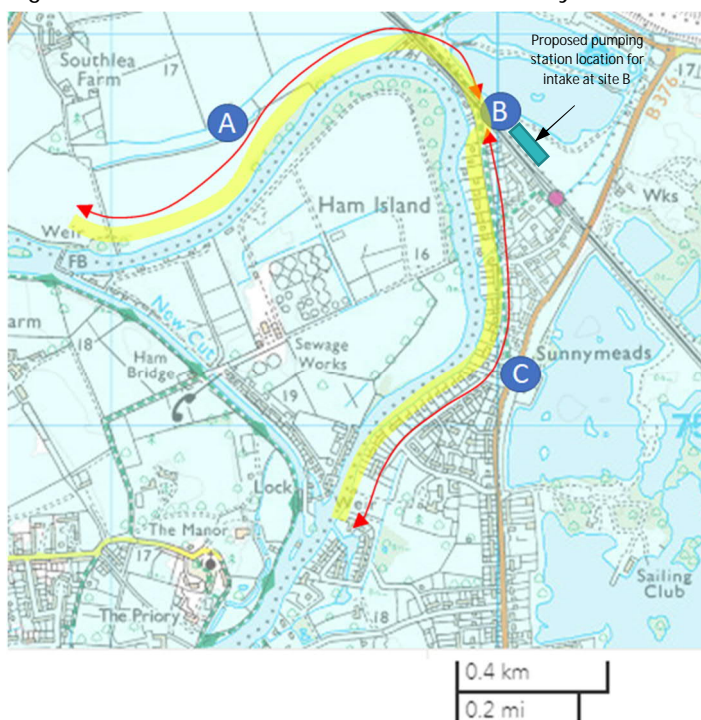
¹⁸ Guidance: Flood risk and coastal change - Ministry of Housing, Communities & Local Government - 2014

¹⁹ For Gate 2 the abstraction flow rates have been increased to 57.5MI/d and 115MI/d. For the higher flow rate the shortfall that would need to be supplied from Wraysbury, assuming that Iver is also running at full capacity, would be 22MI/d.

At the time the option was formulated, the spare capacity of the existing tunnel could not be established with confidence and so a connection to a new pumping station next to the Sunnymeads intake, with a raw water pipeline to the WTW, was included. If this option is to be taken forward, then use of the tunnel should be considered with a new shaft and forwarding pumping station at Iver WTW and a raw water transfer main to the WTW.

The alternative of building a new intake upstream or downstream of the existing Sunnymeads facility did not form part of the considered option during screening as it is clearly better to make use of the existing site from a technical, cost and impact point of view. However, for completeness, the relative merits of the possible alternative upstream and downstream locations as shown in Figure 4.3 are described below.

Figure 4.3: Locations Considered for the Sunnymeads Intake



Source: Mott MacDonald / Contains OS data © Crown copyright [and database right] 2021

As can be seen in Table 4.8 the zones A and C are ruled out on technical grounds; The area marked A is within Flood Zone 3. It cannot be accessed during flood events and is too far from the edge of the flood plain for passive screen design. There is no available river frontage in the area marked C. The existing intake location at point B meets all the technical criteria. Although the intake is within the flood zone, it can be assumed that any vulnerable equipment is sufficiently elevated above the design flood level to satisfy Affinity Water and that access arrangements are acceptable. The indicative location of the pumping station, which is on the other side of the railway, is limited in size and hence not amenable to future expansion but since this scheme would utilise all the spare capacity of the intake that is not a concern.

Table 4.8: Sunnymeads Intake Location Assessment Against Technical Criteria

Criterion	A. From New Cut bifurcation to existing Intake	B. Existing Sunnymeads Intake	C. From existing intake to Kingswood Creek
Design			
Must be sufficient space for permanent works and environmental mitigation measures			Insufficient space
Must be sufficient space for planned future expansion and/or process enhancement		Space is restricted but no future expansion expected as this scheme will use all spare capacity of existing intake.	
Plant must be outside Flood Zones 2 and 3 to allow maintenance and continuous operation during flood events	Area is within Flood Zone 3. It cannot be accessed during flood events and is too far from the edge of the flood plain for passive screen design.	Area is within Flood Zone 3 but M&E equipment is above design flood level and can be accessed during high water events.	
Where possible, site should be near existing assets to allow for operational efficiencies.			
Where possible, project should use or reuse existing assets			
Where possible, works should be built on land already owned by the water company			
Where possible, the site should be selected such that the topography minimises the requirement for earthworks and engineered slopes.			
Within a reasonable distance of a suitable watercourse to accept emergency overflow, drain down and commissioning discharges			
Construction			
Site must allow works to be constructed without endangering construction workers, operational staff, visitors or members of the public			
Sufficient space can be made available for construction and materials storage			
Suitable access for construction workers, deliveries and waste removal			
Operation			
Site allows works to be operated without endangering construction workers, operational staff, visitors or members of the public			
Suitable access for operation including deliveries and waste removal			
Specific River Intake Criteria			
On the outside of a bend, as this reduces siltation and the amount of sediment drawn in,			

Criterion	A. From New Cut bifurcation to existing Intake	B. Existing Sunnymeads Intake	C. From existing intake to Kingswood Creek
Preferably on the main channel of the river, where the flow is greater and more reliable,			
Downstream of the confluence with major tributaries to maximise the flow available.		River Thames is split at this point but division of flow can be controlled to ensure intake not starved	
A location where there is sufficient riverbank frontage (taken as at least 30m in the case of T2AT) and enough space to construct the intake;			

Location B has been reviewed against the environmental, community and planning criteria with the following assessment:

Table 4.9: Sunnymeads Intake Assessment Against Environment, Community and Planning Criteria

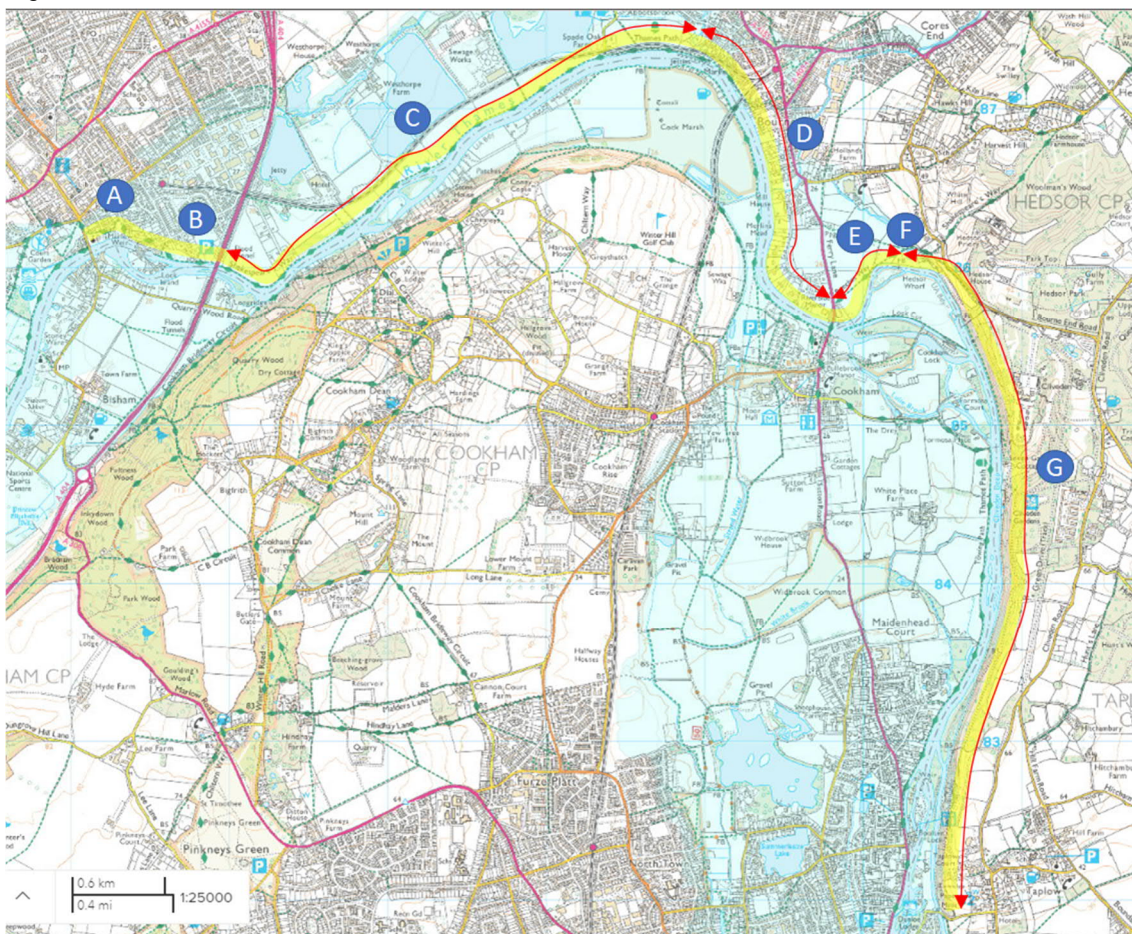
Criterion	B. Existing Sunnymeads Intake
Environment	
Minimise direct impacts on statutory designated sites (Special Area of Conservation, Special Protection Area, Ramsar, SSSI, National Nature Reserve, Local Nature Reserve) and Ancient Woodland.	No statutory designated sites or Ancient Woodland within 100m of proposed option footprint.
Minimise impacts on designated heritage assets (scheduled monuments, listed buildings, Registered Parks and Gardens, Registered Battlefields, World Heritage Sites, and conservation areas) which could result in loss of significance.	Above ground component within 500m of scheduled monument but no likely setting effects as adjacent to existing infrastructure.
Minimise permanent loss of best and most versatile agricultural land (Grades 1, 2 and 3a).	Within an area of Grade 1 agricultural land but the location is not used for agricultural purposes and surrounding land comprises of a water park, railway and residential area so would not result in loss of best and most versatile agricultural land.
Minimise loss of flood storage within Flood Zone 2 or 3.	Pumping station in Flood Zones 2 and 3 but loss of storage is minor in the terms of increasing flood risk.
Minimise disturbance of potentially contaminated land (in relation to authorised and historic landfills)	Not within 500m of authorised or historic landfill.
Minimise loss of priority habitat.	No priority habitat within option footprint
Community	
Avoid loss of property and community assets due to construction.	Part of an informal amenity area next to water park would be lost due to pumping station.
Minimise impact on local community during operation, in particular due to above ground component (including noise, visual amenity etc).	Above ground component within residential area. Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.
Minimise impact on local community during construction (including noise, visual amenity, temporary disturbance of community assets such as Country Parks and disruption to recreation).	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.
Planning	
Aim for consistency with published Local Plan land use allocations	

Criterion	B. Existing Sunnymeads Intake
Avoid development of above ground components within designated areas (Green Belt, Chilterns AONB)	
Ability to integrate with existing infrastructure and proposed Nationally Significant Infrastructure Projects (Highways England, EA, Network Rail, Heathrow, HS2)	Connection from intake to new pumping station passes under railway

4.3.2.2 New Maidenhead River Intake

The stretch of the River Thames considered for the Maidenhead option intake is shown in Figure 4.4.

Figure 4.4: Locations Considered for the Maidenhead Intake



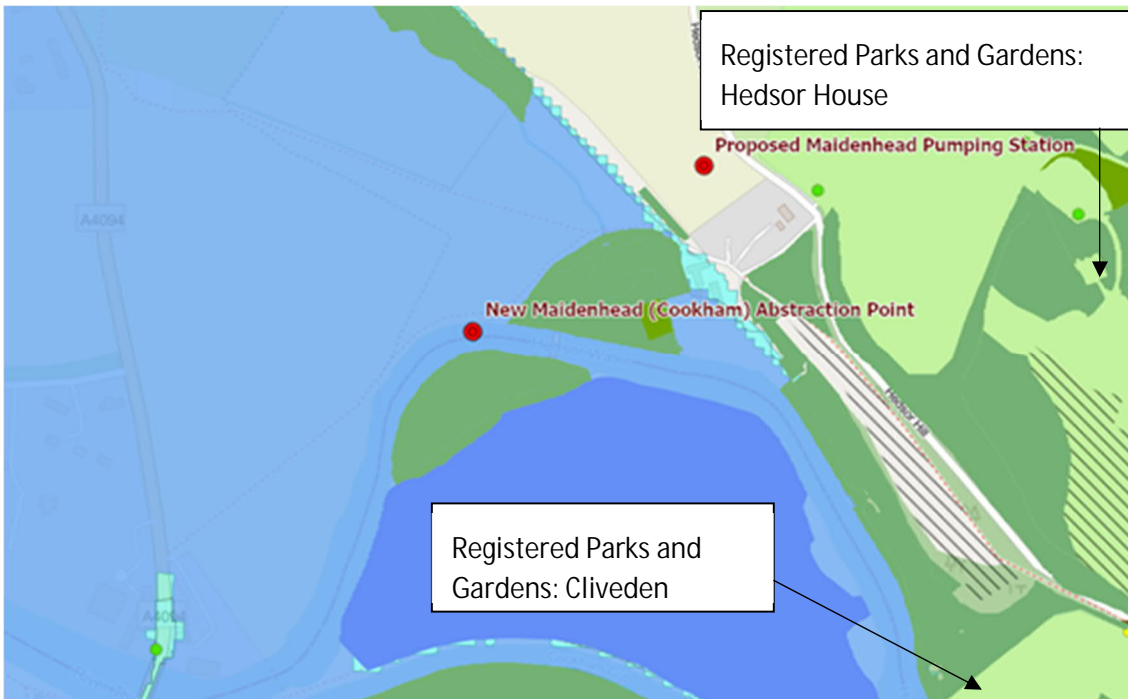
Source: Mott MacDonald/Contains OS data © Crown copyright [and database right] 2021

The review of possible sites against technical criteria eliminated all of the potential locations except for point F: Areas A, B and D are on the river front in Marlow and Bourne End where there is insufficient space. Areas C and E are within Flood Zone 3 where an intake could not be accessed during flood events and the river is too far from the edge of the flood plain for a submerged passive screen design connected to a remote pumping station. For the full length of Area G there is a high steep bank adjacent to the river leaving no room for an intake structure and pumping station at its base.

Therefore, the assessment suggests that the most suitable indicative intake location within this stretch of the river is at point F. Although this would place the intake itself within Flood Zone 3, a passive wedge wire screen is proposed. Since this type of screen is submerged anyway it is not affected by flood levels at the screen site itself. It is also the type of screen which has the lowest visual impact. From the screen, a gravity pipe (i.e. slopes downhill) is proposed to a pumping station located some 350m to the north east. The suggested indicative pumping station location is outside of the flood zone, in an open field without any environmental designations, to the west of the Hedsor House registered park/garden, and to the north of the Cliveden registered park/garden.

A larger scale plan of the indicative site is shown in Figure 4.5.

Figure 4.5: Indicative Maidenhead Intake Site



Source: Mott MacDonald. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right 2021. | Map data © OpenStreetMap contributors, Map layer by Esri

Table 4.10: Maidenhead Intake Location Assessment Against Technical Criteria

Criterion	A. Upstream of Marlow Weir	B. Marlow Weir to A404 Bridge	C. A404 Bridge to Bourne End Marina	D. Bourne End Marina to Ferry Lane Bridge	E. Ferry Lane Bridge to Point F	F. Point F on Hedsor Water Loop of River Thames	G. Point F to Taplow
Design	Insufficient space	Insufficient space		Insufficient space			Insufficient space
Must be sufficient space for permanent works and environmental mitigation measures	Insufficient space	Insufficient space		Insufficient space			Insufficient space

Criterion	A. Upstream of Marlow Weir	B. Marlow Weir to A404 Bridge	C. A404 Bridge to Bourne End Marina	D. Bourne End Marina to Ferry Lane Bridge	E. Ferry Lane Bridge to Point F	F. Point F on Hedsor Water Loop of River Thames	G. Point F to Taplow
Must be sufficient space for planned future expansion and/or process enhancement							
Plant must be outside Flood Zones 2 and 3 to allow maintenance and continuous operation during flood events			Area is within Flood Zone 3. It cannot be accessed during flood events and is too far from the edge of the flood plain for passive screen design.		Area is within Flood Zone 3. It cannot be accessed during flood events and is too far from the edge of the flood plain for passive screen design.	Intake is within Flood Zone 3, but a submerged passive wedge wire screen is proposed with a connection to a pumping station outside the flood plain.	
Where possible, site should be near existing assets to allow for operational efficiencies.							
Where possible, project should use or reuse existing assets							
Where possible, works should be built on land already owned by the water company							
Where possible, the site should be selected such that the topography minimises the requirement for earthworks and engineered slopes.							
Within a reasonable distance of a suitable watercourse to accept emergency overflow, drain down and commissioning discharges							
Construction							
Site must allow works to be constructed without endangering construction workers, operational staff, visitors, or members of the public							
Sufficient space can be made available for construction and materials storage							
Suitable access for construction workers, deliveries and waste removal							
Operation							
Site allows works to be operated without endangering construction workers, operational staff, visitors or members of the public							

Criterion	A. Upstream Weir of Marlow	B. Marlow Weir to A404 Bridge	C. A404 Bridge to Bourne End Marina	D. Bourne End Marina to Ferry Lane Bridge	E. Ferry Lane Bridge to Point F	F. Point F on Hedsor Water Loop of River Thames	G. Point F to Taplow
Suitable access for operation including deliveries and waste removal							
Specific River Intake Criteria							
On the outside of a bend, as this reduces siltation and the amount of sediment drawn in,							
Preferably on the main channel of the river, where the flow is greater and more reliable,						River Thames is split at this point, but division of flow can be controlled to ensure intake not starved	
Downstream of the confluence with major tributaries to maximise the flow available.							
A location where there is sufficient riverbank frontage (taken as at least 30m in the case of T2AT) and enough space to construct the intake;							

Point F has been reviewed against the environmental, community and planning criteria with the following assessment:

Table 4.11: Maidenhead Assessment Against Environment, Community and Planning Criteria

Criterion	F. Point F on Hedsor Water Loop of R Thames
Environment	
Minimise direct impacts on statutory designated sites (Special Area of Conservation, Special Protection Area, Ramsar, SSSI, National Nature Reserve, Local Nature Reserve) and Ancient Woodland.	No statutory designated sites or Ancient Woodland within 100m of proposed option footprint. However impact on riverine habitats would need to be studied in detail if this option was carried forward.
Minimise impacts on designated heritage assets (scheduled monuments, listed buildings, Registered Parks and Gardens, Registered Battlefields, World Heritage Sites, and conservation areas) which could result in loss of significance.	Direct effects avoided but in proximity to Hedsor House Grade II Registered Park and Garden, and to the north of the Cliveden Grade I Registered Park and Garden.
Minimise permanent loss of best and most versatile agricultural land (Grades 1, 2 and 3a).	Permanent loss of Grade 3a agricultural land.
Minimise loss of flood storage within Flood Zone 2 or 3.	Pumping station is outside flood zone. No other above ground component in Flood Zones 2 and 3.
Minimise disturbance of potentially contaminated land (in relation to authorised and historic landfills)	Not within 500m of authorised or historic landfill.
Minimise loss of priority habitat.	No priority habitat within option footprint
Community	
Avoid loss of property and community assets due to construction.	No property or community assets within option footprint.

Criterion	F. Point F on Hedsor Water Loop of R Thames
Minimise impact on local community during operation, in particular due to above ground component (including noise, visual amenity etc).	Limited number of properties within proximity. Hedsor House public park and gardens, a church and allotments within 500m
Minimise impact on local community during construction (including noise, visual amenity, temporary disturbance of community assets such as Country Parks and disruption to recreation).	Limited number of properties within proximity. Hedsor House public park and gardens, a church and allotments within 500m. Potential disruption to recreation during construction.
Planning	
Aim for consistency with published Local Plan land use allocations	
Avoid development of above ground components within designated areas (Green Belt, Chilterns AONB)	
Ability to integrate with existing infrastructure and proposed Nationally Significant Infrastructure Projects (Highways England, EA, Network Rail, Heathrow, HS2)	

4.3.2.3 New Teddington River Intake

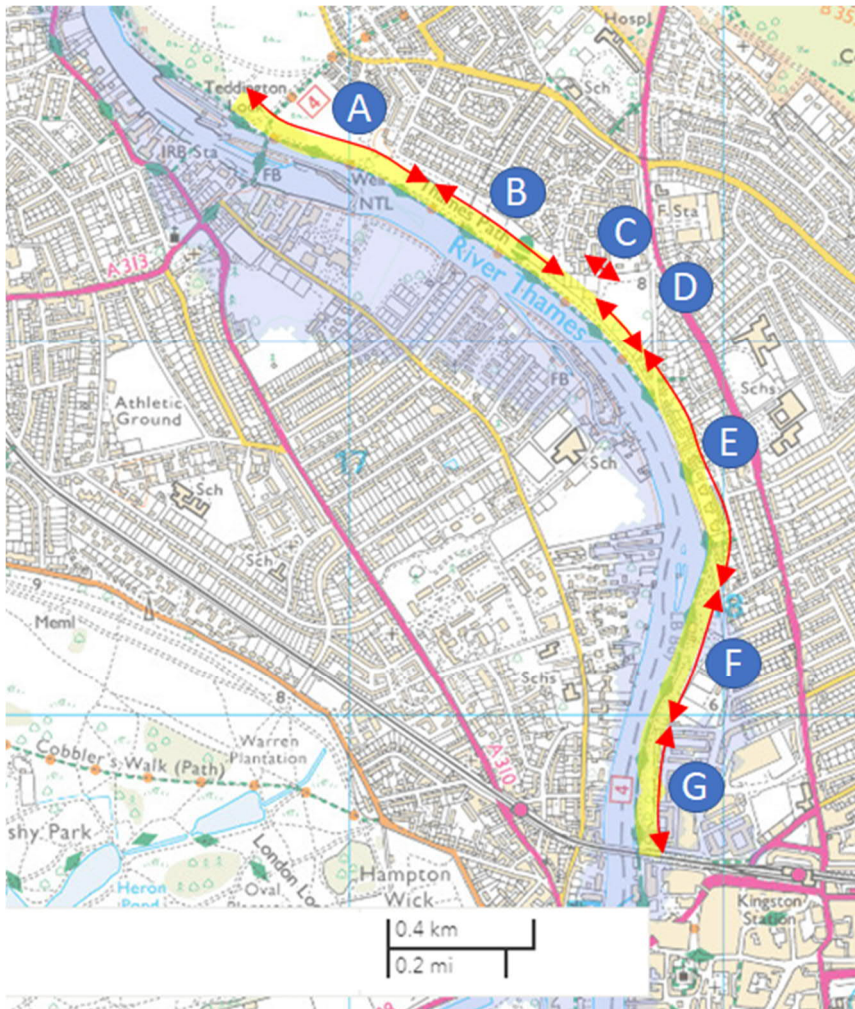
The Teddington DRA abstraction point needs to be situated upstream of the proposed discharge point for treated effluent from Mogden STW (part of the Teddington DRA option within the London Effluent Reuse SRO) and will therefore also be upstream of Teddington weir. It is intended that, especially in periods of low river flow, the volume abstracted for T2AT is balanced by the treated discharge from Mogden, hence the stretch of river between the abstraction point and the discharge point will have a reduced river flow. The further the intake is from the discharge point, the longer the length of river with a diminished flow rate, so it should be sited as close to the discharge location as possible. The Kingston Railway bridge, which is approximately 2.5km from the weir, has been adopted as the upstream limit of the search for a site.

The west bank of the River Thames would avoid a river crossing; however, the area is densely populated and within Flood Zone 3, which prevents the intake from being situated on this side of the river.

Raised ground on the east bank of the River Thames provides land close to the river, which is outside of the flood zone, or requires a practical extent of earthworks to make it so.

The stretch of the River Thames which was considered for the Teddington DRA option intake is shown in Figure 4.6.

Figure 4.6: Locations Considered for Teddington DRA Intake



Source: Mott MacDonald/Contains OS data © Crown copyright [and database right] 2021

Review of the potential sites against the technical criteria left four practical possibilities as shown in Table 4.12. Area A was eliminated on the grounds that it is downstream of the discharge point and could therefore take in a some of the flow from the Mogden discharge. Areas E and G were dismissed because there is insufficient space. Of the remaining four areas, B, C, D and F, the preferred option would be Area D due to it being outside Flood Zone 3, however all four were assessed against the environmental, community and planning criteria as shown in Table 4.13.

Table 4.12: Teddington DRA Intake Location Assessment Against Technical Criteria

Criterion	A. Adjacent to Teddington Lock	B. Area in front of Burnell Avenue	C. Woodland Area at Burnell play space	D. YMCA Hawker playing fields	E. Lower Ham Road	F. Lower Ham Road to Samuel Gray Gardens	G. Samuel Gray to Kingston Railway Bridge
Design							
Must be sufficient space for permanent works and environmental mitigation measures	Site is downstream of discharge location				Insufficient space		Insufficient space
Must be sufficient space for planned future expansion and/or process enhancement							
Plant must be outside Flood Zones 2 and 3 to allow maintenance and continuous operation during flood events		PS would need to be built on raised ground.	PS would need to be built on raised ground.			PS would need to be built on raised ground.	
Where possible, site should be near existing assets to allow for operational efficiencies.							
Where possible, project should use or reuse existing assets							
Where possible, works should be built on land already owned by the water company							
Where possible, the site should be selected such that the topography minimises the requirement for earthworks and engineered slopes.		PS would need to be built on raised ground.	PS would need to be built on raised ground.			PS would need to be built on raised ground.	
Within a reasonable distance of a suitable watercourse to accept emergency overflow, drain down and commissioning discharges							
Construction							
Site must allow works to be constructed without endangering construction workers, operational staff, visitors or members of the public							
Sufficient space can be made available for construction and materials storage							
Suitable access for construction workers, deliveries and waste removal							
Operation							
Site allows works to be operated without endangering construction workers, operational staff, visitors or members of the public							
Suitable access for operation including deliveries and waste removal							

Criterion	A. Adjacent to Teddington Lock	B. Area in front of Burnell Avenue	C. Woodland Area at Burnell play space	D. YMCA Hawker playing fields	E. Lower Ham Road	F. Lower Ham Road to Samuel Gray Gardens	G. Samuel Gray Gardens to Kingston Railway Bridge
Specific River Intake Criteria							
On the outside of a bend, as this reduces siltation and the amount of sediment drawn in,							
Preferably on the main channel of the river, where the flow is greater and more reliable,							
Downstream of the confluence with major tributaries to maximise the flow available.							
A location where there is sufficient riverbank frontage (taken as at least 30m in the case of T2AT) and enough space to construct the intake;							

Table 4.13: Teddington DRA Assessment Against Environment, Community and Planning Criteria

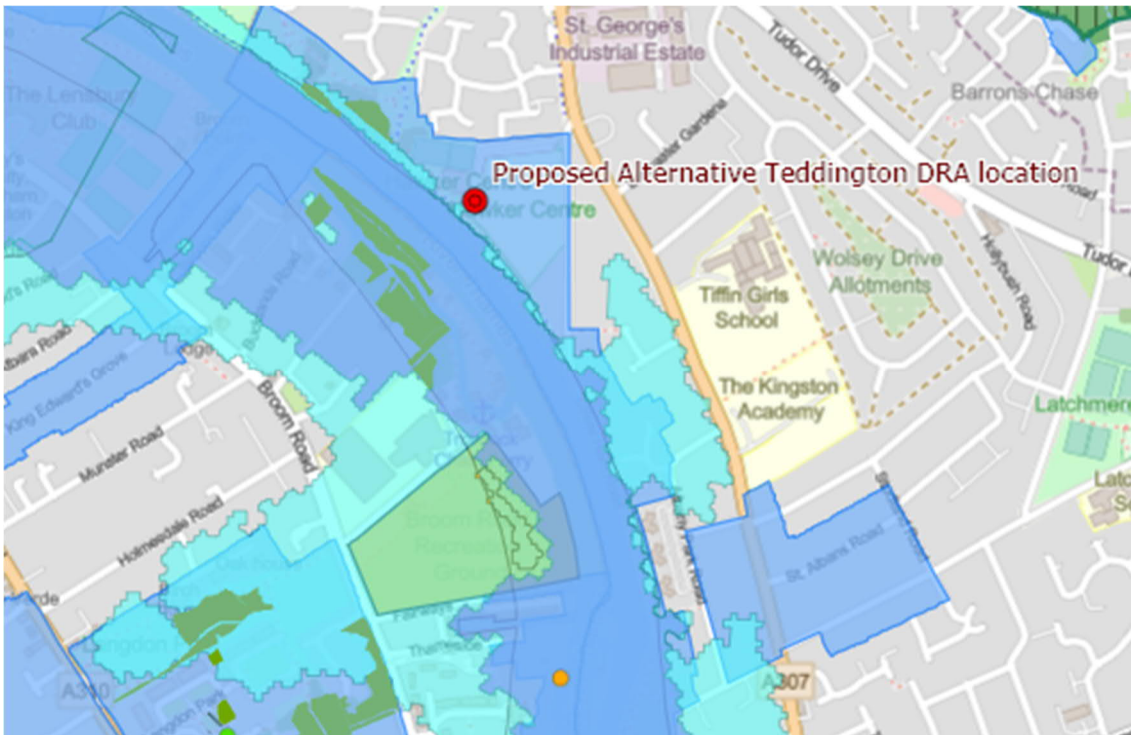
Criterion	B. Area in front of Burnell Avenue	C. Woodland Area at Burnell play space	D. YMCA Hawker playing fields	F. Lower Ham Road to Samuel Gray Gardens
Environment				
Minimise direct impacts on statutory designated sites (Special Area of Conservation, Special Protection Area, Ramsar, SSSI, National Nature Reserve, Local Nature Reserve) and Ancient Woodland.	No statutory designated sites or Ancient Woodland within 100m of proposed option footprint.	No statutory designated sites or Ancient Woodland within 100m of proposed option footprint.	No statutory designated sites or Ancient Woodland within 100m of proposed option footprint.	No statutory designated sites or Ancient Woodland within 100m of proposed option footprint.
Minimise impacts on designated heritage assets (scheduled monuments, listed buildings, Registered Parks and Gardens, Registered Battlefields, World Heritage Sites, and conservation areas) which could result in loss of significance.	Within conservation area with potential for setting effects.	Within conservation area with potential for setting effects.	Within conservation area with potential for setting effects.	Within conservation area and 500m of listed buildings with potential for setting effects.
Minimise permanent loss of best and most versatile agricultural land (Grades 1, 2 and 3a).	Within urban land	Within urban land	Within urban land	Within urban land
Minimise loss of flood storage within Flood Zone 2 or 3.	Pumping station in Flood Zones 2 and 3.	Pumping station in Flood Zones 2 and 3.	Pumping station in Flood Zone 1.	Pumping station in Flood Zones 2 and 3.
Minimise disturbance of potentially contaminated land (in relation to authorised and historic landfills)	Not within 500m of authorised or historic landfill.	Not within 500m of authorised or historic landfill.	Within 500m of historic landfill.	Within 500m of historic landfill (across river).
Minimise loss of priority habitat.	Deciduous woodland priority habitat, potentially could be avoided.	Deciduous woodland priority habitat.	No priority habitat within option footprint.	Deciduous woodland priority habitat, potentially could be avoided.
Community				

Criterion	B. Area in front of Burnell Avenue	C. Woodland Area at Burnell play space	D. YMCA Hawker playing fields	F. Lower Ham Road to Samuel Gray Gardens
Avoid loss of property and community assets due to construction.	Part of an informal greenspace adjacent to residential area would be lost due to pumping station.	Part of an informal greenspace (with play space in proximity) would be lost due to pumping station.	Option within playing fields and adjacent to sports centre and play space. Part of this area would be lost due to pumping station.	Option within public park. Part of this area would be lost due to pumping station.
Minimise impact on local community during operation, in particular due to above ground component (including noise, visual amenity etc).	Above ground component within residential area. Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.	Above ground component within residential area and in proximity to community assets. Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.	Above ground component within residential area and in proximity to community assets. Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.	Above ground component within residential area and in proximity to community assets. Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.
Minimise impact on local community during construction (including noise, visual amenity, temporary disturbance of community assets such as Country Parks and disruption to recreation).	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.
Planning				
Aim for consistency with published Local Plan land use allocations				
Avoid development of above ground components within designated areas (Green Belt, Chilterns AONB)				
Ability to integrate with existing infrastructure and proposed Nationally Significant Infrastructure Projects (Highways England, EA, Network Rail, Heathrow, HS2)				

From the above table, it can be seen that Area D performs better in terms of the environment and community criteria. No priority habitat would be lost and the higher existing ground level makes this a better site from the point of view of loss of flood storage area. The other differentiators relate to loss of public amenity space. Whilst the playing fields are undoubtedly of high amenity value, they are not public space. The impact of locating the works at the playing fields site would need mitigation, for example, by providing improved facilities for the club.

If this option is selected for further consideration, then the most suitable indicative intake location identified would be within the grounds of YMCA Hawker playing fields as shown in the more detailed plan in Figure 4.7.

Figure 4.7: Indicative Teddington DRA Intake Site



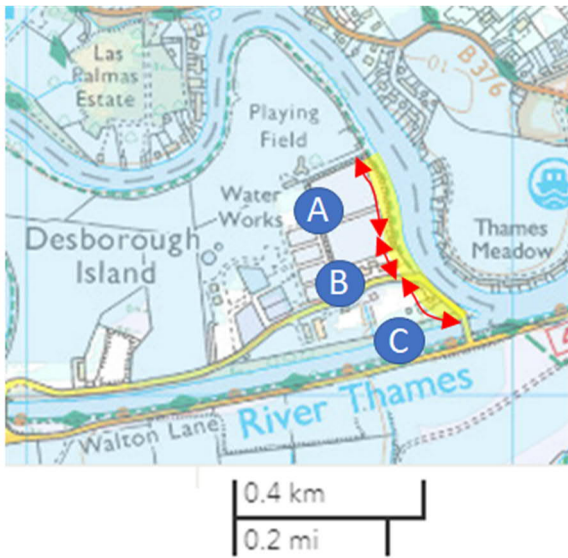
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4.3.2.4 Extended Walton River Intake

For the Walton 2b option, it is proposed that the existing Walton intake is expanded, as opposed to siting a new intake location elsewhere. There is enough space on the current site and this will minimise cost. The relative merits of the possible alternative upstream and downstream locations as shown in Figure 4.8 are described below.

The suggested indicative location of the pumping station related to the intake is within the existing boundary of the Walton Works, to the south of Walton Lane.

Figure 4.8: Locations Considered for the Walton Intake



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As can be seen in Table 4.14, zones A and C are ruled out on technical grounds; There is insufficient space to construct a new intake in the area marked A. There is no available river frontage in the area marked C. The existing intake location at point B meets all of the technical criteria. The suggested indicative location of the pumping station would be close to the intake, on the south side of the lane adjacent to the existing works building.

Table 4.14: Walton Intake Location Assessment Against Technical Criteria

Criterion	A. From boundary of Affinity Water site to existing intake	B. Extension to existing Walton Intake	C. From existing intake to end of Desborough Island
Design			
Must be sufficient space for permanent works and environmental mitigation measures	Insufficient space		Insufficient space
Must be sufficient space for planned future expansion and/or process enhancement		Space is restricted but no future expansion expected.	

Criterion	A. From boundary of Affinity Water site to existing intake	B. Extension to existing Walton Intake	C. From existing intake to end of Desborough Island
Plant must be outside Flood Zones 2 and 3 to allow maintenance and continuous operation during flood events		Intake is within Flood Zone 3 so M&E equipment must be above design flood level and accessible during high water events. PS is in Flood Zone 2 so equipment would also have to be raised.	
Where possible, site should be near existing assets to allow for operational efficiencies.			
Where possible, project should use or reuse existing assets			
Where possible, works should be built on land already owned by the water company			
Where possible, the site should be selected such that the topography minimises the requirement for earthworks and engineered slopes.			
Within a reasonable distance of a suitable watercourse to accept emergency overflow, drain down and commissioning discharges			
Construction			
Site must allow works to be constructed without endangering construction workers, operational staff, visitors or members of the public			
Sufficient space can be made available for construction and materials storage			
Suitable access for construction workers, deliveries and waste removal			
Operation			
Site allows works to be operated without endangering construction workers, operational staff, visitors or members of the public			
Suitable access for operation including deliveries and waste removal			
Specific River Intake Criteria			
On the outside of a bend, as this reduces siltation and the amount of sediment drawn in,			
Preferably on the main channel of the river, where the flow is greater and more reliable,			
Downstream of the confluence with major tributaries to maximise the flow available.		River Thames is split at this point but intake is on main channel	
A location where there is sufficient riverbank frontage (taken as at least 30m in the case of T2AT) and enough space to construct the intake;			

Location B has been reviewed against the environmental, community and planning criteria with the following assessment:

Table 4.15: Walton Intake Assessment Against Environment, Community and Planning Criteria

Criterion	B. Extension to existing Walton Intake
Environment	
Minimise direct impacts on statutory designated sites (Special Area of Conservation, Special Protection Area, Ramsar, SSSI, National Nature Reserve, Local Nature Reserve) and Ancient Woodland.	No statutory designated sites or Ancient Woodland within 100m of proposed option footprint.
Minimise impacts on designated heritage assets (scheduled monuments, listed buildings, Registered Parks and Gardens, Registered Battlefields, World Heritage Sites, and conservation areas) which could result in loss of significance.	Above ground component within 500m of listed building and conservation area but no likely setting effects as extension to existing infrastructure.
Minimise permanent loss of best and most versatile agricultural land (Grades 1, 2 and 3a).	Within non-agricultural land
Minimise loss of flood storage within Flood Zone 2 or 3.	Pumping station in Flood Zones 2 and 3.
Minimise disturbance of potentially contaminated land (in relation to authorised and historic landfills)	Not within 500m of authorised or historic landfill.
Minimise loss of priority habitat.	No priority habitat within option footprint.
Community	
Avoid loss of property and community assets due to construction.	No property or community assets within option footprint.
Minimise impact on local community during operation, in particular due to above ground component (including noise, visual amenity etc).	Above ground component within residential area. Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.
Minimise impact on local community during construction (including noise, visual amenity, temporary disturbance of community assets such as Country Parks and disruption to recreation).	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.
Planning	
Aim for consistency with published Local Plan land use allocations	
Avoid development of above ground components within designated areas (Green Belt, Chilterns AONB)	
Ability to integrate with existing infrastructure and proposed Nationally Significant Infrastructure Projects (Highways England, EA, Network Rail, Heathrow, HS2)	

The Mogden Reuse Indirect 3 option utilises the proposed Walton 2b abstraction and pipeline route but uses water sourced from the proposed Mogden Reuse SRO project. For this option, an extension of the Mogden Reuse outfall would be required from upstream of the Thames Water Walton intake to upstream of the Affinity Water Walton intake. The outfall would take the form of a submerged diffuser and a bankside valve chamber with its cover at ground level.

An open area on the west bank of the River Thames, 200m upstream of Affinity Water's Walton intake, provides the closest suitable location for this outfall. Alternative locations would be at the Lower Halliford public river access point at 600m upstream of the intake or adjacent to Walton Bridge 750m downstream. Should the Mogden Reuse Indirect 3 option be

selected then further work will be required to assess the environmental impact of the above sites compared to the discharge site currently proposed under the London Reuse SRO. For the purposes of this appraisal, the impact of the alternative discharge locations is not a significant differentiator.

4.3.2.5 Wraysbury Tunnel Connection

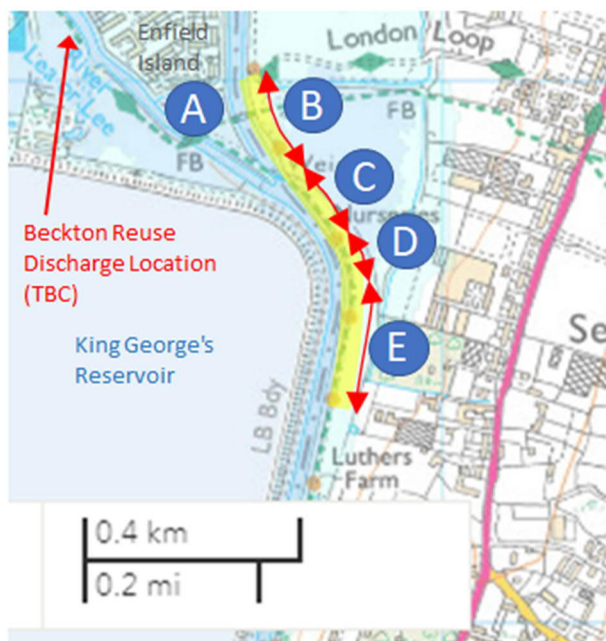
The proposed connection into the existing Wraysbury 100" tunnel is sited entirely within Affinity Water's existing Iver WTW site. The above ground works would include a control and switchgear building which would not have a significant impact relating to any of the community, environmental and planning criteria. There is no alternative location for this connection.

Supplementary works on the Laleham intake (to enable Thames Water to compensate for the abstraction volume via Datchet transferred to Affinity Water) are required as part of this option. The work will entail upgrading of the existing pumps, an allowance for which has been made within the option scope. There are no alternative sites for this supplementary work, which would be within the existing structures at Laleham.

4.3.2.6 New River Lee River Intake

The location of the proposed River Lee Intake would need to be downstream of the outfall from the Beckton effluent reuse option within the London Effluent Reuse SRO, which would be near to the existing Thames Water intake channel for the King George's Reservoir. It is proposed that water is abstracted from the main channel of the River Lee downstream of the confluence with the River Lee flood relief channel at the south end of Enfield Island. The range of locations considered is shown in Figure 4.9.

Figure 4.9: Locations Considered for the River Lee Intake



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As with Maidenhead, due to the width of the flood zones in this location, it is proposed that the pumping station is offset from the river intake outside of the flood plain.

A passive wedge wire screen solution for this location could be feasible if it was possible to guarantee a minimum depth at the screen. Alternatively, an arrangement similar to the existing nearby Thames Water intake could be used, with a channel extending from the river to the edge of the flood plain with conventional screens at the intake.

One location considered was Area A on Enfield Island on the western side of the River Lee flood relief channel. However, this area is completely within the flood zone and was also discounted due to poor accessibility, construction complexity, and the distance to the edge of the flood plain.

Area B is not suitable for the intake because there is a weir at the confluence which would prevent any discharge from the Beckton effluent reuse scheme (London Reuse SRO) contributing to the flow in this reach. Area C is less accessible during flood events and further from the edge of the flood plain than point D. The straight section of channel running alongside the King George’s Reservoir, shown as area E is more constrained for the intake structure construction and access than point D, but should the Beckton Reuse option be selected then the possibility of siting the intake and pumping station in area E should be reconsidered.

If this option is selected and point D is chosen as the preferred intake location, an appropriate indicative location for the pumping station could be within the commercial area to the west of the A112 Sewardstone Road.

The intake location assessment against the technical criteria is shown in Table 4.16.

Table 4.16: River Lee Intake Location Assessment Against Technical Criteria

Criterion	A. West side of R Lee relief channel.	B. Upstream of Enfield Island confluence	C. From confluence to apex of bend	D. Apex of bend close to Northfield Nursery	E. Downstream of Apex of Bend
Design					
Must be sufficient space for permanent works and environmental mitigation measures					
Must be sufficient space for planned future expansion and/or process enhancement	No space for expansion				
Plant must be outside Flood Zones 2 and 3 to allow maintenance and continuous operation during flood events	Area is within Flood Zone 3 and too far from edge of flood plain for passive screen design.	Area is within Flood Zone 3 and too far from edge of flood plain for passive screen design.	Area is within Flood Zone 3 and further from edge of flood plain than point C.	Intake is within Flood Zone 3 but a submerged passive wedge wire screen is proposed with a short connection to a pumping station outside the flood plain.	Intake is within Flood Zone 2

Criterion	A. West side of R Lee relief channel.	B. Upstream of Enfield Island confluence	C. From confluence to apex of bend	D. Apex of bend close to Northfield Nursery	E. Downstream of Apex of Bend
Where possible, site should be near existing assets to allow for operational efficiencies.					
Where possible, project should use or reuse existing assets					
Where possible, works should be built on land already owned by the water company					
Where possible, the site should be selected such that the topography minimises the requirement for earthworks and engineered slopes.					
Within a reasonable distance of a suitable watercourse to accept emergency overflow, drain down and commissioning discharges					
Construction					
Site must allow works to be constructed without endangering construction workers, operational staff, visitors or members of the public					
Sufficient space can be made available for construction and materials storage					
Suitable access for construction workers, deliveries and waste removal					
Operation					
Site allows works to be operated without endangering construction workers, operational staff, visitors or members of the public					
Suitable access for operation including deliveries and waste removal					
Specific River Intake Criteria					
On the outside of a bend, as this reduces siltation and the amount of sediment drawn in,					
Preferably on the main channel of the river, where the flow is greater and more reliable,					
Downstream of the confluence with major tributaries to maximise the flow available.					
A location where there is sufficient riverbank frontage (taken as at least 30m in the case of T2AT) and enough space to construct the intake;					

Location D has been reviewed against the environmental, community and planning criteria with the following assessment:

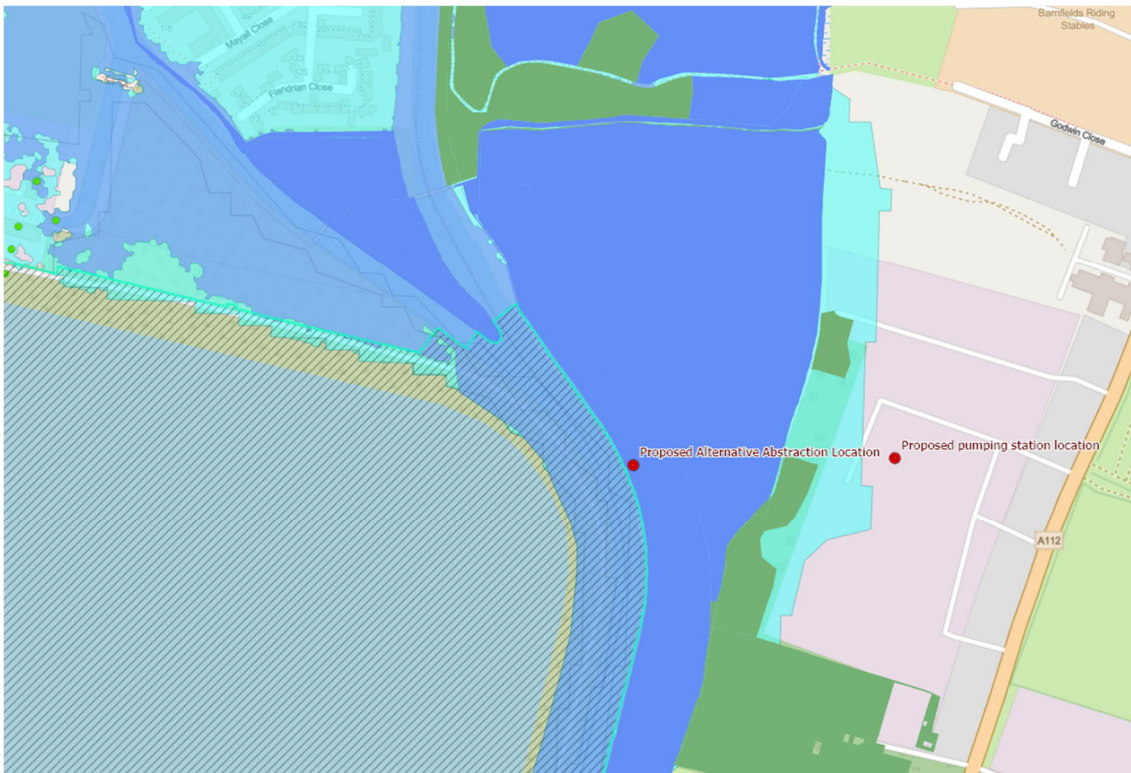
Table 4.17: River Lee Intake Assessment Against Environment, Community and Planning Criteria

Criterion	D. Apex of bend close to Northfield Nursery
Environment	
Minimise direct impacts on statutory designated sites (Special Area of Conservation, Special Protection Area, Ramsar, SSSI, National Nature Reserve, Local Nature Reserve) and Ancient Woodland.	Intake is adjacent to the Chingford Reservoirs SSSI but pumping station is outside of SSSI.

Criterion	D. Apex of bend close to Northfield Nursery
Minimise impacts on designated heritage assets (scheduled monuments, listed buildings, Registered Parks and Gardens, Registered Battlefields, World Heritage Sites, and conservation areas) which could result in loss of significance.	Pumping station within 500m of listed building but no likely setting effects as within existing industrial area.
Minimise permanent loss of best and most versatile agricultural land (Grades 1, 2 and 3a).	Pumping station within Grade 3 land but site is not used for agricultural purposes and surrounding area is industrial so would not result in loss of best and most versatile agricultural land. Possible temporary disturbance to agricultural soils for pipeline connection between intake and pumping station.
Minimise loss of flood storage within Flood Zone 2 or 3.	PS is outside Flood Zones 2 and 3.
Minimise disturbance of potentially contaminated land (in relation to authorised and historic landfills)	Within 500m of historic landfill.
Minimise loss of priority habitat.	Pipeline between intake and pumping station would cross coastal and floodplain grazing marsh priority habitat.
Community	
Avoid loss of property and community assets due to construction.	No property or community assets within option footprint.
Minimise impact on local community during operation, in particular due to above ground component (including noise, visual amenity etc).	Above ground component within industrial area with residential properties in proximity area. Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.
Minimise impact on local community during construction (including noise, visual amenity, temporary disturbance of community assets such as Country Parks and disruption to recreation).	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.
Planning	
Aim for consistency with published Local Plan land use allocations	
Avoid development of above ground components within designated areas (Green Belt, Chilterns AONB)	
Ability to integrate with existing infrastructure and proposed Nationally Significant Infrastructure Projects (Highways England, EA, Network Rail, Heathrow, HS2)	

Figure 4.10 shows the suggested indicative location for the passive wedge wire screen and the pumping station. If the conventional screen alternative was selected at this indicative location, then the point shown would mark the upstream end of the channel leading to the screens, which would then be adjacent to the pumping station.

Figure 4.10: Indicative River Lee Intake Site (Beckton Reuse Option)



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4.4 Water Treatment Works Siting

4.4.1 Technical Criteria

Three localities for the water treatment works, drinking water pumping stations and delivery points were selected, in conjunction with Affinity Water network specialists, to be as close as possible to existing strategic nodes, “hubs”, in their drinking water transmission network. The reason for this was to facilitate distribution of the additional supplies into the existing network with minimal additional pipelines. At this early stage of project development, the approximate localities of the WTWs were selected to be within the Affinity Water supply area²⁰. The three localities are shown in Table 4.18.

General siting criteria, as described in Section 4.2, were applied to identify the optimum site within the proposed WTW localities. The indicative WTW sites allow for comparison of options within the T2AT project and also for comparison between SROs. If any of the options are selected for further development, then the actual site locations will need to be determined through further consideration and consultation with stakeholders.

Table 4.18: WTW Localities

Option	WTW Locality	Rationale
Sunnymeads 1 Maidenhead Teddington DRA	Adjacent to Harefield Service Reservoir	Harefield has excellent existing transfer connections to the Affinity Water network, minimising the need for additional network reinforcement. It is also recognised as a hub within Affinity Water’s future plans for network development; WRMP24 and Connect 2050. There is an existing unused service reservoir compartment at Harefield which is suitable for bringing back into service, thereby avoiding the impact of constructing a new service reservoir to provide the strategic drinking water storage that is a necessary complement to any WTW.
Sunnymeads 2a Walton 2b Mogden Reuse Indirect 3 Lower Thames Reservoir Transfer 2a	In the vicinity of the existing Iver WTW	There is insufficient space within the existing Iver WTW and limited opportunity to expand into adjacent land parcels. However the existing Iver WTW is a significant hub and there would be operational efficiencies in having the new works close by. Although this location provides the opportunity to link into the network served by Iver and also to serve a new link to Harrow, these options are complemented by a pumped link to Harefield to make use of the existing, unused service reservoir and the distribution hub that is there.
Beckton Reuse Indirect	North Mymms	North Mymms was selected as a hub as it has the facility to feed both north and south into the two Affinity WRZs which have the highest predicted supply/demand imbalance. Since Gate 1 the WRSE modelling has identified that an additional conveyance component would be required to supplement the existing transfer capacity from North Mymms to Brookmans Park.

²⁰ Note that the relevance of both these criteria is being challenged by the T2AT development team.

4.4.2 Siting Results

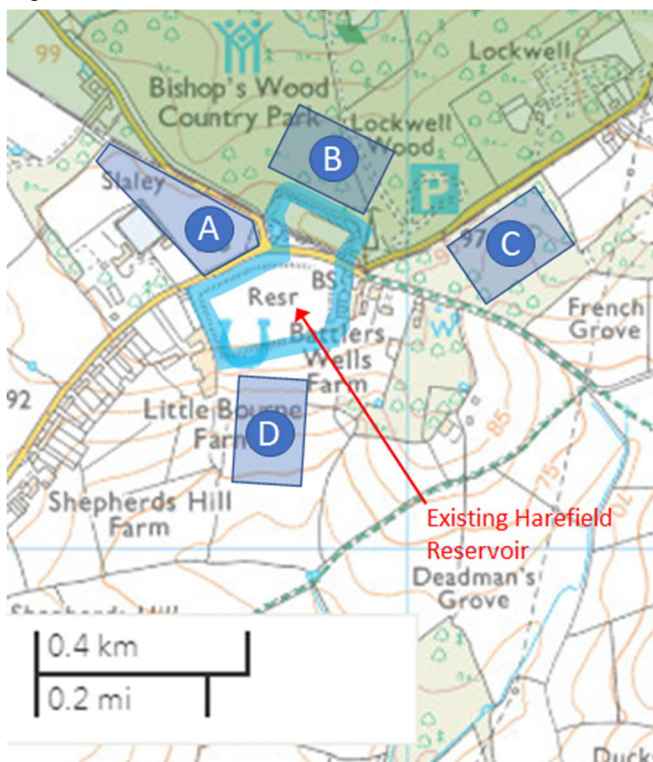
4.4.2.1 Harefield WTW

Harefield is an important, existing distribution hub for Affinity Water, which comprises multiple service reservoirs. It is situated within WRZ4 (Pinn), near the borders of WRZ1 (Misbourne) and WRZ2 (Colne).

Within the existing site there is surplus storage capacity (Reservoir No.3, half of which is not currently in service and has a nominal capacity of 148MI) which is available for use in the T2AT project. It is suggested that any new WTW should be provided with six hours of drinking water storage, so it would be preferential to utilise this existing asset rather than construct a new reservoir. Therefore, seven out of the eight T2AT options propose making use of this storage.

Three of the options also include proposals for treating raw water at Harefield. In these cases, it is preferable for the WTW to be as close to the storage reservoir as possible which gives rise to the four alternative indicative sites shown in Figure 4.11.

Figure 4.11: Locations Considered for Harefield WTW



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All four of the potential locations are technically feasible as indicated in Table 4.19, albeit there is limited available space at site A.

Table 4.19: Harefield WTW Location Assessment Against Technical Criteria

Criterion	A. Field to north of existing reservoir	B. Lockwell Wood	C. French Grove	D. Field to south of existing reservoir
Design				
Must be sufficient space for permanent works and environmental mitigation measures	Restricted site with limited room for future expansion			
Must be sufficient space for planned future expansion and/or process enhancement				
Plant must be outside Flood Zones 2 and 3 to allow maintenance and continuous operation during flood events				
Where possible, site should be near existing assets to allow for operational efficiencies.				
Where possible, project should use or reuse existing assets				
Where possible, works should be built on land already owned by the water company				
Where possible, the site should be selected such that the topography minimises the requirement for earthworks and engineered slopes.				
Within a reasonable distance of a suitable watercourse to accept emergency overflow, drain down and commissioning discharges				
Construction				
Site must allow works to be constructed without endangering construction workers, operational staff, visitors or members of the public				
Sufficient space can be made available for construction and materials storage				
Suitable access for construction workers, deliveries and waste removal				
Operation				
Site allows works to be operated without endangering construction workers, operational staff, visitors or members of the public				
Suitable access for operation including deliveries and waste removal				

Since all the sites are practical from a technical point of view, they were all reviewed against the environmental, community and planning criteria as shown in Table 4.20.

Table 4.20: Harefield WTW Site Assessment Against Environment, Community and Planning Criteria

Criterion	A. Field to north of existing reservoir	B. Lockwell Wood	C. French Grove	D. Field to south of existing reservoir
Environment				

Criterion	A. Field to north of existing reservoir	B. Lockwell Wood	C. French Grove	D. Field to south of existing reservoir
Minimise direct impacts on statutory designated sites (Special Area of Conservation, Special Protection Area, Ramsar, SSSI, National Nature Reserve, Local Nature Reserve) and Ancient Woodland.	Ancient Woodland in close proximity.	Ancient Woodland in close proximity.	Loss of Ancient Woodland.	Ancient Woodland in close proximity.
Minimise impacts on designated heritage assets (scheduled monuments, listed buildings, Registered Parks and Gardens, Registered Battlefields, World Heritage Sites, and conservation areas) which could result in loss of significance.	Adjacent to Grade II listed structure.	Within 500m of Grade II listed building but setting effects unlikely.	Within 500m of Grade II listed building with potential for setting effects.	Within 500m of Grade II listed building but setting effects unlikely.
Minimise permanent loss of best and most versatile agricultural land (Grades 1, 2 and 3a).	Permanent loss of Grade 3a agricultural land.	Permanent loss of Grade 3a agricultural land.	Permanent loss of Grade 3a agricultural land.	Permanent loss of Grade 3a agricultural land.
Minimise loss of flood storage within Flood Zone 2 or 3.	Within Flood Zone 1.	Within Flood Zone 1.	Within Flood Zone 1.	Within Flood Zone 1.
Minimise disturbance of potentially contaminated land (in relation to authorised and historic landfills)	Within 500m of historic landfill.	Within 500m of historic landfill.	Within 500m of historic landfill.	Within 500m of historic landfill.
Minimise loss of priority habitat.	No priority habitat directly impacted by proposed option footprint.	Loss of deciduous woodland priority habitat.	Loss of deciduous woodland priority habitat.	No priority habitat directly impacted by proposed option footprint.
Community				
Avoid loss of property and community assets due to construction.	No permanent or temporary loss of property and community assets.	Permanent loss of land within Country Park.	Part of a possible informal amenity area would be lost (although there are no public rights of way to this area).	No permanent or temporary loss of property and community assets.
Minimise impact on local community during operation, in particular due to above ground component (including noise, visual amenity etc).	Residential properties within proximity. Country Park adjacent. Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.	Residential properties within proximity. Within Country Park. Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.	Residential properties within proximity. Country Park adjacent. Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.	Residential properties within proximity. Country Park within 500m. Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.

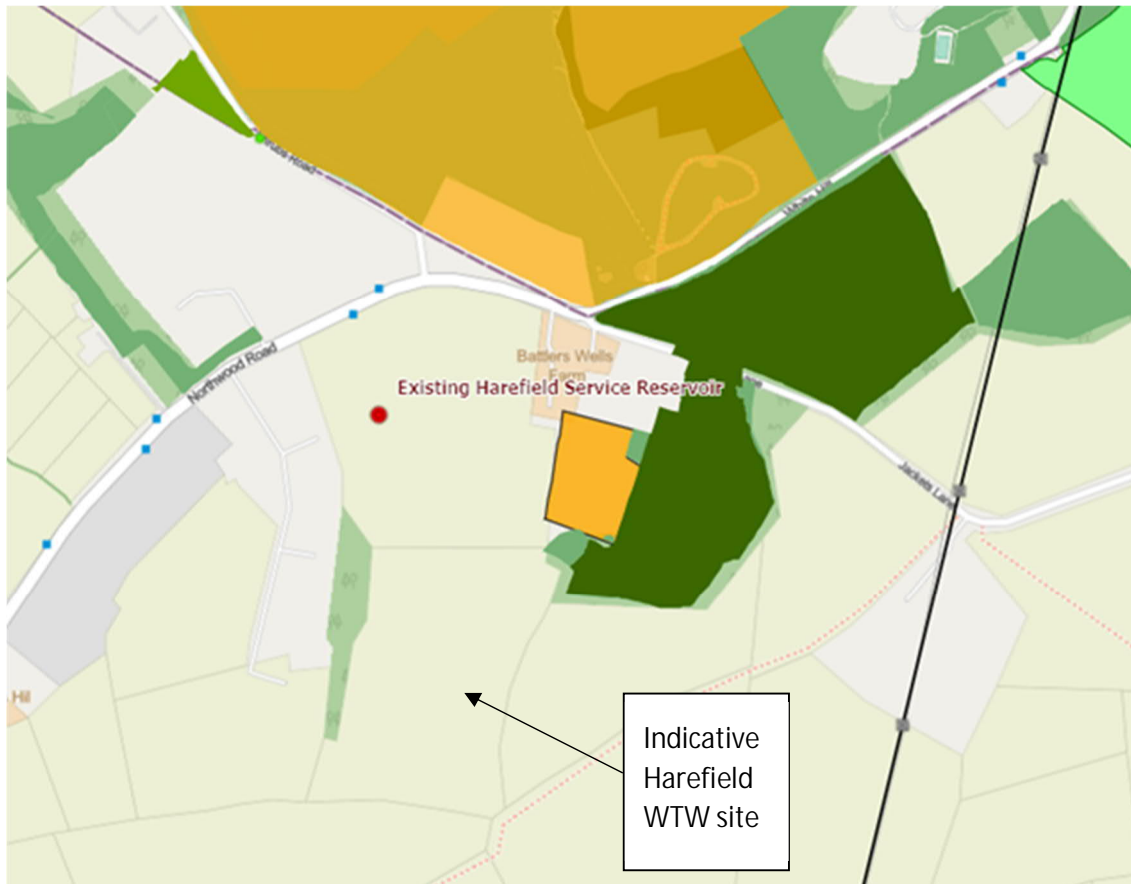
Criterion	A. Field to north of existing reservoir	B. Lockwell Wood	C. French Grove	D. Field to south of existing reservoir
Minimise impact on local community during construction (including noise, visual amenity, temporary disturbance of community assets such as Country Parks and disruption to recreation).	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.
Planning				
Aim for consistency with published Local Plan land use allocations				
Avoid development of above ground components within designated areas (Green Belt, Chilterns AONB)	Site is within green belt	Site is within green belt	Site is within green belt	Site is within green belt
Ability to integrate with existing infrastructure and proposed Nationally Significant Infrastructure Projects (Highways England, EA, Network Rail, Heathrow, HS2)				

The existing reservoir site is bordered by Bishops Wood Country Park to the north (Site B) and woodland to the east (Site C), both of which comprise of Ancient Woodland and deciduous woodland priority habitat, and Littlebourne Equestrian Centre to the west. There is an open field to the north-west of the reservoir (Site A), but this was rejected due to insufficient space (only about 2ha available). The open field to the south (Site D) is therefore suggested as the indicative site due to the following benefits and being the closest suitable space available.

- Close to the existing assets to minimise connecting pipe lengths
- Sufficient space for the WTW (approximately 3ha required for 50MI/d and 5ha for 100MI/d)
- Outside of Flood Zone 3 and other environmental designations, and no loss of priority habitat.
- Within 500m of a watercourse suitable for accepting emergency overflow, drain down and commissioning discharges with the appropriate consents
- Space for future expansion in nearby fields

The indicative site falls from north to south, which could be used to enable gravity flow through the WTW and gravity overflow arrangements. However, the final treated water would need to be pumped to the drinking water service reservoirs, which are situated at a high point to allow for gravity flow into the distribution network.

Figure 4.12: Indicative Harefield WTW Site



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4.4.2.2 Iver 2 WTW

Affinity Water has an existing WTW at Iver, which is an important hub in the south-west of Affinity Water’s WRZ4. The existing site is constrained on all sides with the Great Western Main Line to the south, the M25 to the west, Court Lane Industrial Estate to the north, and fishing lakes to the east. Expansion of this site does not therefore appear to be feasible and so a new WTW location, designated Iver 2, has been sought.

Three of the T2AT options propose treating raw water at Iver 2 WTW and taking the drinking water to the storage reservoir at Harefield. However, treating water at Iver 2 WTW would also provide scope for distributing water into the local WRZ4 or transferring to the existing service reservoir at Harrow.

Following the initial work completed by Affinity Water²¹, a location for the Iver 2 WTW site was sought as close to the existing Iver WTW as possible. For the purposes of this exercise, sites to the West of the M25 were excluded to keep the potential number of raw and drinking water pipeline crossings of the motorway to a minimum²². The area to the south of the Great

²¹ Initial Assessment of Alternative Scheme Concepts Report - Affinity Water - June 2020

²² Note that this exclusion is being backchecked prior to Gate 2.

Western Railway main line is unsuitable due to its environmental and amenity value, and further to the south, beyond the M4, the area is excluded as it would restrict options for the expansion of Heathrow airport. On the eastern side of Iver WTW there is an area of lakes which is also therefore not suitable.

This leaves the area to the north where three potential sites were assessed as shown in Figure 4.13. The area to the south of Iver Lane is Huntsmoor Park, which has medieval origins and is in the vicinity of Huntsmoor Park Farm, which comprises two Grade II listed buildings. Therefore, this area was not considered.

Figure 4.13: Locations Considered for Iver 2 WTW



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Area C, adjacent to the Grand Union Canal, was previously considered by Affinity Water as a potential site for relocating Iver WTW. However, there is insufficient space here to construct a new 50 or 100MI/d WTW.

The technical assessment of the three sites is shown in Table 4.21.

Table 4.21: Iver 2 WTW Location Assessment Against Technical Criteria

Criterion	A. Palmers Moor Farm	B. Iver Lane	C. Adjacent to GUC
Design			
Must be sufficient space for permanent works and environmental mitigation measures			Insufficient space
Must be sufficient space for planned future expansion and/or process enhancement			
Plant must be outside Flood Zones 2 and 3 to allow maintenance and continuous operation during flood events			
Where possible, site should be near existing assets to allow for operational efficiencies.			
Where possible, project should use or reuse existing assets			
Where possible, works should be built on land already owned by the water company			
Where possible, the site should be selected such that the topography minimises the requirement for earthworks and engineered slopes.	Possible contaminated ground		
Within a reasonable distance of a suitable watercourse to accept emergency overflow, drain down and commissioning discharges			
Construction			
Site must allow works to be constructed without endangering construction workers, operational staff, visitors or members of the public			
Sufficient space can be made available for construction and materials storage			
Suitable access for construction workers, deliveries and waste removal			
Operation			
Site allows works to be operated without endangering construction workers, operational staff, visitors or members of the public			
Suitable access for operation including deliveries and waste removal			

The assessment of Areas A and B against the environmental, community and planning criteria is shown in Table 4.22.

Table 4.22: Iver 2 WTW Site Assessment Against Environment, Community and Planning Criteria

Criterion	A. Palmers Moor Farm	B. Iver Lane
Environment		
Minimise direct impacts on statutory designated sites (Special Area of Conservation, Special Protection Area, Ramsar, SSSI, National Nature Reserve, Local Nature Reserve) and Ancient Woodland.	No statutory designated sites or Ancient Woodland within 100m of proposed option footprint.	No statutory designated sites or Ancient Woodland within 100m of proposed option footprint.

Criterion	A. Palmers Moor Farm	B. Iver Lane
Minimise impacts on designated heritage assets (scheduled monuments, listed buildings, Registered Parks and Gardens, Registered Battlefields, World Heritage Sites, and conservation areas) which could result in loss of significance.	Within 500m of Grade II listed buildings (on other side of M25) with potential for setting effects.	Within 500m of Grade II listed buildings (on other side of M25) and conservation area with potential for setting effects.
Minimise permanent loss of best and most versatile agricultural land (Grades 1, 2 and 3a).	Within non-agricultural land.	Within non-agricultural land.
Minimise loss of flood storage within Flood Zone 2 or 3.	Within Flood Zone 1.	Within Flood Zone 1.
Minimise disturbance of potentially contaminated land (in relation to authorised and historic landfills)	Within historic landfill and within 500m of historic or authorised landfill. Likely that impact can be managed or mitigated.	Adjacent to historic landfill and within 500m of historic or authorised landfills. Likely that impact can be managed or mitigated.
Minimise loss of priority habitat.	No priority habitat directly impacted by proposed option footprint.	No priority habitat directly impacted by proposed option footprint.
Community		
Avoid loss of property and community assets due to construction.	Part of a possible informal amenity area would be lost (although there are no public rights of way to this area).	No permanent or temporary loss of property and community assets.
Minimise impact on local community during operation, in particular due to above ground component (including noise, visual amenity etc).	Few residential properties within proximity. National Cycle Network route and public footpaths within 500m. Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.	Residential properties within proximity. Public Park and National Cycle Network route and public footpaths within 500m. Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.
Minimise impact on local community during construction (including noise, visual amenity, temporary disturbance of community assets such as Country Parks and disruption to recreation).	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.
Planning		
Aim for consistency with published Local Plan land use allocations		
Avoid development of above ground components within designated areas (Green Belt, Chilterns AONB)	Site is within green belt	Site is within green belt
Ability to integrate with existing infrastructure and proposed Nationally Significant Infrastructure Projects (Highways England, EA, Network Rail, Heathrow, HS2)		

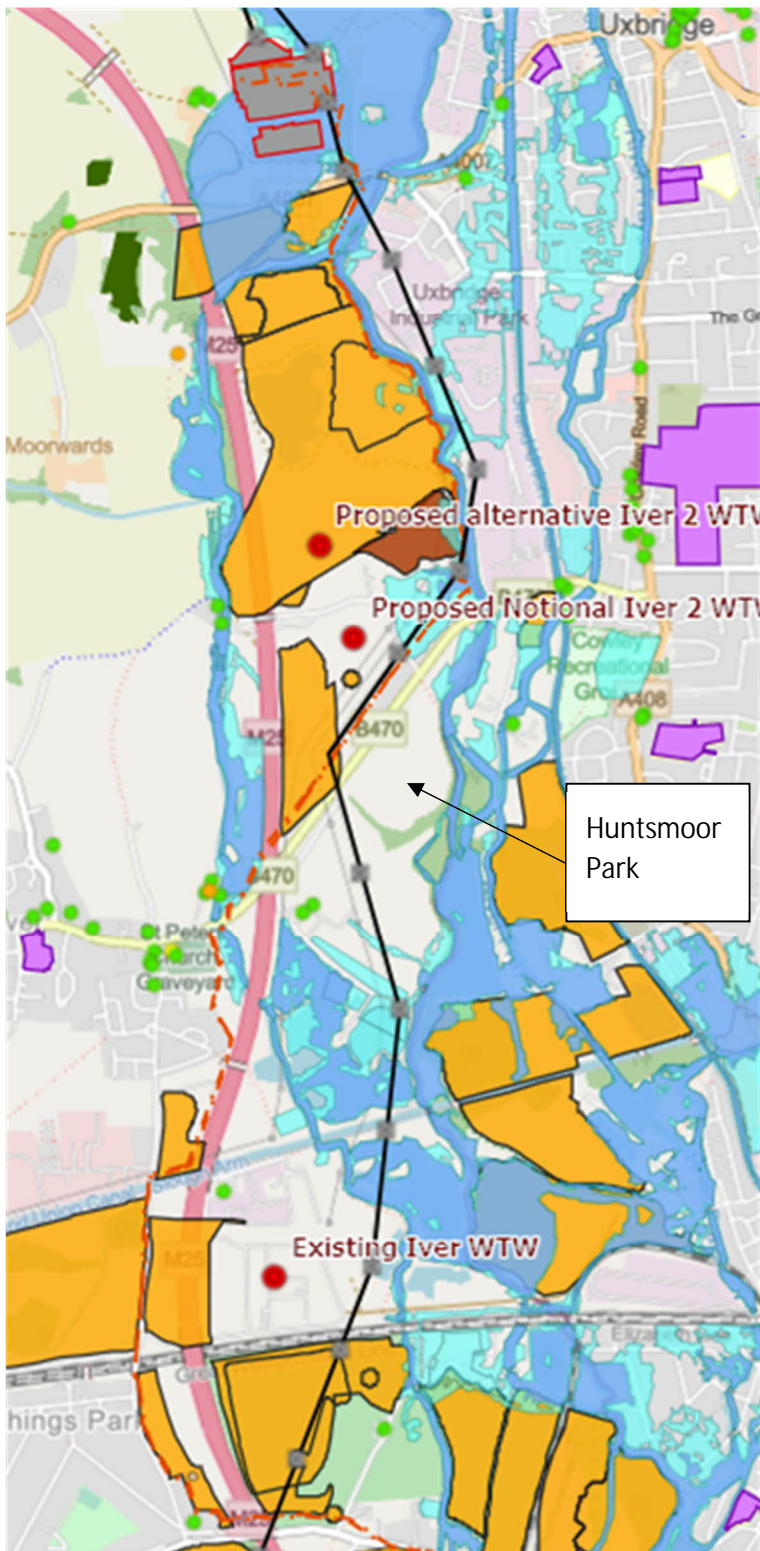
The field to the north of Palmers Moor Lane, Area A, is within a historic landfill area, and further investigations would be required, with the potential for increased cost and complexity if remediation of contaminated ground were to be required. In addition there are public footpaths across, and a lake to the north, suggesting that Area A may have greater amenity value than Area B.

The suggested indicative site, Area B, as shown in Figure 4.14 is an open field, situated to the east of the M25, between Iver Lane and Palmer's Moor Lane. In summary, the site has the following benefits:

- Sufficient space for the WTW

- Outside of Flood Zone 3 and other environmental designations
- Two nearby watercourses suitable for accepting emergency overflow, drain down and commissioning discharges with the appropriate consents
- Near industrial areas, so the area is likely to already experience high-traffic movements
- Space for future expansion in nearby fields
- A motorway pipeline crossing would not be required for a transfer pipeline to Harrow, if it should be required.
- Avoids potential contaminated land area
- Loss of amenity land is less than alternatives

Figure 4.14: Indicative Iver 2 WTW Site



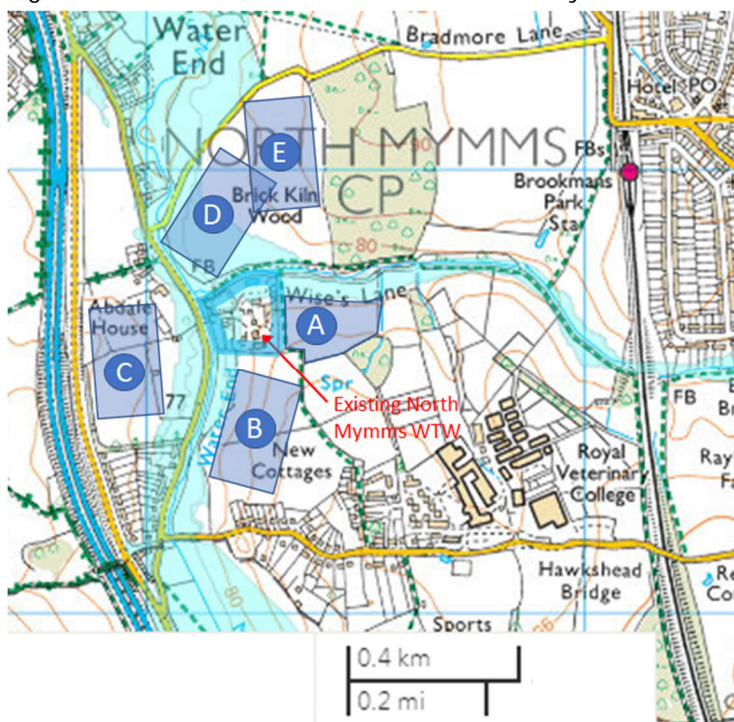
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4.4.2.3 North Mymms WTW

North Mymms is an existing Affinity Water site situated within WRZ3. The site currently comprises a well field, a 28MI/d WTW, and service reservoir, with connections into the distribution network.

The Beckton Reuse Indirect option includes construction of a new WTW and service reservoir in this vicinity, due to the ease of connecting into the existing distribution supply network. This option allows water to be conveyed into WRZ3²³ whereas the other options deliver water into WRZ4. Potential sites are shown in Figure 4.15.

Figure 4.15: Locations Considered for North Mymms WTW



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The open field to the east of the existing site, Area A, was considered; however, there was insufficient space outside of the flood plain, to construct a WTW (available space is less than 3ha).

The field to the south of the existing site, Area B, was also considered; however, this site is significantly steeper (15m change in elevation from east to west) than the field to the north (8m change in elevation), which would increase the complexity of construction and the volume of earthworks required.

Area D has the advantage of being adjacent to the existing site but was excluded as it is liable to flooding.

²³ Note that following Gate 1, WRSE has requested that the connectivity of this option is improved by adding a treated water pumping station and pipeline to Brookmans Park service reservoir, which is a major hub in Affinity Water's network approximately 3km north-east of North Mymms.

Areas C and E are technically practical as indicated in Table 4.23.

Table 4.23: North Mymms Location Assessment Against Technical Criteria

Criterion	A. Field to east of existing WTW	B. Field to south of existing WTW	C. Field to west of existing WTW	D. Field to north of existing WTW	E. Field adjacent to Brick Kiln Wood
Design					
Must be sufficient space for permanent works and environmental mitigation measures	Insufficient space				
Must be sufficient space for planned future expansion and/or process enhancement					
Plant must be outside Flood Zones 2 and 3 to allow maintenance and continuous operation during flood events				Site is within Flood Zone 3	
Where possible, site should be near existing assets to allow for operational efficiencies.					
Where possible, project should use or reuse existing assets					
Where possible, works should be built on land already owned by the water company					
Where possible, the site should be selected such that the topography minimises the requirement for earthworks and engineered slopes.		Not suitable due to slope of ground			
Within a reasonable distance of a suitable watercourse to accept emergency overflow, drain down and commissioning discharges					
Construction					
Site must allow works to be constructed without endangering construction workers, operational staff, visitors or members of the public					
Sufficient space can be made available for construction and materials storage					
Suitable access for construction workers, deliveries and waste removal					Access would require improvement
Operation					
Site allows works to be operated without endangering construction workers, operational staff, visitors or members of the public					
Suitable access for operation including deliveries and waste removal					Access would require improvement
A location where there is sufficient riverbank frontage (taken as at least 30m in the case of T2AT) and enough space to construct the intake;					

The assessment of Areas C and E against the environmental, community and planning criteria is shown in Table 4.24.

Table 4.24: North Mymms WTW Site Assessment Against Environment, Community and Planning Criteria

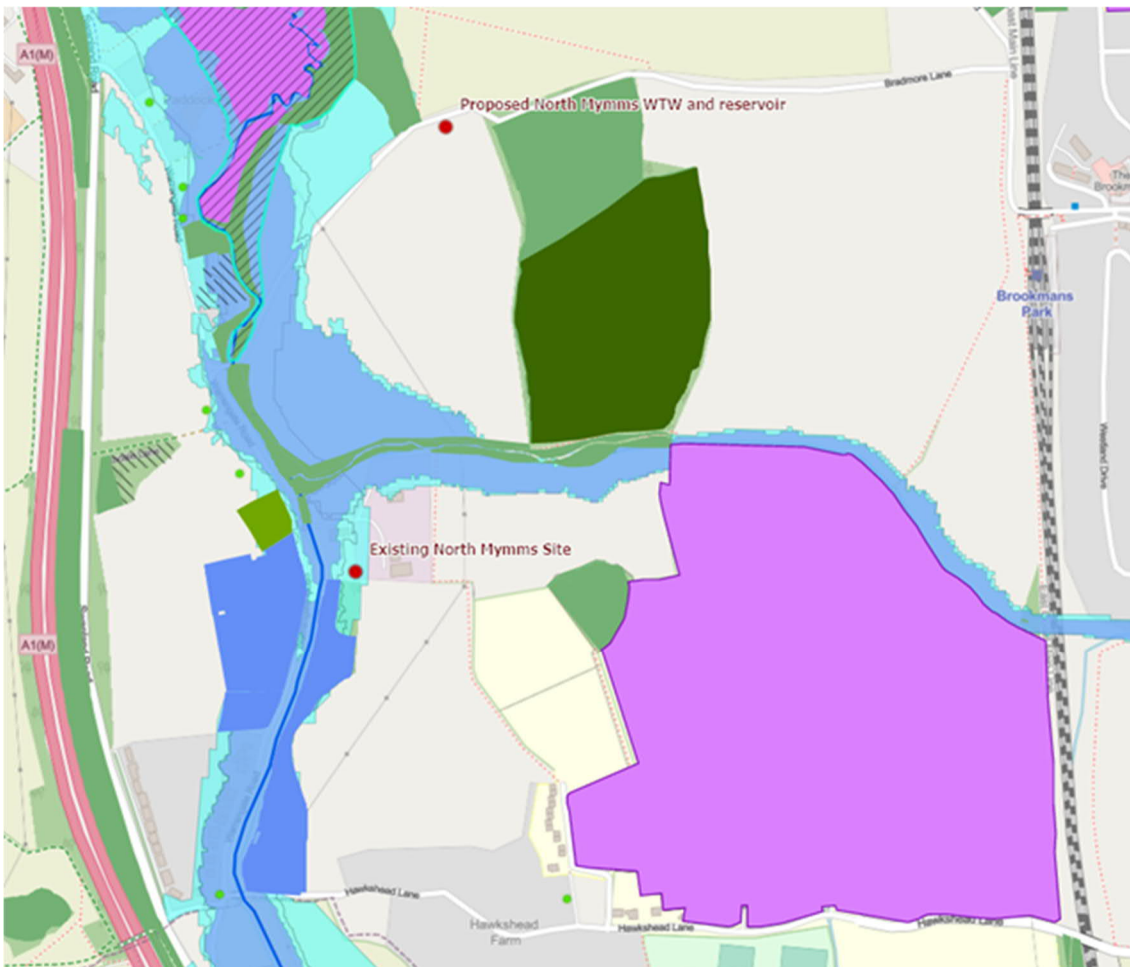
Criterion	C. Field to west of existing WTW	E. Field adjacent to Brick Kiln Wood
Environment		
Minimise direct impacts on statutory designated sites (Special Area of Conservation, Special Protection Area, Ramsar, SSSI, National Nature Reserve, Local Nature Reserve) and Ancient Woodland.	No statutory designated sites or Ancient Woodland within 100m of proposed option footprint.	Within 100m of SSSI and in close proximity to Ancient Woodland.
Minimise impacts on designated heritage assets (scheduled monuments, listed buildings, Registered Parks and Gardens, Registered Battlefields, World Heritage Sites, and conservation areas) which could result in loss of significance.	Within close proximity to Grade II listed buildings with potential for setting effects.	Within 500m of Grade II listed buildings with potential for setting effects.
Minimise permanent loss of best and most versatile agricultural land (Grades 1, 2 and 3a).	Permanent loss of Grade 3a agricultural land.	Permanent loss of Grade 3a agricultural land.
Minimise loss of flood storage within Flood Zone 2 or 3.	Within Flood Zone 1.	Within Flood Zone 1.
Minimise disturbance of potentially contaminated land (in relation to authorised and historic landfills)	Within 500m of historic landfill.	Not within 500m of authorised or historic landfill.
Minimise loss of priority habitat.	Loss of coastal and floodplain grazing marsh priority habitat.	No priority habitat directly impacted by proposed option footprint
Community		
Avoid loss of property and community assets due to construction.	No permanent or temporary loss of property and community assets.	No permanent or temporary loss of property and community assets.
Minimise impact on local community during operation, in particular due to above ground component (including noise, visual amenity etc).	Residential properties within proximity. National Cycle Network route and public footpaths within 500m. Noise action important area within proximity (associated with road). Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.	Few residential properties within proximity. National Cycle Network route and public footpaths within 500m. Visual impact can be mitigated to some extent through screening and high-quality architectural treatment.
Minimise impact on local community during construction (including noise, visual amenity, temporary disturbance of community assets such as Country Parks and disruption to recreation).	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.	Potential for temporary disturbance during construction. This can be managed through standard good practice construction measures.
Planning		
Aim for consistency with published Local Plan land use allocations		
Avoid development of above ground components within designated areas (Green Belt, Chilterns AONB)	Site is within green belt	Site is within green belt
Ability to integrate with existing infrastructure and proposed Nationally Significant Infrastructure Projects (Highways England, EA, Network Rail, Heathrow, HS2)		

The suggested indicative site, as shown in Figure 4.16, is in an open field, situated to north of the existing WTW. The site has the following benefits:

- Close to the existing assets to minimise connecting pipe lengths
- Sufficient space for the WTW

- Outside of Flood Zone 3 and other environmental designations
- Few residential properties nearby
- Nearby watercourse suitable for accepting emergency overflow, drain down and commissioning discharges with the appropriate consents
- Space for future expansion in nearby fields
- Brick Kiln Wood to the east of the field provides screening to the nearby Royal Veterinary College and Brookmans Park village

Figure 4.16: Indicative North Mymms WTW Site



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4.5 Pipeline Route Selection

4.5.1 Technical Criteria

Start and end points for the pipeline routes were dictated by the indicative source and delivery locations. The rationale for selecting these indicative locations is provided in sections 4.3 and 4.4 above.

For each pipeline component, there is an almost unlimited number of potential routes between the start and end points. For this reason, an automated process was used rather than comparing a few selected routes. The tool used to carry out the initial route generation was Mott MacDonald’s Moata Route Optimiser (MRO) software. MRO uses a genetic algorithm that generates a pipeline route that is optimised for the parameters listed in Table 4.25, and aims to avoid the specific constraints, such as buildings and the designations listed in Table 4.26.

Table 4.25: MRO Optimisation Parameters

Totex Item	Criteria
Construction Costs (Capex)	• Pipeline length
	• Excavation
	• Chambers
Operational & Maintenance Costs (Opex)	• Pumping electricity consumption
	• Replacement of assets
	• Maintenance of assets

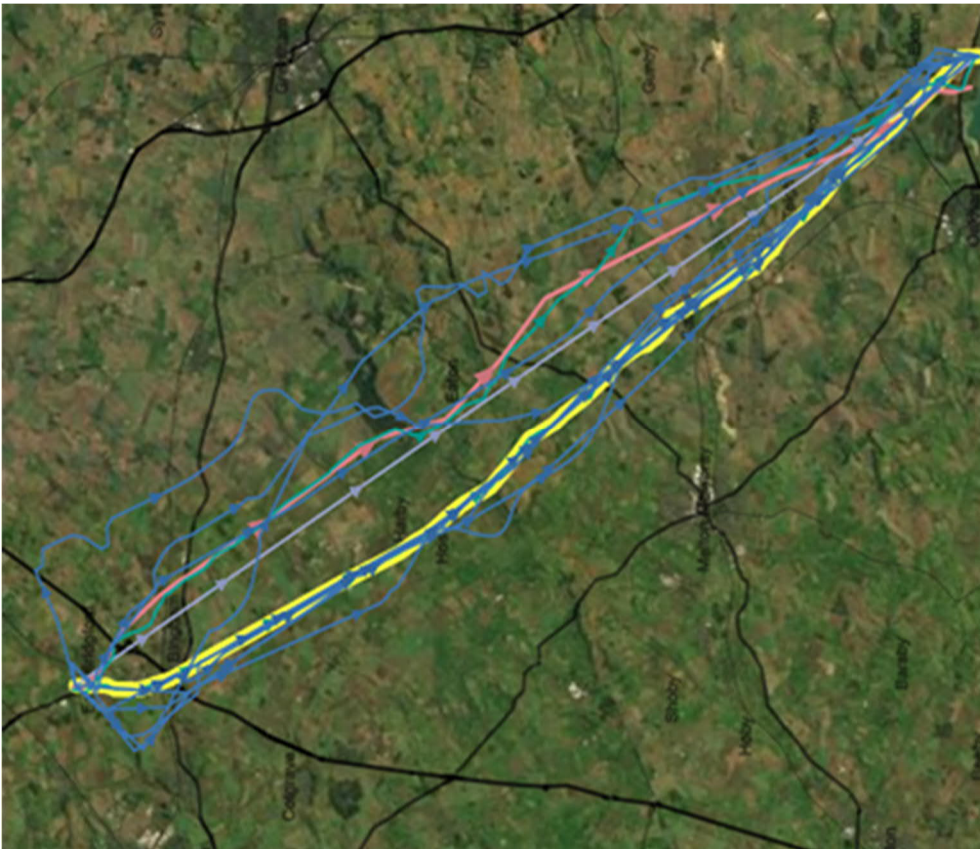
Table 4.26: Constraints within MRO Optimisation

Category	Constraint
Nature Conservation Constraints Avoided	Special Area of Conservation
	Sites of Specific Scientific Interest
	Special Protected Areas
	Ramsar Sites
	National Nature Reserve
	Local Nature Reserves (LNR)
Land Constraints Avoided	Ancient Woodland
	Buildings (10m buffer)
	Authorised Landfill
	Historic Landfill
Heritage Constraints Avoided	Functional Sites
	Listed Buildings
	Scheduled Ancient Monuments
	World Heritage Sites
Strategic Crossings	Registered Battlefields
	Primary Roads
	Secondary Roads
	Main River
	Rail

Category	Constraint
	Motorway

The progressive nature of the genetic algorithm is illustrated by the example in Figure 4.17 which shows an initial route provided to the programme (pink), a selection of routes generated by the optimisation process (blue), and the final route selected by the development team (highlighted yellow).

Figure 4.17: Illustration of Moata Route Optimiser Output



Source: Moata Route Optimiser. Mott MacDonald. Map layer by Esri

Note: Automated pipeline routing software generated solutions (blue) compared against initial alignment (pink) and selected solution (yellow).

For each pipeline component the following process was followed:

- i. Determine the start and end points of each pipeline component and enter them into the MRO tool.
- ii. Enter parameters based on preliminary sizing, such as pipe material and diameter, into MRO for each pipeline component.
- iii. Run 3D optimisations in MRO for each pipeline component. This process was repeated multiple times to build confidence in the chosen solution.
- iv. Carry out an engineering and environmental check on the route solutions and the vertical profiles provided by MRO to identify the best solutions obtained from MRO for each pipeline component and understand why those routes have been generated.

- v. Carry out a “design sprint” review, by the engineers and environmental advisors within the development team, to determine any necessary adjustments prior to finalising the route for optimisation of vertical alignment. During this stage, the MRO derived route for each pipeline component was reviewed to capture criteria that are not within the MRO list of constraints or optimisation algorithm (Priority Habitat Inventory, Country Parks and Registered Parks and Gardens), and judgement was applied to sense-check and refine the indicative routes. Where constraints were unavoidable, decisions were made by the development team based on the lowest impact option, for instance routing the pipeline to pass along a small section of an existing road instead of encroaching on a priority habitat.
- vi. Enter the amended route for each pipeline option back into MRO and run once as a 2D optimisation. The 2D optimisation process determines the vertical alignment of the route.
- vii. Carry out an engineering sense check of the hydraulic profile of each route, which may be dictated by summit points along the route as well as pipeline head loss, and calculate the approximate maximum pressure to ensure it is within the range of standard pipe pressure ratings.
- viii. Export results; MRO dashboard graphic, hydraulic profile and route shapefile for each pipeline component.
- ix. Use exported results to complete information required for the option definition and WRSE model, including concept design, cost and carbon estimates, and environmental metrics.

The indicative pipeline routes for the eight options are shown on the maps in Appendix E. A commentary on the key technical considerations is provided below. Note that the routes used to characterise the options are indicative and, for whichever option is chosen (if any), further work and stakeholder engagement will be required to arrive at the final route.

Further to the above process, and following completion of the WRSE environmental assessments, a detailed review of the environmental and planning implications of each route has been carried out. The output of these reviews is presented in Chapters 5 and 6.

4.5.2 Routing Results

4.5.2.1 Sunnymeads to Harefield Raw Water (Sunnymeads 1)

The Sunnymeads 1 option conveys water from the existing intake at Sunnymeads to a proposed WTW at the existing Harefield service reservoir site; much of the route passing through urban areas. Although a large section of the route passes through a collection of open fields, a significant number of environmental and land use designations (primarily ancient woodland, SSSI, priority habitats and landfills) constrained the route. The indicative pipeline route seeks to minimise the environmental impact of the option and disruption to existing infrastructure in its congested urban setting.

In the location south of the Queen Mother Reservoir, two routes were considered, as shown in Figure 4.18:

- a shorter route passing alongside the railway track and in close vicinity to a priority habitat (dashed red);
- a slightly longer route which crosses the railway track and an additional river crossing (solid red).

The second option was selected given the relatively small increase in pipeline length and to avoid impacting on the priority habitat area.

Figure 4.18: Sunnymeads Route Options South of the Queen Mother Reservoir



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The indicative route is consistent with the strategy for Affinity Water’s future crossings of HS2 and makes use of Potential Crossing Point 3 at Harvil Road which provided the most direct route to Harefield Reservoir and the shortest pipeline length.

4.5.2.2 Maidenhead to Harefield Raw Water (Maidenhead)

The Maidenhead option conveys water from the proposed Maidenhead abstraction point on the River Thames, to the proposed WTW at the existing Harefield service reservoir site. Much of this route passes through rural areas. Although there is less congestion from the built environment compared to other T2AT options, there are a significant number of environmental designations (primarily Ancient Woodland, priority habitats, and multiple registered Historic Parks and Gardens) which constrain the route selection.

The indicative pipeline route for Maidenhead seeks to minimise the environmental impact of the option. Where there was no available route that avoided all constraints, the route which was judged to have the lowest environmental impact was chosen e.g. routing the pipeline through historic landfill instead of Ancient Woodland.

Registered Historic Parks and Gardens were avoided where possible; however, near the abstraction point, the indicative route passes through an open section of Hedsor House

Historic Park and Garden, as the village of Wooburn created a barrier to the north and both Cliveden and Dropmore Historic Parks and Gardens are located to the south (see Figure 4.19). The proposed route through the park is relatively open, and the ground would be reinstated after construction.

Figure 4.19: Hedsor House Pipeline Route



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In the location of Hall Barn Grade II* Registered Park and Garden, multiple routes were considered as shown in Figure 4.20, including:

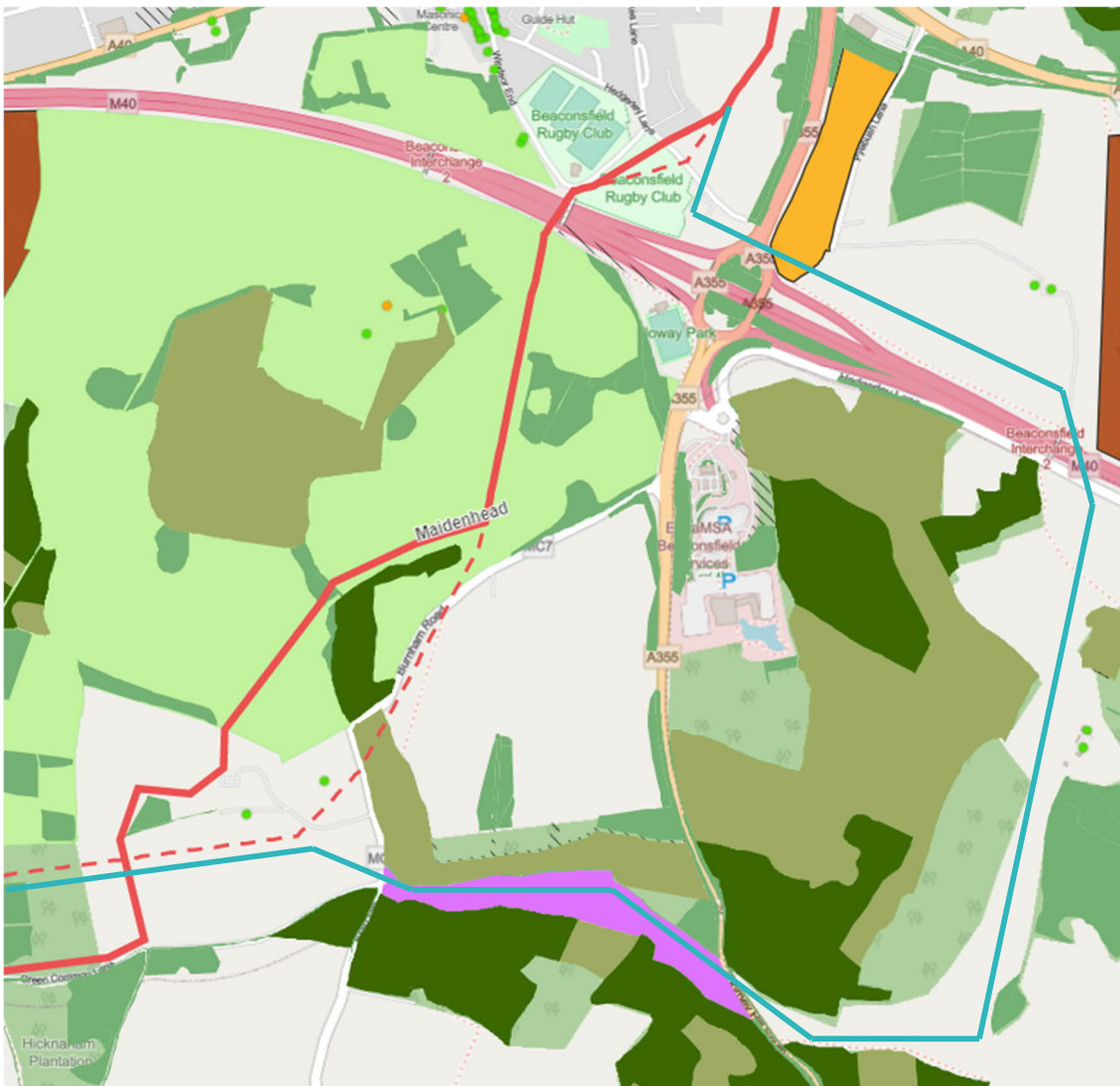
- a shorter route through the park, which would involve passing through ancient woodland (dashed red line)

- a longer route through the park, passing through a small section of priority habitat (deciduous woodland) (solid red line)
- a route which avoided the park but passed through a longer section of priority habitat, a historic landfill, and resulted a significantly longer pipeline route (blue line)

Taking the pipeline along Burnham Road, south of the park, was also considered, but the road would be too narrow to construct the pipeline.

Ancient Woodland was considered to be of greater value than the small section of deciduous woodland and therefore the second option was selected to minimise environmental impact and reduce the length of the pipeline (reducing capital and operational cost and carbon). The indicative pipeline route passes largely through open areas of the park and the ground would be reinstated after construction.

Figure 4.20: Hall Barn Pipeline Routing Options



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4.5.2.3 Teddington to Harefield Raw Water (Teddington DRA)

The Teddington DRA option conveys water from the proposed intake at Teddington to the proposed WTW at the existing Harefield service reservoir site. The majority of the route passes through a heavily constrained area of West London, with the built environment and several environmental and land use designations (primarily LNR, SSSI, priority habitats and landfill sites) constraining the route selection.

Due to the density of urban constraints, the indicative route follows existing roads for much of its length. There is scope to tunnel sections of this route through these areas, which would reduce disruption during construction. However, further analysis will be required to assess the feasibility of tunnelling these sections, should this option be selected for further development.

The indicative route is consistent with the strategy for Affinity Water's future crossings of HS2 and makes use of Potential Crossing Point 3 at Harvil Road which provided the most direct route to Harefield Reservoir and the shortest pipeline length.

4.5.2.4 Iver 2 to Harefield Drinking Water (route common to Sunnymeads 2a, Walton 2b, Mogden Reuse Indirect 3 and Lower Thames Reservoir Transfer 2a)

In general, this indicative route follows largely the same route as the latter part of the Sunnymeads 1 option. In the location immediately downstream of the proposed WTW at Iver 2, two routes were considered:

- a longer route west of the M25 before crossing back eastwards;
- a shorter route east of the M25 passing through a series of historic landfill sites.

The second option was selected to avoid additional crossings on the motorway and adjacent A-roads, which also resulted in a shorter route. The pipeline was routed along field boundaries in its latter section to reduce disruption to landowners.

4.5.2.5 Sunnymeads to Iver 2 Raw Water (Sunnymeads 2a)

This option conveys raw water from the Sunnymeads intake to the proposed Iver 2 WTW. Drinking water is then transferred to Harefield service reservoir via the Iver 2 to Harefield pipeline described above. The indicative route follows largely the same route as the upstream section of the Sunnymeads 1 option. The only difference between the routes is that this option diverges east from Sunnymeads 1 near the proposed Iver 2 WTW.

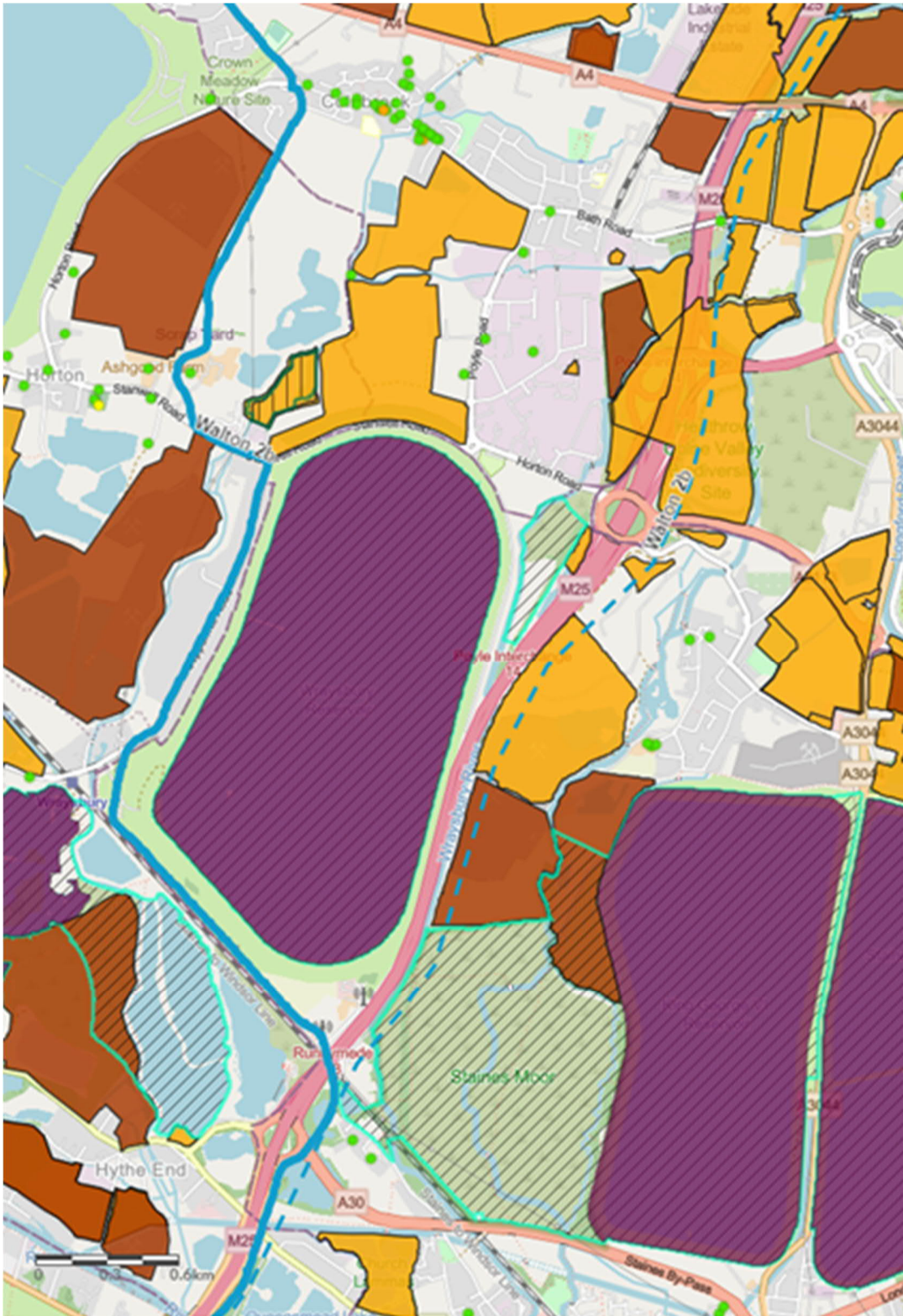
4.5.2.6 Walton to Iver 2 Raw Water (route common to Walton 2b and Mogden Reuse Indirect 3)

This component conveys water from the proposed extended Walton abstraction point to the proposed Iver 2 WTW site. The majority of the route passes through heavily constrained urban areas. A significant number of environmental and land use designations (primarily ancient woodland, SSSI, priority habitats and landfill sites) have constrained the route.

Downstream from the intake pumping station the indicative route passes alongside the M3 corridor. In the location south east of the Queen Mother Reservoir several routes were considered, including the two shown in Figure 4.21:

- a shorter route that passes adjacent to the M25 with a series of landfill sites either side of it (dashed blue line);
- a slightly longer route that goes west to join with the proposed Sunnymeads 1 route north of the Queen Mother Reservoir (solid blue line).

Figure 4.21: Walton 2b Indicative Route South East of the Queen Mother Reservoir



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Note: Flood zones 2 and 3 not included for image clarity

The second option was chosen as it avoided the section along the M25 which was in a heavily constrained area surrounded by landfill sites and priority habitats and would have resulted in significant additional motorway crossings. Choosing this alternative also allowed the pipeline route to take advantage of the open fields between the Queen Mother Reservoir and the existing Iver WTW. Moreover, the first option intercepted the boundary of Heathrow Airport whereas the second option avoided the airport altogether.

The indicative route joins the proposed Sunnymeads 1 route north of the reservoir to the proposed Iver 2 WTW. Drinking water from Iver 2 would follow the proposed Iver 2 to Harefield route described above.

4.5.2.7 Lower Thames Reservoir to Iver 2 Raw Water (Lower Thames Reservoir Transfer 2a)

This option conveys water from the proposed Wraysbury Tunnel Connection to the proposed Iver 2 WTW. The section of pipeline between the Wraysbury 100" Tunnel connection and Iver 2 is relatively short (about 2km) and passes alongside the M25 motorway before deviating to the East towards the proposed WTW at Iver 2. Drinking water from Iver 2 would then follow the proposed Iver 2 to Harefield route described above.

The indicative route assessed for this option avoids crossing the M25 and is constrained by the adjacent Farlows Lake. If this option is selected for further study, then the feasibility of passing between the lake and the motorway will need to be confirmed and, if found to be not practical, less direct routes may need to be investigated.

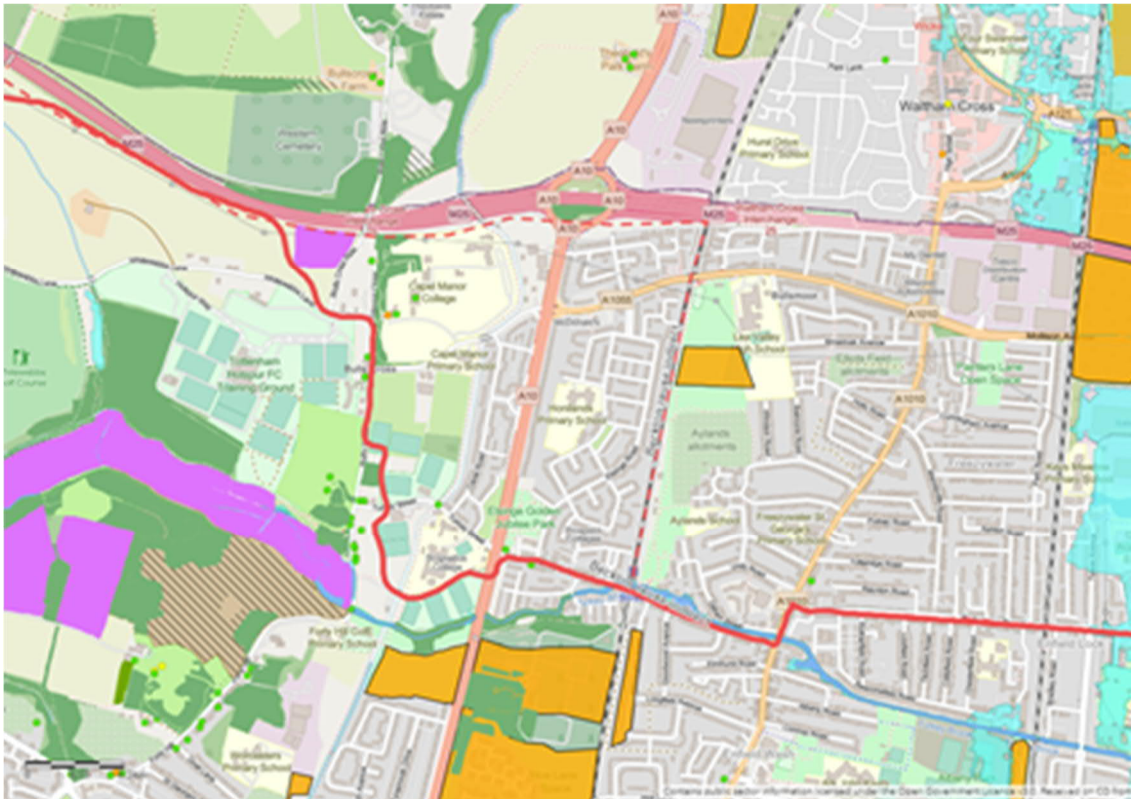
4.5.2.8 River Lee to North Mymms Raw Water (Beckton Reuse Indirect)

The raw water transfer component of the Beckton Indirect Reuse option conveys water from the proposed River Lee abstraction point to the proposed North Mymms WTW. The initial section of this routes passes through the urban area of Enfield before passing through a more rural area in its latter half. Although a large section of the route passes through a collection of open fields, there were significant number of environmental and land use designations (primarily ancient woodland, priority habitats and landfill sites) which constrained the route.

Two routes were considered for the exit point of the pipeline from the initial urban area south of Waltham Cross as shown in Figure 4.22:

- a route that passes along a road and through fields adjacent to a railway line, then runs adjacent to the M25, before opening into fields after the M25 Junction 25 roundabout (dashed red line)
- A route, south of the above route, that passes through open fields but in close vicinity to a priority habitat (solid red line)

Figure 4.22: Beckton Indirect Reuse Indicative Route South of Waltham Cross



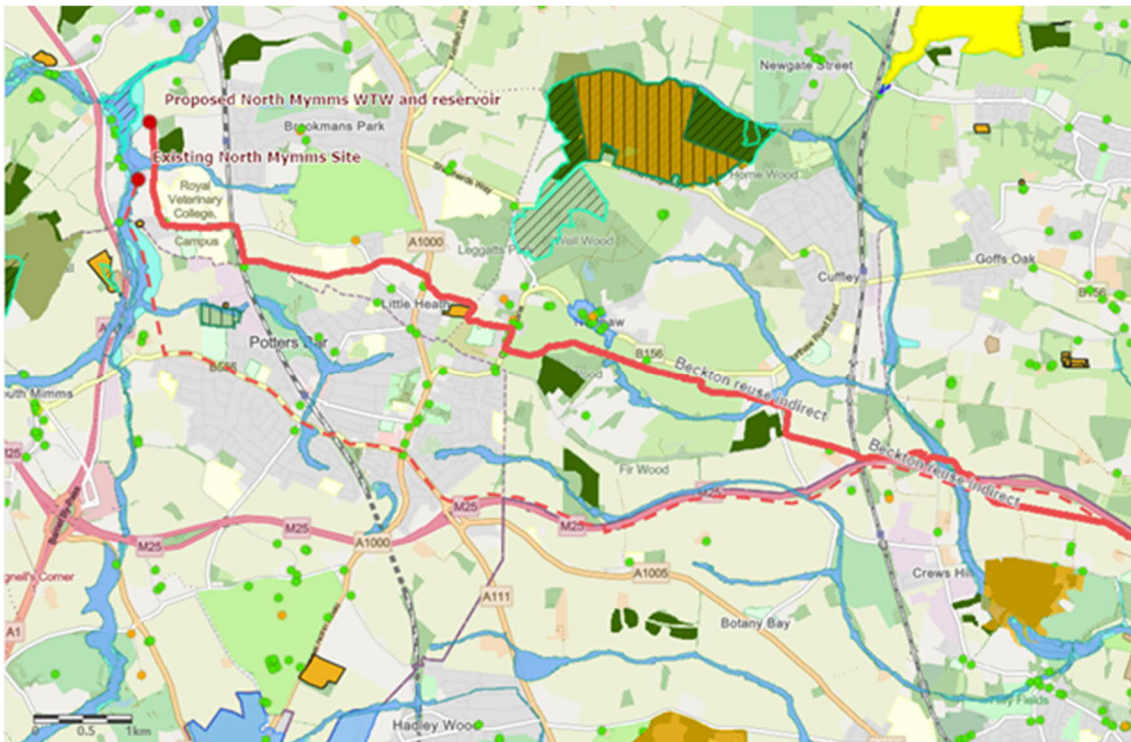
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The second option was chosen for the indicative route as it allowed the pipeline to take advantage of the open fields before running alongside the M25. It would also result in less disruption to existing utilities and roads during construction and avoid working adjacent to the railway.

For the section of pipeline running from Waltham Cross to Potters Bar and North Mymms, multiple routes were considered including the two shown in Figure 4.23:

- A longer route that diverts away from the M25 at a later point and passes through Potters Bar before reaching North Mymms (dashed red line)
- A significantly shorter route north of the above route which passes through a more rural setting (solid red line)

Figure 4.23: Beckton Indirect Reuse Indicative Route Waltham Cross to Potters Bar



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The second option was chosen for the indicative route to take advantage of the open fields and avoid Potters Bar. This would also result in a significantly shorter pipeline and less disruption to the local community of Potters Bar.

4.5.2.9 North Mymms to Brookmans Park Drinking Water (Beckton Reuse Indirect)

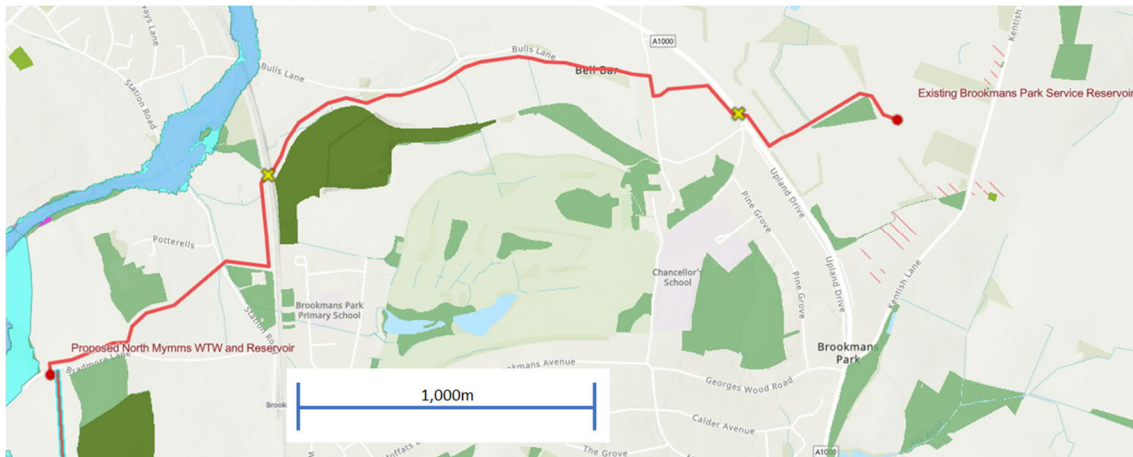
The drinking water transfer component of the Beckton Indirect Reuse option conveys water from the proposed North Mymms WTW to the existing Brookmans Park service reservoir. This component has been added since Gate 1 to supplement the existing transfer capacity from North Mymms to Brookmans Park and the WRSE database has been updated accordingly.

Although a large section of the indicative route passes through a collection of open fields, there were significant number of environmental and land use designations (primarily ancient woodland, priority habitats and landfill sites) which constrained the route.

From the proposed North Mymms WTW, the pipeline runs north-east, through open field, crossing two minor roads and a railway track. The initial north-east bearing avoids Brookmans Park Primary School, adjacent housing, Brookmans Park golf course and a number of small areas of woodland. After crossing the railway track, the route follows an easterly bearing. To avoid woodland and housing, a short section of the pipeline is routed for 360m along minor roads, namely Bulls Lane and Bell Lane. From Bell Lane, the pipeline is routed through open field, crossing the A1000 at a point where non-developed fields simplify approach alignments and enters the Brookmans Park service reservoir compound at the north-west corner, thereby avoiding crossing the Brookmans Park transmitting station site and access road.

The indicative route is shown in Figure 4.24.

Figure 4.24: Indicative Pipeline Route: North Mymms to Brookmans Park



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5 Environmental Appraisal

5.1 Environmental Appraisal

5.1.1 Iterative Environmental Appraisal Process

An iterative process of environmental appraisal has been undertaken in the development of the T2AT options, which aligns with the requirements of relevant legislation and national and local planning policy including the draft National Policy Statement for Water Resources (NPS)²⁴ and the National Planning Policy Framework (NPPF)²⁵ (see Section 5.1.2 for further information on these requirements).

The iterative environmental appraisal process undertaken to date has comprised the following steps:

- Options identification and screening considering environmental criteria as outlined in Chapter 3.
- Initial infrastructure siting and routing considering environmental criteria as outlined in Chapter 4.
- Environmental assessments of options undertaken by WRSE in January 2021, in-line with the methodology in the WRSE guidance²⁶:
 - Habitats Regulations Assessment (HRA) Stage 1: Test of Likely Significance (Screening Assessment)
 - WFD Assessment Level 1: Basic Screening²⁷
 - SEA
 - Natural Capital Assessment and Biodiversity Net Gain
- Environmental assessments carried out prior to the Gate 1 submission, which followed further refinement of infrastructure siting and pipeline route optimisation:
 - Updated Stage 1 HRA and Stage 2 Appropriate Assessment, if required, in accordance with the WRSE guidance²⁶.
 - Updated Level 1 WFD Basic Screening and Level 2 Detailed Impact Screening, if required, in accordance with the WRSE guidance²⁶.
 - Consideration of local level data (Local Wildlife Sites (LWS) and Tree Preservation Orders (TPO)) in-line with the methodology in the ACWG guidance²⁸.
 - Review of SEA against refined options to confirm any changes to the WRSE metrics²⁹.

²⁴ [Draft National Policy Statement for Water Resources Infrastructure – DEFRA - 2019](#)

²⁵ [National Planning Policy Framework - Ministry of Housing, Communities & Local Government - 2019 \(since revised in 2021\)](#)

²⁶ [Regional Plan Environmental Assessment Methodology Guidance- WRSE - June 2020](#)

²⁷ Further information on WFD classification and the approach adopted can be found in: WFD: Consistent Framework for Undertaking No Deterioration Assessments - ACWG - Nov 2020.

²⁸ WRMP Environmental Assessment Guidance and Applicability with SROs – ACWG - October 2020.

²⁹ Comprising SEA (aggregated pre- and post-mitigation, positive and negative scores), HRA (construction and operation, no Likely Significant Effects (LSE), LSE, Uncertain), WFD (no further WFD assessment required, Level 2 WFD assessment required. Level 2 undertaken and further assessment required), BNG (on-site baseline – habitat units, total net unit change – habitat units), Natural Capital (monetised change in value of ecosystem services, £/year).

- Invasive non-native species (INNS) risk assessment.
- Assessment of opportunities for net zero carbon contributions (see Section 5.4 below).
- Consideration of wider benefits including societal benefits and environmental net gain.

Post Gate 1 submission, the following steps are being undertaken:

- Further option refinement through back-checking of the options.
- Stakeholder engagement with Local Planning Authorities and Historic England.

The environmental assessments to date have been prepared based upon published data and information provided by WRSE and from third party organisations. A Geographic Information System (GIS) tool was developed to hold location specific baseline information and used during the options assessment to provide more detailed information to enable the assessment of effects. The information used was the most up-to-date available at the time of the assessments, however it is possible that conditions may change over time.

No data was available online or received from the Councils at the time of writing for:

- LWS and CWS data: Chiltern Council, Runnymede Council, Windsor and Maidenhead Council, and Wycombe Council.
- TPO data: Chiltern Council, Epping Forest Council, Kingston Council, South Bucks Council, Three Rivers Council, Richmond Council, Windsor and Maidenhead Council, and Wycombe Council.

Further environmental appraisal to refine the options in terms of pipeline routing and infrastructure siting is being undertaken for those options which are being developed for the Gate 2 submission. The aim of this appraisal is to reduce impacts and identify mitigation measures and opportunities for environmental and societal benefits. An EIA is anticipated in due course to support submission of an application for planning consent, potentially through a Development Consent Order (DCO).

5.1.2 Key Legislation and Planning Policy Drivers

Table 5.1 provides details of each environmental assessment undertaken for Gate 1, including the underpinning key legislation and planning policy drivers.

Table 5.1: Summary of Gate 1 Environmental Assessments

Assessment / Topic	Key information used in environmental assessments	Key legislation and planning policy
Habitats Regulations Assessment	Habitats Sites (SPA, SAC and Ramsar site) Stage 1 HRA – no Likely Significant Effects (LSE), LSE, LSE, Uncertain effects on the integrity of Habitats Sites Stage 2 Appropriate Assessment (if LSE or Uncertain) – no significant adverse effects or significant adverse effects on the integrity of Habitats Sites	Key legislation: Conservation of Habitats and Species Regulations 2017 Draft NPS: Section 3.3 (Habitats Regulations Assessment) and 4.3 (Biodiversity and nature conservation) NPPF: Section 15 (conserving and enhancing the natural environment), paragraphs 174-175, 179-182.
WFD	WFD waterbodies Level 1 WFD Basic Screening – pass or proceed to Level 2 for identified waterbodies Level 2 Detailed Impact Screening – further work carried out to identify potential	Key legislation: Water Environment (WFD) (England and Wales) Regulations 2017 Draft NPS: Section 4.15 (Water quality and resources)

Assessment / Topic	Key information used in environmental assessments	Key legislation and planning policy
	deterioration risk and measures required to reduce risk.	NPPF: Section 15 (conserving and enhancing the natural environment), paragraph 174.
SEA	SEA matrices for each option undertaken by WRSE using seven-point scale from major negative to major positive.	
Biodiversity, flora and fauna	Statutory designated sites (SPA, SAC, Ramsar site, SSSI, NNR, LNR) Non-statutory designated sites (LWS and CWS) Ancient Woodland Priority habitats	Key legislation: Conservation of Habitats and Species Regulations 2017, Wildlife and Countryside Act 1981, Natural Environment and Rural Communities Act 2006 Draft NPS: Section 3.3 (Habitats Regulations Assessment) and 4.3 (biodiversity and nature conservation) NPPF: Section 15 (conserving and enhancing the natural environment), paragraphs 174-175, 179-182.
Soils	Agricultural Land Classification Landfill sites – authorised and historic	Key legislation: Environmental Protection Act 1990, Draft NPS: Section 4.10 (land use including open space, green infrastructure and Green Belt), and 4.13 (socio-economic impacts) NPPF: Section 15 (conserving and enhancing the natural environment), paragraphs 174-175 and 183-184.
Water	EA Flood Defences EA Main Rivers Flood Zones 2 and 3 Surface Water Features WFD waterbodies Source Protection Zones	Key legislation: Water Environment (WFD) (England and Wales) Regulations 2017 Draft NPS: Section 4.15 (water quality and resources) and 4.8 (flood risk) NPPF: Section 14 (meeting the challenge of climate change, flooding and coastal change), paragraphs 159-169; Section 15 (conserving and enhancing the natural environment), paragraph 174.
Air	Air Quality Management Areas	Key legislation: The Air Quality Standards Regulations 2010/1001 Draft NPS: Section 4.2 (air quality) and 4.6 (dust, odour, artificial light, smoke and steam) NPPF: Section 15 (conserving and enhancing the natural environment), paragraph 186.
Climatic factors	Option carbon data	Key legislation: Climate Change Act 2008 Draft NPS: Section 4.4 (carbon emissions) NPPF: Section 14 (meeting the challenge of climate change, flooding and coastal change), paragraphs 154-158
Landscape	Areas of Outstanding Natural Beauty National Character Areas Green Belt land National Park	Key legislation: Countryside and Rights of Way Act 2000 Draft NPS: Section 4.9 (landscape and visual impacts) NPPF: Section 12 (achieving well-design places); 15 (conserving and enhancing the natural environment), paragraphs 174-177.
Historic environment	Listed buildings: - Grade I listed structures - Grade II* listed structures - Grade II listed structures Registered Parks and Gardens: - Grade I Registered Parks and Gardens - Grade II* Registered Parks and Gardens - Grade II Registered Parks and Gardens Protected Wrecks	Key legislation: Ancient Monuments and Archaeological Areas Act 1979 and Planning (Listed Buildings and Conservation Areas) Act 1990 Draft NPS: Section 4.7 (historic environment) NPPF: Section 16 (conserving and enhancing the historic environment), paragraphs 189-208.

Assessment / Topic	Key information used in environmental assessments	Key legislation and planning policy
	Registered Battlefields Scheduled Monuments Conservation Areas World Heritage Sites	
Population and human health	Noise action important area Indices of Multiple Deprivation 2015 Functional site (schools, medical facilities) OS Greenspace dataset (allotments, bowling green, cemetery, golf course, sports facility, play space, playing field, public park or garden, religious grounds, tennis courts) Country Parks (Natural England dataset) National Parks	Key legislation: Environmental Protection Act 1990 Draft NPS: Section 4.10 (land use including open space, green infrastructure and Green Belt), 4.11 (noise and vibration) and 4.13 (socio-economic impacts) NPPF: Section 8 (promoting healthy and safe communities), Section 12 (achieving well-designed places), Section 15 (conserving and enhancing the natural environment), paragraph 185 Other: Noise Policy Statement for England, Defra, 2010
Material assets	Transport: - Major roads – A roads - Major roads motorway - Railway line - National cycle route - National trails	Key legislation: Environmental Protection Act 1990, The Environmental Permitting (England and Wales) Regulations 2016, The Waste (England and Wales) Regulations 2011 Draft NPS: Section 4.12 (resource and waste management) and 4.14 (traffic and transport) NPPF: Section 8 (promoting healthy and safe communities)
Invasive Non-Native Species (INNS) Risk Assessment	INNS risk assessment	Key legislation: Wildlife and Countryside Act 1981, INNS (Amendment etc.) (EU Exit) Regulations 2019, Invasive Alien Species (Enforcement & Permitting) Order 2019 Draft NPS: Section 4.15 (water resources and quality), para 4.15.9 NPPF: N/A
Natural Capital Assessment and Biodiversity Net Gain	Natural Capital Assessment Ecosystem Services Assessment Biodiversity Net Gain	Key legislation: N/A Draft NPS: Section 3.4 (environmental net gain) and 4.3 (biodiversity and nature conservation) NPPF: Section 15 (conserving and enhancing the natural environment), paragraphs 174-175, 179-180.

5.2 Environmental Appraisal Commentary

This section provides an environmental appraisal summary for each of the T2AT options with consideration given to the key legislation and planning policy drivers in Table 5.1. Appendix F provides a summary of the Gate 1 assessments and the key impacts and mitigation identified for each of the T2AT options. Commentary is then provided on factors that differentiate the options.

5.2.1 Maidenhead

Table 5.2 presents the environmental appraisal summary for the Maidenhead option. Please refer to Appendix F (Tables F.1 and F.2) for more information.

Table 5.2: Maidenhead Option – Environmental Appraisal Summary

Assessment / Topic	Environmental Appraisal Summary
Habitats Regulations Assessment	No adverse effects on the integrity of the Burnham Beeches SAC considered likely. No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar expected, subject to confirmation that increased abstraction from the River Thames would not affect groundwater interactions.
WFD	Precautionary WFD compliance risks identified due to abstraction and additional intake structure required, and potential impediments to meeting Good Ecological Status if the hydrological regime of the Thames (Reading to Cookham) waterbody was affected to the extent that phosphate concentrations could increase.
SEA	
Biodiversity, flora and fauna	Potential for indirect negative effects on statutory designated sites during construction. Direct negative effects due to loss of priority habitat. Potential indirect negative effects on areas of Ancient Woodland within 500m of the indicative pipeline route. Direct and indirect negative effects on multiple LWS/SINC/SNCIs.
Soils	Permanent loss of Grade 3 agricultural land for abstraction point and WTW. Indicative pipeline route passes through a historic landfill site and in proximity to other authorised and historic landfills.
Water	Above ground component in Flood Zone 1 with construction within Flood Zones 2 and 3. Potential for negative effects on water quality of nearby waterbodies during construction. Potential for negative effects on water flows, levels and quality during operation.
Air	Temporary negative effects on air quality during construction. Indicative locations for the pumping station and WTW are not within an AQMA.
Climatic factors	Minor negative construction and moderate negative operational carbon emissions. Resilience of the local environment to climate change may be negatively affected as abstraction is proposed.
Landscape	Permanent effects on landscape due to above ground component. Indicative pipeline is within close proximity to the Chilterns AONB. Direct negative effects on at least one TPO.
Historic environment	Indicative pipeline route passes through Hedsor House Grade II Registered Park and Garden and Hall Barn Grade II Registered Park and Garden. There is a Grade II listed building (London Coal Duty Marker on County Boundary about 150 metres south east of Woodcock Hill Farm House (the house itself is not listed) within 500m of the indicative site for the new Harefield WTW although no setting effects are likely as a result of the WTW.
Population and human health	Temporary disruption to local community and users of community facilities, and temporary disruption to public rights of way and a national cycle route and two golf courses, is likely during construction. No loss of community facilities or recreational assets as a result of above ground component. Possible effects on local communities and human health during operation of WTW.
Material assets	Indicative pipeline route crosses major roads (including M25, M40 and A412), a railway line and National Cycle Network Route 6.
INNS Risk Assessment	Considered unlikely at this stage that this option would contravene INNS legislation
Natural Capital Assessment and Biodiversity Net Gain	Temporary loss of natural capital and ecosystem services as a result of the pipeline and permanent loss as a result of above ground component. Net loss of biodiversity.

Considering the key legislation and national planning policy outlined in Table 5.1, and with the information available at this stage, it is not considered that there are any insurmountable environmental issues that should prevent this option from progressing. A summary of key risks is outlined below.

- Confirmation is required that increased abstraction from the River Thames would not affect groundwater interactions to support the conclusion of no significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar.
- Further WFD assessment is required to address the precautionary WFD compliance risks identified.
- Potential indirect effects on statutory designated sites and direct effects on non-statutory designated sites and priority habitat would require further consideration in terms of draft NPS Section 4.3 and NPPF Section 15 (paragraph 180).
- The permanent loss of Grade 3 agricultural land would require further consideration in terms of draft NPS Section 4.10 (paragraphs 4.10.3 and 4.10.12) and NPPF Section 15 (paragraphs 174-175).
- The proximity of the Chilterns AONB to the pipeline route would require further consideration in terms of draft NPS Section 4.9 (paragraphs 4.9.6 to 4.9.7 and NPPF Section 16 (paragraphs 176-177). However, as noted in the draft NPS (Table 9), since the pipeline would be underground, "*the [operational] impacts of subsurface pipelines are likely to be negligible*".
- The indicative pipeline route would pass through Hedsor House Grade II Registered Park and Garden and Hall Barn Grade II Registered Park and Garden, which would require further consideration in terms of draft NPS Section 4.7 (paragraphs 4.7.11 to 4.7.25 and NPPF Section 16 (paragraphs 199-202).

5.2.2 Sunnymeads 1

Table 5.3 presents the environmental appraisal summary for the Sunnymeads 1 option. Please refer to Appendix F (Tables F.3 and F.4 for more information.

Table 5.3: Sunnymeads 1 Option – Environmental Appraisal Summary

Assessment / Topic	Environmental Appraisal Summary
Habitats Regulations Assessment	No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar expected, if the suggested mitigation measures in the HRA Stage 2: Appropriate Assessment are implemented. These include both standard construction good practice measures and construction methods.
WFD	No further assessment would be necessary for the option, because the types of activities do not present a risk to WFD status or objectives for any waterbodies.
SEA	
Biodiversity, flora and fauna	Indirect negative effects on statutory designated sites during construction. Direct negative effects due to loss of priority habitat. Potential indirect negative effects on areas of Ancient Woodland within 500m of the indicative pipeline route. Direct and indirect negative effects on multiple LWS/SINC/SNCIs.
Soils	Permanent loss of Grade 3 agricultural land Indicative pipeline route passes through several historic landfill sites and in proximity to other authorised and historic landfills.
Water	Above ground component in Flood Zone 1 with construction within Flood Zones 2 and 3.

Assessment / Topic	Environmental Appraisal Summary
	Potential for negative effects on water quality of nearby waterbodies during construction. Potential for negative effects on water flows, levels and quality during operation.
Air	Temporary negative effects on air quality during construction. WTW not within an AQMA.
Climatic factors	Minor negative construction and major negative operational carbon emissions. Resilience of the local environment to climate change may be negatively affected as abstraction is proposed.
Landscape	Permanent effects on landscape due to above ground component. Direct negative effects on at least two TPOs.
Historic environment	Indicative pipeline route passes through Harefield Village Conservation Area and in close proximity to several listed buildings and Harefield Place Grade II Registered Park and Garden. No permanent impact on setting anticipated. There is a Grade II listed building (London Coal Duty Marker on County Boundary about 150 metres south east of Woodcock Hill Farm House (the house itself is not listed) within 500m of the indicative site for the new Harefield WTW although no setting effects are likely as a result of the WTW.
Population and human health	Temporary disruption to local community and users of community facilities, and temporary disruption to public rights of way and three national cycle route, is likely during construction. No loss of community facilities or recreational assets as a result of above ground component. Possible effects on local communities and human health during operation of WTW.
Material assets	Indicative pipeline route crosses major roads (including A4 and A40), railways and three National Cycle Network Routes (0, 6 and 61).
INNS Risk Assessment	Considered unlikely at this stage that this option would contravene INNS legislation
Natural Capital Assessment and Biodiversity Net Gain	Temporary loss of natural capital and ecosystem services as a result of the pipeline and permanent loss as a result of above ground component. Net loss of biodiversity.

Considering the key legislation and national planning policy outlined in Table 5.1, and with the information available at this stage, it is not considered that there any insurmountable environmental issues that should prevent this option from progressing. A summary of key risks is outlined below.

- Mitigation measures would be required to ensure no significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar.
- Potential indirect effects on statutory designated sites and direct effects on non-statutory designated sites and priority habitat would require further consideration in terms of draft NPS Section 4.3 and NPPF Section 15 (paragraph 180).
- The permanent loss of Grade 3 agricultural land would require further consideration in terms of draft NPS Section 4.10 (paragraphs 4.10.3 and 4.10.12) and NPPF Section 15 (paragraphs 174-175).
- The indicative pipeline route would pass through the Harefield Village Conservation Area, which may require further consideration in terms of draft NPS Section 4.7 (paragraphs 4.7.11 to 4.7.25 and NPPF Section 16 (paragraphs 199-202).

5.2.3 Teddington DRA

Table 5.4 presents the environmental appraisal summary for the Teddington DRA option. Please refer to Appendix F (Tables F.5 and F.6) for more information.

Table 5.4: Teddington DRA Option – Environmental Appraisal Summary

Assessment / Topic	Environmental Appraisal Summary
Habitats Regulations Assessment	No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar or Richmond Park SAC are considered likely as no transmission pathways were identified by which a Likely Significant Effect could reasonably occur.
WFD	Precautionary WFD compliance risks identified due to abstraction and additional intake structure required, although it is noted that the impacts may be spatially limited when considered at the scale of the waterbody given the location at the downstream extent/boundary. Also, potential impediments were identified to meeting Good Ecological Status, as the hydrological regime of the waterbody does not support good status, due in part to changes in natural flow of the waterbody attributed to water industry activities.
SEA	
Biodiversity, flora and fauna	Indirect negative effects on statutory designated sites during construction. Direct negative effects due to loss of priority habitat. Potential indirect negative effects on areas of Ancient Woodland within 500m of the indicative pipeline route. Direct and indirect negative effects on multiple LWS/SINC/SNCIs.
Soils	Permanent loss of Grade 3 agricultural land Indicative pipeline route passes through several historic landfill sites and in proximity to other authorised and historic landfills.
Water	Above ground component in Flood Zone 1 with construction within Flood Zones 2 and 3. Potential for negative effects on water quality of nearby waterbodies during construction. Potential for negative effects on water flows, levels and quality during operation.
Air	Temporary negative effects on air quality during construction. Abstraction point is within Kingston upon Thames AQMA. WTW not within an AQMA.
Climatic factors	Minor negative construction and major negative operational carbon emissions. Resilience of the local environment to climate change may be negatively affected as abstraction is proposed.
Landscape	Permanent effects on landscape due to above ground component. Direct negative effects on at least twelve TPOs.
Historic environment	Indicative location of the abstraction point within the Riverside Conservation Area. Indicative pipeline route passes through ten conservation areas and in close proximity to several listed buildings. No permanent impact on setting anticipated. There is a Grade II listed building (London Coal Duty Marker on County Boundary about 150 metres south east of Woodcock Hill Farm House (the house itself is not listed) within 500m of the indicative site for the new Harefield WTW although no setting effects are likely as a result of the WTW.
Population and human health	Temporary disruption to local community and users of community facilities, and temporary disruption to public rights of way and several community and greenspaces, is likely during construction. No loss of community facilities or recreational assets as a result of above ground component but indicative location of the abstraction point is within the grounds of the YMCA Hawker playing fields and in proximity to Thames Path National Trail. Possible effects on local communities and human health during operation of WTW.
Material assets	Indicative pipeline route crosses major roads (including M4 and A4) and railways.
INNS Risk Assessment	Considered unlikely at this stage that this option would contravene INNS legislation
Natural Capital Assessment and Biodiversity Net Gain	Temporary loss of natural capital and ecosystem services as a result of the pipeline and permanent loss as a result of above ground component. Net loss of biodiversity.

Considering the key legislation and national planning policy outlined in Table 5.1, and with the information available at this stage, it is not considered that there any insurmountable environmental issues that should prevent this option from progressing. A summary of key risks is outlined below.

- Further WFD assessment is required to address the precautionary WFD compliance risks identified.
- Potential indirect effects on statutory designated sites and direct effects on non-statutory designated sites and priority habitat would require further consideration in terms of draft NPS Section 4.3 and NPPF Section 15 (paragraph 180).
- The permanent loss of Grade 3 agricultural land would require further consideration in terms of draft NPS Section 4.10 (paragraphs 4.10.3 and 4.10.12) and NPPF Section 15 (paragraphs 174-175).
- The abstraction point would be within the Kingston upon Thames AQMA, which may require further consideration depending on the infrastructure required and anticipated emissions.
- The abstraction point would be within the Riverside Conservation Area, which would require further consideration in terms of draft NPS Section 4.7 (paragraphs 4.7.11 to 4.7.25 and NPPF Section 16 (paragraphs 199-202).
- The pipeline would pass through ten conservation areas, which may require further consideration in terms of draft NPS Section 4.7 (paragraphs 4.7.11 to 4.7.25 and NPPF Section 16 (paragraphs 199-202).
- The indicative location of the abstraction point is within the grounds of the YMCA Hawker playing fields, which may require further consideration in terms of draft NPS Section 4.10 (paragraph 4.10.9 and NPPF Section 8 (paragraph 93).

5.2.4 Sunnymeads 2a

Table 5.5 presents the environmental appraisal summary for the Sunnymeads 2a option. Please refer to Appendix F (Tables F.7 and F.8) for more information.

Table 5.5: Sunnymeads 2a Option – Environmental Appraisal Summary

Assessment / Topic	Environmental Appraisal Summary
Habitats Regulations Assessment	No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar expected, if the suggested mitigation measures in the HRA Stage 2: Appropriate Assessment are implemented. These include both standard construction good practice measures and construction methods.
WFD	No further assessment would be necessary for the option, because the types of activities do not present a risk to WFD status or objectives for any waterbodies.
SEA	
Biodiversity, flora and fauna	Indirect negative effects on statutory designated sites during construction. Direct negative effects due to loss of priority habitat. Potential indirect negative effects on areas of Ancient Woodland within 500m of the indicative pipeline route. Direct and indirect negative effects on multiple LWS/SINC/SNCIs.
Soils	Pipeline passes through several historic landfill sites and in proximity to other authorised and historic landfills.
Water	Above ground component in Flood Zone 1 with construction within Flood Zones 2 and 3. Potential for negative effects on water quality of nearby waterbodies during construction. Potential for negative effects on water flows, levels and quality during operation.
Air	Temporary negative effects on air quality during construction. Indicative site for the WTW is within an AQMA.
Climatic factors	Minor negative construction and major negative operational carbon emissions.

Assessment / Topic	Environmental Appraisal Summary
	Resilience of the local environment to climate change may be negatively affected as abstraction is proposed.
Landscape	Permanent effects on landscape due to above ground component. Direct negative effects on at least two TPOs.
Historic environment	Indicative pipeline route passes through Harefield Village Conservation Area and in close proximity to several listed buildings and Harefield Place Grade II Registered Park and Garden. No permanent impact on setting. Cowley Lock Conservation Area and two Grade II listed buildings (Delaforde Manor and Dovecote at Delaforde Manor) are within 500m of the indicative site for the new Iver 2 WTW with potential for setting effects.
Population and human health	Temporary disruption to local community and users of community facilities, and temporary disruption to public rights of way and three national cycle routes, is likely during construction. No loss of community facilities or recreational assets as a result of above ground component. Possible effects on local communities and human health during operation of WTW.
Material assets	Indicative pipeline route crosses major roads (including M25, A4 and A40), railways and three National Cycle Network Routes (0, 6 and 61).
INNS Risk Assessment	Considered unlikely at this stage that this option would contravene INNS legislation
Natural Capital Assessment and Biodiversity Net Gain	Temporary loss of natural capital and ecosystem services as a result of the pipeline and permanent loss as a result of above ground component. Net loss of biodiversity.

Considering the key legislation and national planning policy outlined in Table 5.1, and with the information available at this stage, it is not considered that there any insurmountable environmental issues that should prevent this option from progressing. A summary of key risks is outlined below.

- Mitigation measures would be required to ensure no significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar.
- Potential indirect effects on statutory designated sites and direct effects on non-statutory designated sites and priority habitat would require further consideration in terms of draft NPS Section 4.3 and NPPF Section 15 (paragraph 180).
- Indicative site for the WTW is within an AQMA, which would require further consideration depending on the infrastructure required and anticipated emissions.
- The indicative pipeline route would pass through the Harefield Village Conservation Area, which may require further consideration in terms of draft NPS Section 4.7 (paragraphs 4.7.11 to 4.7.25 and NPPF Section 16 (paragraphs 199-202).
- Cowley Lock Conservation Area and two Grade II listed buildings (Delaforde Manor and Dovecote at Delaforde Manor) are within 500m of the indicative site for the new Iver 2 WTW with potential for setting effects, which would require further consideration in terms of draft NPS Section 4.7 (paragraphs 4.7.11 to 4.7.25 and NPPF Section 16 (paragraphs 199-202).

5.2.5 Walton 2b and Mogden Reuse Indirect 3

Table 5.6 presents the environmental appraisal summary for the Walton 2b and Mogden Reuse Indirect 3 option. Please refer to Appendix F (Tables F.9 and F.10) for more information.

Table 5.6: Walton 2b and Mogden Reuse Indirect 3 Option – Environmental Appraisal Summary

Assessment / Topic	Environmental Appraisal Summary
Habitats Regulations Assessment	No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar expected, if the suggested mitigation measures in the HRA Stage 2: Appropriate Assessment are implemented. These include both standard construction good practice measures and construction methods.
WFD	Precautionary WFD compliance risks identified due to abstraction, and potential impediments to meeting Good Ecological Status as the hydrological regime of the waterbody (Thames (Egham to Teddington)) does not support good status, due in part to changes in natural flow of the waterbody attributed to water industry activities.
SEA	
Biodiversity, flora and fauna	Indirect negative effects on statutory designated sites during construction. Direct negative effects due to loss of priority habitat. Potential indirect negative effects on areas of Ancient Woodland within 500m of the indicative pipeline route. Direct and indirect negative effects on multiple LWS/SINC/SNCIs.
Soils	Pipeline passes through several historic landfill sites and in proximity to other authorised and historic landfills.
Water	Indicative site for the Mogden Reuse outfall is in Flood Zones 2 and 3. Other above ground component in Flood Zone 1 with construction within Flood Zones 2 and 3. Potential for negative effects on water quality of nearby waterbodies during construction. Potential for negative effects on water flows, levels and quality during operation.
Air	Temporary negative effects on air quality during construction. Indicative site for the Mogden Reuse outfall is located within the Spelthorne AQMA. Indicative site for the WTW is within an AQMA.
Climatic factors	Minor negative construction and moderate negative operational carbon emissions. Resilience of the local environment to climate change may be negatively affected as abstraction is proposed.
Landscape	Permanent effects on landscape due to above ground component. Direct negative effects on at least two TPOs.
Historic environment	Indicative site for the Mogden Reuse outfall is within 500m of Lower Halliford Conservation Area and several Grade II listed buildings, with potential for setting effects. Indicative pipeline route passes through Harefield Village Conservation Area and within 500m of other conservation areas, several listed buildings, some in close proximity (such as Barn to South of Huntsmoor Park Farmhouse and where the indicative pipeline route is aligned along existing roads), Great Fosters Grade II* Registered Park and Garden Harefield Place Grade II Registered Park and Garden. Cowley Lock Conservation Area and two Grade II listed buildings (Delaford Manor and Dovecote at Delaford Manor) are within 500m of the indicative site for the new Iver 2 WTW with potential for setting effects.
Population and human health	Temporary disruption to local community and users of community facilities, and temporary disruption to public rights of way and several community and greenspaces, is likely during construction. No loss of community facilities or recreational assets as a result of above ground component. Possible effects on local communities and human health during operation of WTW.
Material assets	Indicative pipeline route crosses major roads (including M25, M3 and M4), two railway lines and three National Cycle Network Routes (4, 6 and 61).
INNS Risk Assessment	Considered unlikely at this stage that this option would contravene INNS legislation
Natural Capital Assessment and Biodiversity Net Gain	Temporary loss of natural capital and ecosystem services as a result of the pipeline and permanent loss as a result of above ground component. Net loss of biodiversity.

Considering the key legislation and national planning policy outlined in Table 5.1, and with the information available at this stage, it is not considered that there any insurmountable environmental issues that should prevent this option from progressing. A summary of key risks is outlined below.

- Mitigation measures would be required to ensure no significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar.
- Potential indirect effects on statutory designated sites and direct effects on non-statutory designated sites and priority habitat would require further consideration in terms of draft NPS Section 4.3 and NPPF Section 15 (paragraph 180).
- Indicative site for the WTW is within an AQMA, which would require further consideration depending on the infrastructure required and anticipated emissions.
- The indicative site for the Mogden Reuse outfall is within 500m of Lower Halliford Conservation Area and several Grade II listed buildings, with potential for setting effects, which would require further consideration in terms of draft NPS Section 4.7 (paragraphs 4.7.11 to 4.7.25 and NPPF Section 16 (paragraphs 199-202).
- The indicative pipeline route would pass through the Harefield Village Conservation Area, which may require further consideration in terms of draft NPS Section 4.7 (paragraphs 4.7.11 to 4.7.25 and NPPF Section 16 (paragraphs 199-202).
- Cowley Lock Conservation Area and two Grade II listed buildings (Delaford Manor and Dovecote at Delaford Manor) are within 500m of the indicative site for the new Iver 2 WTW with potential for setting effects, which would require further consideration in terms of draft NPS Section 4.7 (paragraphs 4.7.11 to 4.7.25 and NPPF Section 16 (paragraphs 199-202).

5.2.6 Lower Thames Reservoir Transfer 2a

Table 5.7 presents the environmental appraisal summary for the Lower Thames Reservoir Transfer 2a option. Please refer to Appendix F (Tables F.11 and F.12) for more information.

Table 5.7: Lower Thames Reservoir Transfer 2a Option – Environmental Appraisal Summary

Assessment / Topic	Environmental Appraisal Summary
Habitats Regulations Assessment	No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar or Richmond Park SAC are expected subject to confirmation that the option is not expected to require a new license or an increase to peak abstraction from the Wraysbury Reservoirs.
WFD	No further assessment would be necessary for the option, because the types of activities do not present a risk to WFD status or objectives for any waterbodies.
SEA	
Biodiversity, flora and fauna	Indirect negative effects on statutory designated sites during construction. Direct negative effects due to loss of priority habitat. Potential indirect negative effects on areas of Ancient Woodland within 500m of the indicative pipeline route. Direct and indirect negative effects on multiple LWS/SINC/SNCIs.
Soils	Pipeline passes through several historic landfill sites and in proximity to other authorised and historic landfills.
Water	Above ground component in Flood Zone 1 with construction within Flood Zones 2 and 3. Potential for negative effects on water quality of nearby waterbodies during construction. Potential for negative effects on water flows, levels and quality during operation.

Assessment / Topic	Environmental Appraisal Summary
Air	Temporary negative effects on air quality during construction. Indicative site for the WTW is within an AQMA.
Climatic factors	Minor negative construction and operational carbon emissions. The water levels in the surrounding environment are not predicted to be significantly affected by the proposed pipeline, therefore is considered unlikely to affect resilience of the local environment to climate change.
Landscape	Permanent effects on landscape due to above ground component. Direct negative effects on at least two TPOs.
Historic environment	Indicative pipeline route passes through Harefield Village Conservation Area and within 500m of other conservation areas, several listed buildings, some in close proximity (such as Barn to South of Huntsmoor Park Farmhouse and where the indicative pipeline route is aligned along existing roads), Great Fosters Grade II* Registered Park and Garden Harefield Place Grade II Registered Park and Garden. Cowley Lock Conservation Area and two Grade II listed buildings (Delaford Manor and Dovecote at Delaford Manor) are within 500m of the indicative site for the new Iver 2 WTW with potential for setting effects.
Population and human health	Temporary disruption to local community and users of community facilities, and temporary disruption to public rights of way and several community and greenspaces, is likely during construction. No loss of community facilities or recreational assets as a result of above ground component. Possible effects on local communities and human health during operation of WTW.
Material assets	Indicative pipeline route crosses major roads (including M25, A4020 and A40) and two National Cycle Network Routes (6 and 61).
INNS Risk Assessment	Considered unlikely at this stage that this option would contravene INNS legislation
Natural Capital Assessment and Biodiversity Net Gain	Temporary loss of natural capital and ecosystem services as a result of the pipeline and permanent loss as a result of above ground component. Net loss of biodiversity.

Considering the key legislation and national planning policy outlined in Table 5.1, and with the information available at this stage, it is not considered that there any insurmountable environmental issues that should prevent this option from progressing. A summary of key risks is outlined below.

- Potential indirect effects on statutory designated sites and direct effects on non-statutory designated sites and priority habitat would require further consideration in terms of draft NPS Section 4.3 and NPPF Section 15 (paragraph 180).
- Indicative site for the WTW is within an AQMA, which would require further consideration depending on the infrastructure required and anticipated emissions.
- The indicative pipeline route would pass through the Harefield Village Conservation Area, which may require further consideration in terms of draft NPS Section 4.7 (paragraphs 4.7.11 to 4.7.25 and NPPF Section 16 (paragraphs 199-202).
- Cowley Lock Conservation Area and two Grade II listed buildings (Delaford Manor and Dovecote at Delaford Manor) are within 500m of the indicative site for the new Iver 2 WTW with potential for setting effects, which would require further consideration in terms of draft NPS Section 4.7 (paragraphs 4.7.11 to 4.7.25 and NPPF Section 16 (paragraphs 199-202).

5.2.7 Beckton Reuse Indirect

Table 5.8 presents the environmental appraisal summary for the Beckton Reuse Indirect option. Please refer to Appendix F (Tables F.13 and F.14) for more information.

Table 5.8: Beckton Reuse Indirect Option – Environmental Appraisal Summary

Assessment / Topic	Environmental Appraisal Summary
Habitats Regulations Assessment	No significant adverse effects on the integrity of the Lee Valley Ramsar / SPA expected, if the suggested mitigation measures in the HRA Stage 2: Appropriate Assessment are implemented. These include both standard construction good practice measures and construction methods.
WFD	No further assessment would be necessary for the option, because the types of activities do not present a risk to WFD status or objectives for any waterbodies.
SEA	
Biodiversity, flora and fauna	Indirect negative effects on statutory designated sites during construction. Direct negative effects due to loss of priority habitat. Potential indirect negative effects on areas of Ancient Woodland within 500m of the indicative pipeline route. Direct and indirect negative effects on multiple LWS/SINC/SNCIs.
Soils	Permanent loss of Grade 3 agricultural land. Indicative pipeline route does not pass-through historic landfill sites although it is in proximity to other authorised and historic landfills. The indicative sites for the River Lee Abstraction Point, channel and pumping station would be within 500m of a historic landfill site.
Water	Above ground component in Flood Zone 1 with construction within Flood Zones 2 and 3. Potential for negative effects on water quality of nearby waterbodies during construction. Potential for negative effects on water flows, levels and quality during operation.
Air	Temporary negative effects on air quality during construction. Indicative sites for the River Lee Abstraction Point, channel and pumping are not located within an AQMA, although the Enfield AQMA is within close proximity. WTW not within an AQMA.
Climatic factors	Minor negative construction and major negative operational carbon emissions. Resilience of the local environment to climate change may be negatively affected as abstraction is proposed.
Landscape	Permanent effects on landscape due to above ground component. Direct negative effects on at least four TPOs.
Historic environment	Listed buildings within 500m of indicative sites for the River Lee Abstraction Point, channel and pumping station with potential for setting effects Indicative pipeline route is within 500m of a conservation area, several listed buildings, a scheduled monument (Elsyng Palace) and Forty Hall Grade II Registered Park and Garden passes through ten conservation areas and in close proximity to several listed buildings. No permanent impact on setting. Listed buildings within 500m of the indicative site for the new North Mymms WTW, with potential for setting effects.
Population and human health	Temporary disruption to local community and users of community facilities, and temporary disruption to public rights of way and several community and greenspaces, is likely during construction. No loss of community facilities or recreational assets as a result of above ground component. Possible effects on local communities and human health during operation of WTW.
Material assets	Indicative sites for the River Lee Abstraction Point, channel and pumping station are within proximity to the A112. Indicative pipeline route crosses major roads (including M25, A10, A1000), railway lines and two National Cycle Network Routes (0 and 12). Indicative site for the new North Mymms WTW is within proximity to the A1(M) and National Cycle Network Route 6.
INNS Risk Assessment	Considered unlikely at this stage that this option would contravene INNS legislation
Natural Capital Assessment and Biodiversity Net Gain	Temporary loss of natural capital and ecosystem services as a result of the pipeline and permanent loss as a result of above ground component. Net loss of biodiversity.

Considering the key legislation and national planning policy outlined in Table 5.1, and with the information available at this stage, it is not considered that there any insurmountable

environmental issues that should prevent this option from progressing. A summary of key risks is outlined below.

- Mitigation measures would be required to ensure no significant adverse effects on the integrity of the Lee Valley Ramsar / SPA.
- Potential indirect effects on statutory designated sites and direct effects on non-statutory designated sites and priority habitat would require further consideration in terms of draft NPS Section 4.3 and NPPF Section 15 (paragraph 180).
- The permanent loss of Grade 3 agricultural land would require further consideration in terms of draft NPS Section 4.10 (paragraphs 4.10.3 and 4.10.12) and NPPF Section 15 (paragraphs 174-175).
- There are listed buildings within 500m of the indicative site for the new North Mymms WTW and the River Lee Abstraction Point, channel and pumping station with potential for setting effects, which would require further consideration in terms of draft NPS Section 4.7 (paragraphs 4.7.11 to 4.7.25 and NPPF Section 16 (paragraphs 199-202).

5.3 Carbon Footprint

A high-level carbon assessment was undertaken to review and summarise the net zero considerations for the T2AT options.

Table 5.9 presents the baseline estimates of operational and capital carbon emissions for each option. Note that the table only shows the carbon footprint of the T2AT transfer options themselves. Whichever option is selected will require supporting infrastructure both upstream to provide a source and downstream to distribute the transferred flow into the Affinity Water network which will have additional carbon footprint.

Table 5.9: Carbon Footprint of Options

Option	Carbon emissions			
	50MI/d option		100MI/d option	
	Operational Carbon Emissions at full capacity) * ('000 tCO ₂ e/yr)	Capital Carbon Emissions ('000tCO ₂ e)	Operational Carbon Emissions at full capacity) * ('000 tCO ₂ e/yr)	Capital Carbon Emissions ('000tCO ₂ e)
Sunnymeads 1	5.8	24	10.7	40
Maidenhead	5.7	22	10.4	38
Teddington DRA	6.5	31	11.8	52
Sunnymeads 2a	5.7	26	10.6	43
Walton 2b/ Mogden Reuse Indirect 3	6.9	38	12.1	64
Lower Thames Reservoir Transfer 2a	5.3	20	10.1	33
Beckton Indirect Reuse	5.3	23	9.8	39

*Estimated based on the CAW v14 grid power emissions factor of 0.277kg/kWh including transmissions and distribution losses.

As expected, the higher capital and operational carbon footprints are associated with the longer pipelines, such as those required for the Walton 2b and Teddington options, because these options will entail both more material and higher pumping head to overcome friction losses. The lowest capital carbon is associated with the Lower Thames Reservoir options because of the use of the existing reservoirs and the Wraysbury tunnel, avoiding construction of approximately 7km of new pipeline.

Both the Lower Thames Reservoir and the Beckton Reuse options have an operational carbon footprint which is lower than the other options, however it must be remembered that in both cases pumping is required which is not accounted for in the T2AT scheme; for the Lower Thames Reservoir options water has to be lifted from the River Thames into reservoirs, and for the Beckton Reuse options water has to be transferred from Beckton or Teddington.

5.4 Comparison of Environmental Risk

Table 5.10 presents a comparison of environmental risks associated with the T2AT options. At this stage, based upon a review of available information, none of the options present insurmountable issues that would prevent them progressing although there are areas of further investigation required as all options present risks in terms of the draft NPS or NPPF, as described in Section 5.2.

Table 5.10: Comparison of T2AT Options – Environmental Risk

Option	Habitats Regulations Assessment	WFD	SEA	INNS risk assessment	Biodiversity Net Gain and Natural Capital	Embodied Carbon	Operational Carbon
Maidenhead	No significant effects expected subject to confirmation that increased abstraction from the River Thames would not affect groundwater interactions.	Level 2 completed and further assessment needed	No insurmountable issues identified at this stage although further investigation required including impacts on biodiversity, potential loss of agricultural land, proximity of Chilterns AONB and historic environment.	INNS spread unlikely	Monetised change in value of ecosystem services and net loss of biodiversity lowest of all options	Similar to most other options	Similar to most other options.
Sunnymeads 1	Transmission pathways identified, however no significant effects expected if mitigation measures implemented	Does not present a risk to WFD status or objectives for any waterbodies	No insurmountable issues identified at this stage although further investigation required including impacts on biodiversity, potential loss of agricultural land, and historic environment.	INNS spread unlikely	Monetised change in value of ecosystem services and net loss of biodiversity higher than other options	Similar to most other options	Similar to most other options.
Teddington DRA	No transmission pathways – no likely significant effects	Level 2 completed and further assessment needed	No insurmountable issues identified at this stage although further investigation required including impacts on biodiversity, potential loss of agricultural land, historic environment and community assets.	INNS spread unlikely	Monetised change in value of ecosystem services and net loss of biodiversity highest of all options	Higher than most other options	Higher than most other options

Option	Habitats Regulations Assessment	WFD	SEA	INNS risk assessment	Biodiversity Net Gain and Natural Capital	Embodied Carbon	Operational Carbon
Sunnymeads 2a	Transmission pathways identified, however no significant effects expected if mitigation measures implemented	Does not present a risk to WFD status or objectives for any waterbodies	No insurmountable issues identified at this stage although further investigation required including <u>impacts on biodiversity, and historic environment.</u>	INNS spread unlikely	Monetised change in value of ecosystem services and net loss of biodiversity similar to most other options.	Similar to most other options.	Similar to most other options.
Walton 2b and Mogden Reuse Indirect 3	Transmission pathways identified, however no significant effects expected if mitigation measures implemented	Level 2 completed and <u>further assessment needed</u>	No insurmountable issues identified at this stage although further investigation required including <u>impacts on biodiversity and historic environment.</u>	INNS spread unlikely	Monetised change in value of ecosystem services and net loss of biodiversity higher than other options	Highest of all options	Highest of all options
Lower Thames Reservoir Transfer 2a	No transmission pathways – no likely significant effects	Does not present a risk to WFD status or objectives for any waterbodies	No insurmountable issues identified at this stage although further investigation required including <u>impacts on biodiversity and historic environment.</u>	INNS spread unlikely	Monetised change in value of ecosystem services and net loss of biodiversity similar to most other options.	Lowest of all options	Lower than most other options
Beckton Reuse Indirect	Transmission pathways identified, however no significant effects expected if mitigation measures implemented	Does not present a risk to WFD status or objectives for any waterbodies	No insurmountable issues identified at this stage although further investigation required <u>including impacts on biodiversity, loss of agricultural land and historic environment.</u>	INNS spread unlikely	Monetised change in value of ecosystem services and net loss of biodiversity similar to most other options.	Similar to most other options	Lowest of all options

5.5 Input from Environmental Regulators

The National Appraisal Unit (NAU) (comprising EA and Natural England) were consulted on the scope of the Gate 1 deliverables in February 2021, and on the draft Gate 1 deliverables in May 2021. A number of key issues were raised, most of which were resolved in the final Gate 1 deliverables. The remaining issues will be dealt with in increasing detail for the selected options as they progress. The key issues concerning the refinement of options are summarised below:

- Consideration of impact pathways for the interest features for designated nature conservation sites – this will be covered both in the Habitats Regulations Assessment and an initial desk-based assessment for biodiversity, flora and fauna.
- Consideration of impacts on functionally-linked habitat (this is habitat outside of the habitats site boundary which is used by species which are interest features of the site (e.g. feeding, roosting or breeding grounds)) – this will be covered in the Habitats Regulations Assessment.
- Consideration of lighting, including consideration of impacts on bird navigation, and noise, including types of noise e.g. impact noise vs vehicle movements, in rural locations – this will be covered in the Habitats Regulations Assessment and initial desk-based assessments for biodiversity, flora and fauna, landscape and noise.
- Consideration of critical loads for sensitive features if within 200m of roads, or for other types of emissions – this will be covered both in the Habitats Regulations Assessment and initial desk-based assessments for biodiversity, flora and fauna and air quality.
- Hydrological investigations, including groundwater, would be needed to inform project level appropriate assessment, but confidence is needed now that such impacts could be avoided or mitigated – this will be covered both in the Habitats Regulations Assessment and an initial desk-based assessment for biodiversity, flora and fauna. Pipeline construction methods will consider the potential impact on groundwater.
- Consider potential for increased flood risk, including impacts on the Lower Thames flood relief channel – this will be covered in an initial desk-based assessment for hydrology and flood risk.
- Screening of intake works linked to protecting fish/eels will be required on any new intake arrangement. Screening arrangements will also need to be reviewed where it is proposed to increase the abstraction rate.
- Consider opportunities for both terrestrial and aquatic enhancements/ improvements to be put in place as the work is completed, including habitat enhancement, and encouraging people to access the outdoors, which contributes to good mental and physical health – this will be covered both in an initial desk-based assessment for community and health and within the wider benefits study.

6 Planning Review

6.1 Planning Review Criteria

6.1.1 Overall Planning Considerations and Approach

Throughout this report, the consenting route is assumed to be as a DCO made under the Planning Act 2008 (PA2008)³⁰. Under PA2008, drinking water transfers with an output of more than 80 million litres per day qualify as NSIPs for which a Development Consent Order (DCO) must be sought. T2AT options that meet this threshold would need to be consented by means of a DCO. T2AT options below the 80 MI/d threshold or which were drinking water transfers may be consented by means of conventional (TCPA) planning applications to the local planning authorities for the areas through which the project would pass, unless the Secretary of State was to direct that the project nonetheless constituted a National Significant Infrastructure Project (NSIP). Therefore, it is noted that obtaining consent under the Town & Country Planning Act 1990 (TCPA1990) remains an option for the SRO, as is a Hybrid Bill or multiple NSIPs DCO submissions. The criteria chosen for the Planning Review are considered to apply to any of the consenting routes chosen, although it is acknowledged that the underlying planning policy context will differ. For example, the application and weight of Development Plan policy will vary between consenting routes.

6.1.2 Criteria for Planning Appraisal of Options

Table 6.1 sets out the criteria assessed for the Planning Review. It identifies how the data will be sourced and provides a description of each criterion.

Nationally important ecology and historic environmental considerations have not been included as part of this Planning Review, to avoid double counting, and are detailed in the SEA. Chapter 5 of this report provides a summary of the environmental assessments, including key environmental impacts and mitigation next steps for each option.

Table 6.1: Planning Review Criteria

Category	Feature/Receptor	Source	Description
Local Plan land use allocations	Major residential, commercial, mixed-use, employment and open space site allocations	Local Planning Authority – Development Plan Proposal Maps Manual Search	Land allocated by the local planning authority to ensure that enough land is available in appropriate locations to meet growth targets, including residential, commercial and employment. Sites and allocations that have been through examination forming part of adopted local plan documents.
Local plan land use allocations	Major development proposals (including those under construction)	Local Planning Authority – Development Plan Proposal Maps Manual Search	Major development proposals or sites designated in the Local Plan. This criterion would include major developments proposed or under construction, such as garden villages, new transport infrastructure and employment business uses.

³⁰ This assumption has been revisited at Gate. The Gate 2 planning strategy is described in Technical Supporting Document G: Planning, consenting and land acquisition strategy.

Category	Feature/Receptor	Source	Description
Land use constraints	Mineral Safeguarding Areas	Local Planning Authority / Mineral/Waste Planning Authority – Minerals and Waste Local Plan Manual Search	An area designated by Mineral/Waste Planning Authorities which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development.
Land use constraints	Green Belt	Department for Levelling Up, Housing and Communities (DLUHC) GIS data sets	A designation for land around certain cities and large built-up areas, which aims to keep this land permanently open or largely undeveloped. Originator for the data is the DLUHC.
Land use constraints	Area of Outstanding Great Natural Beauty (AONB)	Department for Levelling Up, Housing and Communities (DLUHC) GIS data sets	A designation for area of national landscape importance which aims to protect and manage the areas for visitors and local residents. Under the Countryside and Right of Way Act 2000, Natural England has the power to designate AONB in England that are outside national parks and that are considered to have such natural beauty it is desirable they are conserved and enhanced.
National Significant Infrastructure Projects (NSIPs)	Projects under consideration by the planning inspectorate	National Infrastructure Planning (PINS) Manual search	All Nationally Significant Infrastructure Project applications that the Planning Inspectorate is aware are planned to be submitted; those which are under examination; and those which have been decided.

A Red-Amber-Green (RAG) Rating Assessment has been undertaken to score each option and identify options where certain assets/sites represent a potentially high risk to obtaining DCO consent, as well as sites with the potential for significant impacts on receptors/ features associated with relevant national and local planning policy.

The RAG assessment has identified higher risk options according to the following general guiding principles:

- Red – the option is considered to represent a high risk to obtaining DCO consent;
- Amber – the option contains, or is in proximity to, sensitive receptors or features that could be adversely affected (directly or indirectly), which represents a lower risk to obtaining DCO consent;
- Green – the option contains, or is in proximity to, sensitive receptors or features unlikely to be adversely affected or are considered unlikely to pose a risk to obtaining DCO consent.

The criteria applied to the options for the Planning Review and the associated RAG thresholds are presented in Table 6.2. They have been developed through professional judgement and experience of other DCO options assessment work.

Table 6.2: RAG Rating Thresholds and Criteria

Planning Criterion	Red Threshold	Amber Threshold	Green Threshold	Justification
Local Plan land use allocations	On or encroachment upon allocations	Option is within 250m of allocations	Option is located further than 250m from allocations	Encroachment upon allocations is understood to be a high-risk to obtaining consent
Major development proposals (including those under construction)	On or encroachment upon major development proposals	Option is within 250m of major development proposals	Option is located further than 250m from major development proposals	Encroachment upon major development proposals is understood to be a high-risk to obtaining consent
Mineral Safeguarding Areas	The majority of the option is within Mineral Safeguarding Areas	A proportion of the option is within Mineral Safeguarding Areas	Option is not located within Mineral Safeguarding Areas	Encroachment upon Mineral Safeguarding Area is understood to be a high-risk to obtaining consent
Green Belt *	Major impact on openness and Green Belt purposes	Moderate impact on openness and Green Belt purposes	Minor or no impact on openness and Green Belt purposes	Adverse impacts on openness and Green Belt purposes are understood to be a high-risk to obtaining consent
AONBs	Major impact on AONB land or setting with no opportunity for mitigation	Moderate impact on AONB land or setting	Minor or no impact on AONB land or setting	Adverse impact on nationally designated landscapes is understood to be a high-risk to obtaining consent
NSIPs	On or encroachment of the project extent	Site within 1km of the project extent	Site is located further than 1km from the project extent	Encroachment upon the extent of a project is understood to be a high-risk to obtaining consent

* For each option, the total length of intersection with Green Belt land has been calculated in metres. This was calculated using ArcGIS online by overlaying the extent of the options on top of the national Green Belt dataset. Similar calculations have not been undertaken for other criteria, such as Mineral Safeguarding Areas, due to absent publicly available GIS data sets.

Note that for the planning criteria, the RAG scoring is set up such that a “red” assessment against any of the criteria is not necessarily a complete blocker to proceeding with that alternative.

6.1.2.1 Limitations

Manual searches have been carried out for the Planning Review using Local Planning Authority websites. In the absence of available digitised datasets covering the full extent of the study area, these manual searches rely on information made available by planning authorities in their Local Plans and on public access systems such as Web Viewers.

Whilst the most recent data is sought, it is acknowledged that data may contain errors, omissions or not produce the most up to date information. Manual searches have been undertaken with professional due diligence, but the complexity of obtaining information

through manual searches rather than the information being provided in a digital format may limit what is available at the time of the Planning Review. Further consultation with stakeholders will be conducted to ensure that site-specific features are captured.

6.2 Planning Review Commentary

6.2.1 Maidenhead

The scope of this option is to abstract raw water at a new Maidenhead intake, conveyance to a new WTW at Harefield service reservoir, and utilisation of available storage capacity at the exiting Harefield service reservoir.

Table 6.3 sets out the Planning Review RAG Results for the Maidenhead option.

Table 6.3: Maidenhead Option – RAG Results

Planning Criterion	RAG Rating
Land Use Allocations	Intersects an opportunity site and employment site allocation
Major Development Proposals	No major development proposals identified within 250m
Mineral Safeguarding Areas	The majority of the option is located within Mineral Safeguarding Areas
Green Belt	Major impact as the pipeline intersects with Green Belt for 21km (more than 20km). The proposed Maidenhead pumping station and Harefield WTW could have a significant impact on the openness of the Green Belt.
AONB	The option is within 150m of the boundary of the Chilterns AONB
NSIPs	No NSIPs identified within 1km

6.2.1.1 Land Use Allocations

The Maidenhead pipeline intersects with a designated Opportunity Site at Wilton Park near Beaconsfield (South Bucks Core Strategy, adopted 2011). The site has the potential to deliver 300 new homes, alongside improved sports and recreational facilities for the local community. As the pipeline is below ground, the impacts on the opportunity site would be expected to be limited. However, there may be impacts on the site depending on the extent of the construction works.

The pipeline also intersects an employment site allocation at Maple Cross Industrial Estate (Three Rivers Core Strategy, adopted 2011). This allocation is built out and now forms a key employment area. Again, as the pipeline is below ground, impacts are not expected to be significant.

6.2.1.2 Major Development Proposals

There are no major development proposals identified within the relevant Local Plans which Maidenhead option could impact upon.

6.2.1.3 Mineral Safeguarding Areas

The majority of the pipeline is within mineral safeguarding areas, including sand and gravel and concreting aggregate. However, there may be opportunities for prior extraction where the

mineral resource can be used locally elsewhere. Justification may be required to demonstrate that the need for the SRO scheme outweighs the need to avoid sterilisation.

6.2.1.4 Green Belt

The Maidenhead option dissects Green Belt land for 21km. The pipeline is below ground and so impacts to Green Belt, once the development is in operation, are not expected to be significant. However, above ground works (including the proposed Maidenhead pumping station and the Harefield WTW and service reservoir) are located within the Green Belt.

The impact on the openness of the Green Belt will need to be considered and very special circumstances will need to be demonstrated for any such works. The negative impact of the option upon the green belt is an important risk to achieving consents and the decision-making process will give substantial weight to any harm caused to the Green Belt, its openness or its statutory purposes.

6.2.1.5 AONB

This pipeline route is within 150m of the boundary of the Chilterns AONB and although the option is mostly below ground at this point, the construction effects might give rise to temporary adverse effects on the setting of the AONB given its proximity and the anticipated duration of construction works.

6.2.1.6 NSIPS

There are no NSIPs within 1km of the Maidenhead option proposal.

6.2.2 Sunnymeads 1

The scope of this option is to abstract raw water at the existing Affinity Water Sunnymeads intake; conveyance to a new WTW at the existing Harefield service reservoir site, and utilisation of available service reservoir capacity at the existing Harefield service reservoir.

Table 6.4 sets out the Planning Review RAG Results for the Sunnymeads 1 option.

Table 6.4: Sunnymeads 1 Option – RAG Results

Planning Criterion	RAG Rating
Land Use Allocations	Intersects with a housing development site and a site-specific allocation for a nature reserve.
Major Development Proposals	No major development proposals identified within 250m
Mineral Safeguarding Areas	The majority of the option is located within Mineral Safeguarding Areas
Green Belt	Moderate impact as the pipeline intersects with Green Belt land for 17km (less than 20km). The proposed Harefield WTW could have a significant impact on the openness of the Green Belt.
AONB	The option is not located within or near to an AONB
NSIPs	No NSIPs identified within 1km

6.2.2.1 Land Use Allocations

The Sunnymeads 1 pipeline intersects with a housing development site (allocated under Policy HO1 of the Royal Borough of Windsor and Maidenhead Local Plan, draft submission, 2017) at land east of The Queen-Mother Reservoir, Horton, which has a capacity for 100 dwellings. The policy allocation is draft but holds significant weight due to the Local Plan undergoing examination.

The pipeline route also intersects a site-specific allocation at land west of Hollow Hill Lane, Langley (9.7ha). The allocation proposes the use of a non-statutory informal nature reserve (under Policy SSA24, Slough Site Allocations Plan, adopted 2010).

As the pipeline is below ground, the impacts on the identified site allocations would be expected to be limited. However, there may be impacts on the allocations depending on the extent of the construction works.

6.2.2.2 Major Development Proposals

There are no major development proposals identified within the relevant Local Plans which the Sunnymeads 1 option could impact upon.

6.2.2.3 Mineral Safeguarding Areas

The majority of the pipeline is within mineral safeguarding areas, including sand and gravel and concreting aggregate. Justification may be required to demonstrate that the need for the SRO scheme outweighs the need for mineral safeguarding.

6.2.2.4 Green Belt

The Sunnymeads 1 option dissects Green Belt land for 17km. The pipeline is below ground and so impacts to Green Belt, once the development is in operation, would not be expected to be significant. However, above ground works including the expansion of the existing Sunnymeads intake and pumping station, and the proposed Harefield WTW and existing service reservoir, are located within the Green Belt.

The impact on the openness of the Green Belt will need to be considered and very special circumstances will need to be demonstrated for any such works. The negative impact of the option upon the Green Belt is an important risk to achieving consents and the decision-making process will give substantial weight to any harm caused to the Green Belt, its openness or its statutory purpose.

6.2.2.5 AONB

The option is not located within or near to an AONB.

6.2.2.6 NSIPs

There are no NSIPs within 1km of the Sunnymeads 1 option proposal.

6.2.3 Teddington DRA

The scope of this option is to abstract raw water at a new intake at Teddington, upstream of Teddington weir and upstream of the proposed London Effluent Reuse SRO Teddington DRA

option outfall (treated effluent from Mogden STW), conveyance to a new WTW at Harefield, and utilisation of the available storage capacity at the existing Harefield service reservoir.

Table 6.5 sets out the Planning Review RAG Results for the Teddington DRA option.

Table 6.5: Teddington DRA Option – RAG Results

Planning Criterion	RAG Rating
Land Use Allocations	Within 250m of a housing allocation, recreational allocation and broad designation (Normansfield)
Major Development Proposals	Within 250m of a major development proposal for a mixed-use development
Mineral Safeguarding Areas	The option does not impact Mineral Safeguarding Areas
Green Belt	Moderate impact as the pipeline intersects Green Belt land for 17km (less than 20km). The proposed Harefield WTW could have a significant impact on the openness of the Green Belt.
AONB	The option is not located within or near to an AONB
NSIPs	No NSIPs identified within 1km

6.2.3.1 Land Use Allocations

Within 250m of the Teddington DRA pipeline, there is a housing allocation at Hanworth Library (under Policy site reference 65, Hounslow Local Plan, adopted 2015). There is also a designation at Teddington School/Broom Road Recreational Ground to rebuild the school and to allow for an increased public use of school facilities including sports hall and all-weather pitches (under Policy D12, Richmond upon Thames Local Plan, adopted 2018), located within 250m of the pipeline option. There is a broad designation (within 250m of the pipeline option) for institution use/hotel/training central, leisure, open space, nature conservation and housing at Normansfield (under Policy D1, Richmond upon Thames Local Plan, adopted 2018). Although the allocations are within 250m of the pipeline route, the pipeline is to be below ground, and impacts on these designations are, therefore, not expected to be significant.

6.2.3.2 Major Development Proposals

Within 250m of the Teddington DRA pipeline, there is land identified for residential led mixed-use development (under Policy SA28, Hillingdon Local Plan Part 2, adopted January 2020). Planning approval has been granted for 2,340 homes, 14,000sqm of office space and a 90-bed hotel (under LBH planning application reference 585/APP/2009/2752). The London Borough of Hillingdon will seek to secure the development of the site in accordance with this planning permission. Although the allocation is within 250m of the option, the pipeline is to be below ground, and impacts on the allocation are, therefore, not expected to be significant.

6.2.3.3 Mineral Safeguarding Areas

No areas of mineral safeguarding have been identified within the vicinity of the option.

6.2.3.4 Green Belt

The Teddington DRA option dissects Green Belt land for 17km. The pipeline is below ground and so impacts to Green Belt, once the development is in operation, are not expected to be significant. The proposed Teddington Abstraction Point is not situated on land designated as

Green Belt. However, the proposed Harefield WTW and existing service reservoir is located within the Green Belt and so there could be impacts on the openness of the Green Belt.

The negative impact of the option upon the Green Belt is an important risk to achieving consents and the decision-making process will give substantial weight to any harm caused to the Green Belt, its openness or its statutory purposes.

6.2.3.5 AONB

The option is not located within or near to an AONB.

6.2.3.6 NSIPs

There are no NSIPs within 1km of the Teddington DRA option proposal.

6.2.4 Sunnymeads 2a

The scope of this option is to abstract raw water at the exiting Affinity Water Sunnymeads intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield service reservoir.

Table 6.6 sets out the Planning Review RAG Results for the Sunnymeads 2a option.

Table 6.6: Sunnymeads 2a Option – RAG Results

Planning Criterion	RAG Rating
Land Use Allocations	Intersects with a housing development site and site-specific allocation for an informal nature reserve
Major Development Proposals	No major development proposals identified within 250m
Mineral Safeguarding Areas	The majority of the option is located within Mineral Safeguarding Areas
Green Belt	Moderate impact as the pipeline intersects Green Belt for 19km (less than 20km). The proposed Iver 2 WTW could have a significant impact on the openness of the Green Belt.
AONB	The option is not located within or near to an AONB
NSIPs	No NSIPs identified within 1km

6.2.4.1 Land Use Allocations

The Sunnymeads 2a pipeline intersects with a housing development site (under Policy HO1 of the Royal Borough of Windsor and Maidenhead Local plan, draft submission, 2017) at land east of The Queen-Mother Reservoir, Horton, which has a capacity for 100 dwellings. Whilst the policy allocation is draft, it holds significant weight as planning policy due to its successful transition through Local Plan examination.

The pipeline route also intersects a site-specific allocation at land west of Hollow Hill Lane, Langley (of 9.7ha) (under Policy SSA24, Slough Site Allocations Plan, adopted 2010). The allocation proposes the use of a non-statutory informal nature reserve.

As the pipeline is below ground, the impacts on the allocations are expected to be limited. However, there may be impacts on the allocations depending on the extent of the construction works.

6.2.4.2 Major Development Proposals

There are no major development proposals identified within the relevant Local Plans which the Sunnymeads 2a option could impact upon.

6.2.4.3 Mineral Safeguarding Areas

The majority of the pipeline is within mineral safeguarding areas, including sand and gravel and concreting aggregate. However, there may be opportunities for prior extraction where the mineral resource can be used locally elsewhere. Justification may be required to demonstrate that the need for the SRO scheme outweighs the need to avoid sterilisation.

6.2.4.4 Green Belt

The Sunnymeads 2a option dissects Green Belt land for 19km. The pipeline is below ground and so impacts to Green Belt, once the development is in operation, are not expected to be significant. However, above ground works including the expansion of the existing Sunnymeads intake and pumping station, and the proposed Iver 2 WTW are located within the Green Belt.

The impact on the openness of the Green Belt will need to be considered and very special circumstances will need to be demonstrated for any such works. The negative impact of the option upon the Green Belt is an important risk to achieving consents and the decision-making process will give substantial weight to any harm caused to the Green Belt, its openness or its statutory purposes.

6.2.4.5 AONB

The option is not located within or near to an AONB.

6.2.4.6 NSIPs

There are no NSIPs within 1km of the Sunnymeads 2a option proposal.

6.2.5 Walton 2b and Mogden Reuse Indirect 3

The scope of the option is to abstract raw water via an extension to the existing Affinity Water Walton intake and conveyance to new Iver 2 WTW. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield service reservoir.

Mogden Ruse Indirect 3 comprises the same infrastructure as Walton 2b but utilises water from the proposed London Effluent Reuse SRO, Mogden effluent reuse option. For the Mogden Reuse Indirect 3 option in this scheme, an extension of the Mogden effluent reuse option outfall pipeline is required from the reach containing the Thames Water Walton intake, to the reach containing the Affinity Water Walton intake i.e. to a point upstream of Sunbury weirs.

Table 6.7 sets out the Planning Review RAG Results for the Walton 2b and Mogden Reuse Indirect 3 option.

Table 6.7: Walton 2b and Mogden Reuse Indirect 3 Options – RAG Results

Planning Criterion	RAG Rating
Land Use Allocations	Intersects with a site-specific allocation for an informal nature reserve
Major Development Proposals	No major development proposals identified
Mineral Safeguarding Areas	The majority of the option is located within Mineral Safeguarding Areas
Green Belt	Major impact as the pipeline intersects Green Belt for 34km (more than 20km). The proposed Iver 2 WTW and Harefield WTW could have a significant impact on the openness of the Green Belt.
AONB	The option is not located within or near to an AONB
NSIPs	No NSIPs identified within 1km

6.2.5.1 Land Use Allocations

Within 250m of the pipeline, there is a housing development site (under Policy HO1 of the Royal Borough of Windsor and Maidenhead Local Plan, draft submission, 2017) at land east of The Queen-Mother Reservoir, Horton, which has a capacity for 100 dwellings. Whilst the policy allocation is draft, it holds significant weight as planning policy due to its successful transition through Local Plan examination.

The pipeline route also intersects a site-specific allocation at land west of Hollow Hill Lane, Langley (of 9.7ha) (under Policy SSA24, Slough Site Allocations Plan, adopted 2010). the allocation proposes the use of a non-statutory informal nature reserve.

As the pipeline is below ground, the impacts on the housing development site and site-specific allocation are expected to be limited. However, there may be impacts on the allocations depending on the extent of the construction works.

6.2.5.2 Major Development Proposals

There are no major development proposals identified within the relevant Local Plans which the Walton 2b option could impact upon.

6.2.5.3 Mineral Safeguarding Areas

The majority of the pipeline is within mineral safeguarding areas, including sand and gravel and concreting aggregate. However, there may be opportunities for prior extraction where the mineral resource can be used locally elsewhere. Justification may be required to demonstrate that the need for the SRO scheme outweighs the need to avoid sterilisation.

6.2.5.4 Green Belt

The option dissects Green Belt land for 34km. The pipeline is below ground and so impacts to Green Belt, once the development is in operation, are expected to be minimal. However, above ground works including the proposed Iver 2 WTW and Harefield WTW and service reservoir, are located within the Green Belt.

The impact on the openness of the Green Belt will need to be considered and very special circumstances will need to be demonstrated for any such works. The negative impact of the option upon the Green Belt is an important risk to achieving consents and the decision-making

process will give substantial weight to any harm caused to the Green Belt, its openness or its statutory purposes.

6.2.5.5 AONB

The option is not located within or near to an AONB.

6.2.5.6 NSIPs

There are no NSIPs within 1km of the Walton 2b option proposal.

6.2.6 Lower Thames Reservoir Transfer 2a

This option comprises abstracting water from Thames Water’s Wraysbury and Queen Mother reservoirs via a proposed connection into Affinity Water’s existing Wraysbury (100” inch) tunnel at the existing Iver WTW site. This raw water is then diverted to the proposed Iver 2 WTW. The drinking water is subsequently conveyed to Harefield to utilise the available storage capacity at the existing Harefield service reservoir.

Table 6.8 sets out the Planning Review RAG Results for the Lower Thames Transfer 2a option.

Table 6.8: Lower Thames Reservoir Transfer 2a Option – RAG Results

Planning Criterion	RAG Rating
Land Use Allocations	Within 250m of an opportunity area for significant development / redevelopment
Major Development Proposals	No major development proposals identified
Mineral Safeguarding Areas	The majority of the option is located within Mineral Safeguarding Areas
Green Belt	Moderate impact as the pipeline intersects Green Belt for 12km (less than 20km). The proposed Iver 2 WTW could have a significant impact on the openness of the Green Belt.
AONB	The option is not located within or near to an AONB
NSIPs	No NSIPs identified within 1km

6.2.6.1 Land Use Allocations

Within 250m of the Lower Thames Reservoir Transfer 2a option, there is an opportunity area south of Iver (under Policy CP15, South Bucks Core Strategy, adopted 2011). The area is designated for significant development or redevelopment. As the allocation is within 250m of the option and the pipeline is to be below ground, impacts on the allocation are not expected to be significant.

6.2.6.2 Major Development Proposals

There are no major development proposals identified within the relevant Local Plans which the Lower Thames Reservoir Transfer 2a option could impact upon.

6.2.6.3 Mineral Safeguarding Areas

The majority of the pipeline is within mineral safeguarding areas, including sand and gravel and concreting aggregate. However, there may be opportunities for prior extraction where the

mineral resource can be used locally elsewhere. Justification may be required to demonstrate that the need for the SRO scheme outweighs the need to avoid sterilisation.

6.2.6.4 Green Belt

The Lower Thames Reservoir Transfer 2a pipeline route dissects Green Belt land for 12km. The pipeline is below ground and so impacts to Green Belt, once the development is in operation, are not expected to be significant. However, above ground works including the proposed Iver 2 WTW are located within the Green Belt.

The impact on the openness of the Green Belt will need to be considered and very special circumstances will need to be demonstrated for any such works. The negative impact of the option upon the Green Belt is an important risk to achieving consents and the decision-making process will give substantial weight to any harm caused to the Green Belt, its openness or its statutory purposes.

6.2.6.5 AONB

The option is not located within or near to an AONB.

6.2.6.6 NSIPs

There are no NSIPs within 1km of the Lower Thames Reservoir Transfer 2a option proposal.

6.2.7 Beckton Reuse Indirect

This option comprises of an indirect transfer of recycled water from Beckton STW to a new WTW and new service reservoir near North Mymms. The proposed abstraction point would be located on the River Lee, downstream of the outfall from the proposed Beckton effluent reuse option (including extension from Lockwood shaft), of the London Effluent Reuse SRO.

Another potential source for this option is water abstracted as part of the London Effluent Reuse SRO Teddington DRA option. In this option, raw water is abstracted just upstream of the treated effluent discharge from Mogden STW and pumped via the existing Thames-Lee Tunnel (with an extension) to discharge in a similar location to the proposed Beckton effluent reuse option (London Effluent Reuse SRO).

Table 6.9 sets out the Planning Review RAG Results for the Beckon Reuse Indirect option.

Table 6.9: Beckon Reuse Indirect Option – RAG Results

Planning Criterion	RAG Results
Land Use Allocations	Intersects a site allocation for sport / recreation and an allocation for natural burial uses
Major Development Proposals	No major development proposals identified
Mineral Safeguarding Areas	There are dispersed areas of sand & gravel mineral safeguarding areas
Green Belt	Moderate impact as the pipeline intersects Green Belt for 16km (less than 20km). The proposed Lee Valley pumping station and proposed North Mymms WTW reservoir could have a significant impact on the openness of the Green Belt.
AONB	The option is not located within or near to an AONB

Planning Criterion	RAG Results
NSIPs	No NSIPs identified within 1km

6.2.7.1 Land Use Allocations

The pipeline route intersects a site allocation for professional sport, recreation and community sports / leisure uses at land at and within the vicinity of Tottenham Hotspur Football Club Training Ground (under Policy CL4 (site reference SA62), Enfield Draft Local Plan, 2021). The route also dissects a site allocation for natural burial uses at Sloemans Farm (of 47.32ha of agricultural land) (under Policy BG10 (site reference SA60), Enfield Draft Local Plan, 2021). The Enfield Local Plan is draft but holds some weight as Plan is under consultation, despite not having been through examination as yet. As the pipeline is below ground, the impacts on the allocations are expected to be limited. However, there may be impacts on the allocation depending on the extent of the construction works.

Within 250m of the Beckton Reuse Indirect option, there is a mixed-use allocation at land (known as "The Dell") opposite Enfield Crematorium (Great Cambridge Road) (under Policy H1 (site reference SA44), Enfield Draft Local Plan, 2021). The site has a capacity for 270 dwellings. There is also a housing development site (under Policy HS14, Welwyn Local Plan, adopted 2005) approximately 250m away from the pipeline route at Claregate, Great North Road. The allocation appears to be built out. Although the allocation is within 250m of the option, the pipeline is to be below ground, and impacts on the allocation are, therefore, not expected to be significant.

6.2.7.2 Major Development Proposals

There are no major development proposals identified within the relevant Local Plans which the Beckton Reuse Indirect option could impact upon.

6.2.7.3 Mineral Safeguarding Areas

The Beckton Reuse Indirect option dissects a sand and gravel MSA for approximately 300m in Epping Forest District Council boundary (as defined in the Epping Forest submission draft Local Plan, 2016). Justification may be required to demonstrate that the need for the SRO scheme outweighs the need for mineral safeguarding.

6.2.7.4 Green Belt

The Beckon Reuse Indirect option dissects Green Belt land for 16km. The pipeline is below ground and so impacts to Green Belt, once the development is in operation, are not expected to be significant. However, above ground works including the proposed abstraction point and pumping station at Lee Valley, proposed North Mymms WTW and reservoir and Brookmans Park service reservoir, are located within the Green Belt.

The impact on the openness of the Green Belt will need to be considered and very special circumstances will need to be demonstrated for any such works. The negative impact of the option upon the Green Belt is an important risk to achieving consents and the decision-making process will give substantial weight to any harm caused to the Green Belt, its openness or its statutory purposes.

6.2.7.5 AONB

The option is not located within or near to an AONB.

6.2.7.6 NSIPs

There are no NSIPs within 1km of the Beckon Reuse Indirect option proposal.

6.3 Comparison of Planning Risk

Table 6.10 presents the findings of the Planning Review and RAG outcomes across all of the options.

The results show that the best performing option against the planning RAG criteria is Teddington DRA.

The worst performing option is Maidenhead, as a result of its proximity to the Chilterns AONB and significant length of pipeline within Green Belt designated land.

Note that the ratings given are a measure of planning risk and an indication of the potential compensatory measures that would be required. The red and amber ratings are thus not a “showstopper” for any of the options but do provide an indication of where the pipe routes should be reviewed and potential alternatives sought as the scheme develops.

These results are based on a strategic high-level appraisal of the options using limited desk-based information available for the feasible options submitted to the WRSE and WRMP24 water resources modelling process. This means that the results may change on a further assessment of the criteria used and possible expansion of those criteria. The strategic planning approach will develop this appraisal further using more detailed scheme information, and smaller segments of pipe route, to increase the confidence levels of the planning assessment of the selected SRO options.

Table 6.10: Comparison of Options against Planning Criteria

Transfer Option	Local Plan Land Allocations	Major Development Proposals	Mineral Safeguarding Areas	Green Belt	AONB	NSIPs
Maidenhead	Intersects an opportunity site and employment site allocation	No major development proposals within 250m of the option	The majority of the option is located within Mineral Safeguarding Areas	Major impact as the pipeline intersects with Green Belt for 21km (more than 20km).	The option is within 150m of the boundary of the Chilterns AONB.	No NSIPs identified within 1km of option
Sunnymeads 1	Intersects with housing development site	No major development proposals within 250m of the option	The majority of the is located within Mineral Safeguarding Areas	Moderate impact as the pipeline intersects with Green Belt land for 17km (less than 20km).	The option is not located within or near to an AONB	No NSIPs identified within 1km of option
Teddington DRA	Within 250m of a housing allocation, recreational allocation and broad designation (Normansfield)	Within 250m of a major development proposal for a mixed-use development	The option does not impact Mineral Safeguarding Areas	Moderate impact as the pipeline intersects Green Belt land for 17km (less than 20km).	The option is not located within or near to an AONB	No NSIPs identified within 1km of option
Sunnymeads 2a	Intersects with a housing development site and site-specific allocation for an informal nature reserve	No major development proposals within 250m of the option	The majority of the option is located within Mineral Safeguarding Areas	Moderate impact as the pipeline intersects Green Belt for 19km (less than 20km).	The option is not located within or near to an AONB	No NSIPs identified within 1km of option
Walton 2b and Mogden Reuse Indirect 3	Intersects with a site-specific allocation for an informal nature reserve	No major development proposals within 250m of the option	The majority of the option is located within Mineral Safeguarding Areas	Major impact as the pipeline intersects Green Belt for 34km (more than 20km).	The option is not located within or near to an AONB	No NSIPs identified within 1km of option
Lower Thames Reservoir Transfer 2a	Within 250m of an opportunity area for significant development / redevelopment	No major development proposals within 250m of the option	The majority of the option is located within Mineral Safeguarding Areas	Moderate impact as the pipeline intersects Green Belt for 12km (less than 20km).	The option is not located within or near to an AONB	No NSIPs identified within 1km of option
Beckton Reuse Indirect	Intersects a site allocation for sport / recreation and an allocation for natural burial uses	No major development proposals within 250m of the option	There are dispersed areas of sand & gravel mineral safeguarding areas	Moderate impact as the pipeline intersects Green Belt for 16km (less than 20km).	The option is not located within or near to an AONB	No NSIPs identified within 1km of option

7 Conclusion

7.1 Summary of Selection Process

Development of the T2AT has followed a systematic process to identify 33 potential alternative solutions and screen them to a constrained list of eight options. The two-stage screening process considered technical feasibility and environmental impact.

These broadly defined options were then refined by selecting indicative above ground component sites and pipeline routes for the purpose of preparing initial concept designs. The process of identifying indicative sites and routes was sufficient to allow the concept designs to be developed to a level of detail which enabled (a) the regional modelling to proceed and (b) a comparison of the alternative options. However, it was recognised that if any of the options are selected for further development, then the actual routes and site locations would be determined through further consideration and consultation with stakeholders.

7.2 Overview of Selected Options

Table 7.1 provides a high-level comparison between the options considering a synthesis of the themes covered by this report. The colour coding is a subjective visualisation of the relative merits of each option, with green indicating a more favourable solution and red indicating less favourable.

Note that this comparison does not consider the merits of the upstream source SROs or the need for any downstream network reinforcement.

Table 7.1: Overall Option Appraisal Summary

Option	Technical Challenge	Carbon Footprint	Environment and Amenity Impact	Planning Complexity
Maidenhead	22km overall pipeline length	Similar to most other options	Indicative pipeline route passes through two historic parks and gardens. Further WFD assessment to address precautionary WFD compliance risks.	Work in green belt higher than other options
Sunnymeads 1	22km overall pipeline length	Similar to most other options	Mitigation measures would be required to ensure no significant adverse effects on the integrity of the South West London Waterbodies SPA/Ramsar Higher loss of ecosystem services and biodiversity than other options.	Similar to most other options

Option	Technical Challenge	Carbon Footprint	Environment and Amenity Impact	Planning Complexity
Teddington DRA	31km overall pipeline length	Higher embedded and operational CO ₂ emissions	Further WFD assessment to address precautionary WFD compliance risks. Intake and pumping station in Riverside Conservation Area Highest loss of ecosystem services and biodiversity of all options.	Performs better than other options.
Sunnymeads 2a	23km overall pipeline length	Similar to most other options	Mitigation measures would be required to ensure no significant adverse effects on the integrity of the South West London Waterbodies SPA/Ramsar.	Similar to most other options
Walton 2b and Mogden Reuse Indirect 3	40km overall pipeline length	Highest embedded and operational CO ₂ emissions of all options	Further WFD assessment to address precautionary WFD compliance risks. Mitigation measures would be required to ensure no significant adverse effects on the integrity of the South West London Waterbodies SPA/Ramsar. Higher loss of ecosystem services and biodiversity than other options.	Work in green belt higher than other options
Lower Thames Reservoir Transfer 2a	15km overall pipeline length	Embedded and operational CO ₂ emissions generally lowest of all options	No HRA or WFD issues identified.	Lowest interaction with green belt and local development plans
Beckton Reuse Indirect	24km overall pipeline length	Similar to most other options	Mitigation measures would be required to ensure no significant adverse effects on the integrity of the Lee Valley Ramsar / SPA.	Similar to most other options

Source: Mott MacDonald

Teddington, Walton 2b and Mogden Reuse Indirect 3 perform poorly against the other options. All would require further WFD assessment and would have a higher monetised change in the value of ecosystem services. In addition, the location of the Teddington River intake within the Riverside Conservation Area, although flagged under environmental considerations in our assessment, could also entail planning complexity. Therefore, in comparison with the other T2AT options, these would be considered less favourable for further development to Gate 2.

The Maidenhead option performs well in terms of the monetised change in the value of ecosystem services as loss of woodland is lower than other options. However, the option is in close proximity to the Chilterns AONB, involves construction work in the green belt, impacts two Registered Parks and Gardens, and needs further WFD assessment. This means that although there are not any insurmountable environmental issues that would prevent this option from progressing to Gate 2, it is considered that it would be a less favourable choice for further development.

Sunnymeads 1 and 2a are differentiated because of the divergence between their pipeline routes, with the direct link to a WTW at Harefield (Sunnymeads 1) performing better against most criteria. This suggests that an improvement in the route from the new Iver 2 WTW to Harefield is possible and that this should be considered if any of the options which include Iver 2 is carried forward. As well as Sunnymeads 2a these options are; Walton 2b, Mogden Reuse Indirect 3 and Lower Thames Reservoir Transfer 2a.

Sunnymeads 1 and 2a compare reasonably well to most options but do not compare well to the Lower Thames Reservoir Transfer 2a option. An improvement, against all of the criteria, could be made by using the existing tunnel from Sunnymeads to the existing Iver WTW, saving approximately 7km of pipeline construction. If a cross connection was also added to the Wraysbury 100" tunnel this would effectively create a variant of the Lower Thames Reservoir Transfer 2a option. The Sunnymeads options would become more attractive if it was not possible to implement the Lower Thames Reservoir Transfer 2a option.

The Lower Thames Reservoir Transfer 2a option compares well under all of the themes and hence this would be a favourable option for development to Gate 2.

The Beckton Reuse Indirect option also compares well to the other transfer options, and in particular the other two options which rely on reuse water. If the ability to feed reuse water to Affinity Water is included in the regional best value plan, then this is the most favourable reuse option for development to Gate 2. Furthermore, this is the only T2AT option which feeds directly into the eastern side of Affinity Water's Supply area.

The theme-based comparison between the options comes to the same conclusion as the initial results of the WRSE regional modelling. This is to be expected as the factors which contribute to the cost of each option, and hence influence the regional model output, are the same factors which contribute to technical difficulty, environmental impact and planning risk.

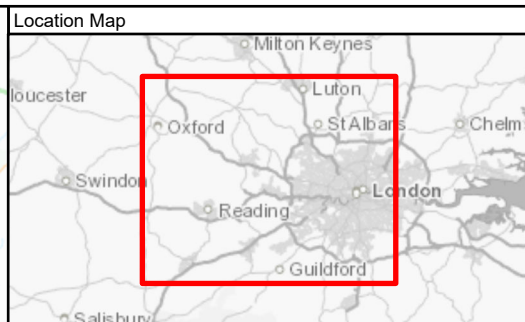
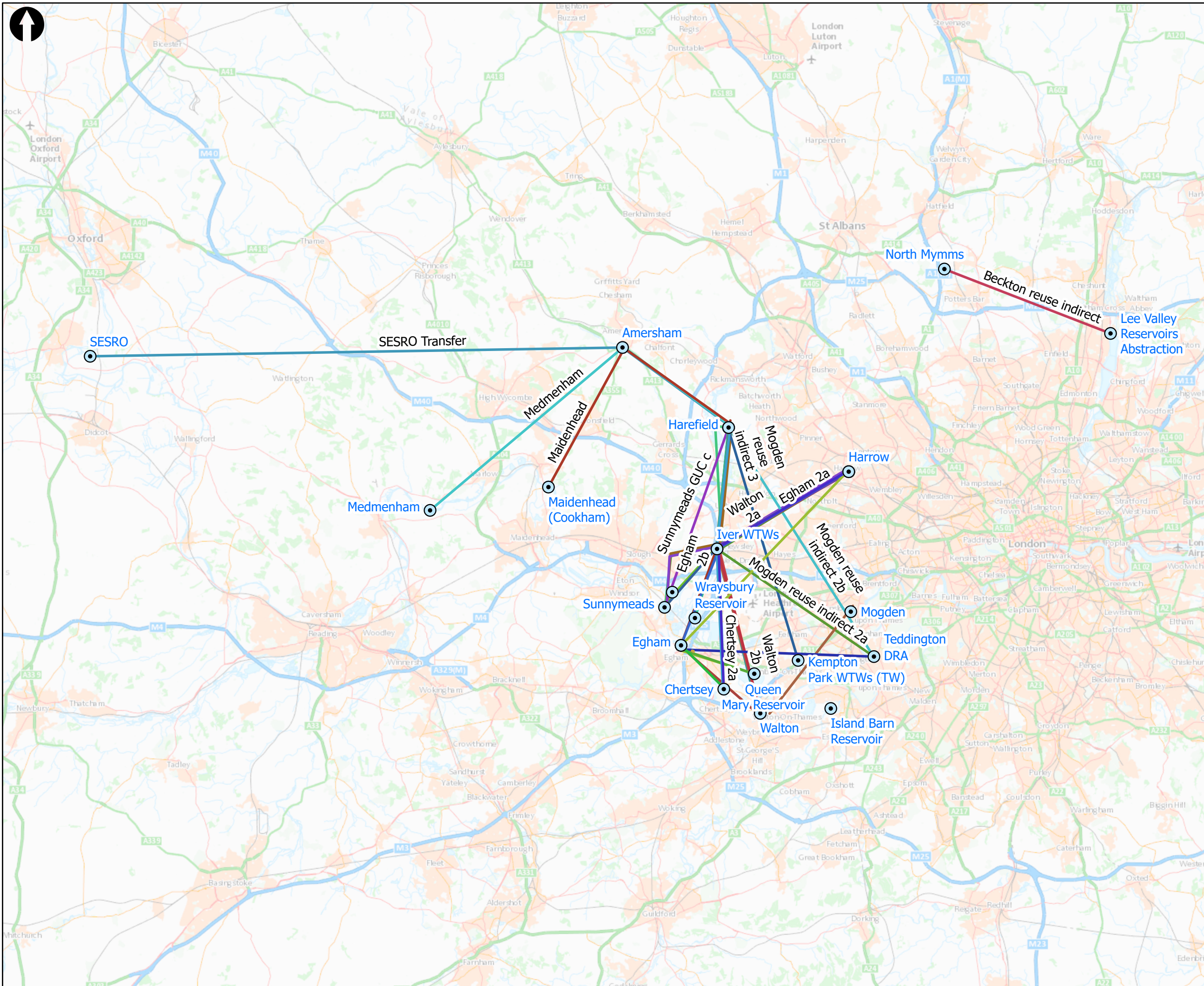
Which, if any, of the T2AT options are carried past Gate 2 will be determined by the further outputs of the WRSE regional modelling, the best value plan which it informs, and the outcomes of the resultant public consultation processes on the emerging and draft plans. The process will consider and compare the merits of whole solutions, of which the transfer scheme would be just one component in a system which ensures continuity of supply to customers. Of particular relevance is the choice of option (or other SRO) to provide the source of new raw water for the T2AT scheme, whether linked to additional effluent reuse, new raw water storage or an inter-regional transfer. The optimisation of the whole system relies on the WRSE best value planning and modelling process, but the choice will also be informed by the relative merits of the different options. The model also considers consequential benefits such as reductions in groundwater abstraction and additional water discharges into the environment.

The above assessments of the T2AT options are therefore to be considered within the larger context of the overall solutions which constitute the best value plan.

The assessments contained within this report are considered appropriate for defining and then characterising the options sufficiently so that they can be compared with each other, and thus inform the decision as to which of the eight options should be carried forward. For the option, or small number of options, selected for further development it will be possible to subject them to scrutiny at a greater level of detail. For these options the pipeline route will be challenged on a segment-by-segment basis to provide a robust and defensible corridor. A similar approach will be applied to the above ground component sites by testing the proposed locations described in this report against a wider range of alternative potential sites. The process and outcome of this re-appraisal of the options will be reported at Gate 2.

Appendices

A. Overview Map of Unconstrained Options



Key to Symbols

- Sites

Pipeline Name

- Beckton / Deephams reuse indirect
- Chertsey 1
- Chertsey 2a
- Chertsey 2b
- Egham 1
- Egham 2a
- Egham 2b
- Lower Thames reservoir 1a
- Lower Thames reservoir 1b
- Lower Thames reservoir 2a
- Lower Thames reservoirs 2b
- Maidenhead
- Medmenham
- Mogden reuse indirect 1a
- Mogden reuse indirect 1b
- Mogden reuse indirect 1c
- Mogden reuse indirect 2a
- Mogden reuse indirect 2b
- Mogden reuse indirect 3
- SESRO Transfer
- Sunnymeads 1
- Sunnymeads 2a
- Sunnymeads 2b
- Sunnymeads GUC a
- Sunnymeads GUC b
- Sunnymeads GUC c
- Walton 1
- Walton 2a
- Walton 2b

Notes

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 OS_Open_Greyscale_2: Contains OS data © Crown Copyright and database right 2020
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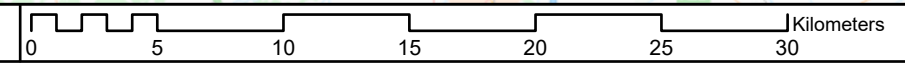
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Thames to Affinity Transfer
 Unconstrained Options
 Overview

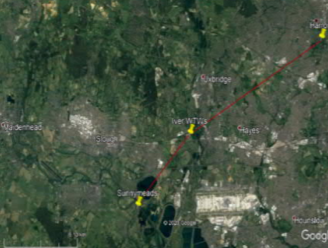

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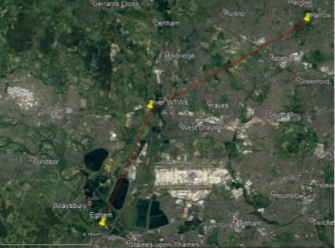
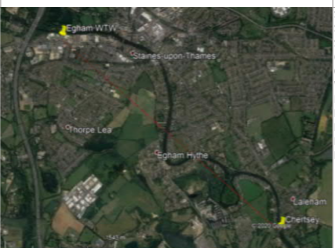
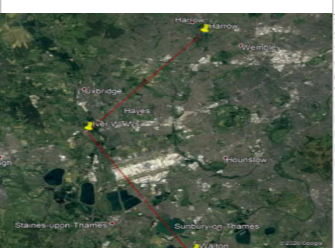
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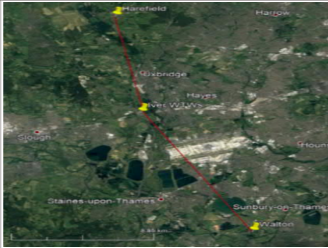
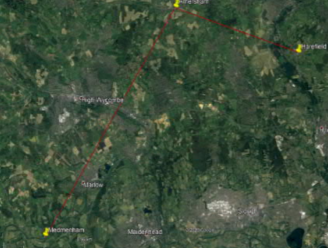
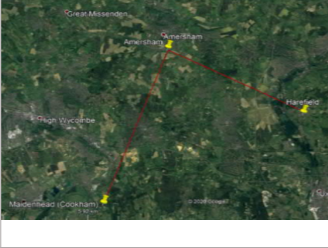
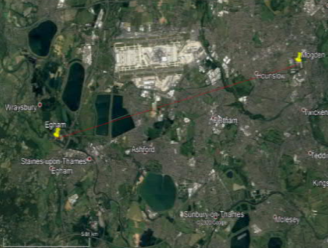
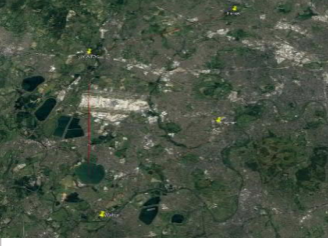
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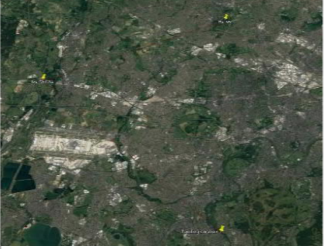



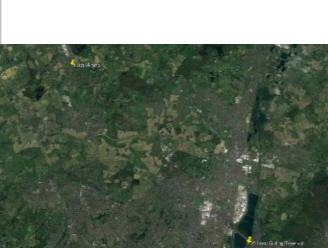
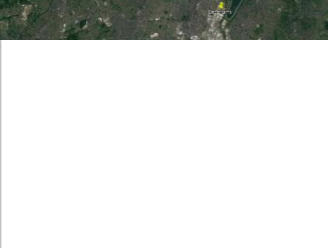


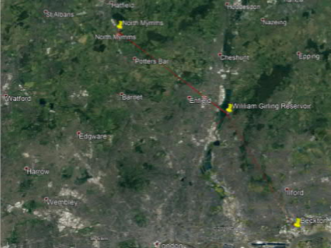
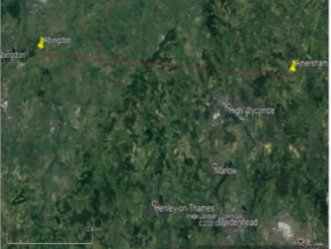
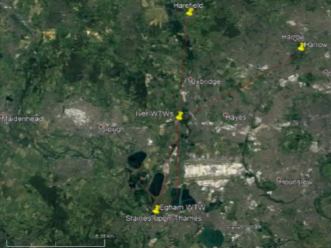
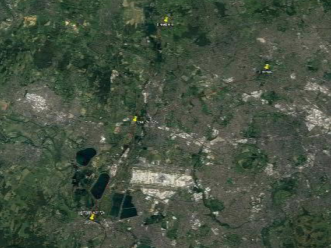
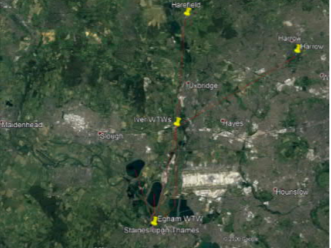
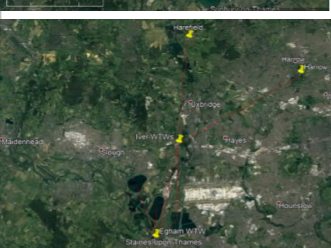
B. Initial Screening Spreadsheet

Option name	WRMP19 Short ID	Option description	Source Water / SRO dependencies	Location (Initial Screening)	Mutual exclusivity	Potential Yield DYAA (M/d)	Delivery underway	Duplication	Comparative rejection	Superseded	Low flow availability	CAMS resource reliability	3rd party water availability	SEA Criteria	Failed at the initial stage?
Sunnymeads 1	1006, 1007, 1008, 1009	Abstraction of raw water at the existing Affinity Water (AFW) Sunnymeads intake; conveyance to a water treatment works (WTW) at the existing Harfield service reservoir (SR) site; and utilisation of the available storage capacity at the existing Harfield SR.	South East Strategic Reservoir Option (SESRO) or Severn Thames Transfer (STT)		Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	16km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and is dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised.	There is scope for the development of a shared option	Soft fall Passes directly through Harfield Pit SSSI and Mid Colne Valley SSSI near Harfield. Passes through Kingcup Meadows and Oldhouse Wood SSSI However, not a hard fall, potential for mitigation but would likely be complex and costly. Within approximately 200m of Wraysbury No. 1 Gravel Pit SSSI / South West London Waterbodies SPA and Ramsar at Sunnymeads. Within 100m of Early medieval and medieval palace and associated monuments, Kingsbury Scheduled Monument. However, on the opposite bank of the river at Sunnymeads.	Re-opened following feedback from AFW. Alternative route from Sunnymeads to Harfield was selected which passed through fewer designated sites.
Sunnymeads 2a	1037, 1038, 1039, 1040	Abstraction of raw water at the existing AFW Sunnymeads intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to Harfield to utilise the available storage capacity at the existing Harfield SR.	SESRO or STT		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	16.7km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and is dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised.	There is scope for the development of a shared option	Pass No direct impacts on designated sites or scheduled monuments. Approximately 300m from Harfield Pit SSSI. Approximately 300m from Mid Colne Valley SSSI. Approximately 200m from Fray's Farm Meadows SSSI. Within approximately 200m of Wraysbury No. 1 Gravel Pit SSSI / South West London Waterbodies SPA and Ramsar at Sunnymeads. Within 100m of Early medieval and medieval palace and associated monuments, Kingsbury Scheduled Monument. However, on the opposite bank of the river at Sunnymeads therefore no direct impact anticipated.	No. Pass through to secondary assessment
Sunnymeads 2b	N/a	Abstraction of raw water at the existing AFW Sunnymeads intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow SR.	SESRO or STT		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	19.3km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and is dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised.	There is scope for the development of a shared option	Pass No direct impacts on designated sites or scheduled monuments. Approximately 400m from Moated site at Down Barns Farm Scheduled Monument. Approximately 200m from Wraysbury No. 1 Gravel Pit SSSI / South West London Waterbodies SPA and Ramsar site at Sunnymeads. Within 100m of Early medieval and medieval palace and associated monuments, Kingsbury Scheduled Monument. However, on the opposite bank of the river at Sunnymeads therefore no direct impact anticipated.	No. Pass through to secondary assessment
Sunnymeads GUC a	N/a	Abstraction of raw water at the existing AFW Sunnymeads intake and conveyance via the Grand Union Canal corridor to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow SR.	SESRO or STT		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	20.9km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and is dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised.	There is scope for the development of a shared option	Pass No direct impacts on designated sites or scheduled monuments. Approximately 500m from Moated site at Down Barns Farm Scheduled Monument. Approximately 200m from Wraysbury No. 1 Gravel Pit SSSI / South West London Waterbodies SPA and Ramsar site at Sunnymeads. Within 100m of Early medieval and medieval palace and associated monuments, Kingsbury Scheduled Monument. However, on the opposite bank of the river at Sunnymeads therefore no direct impact anticipated.	No. Pass through to secondary assessment
Sunnymeads GUC b	N/a	Abstraction of raw water at the existing AFW Sunnymeads intake and conveyance via the Grand Union Canal corridor to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harfield SR.	SESRO or STT		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	18.1km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and is dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised.	There is scope for the development of a shared option	Pass No direct impacts on designated sites or scheduled monuments. Approximately 300m from Harfield Pit SSSI. Approximately 300m from Mid Colne Valley SSSI. Approximately 200m from Fray's Farm Meadows SSSI. Approximately 200m from Wraysbury No. 1 Gravel Pit SSSI / South West London Waterbodies SPA and Ramsar site at Sunnymeads. Within 100m of Early medieval and medieval palace and associated monuments, Kingsbury Scheduled Monument. However, on the opposite bank of the river at Sunnymeads therefore no direct impact anticipated.	No. Pass through to secondary assessment
Sunnymeads GUC c	N/a	Abstraction of raw water at the existing AFW Sunnymeads intake and conveyance to a WTW at the existing Harfield SR site. The drinking water is then conveyed to the existing Harrow SR.	SESRO or STT		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	19.8km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and is dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised.	There is scope for the development of a shared option	Fail Passes directly through Mid Colne Valley SSSI near Harfield. However, not a hard fall, potential for mitigation but would likely be complex and costly. Within approximately 200m of Wraysbury No. 1 Gravel Pit SSSI / South West London Waterbodies SPA and Ramsar at Sunnymeads. Within 100m of Early medieval and medieval palace and associated monuments, Kingsbury Scheduled Monument. However, on the opposite bank of the river at Sunnymeads therefore no direct impact anticipated.	Failed in comparison with Sunnymeads GUC a and b as its conveyance length is similar but the route passes through a SSSI area and the conveyance length will only increase to mitigate passing through this area. Therefore, this option did not pass through to the secondary stage.
Egham 1	462	Abstraction of raw water at the existing Egham intake and conveyance to an expanded Egham WTW. The drinking water is then conveyed to the existing Egham SR.	SESRO or STT, but would also be compatible with the Chalk Stream First (CSF) proposal (increased flows in lower reaches of the Thames as a result of reduced abstraction within the upstream chalk streams).		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50 Actual system DO = 0.	Option is not underway	No duplication with another option	less than 5km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and is dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised. This option is compatible with the Chalk Streams First (CSF) flow recovery plan.	There is scope for the development of a shared option	Pass No direct impacts on designated sites or scheduled monuments. Langham Pond SSSI approximately 260m from Egham. Based on the two points provided for Egham - see image here: https://mottmac.sharepoint.com/:r/r?beamsgj-6d15db7d6e6a69662010e9620f0d8e20-%20Environment/Options%20Screening/Egham%201.JPG?csf=1&web=1&e=CGuarM	No. Pass through to secondary assessment

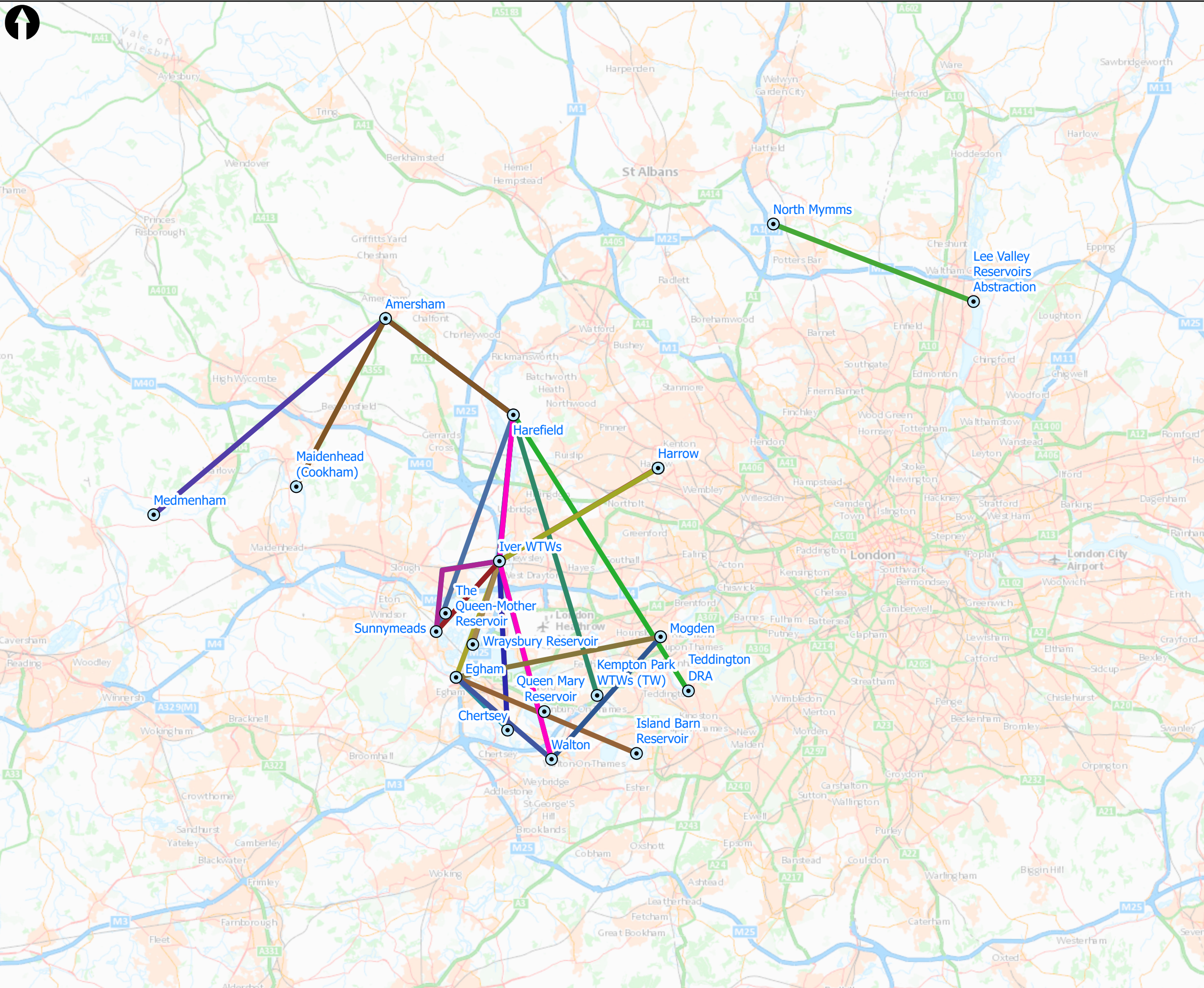
Option name	WRMP19 Short ID	Option description	Source Water / SRO dependencies	Location (Initial Screening)	Mutual exclusivity	Potential Yield DYAA (M/d)	Delivery underway	Duplication	Comparative rejection	Superseded	Low flow availability	CAMS resource reliability	3rd party water availability	SEA Criteria	Failed at the initial stage?
							Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	
Egham 2a	4001	Abstraction of raw water at the existing Egham intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow SR.	SESRO or STT, but would also be compatible with CSF		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Delivery underway (17M/d only)	No duplication with another option	21.6km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and it dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised. This option is compatible with the Chalk Streams First (CSF) flow recovery plan.	There is scope for the development of a shared option	Soft fail Passes directly through Wraybury Reservoir SSSI, South West London Waterbodies SPA and Ramsar site. Passes directly through Wraybury & Hythe End Gravel Pits SSSI. However, not a hard fail, potential for mitigation but would likely be complex and costly. Approximately 300m from Moated site at Down Barns Farm Scheduled Monument. Approximately 120m from Two concentric ditches showing as crop marks at Thorney Scheduled Monument.	No. Pass through to secondary assessment
Egham 2b	4001	Abstraction of raw water at the existing Egham intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield SR.	SESRO or STT, but would also be compatible with CSF		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Delivery underway (17M/d only)	No duplication with another option	19.3km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and it dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised. This option is compatible with the Chalk Streams First (CSF) flow recovery plan.	There is scope for the development of a shared option	Fail Passes directly through Wraybury Reservoir SSSI, South West London Waterbodies SPA and Ramsar site. Passes directly through Wraybury & Hythe End Gravel Pits SSSI. However, not a hard fail, potential for mitigation but would likely be complex and costly. Approximately 200m from Harefield Pit SSSI. Approximately 300m from Mild Colne Valley SSSI. Approximately 300m from Fray's Farm Meadows SSSI. Approximately 400m from another section of South West London Waterbodies SPA and Ramsar site. Less than 100m, approximately 50m, from Two concentric ditches showing as crop marks at Thorney Scheduled Monument.	Failed in comparison with the other Egham options as its conveyance length is similar but the route passes through more protected areas and the conveyance length will only increase to mitigate passing through these areas. Therefore, this option has not passed through to the secondary stage. Note: Chertsey 2b and Walton 2b have similar routes and passed initial screening, which suggests that Egham 2b could potentially also have passed initial screening. However, it would then have been rejected at secondary screening due to construction complexity (similar to Chertsey 2b).
Chertsey 1	N/a	Abstraction of raw water at the existing Chertsey intake and conveyance to an expanded Egham WTW. The drinking water is then conveyed to the existing Harrow SR.	SESRO or STT, but would also be compatible with CSF		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50 Actual system DO = 0.	Option is not underway	No duplication with another option	6km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and it dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised. This option is compatible with the Chalk Streams First (CSF) flow recovery plan.	There is scope for the development of a shared option	Pass Less than 100m, approximately 30m, from Bronze Age settlement, W of Runnymede Bridge Scheduled Monument. However, unlikely to have direct impacts on the SM and mitigation measures could be implemented to avoid disturbance effects / effects on setting during ST construction works. Approximately 200m from Earthworks on Laleham Bur way Scheduled Monument at Chertsey.	No. Pass through to secondary assessment
Chertsey 2a	N/a	Abstraction of raw water at the existing Chertsey intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow SR.	SESRO or STT, but would also be compatible with CSF		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	24.4km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and it dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised. This option is compatible with the Chalk Streams First (CSF) flow recovery plan.	There is scope for the development of a shared option	Soft fail Passes directly through Staines Moor SSSI / South West London Waterbodies SPA and Ramsar site. However, not a hard fail, potential for mitigation but would likely be complex and costly. Approximately 400m from Moated site at Down Barns Farm Scheduled Monument. Approximately 200m from Earthworks on Laleham Burway Scheduled Monument.	No. Pass through to secondary assessment
Chertsey 2b	N/a	Abstraction of raw water at the existing Chertsey intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield SR.	SESRO or STT, but would also be compatible with CSF		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	22.0km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and it dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised. This option is compatible with the Chalk Streams First (CSF) flow recovery plan.	There is scope for the development of a shared option	Soft fail Passes directly through Staines Moor SSSI / South West London Waterbodies SPA and Ramsar site. However, not a hard fail, potential for mitigation but would likely be complex and costly. Approximately 200m from Harefield Pit SSSI. Approximately 300m from Mild Colne Valley SSSI Approximately 300m from Fray's Farm Meadows SSSI. Approximately 200m from Earthworks on Laleham Burway Scheduled Monument.	No. Pass through to secondary assessment
Walton 1	N/a	Abstraction of raw water at the existing AFW Walton intake and conveyance to an expanded Egham WTW. The drinking water is then conveyed to the existing Harrow SR.	SESRO or STT, but would also be compatible with CSF		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50 Actual system DO = 0.	Option is not underway	No duplication with another option	8.62 km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and it dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised. This option is compatible with the Chalk Streams First (CSF) flow recovery plan.	There is scope for the development of a shared option	Pass Less than 100m, approximately 90m, from Bronze Age settlement, W of Runnymede Bridge Scheduled Monument. However, unlikely to have direct impacts on the SM and mitigation measures could be implemented to avoid disturbance effects / effects on setting during ST construction works. GIS is not aligned with Egham so potentially closer than 90m. Approximately 200m from Anglo-Saxon and medieval cemetery Scheduled Monument.	No. Pass through to secondary assessment
Walton 2a	N/a	Abstraction of raw water at the existing AFW Walton intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow SR.	SESRO or STT, but would also be compatible with CSF		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	26.9km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and it dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised. This option is compatible with the Chalk Streams First (CSF) flow recovery plan.	There is scope for the development of a shared option	Pass No direct impacts on designated sites or scheduled monuments. Approximately 200m from Staines Moor SSSI / South West London Waterbodies SPA and Ramsar site. Approximately 400m from Moated site at Down Barns Farm Scheduled Monument. Approximately 130m from Schoolhouse (Lord Knyvet's) Scheduled Monument.	No. Pass through to secondary assessment

Option name	WRMP19 Short ID	Option description	Source Water / SRO dependencies	Location (Initial Screening)	Mutual exclusivity	Potential Yield DYAA (M/d)	Delivery underway	Duplication	Comparative rejection	Superseded	Low flow availability	CAMS resource reliability	3rd party water availability	SEA Criteria	Failed at the initial stage?
							Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	
Walton 2b	N/a	Abstraction of raw water at the existing AFW Walton intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield SR.	SESRO or STT, but would also be compatible with CSF		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	24.4km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and it dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised. This option is compatible with the Chalk Streams First (CSF) flow recovery plan. This option is also compatible with Mogden Reuse as an alternative source.	There is scope for the development of a shared option	Pass Less than 100m (directly adjacent) from Schoolhouse (Lord Knyvett's) Scheduled Monument. However, potential for mitigation to avoid the Scheduled Monument, in aligning the pipeline slightly to avoid impacts. Potentially an easy fix. Mitigation measures could also be implemented to avoid disturbance effects / effects on setting during ST construction works. Approximately 130m from Harefield Pit SSSI therefore not direct. Approximately 200m from Mid Colne Valley SSSI. Approximately 300m from Staines Moor SSSI / South West London Waterbodies SPA / Ramsar site. Approximately 300m from Fray's Farm Meadows SSSI.	No. Pass through to secondary assessment
Medmenham	N/a	Abstraction of raw water at a new Medmenham intake and conveyance to a new WTW at Amersham. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield SR.	SESRO or STT		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	32.2km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and it dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised.	There is scope for the development of a shared option	Pass Passes directly through Old Park Wood SSSI. However, not a hard fall, the pipeline alignment could potentially be altered slightly to avoid the SSSI. Pipeline does not directly link with Harefield on GIS therefore potentially easy fix. Mitigation likely to be costly and complex if the pipeline was to pass directly through SSSI. Option within 100m of Rodbed Wood SSSI. Option within 100m of Large multivallate hillfort known as Danesfield Camp of Scheduled Monument.	No. Pass through to secondary assessment
Maidenhead	N/a	Abstraction of raw water at a new Maidenhead intake, conveyance to a new WTW at Harefield SR, and utilisation of available storage capacity at the existing Harefield SR (route initially went via a proposed new WTW at Amersham).	SESRO or STT		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	23.9km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Water is reliant on supply from STT or SESRO. The resource is reliable and it dependent upon this new supply. The Thames River CAM states "For all consumptive abstractions of 2M/d or above, a HoF of between Q30 and Q50 will be applied based on the perceived level of risk to the water body or downstream bodies." The introduction of the new supply will ensure that abstraction will be able to be utilised.	There is scope for the development of a shared option	Pass Passes directly through Old Park Wood SSSI. However, not a hard fall, the pipeline alignment could potentially be altered slightly to avoid the SSSI. Pipeline does not directly link with Harefield on GIS therefore potentially easy fix. Mitigation likely to be costly and complex if the pipeline was to pass directly through SSSI.	No. Pass through to secondary assessment
Mogden reuse direct	866	Direct transfer of recycled water from Mogden Sewage Treatment Works (STW) to Harrow SR.	London Effluent Reuse SRO		Mogden reuse indirect 1a, Mogden reuse indirect 1b, Mogden reuse indirect 1c, Mogden reuse indirect 2a, Mogden reuse indirect 2b	50	Option is not underway	No duplication with another option	N/a	The option has not been superseded	The option would not require abstraction beyond current licensed limits at times of low flow and is not subject to sustainability reductions	Option is not affected by the CAMS abstraction licence and reliability	Due to Thames water and Affinity water policy decision on direct reuse there is no scope for the development of a shared option	Not required - already failed	Failed at the initial stage as direct reuse would result in unacceptable water quality risk (confirmed AFW and TW water quality scientists).
Mogden reuse indirect 1a	866	Transfer of Teddington Direct River Abstraction (DRA) water for abstraction at the existing Egham intake and conveyance to an expanded Egham WTW. The drinking water is then conveyed to the existing Egham SR. Routed as a tunnel from Teddington finishing immediately upstream of the Egham intake (opposite bank).	Teddington DRA option within London Effluent Reuse SRO (raw water is abstracted from the River Thames and replaced immediately downstream by recycled water from Mogden STW)		Mogden reuse direct, Mogden reuse indirect 1b, Mogden reuse indirect 1c, Mogden reuse indirect 2a, Mogden reuse indirect 2b, Thames Water's Teddington DRA	100 or 50 Actual system DO = 0.	Option is not underway	No duplication with another option	less than 5km	The option has not been superseded	The option would not require abstraction beyond current licensed limits at times of low flow and is not subject to sustainability reductions	Option is not affected by the CAMS abstraction licence and reliability	There is scope for the development of a shared option but the potential amount of water available is limited by the environmental constraints as flagged by the EA (the increase in temperature of higher flows)	Pass No direct impacts on designated sites or scheduled monuments.	No. Pass through to secondary assessment
Mogden reuse indirect 1b	866	Transfer of Teddington DRA water for abstraction at the existing AFW Walton intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow SR. Routed as a tunnel from Teddington finishing immediately upstream of the AFW Walton intake (opposite bank).	Teddington DRA option within London Effluent Reuse SRO		Mogden reuse direct, Mogden reuse indirect 1a, Mogden reuse indirect 1c, Mogden reuse indirect 2a, Mogden reuse indirect 2b, Thames Water's Teddington DRA	50-75	Option is not underway	No duplication with another option	26.7km	The option has not been superseded	The option would not require abstraction beyond current licensed limits at times of low flow and is not subject to sustainability reductions	Option is not affected by the CAMS abstraction licence and reliability	There is scope for the development of a shared option but the potential amount of water available is limited by the environmental constraints as flagged by the EA (the increase in temperature of higher flows)	Pass Less than 100m, approximately 50m from Schoolhouse (Lord Knyvett's) Scheduled Monument. Unlikely to be direct effects and potential for mitigation to be implemented to avoid disturbance effects / effects on setting during ST construction works. Approximately 200m from Moated site at Down Barns Farm Scheduled Monument. Approximately 300m from Staines Moor SSSI / South West London Waterbodies SPA / Ramsar site.	Failed based on increased cost and carbon associated with the long conveyance length, compared to other options.

Option name	WRMP19 Short ID	Option description	Source Water / SRO dependencies	Location (Initial Screening)	Mutual exclusivity	Potential Yield DYAA (M/d)	Delivery underway	Duplication	Comparative rejection	Superseded	Low flow availability	CAMS resource reliability	3rd party water availability	SEA Criteria	Failed at the initial stage?
							Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	
Mogden reuse indirect 1c	866	Transfer of Teddington DRA water for abstraction at the existing AFW Walton intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield SR. Routed as a tunnel from Teddington finishing immediately upstream of the AFW Walton intake (opposite bank).	Teddington DRA option within London Effluent Reuse SRO		Mogden reuse direct, Mogden reuse indirect 1a, Mogden reuse indirect 1b, Mogden reuse indirect 2a, Mogden reuse indirect 2b, Thames Water's Teddington DRA	50-75	Option is not underway	Duplication with Walton 2b	24.4km	The option has not been superseded	The option would not require abstraction beyond current licensed limits at times of low flow and is not subject to sustainability reductions	Option is not affected by the CAMS abstraction licence and reliability	There is scope for the development of a shared option but the potential amount of water available is limited by the environmental constraints as flagged by the EA (the increase in temperature of higher flows)	Pass No direct impacts on designated sites or scheduled monuments. Approximately 300m from Staines Moor SSSI / South West London Waterbodies SPA and Ramsar site. Approximately 120m from Harefield Pit SSSI. Approximately 200m from Mid Colne Valley SSSI. Approximately 400m from Fray's Farm Meadows SSSI.	No. Pass through to secondary assessment
Mogden reuse indirect 2a	866	Piped route from the Teddington DRA abstraction point at Teddington to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow SR.	Teddington DRA option within London Effluent Reuse SRO		Mogden reuse direct, Mogden reuse indirect 1a, Mogden reuse indirect 1b, Mogden reuse indirect 1c, Mogden reuse indirect 2b	50-75	Option is not underway	No duplication with another option	28.5km	The option has not been superseded	The option would not require abstraction beyond current licensed limits at times of low flow and is not subject to sustainability reductions	Option is not affected by the CAMS abstraction licence and reliability	There is scope for the development of a shared option but the potential amount of water available is limited by the environmental constraints as flagged by the EA (the increase in temperature of higher flows)	Pass No direct impacts on designated sites or scheduled monuments. Approximately 300m from Moated site at Down Barns Farm Scheduled Monument.	Failed based on increased cost and carbon associated with the long conveyance length, compared to other options.
Teddington DRA (formerly Mogden reuse indirect 2b)	866	Abstraction of raw water at a new intake at Teddington, upstream of Teddington weir and upstream of the proposed outfall from the London Effluent Reuse SRO. Teddington DRA option: conveyance to a new WTW at Harefield; and utilisation of the available storage capacity at the existing Harefield SR.	Teddington DRA option within London Effluent Reuse SRO		Mogden reuse direct, Mogden reuse indirect 1a, Mogden reuse indirect 1b, Mogden reuse indirect 2a	50-75	Option is not underway	No duplication with another option	22.6km	The option has not been superseded	The option would not require abstraction beyond current licensed limits at times of low flow and is not subject to sustainability reductions	Option is not affected by the CAMS abstraction licence and reliability	There is scope for the development of a shared option but the potential amount of water available is limited by the environmental constraints as flagged by the EA (the increase in temperature of higher flows)	Pass No direct impacts on designated sites or scheduled monuments. Approximately 130m from Ruislip Woods SSSI. Approximately 300m from Brackenbury Farm moated site 3/4 mile (1210m) NW of Ickenham church Scheduled Monument. Approximately 300m from Medieval moated site 382m south-east of Brackenbury Farm Scheduled Monument. Approximately 150m from Ickenham Manor Farm Scheduled Monument.	No. Pass through to secondary assessment
Mogden reuse indirect 3	1029	This option comprises the same infrastructure as Walton 2b, but utilises water from the proposed London Effluent Reuse SRO. Mogden effluent reuse option (effluent from Mogden STW is treated at a new Hydes Field tertiary treatment works (adjacent to the existing Kempton Park WTW), then discharged upstream of the Thames Water Walton intake. An extension would be required to take the discharge to the same reach of the river as the Affinity Water Walton intake).	Mogden effluent reuse scheme within the London Effluent Reuse SRO		Mogden reuse direct, Mogden reuse indirect 1a, Mogden reuse indirect 1b, Mogden reuse indirect 1c, Mogden reuse indirect 2a, Mogden reuse indirect 2b	50-75	Option is not underway	No duplication with another option	32.1	The option has not been superseded	The option would not require abstraction beyond current licensed limits at times of low flow and is not subject to sustainability reductions	Option is not affected by the CAMS abstraction licence and reliability	There is scope for the development of a shared option but the potential amount of water available is limited by the environmental constraints as flagged by the EA (the increase in temperature of higher flows)	Pass No direct impacts on designated sites or scheduled monuments. Approximately 300m from Harefield Pit SSSI. Approximately 500m from Fray's Farm Meadows SSSI. Approximately 500m from Kempton Park Reservoirs / South West London Waterbodies SPA and Ramsar site. Approximately 250m from Kempton Park Pumping Station Scheduled Monument.	No. Pass through to secondary assessment
Deephams reuse direct	N/a	Direct transfer of recycled water from the existing Deephams STW to a new WTW and SR near the location of the existing North Myms AFW site.	London Effluent Reuse SRO		Deephams reuse direct, Beckton reuse direct, Beckton reuse indirect	45	Option is not underway	No duplication with another option	N/a	The option has not been superseded	There is no flow available for use	Option is not affected by the CAMS abstraction licence and reliability	No resource available, this is a resource for Thames Water only. The full 45Ml/d is required by TW as discussed in the T2AT SRO - Option Identification Workshop on 17/07/2020.	Not required - already failed	Failed at the initial stage as the potential resource for option development is already fully allocated to TW. Also failed at the initial stage as direct reuse would result in unacceptable water quality risk (confirmed AFW and TW water quality scientists)
Deephams reuse indirect	N/a	Indirect transfer of Deephams recycled water from the existing William Gilling reservoir to a new WTW and SR near the location of the existing North Myms AFW site.	London Effluent Reuse SRO		Deephams reuse direct, Beckton reuse direct, Beckton reuse indirect	45	Option is not underway	No duplication with another option	N/a	The option has not been superseded	There is no flow available for use	Option is not affected by the CAMS abstraction licence and reliability	No resource available, this is a resource for Thames Water only. The full 45Ml/d is required by TW as discussed in the T2AT SRO - Option Identification Workshop on 17/07/2020.	Not required - already failed	Failed at the initial stage as the potential resource for option development is already fully allocated to TW
Beckton reuse direct	N/a	Direct transfer of recycled water from the existing Beckton STW to a new WTW and SR near the location of the existing North Myms AFW site.	Beckton effluent reuse scheme within the London Effluent Reuse SRO		Deephams reuse direct, Deephams reuse indirect, Beckton reuse indirect	50-150	Option is not underway	No duplication with another option	N/a	The option has not been superseded	The option would not require abstraction beyond current licensed limits at times of low flow and is not subject to sustainability reductions	Option is not affected by the CAMS abstraction licence and reliability	Due to Thames water and Affinity water policy decision on direct reuse there is no scope for the development of a shared option	Not required - already failed	Failed at the initial stage as direct reuse would result in unacceptable water quality risk (confirmed AFW and TW water quality scientists).

Option name	WRMP19 Short ID	Option description	Source Water / SRO dependencies	Location (Initial Screening)	Mutual exclusivity	Potential Yield DYAA (M/d)	Delivery underway	Duplication	Comparative rejection	Superseded	Low flow availability	CAMS resource reliability	3rd party water availability	SEA Criteria	Failed at the initial stage?
							Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	Initial stage	Initial stage
Beckton reuse indirect	N/a	Indirect transfer of recycled water from Beckton STW to a new WTW and SR near North Myrms. The proposed abstraction point would be located on the River Lee, downstream of the outfall from the proposed Beckton effluent reuse option, within the London Effluent Reuse SRO.	Beckton effluent reuse option within the London Effluent Reuse SRO, including extension from Lockwood shaft to River Lee.		Deephams reuse direct, Deephams reuse indirect, Beckton reuse direct	50-150	Option is not underway	No duplication with another option	15km	The option has not been superseded	The option would not require abstraction beyond current licensed limits at times of low flow and is not subject to sustainability reductions	Option is not affected by the CAMS abstraction licence and reliability. This option is also compatible with Mogden DRA, which discharges in a similar location to Beckton STW.	There is scope for the development of a shared option	Pass There are no direct impacts on designated sites or scheduled monuments. There are designated sites within 500m, but over 100m, of the option. Water End Swallow Holes SSSI and Chingford Reservoir SSSI are both approximately 300m from the North Myrms site and Beckton abstraction point respectively. Elyng Palace Scheduled Monument approximately 500m from option.	No. Pass through to secondary assessment
SESRO Transfer	N/a	Direct transfer from the SESRO reservoir to a new WTW at Amersham. The drinking water is then conveyed to Harefield to utilise the available storage capacity at the existing Harefield SR.	SESRO		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	55.6km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Option is not affected by the CAMS abstraction licence. The source of supply at the new reservoir is reliable.	There is scope for the development of a shared option	Soft fail Passes directly through Aston Rowant SSSI and Naphill Common SSSI. Passes directly through Chilterns Beechwoods SAC and Aston Rowant SAC. However, not a hard fail, potential for mitigation but would likely be complex and costly. Within 100m of Knightsbridge Lane SSSI, Ashton Rowant Cutting SSSI and Old Park Wood SSSI.	This option offers significant resilience advantages and therefore, although it has been failed on the comparative basis it could become an option in the future. Therefore it has been reopened and passed through to secondary screening.
Lower Thames Reservoir transfer 1a	N/a	Transfer direct from TW-owned reservoir* to an expanded Egham WTW. The drinking water is then conveyed to the existing Egham SR. * Currently based on using Staines North & South reservoirs.	SESRO		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50 Actual system DO = 0.	Option is not underway	No duplication with another option	7.16km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Release of LTR to AFW is dependent on additional storage becoming available to TW at SESRO. Option is not affected by the CAMS abstraction licence and the supply is reliable.	There is scope for the development of a shared option	LT reservoir to Egham used Soft fail Passes directly through Knight & Bessborough Reservoirs SSSI and South West London Waterbodies SPA and Ramsar site. However, not a hard fail, potential for mitigation but would likely be complex and costly. Approximately 200m from Roman camp, Matthew Arnold School's playing field, Staines Scheduled Monument.	No. Pass through to secondary assessment
Lower Thames Reservoir transfer 1b	N/a	Transfer direct from TW-owned reservoir* to an expanded WTW at Egham. The drinking water is then conveyed to the existing Harrow SR. * Currently based on using Staines North & South reservoirs.	SESRO		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 2a, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	28km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Release of LTR to AFW is dependent on additional storage becoming available to TW at SESRO. Option is not affected by the CAMS abstraction licence and the supply is reliable.	There is scope for the development of a shared option	Fail Passes directly through Wraybury Reservoir SSSI / South West London Waterbodies SPA and Ramsar site. Passes directly through Wraybury & Hythe End Gravel Pits SSSI. However, not a hard fail, potential for mitigation but would likely be complex and costly. Approximately 120m from Staines Moor SSSI. Approximately 400m from Northolt Manor, moated site Scheduled Monument.	Failed in comparison with the other Lower Thames Reservoir transfer options as its conveyance length is similar but this route passes through protected areas and the conveyance length will only increase to mitigate passing through these areas. This option has therefore not passed through to the secondary stage.
Lower Thames Reservoir transfer 2a	N/a	Water from TW's Wraybury and Queen Mother reservoirs is abstracted via a proposed connection into AFW's existing Wraybury (100" inch) tunnel at the existing Iver WTW site. This raw water is then diverted to the proposed Iver 2 WTW. The drinking water is subsequently conveyed to Harefield to utilise the available storage capacity at the existing Harefield SR. (Secondary screening was based on the above scheme. Initial screening was based on a pipe from other Lower Thames reservoirs)	SESRO		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2b	100 or 50	Option is not underway	No duplication with another option	16km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Release of LTR to AFW is dependent on additional storage becoming available to TW at SESRO. Option is not affected by the CAMS abstraction licence and the supply is reliable.	There is scope for the development of a shared option	Soft fail Passes directly through Wraybury Reservoir SSSI / South West London Waterbodies SPA and Ramsar site. However, not a hard fail, potential for mitigation but would likely be complex and costly. Approximately 120m from Harefield Pit SSSI. Approximately 200m from Mid Colne Valley SSSI. Approximately 400m from Fray's Farm Meadows SSSI.	No. Pass through to secondary assessment
Lower Thames Reservoir transfer 2b	N/a	Transfer direct from TW-owned reservoir* to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to the existing Harrow SR. * Currently based on using Staines North & South reservoirs.	SESRO		Sunnymeads 1, Sunnymeads 2a, Sunnymeads 2b, Sunnymeads GUC a, Sunnymeads GUC b, Sunnymeads GUC c, Egham 1, Egham 2a, Egham 2b, Chertsey 1, Chertsey 2a, Chertsey 2b, Walton 1, Walton 2a, Walton 2b, Medmenham, Maidenhead, Abingdon transfer, Lower Thames Reservoir transfer 1a, Lower Thames Reservoir transfer 1b, Lower Thames Reservoir transfer 2a	100 or 50	Option is not underway	No duplication with another option	20km	The option has not been superseded	The source is not subject to sustainability reductions and has a reliable supply	Release of LTR to AFW is dependent on additional storage becoming available to TW at SESRO. Option is not affected by the CAMS abstraction licence and the supply is reliable.	There is scope for the development of a shared option	Soft fail Passes directly through Wraybury Reservoir SSSI / South West London Waterbodies SPA and Ramsar site. However, not a hard fail, potential for mitigation but would likely be complex and costly. Less than 10m from the Two concentric ditches showing as crop marks at Thorney Scheduled Monument. However, potential for mitigation to avoid the Scheduled Monument, in aligning the pipeline slightly to avoid impacts. Potentially an easy fix. Mitigation measures could also be implemented to avoid disturbance effects / effects on setting during ST construction works. Approximately 300m from Moated site at Down Barns Farm Scheduled Monument.	No. Pass through to secondary assessment

C. Map of Options which Passed Initial Screening



Key to Symbols

- Sites

Pipeline Name

- Beckton reuse indirect
- Chertsey 1
- Chertsey 2a
- Chertsey 2b
- Egham 1
- Egham 2a
- Lower Thames reservoir 2a
- Lower Thames reservoirs 2b
- Lower Thames to Egham 1a
- Maidenhead
- Medmenham
- Mogden reuse indirect 1a
- Mogden reuse indirect 1c
- Mogden reuse indirect 2b
- Mogden reuse indirect 3
- Sunnymeads 1
- Sunnymeads 2a
- Sunnymeads 2b
- Sunnymeads GUC a
- Sunnymeads GUC b
- Walton 1
- Walton 2a
- Walton 2b

Notes

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P2	17/11/20	WJG	For Information	ES	QR
P1	01/10/20	WJG	For Information	ES	QR
Rev	Date	Drawn	Description	Ch'k'd	App'd

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Client

Thames Water / Affinity Water

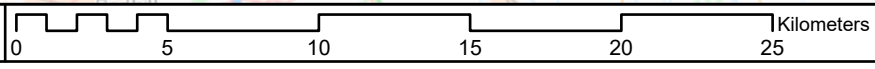
Title

Thames to Affinity Transfer
 Options After Initial Screening
 Overview

Designed	A Baekelandt	Eng Check	E Stanley
Drawn	WJ Goh	Coordination	A Baekelandt
GIS Check	-	Approved	Q Rea
Scale at A3	Status	Rev	Security
1:250,000	PRE	P2	STD

Drawing Number
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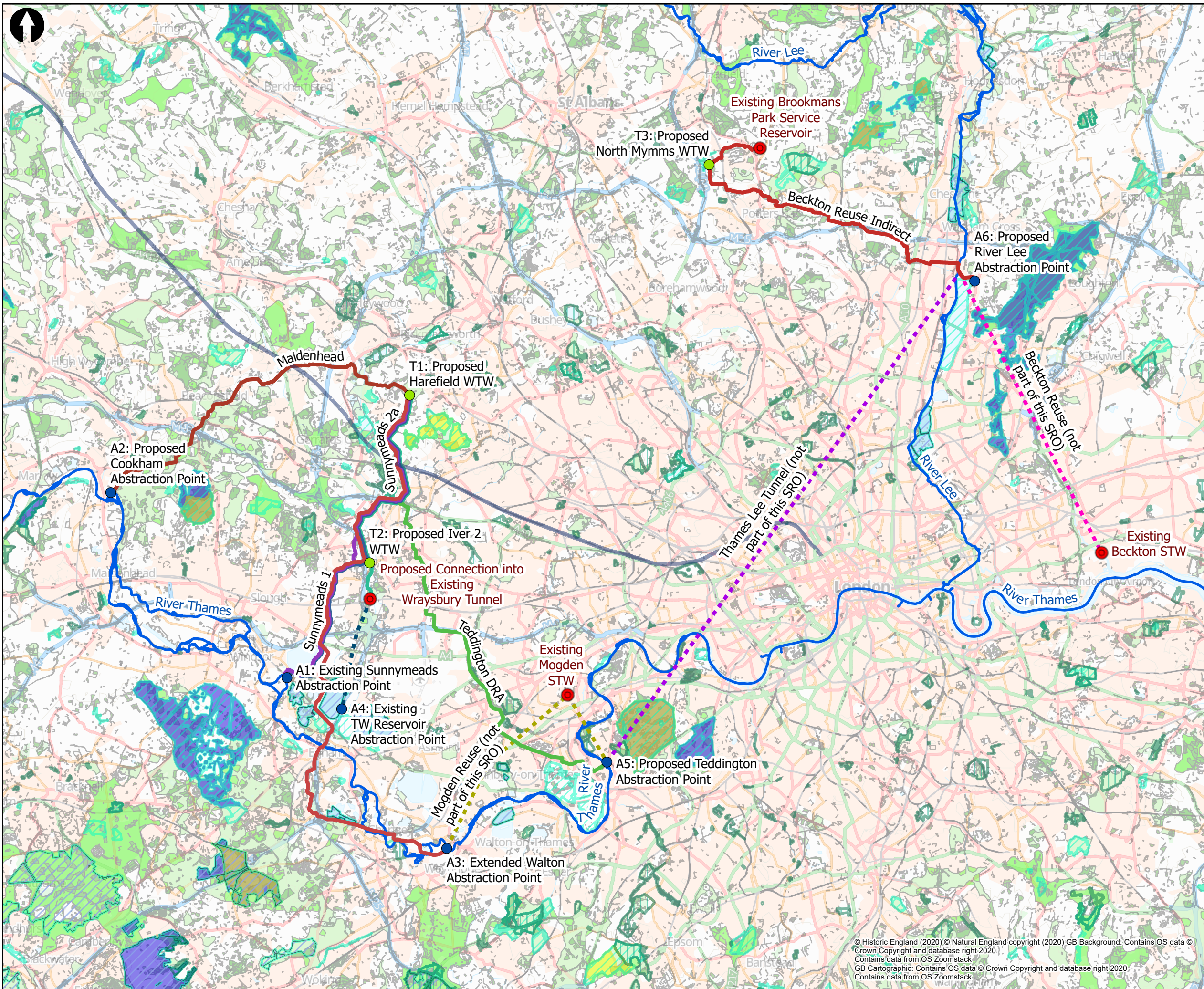
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D. Secondary Screening Spreadsheet

Option name	Option description	Source Water / PSD Appendix	Location (Secondary Screening)	A5: Operational complexity	E1: Modularity and scalability	E2: Ubiquity of equipment (regional/benefit)	E3: Vulnerability of infrastructure to avoid future other benefits	E4: Catchment & low water quality risks	Regulatory approval	Customer preference	Stakeholder/Community Planning	Excavation and Cost	Option value with respect to environmental designation, including EA and RFA considerations	Option value with respect to all EA Learning Objectives	Natural Capital	Water Framework and/or water quality water bodies	European Designated Sites	Construction complexity	Impact from construction	Opportunities	Environmental considerations	CDM considerations	Outcomes of Secondary stage	Comments/Options
Madchester	Abstraction of raw water at a new Madchester intake and connection to new WTP at Ansonham. The drinking water is then conveyed to the existing WTP via a new 1000mm diameter pipe. The drinking water is then conveyed to the existing WTP via a new 1000mm diameter pipe.	SD30 or SD1		Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Not on a comparison table for evaluation due to low investment of option.	
Madchester	Abstraction of raw water at a new Madchester intake and connection to new WTP at Ansonham. The drinking water is then conveyed to the existing WTP via a new 1000mm diameter pipe. The drinking water is then conveyed to the existing WTP via a new 1000mm diameter pipe.	SD30 or SD1		Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	It is noted that the Madchester option has a higher investment than the other options which do not have further development.	
Highgate House Inlet 1a	Transfer of Madchester raw water for abstraction at the existing WTP at Ansonham and conveyance to a new WTP at Ansonham via a new 1000mm diameter pipe. The drinking water is then conveyed to the existing WTP via a new 1000mm diameter pipe.	Madchester WTP option within London Effluent Basin SD		Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	The option delivering water to Highgate can be met via the other options, but the other options which do not have further development.	
Highgate House Inlet 1c	Transfer of Madchester raw water for abstraction at the existing WTP at Ansonham and conveyance to a new WTP at Ansonham via a new 1000mm diameter pipe. The drinking water is then conveyed to the existing WTP via a new 1000mm diameter pipe.	Madchester WTP option within London Effluent Basin SD		Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	The option delivering water to Highgate can be met via the other options, but the other options which do not have further development.	
Highgate House Inlet 2	Transfer of Madchester raw water for abstraction at the existing WTP at Ansonham and conveyance to a new WTP at Ansonham via a new 1000mm diameter pipe. The drinking water is then conveyed to the existing WTP via a new 1000mm diameter pipe.	Madchester WTP option within London Effluent Basin SD		Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	N/A - Proceed to next stage	
Highgate House Inlet 3	The option comprises the same infrastructure as the Highgate House Inlet 2, but with a new 1000mm diameter pipe for conveyance to the existing WTP via a new 1000mm diameter pipe.	Madchester WTP option within London Effluent Basin SD		Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	The option is the same as Highgate House Inlet 2, but with a new 1000mm diameter pipe for conveyance to the existing WTP via a new 1000mm diameter pipe.	
Lock for reuse Inlet	Transfer of recycled water from Buckthorn WTP to a new WTP and new WTP at Ansonham. The drinking water is then conveyed to the existing WTP via a new 1000mm diameter pipe.	Madchester WTP option within London Effluent Basin SD		Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	The option is the same as Highgate House Inlet 2, but with a new 1000mm diameter pipe for conveyance to the existing WTP via a new 1000mm diameter pipe.	
SD30 Transfer	Transfer of raw water from the SD30 transfer to a new WTP at Ansonham. The drinking water is then conveyed to the existing WTP via a new 1000mm diameter pipe.	SD30		Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Not on a comparison table for evaluation due to low investment of option.	
Lower Thames Recycled Transfer 1a	Water from WTP at Ansonham and conveyance to a new WTP at Ansonham via a new 1000mm diameter pipe. The drinking water is then conveyed to the existing WTP via a new 1000mm diameter pipe.	SD30		Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	The option has the shortest pipe route and lowest investment of the other options.	
Lower Thames Recycled Transfer 1b	Water from WTP at Ansonham and conveyance to a new WTP at Ansonham via a new 1000mm diameter pipe. The drinking water is then conveyed to the existing WTP via a new 1000mm diameter pipe.	SD30		Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	The option has the shortest pipe route and lowest investment of the other options.	
Lower Thames Recycled Transfer 1c	Water from WTP at Ansonham and conveyance to a new WTP at Ansonham via a new 1000mm diameter pipe. The drinking water is then conveyed to the existing WTP via a new 1000mm diameter pipe.	SD30		Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	Secondary stage	The option has the shortest pipe route and lowest investment of the other options.	

E. Map of Options which Passed Secondary Screening



Key to Symbols

- Proposed WTW
- Abstraction Point
- Non-Infrastructure Sites
- HS2 line (Phase One)
- Beckton Reuse Indirect
- Lower Thames Reservoir 2a
- Maidenhead
- Sunnymeads 1
- Sunnymeads 2a
- Teddington DRA
- Walton 2b / Mogden Reuse Indirect 3
- Beckton Reuse (not part of this SRO)
- (Indicative) Existing Wraybury Tunnel
- Mogden Reuse (not part of this SRO)
- Thames Lee Tunnel (not part of this SRO)
- River
- Local Nature Reserve
- Special Protection Areas
- Sites of Special Scientific Interest (SSSI)
- National Nature Reserves
- Ramsar
- Special Areas Of Conservation
- Woodland
 - Local
 - National
 - Regional

Rev	Date	Drawn	Description	Ch'k'd	App'd
P9	02/12/21	WJG	Extension to Brookmans Park	DH	TB
P8	15/06/21	WJG	Update for G1 Report	ES	QR
P7	04/03/21	WJG	Information updated to include Mogden Reuse Indirect 3	ES	QR
P6	10/02/21	WJG	Updated following conceptual design	QR	MF
P5	22/12/20	WJG	Added HS2 route and revised Maidenhead Pipe route	PF	QR
P4	17/11/20	WJG	For Information	ES	QR
P3	29/10/20	WJG	For Information	ES	QR
P2	26/10/20	WJG	For Information	ES	QR
P1	01/10/20	WJG	For Information	ES	QR

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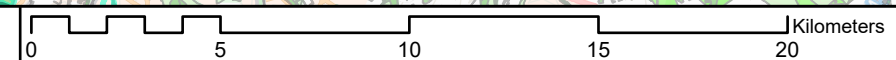
Client
 Thames Water / Affinity Water

Title
 Thames to Affinity Transfer
 Options After Secondary Screening
 Overview

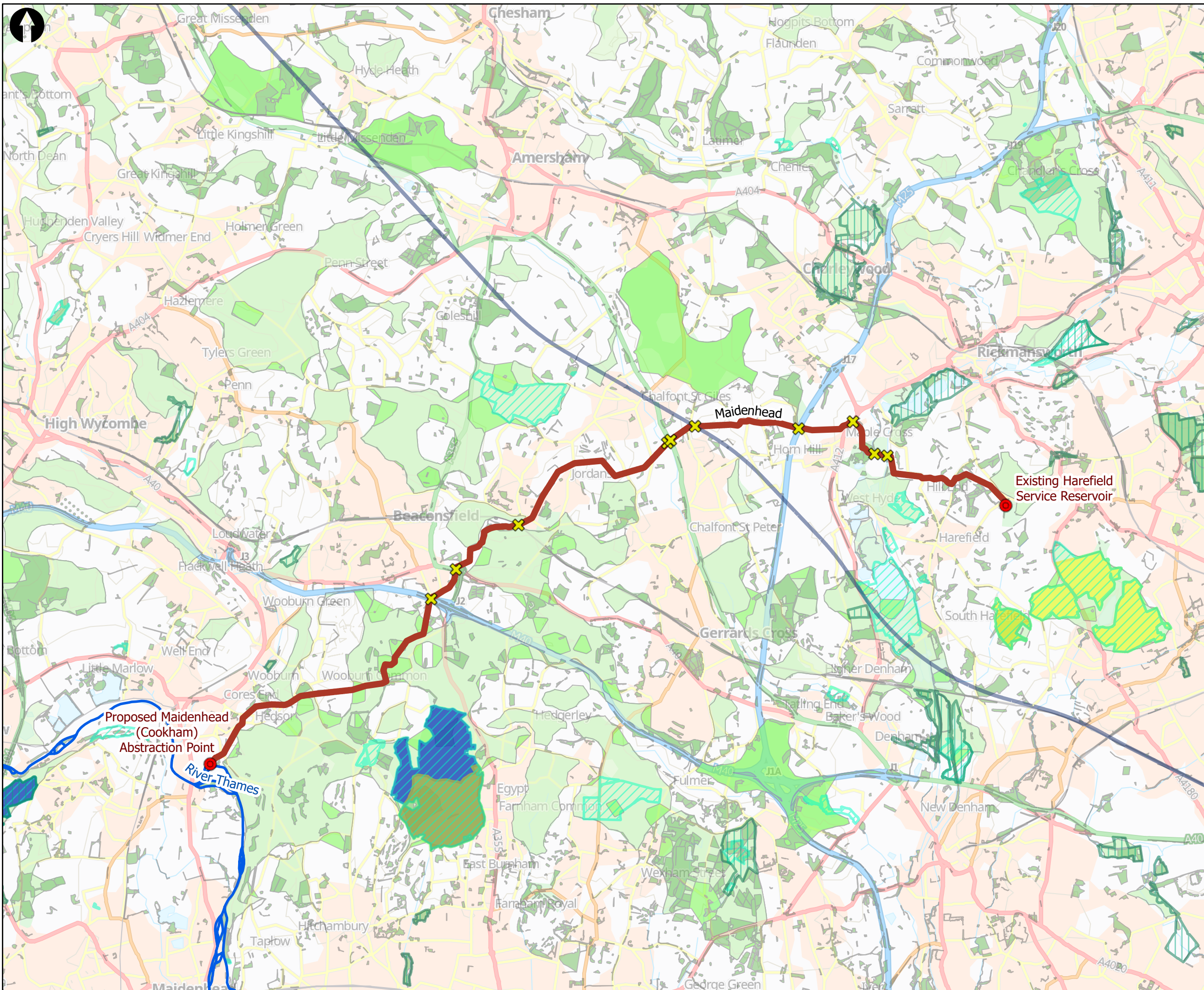
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GIS Check	-	Approved	T Broadley
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Key to Symbols

- Non-Infrastructure Sites
- ✕ Crossings
- HS2 line (Phase One)
- River

Pipeline Name

- Maidenhead

Woodland

- Local
- National
- Regional

Other Symbols:

- Local Nature Reserve
- Sites of Special Scientific Interest (SSSI)
- National Nature Reserves
- Special Areas Of Conservation
- Sites Of Special Scientific Interest - Risk Zones

Notes

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P4	04/03/21	WJG	Updated following concept design	ES	QR
P3	22/12/20	WJG	Added HS2 route	PF	QR
P2	17/11/20	WJG	For Information	ES	QR
P1	01/10/20	WJG	For Information	ES	QR
Rev	Date	Drawn	Description	Ch'k'd	App'd

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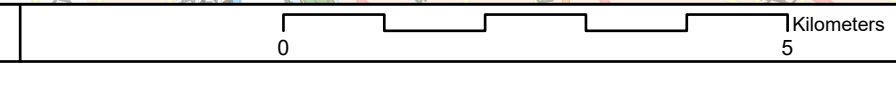
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Thames Water / Affinity Water

Title

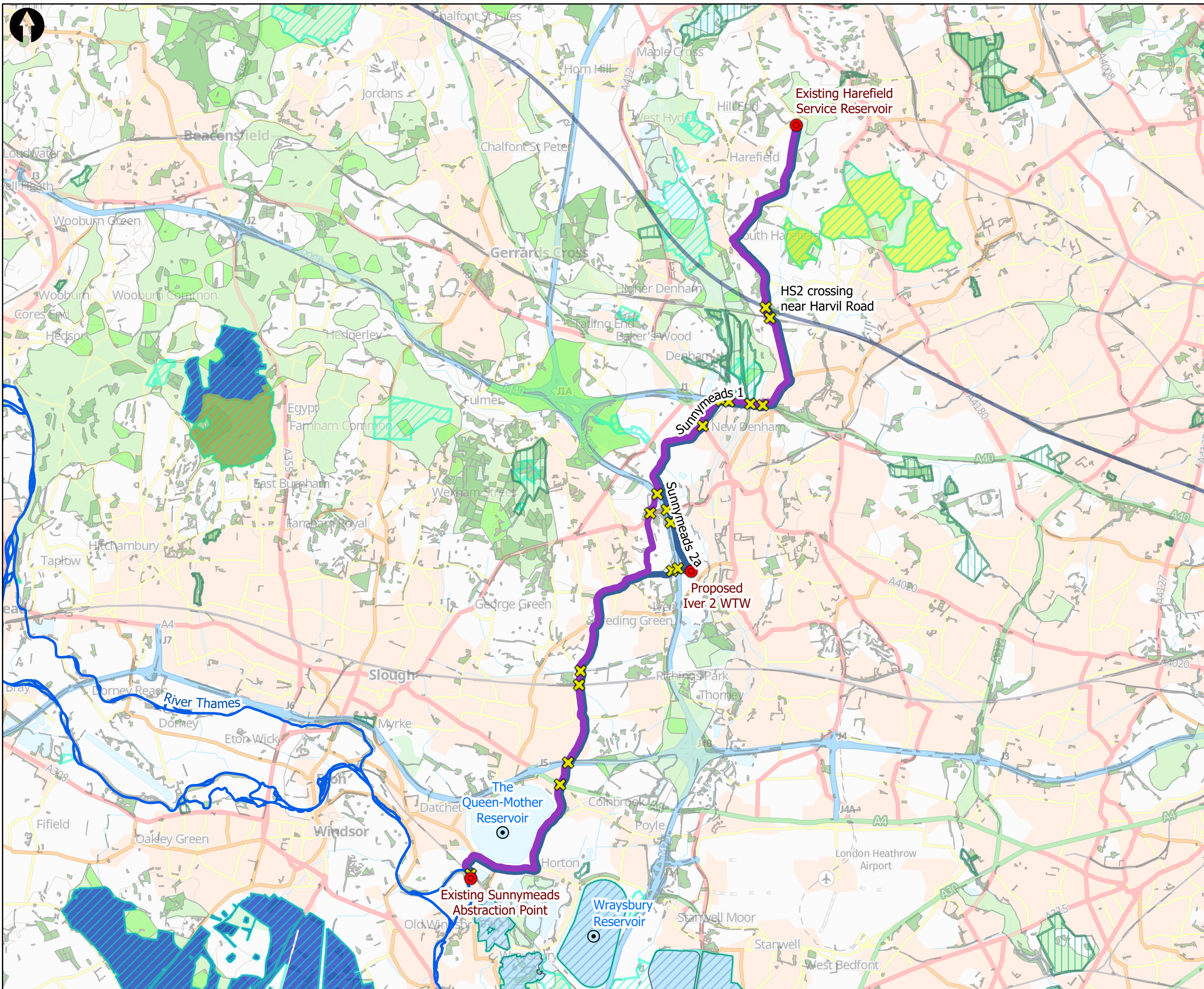
Thames to Affinity Transfer
 Options After Secondary Screening
 Maidenhead

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Drawn	WJ Goh	Coordination	A Baekelandt
GIS Check	-	Approved	Q Rea
Scale at A3	Status	Rev	Security
1:75,000	PRE	P4	STD



Drawing Number

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Key to Symbols

- Non-Infrastructure Sites
- ⊙ Thames Water Reservoirs
- ✕ Crossings
- HS2 line (Phase One)
- River

Pipeline Name

- Sunnymeads 1
- Sunnymeads 2a

Environmental Designations

- Local Nature Reserve
- Special Protection Areas
- Sites of Special Scientific Interest (SSSI)
- National Nature Reserves
- Ramsar
- Special Areas Of Conservation
- Sites Of Special Scientific Interest - Risk Zones

Woodland

- Local
- National
- Regional

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P4	04/03/21	WJG	Updated following concept design	ES	QR
P3	22/12/20	WJG	Added HS2 route	PF	QR
P2	17/11/20	WJG	For Information	ES	QR
P1	01/10/20	WJG	For Information	ES	QR

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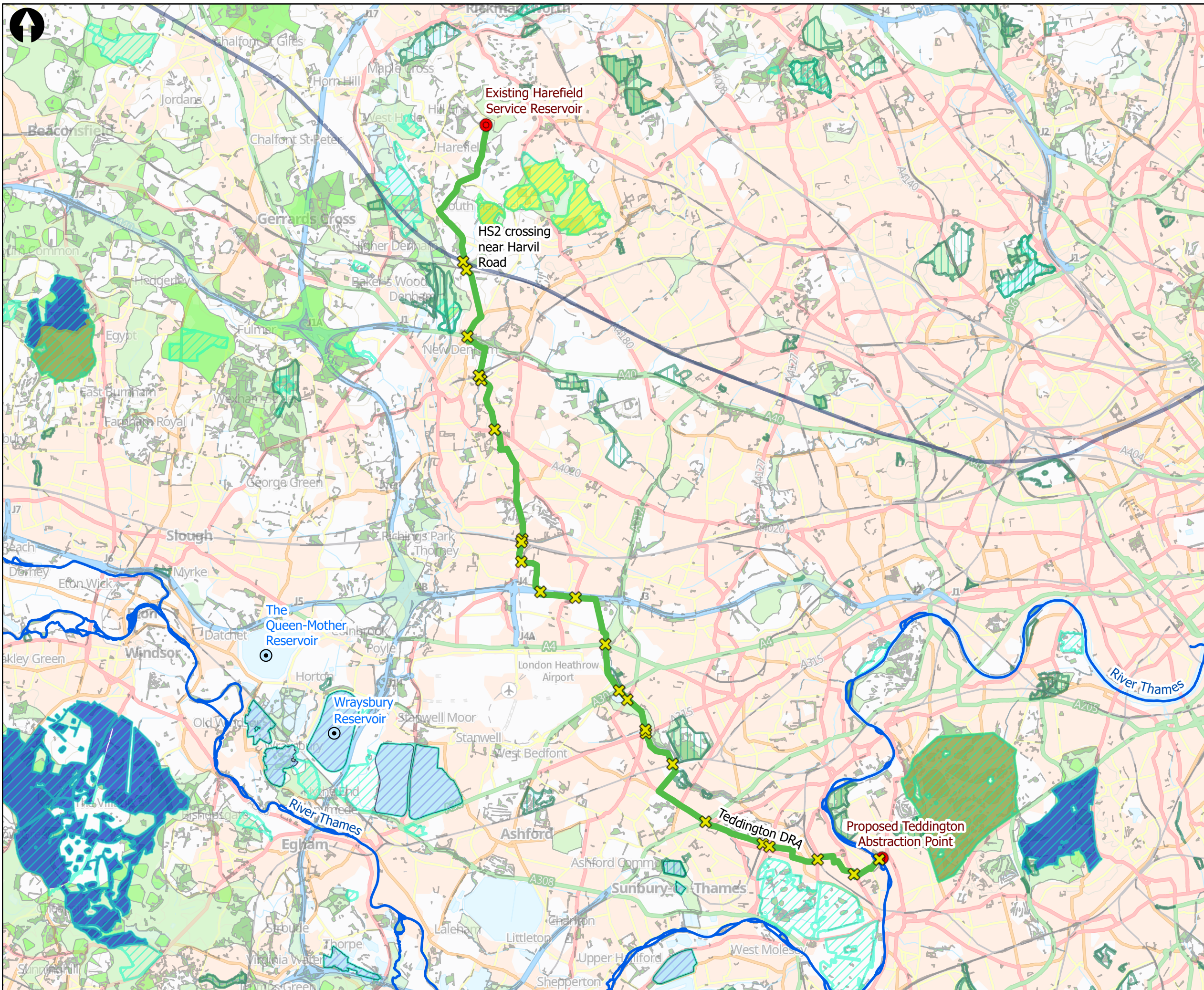
Thames Water / Affinity Water

Title

Thames to Affinity Transfer
 Options After Secondary Screening
 Sunnymeads

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Drawn	WJ Goh	Coordination	A Baekelandt
GIS Check	-	Approved	Q Rea
Scale at A3	Status	Rev	Security
1:75,000	PRE	P4	STD





Key to Symbols

- Non-Infrastructure Sites
- ⊙ Thames Water Reservoirs
- ✕ Crossings
- HS2 line (Phase One)
- River

Pipeline Name

- Teddington DRA

Woodland

- Local
- National
- Regional

Other Symbols:

- Local Nature Reserve
- Special Protection Areas
- Sites of Special Scientific Interest (SSSI)
- National Nature Reserves
- Ramsar
- Special Areas Of Conservation
- Sites Of Special Scientific Interest - Risk Zones

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P3	22/12/20	WJG	Added HS2 route	PF	QR
P2	17/11/20	WJG	For Information	ES	QR
P1	01/10/20	WJG	For Information	ES	QR
Rev	Date	Drawn	Description	Ch'k'd	App'd

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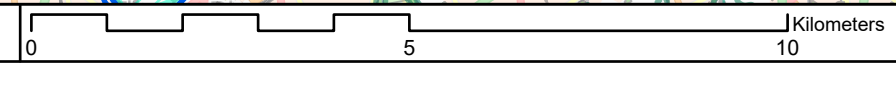
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Title

Thames to Affinity Transfer
 Options After Secondary Screening
 Teddington DRA

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GIS Check	-	Approved	Q Rea
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Key to Symbols

- Non-Infrastructure Sites
- ⊙ Thames Water Reservoirs
- ✕ Crossings
- HS2 line (Phase One)
- River

Pipeline Name

- Walton 2b / Mogden Reuse Indirect 3
- Mogden Reuse (not part of this SRO)

Other Symbols

- ▭ Local Nature Reserve
- ▭ Special Protection Areas
- ▭ Sites of Special Scientific Interest (SSSI)
- ▭ National Nature Reserves
- ▭ Ramsar
- ▭ Special Areas Of Conservation
- ▭ Sites Of Special Scientific Interest - Risk Zones

Woodland

- ▭ Local
- ▭ National
- ▭ Regional

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P4	04/03/21	WJG	Updated following concept design	ES	QR
P3	22/12/20	WJG	Added HS2 route	PF	QR
P2	17/11/20	WJG	For Information	ES	QR
P1	01/10/20	WJG	For Information	ES	QR

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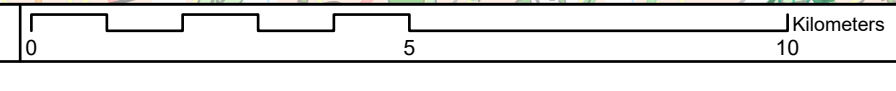
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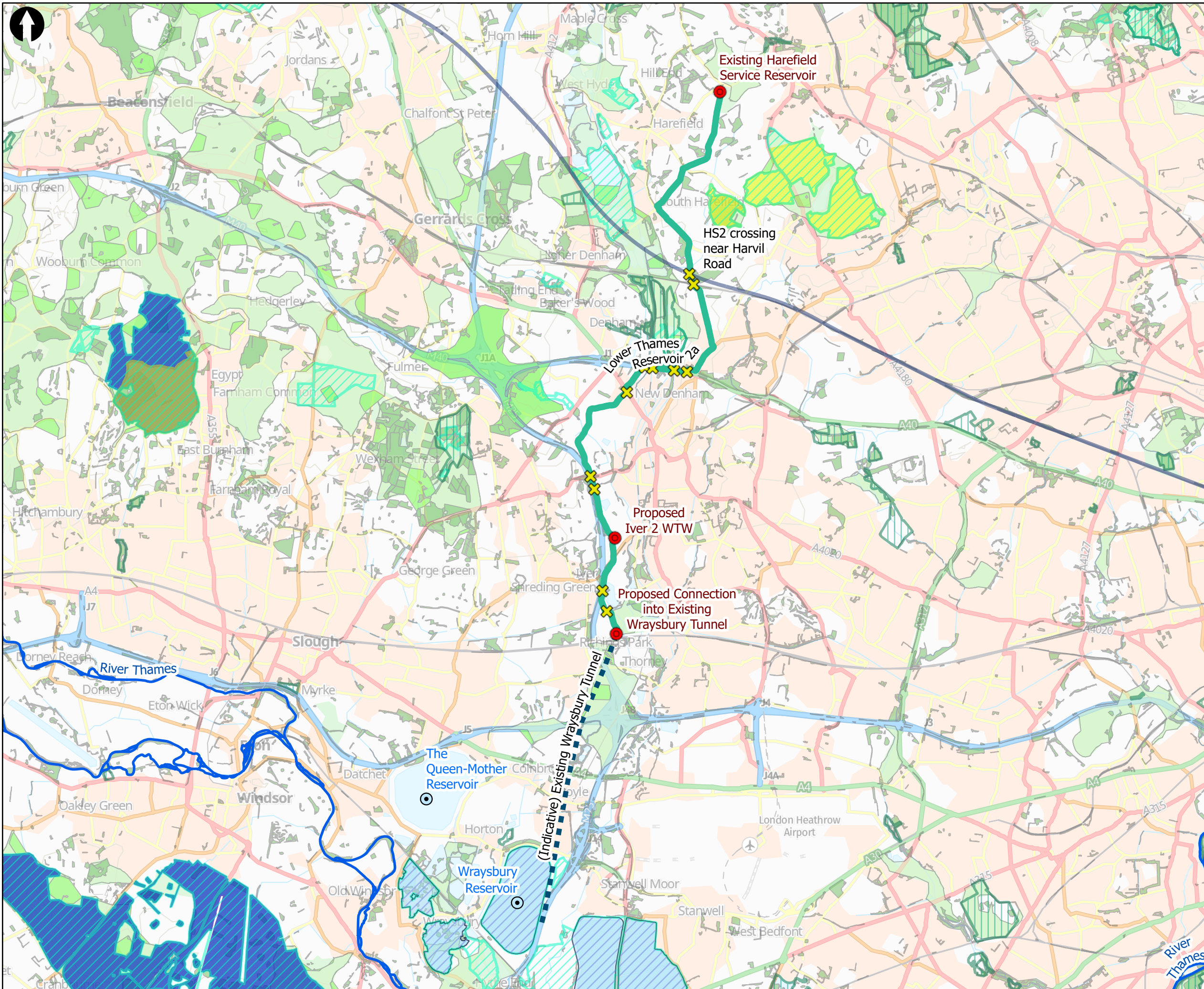
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Thames to Affinity Transfer
 Options After Secondary Screening
 Walton

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Scale at A3	Status	Rev	Security
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Drawing Number
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Key to Symbols

- Non-Infrastructure Sites
- ⊙ Thames Water Reservoirs
- ✕ Crossings
- HS2 line (Phase One)
- River

Pipeline Name

- Lower Thames Reservoir 2a
- (Indicative) Existing Wryasbury Tunnel
- ▨ Local Nature Reserve
- ▨ Special Protection Areas
- ▨ Sites of Special Scientific Interest (SSSI)
- ▨ National Nature Reserves
- ▨ Ramsar
- ▨ Special Areas Of Conservation
- ▨ Sites Of Special Scientific Interest - Risk Zones

Woodland

- Local
- National
- Regional

Notes

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P4	04/03/21	WJG	Updated following concept design	ES	QR
P3	22/12/20	WJG	Added HS2 route	PF	QR
P2	17/11/20	WJG	For Information	ES	QR
P1	01/10/20	WJG	For Information	ES	QR
Rev	Date	Drawn	Description	Ch'k'd	App'd

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Client

Thames Water / Affinity Water

Title

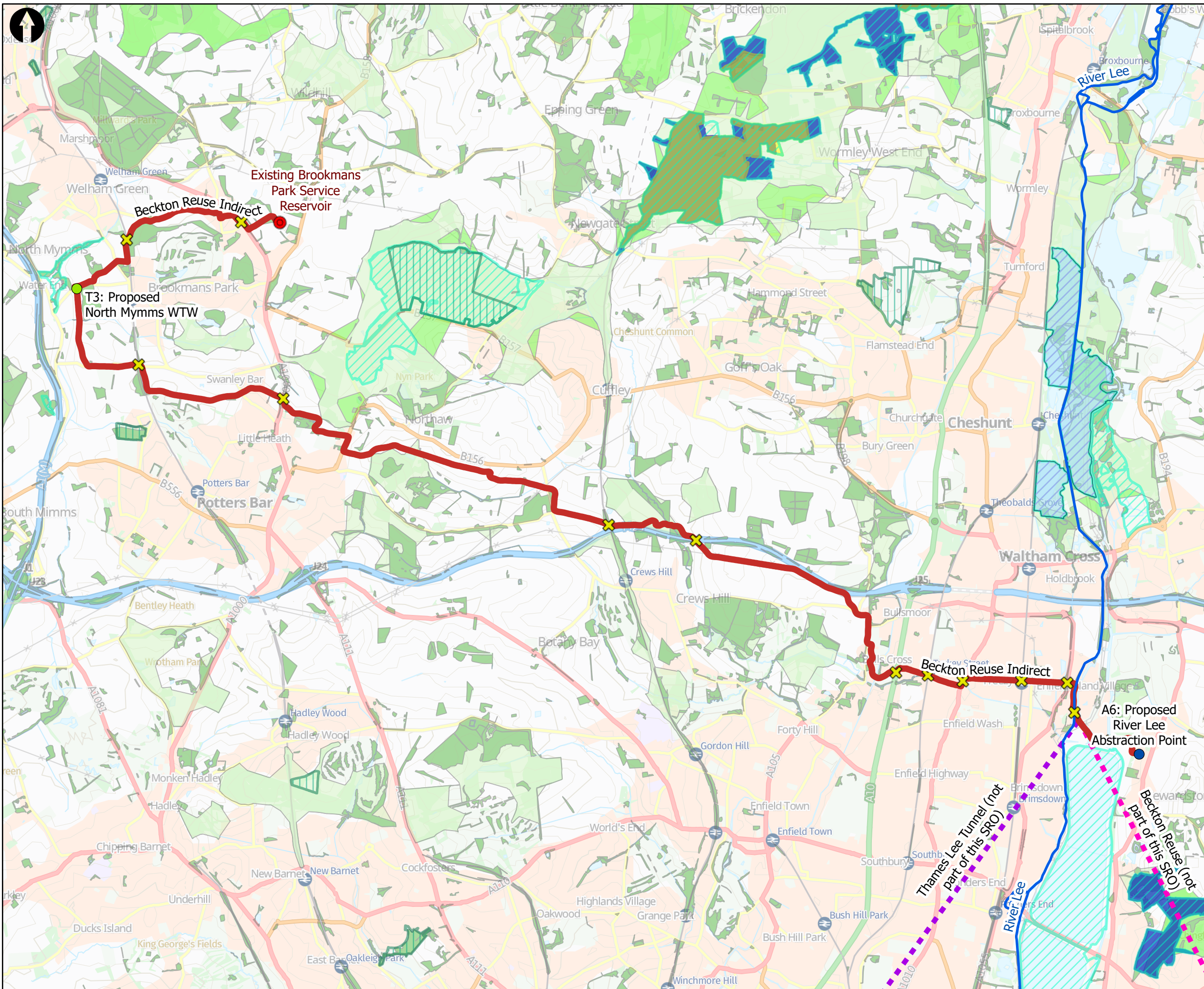
Thames to Affinity Transfer
 Options After Secondary Screening
 Lower Thames Reservoirs

Designed	P Furse	Eng Check	E Stanley
Drawn	WJ Goh	Coordination	A Baekelandt
GIS Check	-	Approved	Q Rea
Scale at A3	Status	Rev	Security
1:75,000	PRE	P4	STD

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Drawing Number
 420176-MMD-00-XX-GIS-Y-0018



Key to Symbols

- Proposed WTW
- Abstraction Point
- Non-Infrastructure Sites
- X Crossings
- Beckton Reuse Indirect
- Beckton Reuse (not part of this SRO)
- Thames Lee Tunnel (not part of this SRO)
- River
- Local Nature Reserve
- Special Protection Areas
- Sites of Special Scientific Interest (SSSI)
- National Nature Reserves
- Ramsar
- Special Areas Of Conservation
- Sites Of Special Scientific Interest - Risk Zones

Woodland

- Local
- National
- Regional

Notes

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P5	02/12/21	WJG	Extension to Brookmans Park	DH	TB
P4	04/03/21	WJG	Updated following concept design	ES	QR
P3	22/12/20	WJG	Added HS2 route	PF	QR
P2	17/11/20	WJG	For Information	ES	QR
P1	01/10/20	WJG	For Information	ES	QR

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Client
 Thames Water / Affinity Water

Title
 Thames to Affinity Transfer
 Options After Secondary Screening
 Beckton

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Drawn	WJ Goh	Coordination	-
GIS Check	-	Approved	T Bradley

Scale at A3	Status	Rev	Security
1:50,000	PRE	P5	STD

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F. Environmental Appraisal of Options

Maidenhead

Table F.1 provides a summary of the Gate 1 environmental assessments undertaken for the Maidenhead option.

Table F.1: Maidenhead: Summary of Gate 1 Environmental Assessments

Environmental assessment	Summary outcome and next steps
Habitats Regulations Assessment	<ul style="list-style-type: none"> Stage 1 Screening Assessment: Uncertain Effects on South West London Waterbodies SPA/Ramsar and Burnham Beeches SAC therefore Stage 2 Appropriate Assessment required. No potential for Likely Significant Effects or Uncertain Effects identified for Chiltern Beechwoods SAC. Stage 2 Appropriate Assessment: <ul style="list-style-type: none"> No adverse effects on the integrity of the Burnham Beeches SAC are considered likely as no transmission pathways were identified by which a Likely Significant Effect could reasonably occur. No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar are expected, subject to confirmation that the increased abstraction on the River Thames would not affect groundwater interactions.
WFD	<ul style="list-style-type: none"> Level 1 Basic Screening: GB106039023233: Thames (Reading to Cookham) waterbody 'screened in' for further WFD assessment because abstraction related activities present some risk to WFD status or objectives to this waterbody. Level 2 Detailed Impact Screening: potentially precautionary WFD compliance risks identified. Possible deterioration risks to fish, invertebrates, hydrological regime, dissolved oxygen and phosphate. These are primarily due to a potential risk of reduced flow due to increased abstraction, and the additional intake structure required. It also identified potential impediments to meeting Good Ecological Status, if the hydrological regime of the waterbody was affected to the extent that phosphate concentrations could increase, as this element is currently below good. Further WFD assessment would be required to improve the certainty of the levels of WFD risk.
SEA	<ul style="list-style-type: none"> For the majority of topics, minor or neutral residual effects identified. Moderate negative effects for biodiversity due to potential impacts on designated sites and loss of habitat, for water due to abstraction from the new Maidenhead intake and due to operational carbon emissions for the abstraction and pipeline. Table F.2 provides a summary of the key impacts for each topic together with mitigation measures.
INNS Risk Assessment	<ul style="list-style-type: none"> Medium freshwater risk of Ponto-Caspian invasions and low future marine invasion risk. However, as raw water transfer options terminate at a WTW, the risks associated with spreading freshwater or marine INNS via the transfer would be effectively eliminated. However, it is possible that the infrequent use of pipeline drainage points and occasional WTW overflows could introduce an INNS risk. Considered unlikely at this stage that this option would contravene INNS legislation, but this does not consider the risk presented by WTW overflow and pipeline drainage.
Natural Capital Assessment and Biodiversity Net Gain	<ul style="list-style-type: none"> Temporary loss of woodland (broadleaved mixed, coniferous and orchards) for the pipeline and permanent loss of pastures for the WTW. Monetised change in value of ecosystem services for the pipeline of -£298.51 per year mainly due to reduction in carbon storage from loss of woodland and also due to natural hazard management due to loss of active floodplain. Monetised change in value of ecosystem services for the WTW of -£670.68 per year mainly due to loss of food production from permanent loss of arable land and also due to reduction in carbon storage. Net loss of biodiversity of -31.35% for the pipeline and -100% for the WTW.

Table F.2 provides commentary of the key environmental impacts for the Maidenhead option for each topic together with mitigation measures.

Table F.2: Maidenhead: Key Environmental Impacts and Mitigation

Topic	Abstraction (Maidenhead (Cookham) Abstraction Point) and pipeline (Cookham to Harefield WTW)	Harefield WTW
Biodiversity, flora and fauna	<ul style="list-style-type: none"> No direct effects on statutory designated sites, woodland or other priority habitats as a result of construction of the Maidenhead (Cookham) Abstraction Point at the indicative site. No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar are expected, but confirmation is required that the increased abstraction on the River Thames would not affect groundwater interactions as identified in the Stage 2 Appropriate Assessment in relation to the South West London Waterbodies SPA/Ramsar (see Table 5.2). Indirect negative effects on statutory designated sites during construction, the nearest being Old Park Wood SSSI, which is within 500m of the indicative pipeline route. There are no direct effects on Ancient Woodland although there are areas within 500m, which could be indirectly affected. Direct negative effects during pipeline construction due to loss of woodland, including deciduous woodland priority habitat and small area of traditional orchard. Potential indirect negative effects on areas of Ancient Woodland within 500m of the indicative pipeline route. Indirect negative effects on multiple LWS/SINC/SNCIs, with at least five sites potentially directly impacted: White Heath Farm Woods and Fields and Harefield Green SINC, Springwell and Stocker's Lake SINC, London's Canals SINC, Maple Lodge Marsh SINC and East Colne Valley Chalk Pits SINC. 	<ul style="list-style-type: none"> Potential for indirect negative effects on statutory designated sites within 2km of the indicative site for the new Harefield WTW (Old Park Wood SSSI and Ruislip Woods SSSI), and on woodland, including Ancient Woodland and deciduous woodland and traditional orchard priority habitats within 500m of the indicative site of the new Harefield WTW.
Soils	<ul style="list-style-type: none"> Permanent loss of Grade 3 agricultural land due to construction of the pumping station at the indicative site for the new Maidenhead (Cookham) Abstraction Point. Temporary loss of Grade 3 agricultural land and an area of Grade 2 agricultural land due to pipeline construction along the indicative pipeline route. The indicative pipeline route passes through a historic landfill site and is within 500m of an authorised landfill site and several historic landfill sites. It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur. 	<ul style="list-style-type: none"> Permanent loss of Grade 3 agricultural land due to construction of the new Harefield WTW at the indicative site. The indicative site for the new Harefield WTW is within 500m of a historic landfill. It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur.
Water	<ul style="list-style-type: none"> The indicative site for the pumping station for the new Maidenhead (Cookham) Abstraction Point, is in Flood Zone 1. A gravity pipeline will be required between the abstraction point and the pumping station which will pass through Flood Zones 2 and 3. Construction of the intake, gravity pipeline and pumping station for the new Maidenhead (Cookham) Abstraction Point could result in a negative effect on the water quality of nearby waterbodies. 	<ul style="list-style-type: none"> The indicative site for the new Harefield WTW would be located within Flood Zone 1. Construction of the new Harefield WTW could result in a negative effect on the water quality of nearby waterbodies. It is expected that with the implementation of good practice pollution prevention and control measures, long-term residual effects are unlikely to occur as a result of construction.

Topic	Abstraction (Maidenhead (Cookham) Abstraction Point) and pipeline (Cookham to Harefield WTW)	Harefield WTW
	<ul style="list-style-type: none"> The indicative pipeline route passes through Flood Zone 1 (low risk of flooding) with some areas of Flood Zones 2 and 3 with potential impacts during construction. As the indicative pipeline route crosses areas of SPZ1-3, and crosses several watercourses, including chalk rivers, construction could result in a negative effect on the water quality of nearby waterbodies. It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur. The new Maidenhead intake could result in negative effects on water flows, levels and quality during operation and further WFD assessment would be required as outlined in Table F.1 above. 	
Air	<ul style="list-style-type: none"> The indicative site for the pumping station for the new Maidenhead (Cookham) Abstraction Point is not located within an AQMA. The indicative pipeline route passes through the South Buckinghamshire AQMA where it crosses the M40. Temporary negative effects on air quality are anticipated. It is expected that with the implementation of good practice measures during construction, there may still be some temporary impacts on air quality, however, long-term residual effects are unlikely to occur. 	<ul style="list-style-type: none"> The indicative site for the new Harefield WTW is not located within an AQMA. Temporary negative effects on air quality are anticipated. It is expected that with the implementation of good practice measures during construction, there may still be some temporary impacts on air quality, however, long-term residual effects are unlikely to occur.
Climatic factors	<ul style="list-style-type: none"> The relative carbon scale identified that, relative to other WRSE Regional Plan options, the abstraction and pipeline would result in minor negative construction and moderate negative operational carbon emissions. Further information on carbon footprint is provided in Section 5.4. The resilience of the local environment to climate change may be negatively affected as abstraction is proposed. It is recommended the levels of the river are monitored to avoid over-abstraction. 	<ul style="list-style-type: none"> The relative carbon scale identified that, relative to other WRSE regional plan options, the new Harefield WTW would result in minor negative construction and operation carbon emissions.
Landscape	<ul style="list-style-type: none"> The pumping station for the new Maidenhead (Cookham) Abstraction Point is in the London Area Greenbelt but not within proximity to the Chilterns AONB. Permanent effects on the landscape are expected with long-term residual effects likely to occur. Opportunities to incorporate screening to reduce the visual effects during operation would be embedded in the design. The indicative pipeline route is in proximity to the Chilterns AONB with the section between Chalfont Common and Maple Cross being within 500m, indicating a landscape of higher sensitivity, and passes through the London Area Greenbelt for almost its entirety, with negative effects anticipated due to the excavation work. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur. Direct negative effects on at least one TPO. 	<ul style="list-style-type: none"> The indicative site for the new Harefield WTW is in the London Area Greenbelt but not within proximity to the Chilterns AONB. Permanent effects on the landscape are expected with long-term residual effects likely to occur. Opportunities to incorporate screening to reduce the visual effects during operation would be embedded in the design.
Historic environment	<ul style="list-style-type: none"> The location of the pumping station for the new Maidenhead (Cookham) Abstraction Point, in a field to the west of Hedsor House Grade II Registered Park and Garden, and to the north of the Cliveden Grade I Registered Park and Garden, avoids direct effects on designated sites. There is a Grade II listed building (Lodge at Hedsor Priory Lodge) within 500m of the pumping station for the new Maidenhead (Cookham) Abstraction Point with potential for setting effects during construction and operation. The indicative pipeline route passes through Hedsor House Grade II Registered Park and Garden and Hall Barn Grade II* Registered Park and Garden with direct impacts during construction. There are also listed buildings and a scheduled monument within 500m of the proposed route with potential for setting effects during construction. Excavation during construction could potentially directly impact buried archaeology if present. The impacts are unknown at this stage and further work is required to determine the significance of any archaeological remains that could be impacted. 	<ul style="list-style-type: none"> There is a Grade II listed building (London Coal Duty Marker on County Boundary about 150 metres south east of Woodcock Hill Farm House (the house itself is not listed) within 500m of the indicative site for the new Harefield WTW although no setting effects are likely as a result of the WTW. Excavation during construction could potentially directly impact buried archaeology if present. The impacts are unknown at this stage and further work is required to determine the significance of any archaeological remains that could be impacted.
Population and human health	<ul style="list-style-type: none"> There are no community facilities within proximity to the pumping station for the new Maidenhead (Cookham) Abstraction Point or the abstraction point itself. Temporary severance of public rights of way, is likely during construction. Disruption to the local community and users of community facilities within proximity to the indicative pipeline route, and temporary disruption to public rights of way and a national cycle route and two golf courses, is likely during construction. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur. 	<ul style="list-style-type: none"> Disruption to the local community and users of community facilities, including a country park and public park and garden within proximity to the indicative site for the new Harefield WTW, and temporary disruption of public rights of way, is likely during construction. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.
Material assets	<ul style="list-style-type: none"> There is likely to be localised traffic disruption during construction of the pumping station for the new Maidenhead (Cookham) Abstraction Point. The indicative pipeline route crosses major roads (including M25, M40 and A412), a railway line and National Cycle Network Route 6 with disruption during construction likely due to potential temporary diversions and traffic disruption. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur. 	<ul style="list-style-type: none"> There is likely to be localised traffic disruption during construction of the new Harefield WTW. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.

Sunnymeads 1

Table F.3 provides a summary of the Gate 1 environmental assessments undertaken for the Sunnymeads 1 option together with next steps.

Table F.3: Sunnymeads 1: Summary of Gate 1 Environmental Assessments

Environmental assessment	Summary outcome and next steps
Habitats Regulations Assessment	<ul style="list-style-type: none"> Stage 1 Screening Assessment: Likely Significant Effects on South West London Waterbodies SPA/Ramsar therefore Stage 2 Appropriate Assessment required. No potential for Likely Significant Effects or Uncertain Effects identified for Windsor Forest & Great Park SAC, Thames Basin Heaths SPA, Thursley, Ash, Pirbright & Chobham SAC or Burnham Beeches SAC. Stage 2 Appropriate Assessment: No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar are expected, if the suggested mitigation measures in the HRA Stage 2: Appropriate Assessment are implemented. These include both standard construction good practice measures and construction methods.
WFD	<ul style="list-style-type: none"> Level 1 Basic Screening: no further assessment would be necessary for the option, because the types of activities do not present a risk to WFD status or objectives for any waterbodies.
SEA	<ul style="list-style-type: none"> For the majority of topics, minor or neutral residual effects identified. Major negative effects for biodiversity due to potential impacts on designated sites and operational carbon emissions. Table F.4 provides a summary of the key impacts for each topic together with mitigation measures.
INNS Risk Assessment	<ul style="list-style-type: none"> Medium freshwater risk of Ponto-Caspian invasions and low future marine invasion risk. However, as raw water transfer options terminate at a WTW, the risks associated with spreading freshwater or marine INNS via the transfer would be effectively eliminated. However, it is possible that the infrequent use of pipeline drainage points and occasional WTW overflows could introduce an INNS risk. Considered unlikely at this stage that this option would contravene INNS legislation, but this does not consider the risk presented by WTW overflow and pipeline drainage.
Natural Capital Assessment and Biodiversity Net Gain	<ul style="list-style-type: none"> Temporary loss of woodland (broadleaved mixed, coniferous and orchards) for the pipeline and permanent loss of pastures for the WTW. Monetised change in value of ecosystem services for the pipeline of -£4,815.31 per year mainly due to reduction in air pollutant removal due to loss of habitat within AQMAs, and also due to reduction in carbon storage due to loss of woodland and natural hazard management due to loss of active floodplain. Monetised change in value of ecosystem services for the WTW of -£670.68 per year mainly due to loss of food production from permanent loss of arable land and also due to reduction in carbon storage. Net loss of biodiversity of -51.55% for the pipeline and -100% for the WTW.

Table F.4 provides commentary of the key environmental impacts for the Sunnymeads 1 option for each topic together with mitigation measures. The proposed location for the WTW for this option is the same as the proposed WTW location for the Maidenhead option (Harefield), see Table F.2.

Table F.4: Sunnymeads 1: Key Environmental Impacts and Mitigation

Topic	Abstraction (Sunnymeads intake) and pipeline (Sunnymeads to new Harefield WTW)
Biodiversity, flora and fauna	<ul style="list-style-type: none"> No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar are expected, if the suggested mitigation measures in the HRA Stage 2: Appropriate Assessment are implemented. These include both standard construction good practice measures and construction methods. Indirect negative effects on statutory designated sites during construction, including Ruislip Woods SSSI/NNR; Mid Colne Valley SSSI; Fray's Farm Meadows SSSI; Denham Lock Wood SSSI; Kingcup Meadows and Oldhouse Wood SSSI; and Wraysbury No. 1 Gravel Pit SSSI, Fray's Valley LNR and Denham Quarry Park LNR, which are within 500m of the indicative pipeline route. Direct negative effects during pipeline construction due to loss of woodland, including deciduous woodland priority habitat and traditional orchard, and other priority habitats including good quality semi-improved grassland and lowland fens. There are no direct effects on Ancient Woodland although there are areas within 500m, which could be indirectly affected. Indirect negative effects on multiple LWS/SINC/SNCIs, with at least four sites potentially directly impacted: Shepherd's Hill Woods and Fields SINC, Mid Colne Valley SINC, Brackenbury Railway Cutting SINC and Breakspear House Woods SINC.
Soils	<ul style="list-style-type: none"> Temporary loss of Grade 3 agricultural land and some areas of Grade 1 agricultural land due to pipeline construction, although it is noted that the indicative pipeline route follows existing roads in the majority of areas of Grade 1 agricultural land. The indicative pipeline route runs along existing roads adjacent to an authorised landfill site (Horton Brook Quarry) and several historic landfill sites, and crosses four historic landfills (Woodlands Park, Slough Road, Tanhouse Farm No. 1 and Tanhouse Farm No. 2). It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur.
Water	<ul style="list-style-type: none"> The indicative pipeline route passes through Flood Zone 1 (low risk of flooding) with some areas of Flood Zones 2 and 3 with potential impacts during construction. As the indicative pipeline route crosses areas of SPZ1-3, and crosses several watercourses, including chalk rivers, construction could result in a negative effect on the water quality of nearby waterbodies. It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur. As this option would require the abstraction of water from an existing intake, although it has the potential to result in negative effects on water flows, levels and quality during operation, no further WFD assessment would be required as outlined in Table F.3 above.
Air	<ul style="list-style-type: none"> The indicative pipeline route passes through the Hillingdon AQMA, South Bucks AQMA and South Bucks District Council AQMA No 2, and Slough AQMA No. 1 and Slough AQMA No. 2. Temporary negative effects on air quality are anticipated. It is expected that with the implementation of good practice measures during construction, there may still be some temporary impacts on air quality, however, long-term residual effects are unlikely to occur.
Climatic factors	<ul style="list-style-type: none"> The relative carbon scale identified that, relative to other WRSE regional plan options, the abstraction and pipeline would result in minor negative construction and major negative operational carbon emissions. Further information on carbon footprint is provided in Section 5.4. The resilience of the local environment to climate change may be negatively affected as abstraction is proposed. It is recommended the levels of the river are monitored to avoid over-abstraction.
Landscape	<ul style="list-style-type: none"> The indicative pipeline route passes through the London Area Greenbelt with negative effects anticipated due to the excavation work. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur. Direct negative effects on at least two TPOs.
Historic environment	<ul style="list-style-type: none"> The indicative pipeline route will pass through Harefield Village Conservation Area and within 500m of several listed buildings, some in close proximity where the indicative pipeline route is aligned along existing roads (for example Milestone outside No 3 Milestone Cottages) and Harefield Place Grade II Registered Park and Garden. Excavation during construction could potentially directly impact buried archaeology if present. The impacts are unknown at this stage and further work is required to determine the significance of any archaeological remains that could be impacted.
Population and human health	<ul style="list-style-type: none"> Disruption to the local community and users of community facilities within proximity to the indicative pipeline route, and temporary disruption to public rights of way and three national cycle routes, is likely during construction. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.
Material assets	<ul style="list-style-type: none"> The indicative pipeline route crosses major roads (including A4 and A40), railways and three National Cycle Network Routes (0, 6 and 61) with disruption during construction likely due to potential diversions and traffic disruption. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.

Teddington DRA

Table F.5 provides a summary of the Gate 1 environmental assessments undertaken for the Teddington DRA option.

Table F.5: Teddington DRA: Summary of Gate 1 Environmental Assessments

Environmental assessment	Summary outcome and next steps
Habitats Regulations Assessment	<ul style="list-style-type: none"> Stage 1 Screening Assessment: Uncertain effects on South West London Waterbodies SPA/Ramsar and Richmond Park SAC therefore Stage 2 Appropriate Assessment required. No potential for Likely Significant Effects or Uncertain Effects identified for Wimbledon Common SAC or Burnham Beeches SAC. Stage 2 Appropriate Assessment: No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar or Richmond Park SAC are considered likely as no transmission pathways were identified by which a Likely Significant Effect could reasonably occur. No key risks to Habitats Sites were identified during construction or operation of this option.
WFD	<ul style="list-style-type: none"> Level 1 Basic Screening: GB106039023232: Thames (Egham to Teddington) waterbody 'screened in' for further WFD assessment because abstraction related activities present some risk to WFD status or objectives to this waterbody. Level 2 Detailed Impact Screening: precautionary WFD compliance risks identified. Possible deterioration risks to fish, macrophytes and phytobenthos, hydrological regime, dissolved oxygen and phosphate. These are primarily due to the potential for reduced flow due to increased abstraction and the additional intake structure required, although it is noted that the impacts may be spatially limited when considered at the scale of the waterbody given the location at the downstream extent/boundary. It also identified potential impediments to meeting Good Ecological Status, as the hydrological regime of the waterbody does not support good status, due in part to changes in natural flow of the waterbody attributed to water industry activities. Further WFD assessment would be required to improve the certainty of the levels of WFD risk.
SEA	<ul style="list-style-type: none"> For the majority of topics, minor or neutral residual effects identified. Moderate negative effects for biodiversity due to potential impacts on designated sites and loss of habitat during pipeline construction, and major negative effects due to operational carbon emissions. Table F.6 provides a summary of the key impacts for each topic together with mitigation measures.
INNS Risk Assessment	<ul style="list-style-type: none"> Medium freshwater risk of Ponto-Caspian invasions and high future marine invasion risk (as it is close to the tidal limit). However, as raw water transfer options terminate at a WTW, the risks associated with spreading freshwater or marine INNS via the transfer would be effectively eliminated. However, it is possible that the infrequent use of pipeline drainage points and occasional WTW overflows could introduce an INNS risk. Considered unlikely at this stage that this option would contravene INNS legislation, but this does not consider the risk presented by WTW overflow and pipeline drainage.
Natural Capital Assessment and Biodiversity Net Gain	<ul style="list-style-type: none"> Temporary loss of woodland (broadleaved mixed and coniferous) for the pipeline and permanent loss of pastures for the WTW. Monetised change in value of ecosystem services for the pipeline of -£5,019.89 per year mainly due to reduction in air pollutant removal due to loss of habitat within AQMAs, and also due to reduction in carbon storage due to loss of woodland and natural hazard management due to loss of active floodplain. Monetised change in value of ecosystem services for the WTW of -£670.68 per year mainly due to loss of food production from permanent loss of arable land and also due to reduction in carbon storage. Net loss of biodiversity of -70.10% for the pipeline and -100% for the WTW.

Table F.6 provides commentary of the key environmental impacts for the Teddington DRA option for each topic together with mitigation measures. The proposed location for the WTW for this option is the same as the proposed WTW location for the Maidenhead option (Harefield), see Table F.2.

Table F.6: Teddington DRA: Key Environmental Impacts and Mitigation

Topic	Abstraction (Teddington) and Pipeline (Teddington to Harefield)
Biodiversity, flora and fauna	<ul style="list-style-type: none"> No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar or Richmond Park SAC are considered likely as no transmission pathways were identified by which a Likely Significant Effect could reasonably occur. No direct effects on statutory designated sites, woodland or other priority habitats as a result of constructing the Teddington DRA abstraction point at the indicative site. Indirect negative effects on statutory designated sites during construction, including, Mid Colne Valley SSSI, Fray's Farm Meadows SSSI and Bushy Park and Home Park SSSI, and several LNRs (Fray's Valley, Cranebank, Hounslow Heath and Pevensy Road), which are within 500m of the indicative pipeline route. Direct negative effects during pipeline construction due to loss of woodland, including deciduous woodland priority habitat and traditional orchard, and other priority habitats including good quality semi-improved grassland. Indirect negative effects on areas of Ancient Woodland within 500m of the indicative pipeline route. Indirect negative effects on multiple LWS/SINC/SNCIs, with at least thirteen sites potentially directly impacted: Uxbridge Common Meadows SINC, Shepherd's Hill Woods and Fields SINC, Carp Ponds and Broad Dock SINC, Cranford Park SINC, London's Canals SINC, Brackenbury Railway Cutting SINC, Breakspear House Woods SINC, Dew's Dell SINC, Unnamed SINC, Feltham Marshalling Yards SINC, The Crane Corridor SINC, The River Thame SINC and Fulwell and Twickenham Golf Courses SINC.
Soils	<ul style="list-style-type: none"> No effects on agricultural land as a result of constructing the Teddington DRA abstraction point at the indicative site. The indicative site for the Teddington DRA abstraction point is within 500m of a historic landfill. Temporary loss of Grade 3 agricultural land and some areas of Grade 1 agricultural land due to pipeline construction, although it is noted that the indicative pipeline route is parallel to existing roads in where it crosses Grade 1 agricultural land. Indicative pipeline route runs along existing roads adjacent to three authorised landfill sites (Heathrow Express Rail Link, West Drayton, Sipson North East Inert Landfill and The Gravel Pit) and across and in proximity to several historic landfill sites, bisecting some of these including Green Lane, Harlington Road, Saint Peters Way, Area to north of Stockley Park, North East Link Spur Road). It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur.
Water	<ul style="list-style-type: none"> The indicative site for the Teddington DRA abstraction point (an area of raised ground on the east bank of the River Thames which is outside of the flood zone) is in Flood Zone 1 and would involve a river crossing. The indicative pipeline route passes through Flood Zone 1 (low risk of flooding) with some areas of Flood Zones 2 and 3 with potential impacts during construction. As the indicative pipeline route crosses areas of SPZ1-3, crosses several watercourses, and is located in proximity to chalk rivers, construction could result in a negative effect on the water quality of nearby waterbodies. It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur. The Teddington DRA could result in negative effects on water flows, levels and quality during operation and further WFD assessment would be required as outlined in Table F.5 above.
Air	<ul style="list-style-type: none"> The indicative site for the Teddington DRA abstraction point is within the Kingston upon Thames AQMA. The indicative pipeline route passes through the Hillingdon AQMA, Hounslow AQMA and Richmond AQMA. Temporary negative effects on air quality are anticipated. It is expected that with the implementation of good practice measures during construction, there may still be some temporary impacts on air quality, however, long-term residual effects are unlikely to occur.
Climatic factors	<ul style="list-style-type: none"> The relative carbon scale identified that, relative to other WRSE regional plan options, the abstraction and pipeline would result in minor negative construction and major negative operational carbon emissions. Further information on carbon footprint is provided in Section 5.4. The resilience of the local environment to climate change may be negatively affected as abstraction is proposed. It is recommended the levels of the river are monitored to avoid over-abstraction.
Landscape	<ul style="list-style-type: none"> The indicative site for the Teddington DRA abstraction point is not within or in proximity to an AONB or Greenbelt. Permanent effects on the landscape are expected with long-term residual effects likely to occur. Opportunities to incorporate screening to reduce the visual effects during operation would be embedded in the design. The indicative pipeline route passes through the London Area Greenbelt with negative effects anticipated due to the excavation work. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur. Direct negative effects on at least twelve TPOs.
Historic environment	<ul style="list-style-type: none"> The indicative location of the Teddington DRA abstraction point (an area of raised ground on the east bank of the River Thames which is outside of the flood zone) is within the Riverside Conservation Area. The indicative pipeline route passes through ten conservation areas (Harefield Village, Hillingdon Village, Harlington Village, Cranford Park, Mays Road, Royal Road, Broad Street, High Street Teddington, King Edwards Grove, and Riverside North) and there are several listed buildings within 500m of the indicative pipeline route with potential for setting effects during construction. Excavation during construction could potentially directly impact buried archaeology if present. The impacts are unknown at this stage and further work is required to determine the significance of any archaeological remains that could be impacted.
Population and human health	<ul style="list-style-type: none"> The indicative site for the Teddington DRA abstraction point is within the grounds of the YMCA Hawker playing fields with disruption to the local community during construction and a permanent impact during operation. The indicative site is also in close proximity to the Thames Path National Trail. Disruption to the local community and users of community facilities within proximity to the indicative pipeline route, and temporary disruption to public rights of way, and several community and greenspaces including public park or garden, playing fields, a school, allotments, a country park (Cranford Countryside Park), is likely during construction. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.
Material assets	<ul style="list-style-type: none"> There is likely to be localised traffic disruption during construction of the pumping station for the new Teddington DRA abstraction point. The indicative pipeline route crosses major roads (including M4 and A4) and railways with disruption during construction likely due to potential diversions and traffic disruption. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.

Sunnymeads 2a

Table F.7 provides a summary of the Gate 1 environmental assessments undertaken for the Sunnymeads 2a option.

Table F.7: Sunnymeads 2a: Summary of Gate 1 Environmental Assessments

Environmental assessment	Summary outcome and next steps
Habitats Regulations Assessment	<ul style="list-style-type: none"> Stage 1 Screening Assessment: Likely Significant Effects on South West London Waterbodies SPA/Ramsar therefore Stage 2 Appropriate Assessment required. No potential for Likely Significant Effects or Uncertain Effects identified for Windsor Forest & Great Park SAC, Thames Basin Heaths SPA, Thursley, Ash, Pirbright & Chobham SAC or Burnham Beeches SAC. Stage 2 Appropriate Assessment: No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar are expected, if the suggested mitigation measures in the HRA Stage 2: Appropriate Assessment are implemented. These include both standard construction good practice measures and construction methods.
WFD	<ul style="list-style-type: none"> Level 1 Basic Screening: no further assessment would be necessary for the option, because the types of activities do not present a risk to WFD status or objectives for any waterbodies.
SEA	<ul style="list-style-type: none"> For the majority of topics, minor or neutral residual effects identified. Major negative effects for biodiversity due to potential impacts on designated sites during pipeline construction, and moderate negative effects due to impacts on designated sites during construction of the Iver WTW and operational carbon emissions for the drinking water conveyance. Table F.8 provides a summary of the key impacts for each topic together with mitigation measures and next steps for Gate 2.
INNS Risk Assessment	<ul style="list-style-type: none"> Medium freshwater risk of Ponto-Caspian invasions and low future marine invasion risk. However, as raw water transfer options terminate at a WTW, the risks associated with spreading freshwater or marine INNS via the transfer would be effectively eliminated. However, it is possible that the infrequent use of pipeline drainage points and occasional WTW overflows could introduce an INNS risk. Considered unlikely at this stage that this option would contravene INNS legislation, but this does not consider the risk presented by WTW overflow and pipeline drainage.
Natural Capital Assessment and Biodiversity Net Gain	<ul style="list-style-type: none"> Temporary loss of woodland (broadleaved mixed, coniferous and orchards) for the pipeline and permanent loss of pastures for the WTW. Monetised change in value of ecosystem services for the pipeline of -£2,932.79 per year mainly due to reduction in air pollutant removal due to loss of habitat within AQMAs, and also due to reduction in carbon storage due to loss of woodland and natural hazard management due to loss of active floodplain. Monetised change in value of ecosystem services for the WTW of -£1,169.61 per year mainly due to loss of food production from permanent loss of arable land and also due to reduction in carbon storage. Net loss of biodiversity of -53.42% for the pipeline and -100% for the WTW.

Table F.8 provides commentary of the key environmental impacts for the Sunnymeads 2a option for each topic together with mitigation measures.

Table F.8: Sunnymeads 2a: Key Environmental Impacts and Mitigation

Topic	Abstraction (Sunnymeads intake), raw water pipeline (Sunnymeads to Iver 2 WTW) and drinking water pipeline (Iver 2 WTW to Harefield)	Iver 2 WTW
Biodiversity, flora and fauna	<ul style="list-style-type: none"> No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar are expected, if the suggested mitigation measures in the HRA Stage 2: Appropriate Assessment are implemented. These include both standard construction good practice measures and construction methods. Potential for direct negative effects on Fray's Valley LNR, and indirect negative effects on statutory designated sites during construction, including Ruislip Woods SSSI/NNR; Mid Colne Valley SSSI; Fray's Farm Meadows SSSI; Denham Lock Wood SSSI; Kingcup Meadows and Oldhouse Wood SSSI; and Wraysbury No. 1 Gravel Pit SSSI, Fray's Valley LNR and Denham Quarry Park LNR, which are within 500m of the indicative pipeline route. Direct negative effects during pipeline construction due to loss of woodland, including deciduous woodland priority habitat and traditional orchard, and other priority habitats including good quality semi-improved grassland and lowland fens. There are no direct effects on Ancient Woodland although there are areas within 500m, which could be indirectly affected. Indirect negative effects on multiple LWS/SINC/SNCIs, with at least four sites potentially directly impacted: Shepherd's Hill Woods and Fields SINC, Mid Colne Valley SINC, Brackenbury Railway Cutting SINC and Breakspear House Woods SINC. 	<ul style="list-style-type: none"> No statutory designated sites within 2km of the indicative site for the new Iver 2 WTW. No direct effects on woodland or priority habitats however there are areas of woodland, including deciduous woodland priority habitat within 500m of the indicative site for the new Iver 2 WTW; therefore there is potential for the construction activities to result in indirect negative effects on these areas.
Soils	<ul style="list-style-type: none"> Temporary loss of Grade 3 agricultural land and some areas of Grade 1 agricultural land due to pipeline construction, although it is noted that the indicative pipeline route follows existing roads in the majority of areas of Grade 1 agricultural land. The indicative pipeline route runs along existing roads adjacent to two authorised landfill sites (Horton Brook Quarry and New Denham Quarry Northern Extension) and several historic landfill sites, and crosses historic landfills, including Woodlands Park, Slough Road A and Tanhouse Farm No. 2. It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur. 	<ul style="list-style-type: none"> The indicative site for the new Iver 2 WTW is located within non-agricultural land. The indicative site for the new Iver 2 WTW is within 500m of historic and authorised landfill sites. It is expected that with the implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.
Water	<ul style="list-style-type: none"> The indicative pipeline route passes through Flood Zone 1 (low risk of flooding) with some areas of Flood Zones 2 and 3 with potential impacts during construction. As the indicative pipeline route crosses areas of SPZ1-3, and crosses several watercourses, including chalk rivers, construction could result in a negative effect on the water quality of nearby waterbodies. It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur. As this option would require the abstraction of water from an existing intake, although it has the potential to result in negative effects on water flows, levels and quality during operation, no further WFD assessment would be required as outlined in Table F.7 above. 	<ul style="list-style-type: none"> The indicative site for the new Iver 2 WTW would be located within Flood Zone 1. Construction of the new Iver 2 WTW could result in a negative effect on the water quality of nearby waterbodies. It is expected that with the implementation of good practice measures, long-term residual effects are unlikely to occur as a result of construction.
Air	<ul style="list-style-type: none"> The indicative pipeline route passes through the Hillingdon AQMA, South Bucks AQMA and South Bucks District Council AQMA No 2, Slough AQMA No. 1 and Slough AQMA No. 2. Temporary negative effects on air quality are anticipated. It is expected that with the implementation of good practice measures during construction, there may still be some temporary impacts on air quality, however, long-term residual effects are unlikely to occur. 	<ul style="list-style-type: none"> The indicative site for the new Iver 2 WTW is located within the South Bucks District Council No 2 AQMA. Temporary negative effects on air quality are anticipated. It is expected that with the implementation of good practice measures during construction, there may still be some temporary impacts on air quality, however, long-term residual effects are unlikely to occur.
Climatic factors	<ul style="list-style-type: none"> The relative carbon scale identified that, relative to other WRSE regional plan options, the abstraction and pipeline would result in minor negative construction and major negative operational carbon emissions. Further information on carbon footprint is provided in Section 5.4. The resilience of the local environment to climate change may be negatively affected as abstraction is proposed. It is recommended the levels of the river are monitored to avoid over-abstraction. 	<ul style="list-style-type: none"> The relative carbon scale identified that, relative to other WRSE regional plan options, the new Iver 2 WTW would result in minor negative construction and operation carbon emissions.
Landscape	<ul style="list-style-type: none"> The indicative pipeline route passes through the London Area Greenbelt with negative effects anticipated due to the excavation work. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur. Direct negative effects on at least two TPOs. 	<ul style="list-style-type: none"> The indicative site for the new Iver 2 WTW is in the London Area Greenbelt. Permanent effects on the landscape are expected with long-term residual effects likely to occur. Opportunities to incorporate screening to reduce the visual effects during operation would be embedded in the design.
Historic environment	<ul style="list-style-type: none"> The indicative pipeline route will pass through Harefield Village Conservation Area and within 500m of several listed buildings, some in close proximity where the indicative pipeline route is aligned along existing roads (for example Milestone outside No 3 Milestone Cottages) and Harefield Place Grade II Registered Park and Garden. Excavation during construction could potentially directly impact buried archaeology if present. The impacts are unknown at this stage and further work is required to determine the significance of any archaeological remains that could be impacted. 	<ul style="list-style-type: none"> Cowley Lock Conservation Area and two Grade II listed buildings (Delaforde Manor and Dovecote at Delaforde Manor) are within 500m of the indicative site for the new Iver 2 WTW with potential for setting effects. Opportunities to incorporate screening to reduce the effects would be embedded in the design. Excavation during construction could potentially directly impact buried archaeology if present. The impacts are unknown at this stage and further work is required to determine the significance of any archaeological remains that could be impacted.
Population and human health	<ul style="list-style-type: none"> Disruption to the local community and users of community facilities within proximity to the indicative pipeline route, and temporary disruption to public rights of way and three national cycle routes, is likely during construction. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur. 	<ul style="list-style-type: none"> Disruption to the local community and temporary severance of public rights of way, is likely during construction. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.
Material assets	<ul style="list-style-type: none"> The indicative pipeline route crosses major roads (including M25, A4 and A40), railways and three National Cycle Network Routes (0, 6 and 61) with disruption during construction likely due to potential diversions and traffic disruption. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur. 	<ul style="list-style-type: none"> There is likely to be localised traffic disruption during construction of the pumping station for the indicative site for the new Iver 2 WTW. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.

Walton 2b and Mogden Reuse Indirect 3

Table F.9 provides a summary of the Gate 1 environmental assessments undertaken for the Walton 2b (and Mogden Reuse Indirect 3) option.

Table F.9: Walton 2b and Mogden Reuse Indirect 3: Summary of Gate 1 Environmental Assessments

Environmental assessment	Summary outcome and next steps
Habitats Regulations Assessment	<ul style="list-style-type: none"> Stage 1 Screening Assessment – Likely Significant Effects on South West London Waterbodies SPA/Ramsar therefore Stage 2 Appropriate Assessment required. No potential for Likely Significant Effects or Uncertain Effects identified for Windsor Forest & Great Park SAC or Richmond Park SAC. Stage 2 Appropriate Assessment: No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar are expected, if the suggested mitigation measures in the HRA Stage 2: Appropriate Assessment are implemented. These include both standard construction good practice measures and construction methods.
WFD	<ul style="list-style-type: none"> Level 1 Basic Screening: GB106039023232: Thames (Egham to Teddington) waterbody 'screened in' for further WFD assessment because abstraction related activities present some risk to WFD status or objectives to this waterbody. Level 2 Detailed Impact Screening: potentially precautionary WFD compliance risks identified. Possible deterioration risks to fish, macrophytes and phytobenthos, hydrological regime, dissolved oxygen and phosphate. These are primarily due to the potential for reduced flow due to increased abstraction. It also identified potential impediments to meeting Good Ecological Status, as the hydrological regime of the waterbody does not support good status, due in part to changes in natural flow of the waterbody attributed to water industry activities. Further WFD assessment would be required to improve the certainty of the levels of WFD risk.
SEA	<ul style="list-style-type: none"> For the majority of topics, minor or neutral residual effects identified. Major negative effects for biodiversity due to potential impacts on designated sites during pipeline construction, and moderate negative effects due to impacts on designated sites during construction of the Iver WTW, for water due to abstraction and flood risk during construction of the pipeline, and operational carbon emissions for the abstraction and pipeline and drinking water conveyance. Table F.10 provides a summary of the key impacts for each topic.
INNS Risk Assessment	<ul style="list-style-type: none"> Medium freshwater risk of Ponto-Caspian invasions and low future marine invasion risk. However, as raw water transfer options terminate at a WTW, the risks associated with spreading freshwater or marine INNS via the transfer would be effectively eliminated. However, it is possible that the infrequent use of pipeline drainage points and occasional WTW overflows could introduce an INNS risk. Considered unlikely at this stage that this option would contravene INNS legislation, but this does not consider the risk presented by WTW overflow and pipeline drainage.
Natural Capital Assessment and Biodiversity Net Gain	<ul style="list-style-type: none"> Temporary loss of woodland (broadleaved mixed and coniferous) for the pipeline and permanent loss of pastures for the WTW. Monetised change in value of ecosystem services for the pipeline of -£4,992.79 per year mainly due to reduction in air pollutant removal due to loss of habitat within AQMAs, and also due to reduction in carbon storage due to loss of woodland and natural hazard management due to loss of active floodplain. Monetised change in value of ecosystem services for the WTW of -£1,69.61 per year mainly due to loss of food production from permanent loss of arable land and also due to reduction in carbon storage. Net loss of biodiversity of -56.21% for the pipeline and -100% for the WTW. Should this option be taken forward, potential impacts, likely required mitigation (including avoiding impacts, reinstatement and compensatory habitat creation), and opportunities for Biodiversity Net Gain will be investigated at Gate 2.

Table F.10 provides commentary of the key environmental impacts for the Walton 2b (and Mogden Reuse Indirect 3) option for each topic together with mitigation measures. The proposed location for the WTW for this option is the same as the proposed WTW location for the Sunnymeads 2a option, see Table F.8.

Table F.10: Walton 2b and Mogden Reuse Indirect 3: Key Environmental Impacts and Mitigation

Topic	Abstraction, raw water transfer (Walton to Iver 2) and drinking water conveyance (Iver 2 to Harefield)
Biodiversity, flora and fauna	<p>No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar are expected, if the suggested mitigation measures in the HRA Stage 2: Appropriate Assessment are implemented. These include both standard construction good practice measures and construction methods.</p> <p>No direct effects on statutory designated sites, woodland or other priority habitats as a result of constructing the Mogden Reuse outfall at the indicative site.</p> <p>Indirect negative effects on statutory designated sites during construction, including Staines Moor SSSI, Ruislip Woods SSSI and NNR; Mid Colne Valley SSSI; Fray's Farm Meadows SSSI; Denham Lock Wood SSSI; Kingcup Meadows and Oldhouse Wood SSSI; Wraysbury Reservoir SSSI; Wraysbury & Hythe End Gravel Pits SSSI; Thorpe Park No. 1 Gravel Pit SSSI; Dumsey Meadow SSSI, and Chertsey Meads LNR, Frays Valley LNR, Denham Quarry Park LNR, which are within 500m of the indicative pipeline route.</p> <p>Direct negative effects during pipeline construction due to loss of woodland, including deciduous woodland priority habitat, and other priority habitats including good quality semi-improved grassland and lowland meadows. There are no direct effects on Ancient Woodland although there are areas within 500m, which could be indirectly affected.</p> <p>Indirect negative effects on multiple LWS/SINC/SNCIs, with at least fourteen sites potentially directly impacted: Desborough Island SNCI, River Thames SNCI, Shepherd's Hill Woods and Fields SINC, Mid Colne Valley SINC, Brackenbury Railway Cutting SINC, Breakspear House Woods SINC, Dew's Dell SINC, Unnamed SINC (Egham), Hilda May Lake SNCI, Moor Lane Nature Reserve SNCI, Wraysbury Reservoir SNCI, River Thames SNCI, Land West of Little Lane SNCI and Ferris Meadows, Ferry Lane SNCI.</p>
Soils	<p>No effects on agricultural land as a result of constructing the Mogden Reuse outfall at the indicative site, and there are no authorised or historic landfills within 500m of the indicative site. It is expected that with the implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.</p> <p>Temporary loss of Grade 3 agricultural land and area of Grade 1 and 2 agricultural land due to pipeline construction along the indicative route. It is noted that the area of Grade 1 land is within Thorney Country Park.</p> <p>Notational pipeline route passes through a historic landfill site and is within 500m of authorised landfill sites and several historic landfills sites.</p> <p>It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur.</p>
Water	<p>The indicative site for the Mogden Reuse outfall is located within Flood Zones 2 and 3.</p> <p>Construction of the outfall could result in a negative effect on the water quality of nearby waterbodies.</p> <p>The indicative pipeline route passes through Flood Zone 1 (low risk of flooding) with some areas of Flood Zones 2 and 3 with potential impacts during construction.</p> <p>As the indicative pipeline route crosses areas of SPZ1-3, and crosses several watercourses, including chalk rivers, construction could result in a negative effect on the water quality of nearby waterbodies.</p> <p>It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur.</p> <p>Abstraction from the existing Walton intake could result in negative effects on water flows, levels and quality during operation and further WFD assessment would be required as outlined in Table F.9 above.</p>
Air	<p>The indicative site for the Mogden Reuse outfall is located within the Spelthorne AQMA.</p>

Topic	Abstraction, raw water transfer (Walton to Iver 2) and drinking water conveyance (Iver 2 to Harefield)
	The indicative pipeline route passes through the Hillingdon AQMA, South Bucks AQMA, South Bucks District Council AQMA No 2, Spelthorne AQMA, M25 AQMA, Slough AQMA No.1 and Slough AQMA No. 2. Temporary negative effects on air quality are anticipated. It is expected that with the implementation of good practice measures during construction, there may still be some temporary impacts on air quality, however, long-term residual effects are unlikely to occur.
Climatic factors	The relative carbon scale identified that, relative to other WRSE regional plan options, the abstraction and pipeline would result in minor negative construction and moderate negative operational carbon emissions. Further information on carbon footprint is provided in Section 5.4. The resilience of the local environment to climate change may be negatively affected as abstraction is proposed. It is recommended the levels of the river are monitored to avoid over-abstraction.
Landscape	The indicative site for the Mogden Reuse outfall is in the London Area Greenbelt. Permanent effects on the landscape are expected with long-term residual effects likely to occur. Opportunities to reduce the visual effects during operation would be embedded in the design. The indicative pipeline route passes through the London Area Greenbelt with negative effects anticipated due to the excavation work. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur. Direct negative effects on at least two TPOs.
Historic environment	The indicative site for the Mogden Reuse outfall is within 500m of Lower Halliford Conservation Area and several Grade II listed buildings, with potential for setting effects during construction and operation. The indicative pipeline route will pass through Harefield Village Conservation Area and within 500m of other conservation areas, several listed buildings, some in close proximity (such as Barn to South of Huntsmoor Park Farmhouse and where the indicative pipeline route is aligned along existing roads), Great Fosters Grade II* Registered Park and Garden Harefield Place Grade II Registered Park and Garden. Excavation during construction could potentially directly impact buried archaeology if present. The impacts are unknown at this stage and further work is required to determine the significance of any archaeological remains that could be impacted.
Population and human health	Disruption to the local community and users of community facilities within proximity to the indicative site for the Mogden Reuse outfall, including Thames Meadow Park and temporary disruption to public rights of way, is likely during construction. Disruption to the local community and users of community facilities within proximity to the indicative pipeline route, and temporary disruption to public rights of way, including the Thames Path National Trail, and three national cycle routes, Harmondsworth Moor Park, Thorney Country Park, Thorney Golf Course and two playing fields, is likely during construction. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.
Material assets	There is likely to be localised traffic disruption during construction of the Mogden Reuse outfall. The indicative pipeline route crosses major roads (including M25, M3 and M4), two railway lines and three National Cycle Network Routes (4, 6 and 61) with disruption during construction likely due to potential temporary diversions and traffic disruption. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.

Lower Thames Reservoir Transfer 2a

Table F.11 provides a summary of the Gate 1 environmental assessments undertaken for the Lower Thames Reservoir Transfer 2a option.

Table F.11: Lower Thames Reservoir Transfer 2a: Summary of Gate 1 Environmental Assessments

Environmental assessment	Summary outcome and next steps
Habitats Regulations Assessment	<ul style="list-style-type: none"> Stage 1 Screening Assessment: Uncertain Effects on South West London Waterbodies SPA/Ramsar therefore Stage 2 Appropriate Assessment required. No potential for Likely Significant Effects or Uncertain Effects identified for Windsor Forest & Great Park SAC or Burnham Beeches SAC Stage 2 Appropriate Assessment: No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar are expected. The Lower Thames Reservoir Transfer 2a option is not expected to require a new license or an increase to peak abstraction from the Wraysbury Reservoirs. Therefore, the current operation does not have the potential to result in adverse effects to surface water levels or water quantity in the reservoir. This should be revised if further investigations disagree with this assessment.
WFD	<ul style="list-style-type: none"> Level 1 Basic Screening: no further assessment would be necessary for the option, because the types of activities do not present a risk to WFD status or objectives for any waterbodies.
SEA	<ul style="list-style-type: none"> For the majority of topics, minor or neutral residual effects identified. Major negative effects for biodiversity due to potential impacts on designated sites for drinking water conveyance and moderate negative effects for biodiversity due to potential impacts on designated sites during construction of the raw water pipeline and Iver WTW and operational carbon emissions for the drinking water conveyance. Table F.12 provides a summary of the key impacts for each topic.
INNS Risk Assessment	<ul style="list-style-type: none"> Medium freshwater risk of Ponto-Caspian invasions and low future marine invasion risk. However, as raw water transfer options terminate at a WTW, the risks associated with spreading freshwater or marine INNS via the transfer would be effectively eliminated. However, it is possible that the infrequent use of pipeline drainage points and occasional WTW overflows could introduce an INNS risk. Considered unlikely at this stage that this option would contravene INNS legislation, but this does not consider the risk presented by WTW overflow and pipeline drainage.
Natural Capital Assessment and Biodiversity Net Gain	<ul style="list-style-type: none"> Temporary loss of woodland (broadleaved mixed and coniferous) for the pipeline and permanent loss of pastures for the WTW. Monetised change in value of ecosystem services for the pipeline of -£1,512.47 per year mainly due to reduction in air pollutant removal due to loss of habitat within AQMAs, and also due to reduction in carbon storage due to loss of woodland and natural hazard management due to loss of active floodplain. Monetised change in value of ecosystem services for the WTW of -£1,169.61 per year mainly due to loss of food production from permanent loss of arable land and also due to reduction in carbon storage. Net loss of biodiversity of -48.52% for the pipeline and -100% for the WTW.

Table F.12 provides commentary of the key environmental impacts for the Lower Thames Reservoir Transfer 2a option for each topic together with mitigation measures. The proposed location for the WTW for this option is the same as the proposed WTW location for the Sunnymeads 2a option, see Table F.8.

Table F.12: Lower Thames Reservoir Transfer 2a: Key Environmental Impacts and Mitigation

Topic	Abstraction (via Wraysbury tunnel), pipeline (Iver to Iver 2) and drinking water conveyance (Iver 2 to Harefield)
Biodiversity, flora and fauna	No significant adverse effects on the integrity of South West London Waterbodies SPA/Ramsar are expected as this option is not expected to require a new license or an increase to peak abstraction from the Wraysbury Reservoir.

Topic	Abstraction (via Wraysbury tunnel), pipeline (Iver to Iver 2) and drinking water conveyance (Iver 2 to Harefield)
	<p>Indirect negative effects on statutory designated sites during construction, including Fray's Farm Meadows SSSI/LNR, Ruislip Woods SSSI/NNR; Denham Lock Wood SSSI; Kingcup Meadows and Oldhouse Wood SSSI; Denham Quarry Park LNR and Denham Country Park LNR, which are within 500m of the indicative pipeline route.</p> <p>Direct negative effects during pipeline construction due to loss of woodland, including deciduous woodland priority habitat. There are no direct effects on Ancient Woodland although there are areas within 500m, which could be indirectly affected.</p> <p>Indirect negative effects on multiple LWS/SINC/SNCIs, with at least five sites potentially directly impacted: Shepherd's Hill Woods and Fields SINC, Mid Colne Valley SINC, Brackebury Railway Cutting SINC, Breakspear House Woods SINC and Dew's Dell SINC.</p>
Soils	<p>Temporary loss of Grade 3 agricultural land due to pipeline construction along the indicative route.</p> <p>The indicative pipeline route runs along existing roads adjacent to an authorised landfill site (New Denham Quarry Northern Extension) and several historic landfill sites, and crosses historic landfills including Palmers Moor Farm, Slough Road A and Woodlands Park).</p> <p>It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur.</p>
Water	<p>The indicative pipeline route passes through Flood Zone 1 (low risk of flooding) with some areas of Flood Zones 2 and 3 with potential impacts during construction. It is expected that with the implementation of good practice measures during construction, long-term residual effects are unlikely to occur.</p> <p>As the indicative pipeline route crosses areas of SPZ1-3, crosses several watercourses, and is located in proximity to chalk rivers, construction could result in a negative effect on the water quality of nearby waterbodies.</p> <p>It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur.</p> <p>As this option would require the abstraction of water from an existing intake, although it has the potential to result in negative effects on water flows, levels and quality during operation, no further WFD assessment would be required as outlined in Table F.11 above.</p>
Air	<p>The indicative pipeline route passes through the Hillingdon AQMA, South Bucks AQMA and South Bucks District Council AQMA No 2, and Slough AQMA No. 1 and Slough AQMA No. 2. Temporary negative effects on air quality are anticipated. It is expected that with the implementation of good practice measures during construction, there may still be some temporary impacts on air quality, however, long-term residual effects are unlikely to occur.</p>
Climatic factors	<p>The relative carbon scale identified that, relative to other WRSE regional plan options, the abstraction and pipeline would result in minor negative construction and operational carbon emissions. Further information on carbon footprint is provided in Section 5.4.</p> <p>The water levels in the surrounding environment are not predicted to be significantly affected by the proposed pipeline, therefore is considered unlikely to affect resilience of the local environment to climate change.</p>
Landscape	<p>The indicative pipeline route passes through the London Area Greenbelt with negative effects anticipated due to the excavation work. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.</p> <p>Direct negative effects on at least two TPOs.</p>
Historic environment	<p>The indicative pipeline route will pass through Harefield Village Conservation Area and within 500m of other conservation areas, several listed buildings, some in close proximity (such as Barn to South of Huntsmoor Park Farmhouse and where the indicative pipeline route is aligned along existing roads), Great Fosters Grade II* Registered Park and Garden Harefield Place Grade II Registered Park and Garden.</p> <p>Excavation during construction could potentially directly impact buried archaeology if present. The impacts are unknown at this stage and further work is required to determine the significance of any archaeological remains that could be impacted.</p>
Population and human health	<p>Disruption to the local community and users of community facilities within proximity to the indicative pipeline route, and temporary disruption to public rights of way and two national cycle routes, is likely during construction. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.</p>
Material assets	<p>The indicative pipeline route crosses major roads (including M25, A4020 and A40) and two National Cycle Network Routes (6 and 61) with disruption during construction likely due to potential diversions and traffic disruption. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.</p>

Beckton Reuse Indirect

Table F.13 provides a summary of the Gate 1 environmental assessments undertaken for the Beckton Reuse Indirect option.

Table F.13: Beckton Reuse Indirect: Summary of Gate 1 Environmental Assessments

Environmental assessment	Summary outcome and next steps
Habitats Regulations Assessment	<ul style="list-style-type: none"> Stage 1 Screening Assessment: Uncertain Effects on Lee Valley Ramsar / SPA therefore Stage 2 Appropriate Assessment required. No potential for Likely Significant Effects or Uncertain Effects identified for Epping Forest SAC or Wormley Hoddesdonpark Woods SAC. Stage 2 Appropriate Assessment: No significant adverse effects on the integrity of Lee Valley Ramsar / SPA are expected, if the suggested mitigation measures in the HRA Stage 2: Appropriate Assessment are implemented. These include standard construction good practice measures, which would need to be secured through approval and implementation of a Construction and Environmental Management Plan.
WFD	<ul style="list-style-type: none"> Level 1 Basic Screening: no further assessment would be necessary for the option, because the types of activities do not present a risk to WFD status or objectives for any waterbodies.
SEA	<ul style="list-style-type: none"> For the majority of topics, minor or neutral residual effects identified. Moderate negative effects for biodiversity due to potential impacts on designated sites and loss of habitat and operational carbon emissions for the abstraction. Table F.14 provides a summary of the key impacts for each topic.
INNS Risk Assessment	<ul style="list-style-type: none"> Medium freshwater risk of Ponto-Caspian invasions and low future marine invasion risk. However, as raw water transfer options terminate at a WTW, the risks associated with spreading freshwater or marine INNS via the transfer would be effectively eliminated. However, it is possible that the infrequent use of pipeline drainage points and occasional WTW overflows could introduce an INNS risk. Considered unlikely at this stage that this option would contravene INNS legislation, but this does not consider the risk presented by WTW overflow and pipeline drainage.
Natural Capital Assessment and Biodiversity Net Gain	<ul style="list-style-type: none"> Temporary loss of broadleaved mixed woodland for the pipelines and permanent loss of pastures for the WTW. Monetised change in value of ecosystem services for the River Lee to North Mymms pipeline of -£1,329.36 per year mainly due to reduction in air pollutant removal due to loss of habitat within AQMAs, and also due to reduction in carbon storage due to loss of woodland and natural hazard management due to loss of active floodplain. Monetised change in value of ecosystem services for the WTW of -£972.94 per year mainly due to loss of food production from permanent loss of arable land and also due to reduction in carbon storage. Monetised change in value of ecosystem services for the North Mymms to Brookmans Park pipeline of -£0.17 per year mainly due to reduction in carbon storage due to loss of woodland. Net loss of biodiversity of -54.73% for the River Lee to North Mymms pipeline, -100% for the WTW and -25.02% for the North Mymms to Brookmans Park pipeline.

Table F.14 provides commentary of the key environmental impacts for the Beckton Reuse Indirect option for each topic together with mitigation measures.

Table F.14: Beckton Reuse Indirect: Key Environmental Impacts and Mitigation

Topic	Abstraction and Pipeline (River Lee to North Mymms)	North Mymms WTW	Pipeline (North Mymms to Brookmans Park)
Biodiversity, flora and fauna	<p>No significant adverse effects on the integrity of Lee Valley Ramsar / SPA are expected, if the suggested mitigation measures in the HRA Stage 2: Appropriate Assessment are implemented. These include standard construction good practice measures.</p> <p>Potential indirect negative effects on statutory designated sites, including Chingford Reservoirs SSSI, which is directly adjacent to the indicative site for the River Lee Abstraction Point.</p> <p>Direct negative effects during construction of new River Lee Abstraction Point at the indicative site due to loss of coastal and floodplain grazing marsh priority habitat. The indicative site for the pumping station for the new River Lee Abstraction Point avoids areas of deciduous woodland priority habitat. A channel will be required between the abstraction point and the pumping station which avoids woodland, including deciduous woodland priority habitat but will directly affect coastal and floodplain grazing marsh priority habitat.</p> <p>Potential indirect negative effects on statutory designated sites, including Water End Swallow Holes SSSI and Chingford Reservoirs SSSI and Furzefield Wood & Lower Halfpenny Bottom LNR, which are within 500m of the indicative pipeline route.</p> <p>Direct negative effects during pipeline construction due to loss of woodland, including deciduous woodland priority habitat, and other priority habitats including coastal and floodplain grazing marsh and good quality semi-improved grassland. There are no direct effects on Ancient Woodland although there are areas within 500m, which could be indirectly affected.</p> <p>Indirect negative effects on multiple LWS/SINC/SNCIs, with at least five sites potentially directly impacted: The New River SINC, Gunpowder Park LWS, Hawkshead Lane Pond and Verge SINC, Northaw Brook Pastures SINC and Woodland area S.E. of Little Heath Farm SINC.</p>	<p>Potential for indirect negative effects on statutory designated sites the nearest being Water End Swallow Holes SSSI, which is within 500m of the indicative site for the new North Mymms WTW, and on woodland, including Ancient Woodland and deciduous woodland, and other priority habitats, including good quality semi-improved grassland within 500m of the indicative site for the new North Mymms WTW.</p>	<p>No potential for Likely Significant Effects or Uncertain Effects identified for Wormley Hoddesdonpark Woods SAC or Lee Valley Ramsar / SPA.</p> <p>Potential indirect negative effects on statutory designated sites, including, Water End Swallow Holes which is within 500m of the indicative pipeline route.</p> <p>Direct negative effects during pipeline construction due to loss of woodland, including small areas of deciduous woodland priority habitat. There are no direct effects on Ancient Woodland although there are areas within 500m, which could be indirectly affected.</p>
Soils	<p>Permanent loss of Grade 3 land due to construction of the River Lee Abstraction Point, channel and pumping station at the indicative sites. It is noted however that on the basis of surrounding land uses, this unlikely to be agricultural land. The indicative sites for the River Lee Abstraction Point, channel and pumping station would be within 500m of a historic landfill site.</p> <p>Temporary loss of Grade 3 agricultural land due to pipeline construction along the indicative route.</p> <p>The indicative pipeline route does not pass through authorised or historic landfill sites although it would be adjacent to the former Enfield Sewage Works historic landfill and 500m of several other historic landfill sites.</p> <p>It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur.</p>	<p>Permanent loss of Grade 3 agricultural land due to construction of the new North Mymms WTW at the indicative site.</p> <p>There are no authorised or historic landfills within 500m of the indicative site for the new North Mymms WTW.</p> <p>It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur.</p>	<p>Temporary loss of Grade 3 agricultural land due to pipeline construction along the indicative route.</p> <p>There are no authorised or historic landfills within 500m of the indicative pipeline route.</p> <p>It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur.</p>
Water	<p>The indicative site for the pumping station for the new River Lee Abstraction Point is in Flood Zone 1. A channel will be required between the abstraction point and the pumping station which will pass through Flood Zones 2 and 3. Construction of the intake, channel and pumping station for the new River Lee Abstraction Point could result in a negative effect on the water quality of nearby waterbodies.</p> <p>The indicative pipeline route passes through Flood Zone 1 (low risk of flooding) with some areas of Flood Zones 2 and 3 with potential impacts during construction.</p> <p>As the indicative pipeline route crosses areas of SPZ1-3, and crosses several watercourses, construction could result in a negative effect on the water quality of nearby waterbodies.</p> <p>It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur.</p> <p>Although this option would require the abstraction of water from a new intake and has the potential to result in negative effects on water flows, levels and quality during operation, no further WFD assessment would be required as outlined in Table F.13 above.</p>	<p>The indicative site for the new North Mymms WTW would be located within Flood Zone 1.</p> <p>Construction of the new North Mymms WTW could result in negative effects on the water quality of nearby waterbodies. It is expected that with the implementation of good practice pollution prevention and control measures, long-term residual effects are unlikely to occur as a result of construction.</p>	<p>The indicative pipeline route passes through Flood Zone 1 (low risk of flooding). As the indicative pipeline route crosses areas of SPZ1-3, and crosses several watercourses, construction could result in a negative effect on the water quality of nearby waterbodies.</p> <p>It is expected that with implementation of good practice, including pollution prevention and control measures, and following reinstatement, long-term residual effects are unlikely to occur.</p> <p>No further WFD assessment would be required as outlined in Table F.13 above.</p>
Air	<p>The indicative sites for the River Lee Abstraction Point, channel and pumping are not located within an AQMA, although the Enfield AQMA is within close proximity.</p> <p>The indicative pipeline route passes through the Enfield AQMA.</p> <p>Temporary negative effects on air quality are anticipated. It is expected that with the implementation of good practice measures during construction, there may</p>	<p>The indicative site for the new North Mymms WTW is not located within an AQMA.</p> <p>Temporary negative effects on air quality are anticipated. It is expected that with the implementation of good practice measures during construction, there may still be some temporary impacts on air quality, however, long-term residual effects are unlikely to occur.</p>	<p>The indicative pipeline route does not pass through any AQMAs.</p> <p>Temporary negative effects on air quality are anticipated. It is expected that with the implementation of good practice measures during construction, there may still be some temporary impacts on air quality, however, long-term residual effects are unlikely to occur.</p>

Topic	Abstraction and Pipeline (River Lee to North Mymms)	North Mymms WTW	Pipeline (North Mymms to Brookmans Park)
	still be some temporary impacts on air quality, however, long-term residual effects are unlikely to occur.		
Climatic factors	<p>The relative carbon scale identified that, relative to other WRSE regional plan options, the abstraction and pipeline would result in minor negative construction and major negative operational carbon emissions. Further information on carbon footprint is provided in Section 5.4.</p> <p>The resilience of the local environment to climate change may be negatively affected as abstraction is proposed. It is recommended the levels of the river are monitored to avoid over-abstraction.</p>	<p>The relative carbon scale identified that, relative to other WRSE regional plan options, the new North Mymms WTW would result in minor negative construction and operation carbon emissions.</p>	<p>The relative carbon scale identified that, relative to other WRSE regional plan options, the and pipeline would result in minor negative construction and minor negative operational carbon emissions. Further information on carbon footprint is provided in Section 5.4.</p>
Landscape	<p>The indicative sites for the River Lee Abstraction Point, channel and pumping are in the London Area Greenbelt. Permanent effects on the landscape are expected with long-term residual effects likely to occur. Opportunities to incorporate screening to reduce the visual effects during operation would be embedded in the design.</p> <p>The indicative pipeline route passes through the London Area Greenbelt with negative effects anticipated due to the excavation work. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.</p> <p>Direct negative effects on at least four TPOs.</p>	<p>The indicative site for the new North Mymms WTW is in the London Area Greenbelt but not within proximity to the Chilterns AONB. Permanent effects on the landscape are expected with long-term residual effects likely to occur. Opportunities to incorporate screening to reduce the visual effects during operation would be embedded in the design.</p>	<p>The indicative pipeline route passes through the London Area Greenbelt with negative effects anticipated due to the excavation work. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.</p>
Historic environment	<p>There are listed buildings within 500m of indicative sites for the River Lee Abstraction Point, channel and pumping station with potential for setting effects during construction and operation.</p> <p>The indicative pipeline route is within 500m of a conservation area, several listed buildings, a scheduled monument (Elsyng Palace) and Forty Hall Grade II Registered Park and Garden, with potential for setting effects during construction.</p> <p>Excavation during construction could potentially directly impact buried archaeology if present. The impacts are unknown at this stage and further work is required to determine the significance of any archaeological remains that could be impacted.</p>	<p>There are listed buildings within 500m of the indicative site for the new North Mymms WTW, with potential for setting effects during construction and operation.</p> <p>Excavation during construction could potentially directly impact buried archaeology if present. The impacts are unknown at this stage and further work is required to determine the significance of any archaeological remains that could be impacted.</p>	<p>The indicative pipeline route is within 500m of several listed buildings, with potential for setting effects during construction.</p> <p>Excavation during construction could potentially directly impact buried archaeology if present. The impacts are unknown at this stage and further work is required to determine the significance of any archaeological remains that could be impacted.</p>
Population and human health	<p>Disruption to the local community and users of community facilities within proximity to the indicative sites for the River Lee Abstraction Point, channel and pumping station, and temporary disruption to public rights of way and two national cycle routes, is likely during construction.</p> <p>Disruption to the local community and users of community facilities within proximity to the indicative pipeline route, and temporary disruption to public rights of way and two national cycle route, is likely during construction.</p> <p>It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.</p>	<p>Disruption to the local community, and temporary disruption of public rights of way, is likely during construction. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.</p>	<p>Disruption to the local community and users of community facilities within proximity to the indicative pipeline route, and temporary disruption to public rights of way, is likely during construction.</p> <p>It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.</p>
Material assets	<p>The indicative sites for the River Lee Abstraction Point, channel and pumping station are within proximity to the A112. There is likely to be localised traffic disruption during construction.</p> <p>The indicative pipeline route crosses major roads (including M25 and A10), a railway line and two National Cycle Network Routes (0 and 12) with disruption during construction likely due to potential temporary diversions and traffic disruption.</p> <p>It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.</p>	<p>The indicative site for the new North Mymms WTW is within proximity to the A1(M) and National Cycle Network Route 6, with disruption during construction likely due to traffic disruption. It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.</p>	<p>The indicative pipeline route crosses major roads (including A1000), a railway line with disruption during construction likely due to potential temporary diversions and traffic disruption.</p> <p>It is expected that with implementation of good practice measures, and following reinstatement, long-term residual effects are unlikely to occur.</p>

