SESRO

Connectivity to the River Thames

Options Appraisal Report

J696-DN-A01A-ZZZZ-RP-ZD-100010

May 2024

Notice

This document has been produced to support the public consultation on key infrastructure options, draft Design Principles and an Interim Master Plan for the South East Strategic Reservoir Option and to inform scoping of the environmental impact assessment. The information presented represents the current stage of the project design. It comprises material or data which is still in the course of completion, pending consultation, engagement and further design and technical development.

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Glossary

Term	Definition
Gate 3 Interim Landscape and Environmental Master Plan	This is the master plan that is being developed for inclusion in the public consultation in 2024. It is a revision to the Indicative Gate 2 Master Plan based on work undertaken for the development of the SESRO project since the Gate 2 RAPID submission.
Indicative Gate 2 Master Plan	The SESRO master plan developed for the Gate 2 RAPID submission (November 2022).
National Policy Statement (NPS) for Water Resources Infrastructure	A policy paper by the Department for Environment Food & Rural Affairs (Defra) designated in September 2023 that sets out the government's policies for developing nationally significant infrastructure projects for water resources in England. Full information on the NPS for Water Resource Infrastructure is available online at https://www.gov.uk/government/publications/national-policy-statement-for-water-resources-infrastructure
Nationally Significant Infrastructure Project (NSIP)	The Planning Act 2008 introduced a new bespoke consenting route for major infrastructure projects in the fields of energy, transport, water, waste and wastewater. An NSIP is a project that can be consented via this route.
Preferred Option	The preferred option at this time, following the option appraisal undertaken working towards the Gate 3 submission but before the public consultation in 2024. It is the preferred option for master planning (i.e., for development of the Gate 3 Interim Landscape and Environmental Master Plan) and for public consultation in summer 2024.
Red/Amber/Green (RAG) Score	Red, Amber, Green (RAG) scoring categories were used to inform the scale of the impact or benefit of each option against each of the appraisal criteria. The RAG 'score' represents a subject-matter expert judgement based on the evidence evaluated in the options appraisal.
Regulators' Alliance for Progressing Infrastructure Development (RAPID)	An alliance of the three water regulators Ofwat, Environment Agency (EA) and Drinking Water Inspectorate formed to help accelerate the development water infrastructure and design future regulatory frameworks. Full information on RAPID is available online at https://www.ofwat.gov.uk/regulated-companies/rapid/

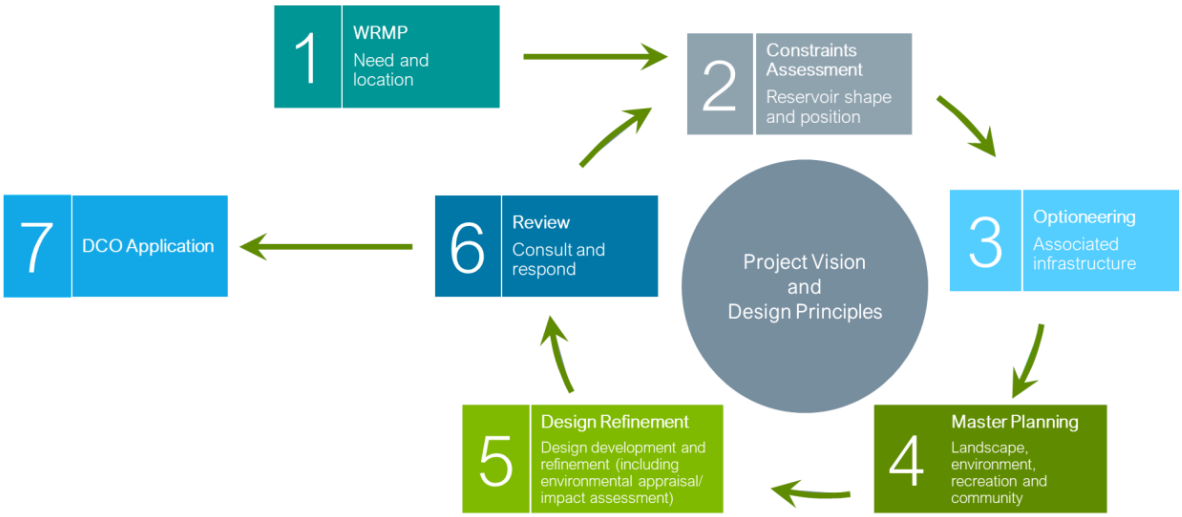
South East Strategic Reservoir Option (SESRO) Project	The concept for the South East Strategic Reservoir Option is to abstract water from the River Thames near Culham when sufficient flow is available, store it in a non-impounding raw water reservoir, located to the south west of Abingdon in Oxfordshire, and release it to the same river reach to augment flow in the river for downstream abstraction at times of low flow.
Water Resource Management Plan (WRMP)	Plans that must be produced by water companies every five years to set out how they will continue to supply water in their supply area over (at least) the next 25 years.
Water Resources South East (WRSE)	An alliance of the six water companies that cover the South East region of England, which are Thames Water, Affinity Water, South East Water, Southern Water, Portsmouth Water and Sutton & East Surry (SES) Water. Full information on WRSE is available online at https://www.wrse.org.uk/
National Landscape	The revised name for Area of Outstanding Natural Beauty (AONB) – November 2023. Note that in the Appendices National Landscape may still be referred to as AONB.

Executive Summary

The South East Strategic Reservoir Option (SESRO) is a strategic resource to the south east to secure water supplied for Thames Water, Affinity Water and Southern Water customers. The project is being developed for RAPID Gate 3 submission and an application for a Development Consent Order (DCO) under the Planning Act 2008 regime.

Stage 3 of the SESRO Multi-Disciplinary Design Development Process in Figure 0.1 is the optioneering of associated infrastructure for the reservoir.

Figure 0.1: SESRO Multi-Disciplinary Design Development Process



Source: Thames Water Internal, 2024

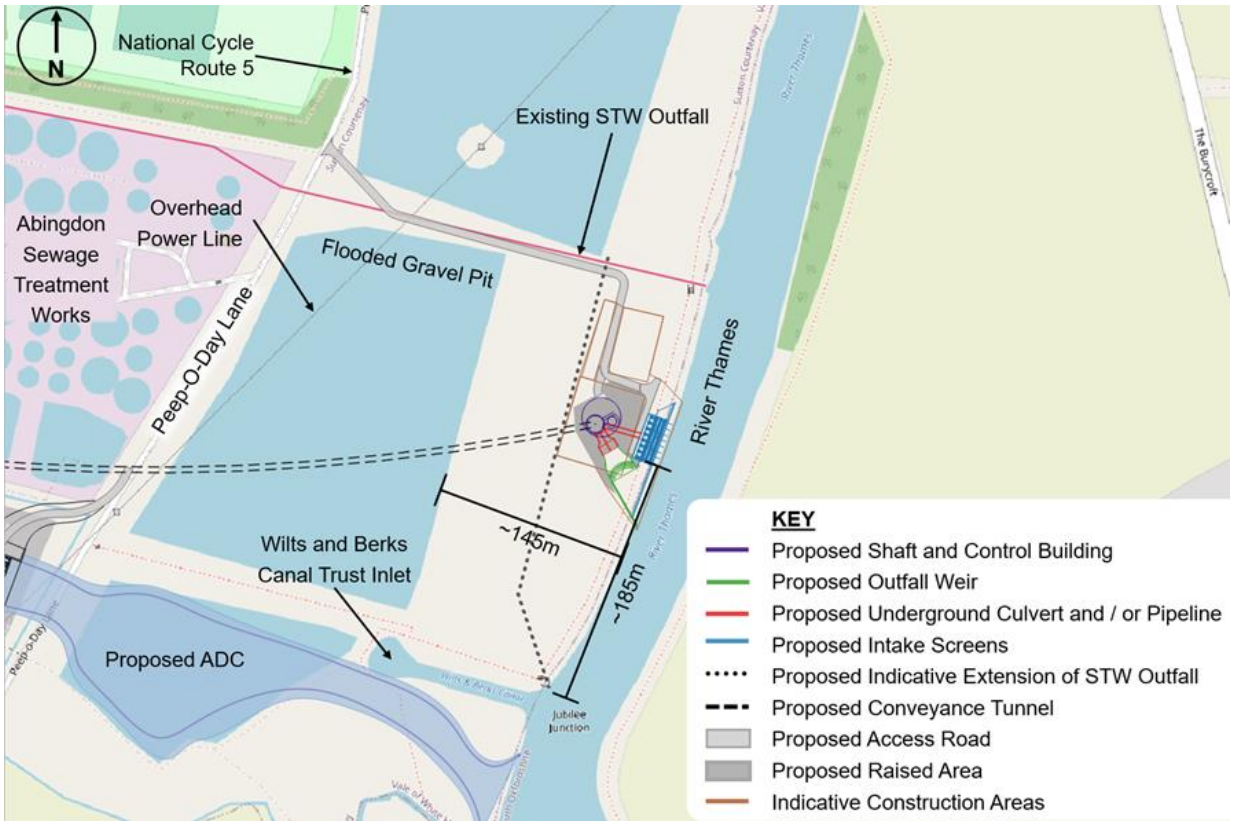
This report sets out the options appraisals undertaken, working towards the Gate 3 submission, to identify preferred options (for master planning and consultation) for the following components of the SESRO project connectivity to the River Thames:

- **The location for the SESRO intake/outfall structure -** the intake/outfall structure is required to fill the reservoir when there is sufficient capacity in the River Thames and transfer flows back to the River Thames when the river flow is low and additional water is needed for water supply.
- **The arrangement of emergency discharge infrastructure -** the emergency discharge is required to safely draw-down the water level in the reservoir and discharge it to the River Thames during an emergency event. At Gate 2, the emergency discharge comprised of a surface channel, the Auxiliary Drawdown Channel (ADC) and tunnel acting together to convey the full emergency discharge flow. This appraisal introduces an alternative proposal for consideration comprised of an enlarged tunnel to be able to take the full emergency discharge flow, which removes the need for the ADC from the scheme altogether.

To identify the preferred options for master planning and consultation, the options appraisal process detailed fully in the SESRO Option Appraisal Context and Methodology Report was followed. The outcomes of the appraisal studies reported in this connectivity to the River Thames report were as follows.

For the location for the intake/outfall structure, Option B in Figure 0.2 is the preferred option of the eight options defined and assessed in this appraisal study. Option B is located on the right bank of the River Thames, east of a flooded gravel pit and just north of the Wilts & Berks Canal Trust Inlet. The site would be accessed via the B4107, Stonehill Lane and Peep-O-Day Lane, and utilises a single location for the intake, outfall and combined shaft and control building.

Figure 0.2: Intake/Outfall Structure - Preferred Option [1]



Source: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri. Mott MacDonald, 2023.

For the emergency discharge, Option C in Figure 0.3 was the provisionally preferred option of the options defined and assessed in this appraisal study. Option C is a tunnel-only arrangement, whereby the full emergency discharge flow is discharged through a conveyance tunnel to the outfall of the intake/outfall structure on the River Thames.

[1] Peep-O-Day Lane is part of the NCN 5. Temporary or permanent modifications to Peep-O-Day Lane adjacent to Abingdon STW may be required, which are not indicated on this figure.

Figure 0.3: Emergency Discharge – Preferred Option

Source: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri. Mott MacDonald

It was recognised that the Emergency Discharge Option B with the ADC has the potential to provide quantifiable benefits to the local area, which would not be delivered by the tunnel-only arrangement of Option C. The quantifiable benefits include wellbeing improvements to canal and towpath users, health improvements associated with increased physical activity and economic activity increases associated with a stretch of canal. A benefits assessment was therefore undertaken to cost the benefits of the ADC that had not been fully considered within the appraisal criteria – the assessment outcome and its comparison with the additional costs of the ADC are presented in Table 0.1.

Table 0.1: Comparison of Costs and Benefits

Cost or Benefit	Present Value in 2023 Prices
The addition cost to construct and operate Option B (instead of Option C) over an 80years	£68.1m (estimate in the region of)
The central estimate from the assessment of the quantifiable benefits for the ADC over 80years	£13.4m

It is considered that the costed benefits are not significant enough to change the preference for Option C from the options appraisal, given that the additional costs for the ADC are in the region of 5 times greater than the costed benefits. Option C in Figure 0.3 is therefore the preferred option for master planning and consultation for the emergency discharge.

Following on from these options appraisals, working towards Gate 3 submission, the next stage in the SESRO design development process (as set out in Figure 0.1) is to

develop the SESRO Gate 3 Interim Landscape and Environmental Master Plan for inclusion in the public consultation in 2024, using the outcome of options appraisals for the associated infrastructure for the reservoir.

It is expected that the options appraisals will be backchecked in Autumn 2024 to consider changes and/or additional information that may have been identified by that time through the Gate 3 design development work (including the development of the Gate 3 Interim Landscape and Environmental Master Plan) and/or the Summer 2024 non-statutory consultation.

A number of next steps have been identified specifically to follow on from the identification of preferred options (for consultation and master planning) for the intake/outfall and emergency discharge. These steps, which will be progressed in the design development for Gate 3, are included within Section 12.2 of this report.

1 Introduction

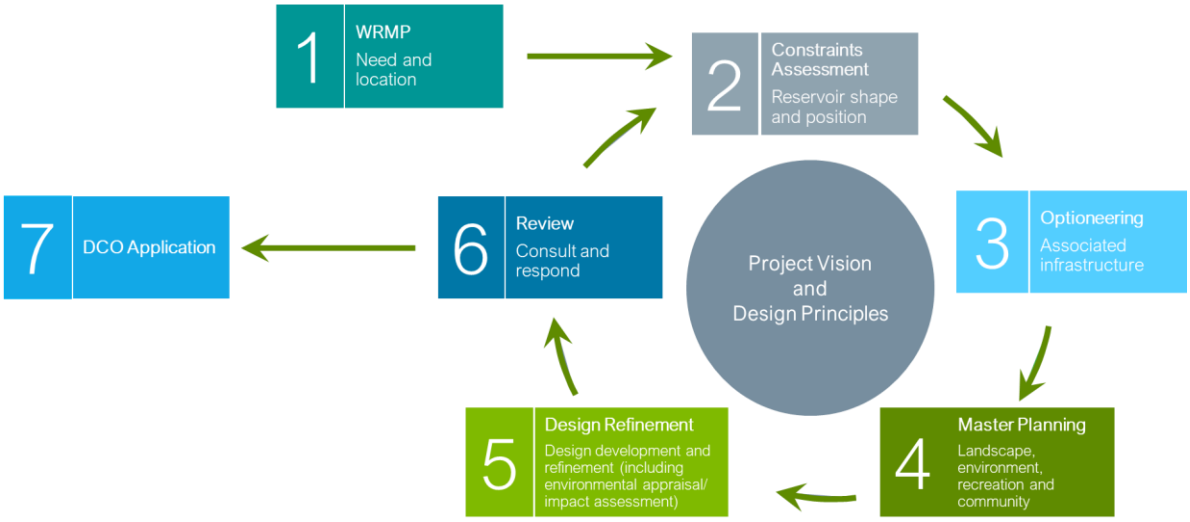
This section provides an overview of the purpose and status of this report and its relationship to the other SESRO options appraisal reports. It also introduces the reasons SESRO requires connectivity to the River Thames.

1.1 Purpose of this Report

1.1.1 The South East Strategic Reservoir Option (SESRO) is a strategic resource to the south east to secure water supplied for Thames Water, Affinity Water and Southern Water customers. The project is being developed for RAPID Gate 3 submission and an application for a Development Consent Order (DCO) under the Planning Act 2008 regime.

1.1.2 The SESRO Design Development Process (shown in Figure 1.1 below) is outlined in the SESRO Option Appraisal Context and Methodology Report[2]. Stage 3 of this process is the optioneering of associated infrastructure and for Gate 3, options appraisals were undertaken for infrastructure identified as being essential associated infrastructure for the reservoir.

Figure 1.1: SESRO Multi-Disciplinary Design Development Process



Source: Thames Water Internal, 2024

1.1.3 This report describes the option appraisals undertaken to identify preferred options associated with the SESRO connectivity to the River Thames, which includes:

- The location for the SESRO intake/outfall structure.
- The arrangement of an emergency discharge to safely discharge water from the reservoir to the River Thames during an emergency event.

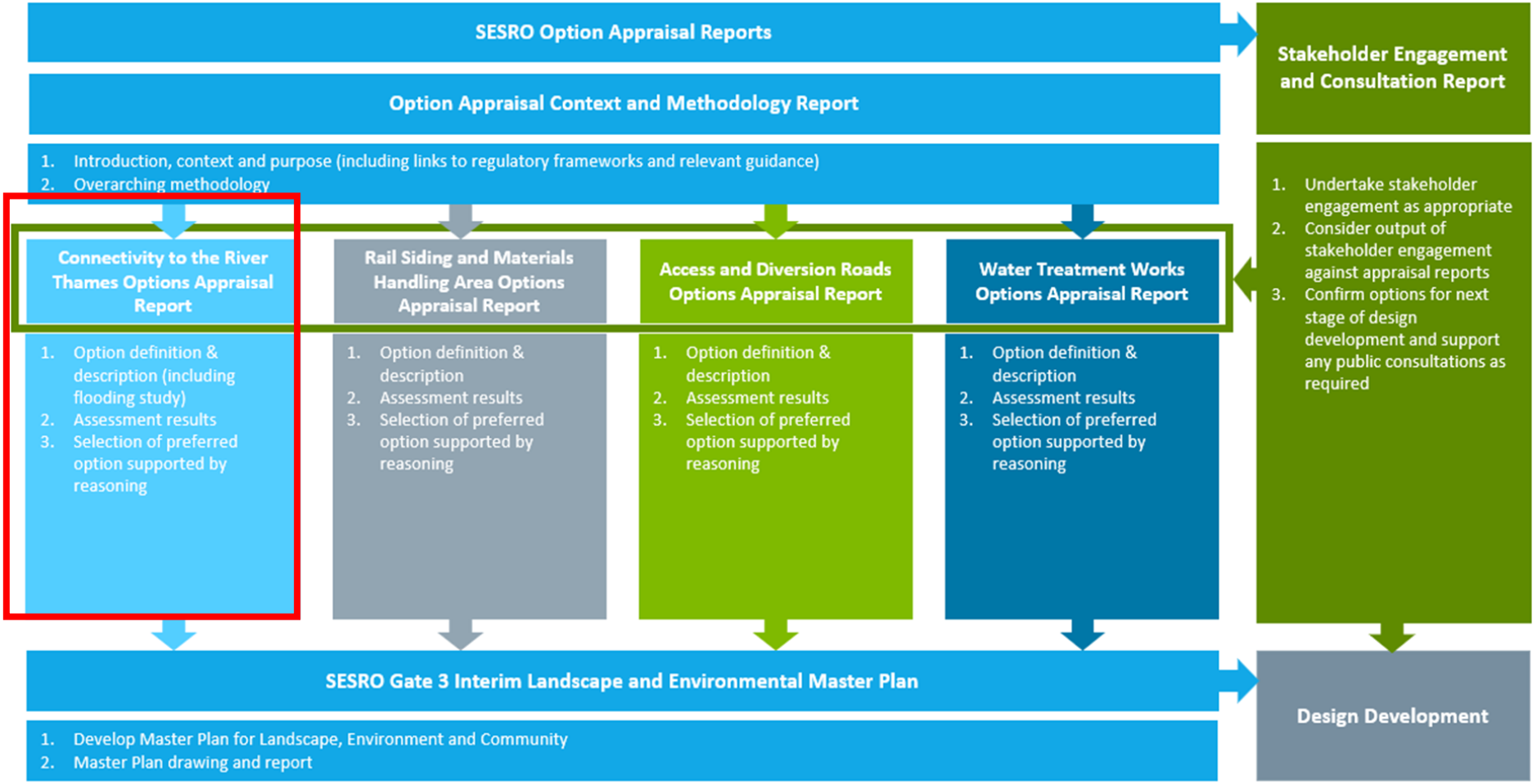
[2] SESRO Option Appraisal Context and Methodology Report, J696-DN-A01A-ZZZZ-RP-ZD-100006

1.1.4 These two elements are considered part of the essential associated infrastructure for the reservoir and there are options for the location and arrangement of each element within the SESRO project. This report sets out the options appraisals undertaken for both elements working towards the Gate 3 submission.

1.1.5 The report forms part of a suite of option reports, as shown in Figure 1.2. The SESRO Option Appraisal Context and Methodology Report describes the approach and methodology adopted for the options appraisals.

Figure 1.2: SESRO Options Appraisal Document Suite

Note that this report is outlined in red in the document suite.



Source: Thames Water Internal, 2024

1.2 Connectivity to the River Thames

1.2.1 The SESRO project requires connectivity to the River Thames for the following reasons.

- To abstract water from the River Thames to fill the reservoir when it is not full and there is sufficient flow in the river.
- To discharge flows from the reservoir into the River Thames when such discharge is needed for water supply (typically during drier periods when river flows are low).
- To be able to safely convey water removed from the reservoir during an emergency drawdown response, into the River Thames. This flow is much greater than those associated with operational abstractions and discharges.

1.2.2 To abstract flows from and discharge flows to the River Thames, several options are defined for appraisal in Section 4, most which are a combined intake and outfall structure.

1.2.3 To discharge flows from the reservoir to the River Thames in an emergency event, several options, which include surface and subsurface components, are defined for appraisal in Section 8.

1.3 Backchecking and Changes to this Report

1.3.1 This is the first issue of this report and therefore no backchecking has been undertaken. In future revisions, this section will summarise any backchecking undertaken that is specific to the options appraisals for the intake/outfall and emergency discharge, and any changes to the report since the previous revision.

1.3.2 It is expected that the next backcheck of the options appraisals will happen in Autumn 2024 to consider changes and/or additional information, which may have been identified by that time through the Gate 3 design development work, including the development of the Gate 3 Interim Landscape and Environmental Master Plan. This will include a review of any assumptions used within this appraisal from the Indicative Gate 2 Masterplan and any changes required following the development of the Gate 3 Interim Landscape and Environmental Master Plan. A timetable for backchecking beyond Autumn 2024 will be decided dependent on future need, with interim backchecks to be undertaken sooner if a significant change is identified before Autumn 2024.

1.3.3 It is noted that the preferred option for the emergency discharge arrangements was confirmed for master planning and consultation after further study was undertaken, following on from the options appraisal. This further study, which was into the costs and benefits of the emergency discharge options appraised, is outlined in Section 11 of this report.

1.3.4 It is noted that at the time of these appraisals, there had been limited access to

the SESRO site for surveys and investigations, such as terrestrial and aquatic ecological surveys due to landowner permissions being negotiated, and as such this appraisal has been completed using available desk-based information. These assessments will need to be backchecked following completion of surveys.

2 Assessment Methodology

The section outlines the options appraisal methodology for the intake/outfall structure and the emergency discharge, following the appraisal steps in the common approach set out in the SESRO Option Appraisal Context and Methodology Report.

2.1 Overview of Appraisal Methodology

2.1.1 The SESRO Option Appraisal Context and Methodology Report sets out the appraisal methodology, which is a common approach that has been adopted for all the option appraisal studies undertaken for the essential associated infrastructure and working towards the Gate 3 submission.

2.1.2 A summary of the activities undertaken for the option appraisals for the intake/outfall structure and the emergency discharge is provided below, in line with the steps in the appraisal methodology.

2.2 Appraisal Step 1: Define Scope and Objectives of Appraisal

2.2.1 The definition of the scope and objectives of the options appraisals for Gate 3 was undertaken at a project level and reported in the SESRO Option Appraisal Context and Methodology Report. That report identifies all the essential associated infrastructure for the reservoir and also sets out the overarching purpose of the options appraisals to support progress towards DCO submission and a Gate 3 submission to RAPID.

2.2.2 The objective of the options appraisals detailed in this report is to identify a preferred location for an intake/outfall structure and preferred option for an emergency discharge.

2.3 Appraisal Step 2: Define Constraints on Option Definition

2.3.1 The constraints identified on the definition of options for the intake/outfall structure are presented in Section 3 of this report. The constraints for the emergency discharge are in Section 7.

2.4 Appraisal Step 3: Develop Appraisal Criteria

2.4.1 The SESRO Criteria Table developed for the options appraisal of associated infrastructure is within the SESRO Option Appraisal Context and Methodology Report.

2.4.2 Criteria descriptions in the table were developed under the themes of design acceptance (engineering), constructability, operability, costs, carbon costs, environmental performance, community and planning considerations, and property and land acquisition.

2.4.3 In general, the criteria relate to key requirements and considerations for the SESRO project based on relevant legislation, policy and guidance, as well as

operational and engineering requirements. They are therefore applicable across the different options appraisals for the associated infrastructure for the reservoir, including the water treatment works (WTW), rail siding and materials handling areas, access and diversion roads, and connectivity to the River Thames.

2.4.4 In the intake/outfall options appraisal, 15 of the 132 criteria were not assessed. Of these excluded criteria 10 are specific criteria used for other appraisals and the remaining five were not used because they do not relate to the feasibility of the option, facilitate differentiation between options or are already assessed under another criteria.

2.4.5 In the emergency discharge options appraisal, 16 of the 132 criteria were not assessed. 13 of these excluded criteria are specific criteria used for other appraisals and the remaining three were not used because they do not facilitate differentiation or are already assessed under another criteria.

2.4.6 Appendix U contains the full list of criteria excluded from intake/outfall and emergency discharge options appraisals, alongside their reasons for exclusion.

2.4.7 The following specific criteria were developed for the assessment of the intake/outfall options only:

- Performance – Impact of intake location on the removal of screenings and large floating debris e.g., rate of removal and volume to be removed - included to consider the operational complexity and performance of the intake/outfall in terms of minimising disruption and maximising efficiency.
- Quality – Impact on water quality received by the reservoir from the intake – included to consider the intake is ensuring reservoir water quality and compliance with water company standards.
- Performance - Geomorphological impacts e.g., potential sedimentation around the structure - included to consider the likely impact geomorphology, in particular sediment deposition, would have on the operational resilience and performance of the intake/outfall.

2.4.8 The following specific criteria were developed for the assessment of both intake/outfall and emergency discharge options:

- Construction Complexity - Complexity of construction technique e.g., construction of tunnels, Auxiliary Drawdown Channel (ADC) or both for the emergency discharge – included to consider construction risk management.
- Severn to Thames Transfer (STT) Integration Complexity – Complexity of connecting STT directly into the intake/outfall structure – included to consider construction risk management and the integration complexity of SESRO and STT during construction.
- Evolvability - Risk to operation from future climate change e.g., losses from evaporation due to higher temperatures, impact of higher rainfall,

intake/outfall flood risk perspective – included to consider how an option's performance could be impacted by future climate change.

- STT Integration Complexity - complexity of operating STT directly into the intake/outfall structure - included to consider the operational and maintenance complexity of assets when looking at the integration of SESRO and STT.

2.5 Appraisal Step 4: Define Options

2.5.1 The options were discussed and defined over the course of several workshops and evidence reviews amongst the Gate 3 SESRO team which consisted of engineers, environmental, ecological, land, planning and property specialists.

2.5.2 For both the intake/outfall structure and the emergency discharge, some of the options were carried through from Gate 2 and further options were developed through this discussion process.

2.5.3 A summary of appraisal step 4 for the intake/outfall structure is presented in Section 4 of this report. The summary for the emergency discharge is in Section 8.

2.6 Appraisal Step 5: Undertake Individual Assessments

2.6.1 In this appraisal step, each option was reviewed and assessed by specialists against the applicable criteria in the SESRO Criteria Table, which was developed in appraisal step 3. For each of the applicable criteria, an option was given a red, amber or green (RAG) score. The RAG score indicates the performance of an option within the ambit of each criterion and the RAG score definitions are as follows:

- Red - A red RAG score is given for a specific option-criterion combination when the option performs poorly against the criterion. For each criterion, a poor (or 'red') performance is defined in the SESRO Criteria Table because it is criteria specific, and a red RAG rating does not necessarily equate to a constraint that makes the option infeasible. A red score would however generally indicate the introduction of a significant risk, which may not be easy to mitigate, to the project from the option being assessed.
- Amber - An amber RAG score is given for a specific option-criterion combination when the option performs moderately against the criterion, neither poorly enough to warrant a red RAG score nor so well as to warrant a green score. For each criterion an amber score is defined fully in the SESRO Criteria Table because a 'moderate' performance is criteria-specific, so no generalisation of an amber score across the range of appraisal criteria can be made here.
- Green - A green RAG score is given for a specific option-criterion combination when the option performs well against the criterion. As with red

and amber scores, a green RAG score is defined for each criterion specifically, as set out in the SESRO Criteria Table.

2.6.2 The SESRO Option Appraisal Context and Methodology Report contains further details on the RAG assessment method.

2.6.3 The RAG assessment for each option was recorded in the format standard across the associated infrastructure options appraisals. The narratives from relevant specialists, documenting the reasoning behind why each RAG score was given for each option, are included within the appendices of this report. Appendix I to Appendix P contain the workbooks for the intake/outfall options, and Appendix Q and Appendix R contain the workbooks for the emergency discharge options.

2.6.4 A summary of appraisal step 5 for the intake/outfall structure is presented in Section 5 of this report. The summary for the emergency discharge is presented in Section 9. In these report sections, the performance of each option in its assessment against the appraisal criteria as set out in paragraph 2.6.1 above is summarised into assessment subthemes, which are set out below.

Table 2.1: Criteria Subthemes for the Connectivity to the River Thames Appraisal

Key Theme	Subtheme
Constructability (Engineering)	Health and Safety
	Third Party Impact
	Logistics
	Programme
	Construction Complexity
	STT
Operability (Engineering)	Health and Safety
	Operational Complexity
	Operational Resilience
	Transport Planning
	Reservoir Water Quality[3]
	STT
Cost and Carbon	Cost
	Carbon
Environmental	Air Quality
	Aquatic Environment
	Biodiversity and Nature Conservation

[3] Criteria in the reservoir water quality subtheme are only applicable to the intake/outfall options appraisal, not the emergency discharge options appraisal.

	Biodiversity and Nature Conservation and Landscape
	Flood Risk
	Historic Environment
	Land Quality
	Landscape and Visual
	Noise
	Pollution
Community, Planning and Land	Socio-Economic
	Consenting
	Property and Land Acquisition

2.6.5 Appraisals have been undertaken using available desktop or historical survey information. Further site work is required to create an environmental baseline for the project and full environmental assessment of the project is planned for 2025. If findings diverge from the desktop information used, further backchecking of this options appraisal will be required as outlined in Section 1.3.

2.7 Appraisal Step 6: Workshop to Agree Preferred Option

2.7.1 Following the individual assessments in appraisal step 5, a workshop was held to bring together specialists to discuss the outputs of the assessments against the criteria, to identify a preferred option for the intake/outfall structure and for the emergency discharge, and to record collective reasons for the preferred options.

2.7.2 The assessment subthemes in Table 2.1 were used to help identify how the different options performed and identify any relevant differentiations between the options. While all the subthemes have degrees of relevance to consenting, in the sense of being decision-making factors for a DCO application, the 'consenting' subtheme identifies certain more specific or narrower criteria, such as the extent of the Order Limits, local planning policy factors, or requirements for other consents/licenses.

2.7.3 A summary of appraisal step 6, including the workshop and appraisal outcome, is presented in Section 6 of this report for the intake/outfall structure. The summary for the emergency discharge is presented in Section 10. The key theme and subtheme narratives presented in these report sections are intended to summarise the key points from assessment narratives, present the issues that provided differentiators between options and provide a preferred option with a reasoned justification.

2.7.4 For the emergency discharge, following the workshop, a subsequent step was undertaken to confirm the preferred option for master planning and consultation; benefits to the local area were identified, quantified and compared

against costs for construction and operation. This cost benefits review is detailed in Section 11 with the appraisal outcome (i.e., preferred option) for the emergency discharge then presented in Section 11.5.

2.8 Appraisal Steps 7 and 8: Review against other SESRO Appraisals, and Masterplanning and Consultation

2.8.1 Appraisal steps 7 and 8 are not reported within this options appraisal report, but rather they are being undertaken as part of the Gate 3 Interim Landscape and Environmental Master Plan development.

3 Intake/Outfall: Constraints on Option Definition

This section sets out the constraints on option development for the intake/outfall in accordance with step 2 of the appraisal methodology.

3.1 Intake/Outfall – Purpose

3.1.1 The intake/outfall structure is to enable operational abstraction of flows from the river to fill the reservoir when the reservoir is not full and there is sufficient flow in the River Thames. It is also to enable discharge of operational flows from the reservoir into the River Thames when such discharge is needed for water supply (typically during droughts when river flows are low).

3.1.2 The rationale for filling and discharging from the reservoir is described below.

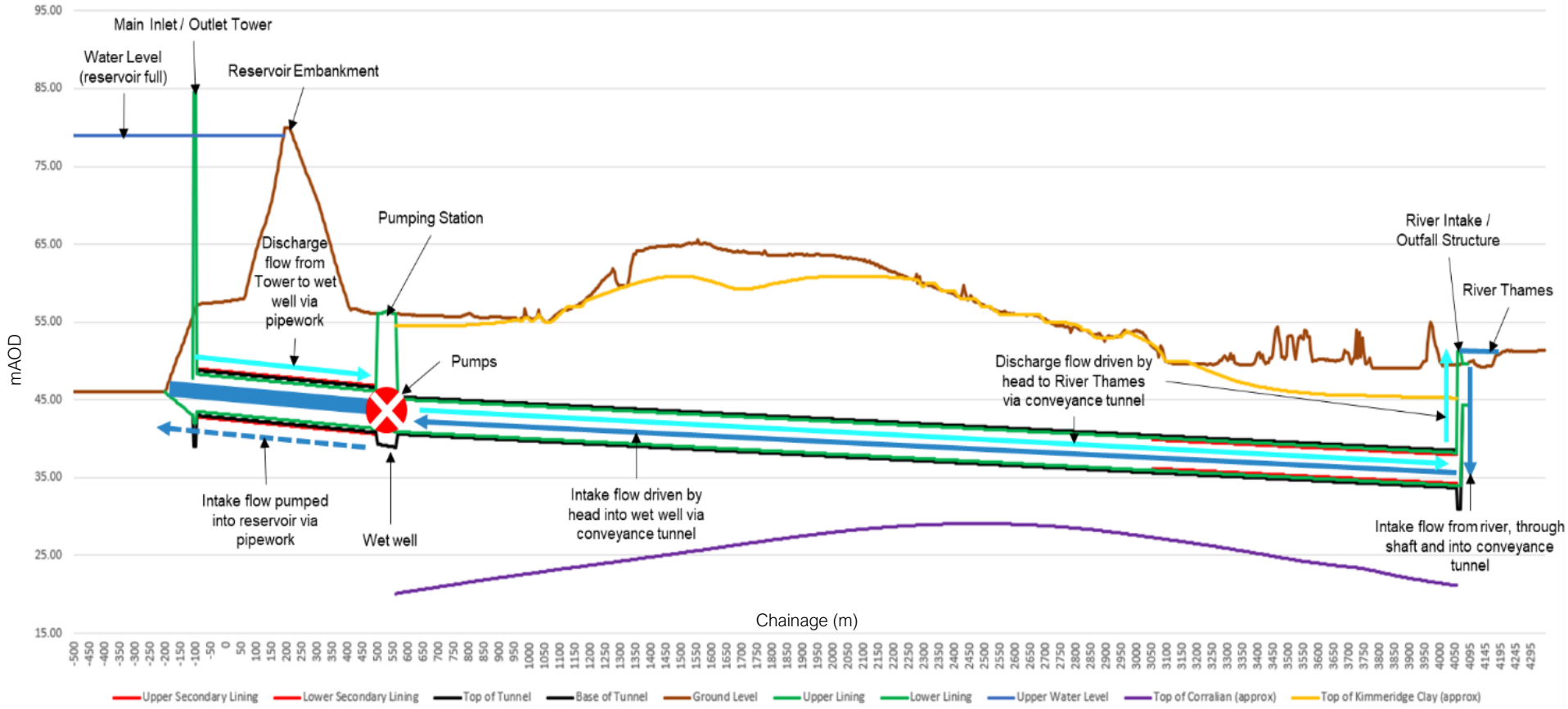
Filling the Reservoir

3.1.3 To fill the reservoir, river water is screened at the riverbank and transferred from the River Thames via a short horizontal conduit into a buried circular shaft. At the base of the shaft is the portal to the conveyance tunnel, which connects to the reservoir via an underground pumping station located just beyond the outer toe of the reservoir embankment. From the pumping station, abstracted water is pumped through a further tunnel underneath the reservoir perimeter embankment to the main inlet/outlet tower inside the reservoir and discharged into the reservoir. This process to fill the reservoir from the River Thames is depicted via the darker blue arrows in Figure 3.1.

3.1.4 The intake screens are to prevent entrainment of fish (including European eel, *Anguilla anguilla*), general floating or submerged organic material and debris in the abstracted flow. The screens are to operate with a maximum abstraction flow rate of 1,200Ml/d (13.9m^3/s) from the River Thames. Different types of screens are available and to date, two have been considered for SESRO. Passive Wedge Wire Cylinder (PWWC) screens include underwater cylinders and are backwashed using air. PWWC screens have been assumed for the spatial layout of the intake and are shown on the plans. However, for the purpose of the visual impact options appraisal, the Hydrolox travelling screens have been assumed. This screen stands partially above the water level and rotates to keep clear of debris. Hydrolox screens are used in the appraisal as they have been used at other Thames Water intake sites and provide the worst-case visual impact (compared to PWWC screens). Both screen options require an above-ground structure for equipment and control on or near the riverbank. The preferred screen type for SESRO will be reviewed, discussed with the EA (and any other relevant stakeholders if necessary) and confirmed at a later stage of design development (pre-DCO submission).

3.1.5 As indicated on Figure 3.1,the conveyance tunnel has a gentle gradient sloping gently upwards from the riverside shaft towards the pumping station, to fit with the elevations of the reservoir bed and river, and to suit geological conditions.

Figure 3.1: Filling and Discharging Flows via Conveyance Tunnels.



Source: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri. Mott MacDonald, 2023.

Discharging Flows to the River Thames

3.1.6 To discharge flows from the reservoir to the River Thames, water is first abstracted through the valved outlets within any of the towers in the reservoir. It is then conveyed by gravity back through the same tunnel under the reservoir embankment to the pumping station. At the pumping station, the water is diverted to flow through an energy recovery turbine to generate electricity before returning to the river via the tunnel. This process is depicted via the light blue arrows in Figure 3.1.

3.1.7 The water level in the reservoir will always be higher than the River Thames during operational discharges, so there will be sufficient pressure to enable flow down the conveyance tunnel, up through the intake/outfall shaft and into the River Thames via the outfall structure using gravity only. The following are requirements of the outfall to the River Thames.

- The outfall to the River Thames must provide a controlled maximum discharge of 600Ml/d (6.9m^3/s) in normal operation, ensuring minimal disturbance to natural river currents during operational releases, over the range of river water levels that the River Thames is controlled within during normal (non-flood) conditions.
- The outfall to the River Thames is also to form (at least part of) the emergency discharge arrangements. Sections 7 to 11 of this report detail the options appraisal for the emergency discharge arrangement. Out of the arrangement options appraised for the emergency discharge, even the smaller diameter conveyance tunnel provides sufficient capacity to transfer a proportion of the emergency discharge flow to the River Thames.
- The outfall should discharge at 45 degrees to the flow of the river to reduce the effect of scour on the riverbed.

3.1.8 The conveyance tunnel between river and pumping station is a ‘wet’ tunnel, which means it will be constantly full of water from the River Thames after commissioning. To keep the water inside from stagnating, a continuous, small ‘sweetening flow’ through the tunnel will be required. The approach to how this sweetening flow is provided will be developed to suit the preferred option as part of the design development.

3.1.9 Permanent access will be required to the shaft, intake and outfall locations for operation and maintenance purposes. It is, however, accepted that the intake/outfall structure may not be accessible in extreme River Thames flooding, which is a normal operating practice within Thames Water. By their nature many river intakes are located on floodplains, and it is a regular occurrence at existing Thames Water river intakes, such as Dachet WTW, for screens to be submerged during flood events. However, it is important that electrical design takes account of likely flood levels and electrical power, and control systems are protected from flooding. Access arrangements and approach to flood protection will be further developed for the preferred option

as part of design development.

3.1.10 The intake/outfall structure is to house control penstocks, which can isolate the shaft and conveyance tunnel from water in the River Thames to enable these structures to be occasionally drained if and when required for inspection or maintenance.

3.2 Intake/Outfall - Constraints

3.2.1 There are few absolute constraints on the intake/outfall location, excepting that the structure needs to be located adjacent to the River Thames to facilitate abstraction and discharge, ensuring water quality. Further design work is required to consider the type of intake screens, and therefore whether these would be on the riverbank or in the river channel.

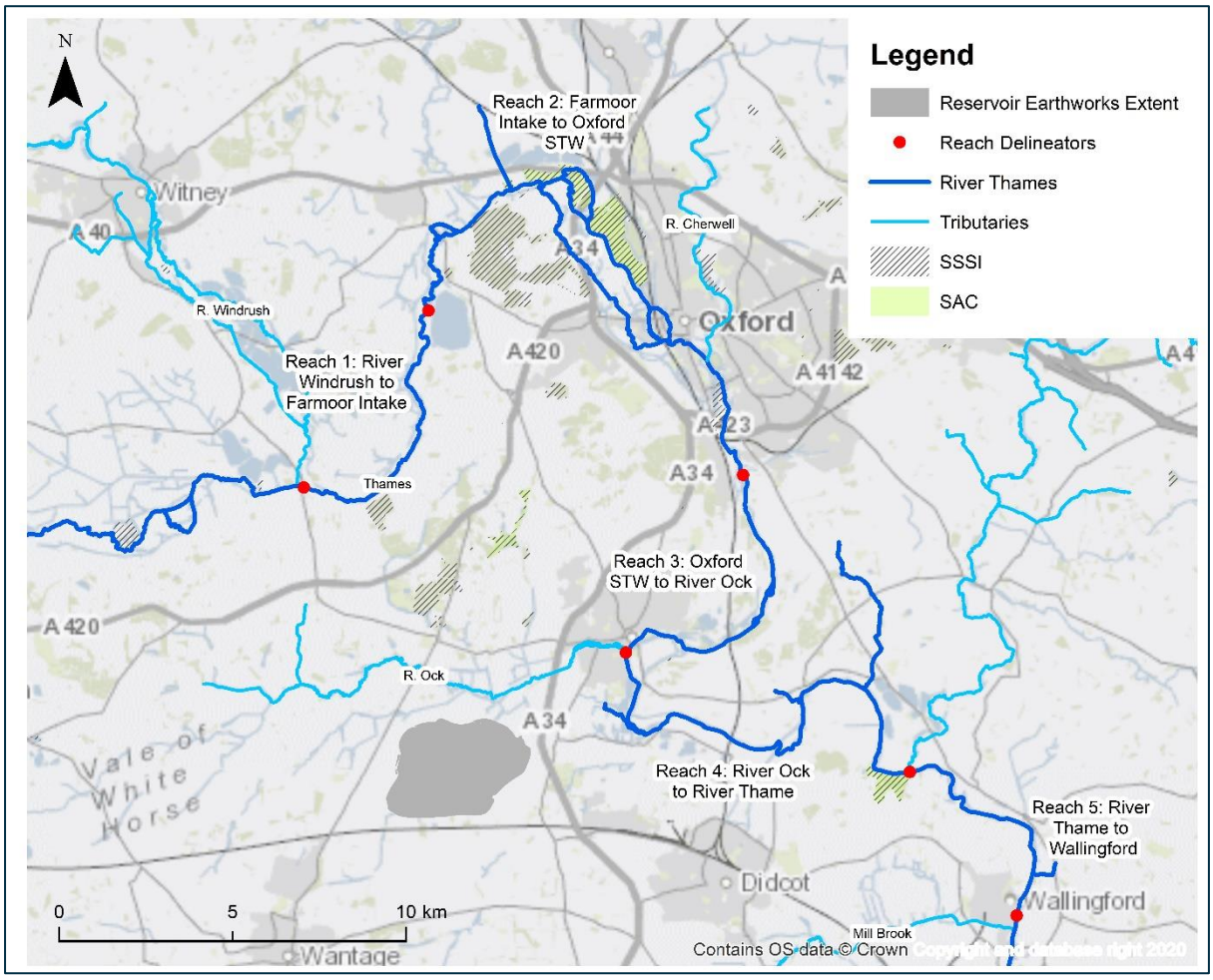
3.2.2 The following has been considered in identifying options for the location of the intake/outfall structure:

- Consideration of environmental acceptability of the intake and discharge flows within local river reaches.
- Proximity to the main SESRO site (to minimise tunnel length).
- Local settlements.

Reach Study

3.2.3 A review of the local reaches of the River Thames was undertaken to inform the selection of an appropriate reach for the SESRO intake/outfall structure. The River Thames was divided into hydrological reaches based on consideration of notable abstractions, discharges and/or tributaries that have a discernible impact on the hydrology of the river. As such, a total of five reaches were identified as shown in Figure 3.2.

Figure 3.2: River Thames Reaches



Source: AtkinsRéalis, 2024

3.2.4 Reach 4 from the confluence with the River Ock to the confluence with the River Thame[4] is closest to the reservoir location and as a starting point would be preferable from a design perspective due to minimising the length of the abstraction/discharge tunnel and ADC (if constructed[5]), and therefore minimising engineering and environmental constraints affecting these. However, more distant reaches were considered through a screening-stage appraisal to determine whether these could offer advantages, such as reduced environmental sensitivity, which would merit extending the area of detailed options for intake/outfall appraisal into these reaches.

3.2.5 The environmental appraisal of the reach options considered the sensitivity of

[4] The River Thame is a left-bank tributary to the River Thames

[5] At Gate 2, the emergency discharge arrangement for the reservoir comprised of an ADC (a surface channel) and a conveyance tunnel acting together to convey the full emergency discharge flow. The second half of this report details the options appraisals undertaken ahead of the Gate 3 submission for the arrangement of the emergency dischargement with Section 8 of this report defining the options that were appraised, not all of which included an ADC.

the ecological and recreational receptors to hydrological changes that are likely to be associated with the operation of the SESRO intake/outfall (it is noted that the river sits with a floodplain through all reaches considered, therefore flooding is not considered a differentiator in the reach screening). The reaches and the initial screening outcomes are summarised as follows.

3.2.6 Reach 1: River Thames from confluence with River Windrush to Farmoor intakes.

- Reach 1 has been screened out due to the complexities of the water level management in this reach, which involves existing impacts of abstraction from Farmoor on the downstream Oxford Watercourses. An additional intake could further increase these impacts.

3.2.7 Reach 2: River Thames from Farmoor intakes to Oxford STW (confluence with Littlemore Brook).

- Reach 2 has been screened out due to the complexities of the water level management through the network of distributaries through Oxford and the potential for impacting flows within these watercourses, which includes the Oxford Meadows Special Area of Conservation (SAC) and a number of Sites of Special Scientific Interest (SSSIs). Furthermore, these sensitive habitats are already impacted by the Farmoor abstraction.

3.2.8 Reach 3: River Thames from Oxford STW (confluence with Littlemore Brook) to confluence with the River Ock.

- The upper part of Reach 3 has complexities related to water quality inputs from the Oxford STW. Further downstream, there are potential complexities around the hydrological connectivity between the River Thames and the Culham Brake SSSI. The SSSI is a seasonally flooded backwater of the Thames with wetland vegetation and willow. Given that SESRO would take water at times of higher river flows, there could be an effect on this site.
- This reach is also further from the proposed location of the reservoir than Reach 4, so may be a less suitable option due to the number of materials and carbon emissions associated with a longer tunnelling distance and also the potential that a longer tunnel may increase the environmental and environmental constraints affecting it. It is noted that there are a number of conurbations to the west of the river in this reach (ie. between the main SESRO site and the river) including Abingdon, Radley, Sandford on Thames and Kennington, which would constrain inlet /outfall locations and limit options for a tunnel route that avoided going under urban area.

3.2.9 Reach 4: River Thames from the confluence with the River Ock to the confluence with the River Thames.

- There is an outfall for Abingdon STW in the upper part of Reach 4. It is likely that this STW outfall would need a short diversion within the reach,

depending on where the intake/outfall is located, so that it is downstream of the intake/outfall structure.

- Little Wittenham SAC and SSSI is located at the downstream extent of Reach 4.
  - The SAC Annex II species, which are a primary reason that this site is a SAC, include large numbers of great crested newts *(Triturus cristatus*) in two main ponds in the woodland.
  - The associated Little Wittenham SSSI occupies the exact same footprint and comprises functionally linked habitat associated with the great crested newts, which are mobile species that use the wider woodland setting as habitat.
  - Both the SAC and SSSI are outside of the existing flood zones for the River Thames, meaning that there are no hydrological links between Little Wittenham SAC / SSSI and the River Thames.
  - The SESRO Gate 2 Habitats Regulations Assessment (HRA)[6] concluded that there were no likely significant effects from the construction and operation of SESRO on Little Wittenham SAC.
  - If an intake/outfall structure was located in the upper section of Reach 4, then this would not change the conclusion (no likely significant effects) for Little Wittenham SAC or SSSI. If the intake/outfall structure were to be located in the lower section of Reach 4, i.e. much closer to the SAC and SSSI, then this may start to trigger other effect pathways such as physical loss/damage of habitats, non-physical disturbance or biological disturbance (e.g. introduction of invasive species).
- Of all reaches, Reach 4 is the closest to the proposed location of the reservoir.

3.2.10 Reach 5: River Thames from the confluence with the River Thame to Wallingford.

- No designated sites or ecologically sensitive receptors have been identified in Reach 5 as part of this study.
- Reach 5 is, however, at least three times the distance from the proposed location of the reservoir than Reach 4; therefore, Reach 5 may be a less suitable option due to the extent of materials and carbon emissions associated with a longer tunnel and also the potential that a longer tunnel may increase the environmental and environmental constraints affecting it.

3.2.11 Following this appraisal, the upper section of Reach 4 has been identified as the most suitable stretch of the River Thames for the SESRO intake/outfall structure given that it has no likely significant effects on designated sites or ecologically

[6] SESRO Gate 2 Submission, Technical Supporting Document Habitats Regulations Assessment. Available online: https://www.thameswater.co.uk/media-library/home/about-us/regulation/regional-water-resources/south-east-strategic-reservoir/gate-2-reports/B-4---SESRO-HRA.pdf

sensitive receptors and also has the strong design benefit of being closest to the reservoir, minimising the length of and likely route constraints along both the conveyance tunnel and ADC (if constructed).

3.2.12 On this basis, intake/outfall option identification has focussed on the upper section of Reach 4 (identified in Figure 3.3 below) and options further afield would only be re-considered if no options in this stretch are found to be viable following assessment, i.e., no options could be taken forward due to environmental, engineering, land-use or consenting showstoppers.

Spatial and Topographic Constraints on Reach 4

3.2.13 The western (right bank) of the River Thames is a highly developed area with a marina, apartments, houses, parks, and sports clubs at the northern end of Reach 4. To the south of Abingdon is the town's sewage treatment works which is set 350m back from the River Thames (to the west). There are also allotments, quarries, operational and flooded gravel pits. There is an overhead powerline running up from the south of the right bank, which crosses over the River Thames near the marina.

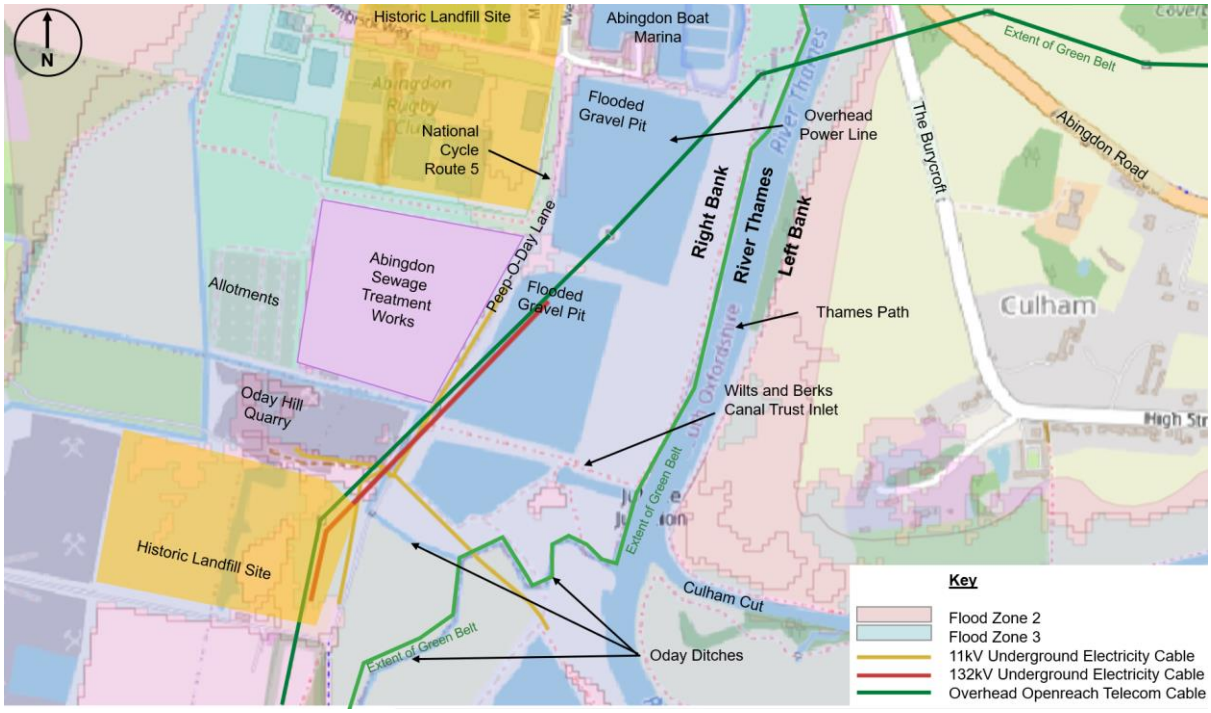
3.2.14 The eastern (left bank) of the River Thames is less developed compared to the right bank, consisting mostly of private farmland and Culham village. This area is largely designated green belt land. A notable feature of the left bank is the existing Thames Path (a National Trail) along the riverbank.

3.2.15 The topography of the left bank generally sits at a higher elevation than the right bank. This difference in elevation means the left bank falls within flood zone 2, but there are areas that are not within flood zone 3. In contrast, a wide area along the right bank is categorised under both flood zones 2 and 3, indicating a higher overall flood risk.

3.2.16 All the constraints on the upper section of Reach 4 from the Abingdon Boat Marina to Culham Cut can be seen on the Figure 3.3.

Figure 3.3: Intake/Outfall Constraints

Note: The full extent of the existing utilities is not shown on this figure.



Source: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri. Mott MacDonald, 2023.

3.2.17 The intake structure needs to be located adjacent to the River Thames, so for some intake/outfall options along this river section, the intake/outfall structure will be within the River Thames floodplain – flood zones 2 and 3 are shown in

3.2.18 Figure 3.3. As the intake/outfall structure will require screens and control penstocks, it will need to include the electrical power and control systems, and these systems will need to be located above flood level. Similarly, ventilation pipework for the shafts and tunnels must terminate above the flood level. This in turn means that the structure will have an above ground building and therefore a visible presence on or near the riverbank. There will also be an access road to the site.

3.2.19 Some of the intake/outfall options (where suitable locations out of the flood zone 3 are available in proximity to the intake/outfall structure) consider placing the shaft at a distance from the intake structure and screens, allowing the control building and ventilation pipework to be situated outside the flood zone 3 and thereby improving access to these structures in flood conditions. For these options, there are available parcels of land along the river stretch in Figure 3.3, which are suitable for the placement of the infrastructure needed for the intake and outfall structure, such as the control building and ventilation pipework.

3.2.20 The intake/outfall options along the river stretch shown in Figure 3.3 are defined in Section 4 of this report.

Abingdon Sewage Treatment Works (STW) Outfall

3.2.21 There are two outfalls from Abingdon Sewage Treatment Works. Both are final effluent outfalls; however, one also has a storm outflow option. The figures below show the outfall locations, the Main Outfall (Outfall 1) discharges to the River Thames directly, and the combined Final Effluent and Storm Outflow (Outfall 2) discharges into the Oday Ditch System. A minimum distance of 150m has been adopted for option development between any proposed SESRO intake location and any upstream Sewage Treatment Works outfall. Water quality modelling will be undertaken ahead of the Gate 3 submission to validate this separation distance.

Figure 3.4: Abingdon Sewage Treatment Works Outfall 1 (Main Outfall)

Source: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri. Mott MacDonald, 2023.

Figure 3.5: Abingdon Sewage Treatment Works Outfall 2 (Final Effluent and Storm Outflow)

Source: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri. Mott MacDonald, 2023.

SESRO and External Scheme Constraints and Opportunities

3.2.22 The following external schemes were identified for consideration in the SESRO intake/outfall options appraisal:

- South Abingdon-on-Thames Bypass (also known as the Southern Abingdon Movement Corridor): In the Vale of White Horse (VoWH) Local Plan 2031 Part 2 (LPP2)[7] and in the South Oxfordshire Local Plan 2035[8], there is policy support and an indicative corridor of land identified for a possible future South Abingdon-on-Thames Bypass, including river crossing to alleviate traffic within Abingdon, with some options connecting from the A415 and heading south close to the section of river identified for locating the intake/outfall structure. In the consultation draft VoWH and South Oxfordshire Joint Local Plan 2041[9] the safeguarded area is proposed to be revised and the future proposal is described as a 'Movement Corridor' rather than bypass, which is understood from discussion with OCC to reflect potential for transport options other than a road bypass.
- The STT Strategic Resource Option (SRO): STT, which has also been considered in water resources planning and the SRO programme, is routed through the Thames floodplain and may require an outfall connection to the

[7] VoWH District Council, *Local Plan 2031 Part 2 Detailed Policies and Additional Sites* (October 2019), page 40. Available online: https://www.whitehorsedc.gov.uk/wp-content/uploads/sites/3/2021/03/VOWHDC-Master-1.pdf
[8] South Oxfordshire District Council, *South Oxfordshire Local Plan 2011-2035* (December 2020), page 151. Available online: https://www.southoxon.gov.uk/wp-content/uploads/sites/2/2021/02/SODC-LP2035-Publication-Feb-2021.pdf
[9] VoWH and South Oxfordshire District Councils, Joint Local Plan 2041 – Preferred Options Consultation (Regulation 18 Part 2), January 2024.

River Thames, possibly at the same location as the intake/outfall structure for the SESRO project. There may however be an opportunity to connect STT to SESRO upstream of the pumping station rather than at the River Thames. However, for the purpose of this study, it is assumed that the STT pipeline will connect into the shaft of the intake/outfall structure for SESRO, to avoid constructing two outfalls on the River Thames. Where the STT pipeline must cross through flooded gravel pits to connect into the intake/outfall structure, it would be routed within a culvert.

Oday Ditches

3.2.23 Despite their location, it should be noted that the Oday ditches (identified in Figure 3.3.) which feed into the River Thames from the right bank, were not necessarily seen as constraints for locating the intake/outfall structure, as it was considered that potential replacement watercourse diversions could present the opportunity to provide better habitats. The Oday ditches were reviewed as part of the Water Framework Directive (WFD) work[10].

[10] SESRO Gate 2 Submission, Technical Annex B5, Water Framework Directive (WFD) Compliance Assessment. Available online at: https://www.thameswater.co.uk/media-library/home/about-us/regulation/regional-water-resources/south-east-strategic-reservoir/gate-2-reports/B-5---SESRO-WFD-Assessment.pdf

4 Intake/Outfall: Options Definition

This section summarises the options developed for the intake/outfall for assessment in accordance with step 4 of the appraisal methodology.

4.1 Intake/Outfall Options For Assessment

4.1.1 Eight individual options for the intake/outfall were identified for assessment – they are listed in Table 4.1 and shown in Figure 4.1 below. All eight options are located within the Culham Reach section of the River Thames, as previously discussed in Section 3. Full details of the intake/outfall options are contained within Appendix A to Appendix H.

4.1.2 Details of the preliminary layouts of the options are in Table 4.1 below. As shown on Figure 4.1, there is a Wilts & Berks Canal Trust Inlet[11] on the right bank opposite the Culham cut (Jubilee Junction). Key variations between the location of these options include:

- Whether the intake and outfall structures are combined or separate, and the respective position of these on the Thames riverbank.
- Location of the shaft collecting intake and outfall flows.
- Proximity to Abingdon STW and whether its outfalls must be extended or not.

Table 4.1: Intake/Outfall Options for Assessment

Option	Intake Location	Outfall Location	Shaft Location
A	On the right bank, upstream of the Abingdon STW outfall, south of Abingdon Marina.	Same as the intake location – Option A is a combined intake/outfall structure.	At the combined intake/outfall location.
B	On the right bank, upstream of the Wilts & Berks Canal Trust Inlet.	Same as the intake location – Option B is a combined intake/outfall structure.	At the combined intake/outfall location.
C	On the right bank, upstream of the Wilts & Berks Canal Trust Inlet.	Same as the intake location – Option C is a combined intake/outfall structure.	Within Abingdon STW.
D	On the right bank, south of Abingdon STW.	On the right bank, upstream of Wilts & Berks Canal Inlet. For Option D, the intake and outfall structures are separate.	South of Abingdon STW, within an existing quarry site.

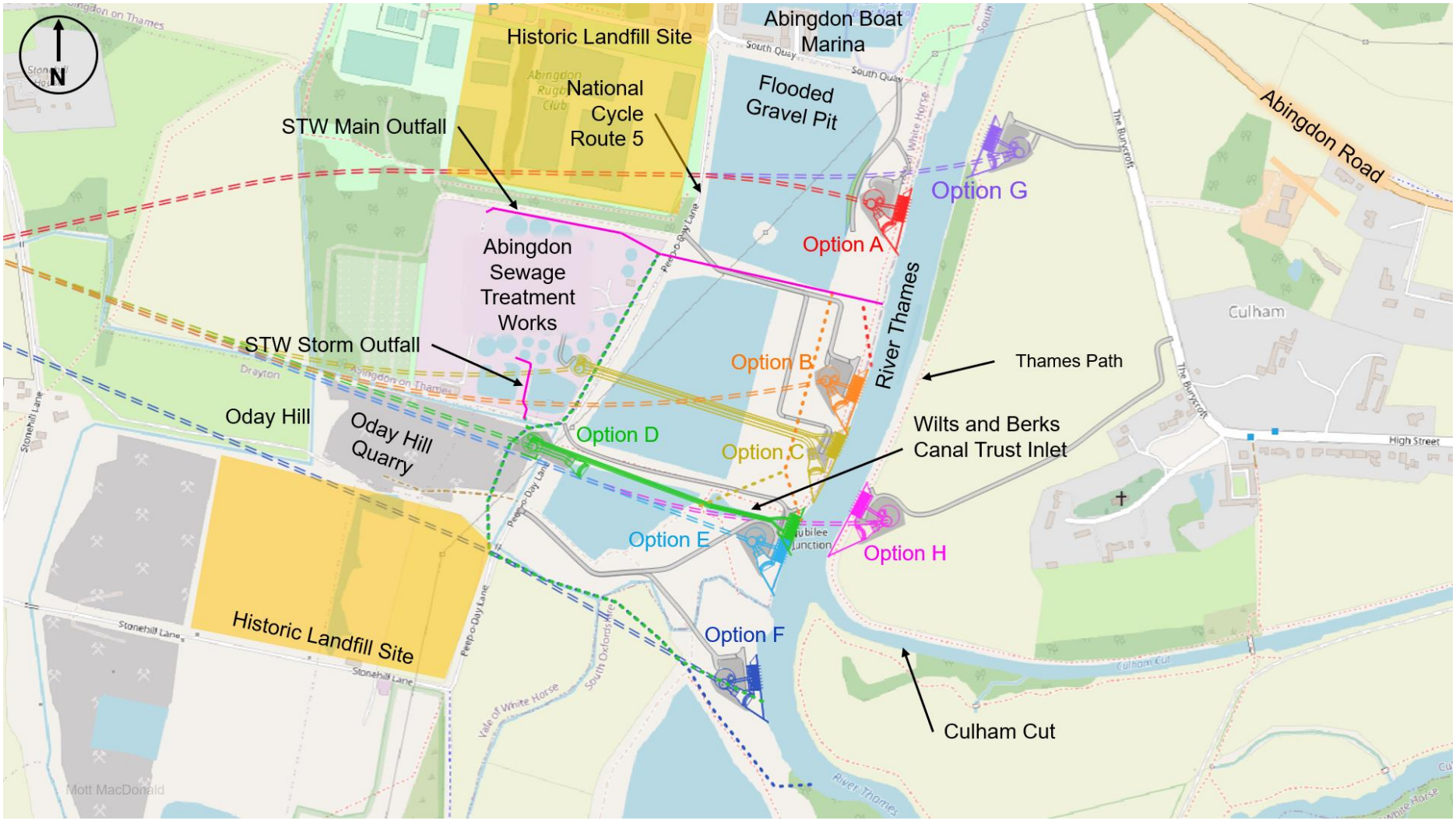
[11] Land Registry data confirms the inlet is leased by the Wilts & Berks Canal Trust.

E	On the right bank, immediately downstream of Wilts & Berks Canal Trust Inlet.	Same as the intake location – Option E is a combined intake/outfall structure.	At the combined intake/outfall location.
F	On the right bank, downstream of Culham Cut.	Same as the intake location – Option F is a combined intake/outfall structure.	At the combined intake/outfall location.
G	On the left bank, upstream of Abingdon STW outfall, south of Abingdon Marina.	Same as the intake location – Option G is a combined intake/outfall structure.	At the combined intake/outfall location.
H	On the left bank, upstream of Culham Cut.	Same as the intake location – Option H is a combined intake/outfall structure.	At combined the intake/outfall location.

4.1.3 As detailed in paragraph 3.1.4, for all options, the spatial layouts have been developed assuming the use of Johnson Passive Wedge-Wire Cylinder (PWWC) intake screens because these screens provide the worst-case scenario for spatial layouts when compared to rotating screens since they have a larger footprint. However, due to current uncertainty of screen selection, Hydrolox rotating screens have been assumed when considering visual impact as these require a more substantial and industrial above ground structure.

4.1.4 The access to all of the intake/outfall location options on the right bank is proposed to be via the B4017. From there, the route continues via Stonehill Road and finally via Peep-O-Day Lane. It should be noted that Peep-O-Day Lane is part of the National Cycle Network Route 5 (NCN 5), and so consultation with Oxfordshire County Council (OCC) will be required to determine how the NCN will be managed along with what temporary or permanent modifications are required. The proposed access to the intake/outfall location options on the left bank would be via the A415 (Abingdon Road) and then via The Burycroft Road.

Figure 4.1: Location Plan of All Intake/Outfall Structure Options



Source: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri. Mott MacDonald, 2023.

4.2 Information for Options Assessments

4.2.1 Information was developed for the options on which to base the option assessments. Table 4.2 below presents the key attributes for the intake/outfall options.

Table 4.2: Comparison of Key Attributes for the Intake/Outfall Structure Options

	A	B	C	D	E	F	G	H
Combined structure (combined intake/outfall at the shaft location)	✓	✓	✗[1]	✗[2]	✓	✓	✓	✓
No Green Belt loss[3]	✓	✓	✓	✓	✓	✗	✗	✗
Low risk of sediment deposition	✗	✓	✓	✓	✓	✓	✓	✗
Outfall discharges into an existing gravel pit	✗	✗	✗	✓	✗	✗	✗	✗
Lower risk of contaminated land (landfill)	✗	✓	✓	✓	✓	✗	✗	✓
Shaft located away from riverbank	✗	✗	✓	✓	✗	✗	✗	✗
Outside flood zone 3	✗	✗	✓[4]	✓[5]	✗	✗	✓[6]	✓[7]
No construction works required to gravel pits	✗	✓	✗	✗	✓	✓	✓	✓
Water available for mixing [8]	100%	100%	100%	100%	100%	~90%	100%	100%
Tunnel length (m)	3,610	3,620	3,260	3,220	3,550	3,530	3,840	3,740
New access road length required (m)	370	430	540	410	460	475	240	580
STW outfall extension length (m)	97	335	390	980	980	1,120	0	980

Notes for Table 4.2:

1. Option C has a combined intake/outfall, but it is located away from the shaft, which is within Abingdon STW, as detailed in Table 4.1.
2. The intake, outfall and shaft for Option D are located separately as detailed in Table 4.1.
3. Options D, E and to some minor extent C, currently overlap very slightly with the Green Belt boundary which extends (in this area) up to the western bank of the River Thames, so structures extending from the bank could be just within it. It is assumed that the outfall extension would be primarily below the surface of the river and that any potential surface impacts would be able to be mitigated or designed in a way that does not impact the Greenbelt or that would be deemed acceptable and therefore have excluded the impact on the Green Belt for these options.
4. The shaft for Option C is located within the Abingdon STW and therefore outside of the flood zone 3.
5. The shaft for Option D is located within the Oday Hill Quarry, in an area which will need to be raised to give access across the ADC gated structure (if constructed). The area in which the shaft for Option D is located will be raised outside of the flood zone 3.

6. The screen and outfall structure for Option G is located partially within flood zone 3 but the shaft is located outside of flood zone 3.
7. The intake/outfall structures and shaft for Option H are located outside of flood zone 3.
8. Water available for mixing considers what percentage of flow from the River Thames is available for mixing into the reservoir. Since Option F is located downstream of Culham Lock Cut, part of the River Thames flow would be diverted through Culham Lock Cut, leaving an estimated 90% of available flow for mixing.

5 Intake/Outfall: Options Assessment

This section summarises the option assessments undertaken for the intake/outfall in accordance with step 5 of the appraisal methodology. The section starts by outlining the assumptions taken in the assessments, before individually summarising the performance of each intake/outfall option when assessed.

5.1 Assessment Assumptions

5.1.1 This Section sets out the assumptions used in the assessment of intake/outfall options, future changes in assumptions should be reviewed for any potential effect on the outcome of the options appraisal. Section 1.3 earlier in this report outlines the backchecking planned for the options appraisals work.

Engineering Assessment Assumptions

5.1.2 The engineering assessment was considered in two themes: Construction and Operation. The following assumptions informed the assessment:

5.1.3 Screening

- Different types of screens for the intake are available and two have been considered for SESRO as detailed in paragraphs 3.1.4 and 4.1.3.

5.1.4 Programme

- It has been assumed that the Tunnel Boring Machine (TBM) will be driven from the westernmost shaft i.e., the pumping station at the SESRO site and that temporary access will be required at the easternmost shaft (intake/outfall) for withdrawal of the TBM during construction.
- With respect to programme, the two main drivers are the impacts due to the TBM drive and the completion of tunnel secondary lining. Other differences in programme between options (such as a connecting culvert, enabling works etc.) have not been considered as it is assumed that these changes would not impact the overall duration of the programme. At the time of appraisal, the pumping station location was in close proximity to a 132kV overhead powerline and as such, the diversion of the powerline remains in the programmes for each of the options and drives the start of the construction of the pumping station and when complete, the TBM drive is assumed to start from the pumping station.
- Differences in the programme between options are recognised during the assessment, however at a high-level the baseline programme for the different options has been assessed based on the SESRO Gate 2 construction programme, which assumes the construction of Option E.

5.1.5 Logistics

- With respect to logistics, it has been assumed that a 3,000m^2 minimum area will be required at the shaft location to complete the works. This will include the general site activities as well as running shaft and tunnel activities, including a minimum area to support the safe running of the shaft with space for a minimum of two cranes and lifting areas, ventilation and services etc. Clear access should be provided on at least three quarters of the shaft perimeter and the area above and directly surrounding the shaft should be clear of power lines or any other obstructions to allow for safe lifting in and out and to facilitate the shaft secondary lining.
- In addition to the above, to facilitate the safe and efficient construction of the work scope an area of 1,800m^2 directly adjacent to the shaft is needed to house the batching plant for the secondary lining works. This will include a concrete pad to site silos and other necessary plant as well as access routes and space for the storage of raw materials.
- An area of 2,000m^2 is needed for storage and the site compound. This does not need to be directly next to the shaft, but it is beneficial to be able to locate this as close as practically possible to deliver the works efficiently. This should include an access route to/from the shaft area as well as general welfare facilities.
- 1,800m^2 is required directly next to the main shaft site. Additional space beyond this will be beneficial but not critical to the delivery of the works. This space will facilitate concurrent working and allow for some programme optimisation, making it possible to complete works such as the prefabrication of reinforcement cages and additional stripping of the TBM alongside the shaft, without impacting directly on the critical activities. It is assumed this area will be required to completely strip the TBM before it is sent from site in standard lorry sized loads instead of from site in one piece. This needs to be undertaken, as the existing routes to and from the site are moderately limited e.g., there are some bends and narrow sections which large delivery vehicles would not be able to negotiate, and so the TBM must be stripped to a size so it can be taken away by vehicles which can use the existing roads.

5.1.6 Sewage Treatment Works (STW)

- For Option C, it has been assumed that access to Abingdon STW, would be from the B4017 on to Stonehill Lane and then via Peep-O-Day Lane, accessing the STW from the south. The direction of access has been chosen for Option C due to the shaft location occupying the Southeast corner of the Abingdon STW, in place of the disused settlement tank. No specific assumptions have been made around planned upgrades or diversions within Abingdon STW.
- Due to the need to have a minimum separation distance of 150m from the STW outfall and the SESRO intake, it is assumed that both the main and storm outfalls at Abingdon STW can be extended and pumped where necessary. It is not envisaged that the introduction and commissioning of

new outfalls would present any risk to the project, subject to further engagement with the EA to confirm.

5.1.7 Constructability

- It is assumed that it is possible to fill part of the flooded gravel pits to reclaim land for some intake/outfall options, and that it is possible to route culverts within the flooded gravel pits.
- It has been assumed that the shaft in Options A, B, E and F would encounter the same potential difficulties during construction since they sit within flood zone 3.

5.1.8 Severn to Thames Transfer (STT)

- Studies are to be undertaken to confirm how best to integrate SESRO and STT; however, for the purpose of this appraisal study, it is assumed that the STT pipeline is to connect directly into the intake/outfall structure and discharge into the River Thames.
- For the purposes of this options appraisal, as at Gate 2, it is assumed that, if required, the STT pipeline would be routed within the footpath of the ADC (or a similar route if there is no ADC) and the pipeline would be installed while SESRO is constructed.

Cost and Carbon Assessment Assumptions

5.1.9 Capital cost and carbon for each option were derived using the approach outlined in the Gate 2 reports. Some aspects of the cost and carbon build-ups needed to be updated or added. Quantities were estimated to reflect the differences between options. Where available, benchmarked unit cost rates from Gate 2 were used, and where these were not available new rates were developed. Emissions factor rates were identified for key items from Civil Engineering Standard Method of Measurement (CESMM4).

Environmental Assessment Assumptions

5.1.10 A number of topics for the environmental assessment were considered individually. The following assumptions informed the assessment:

5.1.11 Aquatic Environment

- The intake/outfall structure will result in a loss of either 35m or 38m of River Thames riverbank for all options as a result of the fish screen, depending on the design taken forward. The assessment has assumed the worst case and that around 38m of riverbank will be lost. This does not differ between options. Mitigation will be provided through the project's overall BNG approach.
- Option F also results in some habitat loss within the Oday Ditch catchment, a tributary of the River Thames and part of the River Thames (Evenlode to

Thame) WFD waterbody. Whilst there is uncertainty about the current hydrological, geomorphological and ecological baseline of the Oday Ditch system, it is considered likely that effects can be remedied through mitigation or compensation - either within the Oday Ditch catchment or nearby. The extent of mitigation required is, nevertheless, higher for Option F than for any other option.

5.1.12 Biodiversity and Nature Conservation

- It is assumed that the Ancient Woodland Inventory and Ancient Tree Inventory was correct and comprehensive at the time of the optioneering process (summer 2023). The latter would need to be confirmed once land access is available and surveys can be carried out to confirm the desktop data.
- The assessment of habitats to be impacted was undertaken using aerial imagery and UK Habitat information collected for Gate 2, the latter of which was collected using desk study information and aerial imagery and has not been fully ground truthed.

5.1.13 Historic Environment

- The existing publicly available data regarding buried archaeology is not complete and is subject to further desk study and non-intrusive and intrusive surveys to understand the presence, extent, and value of buried remains.

5.1.14 Land Quality

- The acquisition of land rights for tunnel sections would involve acquiring the relevant subsoil strata and this would be at a depth so as not to cause material detriment to the surface interests. Data provided by third parties including historical maps to undertake these assessments are accurate.

5.1.15 Landscape and Visual

- A trenchless method of excavation is to be utilised for the extension of the STW Outfall.
- Some temporary security lighting and/or night-time construction work could be required during construction, as well as lighting during early morning and evening working in the winter.
- Limited lighting would be required for operation.
- Appropriate mitigation, seeding and planting could be implemented for all options.

5.1.16 Noise

- Noise emissions for construction activities (including construction traffic movements and main construction plant / numbers) are based on Gate 2

assumptions, with updates made following a review by the SESRO construction advisor, as required.

- Property counts do not consider the screening of receptors by nearby buildings (i.e. noise screening for the second row of properties is not considered due to the presence of the first row of properties).
- Red, Amber, Green (RAG) bands are based on an assessment for each residential property, but all noise and vibration sensitive receptors identified at Gate 2 are included in the analysis.

5.1.17 Flood risk

- Due it's nature, the intake and outfall structure needs to be located adjacent to the river, with direct connectivity to the river. Intake screens and outfall pipes will need to be located within the river with the wider intake/outfall structure on the bank. Therefore, either some or all of each intake/outfall option will be located within the floodplain.
- The NPS sets out that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, whether existing or future. However, where development is necessary, it should be made safe without increasing flood risk elsewhere. Supporting guidance explains that essential infrastructure is permissible in areas of high flood risk, subject to the sequential and exception tests.
- The Sequential Test ensures that a sequential, risk-based approach is followed to steer new development to areas with the lowest risk of flooding, taking all sources of flood risk and climate change into account. Where it is not possible to locate development in low-risk areas, the Sequential Test should go on to compare reasonably available sites within medium risk areas; and then, only where there are no reasonably available sites in low and medium risk areas, within high-risk areas. The sequential test applies to the SESRO project as a whole, therefore, impact on flooding has been considered within the assessments, and considered alongside other issues relevant for the NPS and other relevant legislation.
- If the sequential test shows that it isn't possible to use an alternative site a proposed development is required to pass the exception test except in a number of instances as outlined in Table 2 of the Flood Risk and Coastal Change Guidance[12]. This includes water compatible development. It is assumed that the intake/outfall structure should be classed as water compatible development as it must be able to take water from the river at all operational river levels. The intake is similar to the other types of development listed as examples of water compatible development in the guidance. Therefore, it is assumed that it does not apply.

[12] Flood risk and coastal change - GOV.UK (www.gov.uk)

Community, Planning and Land Assessment Assumptions

5.1.18 The assessment was considered under subthemes: Community, Planning and Property and Land. The following assumptions informed the assessment:

5.1.19 Community/Socio-economic

- All Public Rights of Way (ProW) severed by the development will be re-routed / reinstated.

5.1.20 Planning

- The assessment assumptions with regard to the intake/outfall design are as set out in the engineering section, above, in particular that the tunnel would be constructed via tunnel boring.
- For options that pass through or are in proximity to Oday Hill Quarry, it is assumed that the future restoration plan for the quarry will be compatible with the SESRO proposals, as required by a condition in the quarry's planning permission.
- The detailed design of right-bank options could possibly include intake structures above water level that extend slightly into the Green Belt (which ends at the west bank of the River Thames in this area), but the overlap is likely to be very minimal, if any, and the relocated Abingdon STW outfall, for those options that require it, would be a like-for-like relocation below water level.

5.1.21 Property and Land

- The design of options D, E and to some minor extent C, currently overlaps very slightly with the Green Belt boundary which extends (in this area) up to the western bank of the River Thames, so structures extending from the bank could be just within it. It is assumed that the outfall extension would be primarily below the surface of the river and that any potential permanent surface impacts would be able to be mitigated or designed in a way that does not impact the Greenbelt or that would be deemed acceptable and therefore have excluded the impact on the Green Belt for these options. Any surface impacts during construction would be temporary.
- For options that pass through or are in proximity to Oday Hill Quarry, it is assumed that the future restoration plan for the quarry will be compatible with the SESRO proposals, as required by a condition in the quarry's planning consent.
- It has been assumed that the tunnel would be constructed via tunnel boring machine and would have minimal impact on the surface land use for agricultural and leisure uses.

- It has been assumed that there will be an exclusion zone above the proposed tunnel which would prevent, minimise or impact high density development above the tunnel.
- It has been assumed that any vibration from the construction or use of the tunnel would not be sufficient to impact surface use or damage surface property.

5.2 Intake/Outfall Option A

5.2.1 This section summarises the performance of Option A considering the appraisal themes and subthemes. For full details of the assessment of Option A against the individual criteria, refer to Appendix I.

Engineering (Constructability) Performance

5.2.2 Option A can be constructed safely but requires enhanced controls due to the very tight working area adjacent to water, both from the flooded gravel pit and River Thames.

5.2.3 Considering third party impact from Option A, disruption is likely to be significant. Temporary/permanent infill of the gravel pit for Option A will need permissions and is a complex activity. There will be an interface with the River Thames to construct the outlet and inlet. Access to the site for Option A via Peep-O-Day Lane would impact cyclists as it is part of the NCN 5. Access to this area via South Quay road may mean road access will be required past local residents.

5.2.4 For Option A, there are limited programme opportunities for construction programme acceleration due to the length of the tunnel and the complicated sequence of works. The tight work area also reduces the possibility of concurrency in the programme.

5.2.5 Access to construct Option A is based on using Stonehill Lane, which runs into an unnamed track east and then north into Peep-O-Day Lane. From Peep-O-Day Lane, access would be along West Quay and then onto South Quay. Using Marcham Road for all works remains an opportunity. To achieve this, structures across the A34, Stonehill Lane and the B4017 will be required to be constructed followed by a haul road. Option A would require the earthworks within the flooded gravel pit and would increase the number of material deliveries.

5.2.6 Regarding construction complexity, the site for Option A is very restricted for space. Piling work may be required to make ground suitable for construction activities. Powerlines may require diversion or temporary switch offs, and they may also limit the size of import/export wagons. The shaft, outlet, inlet and the widening works of the area in the flooded gravel pit are all close together limiting concurrent works. The TBM will need to be recovered from the shaft. Access to the tunnel for the secondary lining will take place from within the

shaft.

5.2.7 Assuming the STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall structure, the STT pipeline for Option A would need require a long deviation from its assumed route as the location is further north than the ADC discharge location. The final section of pipeline would need to be inside a culvert, when routed through the flooded gravel pit, adding to construction complexity.

5.2.8 It is noted for constructability that Option A is located in a narrow corridor of land, which leads to complications in access and also increases the volume of work involved. It will require a widening of this area both temporarily to facilitate construction as well as in the permanent case. This widening will take the works towards the overhead powerlines, which introduces an additional risk.

Engineering (Operability) Performance

5.2.9 The health and safety criteria during operation considers the risk of endangering operational staff, visitors or members of the public, and also whether access/egress can be provided during normal operations and emergencies. Option A avoids the need for long culverts, which reduces challenges for access/egress for maintenance, but is located in the flood plain so has a higher risk of flooding and of losing access due to flooding. The access road to the structure would be submerged in a large River Thames flood event since the main structure is located in the River Thames floodplain. Public access routes may also need to pass close to the structure due to its narrow area of land. Option A can be operated safely but requires enhanced control measures due to its proximity to water.

5.2.10 Considering operational complexity, Option A avoids the need for long culverts, which may make operation and maintenance less challenging for this option.

5.2.11 Considering operational resilience, Option A is in flood zone 3 so is exposed to higher flood risk, but the access road for Option A is not intended to be raised, reducing the risk of impacting flooding. Option A is located within a zone of deposition and therefore sedimentation may occur around the structure, impacting operation.

5.2.12 From a transport planning perspective, potential disruption to the existing road network during operation of Option A is likely to be limited. The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 3.1km. If access to Option A after construction is to remain via the south using Peep-O-Day Lane, there is an opportunity to upgrade Peep-O-Day Lane to make it better suited for users.

5.2.13 Considering the potential impact on reservoir water quality, Option A requires moderate amounts of interventions to ensure water quality such as air diffusers within the reservoir.

5.2.14 The STT pipeline to Option A would potentially require a large operational input. The section of pipeline within the flooded gravel pit would likely be difficult to maintain as it would need to be culverted.

Cost and Carbon Performance

5.2.15 An initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option A is the lowest cost intake/outfall option.

5.2.16 An initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent approximately 1.6% of total SESRO carbon. Option A is the lowest carbon intake/outfall option.

Environmental Performance

5.2.17 Option A performs well against the air quality criterion because the Marcham Air Quality Management Area (AQMA) is located approximately 2.2km northwest and Abingdon AQMA approximately 1.4km north. There are between 10 to 100 high sensitivity receptors within 20m of the construction route for Option A and between 10 to 100 high sensitivity receptors between 210m to 350m of the main works. There will likely be minimal operational-related traffic, so any potential effects from vehicle emissions during operation will likely be negligible.

5.2.18 Considering the aquatic environment, Option A will result in the removal of approx. 38m of riparian habitat, which is considered a moderate adverse impact on the Thames (Evenlode to Thames) WFD Waterbody. The impact is expected to be localised and not affect WFD compliance at a water body level. Option A will not impact a source protection zone (SPZ).

5.2.19 Option A performs well against the majority of the biodiversity and nature conservation criteria because there are no statutory designated sites within 100m of Option A and the closest SSSI to the intake/outfall, which is Culham Brake SSSI, is 1.4km northeast. The intake/outfall is within the Impact Risk Zone for Culham Brake SSSI, but pipeline works are not included within the list of risks within this area. There is no known terrestrial priority habitat directly impacted by the proposed footprint of Option A. Option A, however, has a lack of space for biodiversity net gain (BNG). Desk study of Natural England's Ancient Woodland Inventory and historical maps, indicates that no ancient woodland (considered to be irreplaceable habitat), would be affected. Desk study of the Woodland Trust's Ancient Tree Inventory indicates that no ancient or veteran trees (also considered to be irreplaceable habitat) are located close to Option A; however, survey may potentially identify trees that could be classified as ancient or veteran trees.

5.2.20 For Option A, construction of the intake/outfall would require the removal of vegetation along the River Thames and a tree belt by an adjacent gravel pit, potentially including some A or B grade trees. Some localised vegetation

clearance may be required for the access road and the extension of the STW outfall, which may provide habitat for protected and notable species.

5.2.21 Option A is located within the flood zones 2 and 3. A flood risk assessment and replacement flood storage will be required.

5.2.22 Considering the historic environment, for setting effects, there is a scheduled monument 530m southeast, a Grade II listed building 435m southeast, and Culham Conservation Area 380m southeast of Option A. There are no known historic buildings within the footprint of Option A and no loss of non-designated landscapes. There is likely to be some loss of paleoenvironmental material within the River Thames floodplain, and minimal disturbance of known archaeological remains.

5.2.23 Option A performs poorly when considering land quality because it passes beneath/through the Southern Town Park historical landfill, where there may be significant effects associated with its disturbance. Option A also passes beneath the A34, close to two sewage works, as well as a farm with associated tanks and 170m north of Sutton Wick leachate treatment plant. There is an area of Made Ground along the route, and the tunnel for Option A would be bored through Kimmeridge Clay, which may present a risk of hydrocarbon contamination due to potential bituminous content. For Option A, however, the potential to disturb unexploded ordnance (UXO) would be low risk and there is a lack of designated geological sites.

5.2.24 Considering landscape and visual impacts, there would be close-range views of Option A from parts of the Thames Path National Trail, a nearby PRoW and from the Thames River. There could also be intermittent middle-distance views from NCN 5 and Vale Way long distance path, and visitors to Abingdon Marina and nearby residents may have partially filtered views through intervening vegetation towards the infrastructure. Amber scores are awarded in relation to infrastructure along the River Thames which would be unlikely to have a significant effect on the landscape character or tranquillity of the National Landscape (NL), due to the scale of the structures above ground, but may affect the sense of tranquillity along the River Thames. The loss of vegetation and tree belts could erode a key characteristic, which contributes positively to the local landscape character. Construction activities and traffic for Option A could lead to noticeable changes to the visual amenity of the community near Abingdon Marina due to temporary security lighting and/or night-time construction works. However, Option A would not affect Tree Preservation orders (TPOs), views from the NL or operational visual amenity.

5.2.25 For noise, the closest sample receptors are located approximately 210m and 225m away from Option A and are likely to experience construction noise from secondary lining activities. Construction of the proposed access road for Option A is located approximately 70m away from the nearest sample receptor. Construction traffic has the potential to result in adverse effects on the local road network, but these are unlikely to be significant. The closest receptor may

experience noise during normal operations but, with the implementation of standard control measures, it is anticipated that significant effects would be avoided.

5.2.26 Option A performs well against the pollution criteria as spillages from construction and operation are likely to be readily controlled using standard mitigation.

Community, Planning and Land Performance

5.2.27 The intake/outfall and access road for Option A are located within 500m of homes, Abingdon Marina, a sports club and NCN 5 and disruption of NCN 5 is expected during construction. Some disruption from traffic and temporary periods of restricted access during construction for Option A is expected. Option A represents disruption to a stretch of NCN during construction, but this does not preclude the recreational opportunities of a strategically important route in the long term.

5.2.28 Option A is outside the area safeguarded for SESRO in the VoWH Local Plan and lies within an area safeguarded for the possible future South Abingdon-on-Thames Bypass (in the existing Local Plan to 2031) or the Southern Abingdon Movement Corridor (in the consultation draft Joint Local Plan to 2041), with above-ground structures having the potential to conflict with a possible future crossing of the river.

5.2.29 For property and land acquisition, is assumed that construction via a tunnel boring machine would not detrimentally impact surface uses, although there is a potential that the exclusion zone may impact residential properties and there may be owners of Special Category Land[13] (SCL) affected by Option A or owners of land that require special consideration (such as the VoWH Council and National Highways). As with all the options, the acquisition of rights to extract water may be required from the riparian owners. Access to the shaft location would not give rise to significant number of Category 3[14] parties.

5.3 Intake/Outfall Option B

5.3.1 This section summarises the performance of Option B considering the appraisal themes and subthemes. For full details of the assessment of Option B against the individual criteria, refer to Appendix J.

[13] Special Category Land is defined in Section 131 of the Planning Act 2008 to include common, open space or fuel or field garden allotment. Other special land considerations include utility infrastructure, national asset protection agencies and Crown bodies.
[14] Category 3 parties are defined in Section 57 of the Planning Act 2008. Category 3 parties include parties that the Applicant thinks, if the order sought by the application were made and fully implemented, the person would or might, making diligent inquiry, be entitled to make a relevant claim for compensation under Section 10 of the Compulsory Purchase Act 1965 and/or Part 1 of the Land Compensation Act 1973 and/or Section 152(3) of the Act.

Engineering (Constructability) Performance

5.3.2 Option B can be constructed safely but requires enhanced controls because it is located between one of the flooded gravel pits and the River Thames.

5.3.3 Considering third party Impact from Option B, disruption is likely to be significant because there will be interface with the River Thames to construct the outlet/inlet and access to the site for Option B via Peep-O-Day Lane would impact cyclists as it is part of the NCN 5.

5.3.4 For Option B, there are limited programme opportunities for construction programme acceleration due to the length of the tunnel and the complicated sequence of works. It is estimated that the total float in the programme, compared with the SESRO Gate 2 programme, will reduce for the recovery of the TBM. It may however be possible to construct some elements concurrently, including the intake/outfall as well as the strip of the TBM at surface level.

5.3.5 Access to construct Option B is based on using Stonehill Lane, which runs into an unnamed track east and then north into Peep-O-Day Lane. From Peep-O-Day Lane, access would be east along an existing track and then north adjacent to the River Thames. The access would include constructing a haul road around the flooded gravel pits, which may add to the temporary works complexity and requirements. There is a good amount of available space on three sides for Option B so considering logistics there is space available for construction and materials storage.

5.3.6 Considering construction complexity, the shaft, outlet and inlet are all close together and limit works that can be undertaken concurrently. The TBM will need to be recovered from the shaft. Access to the tunnel for the secondary lining will take place from within the shaft.

5.3.7 Assuming the STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall structure, the STT pipeline for Option B would need require a short deviation from its assumed route as the location is further north than the ADC discharge location. The final section of pipeline would need to be inside a culvert, when routed through the flooded gravel pit, adding to construction complexity.

Engineering (Operability) Performance

5.3.8 The health and safety criteria during operation considers the risk of endangering operational staff, visitors or members of the public, and also whether access/egress can be provided during normal operations and emergencies. Option B avoids the need for long culverts, which reduces challenges for access/egress for maintenance, but the access road to the structure would be submerged in a large River Thames flood event due to the main structure being located in the River Thames floodplain. Option B can be operated safely but requires enhanced control measures due to its proximity to water.

5.3.9 Considering operational complexity, Option B avoids the need for long culverts and therefore operation/maintenance is considered to be less challenging for this option.

5.3.10 Considering operational resilience, Option B is located in flood zone 3 so has a higher risk of flooding and of losing access due to flooding. The access road to Option B is, however, not intended to be raised, reducing the risk of impacting flooding.

5.3.11 Option B is located at a crossover between two bends i.e., the option is approximately halfway between two opposing bends in the River Thames. As a result, there may be some deposition in the margins, but it will be less concentrated than on the inside of a bend. This has potential to cause some sedimentation around the structure that may impact operation.

5.3.12 From a transport planning perspective, potential disruption to the existing road network during operation of Option B is likely to be limited. The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2.75km. If access to Option B after construction is to remain via the south using Peep-O-Day Lane, there is an opportunity to upgrade Peep-O-Day Lane to make it better suited for users.

5.3.13 Considering the potential impact on reservoir water quality, Option B requires moderate amounts of interventions to ensure water quality such as air diffusers within the reservoir.

5.3.14 The STT pipeline to Option B would require a large operational input. The section of pipeline within the flooded gravel pit would likely be more difficult to maintain as it would need to be culverted.

Cost and Carbon Performance

5.3.15 An initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option B results in a total project cost of 0.1% more than the lowest cost intake/outfall option.

5.3.16 An initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent approximately 1.6% of total SESRO carbon. Option B results in a total project carbon of 0.1% more than the lowest carbon intake/outfall option.

Environmental Performance

5.3.17 Option B performs well against the air quality criterion because the Marcham AQMA is located approximately 2.2km northwest and Abingdon AQMA approximately 1.6km north-northeast. There are between 1 to 10 high sensitivity receptors within 20m of the construction route for Option B and between 1 to 10 high sensitivity receptors approximately 310m SE of the main works. There will likely be minimal operational-related traffic, so any potential

effects from vehicle emissions will likely be negligible for Option B.

5.3.18 Considering the aquatic environment, Option B will result in the removal of approx. 38m of riparian habitat, which is considered a moderate adverse impact on the Thames (Evenlode to Thames) WFD Waterbody. The impact is expected to be localised and not affect WFD compliance at a water body level. Option B will not impact a source protection zone (SPZ).

5.3.19 Option B performs well against the majority of the biodiversity and nature conservation criteria because there are no statutory designated sites within 100m and the closest SSSI to the intake/outfall is 1.7km northeast. There is no known terrestrial priority habitat directly impacted by the proposed footprint of Option B. Option B, however, has a lack of space for BNG. Desk study of Natural England's Ancient Woodland Inventory and historical maps, indicates that no ancient woodland (considered to be irreplaceable habitat), would be affected. Desk study of the Woodland Trust's Ancient Tree Inventory indicates that no ancient or veteran trees (also considered to be irreplaceable habitat) are located close to Option B; however, survey may potentially identify trees that could be classified as ancient or veteran trees.

5.3.20 For Option B, construction of the intake/outfall could require the removal of some potentially grade A or B grade trees along the River Thames. Some localised vegetation clearance may be required for the access road and the extension of the STW outfall, which may provide habitat for protected and notable species.

5.3.21 Option B is located within the flood zones 2 and 3. A flood risk assessment and replacement flood storage will be required.

5.3.22 Considering the historic environment, for setting effects, there is a scheduled monument and a Grade II* listed dovecote located 360m southeast, a Grade II* listed manor house 70m east of the dovecote, and the Culham Conservation Area 290m to the southeast of Option B. There are no known historic buildings within the footprint of Option B and no loss of non-designated landscapes. There is likely to be some loss of paleoenvironmental material within the River Thames floodplain.

5.3.23 Option B performs poorly when considering land quality because it passes beneath the A34, Abingdon STW and gravel pits, as well as an adjacent farm with associated tanks and 150m north of Sutton Wick leachate treatment plant. There may be the potential for unrecorded areas of Made Ground along the route and the tunnel would be bored through Kimmeridge Clay which may present a risk of hydrocarbon contamination due to potential bituminous content. Option B passes 140m north of Sutton Wick No.1 landfill, while the access road extends to Peep-O-Day Lane adjacent to the Southern Town Park historical landfill. For Option B, the potential to disturb UXO would be low risk and there is a lack of geologically designated sites.

5.3.24 Considering landscape and visual impact, there would be open close-range

views of Option B from the Thames Path National Trail, a nearby Public Right of Way (PRoW) and the River Thames. The infrastructure for Option B could also be visible in middle-distance views from residential properties on the western edge of Culham Conservation Area and filtered middle-distance views from NCN 5 and Vale Way Long Distance Path to the west. Infrastructure for Option B along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the NL due to the scale of the structures above ground but may affect the sense of tranquillity along the River Thames. The loss of vegetation and tree belts could erode a key characteristic, which contributes positively to the local landscape character. There would be noticeable changes to the visual amenity of the community on the western edge of Culham due to construction and associated traffic. However, Option B would not affect TPOs, views from the NL or operational visual amenity.

5.3.25 For noise, the closest sample receptors are located approximately 320m and 370m away from Option B and could experience construction noise from secondary lining activities. Construction traffic for Option B has the potential to result in adverse effects on properties on Stonehill Lane. With the implementation of standard control measures, it is anticipated that significant effects would be avoided.

5.3.26 Option B performs well against the pollution criteria as spillages from construction and operation are likely to be readily controlled using standard mitigation.

Community, Planning and Land Performance

5.3.27 The intake/outfall and access road for Option B are located within 500m of homes, Abingdon Marina, a sports club and NCN 5. Disruption will be experienced during construction along a long section of NCN 5. Some disruption from traffic and temporary periods of restricted access during construction for Option B is expected. Option B performs well against criteria related to opportunities to improve PRoW links and impacts during operation. During operation of Option B, it is reasonable to expect no disruption to residents or those accessing assets such as NCN 5.

5.3.28 Considering consenting, Option B is outside the area safeguarded for SESRO in the VoWH Local Plan. In other respects, it is similar to the other right-bank options: see the summary given for Option A, above.

5.3.29 For property and land acquisition, is assumed that construction via a tunnel boring machine would not detrimentally impact surface uses along the tunnel length, although there may be owners of SCL, or owners of land that require special consideration, affected by Option B (the VoWH Council and National Highways). As with all the options, the acquisition of rights to extract water may be required from the riparian owners. Access to the shaft location would not give rise to significant number of Category 3 parties.

5.4 Intake/Outfall Option C

5.4.1 This section summarises the performance of Option C considering the appraisal themes and subthemes. For full details of the assessment of Option C against the individual criteria, refer to Appendix K.

Engineering (Constructability) Performance

5.4.2 Option C can be constructed safely but requires enhanced controls. For Option C, there are two separate working areas for the shaft and the inlet/outlet. The shaft that is located within the Abingdon STW will add additional safe working arrangements. Enabling works within the STW will increase the volume of work, increasing the number of risks and hazards.

5.4.3 Considering third party impact from Option C, the works will affect the operation of Abingdon STW. The flooded gravel pit water levels will need reducing, which may restrict when construction can be undertaken, assuming that water must be pumped into the adjacent River Thames at certain tide levels. It may also restrict construction seasons if aquatic life is found present within the flooded gravel pits. Works to reduce the water level of the flooded gravel pits may rely on a third party (specialist contactor). Works to construct Option C would impact vehicle and pedestrian/cyclist access along Peep-O-Day Lane, which is part of the NCN 5.

5.4.4 Option C has a short tunnel length, so would likely save on the tunnelling programme and increase total float on the TBM recovery, compared to the SESRO Gate 2 construction programme. The Option C works on the channel through the gravel pit, the shaft and the intake/outfall will be dependent on each other, but this is mitigated by the separation in these elements.

5.4.5 Access is based on using Stonehill Lane, which runs into an unnamed track east and then north into Peep-O-Day Lane. Option C would require the construction of a culvert through the flooded gravel pit, which would increase the number of material deliveries. Due to a longer STW outfall extension plus the intake pipework within the culvert, Option C would require a large amount of materials storage and resources importing.

5.4.6 Regarding construction complexity, permission will be required (from Thames Water STW operations team) to complete works for Option C within the existing treatment works and elements within it may require relocation before main works can commence. Permissions are also likely to be required from the Environment Agency (EA) when extending or relocating the main STW and storm outfalls. The interface with the existing treatment works is a considerable increase in the enabling works scope, but the separate locations for the shaft and the inlet and outlet will enable these works to take place concurrently. The TBM will need to be recovered from the shaft. Access to the tunnel for the secondary lining will take place from within the shaft. The working area within Abingdon STW will need to take account of these requirements for TBM

recovery and access for secondary lining work.

5.4.7 Assuming the STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall structure, the STT pipeline for Option C would need require a moderate deviation from its assumed route as the location is further north than the ADC discharge location.

5.4.8 It is noted that Option C is considered to carry risk to constructability and programme due to the uncertainty of the works required at Abingdon STW.

Engineering (Operability) Performance

5.4.9 The health and safety criteria during operation considers the risk of endangering operational staff, visitors or members of the public, and also whether access/egress can be provided during normal operations and emergencies. Due to the main shaft being located in the Abingdon STW, this part of the structure could be more easily separated from public access routes and could also be more easily accessed during a River Thames flood. However, the inclusion of long culverts means access/egress for maintenance is considered to be more challenging for this option. Option C can be operated safely but requires enhanced control measures due to its proximity to water.

5.4.10 Considering operational complexity, Option C includes long culverts, which may make operation and maintenance more challenging for this option.

5.4.11 Considering operational resilience, the main shaft site is located within Abingdon STW, which is outside of flood zone 3, reducing risk of flood damage and of flooding restricting access. Existing disused assets from Abingdon STW could be reused within the design. Also, Option C is located at a cross over between bends, near outside of the bend. There may be some deposition around the structure, but it is not expected to occur to a great extent in this area and impact the performance of the structure.

5.4.12 From a transport planning perspective, potential disruption to the existing road network during operation of Option C is likely to be limited. The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2.8km. If access to Option C after construction is to remain via the south using Peep-O-Day Lane, there is an opportunity to upgrade Peep-O-Day Lane to make it better suited for users.

5.4.13 Considering the potential impact on reservoir water quality, Option C requires moderate amounts of interventions to ensure water quality such as air diffusers within the reservoir.

5.4.14 The STT pipeline to Option C would potentially require a large operational input. The section of pipeline within the flooded gravel pits would likely be more difficult to maintain as it would need to be culverted.

Cost and Carbon Performance

5.4.15 An initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option C results in a total project cost of 0.3% more than the lowest cost intake/outfall option.

5.4.16 An initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent approximately 1.6% of total SESRO carbon. Option C results in a total project carbon of 1.6% more than the lowest carbon intake/outfall option.

Environmental Performance

5.4.17 Option C performs well against the air quality criterion because the Marcham AQMA is located approximately 2.2km northwest and Abingdon AQMA approximately 1.6km north-northeast. There are between 1 to 10 high sensitivity receptors within 20m of the construction route for Option C and between 1 to 10 high sensitivity receptors approximately 310m SE of the main works. There will likely be minimal operational-related traffic, so any potential effects from vehicle emissions will likely be negligible for Option C.

5.4.18 Considering the aquatic environment, Option C will result in the removal of approx. 38m of riparian habitat, which is considered a moderate adverse impact on the Thames (Evenlode to Thames) WFD Waterbody. The impact is expected to be localised and not affect WFD compliance at a water body level. Option C will not impact a source protection zone (SPZ).

5.4.19 Option C performs well against the majority of the biodiversity and nature conservation criteria because there are no statutory designated sites within 100m of Option C and the closest SSSI to the intake/outfall is 1.8km NE. There is no known terrestrial priority habitat directly impacted by the proposed footprint of Option C. Option C, however, has a lack of space for BNG. Desk study of Natural England's Ancient Woodland Inventory and historical maps, indicates that no ancient woodland (considered to be irreplaceable habitat), would be affected. Desk study of the Woodland Trust's Ancient Tree Inventory indicates that no ancient or veteran trees (also considered to be irreplaceable habitat) are located close to Option B; however, survey may potentially identify trees that could be classified as ancient or veteran trees.

5.4.20 For Option C, construction of the intake/outfall would require the removal of a number of trees along the River Thames, which are assumed to include several A or B grade trees. Some localised vegetation clearance may be required for the access road and for the extension of the STW outfall, which may provide habitat for protected and notable species. It is assumed the existing trees in the vicinity would not be impacted by the construction of the shaft and Control Building as they would be installed within an area of hardstanding at the Abingdon Sewage Treatment Works.

5.4.21 Option C has the main shaft constructed within the Abingdon Sewage

Treatment Works and outside of the flood zone (still in flood zone 2). However, the intake/outfall structure will be located within flood zone 3. A flood risk assessment and replacement flood storage will be required.

5.4.22 Considering the historic environment, for setting effects, there is a scheduled monument and a Grade II* listed dovecote 350m east, a Grade II* listed manor house 70m east of the dovecote and the Culham Conservation Area 290m southeast of Option C. There are, however, no known historic buildings within the footprint of Option C and no loss of non-designated landscapes. There is likely to be some loss of paleoenvironmental material within the River Thames floodplain.

5.4.23 Option C passes beneath the A34 and Abingdon STW, as well as an adjacent farm with associated tanks, 150m north of Sutton Wick leachate treatment plant and adjacent to gravel pits. Excavation will directly disturb ground in the southeast of the sewage works and is proposed through a historical and now flooded gravel pit. There may be the potential for unrecorded areas of Made Ground along the route and the tunnel would be bored through Kimmeridge Clay which may present a risk of hydrocarbon contamination due to potential bituminous content. Option C passes 220m south of the Southern Town Park historical landfill and 140m north of Sutton Wick No.1 landfill, while the access road extends to Peep-O-Day Lane adjacent to the Southern Town Park historical landfill. For Option C, however, the potential to disturb UXO would be low risk and there is a lack of geologically designated sites.

5.4.24 Considering landscape and visual impact, there would be open close-range views of Option C from the Thames Path National Trail and the River Thames. The infrastructure could be visible in middle-distance views from residential properties on the western edge of Culham Conservation Area. Infrastructure along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the NL but could affect the sense of tranquillity along the River Thames. The loss of some trees could erode a key characteristic, which contributes positively to the local landscape character. There would be noticeable changes to the visual amenity of the community on the western edge of Culham due to construction and associated traffic. The effect of operational lighting could potentially lead to noticeable changes to the visual amenity of the local community on the western edge of Culham. However, Option C would not affect TPOs, views from the NL or operational visual amenity.

5.4.25 For noise, the closest sample receptors are located approximately 310m and 400m away from Option C and could experience construction noise from secondary lining activities. Construction traffic has the potential to result in adverse effects on properties on Stonehill Lane. The closest receptor may experience noise during normal operations but with the implementation of standard control measures it is anticipated that significant effects would be avoided.

5.4.26 Option C performs well against the pollution criteria as spillages from construction and operation are likely to be readily controlled using standard mitigation.

Community, Planning and Land Performance

5.4.27 The intake/outfall and access road for Option C are located within 500m of homes, Abingdon Marina, a sports club and NCN 5. Disruption will be experienced during construction along a long section of NCN 5. Some disruption from traffic and temporary periods of restricted access during construction for Option C is expected. However, Option C performs well for criteria related to opportunities to improve PRoW links and impacts during operation. During operation of Option C, it is reasonable to expect no disruption to residents or those accessing assets such as NCN 5.

5.4.28 Considering consenting, Option C is outside the area safeguarded for SESRO in the VoWH Local Plan. In other respects, it is similar to the other right-bank options: see the summary given for Option A, above.

5.4.29 For property and land acquisition, is assumed that construction via a tunnel boring machine would not detrimentally impact surface uses, although there may be owners of SCL, or owners of land that require special consideration, affected by Option C (such as the VoWH Council and National Highways). As with all the options, the acquisition of rights to extract water may be required from the riparian owners. Access to the shaft location would not rise to significant number of Category 3 parties.

5.5 Intake/Outfall Option D

5.5.1 This section summarises the performance of Option D considering the appraisal themes and subthemes. For full details of the assessment of Option D against the individual criteria, refer to Appendix L.

Engineering (Constructability) Performance

5.5.2 Option D can be constructed safely but requires enhanced controls due to working required adjacent to a flooded gravel pit and Abingdon STW, and tight construction working areas.

5.5.3 Considering third party impact from Option D, disruption is likely to be significant. Works to construct Option D would impact vehicle and pedestrian access along Peep-O-Day Lane, which is part of the NCN 5.

5.5.4 The tunnel length for Option D is short so there are programme acceleration opportunities. It would likely save on the tunnelling programme and increase total float on the TBM recovery, compared to the SESRO Gate 2 construction programme. Due to the separation of the elements, there is an opportunity for concurrency between the shaft and intake/outfall structures.

5.5.5 Access to construct Option D is based on using Stonehill Lane, which runs into an unnamed track east and then north into Peep-O-Day Lane. Permission will be required to complete works within the existing quarry. Option D would require the construction of a culvert through the flooded gravel pit, which would increase the number of material deliveries. Option D would require a moderate amount of import materials due to the length of its STW outfall extension plus the intake pipework within the culvert.

5.5.6 Regarding construction complexity, the overflow channel should be completed after the pipeline and other structures so that working area is available. Infilling of the gravel pit temporarily will be required to complete this. The TBM will need to be recovered from the shaft. Access to the tunnel for the secondary lining will take place from within the shaft. Option D requires a significant extension of the STW outfall. Powerlines may require diversion or temporary switch offs to construct the shaft and they may also limit the size of import/export wagons.

5.5.7 Assuming a STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall shaft structure, no deviation of this pipeline will be required. The STT pipeline for Option D would be considered simple construction particularly as the outfall is located into flooded gravel pits.

5.5.8 It is noted for constructability that this site is in a difficult location, very close to the OH powerlines, and there is a significant risk that these lines will need to be relocated. There is an opportunity within Option D to slightly relocate the shaft to the west away from the OH power lines, which may improve the performance of this option against the criteria. At present, the locality of these lines makes this a complicated build. Another opportunity may exist in connecting both the intake and outtake to the existing gravel pit and ADC channel (if constructed) with the shaft located within the Quarry. This may improve the performance of this option.

Engineering (Operability) Performance

5.5.9 The health and safety criteria during operation considers the risk of endangering operational staff, visitors or members of the public, and also whether access/egress can be provided during normal operations and emergencies. During larger River Thames flood events, the shaft for Option D would be more accessible than other options as it is set away from the bank of the River Thames; however, the inclusion of long culverts means access/egress for maintenance is considered to be more challenging for this option. Option D can be operated safely but requires enhanced control measures due to its proximity to water.

5.5.10 Considering operational complexity, Option D includes long culverts that would make access and operation/maintenance more challenging for this option.

5.5.11 Considering operational resilience, the main shaft for Option D is to be constructed within a raised area on the edge of flood zone 3, reducing the risk of flood damage and of flooding restricting access. Option D is also located at a

crossover between bends in the river, near the outside of the bend, so deposition around the structure is not expected to occur to a great extent in this area and impact the performance of the structure.

5.5.12 From a transport planning perspective, potential disruption to the existing road network during operation of Option D is likely to be limited. The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2.4km. If access to Option C after construction is to remain via the south using Peep-O-Day Lane, there is an opportunity to upgrade Peep-O-Day Lane to make it better suited for users.

5.5.13 Considering the potential impact on reservoir water quality, Option D requires moderate amounts of interventions to ensure water quality such as air diffusers within the reservoir.

5.5.14 The STT pipeline to Option D would require some operational input.

5.5.15 The intake for Option D is located at the entrance to the stub section of the Wilts & Berks canal. This existing stub section would need diversion to enable boat users to access any future reconstructed canal[15].

Cost and Carbon Performance

5.5.16 An initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option D results in a total project cost of 0.2% more than the lowest cost intake/outfall option.

5.5.17 An initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent approximately 1.6% of total SESRO carbon. Option D results in a total project carbon of 1.3% more than the lowest carbon intake/outfall option.

Environmental Performance

5.5.18 Option D performs well against the air quality criterion because the Marcham AQMA is located approximately 2.2km northwest and Abingdon AQMA approximately 1.7km north-northeast. There are between 1 to 10 high sensitivity receptors within 20m of the construction route for Option D and Abingdon Sewage Treatment Works are also located adjacent to the main works. There will likely be minimal operational-related traffic, so any potential effects from vehicle emissions will likely be negligible.

5.5.19 Considering the aquatic environment, Option D will result in the removal of approx. 38m of riparian habitat, which is considered a moderate adverse impact on the Thames (Evenlode to Thames) WFD Waterbody. The impact is expected to be localised and not affect WFD compliance at a water body level.

[15] If an emergency discharge option including an ADC is selected with Option D, the ADC will provide access to any future Wilts & Berks Canal.

Option D will not impact a source protection zone (SPZ).

5.5.20 Option D performs well against the majority of the biodiversity and nature conservation criteria because there are no statutory designated sites within 100m of Option D and the closest SSSI to the intake/outfall is approximately 1.9km Northeast. There is no known terrestrial priority habitat directly impacted by the proposed footprint of Option D. Option D, however, has a lack of space for BNG. The location of the intake/outfall would result in the removal of trees, hedgerow, grassland and riparian vegetation along the Thames and would also block natural access to the existing stub section of Wilts & Berks Canal. This could impede movement of riparian species. It is assumed that the canal would be diverted if Option D were selected. Desk study of Natural England's Ancient Woodland Inventory and historical maps, indicates that no ancient woodland (considered to be irreplaceable habitat), would be affected. Desk study of the Woodland Trust's Ancient Tree Inventory indicates that no ancient or veteran trees (also considered to be irreplaceable habitat) are located close to Option D; however, survey may potentially identify trees that could be classified as ancient or veteran trees.

5.5.21 For Option D, construction of the intake/outfall only requires the removal of a few trees and some vegetation clearance. Localised vegetation clearance for Option D may also be required for the access road and for the extension of the STW Outfall. The vegetation to be removed may provide habitat for protected and notable species.

5.5.22 Option D has the main shaft constructed within a raised area on the edge of the River Thames flood zone (still in flood zone 2), However, the intake/outfall structure will be located within flood zone 3. A flood risk assessment and replacement flood storage will be required.

5.5.23 Considering the historic environment, for setting effects, there is a scheduled monument and a Grade II* listed dovecote 350m east, a Grade II* listed manor house 70m east of the dovecote, and the Culham Conservation Area 330m southeast. There are, however, no known historic buildings within the footprint of Option D and no loss of non-designated landscapes. There is likely to be some loss of paleoenvironmental material within the River Thames floodplain.

5.5.24 Option D performs poorly when considering land quality because it passes 100m north of Sutton Wick No.1 landfill and could potentially disturb a corner of the landfill. Option D passes beneath the A34 and gravel pits south of Abingdon STW, as well as adjacent to a farm with associated tanks, and 150m north of Sutton Wick leachate treatment plant and passes through a historical and now flooded gravel pit. There may be the potential for unrecorded areas of Made Ground along the route, and the tunnel would be bored through Kimmeridge Clay, which may present a risk of hydrocarbon contamination due to potential bituminous content. For Option D, however, the potential to disturb UXO would be low risk and there is a lack of geologically designated sites.

5.5.25 Considering landscape and visual impacts, there would be open close-range

views of Option D from the River Thames from the Thames Path National Trail and residential properties on the western edge of Culham Conservation Area. The Control Building could be visible in the background along with some close-range views from NCN 5 and Vale Way Long Distance Path. Infrastructure along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the NL but could affect the sense of tranquillity along the River Thames. The loss of some trees for Option D could erode a key characteristic, which contributes positively to the local landscape character. There could be noticeable changes to the visual amenity of the western edge of Culham as trees along the left bank of the River Thames would only partially filter views of construction and associated traffic. The effect of operational lighting would be limited and would have little effect on the visual amenity of the local community on the western edge of Culham due to intervening vegetation. However, Option D would not affect TPOs, vegetation loss, views from the NL or operational visual amenity.

5.5.26 For noise, the closest sample receptor is located approximately 350m away and could experience construction noise from secondary lining activities. Construction traffic for Option D has the potential to result in adverse effects on properties on Stonehill Lane. Receptors may experience noise during normal operations but with the implementation of standard control measures it is anticipated that significant effects would be avoided.

5.5.27 Option D performs well against the pollution criteria as spillages from construction and operation are likely to be readily controlled using standard mitigation.

Community, Planning and Land Performance

5.5.28 The intake/outfall and access road for Option D are located within 500m of a sports club and NCN 5. NCN 5 will be disrupted as a result of construction. Some disruption from traffic and temporary periods of restricted access during construction is expected. However, Option D performs well for criteria related to PRoW, opportunities and operational impacts because linkages to the NCN could be improved with Option D and, during operation of Option D, it is reasonable to expect no disruption to residents.

5.5.29 Considering consenting, Option D, remains within the area safeguarded for SESRO and places the control building within the previously developed area of Oday Quarry rather than on the riverbank.

5.5.30 For property and land acquisition, it is assumed that construction via a tunnel boring machine would not detrimentally impact surface uses along the tunnel length, although there is a potential that the exclusion zone may impact residential properties and there may be owners of SCL, or owners of land that require special consideration, affected by Option D (the VoWH Council and National Highways). The acquisition of rights to extract water may be required from the riparian owners. Access to the shaft location would not give rise to

significant number of Category 3 parties.

5.6 Intake/Outfall Option E

5.6.1 This section summarises the performance of Option E considering the appraisal themes and subthemes. For full details of the assessment of Option E against the individual criteria, refer to Appendix M.

Engineering (Constructability) Performance

5.6.2 Option E can be constructed safely but requires enhanced controls due to working adjacent to a flooded gravel pit, the River Thames and a channel. There are tight construction working areas for Option E.

5.6.3 Considering third party Impact, works for Option E would impact vehicle and pedestrian access along Peep-O-Day Lane, which is part of the NCN 5. Access would need agreement through the adjacent fields. The temporary access would become part of the permanent access.

5.6.4 Option E will require time for undertaking the tunnelling and carrying out the secondary lining of the tunnel. The STW outfall extension can be completed concurrently with the other works. Programme acceleration opportunities for Option E are limited with this location due to the length of the tunnel. Work is not on the critical path of the Gate 2 SESRO construction programme.

5.6.5 Access to construct Option E is based on using Stonehill Lane, which runs into an unnamed track east and then north into Peep-O-Day Lane. From Peep-O-Day Lane, access would be east through the fields. Option E requires a moderate number of materials importing, due to the length of its STW outfall extension.

5.6.6 Considering construction complexity, working space is limited for Option E and a tight working layout will need to be adopted. The TBM will need to be recovered from the shaft. Access to the tunnel for the secondary lining will take place from within the shaft. This will impact works constructing the inlet and outlet. Close proximity of elements of the works will mean that items will need to be completed in a sequential way. Option E requires a long extension of the STW outfall.

5.6.7 Assuming a STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall structure no deviation of this pipeline will be required. The STT pipeline for Option E would be considered a simple construction.

5.6.8 It is noted for constructability that Option E is within a low-lying area and has access obstacles to overcome. Option E is a site flanked by an existing channel, which may require realignment before works commence to give access around the shaft, adding an additional complexity to the option. There is some opportunity for concurrency at this location, but it is made difficult

because of the position and interfaces in the area.

Engineering (Operability) Performance

5.6.9 The health and safety criteria during operation considers the risk of endangering operational staff, visitors or members of the public, and also whether access/egress can be provided during normal operations and emergencies. Option E avoids the need for long culverts, which reduces challenges for access/egress for maintenance. The access road to the structure would, however, be submerged in a large River Thames flood event due to the main structure being located in the River Thames floodplain. Option E can be operated safely but requires enhanced control measures due to its proximity to water.

5.6.10 Considering operational complexity, Option E avoids the need for long culverts, which may make operation and maintenance less challenging for this option.

5.6.11 Considering operational resilience, Option E is located at a crossover between bends, near the outside of the bend, so deposition around the structure is not expected to occur to a great extent and impact the performance of the structure. Option E is, however, located within flood zone 3 so is at higher risk from flooding and losing access due to flooding.

5.6.12 From a transport planning perspective, potential disruption to the existing road network during operation of Option E is likely to be limited. The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2.5km. If access to Option E after construction is to remain via the south using Peep-O-Day Lane, there is an opportunity to upgrade Peep-O-Day Lane to make it better suited for users.

5.6.13 Considering the potential impact on reservoir water quality, Option E requires moderate amounts of interventions to ensure water quality such as air diffusers within the reservoir.

5.6.14 The STT pipeline to Option E would require some operational input.

Cost and Carbon Performance

5.6.15 An initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option E results in a total project cost of 0.02% more than the lowest cost intake/outfall option.

5.6.16 An initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent approximately 1.6% of total SESRO carbon. Option E results in a total project carbon of 0.3% more than the lowest carbon intake/outfall option.

Environmental Performance

5.6.17 Option E performs well against the air quality criterion because the Marcham AQMA is located approximately 2.2km northwest and Abingdon AQMA approximately 1.7km north-northeast. There are between 1 to 10 high sensitivity receptors within 20m of the construction route for Option E. There will likely be minimal operational-related traffic, so any potential effects from vehicle emissions will likely be negligible.

5.6.18 Considering the aquatic environment, Option E will result in the removal of approx. 38m of riparian habitat, which is considered a moderate adverse impact on the Thames (Evenlode to Thames) WFD Waterbody. The impact is expected to be localised and not affect WFD compliance at a water body level. Option E will not impact a source protection zone (SPZ).

5.6.19 For Option E, the intake/outfall pipeline passes through an area of terrestrial priority habitat coastal, and floodplain grazing marsh and may require the removal of areas of trees, shrub, grassland and riparian vegetation along the Thames. The access track is also located within an area of coastal and floodplain grazing marsh priority habitat which would be lost. There is also a lack of space for BNG. Desk study of Natural England's Ancient Woodland Inventory and historical maps, indicates that no ancient woodland (considered to be irreplaceable habitat), would be affected. Desk study of the Woodland Trust's Ancient Tree Inventory indicates that no ancient or veteran trees (also considered to be irreplaceable habitat) are located close to Option E; however, survey may potentially identify trees that could be classified as ancient or veteran trees.

5.6.20 For Option E, construction of the intake/outfall could require the removal of some potential A or B grade trees along the River Thames. Localised vegetation clearance may be required for the access road and the extension of the STW outfall, which may provide habitat for protected and notable species.

5.6.21 Option E is located within flood zones 2 and 3. A flood risk assessment and replacement flood storage will be required.

5.6.22 Considering the historic environment, for setting effects, there is a scheduled monument and a Grade II* listed dovecote 370m east, a Grade II* manor house 70m east of the dovecote, and the Culham Conservation Area lies 340m southeast of Option E. There are, however, no known historic buildings within the footprint of Option E and no loss of non-designated landscapes. There is likely to be some loss of paleoenvironmental material within the River Thames floodplain.

5.6.23 Option E performs poorly when considering land quality because it passes 100m north of Sutton Wick No.1 landfill and could potentially disturb the corner of the landfill. Option E passes beneath the A34 and gravel pits south of Abingdon STW, as well as adjacent to a farm with associated tanks and 150m north of Sutton Wick leachate treatment plant and passes through a historical

and now flooded gravel pit. There may be the potential for unrecorded areas of Made Ground along the route and the tunnel would be bored through Kimmeridge Clay, which may present a risk of hydrocarbon contamination due to potential bituminous content. For Option E, however, the potential to disturb UXO would be low risk and there is a lack of designated geological sites.

5.6.24 Considering landscape and visual impacts, there would be open, close-range views of Option E from the River Thames, from the Thames Path National Trail and residential properties on the western edge of Culham Conservation Area. The Control Building could also be visible in filtered views from NCN 5 and Vale Way Long Distance Path. Amber scores are awarded as infrastructure along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the NL but could affect the sense of tranquillity along the River Thames. The loss of some trees could erode a key characteristic which contributes positively to the local landscape character. There could be noticeable changes to the visual amenity of the western edge of Culham as trees along the left bank of the River Thames would only partially filter views of construction activities. The effect of operational lighting would be limited but could potentially lead to noticeable changes to the visual amenity of the local community on the western edge of Culham screened by intervening vegetation. However, Option E would not affect TPOs and views from the NL.

5.6.25 For noise, the closest sample receptor is located approximately 360m away and could experience construction noise from secondary lining activities. Construction traffic has the potential to result in adverse effects on properties on Stonehill Lane. Receptors may experience noise during normal operations but with the implementation of standard control measures it is anticipated that significant effects would be avoided.

5.6.26 Option E performs well against the pollution criteria as spillages from construction and operation are likely to be readily controlled using standing mitigation.

Community, Planning and Land Performance

5.6.27 The intake/outfall and access road for Option E are located within 500m of a sports club and NCN 5. Some disruption from traffic and temporary periods of restricted access during construction is expected. However, Option E performs well for criteria related to PRoW opportunities and operational impacts because linkages to the NCN could be improved with Option E and, during operation of Option E, it is reasonable to expect no disruption to residents.

5.6.28 Considering consenting, Option E remains within the area safeguarded for SESRO.

5.6.29 For property and land acquisition, it is assumed that construction via a tunnel boring machine would not detrimentally impact surface uses along the tunnel length, although there may be owners of SCL, or owners of land that require special consideration, affected by Option E (such as the VoWH Council and

National Highways). The acquisition of rights to extract water may be required from the riparian owners. Access to the shaft location would not give rise to significant number of Category 3 parties.

5.7 Intake/Outfall Option F

5.7.1 This section summarises the performance of Option F considering the appraisal themes and subthemes. For full details of the assessment of Option F against the individual criteria, refer to Appendix N.

Engineering (Constructability) Performance

5.7.2 Option F can be constructed safely but requires enhanced controls due to close proximity to the River Thames and another body of water on the other side of the shaft.

5.7.3 Considering third party impact, works for Option F would impact vehicle and pedestrian access along Peep-O-Day Lane, which is part of the NCN 5. Access would need agreement through the adjacent fields. The temporary access would become part of the permanent access.

5.7.4 The length of the main tunnel for Option F impacts the programme duration, but the work scope does not involve major culvert or pipe runs. The STW outfall extension can be completed concurrently with the other works. Programme acceleration opportunities are limited with this location due to the length of the tunnel. Work for Option F is not on the critical path for the construction of the SESRO project, assuming the same programme as at Gate 2 (except for the intake/outfall works).

5.7.5 Access to construct Option F is based on using Stonehill Lane, which runs into an unnamed track east and then north into Peep-O-Day Lane. From Peep-O-Day Lane, access would be east through the fields. Option F requires a moderate number of materials importing due to the length of its STW outfall extension.

5.7.6 Considering construction complexity, working space is limited for Option F due to the tight nature of the area and a tight working layout will need to be adopted. The TBM will need to be recovered from the shaft. Access to the tunnel for the secondary lining will take place from within the shaft. This will impact works constructing the inlet and outlet. Close proximity of elements of the works will mean that items will need to be completed in a sequential way. The tight nature of the area also limits the opportunity for concurrent working whilst allowing space for cranage and general access to the site alongside the main tunnel driven activities. Option F requires a long extension of the STW outfall.

5.7.7 Assuming a STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall structure a moderate of this pipeline will be required. The STT pipeline for Option F would be considered a simple

construction.

Engineering (Operability) Performance

5.7.8 The health and safety criteria during operation considers the risk of endangering operational staff, visitors, or members of the public, and also whether access/egress can be provided during normal operations and emergencies. Option F avoids the need for long culverts, which reduces challenges for access/egress for maintenance. The access road to the structure would, however, be submerged in a large River Thames flood event due to the main structure being located in the River Thames floodplain. Option F can be operated safely but requires enhanced control measures due to its proximity to water.

5.7.9 Considering operational complexity, Option F avoids the need for long culverts, which may make operation and maintenance less challenging for this option.

5.7.10 Considering operational resilience, Option F is located on the outside of the bend so deposition around the structure is not expected to occur to a great extent in this area and geomorphology is therefore not expected to impact the performance of the structure. Option F is, however, located within flood zone 3 so is at higher risk from flooding and of losing access due to flooding.

5.7.11 From a transport planning perspective, potential disruption to the existing road network during operation of Option F is likely to be limited. The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2.5km. If access to Option F after construction is to remain via the south using Peep-O-Day Lane, there is an opportunity to upgrade Peep-O-Day Lane to make it better suited for users.

5.7.12 Considering the potential impact on reservoir water quality, Option F requires moderate amounts of interventions to ensure water quality such as air diffusers within the reservoir.

5.7.13 The STT pipeline to Option F could be routed to avoid the flood gravel pits, making it easier to maintain.

Cost and Carbon Performance

5.7.14 An initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option F results in a total project cost of 0.01% more than the lowest cost intake/outfall option.

5.7.15 An initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent approximately 1.6% of total SESRO carbon. Option F results in a total project carbon of 0.3% more than the lowest carbon intake/outfall option.

Environmental Performance

5.7.16 Option F performs well against the air quality criterion because the Marcham AQMA is located approximately 2.2km northwest and Abingdon AQMA approximately 1.7km north-northeast. There are between 1 to 10 high sensitivity receptors within 20m of the construction route for Option F. There will likely be minimal operational-related traffic, so any potential effects from vehicle emissions will likely be negligible.

5.7.17 Considering the aquatic environment, Option F will result in the removal of approx. 38m of riparian habitat on the main River Thames, which is considered a moderate adverse impact on the Thames (Evenlode to Thames) WFD Waterbody. Compared to other options, a section of the Oday Ditch, a WFD principal waterbody, will also be lost. The option therefore has the potential to impact the ecological status of this particular watercourse. However, this impact is considered to be confined to the Oday Ditch sub-catchment and not at a waterbody scale. Whilst there is uncertainty about the current hydrological, geomorphological, and ecological baseline of the Oday Ditch system, it is considered likely that effects can be remedied through mitigation or compensation - either within the Oday Ditch catchment or nearby. The extent of mitigation required is, nevertheless, higher for Option F than for any other option. Option F will not impact a source protection zone (SPZ).

5.7.18 For Option F, the intake/outfall pipeline passes through the River Thames and an area of priority habitats coastal, and floodplain grazing marsh and may require the removal of areas of trees, shrub, grassland, and riparian vegetation along the Thames. The access track is also located within an area of coastal and floodplain grazing marsh priority habitat, which would be lost.

5.7.19 For Option F, construction of the intake/outfall could require the removal of some potential A or B grade trees along the River Thames. Localised vegetation clearance may be required for the access road and the extension of the STW outfall, which may provide habitat for protected and notable species. Desk study of Natural England's Ancient Woodland Inventory and historical maps, indicates that no ancient woodland (considered to be irreplaceable habitat), would be affected. Desk study of the Woodland Trust's Ancient Tree Inventory indicates that no ancient or veteran trees (also considered to be irreplaceable habitat) are located close to Option F; however, survey may potentially identify trees that could be classified as ancient or veteran trees.

5.7.20 Option F is located within the flood zones 2 and 3. A flood risk assessment and replacement flood storage will be required.

5.7.21 Considering the historic environment, for setting effects, there is a scheduled monument and a Grade II* listed dovecote 450m northeast, a Grade II* manor house 70m east of the dovecote, and the Culham Conservation Area 390m southeast. There are, however, no known historic buildings within the footprint of Option F and no loss of non-designated landscapes. There is likely to be

some loss of paleoenvironmental material within the River Thames floodplain.

5.7.22 Option F performs poorly when considering land quality because it passes directly under/through the Sutton Wick No.1 landfill and there may be significant effects associated with its disturbance. Option F passes beneath the A34 and adjacent to a farm with associated tanks and 30m north of Sutton Wick leachate treatment plant. There may be the potential for unrecorded areas of Made Ground along the route and the tunnel would be bored through Kimmeridge Clay, which may present a risk of hydrocarbon contamination due to potential bituminous content. For Option E, however, the potential to disturb UXO would be low risk and there is a lack of geologically designated sites.

5.7.23 Considering landscape and visual impacts, the introduction of the intake/outfall, including the Control Building, could affect the sense of tranquillity along the River Thames and slightly affect the 'openness of the green belt'. The loss of some trees could erode a key characteristic, which contributes positively to the local landscape character. There would be open close-range views from the River Thames to Option F infrastructure and intake screens/river barrier. The infrastructure could be visible in partially filtered middle-distance views between trees from the north-western edge of Sutton Courtenay Manor Grade II Registered Park and Garden. Infrastructure along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the NL. Option F would not affect TPOs, views from the NL or visual amenity.

5.7.24 For noise, the closest sample receptor is located approximately 450m away from Option F. Construction traffic has the potential to result in adverse effects on properties on Stonehill Lane. The closest receptor may experience noise during normal operations but with the implementation of standard control measures it is anticipated that significant effects would be avoided.

5.7.25 Option F performs well against the pollution criteria as spillages from construction and operation are likely to be readily controlled using standard mitigation.

Community, Planning and Land Performance

5.7.26 The intake/outfall and access road are located within 500m of a sports club and NCN 5. Some disruption from traffic and temporary periods of restricted access during construction is expected. The access road also joins to the NCN, which may be disrupted as a result of construction. However, Option F performs well for criteria related to PRoW opportunities and operational impacts because linkages to the NCN could be improved with Option F and, during operation of Option F, it is reasonable to expect no disruption to residents.

5.7.27 Considering consenting, Option F is outside the area safeguarded for SESRO in the VoWH Local Plan. It avoids the area safeguarded for the possible future South Abingdon-on-Thames Bypass (in the existing Local Plan) but is within the revised area proposed to be safeguarded for the Southern Abingdon Movement Corridor (in the emerging draft Joint Local Plan to 2041).

5.7.28 For property and land acquisition, is assumed that construction via a tunnel boring machine would not detrimentally impact surface uses along the tunnel length, although Option F would impact on Greenbelt and there may be owners of SCL, or owners of land that require special consideration, affected by Option F (such as the VoWH Council and National Highways). As with all the options, the acquisition of rights to extract water may be required from the riparian owners. Access to the shaft location would not rise to significant number of Category 3 parties.

5.8 Intake/Outfall Option G

5.8.1 This section summarises the performance of Option G considering the appraisal themes and subthemes. For full details of the assessment of Option G against the individual criteria, refer to Appendix O.

Engineering (Constructability) Performance

5.8.2 Option G can be constructed safely but requires enhanced controls due to large working area adjacent to the River Thames. There is good construction working area available.

5.8.3 Considering third party impacts, the new site and access road will likely cause disruption to the Thames Path (National Trail), which would need to be diverted during construction and operation.

5.8.4 The length of the tunnel in Option G would increase tunnelling duration and add time onto the tunnel drive, cleaning of the tunnel and removing temporary services and the secondary lining compared to the SESRO Gate 2 construction programme. The tunnel length would increase the overall duration of the construction programme, reducing opportunities for construction programme acceleration. Option G would affect the critical path for the construction of the SESRO project and delay planned completion of the reservoir (compared to the Gate 2 programme) due to the additional time to complete the tunnel and that the reservoir filling calendar restricts filling to between 01 November and 31 March each year. Option G therefore increases the programme length due to the time added by the tunnel length and in turn the filling of the reservoir.

5.8.5 Access to Option G is based on using Abingdon Road and The Burycroft avoiding Abingdon. It is considered that there is adequate space available for construction and materials storage with a good working area available for Option G.

5.8.6 Considering construction complexity, the main interface with Option G is the works adjacent to the River Thames. Option G is not considered significantly complex to construct and does not require an extension to the existing STW outfall.

5.8.7 Assuming a STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall structure, the final section of pipeline would

need cross the River Thames by going underneath it, which increases the construction complexity of the option.

5.8.8 It is noted for constructability that Option G is a standard arrangement with very little additional works required adequate space available for the works and the potential of concurrency. The ground is raised compared with the opposite side of the river, which has many benefits for Option G including a minimisation of platform works and a reduced flood risk.

Engineering (Operability) Performance

5.8.9 The health and safety criteria during operation considers the risk of endangering operational staff, visitors, or members of the public, and also whether access/egress can be provided during normal operations and emergencies. Option G avoids the need for long culverts, which reduces challenges for access/egress for maintenance. The shaft for Option G is on the left bank of the River Thames with an access road that would be above flood levels, so it would likely remain accessible during larger River Thames flood events. Option G can be operated safely but requires enhanced control measures due to its proximity to water.

5.8.10 Considering operational complexity, Option G avoids the need for long culverts, which may make operation and maintenance less challenging for this option.

5.8.11 Considering operational resilience, the main shaft for Option G is located on the left bank of the River Thames, where the ground level is higher and outside of flood zone 3, so it would have a lower risk of flood damage or loss of access through flooding. Option G is, however, located at a crossover between two bends so there may be some deposition in the margins, but it will be less concentrated than on the inside of the bend. This has potential to cause some sedimentation around the structure, which could impact operation.

5.8.12 From a transport planning perspective, there is likely to be no disruption to the existing road network during operation of Option G. The distance from Abingdon Road (the A415) to Option G is approximately 500m and the route to Option G from Abingdon Road is a good option for road access during operation, assuming that the Thames Path is diverted for Option G.

5.8.13 Considering the potential impact on reservoir water quality, Option G requires moderate amounts of interventions to ensure water quality such as air diffusers within the reservoir.

5.8.14 The section of the STT pipeline within/under the River Thames would increase operational input and make it more difficult to maintain.

Cost and Carbon Performance

5.8.15 An initial high-level cost estimate indicates that the Initial high-level cost estimate indicates that the range in costs for intake/outfall options represent

<0.5% of total SESRO costs. Option G results in a total project cost of 0.4% more than the lowest cost intake/outfall option.

5.8.16 Initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent approximately 1.6% of total SESRO carbon. Option G results in a total project carbon of 0.5% more than the lowest carbon intake/outfall option.

Environmental Performance

5.8.17 Option G performs well against the air quality criterion because the Marcham AQMA is located approximately 2.2km northwest and Abingdon AQMA approximately 1.4km north-northwest from Option G. There is one high sensitivity receptor within 20m of the construction route for Option G and between 10 to 100 high sensitivity receptors approximately 280m NW and SE of the proposed works. There will likely be minimal operational-related traffic for Option G, so any potential effects from vehicle emissions will likely be negligible.

5.8.18 Considering the aquatic environment, Option G will result in the removal of approx. 38m of riparian habitat, which is considered a moderate adverse impact on the Thames (Evenlode to Thames) WFD Waterbody. The impact is expected to be localised and not affect WFD compliance at a water body level. Option G will not impact a source protection zone (SPZ).

5.8.19 The intake/outfall would require the removal of areas of woodland, trees, cropland, and riparian vegetation along the Thames. There is no known priority habitat directly impacted by the proposed footprint for Option G. There is, however, a lack of space for BNG. Desk study of Natural England's Ancient Woodland Inventory and historical maps, indicates that no ancient woodland (considered to be irreplaceable habitat), would be affected. Desk study of the Woodland Trust's Ancient Tree Inventory indicates that no ancient or veteran trees (also considered to be irreplaceable habitat) are located close to Option G; however, survey may potentially identify trees that could be classified as ancient or veteran trees.

5.8.20 Construction of the intake/outfall only requires the removal of a few trees along the River Thames and a short section of hedgerow along The Burycroft, so few (if any) A or B grade trees would be impacted. The vegetation to be removed may provide habitat for protected and notable species.

5.8.21 Option G is on the left bank of the River Thames, where the ground level is higher, however the screens will still be located within flood zone 3 with the main intake/outfall structure located within the flood zone 2. A flood risk assessment and replacement flood storage will be required.

5.8.22 Considering the historic environment, for setting effects, there is a Grade II listed building 350m southeast and the Culham Conservation Area 240m east of Option G. There are, however, no known historic buildings within the footprint of Option G and no loss of non-designated landscapes. There is likely to be

some loss of paleoenvironmental material within the River Thames floodplain.

5.8.23 Option G performs poorly when considering land quality because it passes directly under/through the Southern Town Park historical landfill and there may be significant effects associated with its disturbance. Option G passes beneath the A34, close to two historic sewage works and adjacent to a farm with associated tanks and 170m north of Sutton Wick leachate treatment plant. An area of Made Ground lies along the route and the tunnel would be bored through Kimmeridge Clay, which may present a risk of hydrocarbon contamination due to potential bituminous content. For Option G, the potential to disturb UXO would be low risk and there is a lack of designated geological sites.

5.8.24 Considering landscape and visual impacts, the introduction of the intake/outfall could affect the sense of tranquillity along the River Thames and slightly affect the 'openness of the green belt'. The loss of some trees could erode a key characteristic, which contributes positively to the local landscape character. There would be open close-range views of Option G from the Thames Path National Trail, a nearby PRoW and the River Thames. The infrastructure could also be visible in middle-distance views from residential properties on the north-western edge of Culham, including the Conservation Area, and filtered middle-distance views from residential properties near Abingdon Marina, NCN 5 and Vale Way Long Distance Path to the west. Infrastructure along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the NL. Construction and associated traffic could lead to noticeable changes to the visual amenity of the community on the north-western edge of Culham, which could be difficult to mitigate. The effect of operational lighting could potentially lead to noticeable changes to the visual amenity of the local community on the western edge of Culham. However, Option G would not affect TPOs, result in vegetation loss or impact views from the NL.

5.8.25 For noise, the closest sample receptor is located approximately 190m away from Option G and is likely to be affected by construction noise from secondary lining activities. Construction traffic has the potential to result in adverse effects on properties on The Burycroft, especially Tollgate Cottage. The closest receptor may experience noise during normal operations but, with the implementation of standard control measures, it is anticipated that significant effects would be avoided.

5.8.26 Option G performs well against the pollution criteria as spillages from construction and operation are likely to be readily controlled using standard mitigation.

Community, Planning and Land Performance

5.8.27 The intake/outfall and access road for Option G occupy parts of the Thames Path and this would be significantly altered during construction. The

intake/outfall and access road are within 500m of homes and a place of worship. It is expected for Option G that there would be disruption from traffic and temporary periods of restricted access. Option G performs poorly against the criteria related to PRoW, recreational benefits, and economic incentives.

5.8.28 Considering consenting, Option G is outside the area safeguarded for SESRO in the VoWH Local Plan and lies within an area safeguarded for the possible future South Abingdon-on-Thames Bypass, with above-ground structures having the potential to conflict with a possible future road crossing of the river. It also extends construction to the left bank of the Thames, requiring slightly greater overall Order Limits extent, and places above-ground structures in the Green Belt. However, it avoids the need to consent relocation of the Abingdon STW outfall and in the overall planning balance, Green Belt impacts would to an extent be weighed against the benefit of avoiding development in the flood plain on the right bank of the Thames.

5.8.29 For property and land acquisition, is assumed that construction via a tunnel boring machine would not detrimentally impact surface uses along the tunnel length, although Option G would impact Greenbelt land to the east of the Thames and there may be owners of SCL, or owners of land that require special consideration, affected by Option G (such as the VoWH Council and National Highways). As with all the options, the acquisition of rights to extract water may be required from the riparian owners. The acquisition of subsoil under the River Thames may be problematical. Access to the shaft location, and its operation may give rise to more Category 3 parties compared with Options A, B, C, D, E and F.

5.9 Intake/Outfall Option H

5.9.1 This section summarises the performance of Option H considering the appraisal themes and subthemes. For full details of the assessment of Option H against the individual criteria, refer to Appendix P.

Engineering (Constructability) Performance

5.9.2 Option H can be constructed safely but requires enhanced controls due to the large working area adjacent to the River Thames. There is good construction working area available.

5.9.3 Considering third party impacts, the new site and access road will likely cause disruption to the Thames Path (National Trail), which would need to be diverted during construction and operation.

5.9.4 The length of the tunnel on Option H would increase tunnelling duration and add time onto the tunnel drive, cleaning of the tunnel and removing temporary services and the secondary lining compared to the SESRO Gate 2 construction programme. The tunnel length would increase the overall duration of the construction programme, reducing opportunities for construction programme

acceleration. Option H would affect the critical path and delay the planned completion (compared to the SESRO Gate 2 programme) due to the additional time to complete the tunnel and that the reservoir filling calendar restricts filling to between 01 November and 31 March each year. Option H therefore increases the programme length due to the time added by the tunnel length and in turn the filling of the reservoir.

5.9.5 Access for Option H is based on using Abingdon Road and The Burycroft avoiding Abingdon. It is considered that there is adequate space available for construction and materials storage with a good working area available for Option H. Resources need importing for Option H due to the long STW extension.

5.9.6 Considering construction complexity, the main interface with Option H is the works adjacent to the River Thames. Option H is not considered significantly complex to construct but it does require a long STW extension.

5.9.7 Assuming a STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall structure, the final section of pipeline would need to cross the River Thames by going underneath it, which increases the construction complexity of the option.

5.9.8 It is noted for constructability that Option H is a standard arrangement with adequate space available for the works, the potential of concurrency and very little additional works required (except that Option H requires an additional STW outfall extension). The ground is raised compared with the opposite side of the river, which has many benefits for Option H including a minimisation of platform works and a reduced flood risk. One drawback of this site is the need for plant and materials to access through built-up areas on this (eastern) side of the river.

Engineering (Operability) Performance

5.9.9 The health and safety criteria during operation considers the risk of endangering operational staff, visitors, or members of the public, and also whether access/egress can be provided during normal operations and emergencies. Option H avoids the need for long culverts, which may make access/egress for maintenance less challenging for this option. The shaft for Option H is on the left bank of the River Thames with an access road that would be above flood levels, so it would likely remain accessible during larger River Thames flood events. Option H can be operated safely but requires enhanced control measures due to its proximity to water.

5.9.10 Considering operational complexity, Option H avoids the need for long culverts, which may make the operation/maintenance less challenging for this option.

5.9.11 Considering operational resilience, the main shaft for Option H is located on left bank of River Thames, where ground level is higher and outside of flood zone 3, so it would have a lower risk of flood damage or loss of access through

flooding. Option H is, however, located on the inside of the bend so it is likely to be in a depositional area. This could result in sedimentation around the structure impacting operation.

5.9.12 From a transport planning perspective, there is likely to be no disruption to the existing road network during the operation of Option H. The distance from Abingdon Road (the A415) to Option H is approximately 1.15km and the route to Option H from Abingdon Road is a good option for road access during operation, assuming that the Thames Path is diverted for Option H.

5.9.13 Considering the potential impact on reservoir water quality, Option H requires moderate amounts of interventions to ensure water quality such as air diffusers within the reservoir.

5.9.14 The section of the STT pipeline to Option H within/under the River Thames would increase operational input and make it more difficult to maintain.

Cost and Carbon Performance

5.9.15 Initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option H results in a total project cost of 0.4% more than the lowest cost intake/outfall option.

5.9.16 An initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent approximately 1.6% of total SESRO carbon. Option H results in a total project carbon of 0.8% more than the lowest carbon intake/outfall option.

Environmental Performance

5.9.17 Option H performs well against the air quality criterion because the Marcham AQMA is located approximately 2.2km northwest and Abingdon AQMA approximately 1.7km north-northwest from Option H. There are between 1 to 10 high sensitivity receptors within 20m of the construction route for Option H and between 1 to 10 high sensitivity receptors approximately 210m east of the main works. There will likely be minimal operational-related traffic, so any potential effects from vehicle emissions will likely be negligible.

5.9.18 Considering the aquatic environment, Option H will result in the removal of approx. 38m of riparian habitat, which is considered a moderate adverse impact on the Thames (Evenlode to Thames) WFD Waterbody. The impact is expected to be localised and not affect WFD compliance at a water body level. Option H will not impact a source protection zone (SPZ).

5.9.19 For Option H, the intake/outfall would require the removal of trees, cropland, and riparian vegetation along the Thames. There is no known terrestrial priority habitat directly impacted by the proposed footprint of Option H. There is, however, a lack of space for BNG. Desk study of Natural England's Ancient Woodland Inventory and historical maps, indicates that no ancient woodland

(considered to be irreplaceable habitat), would be affected. Desk study of the Woodland Trust's Ancient Tree Inventory indicates that no ancient or veteran trees (also considered to be irreplaceable habitat) are located close to Option A; however, survey may potentially identify trees that could be classified as ancient or veteran trees.

5.9.20 For Option H, construction of the intake/outfall may require the removal of several potential A and B grade trees along the River Thames and a short section of hedgerow along The Burycroft for the access road and the extension of the STW outfall. The vegetation to be removed may provide habitat for protected and notable species.

5.9.21 Option H is on the left bank of the River Thames, where the ground level is higher, however the screens will still be located within flood zone 3 with the main intake/outfall structure located within the flood zone 2. A flood risk assessment and replacement flood storage will be required.

5.9.22 Considering the historic environment, for setting effects, there is a scheduled monument and Grade II* listed dovecote 220m east of Option G. The proposed access road crosses into the boundary of the Culham Conservation Area and the intake/outfall is 130m from the Conservation Area boundary. Loss of known archaeology is expected on the east bank of the River Thames from the intake/outfall structure and associated access road. There are, however, no known historic buildings within the footprint of Option H and no loss of non-designated landscapes. There is likely to be some loss of paleoenvironmental material within the River Thames floodplain.

5.9.23 Option H performs poorly when considering land quality because it passes 100m north of Sutton Wick No.1 landfill and the STW outfall extension could potentially disturb the corner of the landfill. Option H is proposed to pass beneath the A34 and gravel pits south of Abingdon STW, as well as adjacent to a farm with associated tanks and 150m north of Sutton Wick leachate treatment plant and passes through a historical and now flooded gravel pit. There may be the potential for areas of Made Ground along the route and the tunnel would be bored through Kimmeridge Clay, which may present a risk of hydrocarbon contamination due to potential bituminous content. For Option H, however, the potential to disturb UXO would be low risk and there is a lack of designated geological sites.

5.9.24 Considering landscape and visual impacts, the introduction of infrastructure for Option H could affect the sense of tranquillity along the River Thames and slightly affect the 'openness of the green belt'. The loss of some trees could erode a key characteristic, which contributes positively to the local landscape character. There would be open close-range views from the River Thames National Trail and residential properties on the western edge of Culham Conservation Area. Construction and associated traffic could lead to very noticeable changes to visual amenity of the community on the western edge of Culham, which could be attributed to temporary security lighting and/or night-

time construction. Infrastructure along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the NL. The effect of operational could potentially lead to noticeable changes to the visual amenity of the community on the western edge of Culham. However, Option H would not affect TPOs and views from the NL.

5.9.25 For noise, the closest sample receptor is located approximately 205m away from Option H and is likely to be affected by construction noise from secondary lining activities. The proposed access road construction is approximately 17m and 40m from the closest sample receptors. Construction traffic has the potential to result in adverse effects on properties on The Burycroft, especially Tollgate Cottage. The closest receptor may experience noise during normal operations but, with the implementation of standard control measures, it is anticipated that significant effects would be avoided.

5.9.26 Option H performs well against the pollution criteria as spillages from construction and operation are likely to be readily controlled using standard mitigation.

Community, Planning and Land Performance

5.9.27 The intake/outfall and access road for Option H occupy parts of the Thames Path and would be significantly altered during construction. The intake/outfall and access road are within 500m of homes and a place of worship. Option H performs poorly against the criteria in relation to PRoW opportunities, recreational benefits, and economic incentives. It is also expected that there will be some disruption from traffic and temporary periods of restricted access.

5.9.28 Considering consenting, Option H is partly outside the area safeguarded for SESRO in the VoWH Local Plan but avoids the area safeguarded for the possible future South Abingdon-on-Thames Bypass. It extends construction to the left bank of the Thames, requiring slightly greater overall Order Limits extent, and places above-ground structures in the Green Belt. However, in the overall planning balance Green Belt impacts would to an extent be weighed against the benefit of avoiding development in the flood plain on the right bank of the Thames.

5.9.29 For property and land acquisition, it is assumed that construction via a tunnel boring machine would not detrimentally impact surface uses along the tunnel length, although Option H may impact on Greenbelt land to the east of the Thames and there may be owners of SCL, or owners of land that require special consideration, affected by Option H (such as the VoWH Council and National Highways). The acquisition of subsoil under the River Thames may be problematical. Access to the shaft location, and its operation may give rise to more Category 3 parties compared with Options A, B, C, D, E and F.

6 Intake/Outfall: Preferred Option

This section summarises step 6 of the appraisal methodology to identify a preferred option for the intake/outfall for use in master planning and consultation.

6.1 Comparison of Engineering Performances

6.1.1 For the constructability and operability themes, the two tables below present a comparisons of the intake/outfall options, after their assessment against the appraisal criteria (reported in Section 5) and workshop discussion. The results for each theme are presented as a summary of subthemes.

Table 6.1: Intake/Outfall - Constructability Subtheme Narratives

Subtheme	Narrative
Health and Safety	All options have various health and safety risks due to working next to water in tight areas, with no significant difference in risk level expected between options.
Third Party Impact	The options on the left bank of the river, Options G and H, are preferred as they are close to a main road with a route which would be less disruptive than other options (although they would likely require diversion of Thames Path National Trail during construction). The remaining options on the right bank are significantly further from a main road and would cause more disruption, particularly to the National Cycle Network Route 5.
Logistics	Options B, G, and H have good working areas, whereas the other options are relatively tight working areas. Option G has a short access road requirement, with the site being ~500m from an A-road, while other options are further and require more additional access road construction. Options A and G are expected to have the lowest requirement of imported material, with Options C and H having the highest expected requirements. Options C and D require two separate site locations which would increase haulage distance for construction materials. All options are expected to have a high number of vehicle movements, although Option C is expected to have fewer movements/more space to accommodate them. Overall, Option G is preferable in terms of logistics.
Programme	Option D has the shortest tunnel so would save time on tunnel programme duration and would introduce more float. Options G and H have the longest tunnels, requiring an extra 8 weeks to complete, compared to the other options. These extra weeks may push completion outside the filling season between 1st November and

	31st March, and so for Options G and H the overall programme is extended by 8 months. If the location of the pumping station at the SESRO site can be relocated to avoid the need to divert the existing overhead powerlines at the start of construction, then there is greater confidence that the completion for Options G and H would not need to move into the next filling season. Options C and D have separate sites for the intake/outfall and the tunnel shaft, and so the separate structures could be built concurrently, saving time compared to other options. Options A and F have limited opportunities for programme efficiencies due to tight working areas. For many options, potential access issues may cause programme risk, although Option B is slightly less risky, and Options G and H have significantly less risk in their access plan as access on the left bank is more straightforward. Option C is the only option which reuses an existing asset which is both a risk and opportunity to the programme, given the unknown nature of existing infrastructure and ground conditions in the STW. Overall, Options B and D are preferable in terms of programme.
Construction Complexity	Options B, G, and H require relatively less complex temporary works, while Options A and D have relatively more complex temporary works. Options A, C, D, and H require significantly more complex additional structures compared to other options, with Option B requiring the fewest structures. Option A requires partial filling in of an existing gravel pit, which is a complexity other options avoid. Options B, E, and F require less complex construction techniques than the other options. Options A, C, and D have less favourable terrain than the other options as they require additional earthworks, which also introduces

	complexity to design based on ground conditions and a higher risk of encountering unexpected conditions. Overall, Options A, C, and D are generally less favourable in terms of complexity, while Options B, E, and F are more favourable.
STT	Options D and E have the least challenging STT pipeline connection, due to a shorter diversion pipeline, sufficient space for making connection and good opportunity for a perpendicular connection. They are also on the right bank meaning that the STT pipeline does not need to cross the River Thames. Options A, G, and H have the most complex connection because they are longer than the other options and also for Options G and H, which are on the left bank of the River Thames, the pipeline would need to cross under the river adding to the depth of the pipeline. If STT and SESRO are constructed at different times, then crossing of the SESRO tunnel and STT pipeline may add complexity to all options, except Option F. Overall, Options D and E are therefore more favourable, while Option A, G and H are unfavourable out of the eight intake/outfall options.

Table 6.2: Operability Subtheme Narratives

Subtheme	Narrative
Health and Safety	Option G and H are preferred as they do not have long culverts and are not located in the River Thames flood plain, which may make maintenance access easier/safer compared to other options. However, overall, this criterion is not assessed to significantly differ between options.
Operational Complexity	Operational complexity is not expected to vary significantly between options as all options consider the same intake screen design. Maintenance of options with long culverts (Options C and D) may be relatively more complex.
Operational Resilience	Flooding and flood risk has a big impact on operational resilience and is covered under the Environment Assessment. Options C, D, E, and F are located on the outside of bends so would not expect deposition of suspended solids from the river water in the intake screens, whereas Options B and G are between bends so may

	experience some deposition, and Options A and H are inside bends so deposition would be expected. Option C also makes use of a disused area of the existing Abingdon STW, which is good from a reuse point of view, however it may present risks with unknown ground conditions and the area may be needed in the future. The preferred sites are Options C, D, G and H, as they have the shaft located outside of the flood zone. However, all sites will need to construct the control building so that they are above the flood level to prevent them from being inundated during a flood.
Transport Planning	The two options on the left bank of the Thames, Options G and H, are preferred as they are located closer to a main road (the A415) than the other options on the right bank. Option G and H are located approximately 0.5km and 1.15km from the A415 respectively, both with a good route option for road access. The options on the right bank are less preferred than Options G and H because they are further from a main road, being approximately 2.4km to 3.1km from the B4017, with a route using Peep-O-Day Lane that is likely to cause moderate disruption to the existing road network during operation. The right bank options may however bring an opportunity to improve the existing NCN 5.
Reservoir Water Quality	There is no expected difference between options regarding reservoir water quality.
STT	The most favourable options are Options C, D, E and F, as their locations would mean that the STT pipeline as it approaches the intake/outfall structure is less likely to be buried under a flooded/restored gravel pit or the River Thames, which would be better for maintenance access.

6.1.2 Overall, for Engineering the preferred option is Option B for the following reasons:

- On balance of all engineering subthemes, Option A is overall less preferred compared to Option B since it is considered more complex to construct than Option B, noting that it requires partial filling of an existing gravel pit (a complexity other options avoid).
- Options C and D may offer operational advantages over other options, such as shafts located outside of flood zone 3 and STT pipeline routeing that avoids the flooded gravel pits; however, on balance of all engineering subthemes, Option B is preferred over Options C and D because these options are considered more complex to construct with less favourable terrain, more complex additional structures, more complex construction

techniques and for Option D more complex temporary works. Also, in terms of operability, an option which contains all structures in one location (intake, outfall, and shaft) is considered preferable.

- Compared to Options E and F, Option B provides sufficient space to construct the intake, outfall, and shaft (whereas the other right bank options have relatively tight working areas). Option B also requires less complex temporary works and construction of a shorter extension for the STW outfall and of the fewest structures. It is noted that for right bank options, potential access issues may cause programme risk, except that Option B is a preferred option for programme, carrying less overall programme risk. Access to Option B can be routed to avoid residential areas, although like all right bank options it will impact on the NCN Route 5 during construction. Therefore, on balance of all engineering subthemes, Option B is preferred over Options E and F.
- Options G and H may offer advantages over Option B (and the other options) due to the fact that they are located on the left bank with more straightforward access and the majority of construction out of flood zone 3; however, on balance of all engineering subthemes, Option B is preferred over Options G and H because if the SESRO pumping station cannot be relocated (to avoid overhead power cables), their longer tunnel lengths require a longer tunnelling programme, which carries a high risk of missing a filling season. Options G and H would also require a complex crossing of the River Thames should STT need to connect to the intake/outfall structure, whereas Option B would provide a good location to connect STT into the shaft of the intake/outfall structure without the need to extend the pipeline like other options.

6.2 Comparison of Cost and Carbon Performances

6.2.1 For the cost and carbon theme, the table below presents a comparison of the intake/outfall structure options, after their assessment against the appraisal criteria (reported in Section 5) and workshop discussion.

Table 6.3: Intake/Outfall - Cost and Carbon Subtheme Narratives

Subtheme	Narrative
Cost	From initial high-level estimates, Options A, E and F have the lowest capital cost so would be preferred under this criterion. Options G and H have the highest capital costs so would be least preferred. However, the range in costs for intake/outfall options represent <0.5% of total SESRO costs so none of the costs are considered to be disproportionate in comparison with the other options such that one option is an unreasonable preference, if it performs well in the other subthemes. Cost is therefore not seen as a material differentiator between options when identifying a preferred option.

Carbon	From initial high-level estimates, Options A and B have the lowest capital carbon emissions so would be preferred under this criterion. Options C and D have the highest capital carbon emissions so would be least preferred. However, for the same reasoning as with cost, carbon is not considered to be a material differentiator between options at this stage.

6.2.2 Overall, the range between the options for initial cost and carbon estimates is small in comparison to the overall project costs and carbon. Therefore, cost and carbon are not currently considered as material differentiators in the assessment of options for the intake/outfall structure.

6.3 Comparison of Environmental Performances

6.3.1 For the environmental performance theme, the table below presents a comparison of the SESRO intake/outfall structure options, after their assessment against the appraisal criteria (reported in Section 5) and workshop discussion. The subtheme narratives in the table consider options during both construction and operation.

Table 6.4: Intake/Outfall - Environmental Subtheme Narratives

Subtheme	Narrative
Air Quality	All route options for the intake/outfall are located further than 1km from Marcham AQMA and Abingdon AQMA. In relation to construction there are no proposed dust generating activities that could not be managed using normal good practices to prevent significant effects. Given that relatively low numbers of plant and vehicles would be used during both construction and operation, there would likely be a negligible change in air quality. Air quality is not a material differentiator.
Aquatic Environment	Options A, B, C, D, E, G and H will all have a similar impact on the aquatic environment and will result in the loss of 38 m of riverbank. Option F will have a similar impact, but the proposed access road means that a tributary of the River Thames, in the Thames (Evenlode to Thame) WFD waterbody, will also be impacted by the project. All impacts can be mitigated, but a larger amount of mitigation is needed for Option F and there are uncertainties about where and how this is delivered at this stage. In terms of sedimentation risks, Options A and H have the greatest sedimentation risk due to being located near the inside of a river bend where sediments are most likely to accumulate naturally. There is some sedimentation risk for Options B, C, D and E as these

	are all located in a straighter section. Risks are low for Option F due to being located on the outside of a river bend where sedimentation is less likely to occur.
Biodiversity and Nature Conservation	Option E and F are the least preferred as the intake/outfall would affect floodplain and coastal grazing marsh priority habitat. Options A, B, C, D, G and H would remove limited areas of habitat along the Thames, and all have similar effects.
Biodiversity and Nature Conservation and Landscape	Option A, B, C, E, F and H would require the removal of vegetation along the River Thames potentially including some grade A or B trees. Option D and G are preferred as few, if any, trees will need to be removed.
Flood Risk	All sites include construction within flood zones 2 and 3, will require a flood risk assessment, replacement flood storage and to meet the requirements of the Sequential Test. The preferred sites are Options C, D, G and H, as they have the shaft located outside of flood zone 3 (see Table 4.1). However, all sites will need to construct the shafts so that they are above the flood level to prevent them from being inundated during a flood. The benefits of having the site located on the east bank and outside of the flood zone 3 completely or partially (Options G and H) is that access to the site may be maintained during a flood.
Historic Environment	All options affect the setting of a scheduled monument, Grade II or II* listed buildings and the Culham Conservation Area. Option H may also result in the loss of known archaeology on the east bank of the River Thames. Option H is marginally least preferred, otherwise historic environment is not a material differentiator.
Land Quality	Option A, D, E, F, G and H pass beneath or within 100m of the Sutton Town Park historical landfill or the Sutton Wick No.1 landfill and, therefore, there may be significant risks associated with disturbance of contaminated materials. Options B and C are more distant from these landfills so are preferred. Other sources of contamination and UXOs are not material differentiators.
Landscape and Visual	All options could result in open close-range views from the River Thames and Thames Path National Trail and some residential properties on the north-west edge of Culham, aside from Option F which would also have views from a Registered Park and Garden (RPG). All options could lead to the loss of some trees which could erode a key characteristic which contributes positively to the local landscape character.

	All options could affect the sense of tranquillity along the River Thames, and Options G and H infrastructure could also affect the 'openness of the green belt' as well as the potential for construction and associated traffic to lead to noticeable changes to the visual amenity of the community on the western edge of Culham. Options F, G and H are least preferred due to greater effects on the local landscape character. Of these, Option H is least preferred due to effects on visual amenity on the western edge of Culham during construction. Of the other options A, C and D are preferred due to limited effects on visual amenity during operation.
Noise	Option F is preferred due to its relatively long distance to sensitive receptors. Options A, G and H are least preferred as they are relatively close to sensitive receptors.
Pollution	No significant effects identified as spillages can be controlled through standard good practice. Therefore this sub-theme is not considered to be a material differentiator.

6.3.2 Overall, the following options are least preferred from an environmental perspective:

- Option G and H due to their impact on 'the openness of the greenbelt' and Thames Path
- Options E and F due to their impact on coastal grazing marsh priority habitat
- Option A, G and F as they pass beneath Sutton Town Park historical landfill or the Sutton Wick No.1 landfill. Options D, E and H pass within 100m of these landfills.

6.3.3 Therefore, from an environmental perspective, Options B and C are preferred.

6.4 Comparison of Community, Planning and Land Performances

6.4.1 For the community, planning and land theme, the table below presents a comparison of the intake/outfall options, after their assessment against the appraisal criteria (reported in Section 5) and workshop discussion.

Table 6.5: Intake/Outfall - Community, Planning and Land Subtheme Narratives

Subtheme	Narrative
Socio-Economic	Options A, B, C and D will likely result in the disruption of the National Cycle Network 5 during construction. The access road for Options G and H will occupy parts of the Thames Path and would significantly alter this during construction. Options E and F are preferred as these options pose the least disruption to NCN 5.

Consenting	Overall, Options D and E are preferred due to being consistent with the existing safeguarded area for SESRO infrastructure and avoiding potential conflict with the possible future South Abingdon-on-Thames Bypass in the existing Local Plan to 2031, albeit this area is extended to affect more options in the emerging draft Local Plan to 2041 and described as the Southern Abingdon Movement Corridor that may encompass non-road options. Of Options D and E, there is potentially a slight benefit to Option D in it locating the control building on the previously developed Oday Quarry site rather than on the riverbank. Options G and H on the left bank of the Thames are not preferred overall due to the extended Order Limits and above-ground development required in the Green Belt. Options A, B and F are the middle-ground: these also lie outside the safeguarded area for SESRO, Option A has possibly greater potential to conflict with the possible future South Abingdon-on-Thames Bypass and hypothetical location of a river crossing, and Option F lies in the Green Belt.
Property and Land Acquisition	For all options, two SCLs may be affected. Considering that the majority of the land requirement will comprise subsoil, Options B, C, and E, are all assessed to have limited impact upon the land. Options F, G and H have been graded the most negative due to the impact of the location of the outfall extension impacting an area designated as Green Belt. The initial and indicative alignments for the tunnel routes of options A and G could, potentially, pass under the north edge of an area of existing residential development with open space for sports/play area, north of Barrow Road. This could hypothetically have the risk of affecting a proposed residential development through the application of a surface level exclusion zone.

6.4.2 The comparisons in Table 6.5 are summarised below:

- Socio-economic: Options on the right bank are generally preferred as Options G and H on the left bank impact on the Thames Path, a National Trail. Of the options on the right bank, Options E and F are preferred with regards to the community as they pose the least disruption to National Cycle Network Route 5.

- Consenting: Options D and E are preferred as they lie within the safeguarded area for SESRO and avoid the area safeguarded for the possible future South Abingdon-on-Thames Bypass in the existing Local Plan to 2031, albeit this area is proposed to be extended and potentially encompass non-bypass options in the emerging draft Local Plan to 2041.
- Property and Land Acquisition: Options B, C, and E are all preferred as they are considered to have a limited impact upon the land whereas Options F, G and H are within Green Belt.

6.4.3 It would be difficult to demonstrate Very Special Circumstances to justify locating an above-ground intake/outfall and associated structures in a Green Belt area if alternatives are available. This would need to be weighed against policy to locate development outside flood zones, subject to the Sequential Test and Exception Test, as the right-bank options are in flood zone 3 locations. The specifics of this balance would depend on details of design i.e., the extent of above-ground development required and the degree to which it falls within the definition of 'water compatible development' expressed in Annex 3 of the NPPF.

6.4.4 Overall, the preferred option across Community, Planning and Land is Option E because it appears favourable for each of the subthemes; however, it is not necessarily a clear favourite amongst the options.

6.5 Confirmation of Preferred Option for the intake/outfall structure

6.5.1 The outcome from the assessment and workshop for the intake/outfall structure is that the preferred location is Option B.

6.5.2 For Engineering, Option B is the preferred option as it provides sufficient space during construction, it requires fewer structures and less complex construction techniques, and it has one of the shorter tunnel lengths, leading to less programme risk.

6.5.3 Option B is mid-performing in terms of capital costs, however the variance in option costs are low when compared to the project costs so costs are not considered to be a material differentiator to option selection.

6.5.4 For Environment, Options B and C are preferred primarily for Land Quality as there is little risk of landfill disturbance and their effects on other issues are relatively limited, however, there are few subthemes within Environment that are material differentiators between the options. It should be noted that B and C are within flood zone 3, although the shaft for Option C is located within the Abingdon STW and therefore outside of flood zone 3.

6.5.5 For Community, Planning and Land Option E is preferred as it appears favourable for each of the themes, however, it is not necessarily a standout favourite.

6.5.6 Overall, when discussed at the appraisal workshop Option B was deemed to be

the preferred option as it performs moderately well across all themes, particularly for engineering and constructability.

6.5.7 It should be noted that, Option B is considered to be the preferred option regardless of which emergency discharge option is selected. This is due to the fact that the appraisals of the intake/outfall options are not impacted by the emergency discharge options.

7 Emergency Discharge: Constraints on Option Definition

This section sets out the constraints on option development for the emergency discharge in accordance with step 2 of the appraisal methodology.

7.1 Emergency Discharge Purpose

7.1.1 It is necessary for the design of SESRO to include infrastructure to enable the water level in the reservoir to be lowered quickly, as an emergency response to the very unlikely situation of a defect being identified within the dam structure. Water removed from the reservoir needs to be conveyed to a watercourse with sufficient hydraulic capacity to safely receive this flow during normal conditions. The only watercourse with sufficient capacity within the vicinity of the SESRO is the River Thames.

7.1.2 A required drawdown rate has been determined for the SESRO taking cognisance of national guidance on this subject, namely 'Guide to Drawdown Capacity for Reservoir Safety and Emergency Planning – Volume 1 (2017)' published by the EA. Thames Water standards have also been considered. The drawdown rate adopted for use in designing the SESRO to date is 1m drop of reservoir level per day starting at Top Water Level, for a minimum period of 5 days. This rate reflects the practical maximum drawdown rate identified in the guide.

7.1.3 Given the surface area of the reservoir this water level drop rate equates to an emergency discharge flow of 75m^3/s. This is the flow which needs to be safely conveyed to the River Thames. Table 7.1 shows a breakdown of the discharge flow calculation.

Table 7.1: Emergency Discharge Rate

Key Requirement	Value
Surface area of reservoir	6.5km^2
An upper cap on practical drawdown rate	1m/day
Volume of water to be released in a day: **6.5km^2 x 1m/per day**	6,500,000m^3
Volume of water to be released in an hour: **6,500,000m^3 / 24 hrs**	270,833m^3/hr
Volume of water to be released in a second: **270,833 / 3600 seconds**	75m^3/s

7.1.4 In the Gate 2 indicative design[16], the emergency discharge was achieved by:

- 30m^3/s via the intake / outfall conveyance tunnel
- 45m^3/s via an ADC – consisting of siphons and a surface channel.

7.2 High-Level Configuration

7.2.1 In simple terms, the following configurations may facilitate the emergency discharge to flow from the reservoir to the River Thames:

- Subsurface Tunnel – As described in Section 3.1, a tunnel is required between the reservoir and River Thames to fill the reservoir and release water from the reservoir back to the river in normal operation. During previous SESRO design work it was established that the tunnel could be configured to also discharge a proportion of the emergency flow to the river. Therefore, a tunnel was included as part of the emergency discharge arrangement in the Gate 2 concept design and is considered to be an embedded element of the emergency discharge arrangements. Option definition focusses on the volume discharged through this route.
- Combined Tunnel and Surface Channel – A channel could be constructed to convey a proportion of the emergency flows in combination with the tunnel, using cuttings or by forming embankments. The Gate 2 concept design included a navigable channel that would facilitate future reconstruction of the Wilts & Berks Canal. As described above, because a tunnel is required for operation of SESRO it shall form at least part of the emergency discharge, therefore a surface only emergency discharge is not considered within this study.

7.2.2 Based on the above, for the emergency discharge, this study develops and appraises a subsurface (tunnel only) option as well as a combined tunnel and surface channel option. The options are defined for appraisal in Section 8 of this report. The following section considers the constraints for both surface and subsurface configurations.

7.3 Surface Constraints

Spatial Constraints

7.3.1 Given the location of the reservoir, the preference to discharge to Reach 4 of the River Thames as described in Section 3.2 and the quantum of flow that needs to be discharged to the River Thames in an emergency, any surface channel between both will need to be routed north of Drayton and south of Abingdon.

7.3.2 There are a number of flooded gravel pits adjacent to the River Thames in this

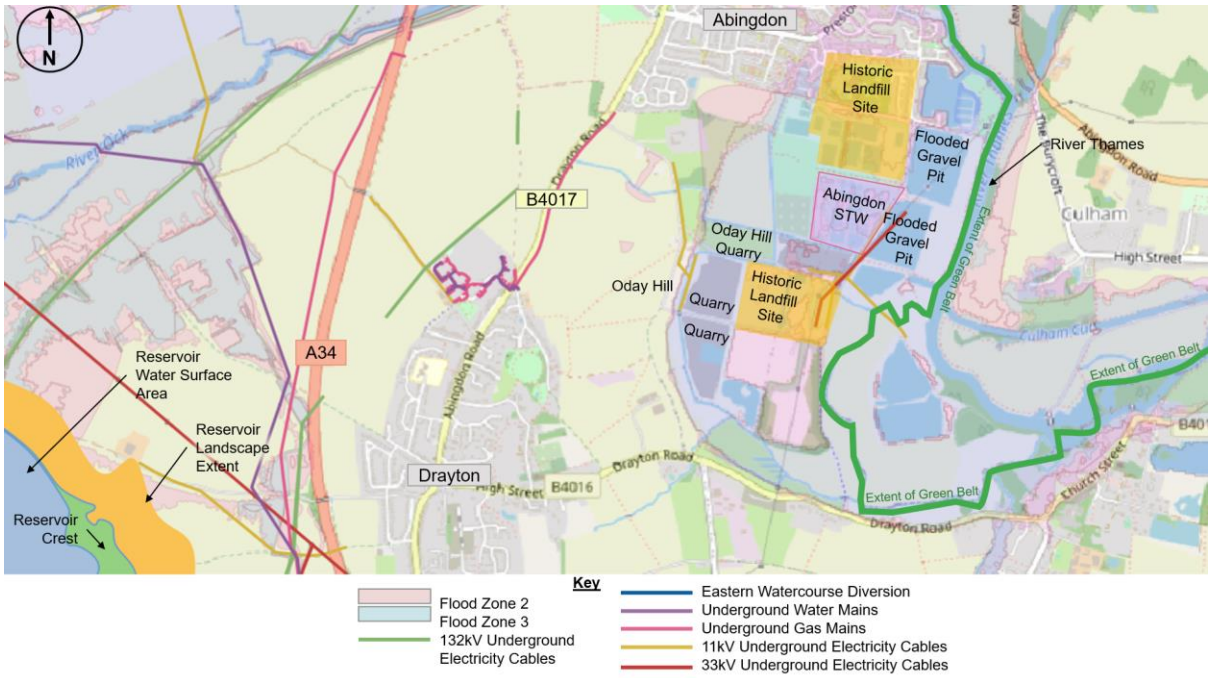
[16] SESRO Gate 2 Submission, Supporting Document A-1: Concept Design Report. Available online at: https://www.thameswater.co.uk/media-library/home/about-us/regulation/regional-water-resources/south-east-strategic-reservoir/gate-2-reports/A-1---SESRO-Concept-Design-Report.pdf

area, as shown in Figure 7.1. Gravel pits between Oday Hill and the river are still being worked (in 2023) and the quarry owner is expected to repurpose these pits into lakes when gravel abstraction finishes, with the restoration process set to commence from 2023/24. On this basis it is assumed that these pits will be established as lakes or ponds when SESRO is constructed; however, this is not considered to form a constraint to surface channel route identification, rather the impact of any options that route through the gravel pits will be considered in the option appraisal.

7.3.3 Figure 7.1 shows the locations of historical landfill areas in the vicinity of emergency discharge channel alignment. These were present before the 1974 Pollution Control Act, and so it is possible that they are not in line with modern landfill standards with potential contamination in the surrounding ground. It may be possible to construct through landfill with remediation (which introduces increased cost, construction complexity and health and safety concerns); however, they have been treated as constraints for the purpose of initial surface channel route selection and a route through them will only be considered if no other options are available after option identification and assessment.

Figure 7.1: Emergency Discharge Constraints

Note: The full extent of the existing utilities is not shown on this figure.



Source: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri. Mott MacDonald, 2023.

Surface Channel Constraints

7.3.4 It would be possible to develop a surface channel for emergency discharge that is either navigable or unnavigable; a continuous navigable channel has been assumed for initial assessment for the following reasons:

- A surface channel would be a sizable piece of infrastructure irrespective of whether it is suitable for boat traffic. Any surface channel option would have engineering complexity, land take and environmental impact that would not be present in a tunnel only option. A navigable channel has the greatest potential for socio-economic and environmental benefit. It is noted that there would be little difference in the infrastructure required (and therefore impact) to develop an open channel solution regardless of navigability as described further below.
- A surface channel (either navigable or unnavigable) connecting the reservoir to the River Thames would need to cross the alignment of two roads, the A34 and the B4017, and at these locations bridges or culverted crossings would be required. The construction of a bridge or culvert crossing would require temporary or permanent alteration to the alignment of the A34 and need approval from National Highways. The alternative would be to have an unnavigable underground pipeline section to transfer water under the A34 and possibly the B4017, which would not provide an open channel connection for the full route between the SESRO site and the river. It would also remove the opportunity for active travel from the river to the SESRO site along a towpath.
- A navigable channel would utilise locks to accommodate the level changes between the SESRO site and the river. A non-navigable channel would need a similar solution to the level changes albeit without the lock chambers. If no allowance was made in the design for locks to be installed either as part of the project or by others at a later date, then it would potentially prevent the channel from being used in any future reconstruction of the Wilts & Berks Canal.

7.3.5 For this study, initial option identification and assessment will focus on surface channel options with full connectivity from the river to the SESRO site and navigation. This allows the maximum impacts and benefits to be compared with a fully underground tunnel solution. Following the assessment, the potential for hybrid solutions (partially above ground and partially below) to change the outcome of the assessment will be reviewed in the consideration of the preferred option.

Existing Utilities

7.3.6 Numerous utility services, including an underground potable water trunk main, intermediate pressure gas mains, and electricity cables of 33kV, 11kV, and 132kV, are situated between the reservoir and the River Thames, as shown in Figure 7.1. Several of these utilities will require some level of diversion to allow for a surface channel between the reservoir and the River Thames.

Topography Constraints

7.3.7 Regardless of the route, any surface channel between the reservoir and River Thames will pass through the River Thames floodplain and impact the flooding

mechanisms in the area. This has been considered further and is reported in Section 8 Emergency Discharge – Options for Assessment.

7.3.8 Any surface channel between the reservoir and River Thames is likely to be routed through the north side of Oday Hill. It is noted that the levels in this area are approximately 10-12m higher than the surrounding existing ground levels, and because of this, any section of channel east of the A34 needs to be formed using a cutting, as opposed to embankment fill further upstream.

7.3.9 The Oday Hill quarry is currently operational as a quarry but is expected to be restored before the SESRO project is developed. The extant planning permission for an extension to Oday Quarry approved in February 2023 (OCC ref. MW.0104/20; VoWH ref. P20/V3206/CM; replaced through s.73 by MW.0170/23 to authorise an extension of time to March 2024) contains Condition 7 requiring a restoration plan that does not prejudice the SESRO project or the Wilts & Berks Canal. Thames Water withdrew its objection to the quarry permission on that basis and did not object to the s.73 application. The restoration plans approved for the quarry under condition discharge application MW.0038/23 include converting the existing quarry into a waterbody with surrounding planting and a channel for the potential Wilts & Berks Canal. Thames Water commented on those plans to request further design information and in due course 'as built' details in order to inform design decisions relating to the potential use of this channel as part of the ADC.

7.3.10 The same considerations for Oday ditches were applied to the emergency discharge as outlined for the intake/outfall structure in Section 3.2.

7.4 Subsurface Constraints

Spatial Constraints

7.4.1 For subsurface tunnel solutions, like surface solutions, they should ideally avoid areas of high contamination risk associated with historical landfills. This is likely to be more pertinent at subsurface level because surface contamination can potentially be treated or cleared after visual inspection. However, at subsurface level, it may be less obvious to track the extent of contamination from leachate meaning there is potential to drive tunnelling through and creating new pollutant pathways and spreading contamination, which if the leachate is hazardous also has health and safety implications to tunnel driving operatives. The risk is that tunnelling can enable pathways for leachate and enable contamination to spread to other strata, especially water bearing strata.

7.4.2 Subsurface options should avoid being routed below existing structures where possible. Future development above the tunnel after its construction is possible but the foundation design of any structures must not adversely affect the tunnel. Residential developments would be usually fine in this case, but structures with a higher load, such as multistorey buildings or bridge abutments should be avoided or would need to be checked for their potential impact on the tunnel if proposed in the future. However, at present there are no proposals for such

structures in the vicinity of the potential tunnel alignments.

Existing Utilities

7.4.3 Information on the existing utilities is detailed in Section 7.3 above.

Topographic Constraints

7.4.4 Tunnelling options need to consider the minimum cover depth. In particular, the existing ground level gets lower towards the River Thames, and this is considered in development of the tunnel options.

7.4.5 It is acceptable for tunnels to be located through areas of floodplain, but it is noted that control buildings associated to the intake/outfall shaft should be located above the flood level in order to keep the equipment dry during a flood event.

Geological Constraints

7.4.6 The geological composition of the area encompassing the proposed channel and conveyance tunnel primarily consists of Corallian rock situated beneath the tunnel, with the tunnel itself embedded within Kimmeridge Clay, see

7.4.7 Figure 3.1. The tunnel should remain within the Kimmeridge Clay strata with sufficient cover above and below to avoid difficulties with cutting through the Corallian rock aquifer (consisting of beds of limestone and sandstone). Tunnelling through this layer would have the potential to impact the groundwater. If water pressure breakthrough from below is encountered during tunnel driving, this would also present a health and safety risk and although sufficient clay cover will help to mitigate this risk, it remains due to the uncertainty of strata level.

8 Emergency Discharge: Options Definition

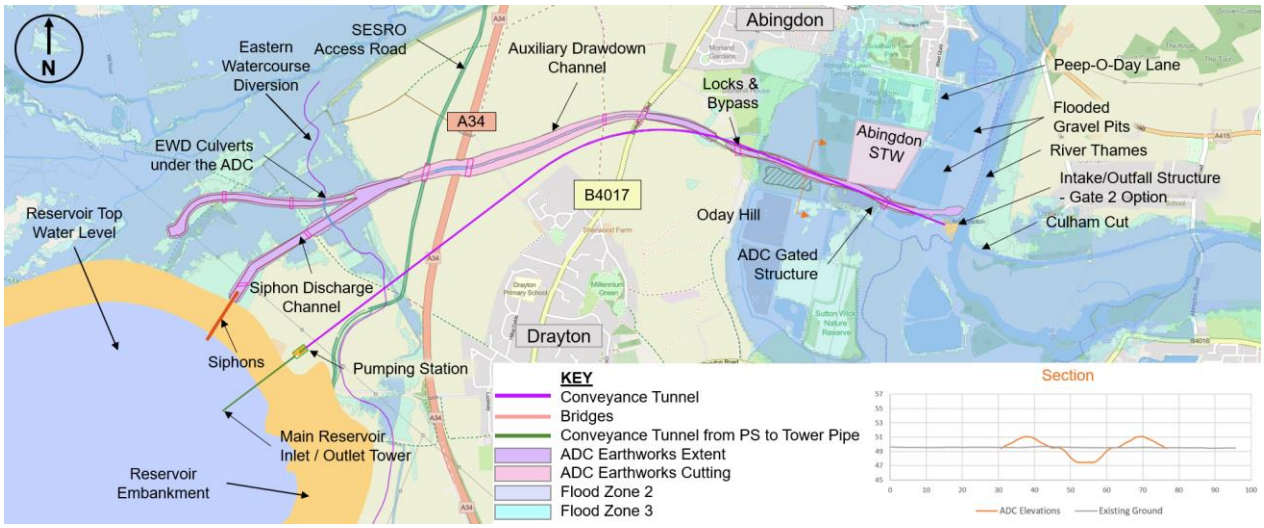
This section summarises the options developed for the emergency discharge for assessment in accordance with step 4 of the appraisal methodology.

8.1 Emergency Discharge Option A

8.1.1 Option A, as shown in Figure 8.1, was developed as part of the SESRO preliminary design concept (2006-2009) and included in the SESRO design at Gate 2. It consists of two components for discharging flows from the reservoir during emergency events:

- The ADC which consists of a surface channel capable of transferring 45m^3/s to the River Thames via gravity to the outfall structure. When not in operation, the channel is navigable by canal boats. Emergency discharge flows are discharged into the head of the channel via an array of large siphon pipes buried in the crest of the reservoir perimeter embankment.
- A conveyance tunnel, capable of transferring 30m^3/s via gravity to the River Thames outfall structure as part of the emergency discharge.

Figure 8.1: Emergency Discharge Option A – ADC and Tunnel



Source: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri. Mott MacDonald, 2023.

8.1.2 The ADC includes a box culvert to allow the channel to pass below the A34, as well as locks and a footpath along the channel to allow recreational use and to form the eastern end of a potential reconstructed Wilts & Berks Canal.

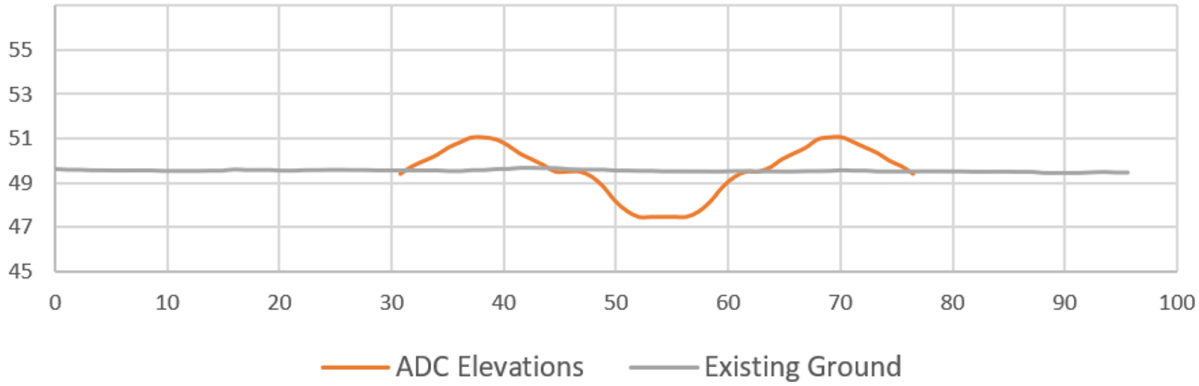
8.1.3 The design at Gate 2[17] included levees either side of the ADC channel (where not in a cutting through Oday Hill) to allow the water level to rise above normal pound level and be contained during an emergency drawdown scenario.

[17] SESRO Gate 2 Submission, Supporting Document A-1: Concept Design Report. Available online at: https://www.thameswater.co.uk/media-library/home/about-us/regulation/regional-water-resources/south-east-strategic-reservoir/gate-2-reports/A-1---SESRO-Concept-Design-Report.pdf

However, some of these levees were in the flood plain of the River Thames, shown in Figure 8.1 and Figure 8.2.

Figure 8.2: Emergency Discharge Option A Levees

Note: The section shows the Option A levees above the existing ground within the River Thames flood plain, approximately 3.4km from the reservoir.



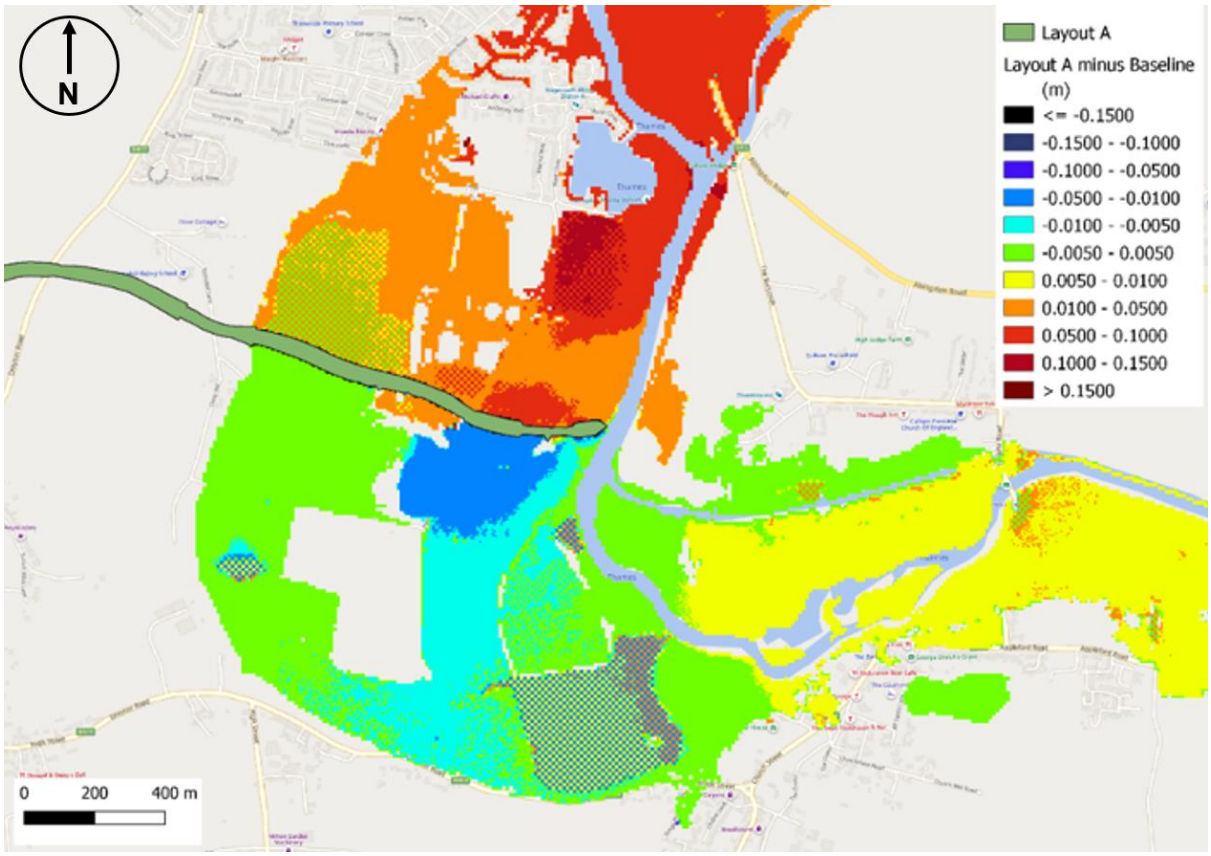
Source: Mott MacDonald, 2023.

8.1.4 At Gate 2 it was identified that the construction of the ADC with raised levees has the potential to impact flooding, so flood modelling was subsequently undertaken to consider and quantify the potential impact of levees along the ADC.

8.1.5 A River Thames fluvial flood model was obtained from the EA – this model was used to establish the baseline fluvial flood extents / depths in the flood plain. The levees for the Gate 2 design of the ADC were then built into the River Thames fluvial flood model, and the model was re-run to investigate how the fluvial flood extents / depths could be impacted by the presence of the ADC levees. Figure 8.3 shows that effect of the levees on flooding depth during a 1 in 100year (+ climate change) flood event. This shows that depth of flooding to the north of the ADC levees increases – and therefore the inclusion of such levees in the Thames floodplain would increase flood risk in Abingdon.

Figure 8.3: Emergency Discharge Option A – Extent of Additional Flooding

Note: Units are change to flood depth during 1 in 100 year + climate change event, in metres



Source: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri. Mott MacDonald, 2023.

8.1.6 The increase in flooding was deemed unacceptable[18] and so Option A has been excluded from the full assessment, and the concept of Option A was developed into Option B.

8.2 Emergency Discharge Option B

8.2.1 Option B consists of both the ADC and conveyance tunnel, as per Option A and capable of transferring the same flows in an emergency as Option A.

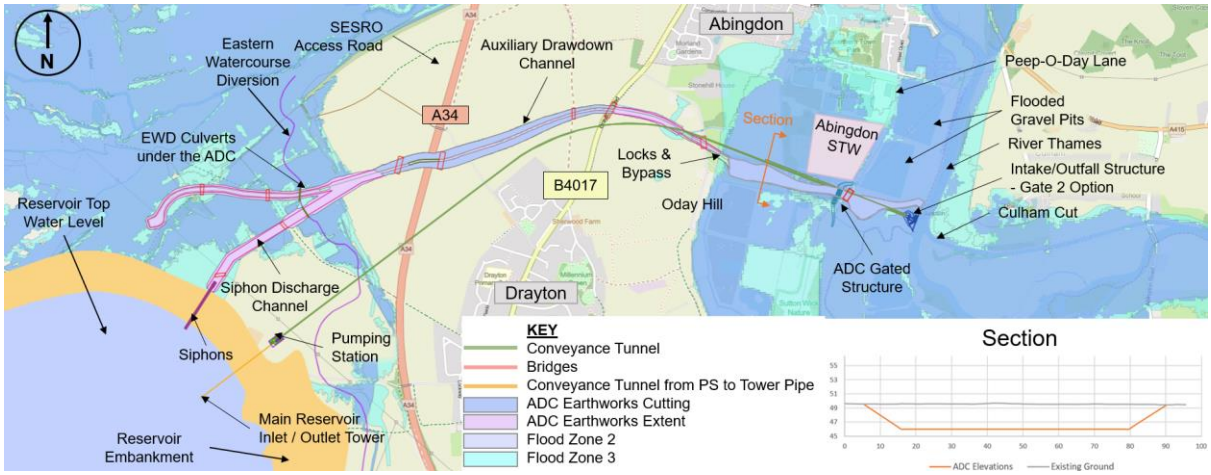
8.2.2 In an emergency discharge scenario, the ADC would need to be evacuated before any discharge commences. Once the channel is evacuated, discharge from the siphon pipes would commence, and then flow would be transferred from the reservoir to the siphon discharge channel, a straight channel with sloped embankments, which feeds into the ADC to carry emergency flow to the River Thames. The siphons would be operated in sequence to build up the flow in the channel.

[18] Based on the Design Manual for Roads and Bridges (Volume 11.3.10: Road Drainage and the Water Environment) a significant increase in flood level for housing is 0.01m and farmland 0.05m.

8.2.3 The concept for the ADC developed during the early stages of Gate 3 is the same as Option A apart from where the ADC passes into the River Thames floodplain to the east of Oday Hill, see Figure 8.4:

- The channel becomes wider and deeper to increase discharge capacity without levees and to align better with plans for gravel pit restoration (which has received planning permission).
- The levees from Oday Hill to the River Thames are removed, to remove their potential impact on River Thames flooding, see the section on Figure 8.4. The design means that in an emergency discharge scenario, water in the downstream section of the ADC would enter the River Thames floodplain.
- A gated structure is introduced close to Peep-O-Day Lane to prevent River Thames flooding from passing back up the ADC, which would otherwise adversely affect the performance of the floodplain during fluvial events, resulting in increased flood levels during extreme events.
- As with Option A, the ADC is to be navigable and will have footpaths running alongside it to allow recreational use.

Figure 8.4: Emergency Discharge Option B – ADC and Tunnel



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8.2.4 For the tunnel to discharge in an emergency, the large flow is controlled using specialist discharge valves housed within the underground pumping station. The water level in the reservoir will be higher than the River Thames so there will be enough head to drive the emergency flow up to 30m^3/s out of the wet well, down the conveyance tunnel, up through the intake/outfall shaft and into the River Thames via the outfall structure.

8.2.5 The conveyance tunnel for Option B consists of two parts, as shown in Figure 8.5 including:

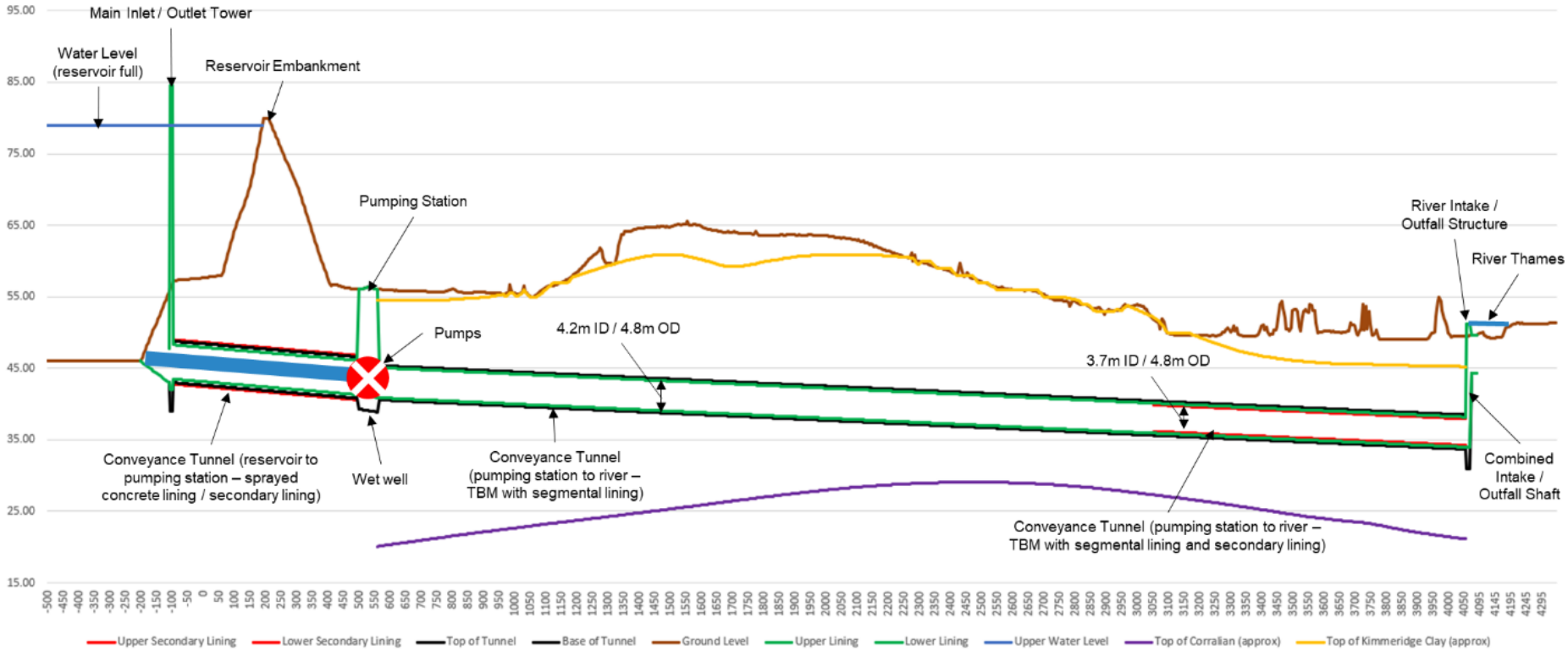
- Approximately 475m of tunnel between the Main Inlet/Outlet Tower within the reservoir and the pumping station wet well. The section of tunnel

crosses below the reservoir embankment and is likely to require a secondary lining. It is 'dry' so that it may contain a pipeline inside to convey flows between the reservoir and the wet well. The tunnel would also contain several services, ducts, and operations access.

- Approximately 3,650m of 4.8m outer diameter segmentally lined tunnel between the pumping station wet well and the intake/outfall structure. The tunnel requires a secondary lining in the final 1,000m because the Confinement Pressure Ratio is insufficient due to decreasing ground cover and Kimmeridge Clay level.

Figure 8.5: Emergency Discharge Option B Longitudinal Section

Note: The figure is the longitudinal section showing the tunnel for Option B.



Source: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri. Mott MacDonald, 2023

8.3 Emergency Discharge Option C

8.3.1 Option C does not include the ADC and instead utilises the conveyance tunnel alone to transfer 75m^3/s to the River Thames in an emergency, as shown on Figure 8.6 below.

Figure 8.6: Emergency Discharge Option C – Tunnel Only

Source: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri. Mott MacDonald, 2023

8.3.2 The larger diameter tunnel includes the same components and operates the same way in an emergency as the tunnel described for Option B, however instead of discharging to the ADC, the siphons transfer the 45m^3/s directly into the pumping station wet well.

8.3.3 The section of tunnel which passes beneath the embankment between the Main Inlet/Outlet Tower within the reservoir and the pumping station wet well is the same as described in 3.1 for Option B.

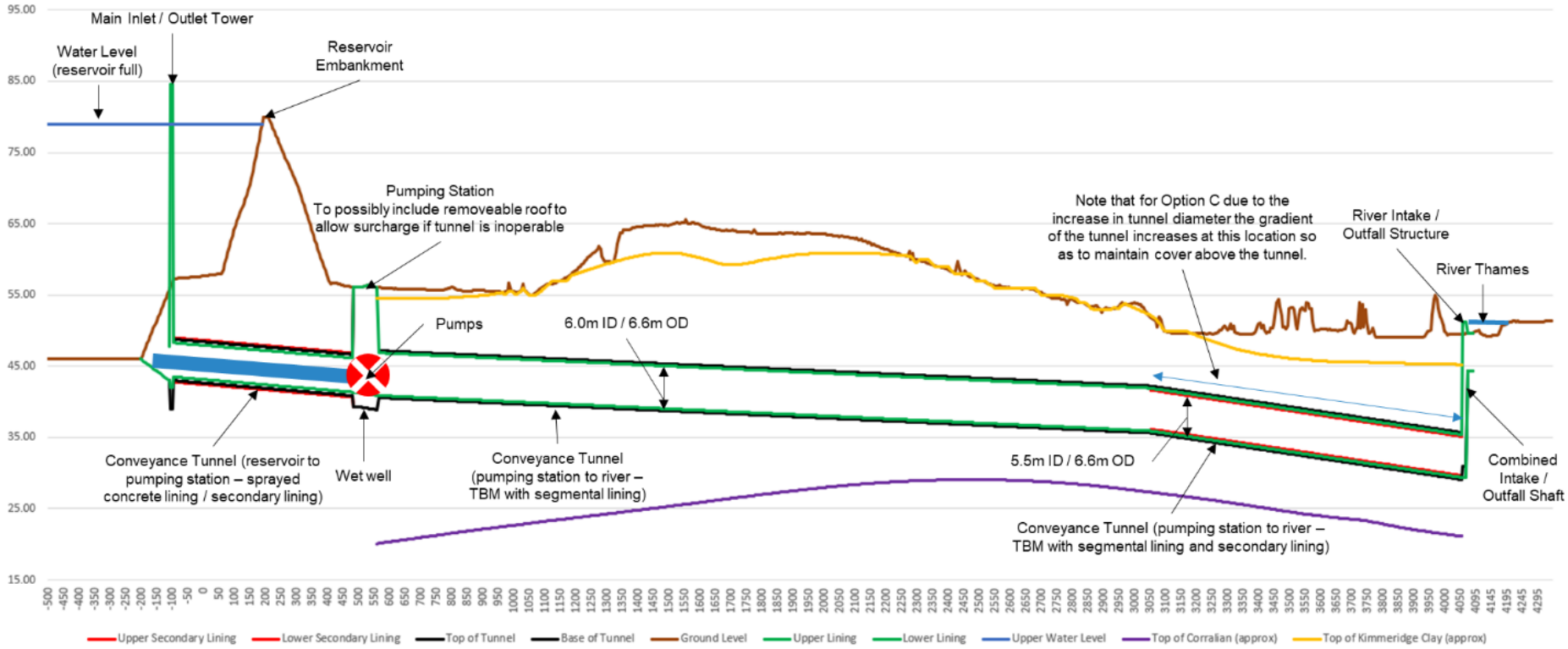
8.3.4 The following differences in key dimensions are noted between Option B and Option C:

- The intake/outfall shaft size increases from an internal diameter of 11.7m for Option B to 16.7m for Option C – this is driven by the need to remove a larger TBM from the shaft upon completion of the conveyance tunnel bore.
- The outfall structure size increases as the length of the outfall weir increases to be able to handle the increased volume of discharge.
- The conveyance tunnel between the pumping station wet well and the intake/outfall shaft is 4.8m outer diameter for Option B and 6.6m outer diameter for Option C.
- The gradient of the tunnel for Option C increases over the final 1,000m as it approaches the intake/outfall shaft to maintain cover above the tunnel, as shown in Figure 8.7.

- Like Option B, the section of tunnel still requires a secondary lining because the Confinement Pressure Ratio is insufficient due to decreasing ground level and Kimmeridge Clay level.
- The pumping station wet well increases approximately 33% in length between Option B and Option C. This is due to the need for more space to enable the siphons to discharge into the pumping station wet well.
- The number and size of intake screens does not differ between Option B and C.

Figure 8.7: Emergency Discharge Option C Longitudinal Section

Note: This figure is the longitudinal section showing the tunnel for Option C.



Source: Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri. Mott MacDonald, 2023

9 Emergency Discharge Options Assessment

This section summarises the option assessments undertaken for the emergency discharge in accordance with step 5 of the appraisal methodology. The section starts by outlining the assumptions taken in the assessments, before individually summarising the performance of each emergency discharge option when assessed.

9.1 Options for Assessment

9.1.1 As described in Section 8, only Options B and C have been taken through to full assessment, Option A was discounted and developed into Option B ahead of the appraisal assessment.

9.2 Assessment Assumptions

9.2.1 This Section sets out the assumptions used in the assessment of emergency discharge options, future changes in assumptions should be reviewed for any potential effect on the outcome of the options appraisal. Section 1.3 earlier in this report outlines the backchecking planned for the options appraisals work.

Engineering Assessment Assumptions

9.2.2 The engineering assessment was considered in two themes: Construction and Operation. The following assumptions informed the assessment:

9.2.3 Auxiliary Drawdown Channel (ADC)

- It is assumed that the ADC does not require the import of material for constructing the sections which require embankments.
- Where the ADC alignment crosses the A34 and B4017, it is assumed that these can be achieved and, after further design work, would be accepted by the relevant highway authority. The crossing of the ADC under the A34 is assumed to require a culvert structure under a permanent diversion of the A34.
- For the gated structure which prevents flooding from the River Thames entering the ADC, it is assumed a local section of the ADC can be narrowed to approximately 25m so that flood gates (type to be specified) can be installed.
- It is assumed that it will be possible to route the Eastern Watercourse Diversion under the ADC through culverts, but this would need to be in the location shown due to the hydraulic attributes of both assets.
- Regarding the programme, earthworks and bird nesting calendars have been used to develop the programme. It is assumed that access to construct the ADC is via the access road from Marcham Road (A415). Initial work includes diverting an intermediate pressure gas main to the west of the A34 that will enable the diversion of the A34, it is assumed that the gas main diversion will be able to start once a haul road has been created. Once the

A34 diversion is complete, an underpass can be constructed beneath the A34 along the alignment of the ADC which will enable access to construct further structures (such as bridges) to the east of the A34 on the B4017 and Stonehill Lane. These will then enable the ADC to be constructed under the A34 to the River Thames. No allowance has been made for any utility diversions on the B4017 and Stonehill Lane, as it has been assumed that any required diversions would take place during the period when the works on the A34 diversion take place.

- It is assumed that an emergency plan will be developed which will include the evacuation of the ADC ahead of discharging emergency flows through it.

9.2.4 Tunnelling and Tunnel Boring Machine (TBM)

- For the tunnel alignment, a minimum radius of 1000m was assumed, which would allow opportunity to use tighter curves in the future should additional constraints be identified.
- It has been assumed that the TBM will be driven from the westernmost shaft i.e., the pumping station and that temporary access will be required at the easternmost shaft (intake/outfall) for withdrawal of the TBM during construction. It is assumed that there will be no surface level construction works required for the tunnel.
- It is assumed that the temporary works/propping within the pumping station will be designed to accommodate the installation of the TBM and will not restrict progress.
- It is assumed that the required power will be available for the TBM for the start of the tunnelling programme.
- The conveyance tunnel is a ‘wet’ tunnel, which means it will be constantly filled with water from the River Thames after construction. To keep the water inside from stagnating it is assumed that ‘sweetening flows’ will be introduced. The approach to how this sweetening flow is provided will be developed to suit the preferred option as part of the design development. It is assumed that this will involve the addition of minor infrastructure and will not be significant in the emergency discharge option assessment.
- Regardless of diameter, the tunnel will be segmentally lined throughout its entire length and settlement of the ground above shall be within acceptable limits. Cover over the tunnel has been assumed to be equivalent to one diameter. This is in line with the level of uncertainty at this project stage.
- Spoil from the TBM will be able to be treated and subsequently placed as landscape fill within the wider SESRO project.
- It is assumed that the conveyance tunnel between the Main Inlet/Outlet Tower and the pumping station requires a secondary lining to accommodate consolidation settlement of the embankment. The conveyance tunnel within 1km of the intake/outfall Shaft requires secondary lining because the

Confinement Pressure Ratio (CPR) is insufficient due to decreasing ground level and Kimmeridge Clay level.

- For the purposes of the assessment the tunnel between the reservoir and the pumping station, it is assumed that the embankment is constructed prior to the tunnel to be able to accommodate the expected movements due to settlement.
- Regarding the tunnel, programme assumptions include a procurement period of 18-months has been included in the programme for the TBM. The start of the establishment of the TBM is driven by the completion of the base slab in the pumping station. Once the TBM is underway, a period of 2 weeks has been included to enable the start of the critical path work on the tunnel between the pumping station and the reservoir.
- The TBM has been assumed to be working 24 hours a day for 5 days per week, with weekends used for maintenance and additional TBM drive when needed. The initial 8-weeks of the TBM drive has been assumed to be a learning curve before proceeding into cruise mode. A 6m ID tunnel is assumed reduce TBM progression per day by 10% compared to a 4.2m ID tunnel. A significant period for segment delivery has been assumed to maintain the TBM production output.

Cost and Carbon Assessment Assumptions

9.2.5 Capital cost and carbon for each option were derived using the approach outlined in the Gate 2 reports. Some aspects of the cost and carbon build-ups needed to be updated or added. Quantities were estimated to reflect the differences between options. Where available, benchmarked unit cost rates from Gate 2 were used, and where these were not available new rates were developed. Emissions factor rates were identified for key items from Civil Engineering Standard Method of Measurement (CESMM4).

Environmental Assessment Assumptions

9.2.6 Several topics for the environmental assessment were considered individually. The following assumptions informed the assessment.

9.2.7 Aquatic Environment

- The BNG metric makes a distinction between rivers, ditches, and canals with no possibility to ‘trade’ BNG units between each category, meaning a ditch cannot be created to compensate for a river lost; and vice versa. This is relevant to this options appraisal due to the fact that Option B includes the creation of new canal habitat; but that there is no existing working / operational canal lost across the project. As a result, from a BNG point of view, the new canal created as a result of Option B is surplus to the river and ditch BNG mitigation requirements.
- Since the Gate 2 assessment, a new version of Defra’s Biodiversity Metric (version 4.0) has been released which provides updated guidance on BNG.

These updates have been included within this assessment. The most noteworthy change for this options appraisal is that agricultural land cover within 10m of a watercourse (inc. rivers and ditches) reduces the number of BNG units delivered by that watercourse. For SESRO, this means the BNG watercourse baseline is reduced and, therefore, less mitigation on watercourses is required to achieve BNG targets. It is noted that updated BNG guidance has been released by Defra, so BNG estimates used as part of this assessment will be changed in future. The new guidance will be reviewed to confirm whether back-checking is needed alongside responding to output from the summer 2024 public consultation.

- The current baseline for the Oday Ditch system located under the footprint of Option B is unknown. Whilst it is reasonable to assume that any watercourse lost can be compensated for and that the habitat and ecological quality can be improved as part of this process, there are uncertainties about where and how at this stage.
- Considering the main River Thames (aquatic environment), for Option B the peak flow (noting it is highly infrequent) would be split between the ADC (45m^3/s) and the intake / outfall conveyance tunnel (30 m^3/s). For Option C all of the 75 m^3/s would be conveyed through the intake / outfall conveyance tunnel. As a result, for Option B the peak flows would enter the River Thames at slightly different locations whilst for Option C all peak flows would enter the River Thames at the same location. It is possible that combining all flows into a single location may result in more scouring locally which may necessitate additional engineering to protect the riverbed and bank. The extent to which these protection measures are additional for Option C compared to Option B requires additional modelling and engineering work. It has, therefore, not been included as a differentiator between the two options.

9.2.8 Biodiversity and Nature Conservation

- It is assumed that the Ancient Woodland Inventory and Ancient Tree Inventory was correct and comprehensive at the time of the optioneering process (summer 2023). The latter would need to be confirmed once land access is available and surveys can be carried out to confirm the desktop data.
- The assessment of habitats to be impacted was undertaken using aerial imagery and UK Habitat information collected for Gate 2, the latter of which was collected using desk study information and aerial imagery and has not been fully ground truthed.

9.2.9 Historic Environment

- The existing publicly available data regarding buried archaeology is not complete and is subject to further desk study and non-intrusive and intrusive surveys to understand the presence, extent, and value of buried remains.

9.2.10 Land Quality

- Data provided by third parties including historical maps to undertake these assessments are accurate and up to date.

9.2.11 Landscape and Visual

- Tunnelling would be undertaken 24/5 working from the reservoir end towards the river, using a trenchless method of excavation.
- Lighting would be required at the reservoir end of the tunnel throughout construction.
- There would generally not be a need for 24/5 working at the intake and outfall location, except for the end of the construction period, when the tunnel would be lined.
- There would be towpaths along the ADC for recreation and to provide links with existing PRoW and cycle routes.
- Boats would be allowed to use the ADC.
- Appropriate mitigation seeding and planting could be implemented for the ADC, to integrate it into the landscape and create a positive recreational feature.

9.2.12 Noise

- Noise emissions for construction activities (including construction traffic movements and main construction plant / numbers) are based on Gate 2 assumptions, with updates made following a review by the SESRO construction advisor as required.
- Property counts do not consider the screening of receptors by nearby buildings (i.e., noise screening for the second row of properties is not considered due to the presence of the first row of properties).
- Red, Amber, Green (RAG) bands are based on an assessment for each residential property, but all noise and vibration sensitive receptors identified at Gate 2 are included in the analysis.

Community, Planning and Land Assessment Assumptions

9.2.13 The assessment was considered under subthemes: Community, Planning and Property and Land. The following assumptions informed the assessment:

9.2.14 Community/Socio-economic

- All Public Rights of Way (PRoW) severed by the development will be re-routed / reinstated.

9.2.15 Planning

- The assessment assumptions regarding the emergency discharge design are as set out in the engineering section, above. For options that pass through or are in proximity to Oday Hill Quarry, it is assumed that the future restoration plan for the quarry will be compatible with the SESRO proposals, as required by a condition in the quarry's planning consent.
- It is assumed that an ADC channel option would require an additional route and land-take compared to the transfer tunnel.
- The A34 crossing by the ADC would be via a box culvert to enable recreational use of the ADC and path along its bank, rather than a crossing via inverted siphon.

9.2.16 Property and Land

- It is assumed that the final design of the emergency discharge will not impact the Green Belt designation applied to the river surface, and that any potential surface impacts would be able to be mitigated or designed in a way that would be deemed acceptable.
- For options that pass through or, are in proximity to Oday Hill Quarry, it is assumed that the future restoration plan for the quarry will be compatible with the SESRO proposals, as required by a condition in the quarry's planning consent.
- It has been assumed that the emergency discharge Tunnel would be constructed via tunnel boring machine and would have minimal impact on the surface land use for agricultural and leisure uses.
- It has been assumed that there will be an exclusion zone above the proposed tunnel which would prevent, minimise, or impact high density development above the tunnel.
- It has been assumed that any vibration from the construction or use of the tunnel would not be sufficient to impact surface use or damage surface property.

9.3 Emergency Discharge Option B

9.3.1 This Section summarises the performance of Option B considering the appraisal themes and subthemes. For full details of the assessment of Option B against the individual criteria, refer to Appendix Q.

Engineering (Constructability) Performance

9.3.2 Option B can be constructed safely but enhanced control measures are required, particularly for the ADC component of Option B, which introduces several sites where surface works will need to interact with existing infrastructure e.g., the crossing of the A34 and B4017. At these points measures like traffic control will need to be established to ensure the safety of construction workers and the public. The TBM construction method is well-suited to a 3 to 4km tunnel in clay, although there are inherent risks to

underground works.

9.3.3 The ADC required for Option B has a high potential to impact third parties during construction as it interacts with road networks. However, the ADC has a potential opportunity to incorporate a haul road along it during construction, improving access to the intake/outfall site.

9.3.4 The construction of a smaller diameter tunnel, such as the 4.2m internal diameter conveyance tunnel for Option B, is likely to save construction time, increasing the total float in the programme associated with the tunnelling. Works to construct the ADC would be additional to the tunnelling but are not programme-critical for the construction of the SESRO project (as they would be undertaken in parallel with the tunnelling and other works) and would not affect overall SESRO construction programme.

9.3.5 The main risks associated with the construction programme for the tunnel relate to unexpected ground conditions and potential breakdown of the TBM. Although the ADC would not be on the programme critical path, requirements such as service diversions and construction in the floodplain introduce further programme risks for Option B.

9.3.6 The construction of the ADC will likely make Option B more logistically challenging because it will increase the number of worksites, the haulage distances/vehicle movements, and the concrete requirements (due to the ADC structures).

9.3.7 Construction of a smaller diameter tunnel, such as the 4.8m outer diameter conveyance tunnel for Option B, is likely to be less complex than a larger tunnel because the area required for temporary works is smaller, there is less tunnel spoil removal and there is a lower risk of encountering issues with ground conditions and settlement. However, the construction of the ADC will likely add complexities to Option B, such as a requirement for further temporary works, a crossing with a high voltage overhead line and the construction of potentially complex structures (such as the A34 crossing). To construct the ADC also requires a high volume of excavation, earthworks movements and vehicle movements.

9.3.8 For the purposes of this options appraisal, as at RAPID Gate 2, it is assumed that the STT pipeline could be routed within the footpath of the ADC so Option B with the ADC provides a means for the STT pipeline to cross the A34 and the B4017, making it easier to connect to the intake/outfall structure, should the STT project deem that it is preferred to connect directly to the River Thames to discharge.

Engineering (Operability) Performance

9.3.9 Option B could be safely operated with enhanced control measures. Management of surface channel and visitor access would be required for the ADC, which means more possible health and safety risks. An emergency

drawdown event would require evacuation of ADC.

9.3.10 Considering operational complexity, Option B would also require ongoing maintenance of the ADC as well as for the underground works. The ADC is in the Thames floodplain, which introduces additional operational complexities.

9.3.11 Considering operational resilience, the ADC has potential for future Wilts & Berks Canal and navigable function. Option B is resilient in that it has two methods of discharging flows from the reservoir, increasing reliability, although not sufficient for full emergency discharge if one method is out of operation. Sweetening flow is likely to be lower with lower energy requirement, although minimal difference to overall energy requirement. The ADC increases the footprint of Option B in the floodplain.

9.3.12 For the purposes of this options appraisal (as at RAPID Gate 2), it is assumed that the STT pipeline could be routed within the footpath of the ADC, so Option B with the ADC would enable crossings of the A34 and B4017 that would likely make it easier to maintain the pipeline if needed because the pipeline would be accessible from the towpath under the roads.

Cost and Carbon Performance

9.3.13 Initial high-level cost estimate indicates that the range in costs for emergency discharge options represent approximately 3% of total SESRO costs. Option B results in a total project cost of 2.8% more than the lowest cost emergency discharge option.

9.3.14 Initial high-level carbon estimate indicates that the range in carbon for emergency discharge options represent approximately 2.1% of total SESRO carbon. Option B is the lowest carbon emergency discharge option as tunnelling is expected to be more carbon intensive than ADC excavation.

Environmental Performance

9.3.15 Option B performs well against the air quality criteria with negligible change in air quality expected as a result of Option B.

9.3.16 Considering the Oday Ditches (aquatic environment), Option B means that watercourse length is lost due to the inclusion of the ADC. However, the ADC creates habitat itself as it is counted as a Canal in the BNG metric. Using version 4.0 of the Metric, BNG targets of 10 or 20% will likely be exceeded. The inclusion of the ADC within this design means that watercourses in Cow Common Brook and Portabello Ditch and Thames (Evenlode to Thame) WFD waterbodies will be lost. However, assuming mitigation is put in place, there should be no risk of WFD Deterioration.

9.3.17 In relation to the River Thames (aquatic environment), there is some uncertainty about the extent of additional bank protection measures needed for Option C compared to Option B. It is currently assumed this is not significantly different

and has not been included as an option differentiator.

9.3.18 For biodiversity and nature conservation, Option B would result in the loss of terrestrial priority grazing marsh habitat. There are, however, no impacts expected on designated sites and Option B has an opportunity for BNG because the construction of the ADC offers the opportunity to create riparian habitat. Desk study of Natural England's Ancient Woodland Inventory and historical maps indicates that no ancient woodland (considered to be irreplaceable habitat) would be affected.

9.3.19 Desk study of the Woodland Trust's Ancient Tree Inventory indicates that no ancient or veteran trees (also considered to be irreplaceable habitat) are located close to Option D; however, future surveys may potentially identify trees that could be classified as ancient or veteran trees.

9.3.20 Construction of the ADC for Option B will require removal of terrestrial habitats and may negatively impact protected and notable species.

9.3.21 Although Option B has been developed to mitigate issues arising from having the ADC located within the Thames floodplain, there remains a potential impact to the operation of the functional floodplain. Fluvial flooding is not an issue for the tunnel, however, approx. 57% of the ADC is routed through flood zone 2 or 3. Replacement flood storage will need to be established for this loss however, the ADC is linear infrastructure and so the total volume is relatively low.

9.3.22 Considering the historic environment, limited impact is expected as the majority of the construction of the tunnel for Option B is underground, but the ADC is expected to have some setting impacts on a Scheduled Monument, Listed Buildings and a conservation area along with excavation impacts on archaeological remains.

9.3.23 For land quality, Option B is in proximity to a landfill and has the possibility of UXO on-site and the potential to disturb contaminated land (gravel pits and leachate treatment plant).

9.3.24 Considering landscape and visual impacts, Option B performs poorly in relation to views from nearby PRoW, local paths, and cycle networks, and from residential properties in Steventon, Drayton, Caldecott and the Culham Conservation Area. The above ground tunnel infrastructure would affect the local landscape character, mainly at the reservoir end (common to both options), where effects may be significant locally. Construction activities and associated traffic could lead to noticeable changes to the visual amenity of local communities. Operational lighting would lead to noticeable changes to the visual amenity of the local community at the northern end of Steventon. However, Option B is likely to be mitigated in the long term and will ultimately enhance the Thames floodplain character and provide new recreational links in the landscape.

9.3.25 Option B performs poorly against the construction noise criterion because there

are two sample receptors located approximately 90m away from the ADC, which are likely to experience significant noise and vibration effects during construction works. The pumping station is, however, unlikely to be audible to the closest sample receptor during normal operations for Option B (and is common to both options).

9.3.26 Option B performs well against the pollution criteria as there are no pollution issues likely to arise due to standard controls.

Community, Planning and Land Performance

9.3.27 The ADC for Option B allows additional recreational benefits and connects to existing routes, supporting the overall socio-economic incentives of the SESRO project. There is also minimal disruption to community access expected during operation of Option B. However, the ADC passes within 850m of Drayton and within 800m of Abingdon, with the ADC and tunnel intersecting main roads, so it is expected some disruption of community access and use of community assets will be experienced during construction.

9.3.28 Considering consenting, Option B has greater overall land-take and greater potential to interact with and be a constraint to other land-uses and policies due to being above ground and requiring levee construction; it would also involve works for the A34 crossing that are more likely to be disruptive to National Highways' strategic infrastructure asset. However, it has the advantage of delivering a channel to facilitate the potential future Wilts & Berks Canal.

9.3.29 For property and land acquisition, the land is predominately privately owned, including Oday Hill Quarry and land associated with Stonehill Farm, and may be two SCLs affected by Option B (the VoWH Council and National Highways). The additional land take, compared with Option C, is a significant negative difference for Option B.

9.4 Emergency Discharge Option C

9.4.1 This Section summarises the performance of Option C considering the appraisal themes and subthemes. For full details of the assessment of Option C against the individual criteria, refer to Appendix R.

Engineering (Constructability) Performance

9.4.2 Option C can be constructed safely but enhanced control measures are required. The TBM construction method is well-suited to a 3 to 4km tunnel in clay, although there are inherent risks to underground works.

9.4.3 As there is no surface channel, there will be less impact on third parties, for example, the road network is less likely to be impacted; however, access to the intake/outfall site during construction will be on existing roads.

9.4.4 The construction of a larger diameter tunnel, such as the 6m internal diameter

tunnel for Option C, is likely to add time to the programme associated with the tunnelling. The main risks associated with the construction programme for the tunnel relate to unexpected ground conditions and potential breakdown of the TBM.

9.4.5 Since Option C does not require the ADC, it is likely to be less logistically challenging. A larger tunnel diameter will require more concrete, which may mean increased concrete deliveries, although Option C does not require structures for an ADC.

9.4.6 Construction of a larger diameter tunnel, such as the 6.6m outer diameter conveyance tunnel for Option C, is likely to be more complex than a smaller tunnel because the area required for temporary works is larger and there is a higher risk of encountering issues with ground conditions and settlement. A larger diameter tunnel exposes construction to more risks from ground conditions. However, Option C avoids the complexity of constructing the ADC, meaning reduced excavation, vehicle movements and structures required.

9.4.7 For the purposes of this options appraisal, as at RAPID Gate 2, it is assumed that the STT pipeline could be routed within the footpath of the ADC for options that include it. Option C without the ADC does not provide a clear means for the STT pipeline to cross the A34 and the B4017 to connect to the intake/outfall structure, should the STT project deem that it is preferred to connect directly to the River Thames to discharge. The STT pipeline would need to be routed under the roads, using directional drilling or a similar construction technique, which would require the installation of drive and reception shafts.

Engineering (Operability) Performance

9.4.8 Option C could be operated safely with enhanced control measures. As there is no surface channel, there will be less interaction with other infrastructure and people, bringing fewer risks.

9.4.9 Considering operational complexity, Option C would avoid the requirement of ongoing maintenance of the ADC.

9.4.10 Considering operational resilience, Option C has a small footprint in the flood zone, only has a single way of discharging water (with no alternative option in the case of the tunnel being unavailable) and does not present opportunity for future expansion or dual functions as the ADC does. A larger diameter tunnel is likely to require a higher sweetening flow and therefore energy requirement, although this represents a small difference to overall operational energy requirements.

9.4.11 For the purposes of this options appraisal, as at RAPID Gate 2, it is assumed that the STT pipeline could be routed within the footpath of the ADC for options that include it. Option C without the ADC would not easily enable crossings of the A34 and B4017 and the crossings would likely require sections of pipeline under the roads using inverted siphons, which would potentially make the

option more difficult to maintain.

Cost and Carbon Performance

9.4.12 Initial high-level cost estimate indicates that the range in costs for emergency discharge options represent approximately 3% of total SESRO costs. Option C is the lowest cost emergency discharge option.

9.4.13 Initial high-level carbon estimate indicates that the range in carbon for emergency discharge options represent approximately 2.1% of total SESRO carbon. Option C results in a total project carbon of 2.1% more than the lowest carbon emergency discharge option (Option B).

Environmental Performance

9.4.14 Option C performs well against the air quality criteria with negligible change in air quality expected from Option C.

9.4.15 Considering the aquatic environment, whilst Option C does not provide opportunity for the creation of habitat, using version 4.0 of the Metric, BNG targets of 10 or 20% and habitat trading rules will likely be exceeded.

9.4.16 Option C performs well against the majority of the biodiversity and nature conservation criteria, except in relation to lack of opportunity / need for BNG. As an underground option ancient and veteran trees would not be affected even if present.

9.4.17 Option C performs well against the biodiversity and nature conservation and landscape criterion because there is limited impact expected on vegetation (including trees, woodland, hedges, and shrubs) since the majority of construction is underground.

9.4.18 Regarding flood risk, fluvial flooding is not an issue for Option C as it is the tunnel only option.

9.4.19 Considering the historic environment, there is limited impact expected from Option C because the majority of construction is deep underground. There may be some setting effects from above ground structures in relation to a scheduled monument, listed building, and a conservation area.

9.4.20 For land quality, Option C is in proximity to a landfill and has the possibility of UXO on-site and the potential to disturb contaminated land (gravel pits and leachate treatment plant).

9.4.21 Considering landscape and visual impacts, Option C performs poorly because infrastructure would affect the local landscape character, mainly at the reservoir end. The construction and infrastructure would also be visible from PRoW, paths, and cycle networks. The infrastructure at either end of the tunnel would be visible from the North Wessex NL. Construction activities and operational

lighting would also lead to noticeable changes in the visual amenity of local communities.

9.4.22 Option C performs well against both construction and operational noise criteria because the closest sample receptor is unlikely to experience significant noise and vibration effects during construction and operation.

9.4.23 Option C performs also well against the pollution criteria as there are no pollution issues likely to arise due to standard controls.

Community, Planning and Land Performance

9.4.24 There is minimal disruption of community access/assets expected during operation of Option C, and limited disruption during construction since tunnel construction is fully underground. No recreation resources would be negatively impacted. However, there are no opportunities to maximise socio-economic or recreational benefits or to improve route connectivity identified.

9.4.25 Considering consenting, Option C has the advantage of lower overall land take and less potential for disruption to the A34 for crossing construction, but it does not deliver a channel to facilitate the potential future Wilts & Berks Canal. Overall, the tunnel-only option has less potential for interaction with other land uses and policies; however, reduced disruption to the A34 aside, this is a relatively minor difference in the context of SESRO as a whole and the options for the intake/outfall location and infrastructure.

9.4.26 For property and land acquisition, it is assumed that with this tunnel only option that there would be no permanent impact on surface properties. There may be two SCLs affected by Option B (the VoWH Council and National Highways). The small land take for Option C, compared with option B, is a significant positive difference for Option C.

10 Emergency Discharge: Preferred Option

This section summarises step 6 of the appraisal methodology to identify a preferred option for the emergency discharge for use in master planning and consultation.

10.1 Comparison of Engineering Performances

10.1.1 For the constructability and operability themes, the two tables below present a comparison of the intake/outfall options, after their assessment against the appraisal criteria (reported in Section 9) and workshop discussion. The results for each theme are presented as a summary of subthemes.

Table 10.1: Emergency Discharge - Constructability Subtheme Narratives

Subtheme	Narrative
Health and Safety	Option B has more surface works due to the need for the ADC which means more interactions with existing infrastructure and therefore more expected risk, but it is expected that for both options enhanced control measures can be applied to ensure safe construction.
Third Party Impact	Option B is expected to have more potential to impact the existing road network during construction as the ADC requires a crossing for the A34 and various other locks/bridges. Option C is therefore preferable.
Logistics	Option B requires more surface space than Option C for construction of the ADC, which will also require additional material imports and related vehicle movements as there are several associated structures for the ADC. Option C is therefore preferable.
Programme	Generally, the programme for Options B and C are expected to be similar and face similar risks. Option B has a smaller tunnel which will likely result in a 2-week time saving, but as the tunnel is not on the critical path this will not reduce overall programme. The ADC required for Option B introduces additional programme dependencies, particularly with the A34 crossing, and the installation of a gated structure near the end of the ADC. Due to these dependencies Option C is preferable.
Construction Complexity	The construction of the ADC introduces additional complexity to Option B, particularly with the additional associated structures (A34 crossing, locks, gated structure, etc.) and because over 50% of the ADC is within the flood zone. However, Option C has a larger diameter tunnel, which almost doubles the amount of spoil

	generated as well as increasing the risk from unexpected ground conditions. It also increases risk of ground settlement above the tunnel affecting other structures. Although the complexity associated with the tunnel is greater than for Option B, Option C is the preferred option because removal of the ADC construction makes Option C is less complex overall than Option B.
STT	For the purposes of this options appraisal, as at RAPID Gate 2, it is assumed that the STT pipeline could be routed within the footpath of the ADC in Option B. Without the ADC Option C has less flexibility to construct the STT pipeline to the river, if required, during construction of SESRO. Option B is therefore preferred because it includes the ADC, which may provide a means for the STT pipeline, if required, to cross the A34 and the B4017, should the STT project deem that it is preferred to connect directly to the River Thames to discharge. These crossings would be more difficult and complicated to resolve without the ADC.

Table 10.2: Emergency Discharge - Operability Subtheme Narratives

Subtheme	Narrative
Health and Safety	Option B is likely to have a higher level of risk during operation due to the ADC and its interaction with existing infrastructure and the public, however this is expected to be mitigatable. Option C is marginally preferred in terms of operational health and safety as there are fewer access risks, and because during an emergency discharge scenario Option B would require evacuation of the ADC.
Operational Complexity	Option B with the ADC introduces additional operation and maintenance activities associated with the locks and gated structure. It would also be open to boat traffic which would need to be managed and emergency protocols would require telemetry that would need to be tested regularly. As such, Option C is less complex and is the preferred option.
Operational Resilience	Option C has a smaller footprint within the flood plain as it has fewer surface structures – see Flood Risk under the Environmental Assessment. However, Option C only has a single way of discharging water with no alternative option in the case of the tunnel being unavailable. There is little future adaptability for Option C compared to Option B, which has an ADC which can be modified in the future and is proposed to be navigable and aid

	future expansion of social/recreational infrastructure. The ADC could form part of the potential Wilts & Berks Canal, giving it a dual function. Option C is also expected to have higher energy requirements for sweetening flow, although this is not expected to be significant. On the balance, there is no preferred option with respect to operational resilience, as there is sufficient resilience in Option C.
Transport Planning	Option B is expected to have higher potential impact on the existing road network during operation as maintenance activities would be required on the ADC and its road crossings, so Option C is the preferred option.
STT	For the purposes of this options appraisal, as at RAPID Gate 2, it is assumed that the STT pipeline could be routed within the footpath of the ADC or would follow a similar route if there is no ADC; therefore, both options have the same RAG assessment. Option B may be slightly preferrable as the ADC may provide means for the STT pipeline, if required, to cross the A34 and B4017, and these crossings would likely make it easier to maintain the pipeline compared to no-dig underground crossings.

10.1.2 Overall, for Engineering the provisionally preferred option is Option C (the tunnel only option), as reasoned below.

10.1.3 In terms of constructability, there is not a scalable difference between the 4.2m (Option B) and 6m (Option C) internal diameter tunnels. There is a higher risk of unknown ground conditions with a larger tunnel (Option C) and almost twice as much spoil would be generated; however, the amount generated is relatively small when compared to the scale of earthworks on the SESRO project and could be accommodated in the project without need for disposal off-site. For Option B, in addition to the tunnel, the option introduces earthworks for the ADC, which would have a greater impact on local traffic and add complex interfaces with the A34 crossing and gated structure.

10.1.4 Overall, for operability, by not including the ADC, in simple terms, Option C has less assets that need management and maintenance, and there is no impact from the Thames floodplain. The set up and power requirements are not considered significantly different between the 4.2m and 6m internal tunnel diameters. There is a slight preference for Option B in terms of operational resilience because it includes two means of discharging emergency flows to the River Thames in case either the ADC or 4.2m internal diameter tunnel cannot be used; however, neither of these two discharge routes can accommodate the full emergency flow alone and this is considered insufficient to override the overall preference for Option C.

10.1.5 It is noted that whilst the provisional preference is for Option C further design work is required to confirm that the larger tunnel required for this option is feasible. This is further described in the next steps section (Section 12.2).

10.2 Comparison of Cost and Carbon Performances

10.2.1 For the cost and carbon theme, the table below presents a comparison of the performance of the emergency discharge options, after their assessment against the appraisal criteria (presented in Section 9) and workshop discussion.

Table 10.3: Emergency Discharge - Cost and Carbon Subtheme Narratives

Subtheme	Narrative
Cost	From initial high-level estimates, Option B has the higher CAPEX cost of the two options: Option B results in a total project cost approximately 2.8% higher than Option C. Given that the difference between the initial estimates is a small percentage of the overall cost of the SESRO project, the cost of Option B is not considered to be disproportionate in comparison with Option C such that it is an unreasonable preference over Option C if it performs better in the other subthemes. Cost is therefore not seen as a material differentiator at this stage between options when identifying a preferred option.
Carbon	From initial high-level estimates, Option C has the higher capital carbon emissions because tunnelling is expected to be more carbon-intensive than excavating the ADC; however, there is only a small difference of 2% between the initial estimates for both options of the Gate 2 carbon estimate for the SESRO project.

10.2.2 Option C has the lower capital costs than Option B, but the difference in cost between the options is approximately 2.8% of the overall cost of SESRO so the cost difference is not considered a material differentiator in this assessment.

10.2.3 For carbon, the range between the two options for the initial carbon estimate is relatively small in comparison to the overall project, so carbon is not considered as a material differentiator in the assessment of the emergency discharge options.

10.2.4 Further work was recommended to gain confidence in the tunnelling and ADC costs, although it was not expected that this work would change the overall assessment given here, which is that delivering two assets (Option B) would have a higher cost than delivering one (Option C) and that the cost difference is not material compared to the overall project cost. The further work, which has been undertaken subsequently, is detailed in Section 11.

10.3 Comparison of Environmental Performances

10.3.1 For the environmental performance theme, the table below presents a comparison of the performance of the emergency discharge options, after their assessment against the appraisal criteria (presented in Section 9) and workshop discussion.

Table 10.4: Emergency Discharge - Environmental Subtheme Narratives

Subtheme	Narrative
Air Quality	Both options are located further than 1km from Marcham AQMA and Abingdon AQMA. In relation to construction there are no proposed dust generating activities that could not be managed using normal good practices to prevent significant effects. Given that relatively low numbers of plant and vehicles would be used during both construction and operation, there would likely be a negligible change in air quality. Air quality is therefore not considered a material differentiator between options in this appraisal.
Aquatic Environment	Option B will result in approximately 4.1 km of new canal creation, which will support a range of plant, fish, and macroinvertebrate species. Under the BNG v4.0 metric and associated trading rules, canal creation can no longer be used to compensate for river or ditch habitat loss. As there is no working / operational canal lost, even though it provides 4.1 km of new still water habitat for aquatic life, the canal habitat created is surplus to the main project's BNG requirements. Option B results in loss of approximately 1.1 km of existing flowing watercourse, some of which sits within the Oday Ditch catchment, which forms part of the Thames (Evenlode to Thame) WFD waterbody. There is no watercourse lost or created in the Oday Ditch catchment as part of Option C. It has been assumed that the extent of bank (scour) protection is not significantly different between Options B and C, and this is not a differentiator. As a result, on the balance between watercourse loss and gain, Option C is preferable.

Biodiversity and Nature Conservation	Option C is preferred as there would be no known priority habitat directly impacted by the proposed option footprint as almost all works would be underground. Option B would require the removal of coastal and floodplain grazing marsh priority habitat and deciduous woodland. However, Option B, including a surface water canal, would allow for the creation of riparian habitats.
Biodiversity and Nature Conservation and Landscape	Option C is preferred as little vegetation clearance will be required, as works would be primarily underground. Option B is least preferred as the option will require the removal of habitats, and protected and notable species may be impacted.
Flood Risk	Although Option B has been developed to mitigate issues arising from having the ADC located within the Thames floodplain, there remains a potential impact on the operation of the functional floodplain associated with the ADC in Option B, which is not present in Option C. Furthermore, approximately 57% of the ADC is routed through floodplain in Option B. Replacement flood storage will need to be established for this loss however, the ADC is linear infrastructure and so the total volume is relatively low. Fluvial flooding is generally not an issue for Option C, the tunnel only option, and Option C is the preferred option.
Historic Environment	Both options have the potential to have some setting effects on scheduled monuments, listed buildings, and the Culham Conservation Area. Option C is also likely to result in some probable loss of buried paleoenvironmental remains. The historic environment subtheme is not considered a material differentiator between options in this appraisal.
Land Quality	Both options pass 90m north of the Sutton Wick No. 1 historic landfill and have the potential to disturb potentially contaminated land and UXO. The land quality subtheme is therefore not considered as a material differentiator between options in this appraisal.
Landscape and Visual	The above ground tunnel infrastructure would have a long-term adverse effect on the local landscape character and views locally, with both Options B and C. However, Option B is the preferred option as, although there is likely to be a significant effect on local views of sensitive visual receptors in the short-term due to the introduction of the ADC, such effects could be mitigated long-term. Furthermore, the option would help to restore the historic

	Wilts & Berks canal and provide new connections for recreational access, thereby enhancing waterborne recreation and access locally, which is an intrinsic and positive attribute of the floodplain character near the River Thames. Option C would not provide this opportunity and is, therefore, least preferred.
Noise	Option C is preferred as the closest receptors are unlikely to experience any significant effects during construction and operation as works will be underground. Receptors in proximity to Option B are likely to experience significant effects during construction.
Pollution	No significant effects identified as spillages can be controlled through standard good practice. Through tunnelling activity on both options, there is potential for changing leachate pathways for pollution from historical landfills. However, the risk is similar for both options, so this is not considered a material differentiator between options in this appraisal.

10.3.2 Option C is the provisionally preferred option for the majority of environmental topics as this option will have the least impact upon vegetation clearance, priority habitats, noise receptors and the River Thames floodplain. Across most criteria there are more likely significant effects from Option B. The exception is Landscape and Visual where it is the preferred option as significant effects could be mitigated long-term and the option would help to restore the historic Wilts & Berks canal, which would provide new connections for recreational access and enhance waterborne recreation and access locally (an intrinsic and positive attribute of the floodplain character near the River Thames). The subthemes of Air Quality, Historic Environment, Aquatic Environment, Land Quality and Pollution are not considered material differentiators between options in this appraisal.

10.4 Comparison of Community, Planning and Land Performances

10.4.1 For the community, planning and land theme, the table below presents a comparison of the emergency discharge options, after their assessment against the appraisal criteria (presented in Section 9) and workshop discussion.

Table 10.5: Emergency Discharge - Community, Planning and Land Subtheme Narratives

Subtheme	Narrative
Socio-Economic	An initial assessment of socio-economic benefit indicates that there is potential for benefit from the ADC; therefore, Option B is preferred as, although it has the potential for significant disruption from construction, there are significant recreational benefits that could be realised during

	operation. Option C is the least preferred as there are no opportunities for enhancement. Further work was subsequently undertaken to quantify the ADC benefit for assessment against its cost of construction. The cost benefits review is presented in Section 11 of this report.
Consenting	Option C is slightly preferred over Option B due to the former's tunnel-bored nature minimising overall land-take and potential conflicts with existing or future development; however, it does not provide the Wilts & Berks Canal channel. Overall, consenting per se is not a strong differentiator and other criteria are more significant, including the need for additional land acquisition for a canal option and the need for major works to the A34.
Property and Land Acquisition	Option B is significantly less viable than Option C due to the higher impact of the ADC on permanent land take and temporary land impacts for its delivery. With such a significant difference in the land requirements, both in terms of immediate effect on land and associated with compensation for secondary affects, a very strong case would have to be presented for the choice of Option B being in the public interest.

10.4.2 Overall, for this theme, Option B is provisionally preferred as this option has significant recreational benefits from the ADC that could be realised during operation. However, Option C is strongly recommended from a land perspective as it minimises additional land take and also the implications associated with the potential for major impacts to statutory consultees.

10.4.3 Further study of the socio-economic benefits of the canal option was recommended, in order to evaluate this against the additional land-take and potential compulsory acquisition that may be required, noting that this would need to be strongly justified in a development consent order application. Section 11 of this report summarises the subsequent cost benefit review undertaken for the ADC as the emergency discharge option.

10.5 Provisionally Preferred Option for the Emergency Discharge

10.5.1 The outcome from the assessment and consensus from the workshop for the emergency discharge arrangement is that Option C (tunnel only) is the provisionally preferred option, subject to a cost benefit review of the ADC.

10.5.2 There are many areas where Option C is preferred. For engineering, it is preferred because Option C does not include the ADC, which is a large piece of infrastructure to construct with earthworks, locks, and complex interfaces through the A34 diversion and gated structure. The locks and gated structure will be open to the public and require maintenance during operation, thus

introducing an additional operational burden to the project. In contrast, the larger tunnel diameter does not add greater operational complexity and is assessed to be lower impact than the ADC in terms of construction complexity. It is noted that further engineering design work is needed to gain confidence in the feasibility of the larger tunnel for Option C.

10.5.3 Option C is the preferred option for most environmental topics as this option will have the least impact upon vegetation clearance, priority habitats and noise receptors. Option C is a clear preference from a land perspective as it minimises land take and the cost implications associated with compensation for secondary effects. Should Option C not be pursued, a strong case will be required to justify the additional land take and the benefits of any alternative proposal.

10.5.4 Option C has a lower capital cost and carbon cost, although this is not considered to be material compared to the overall cost of the project. However, the cost difference between the two options is important in establishing the balance of cost against the costed socio-economic benefits for the ADC. An initial assessment of socio-economic benefit indicates that there is potential for benefit from the ADC; however, further work was subsequently undertaken to quantify the ADC benefits for assessment against its cost. The cost benefits review that has been undertaken for the ADC is presented in the next section of this report, Section 11.

10.5.5 Following the cost benefits review, the preferred option for master planning and consultation was confirmed as set out in Section 11.5.

10.5.6 Section 7.3 indicated that a hybrid unnavigable surface channel/pipeline options could be developed as an alternative to Option B and that the potential for these options to change the outcome of the assessment would be reviewed. However, for the reasons detailed above, the provisional preference identified was for a tunnel only option, subject to the further work to identify and price the benefits of the ADC (undertaken subsequently and summarised in Section 11). It is expected that an unnavigable solution and/or a solution that does not provide active travel routes to the SESRO site would not provide as many benefits as the navigable ADC in Option B and would not result in significant differences in performance over the majority of other appraisal criteria[19]; therefore, no further work is planned for alternative hybrid options.

[19] The exception would be the potential third party impacts on road users during construction. An improvement in this area would not result in a revision of the preferred option.

11 Emergency Discharge Options: Cost Benefits Review

This section summarises the cost benefits review for the ADC as the emergency discharge option to confirm the preferred option for master planning and consultation.

11.1 Introduction

11.1.1 As stated in Section 7, it is necessary for the design of SESRO to include infrastructure to enable the water level in the reservoir to be lowered quickly, as an emergency response to the very unlikely event of a defect being identified within the dam structure. The following configurations to facilitate an emergency discharge to the River Thames have been assessed:

- Subsurface tunnel (Emergency Discharge Option C).
- Combined tunnel and surface channel (Emergency Discharge Option B) – a channel could be constructed to convey a proportion of the emergency flows in combination with the tunnel, using cuttings or by forming embankments.

11.1.2 The subsurface tunnel (Option C) was identified as the provisionally preferred option for the reasons stated in Section 10.5; however, Emergency Discharge Option B (defined in Section 8.2) has the potential to provide a series of quantifiable benefits, which Option C would not provide. A benefits assessment has therefore been undertaken for Option B, notably for the ADC element of this. This enables a further review of the option assessment reported in Sections 9 and 10 and consideration of whether the potential benefits, which could be delivered by the ADC, are large enough to outweigh the reasons set out in Section 10.5 for provisionally preferring Option C.

11.1.3 Whilst not identified as a material differentiator between Options B and C, it is noted that Option B has a higher cost than Option C. Therefore, in the first instance, a comparison has been undertaken between potential benefits from Option B and the additional cost of providing this option. If it were found that the potential benefits outweigh the additional costs, a further review would be undertaken to compare the additional ADC benefits with the reasons set out in Section 10 for provisionally preferring Option C, and a further multidisciplinary workshop would be held to identify the preferred option for consultation.

11.1.4 For the cost benefits review, the following steps have been undertaken:

- Further review of the cost difference between Options B and C.
- A benefits assessment identifying and quantifying benefits to the local area from Option B, which links the River Thames and SESRO.
- Comparison of costs and benefits of the two options.

11.2 Cost Assessment

Basis of the Cost Assessment

11.2.1 The purpose of the cost assessment is to estimate the additional cost for constructing and operating the ADC (Option B) over increasing the size of the tunnel (Option C), since the ADC and a larger tunnel could both fulfil the function of providing emergency discharge to the River Thames from SESRO.

11.2.2 The following should be noted regarding the cost assessment:

- The cost estimates are high-level, indicative, early-stage estimates, which do not incorporate costed risk or optimism bias.
- For comparison with the costed benefits, the estimate of the additional cost is given as a net present value (NPV) in 2023 prices. The cost estimate includes additional capital and operational expenditure (OPEX) over 80 years, assuming construction occurs over the first ten years starting in 2030.
- Replacement CAPEX is considered within the cost estimate over the 80 years.
- It is assumed for both options that the mechanical and electrical (M&E) OPEX is 1.5% of M&E CAPEX per (operational) year and that civils OPEX is 0.25% of civils CAPEX per (operational) year. It is expected that the OPEX for Option B would likely be higher than for Option C, given that additional operational and maintenance requirements would arise for the canal locks, gated structures, and remediation of the canal tow path.

Cost Assessment Outputs

11.2.3 The NPV (in 2023 prices) of the additional cost to construct and operate Option B (compared to Option C) over an 80-year time period was estimated to be in the region of £68m.

11.3 Benefits Assessment

Basis of the Benefits Assessment

11.3.1 The purpose of the SESRO ADC benefits assessment is to identify and quantify benefits to the local area resulting from the construction and operation of the ADC in the form of a canal linking the Thames and SESRO.

11.3.2 The ADC provides a series of quantifiable benefits:

- Health improvements associated with increased physical activity.
- Wellbeing/quality of life improvements to canal and towpath users.
- Economic activity increases associated with a stretch of canal.

11.3.3 There are other qualitative benefits in terms of improved accessibility to the

reservoir for local residents (high quality offroad access), facilitating more trips to the reservoir, cultural heritage of restarting the Wilts & Berks Canal, legacy benefits of enabling further development of Wilts & Berks Canal, and the creation of habitats and associated ecosystem services.

11.3.4 The assessment seeks to only quantify the additional benefits created as a result of the canal. This creates a need to develop a methodology that accounts for activity that would have occurred if the canal did not exist– known as displaced activity and is not considered a benefit because it is not additive/additional. To accurately estimate benefit, a displacement reduction factor is used in the methodology to account for potential displaced activity that would otherwise have been included within the benefit estimate.

Benefits Assessment Outputs

11.3.5 The estimates for the present value of quantifiable benefits over an 80-year time period (in 2023 prices) are presented in Table 11.1. The central estimate of £13.4m reflects a significant amount of wellbeing benefits associated with regular visits to the ADC (approximately 88% of annual benefits).

Table 11.1: Benefit Estimates (Using Heath Discount Rate)

Level of displacement	Present value
High displacement	£8.5m
Medium displacement	£13.4m
Low displacement	£18.1m

11.3.6 The range of estimates in Table 11.1 shows different levels of displacement that in turn reflect how conservative the estimate is with a higher displacement leading to a more conservative estimate. The medium displacement scenario is seen as a realistic central estimate. The modelling for each quantitative benefit (health, wellbeing and economic) was intentionally conservative – for example, wellbeing only focuses on value of regular visitors and disregards infrequent visitors who still benefit from the ADC. This approach ensures that the estimate is robust and reflects the added value of the ADC instead of one area or group benefiting at the expense of another.

Discussion of the Benefits Assessment

11.3.7 The analysis suggests that the ADC could result in benefits (presented qualitatively and quantitatively) over its lifetime. It would provide people from the local area and visitors access to the reservoir without having to interact with roads whilst enjoying green and blue space. Building the ADC, incorporating canal elements (as per Option B), from the River Thames to the reservoir would also create a platform for the restoration of the Wilts & Berks Canal. The full

restoration of the Wilts & Berks Canal (route length over 100km) has potential to deliver significant benefits; however, this would require works by others and therefore has not been include in this assessment.

11.3.8 As it is recognised that a fully restored canal would deliver greater benefits than have been assessed for the ADC, it is therefore important that the project does not frustrate the ambition of the Wilts & Berks Canal Trust to reconstruct the canal. The reserved canal corridor should continue to be included in the Master Plan to the boundary with the A34, to allow for future works by the canal trust.

11.3.9 If the ADC is not included within the SESRO project, it would forego the aforementioned benefits of access, health and wellbeing, and potential legacy benefits associated with the later restoration of the Wilts & Berks Canal. Some benefits could be realised if off-road access to the reservoir for a range of users (walkers, cyclists, parents with prams etc.) was provided, which could cost significantly less than the ADC.

11.4 Cost Benefit Comparison

11.4.1 The socio-economic benefits of the ADC option have been reviewed against the additional construction costs for the ADC including the land-take and potential compulsory acquisition that may be required. Table 11.2 below presents:

- The present value of additional cost to construct and operate the ADC (Option B) instead of increasing the size of the tunnel (Option C) over 80 years in 2023 prices.
- The central estimate of the present value of benefits over 80 years in 2023 prices from the benefits assessment.

Table 11.2: Comparison of Costs and Benefits

Cost or Benefit	Estimate
Additional costs for Option B over Option C	£68.1m (estimate in the region of)
Central estimate of benefits for the ADC	£13.4m

11.4.2 The additional cost for Option B is therefore estimated to be in the region of five times greater than the costed value of benefits of the ADC.

11.5 Confirmation of the Preferred Option for the Emergency Discharge

11.5.1 Option C was the provisionally preferred option from the options' RAG assessments and appraisal workshop for the reasons detailed in Section 10.5; however, it was recognised that the ADC could deliver benefits that were not fully considered within the appraisal criteria, so a benefits assessment was undertaken to cost the benefits of the ADC.

11.5.2 Since the additional cost for Option B is in the region of five times greater than the costed benefits of the ADC, the costed benefits are not considered significant enough to outweigh the additional cost of Option B over Option C. It is therefore considered that the costed benefits are also not significant enough to outweigh the other reasons (detailed in Section 10.5) that Option C was provisionally preferred over Option B.

11.5.3 Following the cost benefits review, Option C is therefore the preferred option for the emergency discharge.

12 Conclusions and Next Steps

This section provides conclusions from this Connectivity to the River Thames appraisal report and provides recommendations for future work.

12.1 Conclusions

12.1.1 An assessment methodology was established, as outlined in Section 2 and detailed fully in the SESRO Option Appraisal Context and Methodology Report. The process followed for identifying the preferred options is summarised below:

- Appraisal step 1: The purpose of the Connectivity to the River Thames appraisal study was to identify a preferred location for the SESRO intake/outfall structure and a preferred arrangement for emergency discharge from the reservoir to the River Thames. The preferred options are for master planning and consultation in summer 2024.
- Appraisal step 2: Constraints for the definition of options for the intake/outfall structure and the emergency discharge were identified, as outlined in Sections 3 and 7 respectively.
- Appraisal step 3: The SESRO Criteria Table was developed for all the options appraisals of associated infrastructure for the reservoir and is included in the SESRO Option Appraisal Context and Methodology Report.
  - Three specific criteria, detailed in Section 2.4 of this report, were developed for assessment of the intake/outfall options only, relating to topics such as intake/outfall operational complexity, reservoir water quality, and geomorphology and sediment deposition.
  - Four specific criteria, detailed in Section 2.4 of this report, were developed for the assessment of the intake/outfall and emergency discharge options only, relating to topics such as construction complexity, evolvability, and connectivity and integration with STT.
- Appraisal step 4: Options were defined to a sufficient level of detail for them to be assessed, as presented in Sections 4 and 8 for the intake/outfall and emergency discharge respectively.
- Appraisal step 5: Technical specialists assessed the options against the criteria, based on their expertise and the assessment methodology. The performance of individual options against the assessment criteria are summarised in Sections 5 and 9 for the intake/outfall and emergency discharge respectively.
- Appraisal step 6: Following the individual option assessments, a workshop was held to bring together specialists to discuss the performance of options in the assessment, so that preferred options could be identified for the intake/outfall and emergency discharge. Sections 6 and 10 present the appraisal narratives, comparing the performance of options and identifying key differentiators between options. The outcomes of the options appraisals for the intake/outfall and the emergency discharge are summarised below.

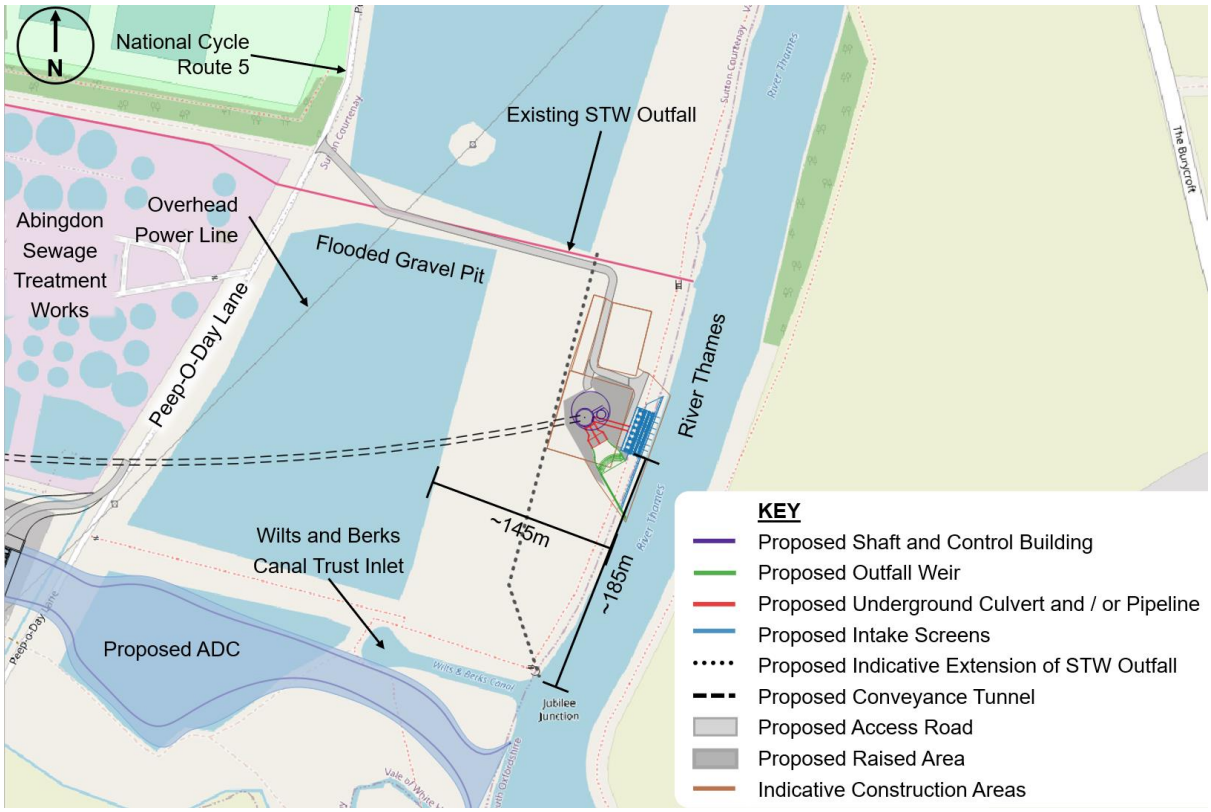
For the identification of a preferred option for the emergency discharge, further work was subsequently undertaken to compare the costs and benefits of the two options as presented in Section 11.

- **Appraisal steps 7 and 8:** Appraisal steps 7 and 8 will be undertaken as part of the next steps set out below in Section 12.2.

Intake/Outfall Structure

12.1.2 The outcome of the appraisal study is that Option B is the preferred location for the intake/outfall structure, as shown in Figure 12.1. The option is located along the right bank of the River Thames, east of a flooded gravel pit and just north of the Wilts & Berks Canal Trust Inlet. The site would be accessed via the B4107, Stonehill Lane and Peep-O-Day Lane, and utilise a single location for the intake, outfall and combined shaft and control building.

Figure 12.1: Intake/Outfall Preferred Location - Option B[20]



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Emergency Discharge

12.1.3 Option C, as presented in Figure 12.2, is the preferred arrangement for the emergency discharge for master planning and consultation. This tunnel-only option moves away from previous studies on the SESRO project by not

[20] Peep-O-Day Lane is part of the NCN 5. Temporary or permanent modifications to Peep-O-Day Lane adjacent to Abingdon STW may be required, which are not indicated on this figure.

including an ADC to discharge a proportion of the 75m³/s flow required to draw down 1m of water per day from the 150Mm³ reservoir in an emergency situation.

12.1.4 Option C would convey the full 75m³/s emergency flow through a tunnel:

- 45m³/s is transferred from the reservoir to the pumping station wet well via siphons.
- 30m³/s is transferred from the reservoir to the pumping station wet well by opening an emergency gate in the Main Inlet/Outlet Tower within the reservoir, to allow water to fill pipework which sits inside of 475m of conveyance tunnel between the Tower and the pumping station.
- The combined 75m³/s flows through 3,650m of conveyance tunnel between the pumping station and the River Thames.
- The emergency flow is discharged into the River Thames via the outfall of the intake/outfall structure, which has also been appraised in this report.

Figure 12.2: Emergency Discharge Preferred Arrangement – Option C

Note: the differences in key dimensions between Option B and C are outlined in paragraph 8.3.4.

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12.1.5 Selection of Option C for the emergency discharge reduces engineering complexity, reduces land take, reduces impact on the River Thames floodplain and generally reduces environmental impacts. It is also noted that the ADC (included in Option B) represents a higher risk to the delivery of the DCO as it necessitates a significant area of additional land that will have to be thoroughly justified by the additional benefits.

12.1.6 However, it is recognised that moving forward with Option C would also remove the social benefits created by the ADC, such as enabling recreational boats to access the SESRO site and creating an active travel route between the river and the reservoir. The potential recreational benefits have been costed and are

not considered significant enough to outweigh the additional construction costs and other justifications for selecting Option C.

Further Review

12.1.7 Within this study Option B is assessed to be the preferred option for the intake/outfall structure location, and Option C is assessed to be the preferred emergency discharge arrangement. Upon review, these two preferred options do not conflict with one another. Locating the intake/outfall structure at Option B means that the conveyance tunnel length would be one of the shorter lengths when compared to other options, and construction activity would remain within the safeguarded area.

12.1.8 Section 7.3 indicated that the surface channel, which formed part of the emergency discharge arrangement for Option B, would be a continuous open channel and be navigable. The potential for hybrid unnavigable surface channel/pipeline options to change the outcome of the assessment was identified in Section 7.3 and reviewed in Section 10.5. It was concluded that:

- An unnavigable continuous open channel solution with an active travel route to SESRO would have similar cost and potentially less socio-economic benefit than Option B. It is noted that the design of an unnavigable continuous open channel solution would be almost the same as a navigable channel, with similar land-take, impact on the environment, engineering, and cost. A key difference in design would be that an unnavigable surface channel would not need to include locks, but suitable infrastructure would need to be constructed to facilitate their installation in the future if the Wilts & Berks Canal were to be reinstated.
- An unnavigable solution with no direct active travel connection from the river to the SERSO site would be unlikely to significantly lower cost and would provide less socio-economic (and potentially environmental) benefit than Option B. A hybrid pipeline/open channel solution could achieve the complex road crossing of the A34 with a section of underground pipework and inverted siphons. This would potentially be less disruptive but would still be a complex construction task, require permission from National Highways and prevent navigation or a direct active travel route into the site (with associated reduction to socio-economic benefit).

12.1.9 On this basis, it is unlikely that introducing hybrid options (with a pipeline and an unnavigable surface channel) would change the preference for Emergency Discharge Option C (the pipeline only option).

12.2 Next Steps

12.2.1 As set out in the SESRO Design Development Process (Figure 1.1), the next stage on from the options appraisal of associated infrastructure is to develop the Gate 3 Interim Landscape and Environmental Master Plan to reflect the outcomes of the options appraisal study and the other appraisal reports shown

in Figure 1.2. For this master plan, the outcomes of this appraisal should be reviewed against the other appraisals, as outlined in Section 2.8 of this report.

12.2.2 Initial master planning work was started using both Options B and C for the emergency discharge (i.e., with and without the ADC), given that a preference had not been confirmed at the time of starting the master planning activities, subject to the cost benefits review for the ADC. Appendix S and Appendix T to this report present the draft master plans developed with Option B and Option C respectively. Further work subsequently confirmed the preference for Option C, as presented in Section 11 of this report; therefore, the Gate 3 Interim Landscape and Environmental Master Plan will continue to be developed using Emergency Discharge Option C.

Intake/Outfall Next Steps

12.2.3 The following work is recommended for the intake / outfall as part of the SESRO project design development, to confirm the general arrangement of the preferred option:

- Further study and technical analysis to establish the appropriate separation distance between the Abingdon STW outfall and the SESRO intake, followed by design development of Abingdon STW outfall extension (which is conceptual only in this report), including engagement with the EA if the outfall needs moving.
- Further discussions with the Thames Water Operations team running Abingdon STW, to fully assess the requirements for extending the outfalls and to understand if there are any planned works during AMP8 and beyond. Discussion also with the EA to establish their requirements to grant consent to moving the discharge location.
- Review and confirm the preferred screen type for the SESRO intake and develop the Intake design accordingly as part of design development for DCO submission. This will include discussion with the EA and other relevant stakeholders as appropriate.
- Engagement with OCC to discuss plans to access the intake/outfall structure during construction and operation, for inspection and maintenance activities e.g. intake screen inspection or maintenance. This may need to include mitigating impacts on the NCN 5, as some sections of the route are shared between vehicles and cyclists, so appropriate provisions may need to be agreed during construction.
- Confirm access arrangements and approach to flood risk and flood protection for the preferred option as part of design development including:
  - Confirmation of required access arrangements;
  - Review of replacement flood storage required for the intake/outfall; and
  - Engage and discuss the flood risk design criteria with the EA for the intake/outfall.

- Many of the assessments under the environment and community, planning and land themes are based on desktop studies. For the preferred options these will be validated (particularly in relation to environmental issues) with field surveys and contact with relevant stakeholders where required. If findings diverge from the desktop information used further backchecking of this options appraisal will be required as outlined in paragraph 1.3.2.

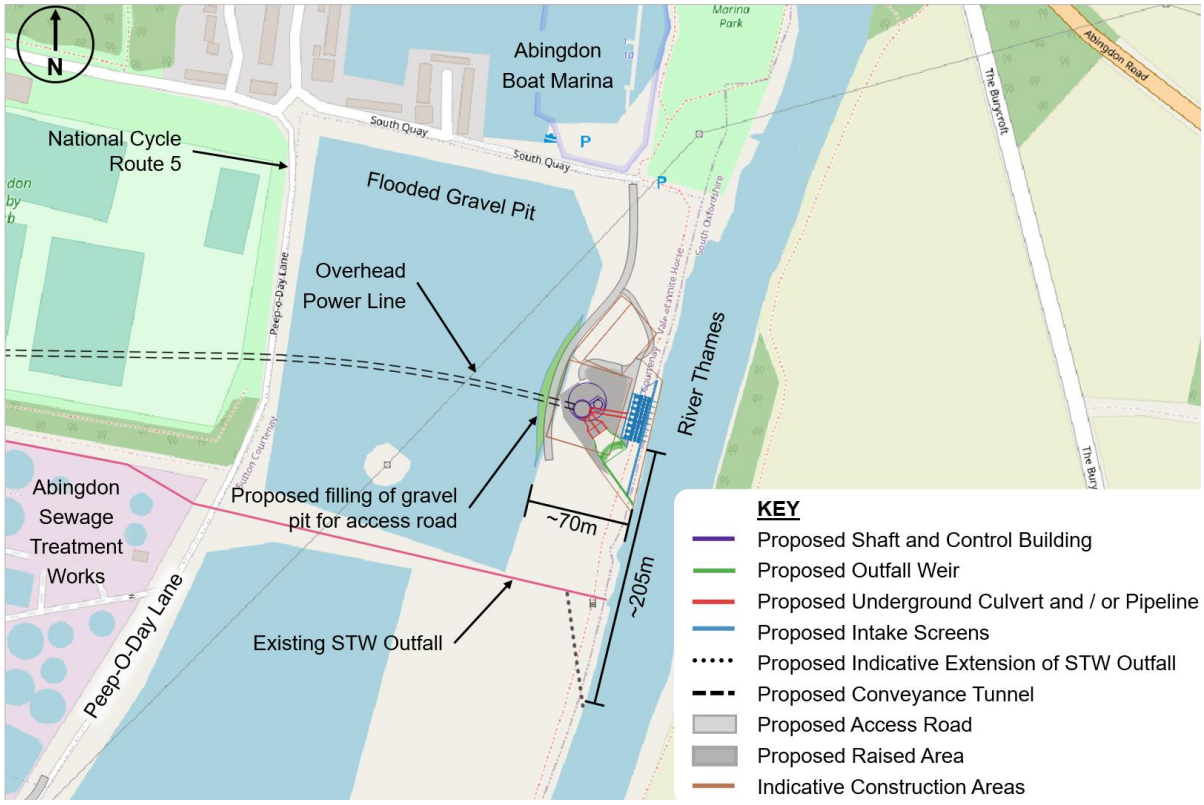
Emergency Discharge Next Steps

12.2.4 The following work is recommended for the emergency discharge arrangements as part of the SESRO project design development, to gain increased confidence in the tunnel design:

- Review of tunnel sequencing and programme in the context of the whole project to ensure the preferred option for the emergency discharge is deliverable.
- Further design development work to establish the potential protection required for the riverbank and riverbed (from scour).
- Develop design to incorporate the ability to provide the required sweetening flow for the tunnel.
- Further assessment of the impacts of the embankment settlement on the tunnel.
- Internal pressures design, which has the potential to change the overall size of the tunnels, and hence impact programme and costs.
- Develop a safe system of work for access for inspection, maintenance and to remove silt and control build-up of invasive species such as Zebra or Quagga mussels. This could have an impact on the design and hence programme and costs.
- Engage and discuss the flood risk design criteria for the emergency discharge with the EA, particularly in regard to the design scenarios and the joint probability of river flood and emergency discharge.
- Many of the assessments under the environment and community, planning and land themes are based on desktop studies. For the preferred options these will be validated (particularly in relation to environmental issues) with field surveys and contact with relevant stakeholders where required. If findings diverge from the desktop information used further backchecking of this options appraisal will be required as outlined in paragraph 1.3.2.

Appendix A. Options for Assessment – Option A

Figure 12.3: Intake/Outfall Option A Layout



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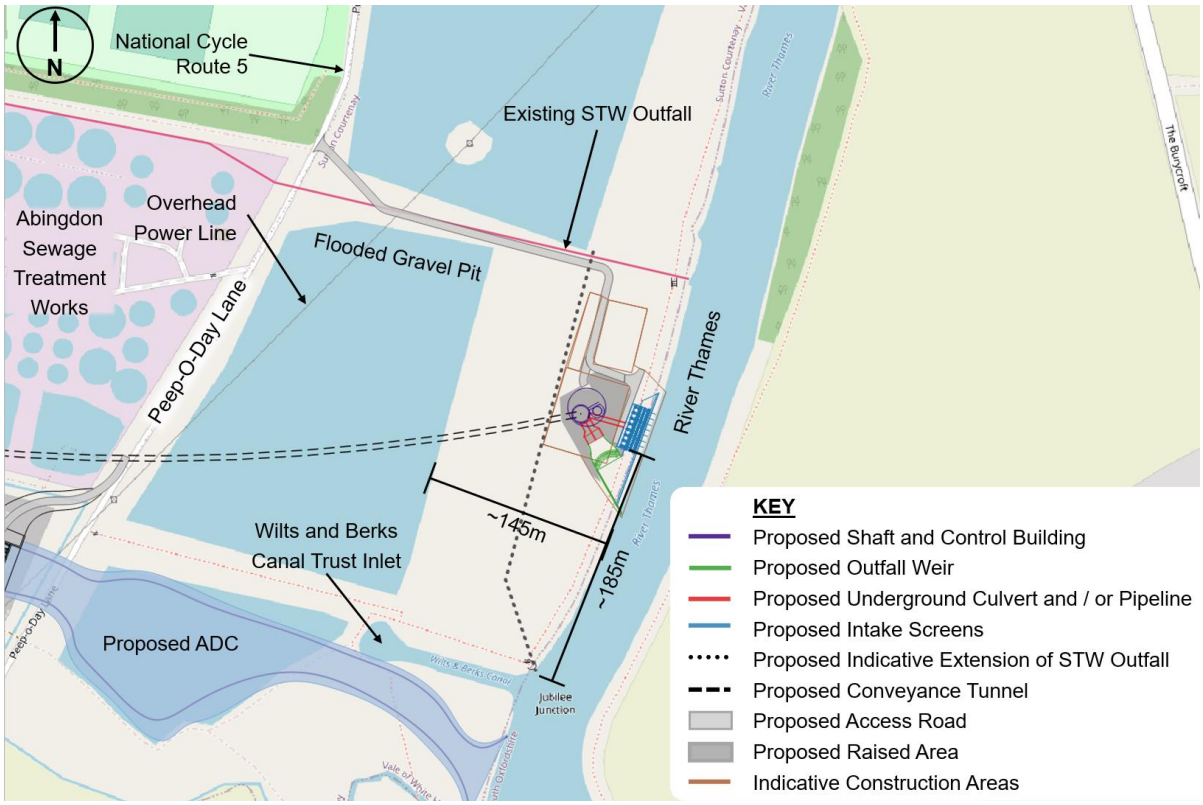
Option Location	This option has a combined intake and outfall shaft located between the northernmost flooded gravel pit and the right bank of the River Thames, south of Abingdon Marina and upstream of the Abingdon Sewage Treatment Works main discharge flow outfall. The site is heavily constrained spatially, with only ~70m between the flooded gravel pit and the River Thames, which means that it is likely that part of the existing gravel pit would need filling to reclaim sufficient space for the option. Figure 12.3 above shows the option layout.
Site Access	The site access is from the south B4017, Stonehill Lane and then Peep-O-Day Lane. The option requires 370m of additional access road, coming off South Quay, a road which forms part of the Marina residential area. The option would require using the section of cycle only NCN 5 to be open to vehicular traffic during construction.

Floodplain	The location of the intake/outfall structure, including shaft and control building, is within the Thames flood zone 3 and the tunnel route passes through the Southern Town Park historic landfill.
Geomorphology	The location of the intake/outfall structure is within the zone for sedimentation deposition.
Outfall Extension	Due to its location upstream of Abingdon STW, the option necessitates only a short extension (97m) of the existing STW outfall.

Appendix B. Options for Assessment – Option B

Figure 12.4: Intake/Outfall Option B Layout

Note: Option B on the figure is shown with the ADC.



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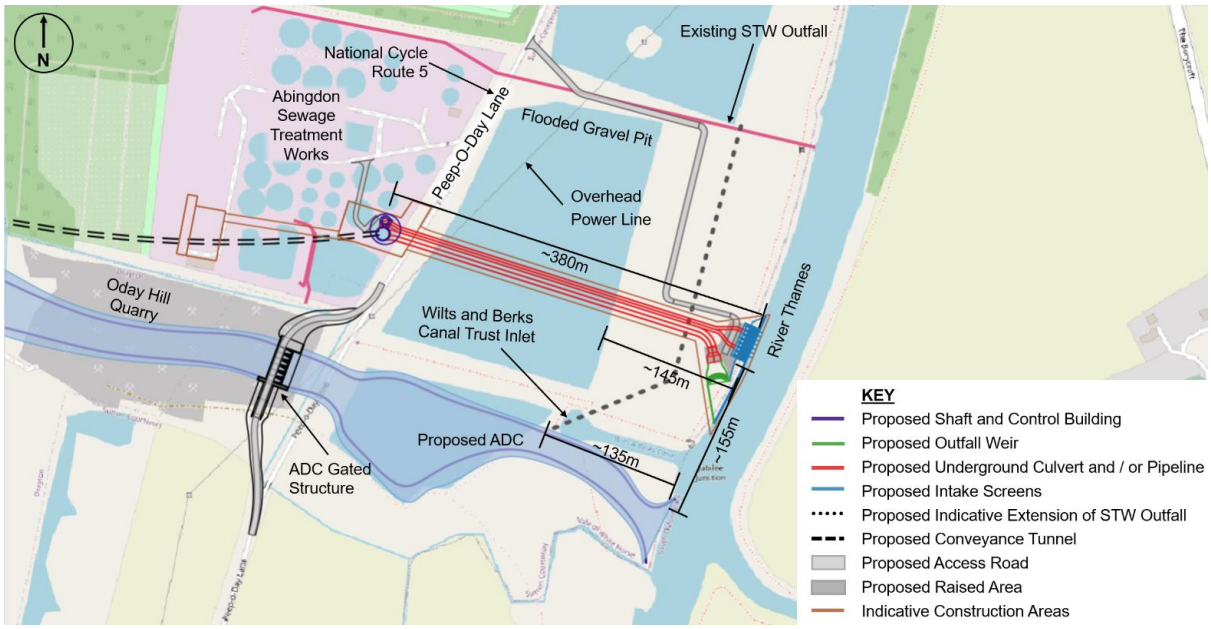
Option Location	This option has a combined intake and outfall shaft located at the riverbank upstream of the Wilts & Berks Canal Trust Inlet on the right bank of the river, as can be seen on Figure 12.4. The site is somewhat constrained spatially, with 145m between the flooded gravel pit and the River Thames, however, unlike Option A, it is not anticipated that part of the existing gravel pit would need filling to reclaim sufficient space for the option.
Site Access	Like Option A, site access is from the south B4017, Stonehill Lane then Peep-O-Day Lane. Approximately 430m of new access road would be required from Peep-O-Day Lane. The option would require using the section of cycle-only NCN 5 to be open to vehicular traffic during construction.
Floodplain	The location of the intake/outfall structure, including shaft and control building, is within the Thames flood zone 3.

Geomorphology	The location of the intake/outfall structure is at a cross over between two river bends and so there may be sediment deposition close to the structure.
Outfall Extension	Due to its location downstream of Abingdon STW, the option necessitates the extension of the existing STW outfall.

Appendix C. Options for Assessment – Option C

Figure 12.5: Intake/Outfall Option C Layout

Note: Option C on the figure is shown with the ADC.



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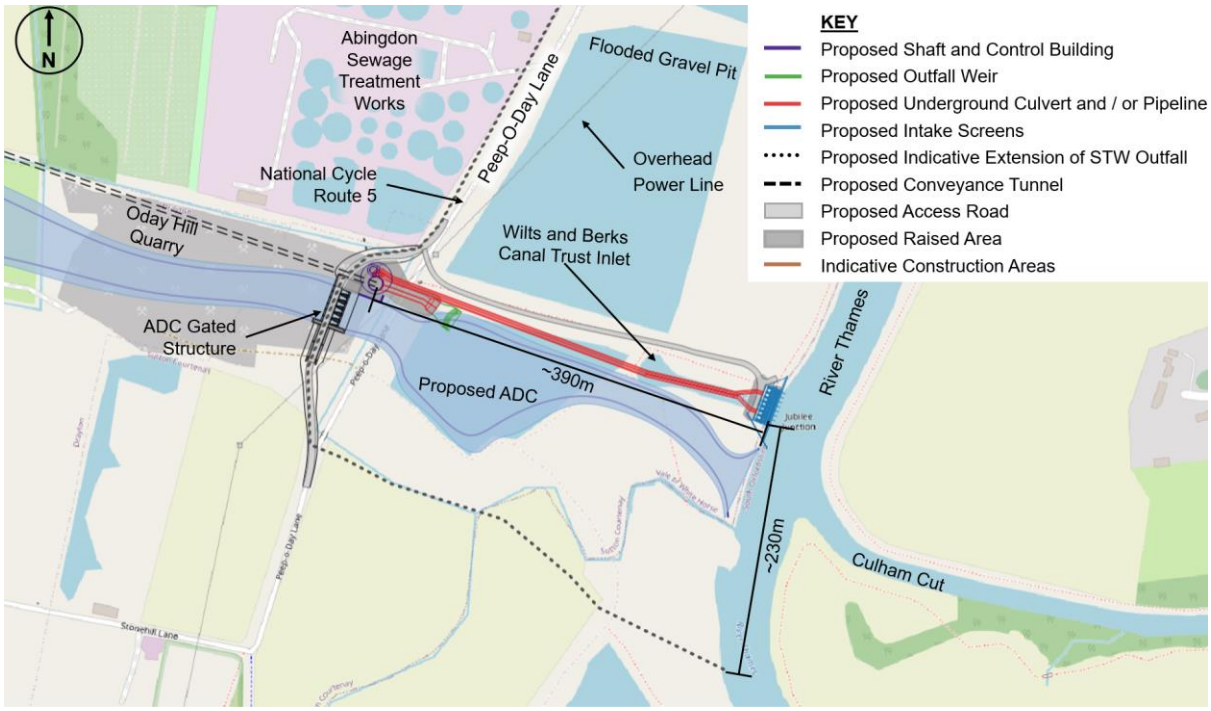
Option Location	As shown on Figure 12.5, Option C proposes to build a combined intake and outfall structure located between the flooded gravel pit and right bank of River Thames, connected to the shaft via a culvert through the gravel pit, which would need to be approximately 360m long. The shaft and control building will be located within a disused area of the Abingdon sewage treatment works, which offers a visual and spatial advantage, however the distance between the control building and screens is close to the practical limit for air blasting to clear the intake screens, assuming they are Johnson PWWC screens.
Site Access	Access to the intake/outfall structure is from the south B4017, Stonehill Lane then Peep-O-Day Lane and would require 540m of new access road. Access to the shaft and control building within the STW would also be via Peep-O-Day Lane. The option would require using the section of cycle-only NCN 5 to be open to vehicular traffic during construction.
Floodplain	The location of the intake and outfalls are within the Thames flood zone 3; however, the separated shaft and control building is

	outside of the flood zone 3 but within flood zone 2, sited within Abingdon STW.
Geomorphology	The location of the intake and outfall are at a cross over between two river bends, near the outside of the bend, and so there may be sediment deposition close to the structure.
Outfall Extension	Due to its location downstream of Abingdon STW, the option necessitates the extension of the existing STW outfall into the Wilts & Berks Canal Trust Inlet.

Appendix D. Options for Assessment – Option D

Figure 12.6: Intake/Outfall Option D Layout

Note: Option D on the figure is shown with the ADC.



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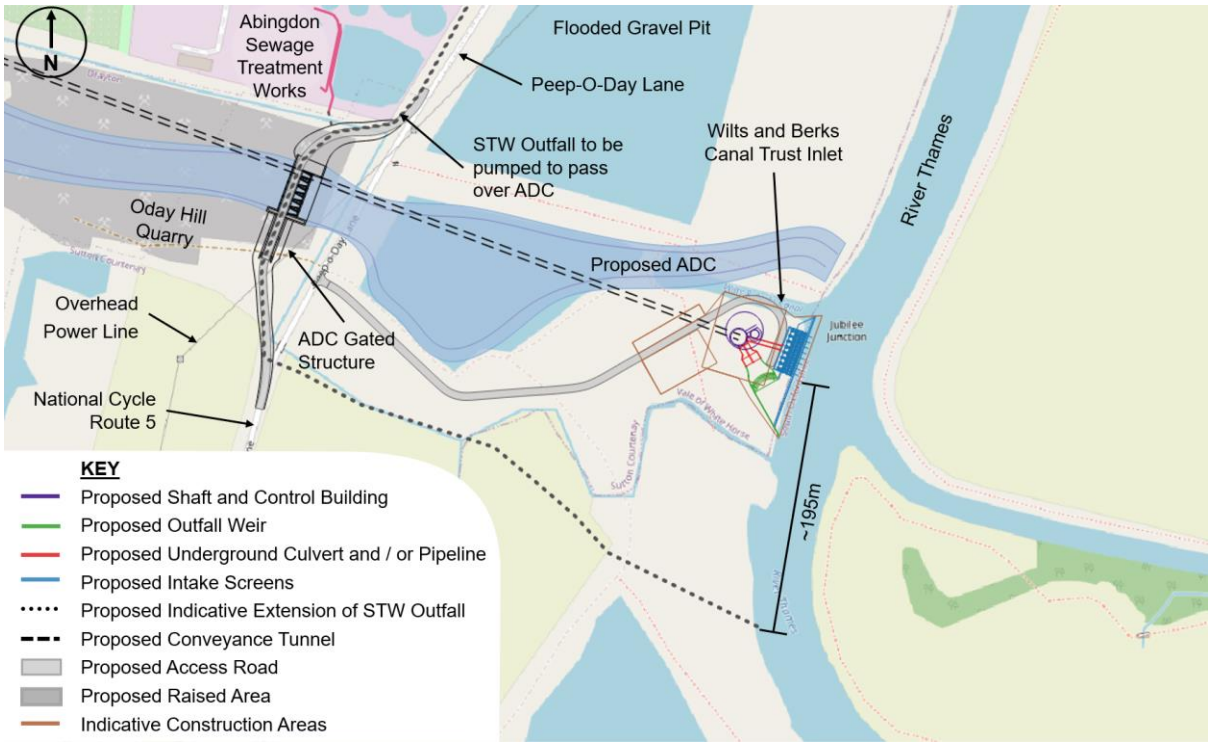
Option Location	Option D has the shaft and control building located within the existing quarry, the location is also adjacent to ADC gated structure, should the ADC be taken forward. The above ground structures are away from the riverbank, which offers a visual and spatial advantage. Option D can be seen on Figure 12.6. The option includes a separate outfall weir in proximity to the proposed shaft (~60m away), which discharges to the existing flooded gravel pit. The intake is connected to the shaft via a culvert and pipeline, approximately 370m long which clashes with the Wilts & Berks Canal Trust Inlet, on the right bank of the River Thames. As with Option C, the distance between the control building and screens is close to the practical limit for air blasting to clear the intake screens, assuming they are Johnson PWWC screens.
Site Access	Access to the intake/outfall structure is from the south B4017, Stonehill Lane then Peep-O-Day Lane and would require 410m of new access road. The option uses less of Peep-O-Day Lane and

	would not need to use the section of cycle-only NCN 5 to be open to vehicular traffic during construction.
Floodplain	The intake and outfall are within the Thames flood zone 3; however, the separated shaft and control building is outside of flood zone 3.
Geomorphology	The location of the intake is at a cross over between two river bends, near the outside of the bend, and so there may be sediment deposition close to the structure.
Outfall Extension	The option necessitates the extension of Abingdon Sewage Outfall, so it is discharging downstream of the intake screens.

Appendix E. Options for Assessment – Option E

Figure 12.7: Intake/Outfall Option E Layout

Note: Option E on the figure is shown with the ADC.



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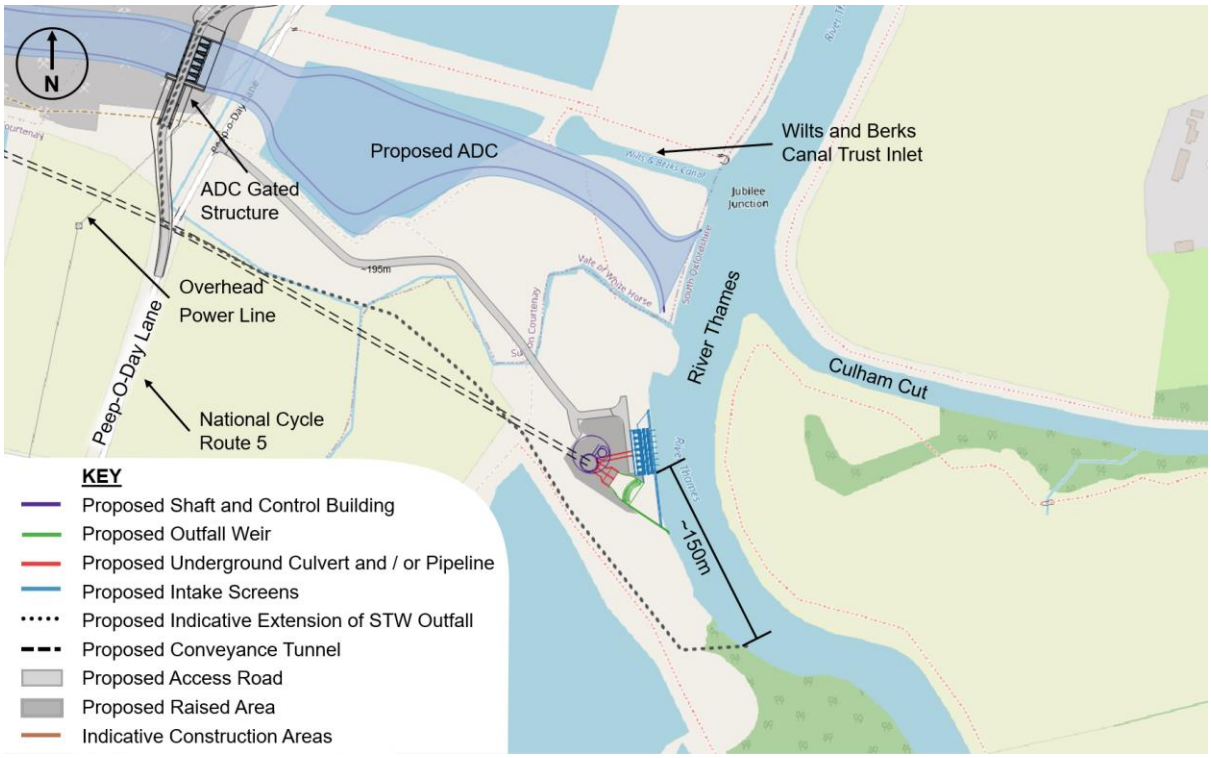
Option Location	For Option E, as shown on Figure 12.7, the shaft and combined intake and outfall are located at the riverbank downstream of the Wilts & Berks Canal Trust Inlet on the right bank of the River Thames. The option would be located immediately opposite the Culham Lock Cut junction and would be more visible to boat users and pedestrians than the previous options.
Site Access	As with Option D, access to the intake/outfall structure is from the south B4017, Stonehill Lane then Peep-O-Day Lane and would require 460m of new access road (see Figure 12.7). Along with Option F, the option utilises the least amount of Peep-O-Day Lane and would not need to use the section of cycle-only NCN 5 to be open to vehicular traffic during construction.
Floodplain	The location of the intake/outfall structure is within the Thames flood zone 3.

Geomorphology	The location of the intake is at a cross over between two river bends, near the outside of the bend, and so there may be sediment deposition close to the structure.
Outfall Extension	A relatively long extension (16m and 320m for the outfall and storm discharge respectively, which both connect into a new 640m joint discharge line running to the River Thames) of both Abingdon STW outfalls is required to ensure STW flows are discharged downstream of the intake for Option E. If the ADC is taken forward, the STW outfall extension would need to pass over the ADC, and therefore some pumping may be required.

Appendix F. Options for Assessment – Option F

Figure 12.8: Intake/Outfall Option F Layout

Note: Option F on the figure is shown with the ADC.



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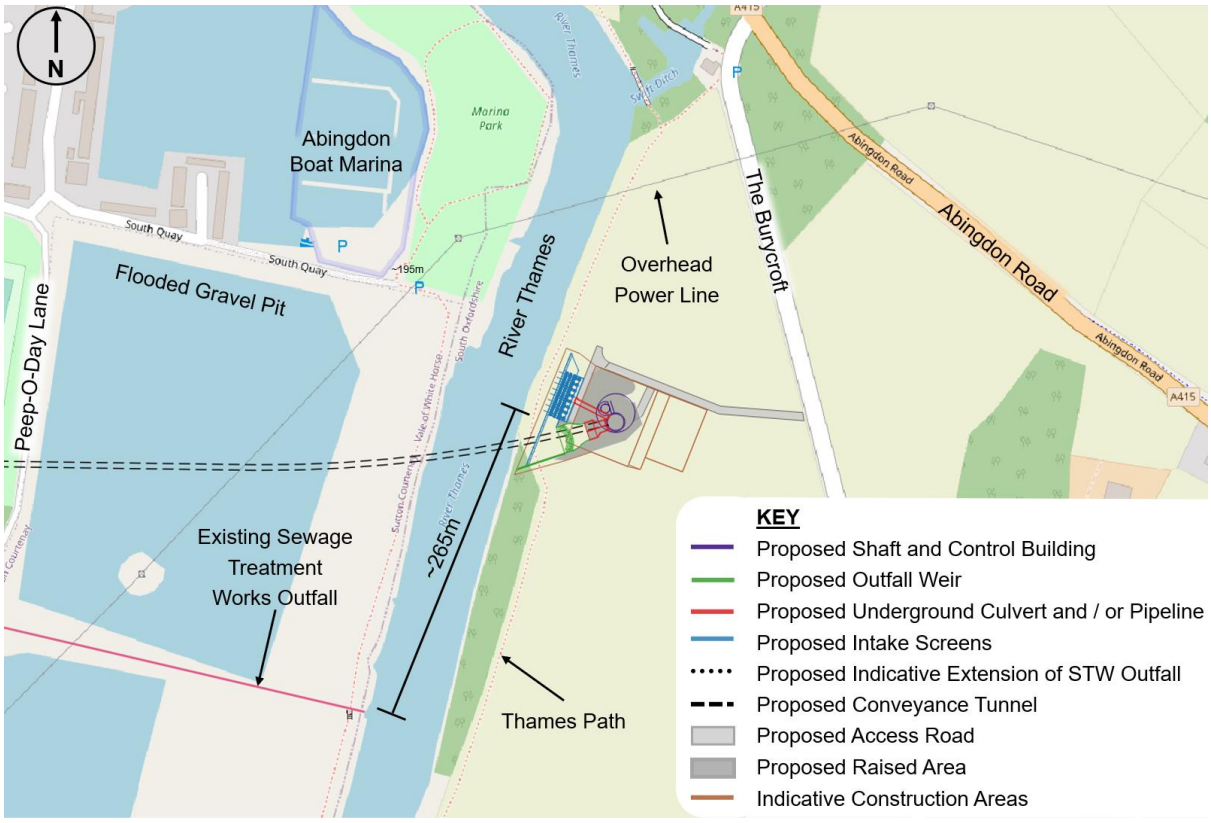
Option Location	As shown on Figure 12.8, Option F has a combined intake, outfall and shaft located at the riverbank downstream of the Culham Lock Cut on the right bank of the River Thames. Its location is thought to beneficial from a visual point of view, as it is in an isolated location and the orientation of the outfall reduces visual impacts (in comparison to other options). It is also thought that its location would cause less disturbance to inexperienced users of the river in this section, with respect to navigation.
Site Access	Access would be the same as Option E, with a 475m long road from Peep-O-Day Lane.
Floodplain	The location of the intake/outfall structure is within the Thames flood zone 3. It is also within a Green Belt area, along with the access road extension from Peep-O-Day Lane. The tunnel route passes through the Sutton Wick historic landfill where there may be contaminated land.

Geomorphology	The location of the option is on the outside of a river bend and so there is unlikely to be sediment deposition close to the structure.
Outfall Extension	Option F requires the joint longest extension out of any of the options for both Abingdon STW outfalls (16m and 320m for the outfall and storm discharge respectively, which both connect into a new 780m joint discharge line running to the River Thames). If the ADC is taken forward, the STW outfall extension would need to pass over the ADC, and therefore some pumping may be required.

Appendix G. Options for Assessment – Option G

Figure 12.9: Intake/Outfall Option G Layout

Note: Option G on the figure is shown with the ADC.



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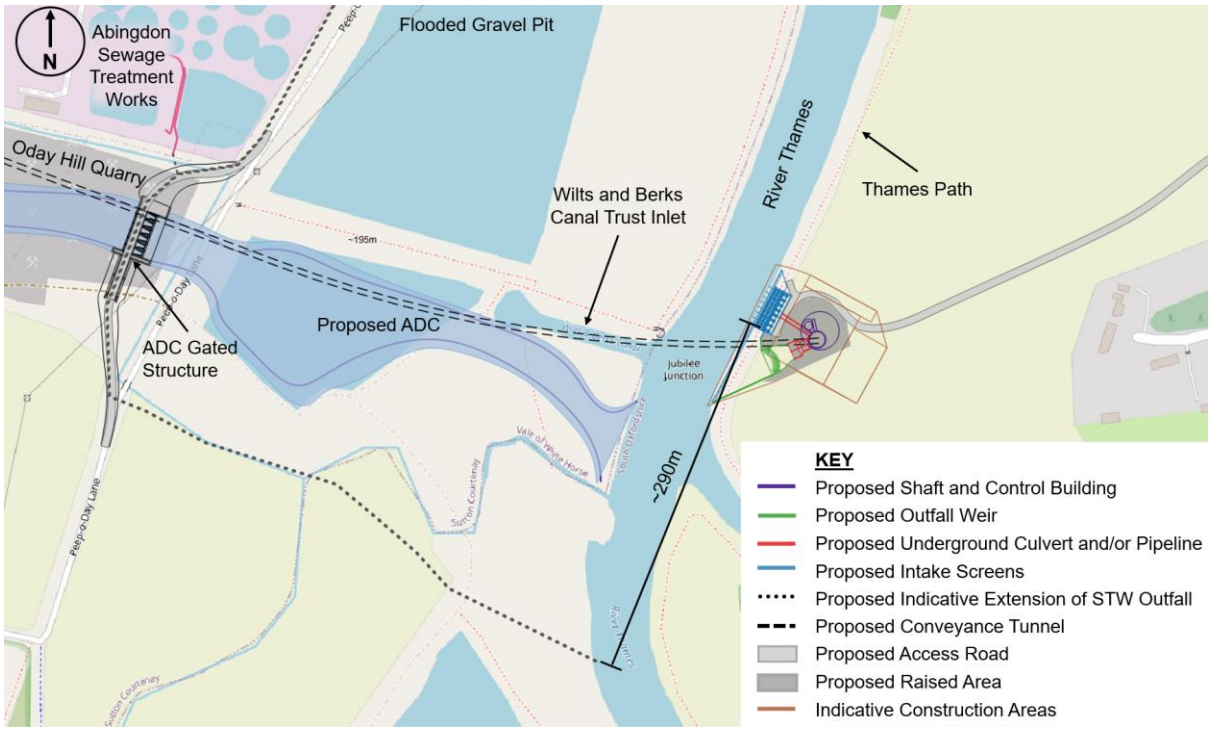
Option Location	Option G combines intake, outfall and shaft located to the east of the woodland on the left bank of the river Thames as shown on Figure 12.9.
Site Access	The site access is from the Abingdon Road and then The Burycroft. The option requires 240m of additional access road, coming off The Burycroft.
Floodplain	The location of the intake/outfall structure, including shaft and control building, is outside of the Thames flood zone 3 but within flood zone 2. However, the option sits within Green Belt land and is unlikely to clash with the Thames Path, a national trail route along the riverbank of the River Thames. Also, the tunnel route passes through the Southern town Park historic landfill.

Geomorphology	The location of the intake is at a cross over between two river bends, near the outside of the bend, and so there is a low risk of sediment deposition close to the structure.
Outfall Extension	Due to its location upstream of Abingdon STW by approximately 265m, the option does not necessitate the extension of the existing Abingdon STW outfalls.

Appendix H. Options for Assessment – Option H

Figure 12.10: Intake/Outfall Option H Layout

Note: Option H on the figure is shown with the ADC.



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Option Location	Option H has a Combined intake/outfall located approximately 265m upstream of the Culham Cut, and a shaft located on the left bank of the river Thames. This option was introduced to consider a shaft location on the left bank, and outside the floodplain. See Figure 12.10. Option H combines intake, outfall, and shaft on the left bank of the river Thames, approximately 265m upstream of the Culham Cut.
Site Access	The site access is from the Abingdon Road and then The Burycroft. The option requires 580m of additional access road, coming off The Burycroft.
Floodplain	The location of the intake/outfall structure, including shaft and control building, is outside of the Thames flood zone 3 but within flood zone 2. However, the option sits within Green Belt land and is likely to clash with the Thames Path, a national trail route along the riverbank of the River Thames.

Geomorphology	The location of the intake is on the inside of a river bend so there is a high risk of sediment deposition close to the structure impacting on operation.
Outfall Extension	Due to its location, the option necessitates a long extension (980m) of the existing STW outfall.

Appendix I. Intake/Outfall Option A Criteria Workbook

Intake Outfall Option A Appraisal Workbook

Criteria code	Criteria Description	Method of Assessment	RAG	Description of RAG	Narrative	Sub-Theme
Constructability						
CON1	Safety - Risk of endangering construction workers or members of the public during construction e.g. water, ground, height, rail, road and utilities	Look at programme and list types of construction involved. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be constructed safely but enhanced control measures required	Very tight working area adjacent to water both from the flooded gravel pit and River Thames. Overhead HV power cables adjacent to the permanent access road.	Health and Safety
CON2A	Programme - Duration, longest /shortest, but also consider whether the longer duration has an impact on the overall scheme programme	Compare differences in the programmes which would materialise from different options. Consider earthworks seasons.	A	Likely to extend the duration of the relevant area of works (e.g. road, rail siding or intake/offtake construction) compared to the Gate 2 SESRO programme but unlikely to impact on the critical path of the Gate 2 SESRO programme.	Complicated sequential work. The overall programme duration will be unaffected as the increase in tunnel duration will not affect the critical path and it will be maintained through the tunnel to the reservoir. Increased need for dewatering / sheet piling will increase the site activity.	Programme
CON2B	Programme - Opportunities for construction programme acceleration through efficiencies	Compare differences in the programmes which would materialise from different options.	R	The option has no potential to introduce programme efficiencies and reduce the construction programme	Tight site and working so opportunities for efficiencies will be limited. STW extension can be completed alongside main works due to the location being different. Programme acceleration opportunities are limited with this location due to the length of the tunnel. If sheet piling along the river is required for the intake and outfall there would not be a dramatic increase in time to complete the gravel pit side, but the Earthworks time would increase.	Programme
CON2C	Programme - Dependencies i.e. proximity or physical relationships between elements of scope that introduce programme dependencies	Is the options on the critical path? Will it impact other critical activities?	R	Multiple major programme dependencies	Long tunnel length will change the critical path and could add 7-months onto the programme if tunnelling works are delayed as the start of the filing season will be missed. The critical path will change, instead of the tunnel . Close proximity of elements will mean that items will need to be completed in a sequential way. Works will not be able to commence until temporary land take has been completed. Recovery of TBM space dependent so will impact works constructing the inlet and outlet.	Programme
CON2D	Programme - Risk	Are there items in the construction which have a significant programme risk	R	Major programme risk	Access is based on using Stonehill Lane which runs into an unnamed track east and then north into Peep O Day Lane. From Peep O Day Lane access would be along West Quay and then onto South Quay. Using Marcham Road for all works remains an opportunity. To achieve this structures across the A34, Stonehill Lane and the B4017 will be required to be constructed followed by a haul road. Temporary / permanent infill of the gravel pit will need permissions and is a complex activity that is not required for other options. Piling work may be required to make ground suitable for construction activities. Powerlines may require diversion or temporary switch off's. They may also limit the size of import / export wagons. Works involving making temporary and permanent space for the scheme add risk.	Programme
CON2E	Programme - Use of existing assets to reduce the amount of construction required	Identify if any existing assets can be used	A	Option does not make use of existing assets	Other than road access, this option does not reuse assets or temporary works for permanent items.	Programme
CON3A	Logistics - Space available for construction and materials storage	Determine space constraints using GIS and options layouts from option definition.	A	Limited / restricted space	A relatively tight working area between a flooded gravel pit and the River Thames.	Logistics
CON3B	Logistics - Suitable and efficient access for construction workers, deliveries and waste removal including minimisation of lengths of new roads for access during construction	Determine method of access using GIS and options layouts from option definition.	A	Due to restricted access, an additional length of road is likely required for construction of the option.	The distance to the site from the B4017 (via Stonehill Lane, Peep-O-Day Lane and South Quay) is approximately 3,100m. This would require upgrades to approx. 620m length of Peep-O-Day Lane. The length of additional new access road is approximately 370m. The access road is currently envisaged to connect to the existing South Quay road but there are opportunities to avoid using this road to reduce 3rd party impacts. There may be an opportunity for construction access to the intake/outfall structure site via the Auxiliary Drawdown Channel, which would then reduce construction vehicle usage of the B4017 and Stonehill Lane. However, this is programme dependent and will only be an opportunity if the ADC is retained in the design.	Logistics
CON3C	Logistics - Import of materials or resources during construction	Use quantity estimates to assess different options.	A	Moderate amount of import materials required.	Relatively short additional road length (370m) for accessing site, with a moderate tunnel length (3610m). Short length for extending the Sewage Treatment Works Twin 300 dia Pipework length (90m).	Logistics
CON3D	Logistics - Haulage distance required for construction materials arrival on site to the placement location	Determine length using GIS and options layouts from option definition.	G	One main site location is used for construction of the option.	One main site location is used for construction of the option.	Logistics
CON3E	Logistics - Vehicle movements	Use vehicle movement estimates to assess different options.	R	Construction works likely to require a large number of vehicle movements and vehicle movements may be difficult.	Narrow restricted area making vehicle movements difficult. One way system may need to be implemented or no passing of the shaft possible at various stages.	Logistics
CON4A	Construction Complexity - Temporary conditions/works requirements e.g. embankment slope stability and moisture outside of placement seasons.	Expert Judgement	R	No acceptable Temporary Works available to enable construction	Requires a STW outfall extension - approximate length is 90m, temporary works required to create a dry working area at the outfall. Safe working arrangements for working adjacent to water from both the flooded gravel pit and the River Thames. Some earthworks within the gravel pit will be required to increase the area adjacent to the shaft. A temporary cofferdam / retaining structure is likely required. Temporary access required includes a narrow track in between 2no flooded gravel pits.	Construction complexity
CON4B	Construction Complexity - Location conflict/opportunity with another engineering component of the scheme or other SRO/non-SRO schemes, e.g. Severn to Thames Transfer (STT), Thames to Southern Transfer (T2ST), TW Swindon and Oxfordshire supply zone transfer, Transfer to Farmoor Reservoir	Expert judgement and knowledge of surrounding schemes	R	Location / layout of option clashes with another component of this scheme (or another scheme) which is already set or would be difficult to change	Assuming that the STT pipeline connects into the shaft for discharging to the Thames through the outfall, the shaft is located between an existing flooded gravel pit and the River Thames with constraints on both sides of the flooded gravel pit - this location is likely to be very challenging to allow connection of the Severn to Thames (STT) pipeline into the outfall structure.	Construction complexity
CON4C	Construction Complexity - Minimise the number and complexity of additional structures/assets required or modifications to the existing structures/assets in order to facilitate the option, e.g. bridges, culverts, crossings	Determine using GIS and options layouts from option definition.	R	Option requires a complex and/or high number of additional structures and/or modifications to existing structures.	The option has: a requirement for part infilling of a flooded gravel pit, relatively short culverts and a short extension of the sewage treatment works outfall.	Construction complexity
CON4E	Construction Complexity - Complexity of construction technique e.g. construction of tunnels, Auxiliary Drawdown Channel (ADC) or both for the emergency discharge	List out the differences in construction complexity (engineering cost risk & stakeholder interfaces risk). Use expert judgement to decide on the assessment. Compare with inclusions on cost to ensure no double-counting.	R	Complex construction technique required that carries a high risk that may be difficult to mitigate. Examples of high risk activities (for intake/outfall) include: infilling of existing gravel pits.	The option requires some filling in of the existing gravel pit	Construction complexity
CON5A	3rd Party Impact - Potential to disrupt existing road network during enabling works and construction	Expert judgement	R	Disruption likely to be significant	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 3,100m. The route will likely cause significant disruption, particularly to the National Cycle Network Route 5, which would need to be upgraded and used during construction.	3rd Party Impact
CON7A	Ground - Terrain of site, and implications for the need for earthworks and engineered slopes	Use of lidar and civil 3D models to assess amount/location of earthworks required	A	Terrain is unfavourable to the design of assets and therefore increases the amount of earthworks required	Option is on the right bank of the River Thames, and therefore the site is low and flat. However, this option requires some raising of the ground to bring the shaft above flood level as well as infilling of the existing gravel pit, and therefore an increased amount of earthworks.	Construction complexity
CON7B	Ground - Risk of unexpected conditions	Use of expert judgement based on comparable areas	R	High exposure to risk of unexpected ground conditions.	Relatively high risk of unexpected ground conditions due to the need for some infilling of the existing gravel pit, and distance from existing boreholes.	Construction complexity

CON7C	Ground - Impact of ground conditions on the complexity of design and construction	Expert judgement	A	Ground conditions may impact the complexity of design and construction to a limited extent resulting in, for example, increased costs and a requirement for materials that are difficult to source.	Complexity of the design of the partial infilling of the existing flooded gravel pit could be impacted by ground conditions.	Construction complexity
CON7D	Ground - Risk of ground settlement above line of tunnel affecting other structures/houses	Expert judgement	A	Risk level acceptable or can be reduced with mitigation	Tunnel route chosen to avoid passing below structures that can be identified from aerial imagery.	Construction complexity
CON8A	STT Integration Complexity - Complexity of connecting STT directly into the intake/outfall structure.	Expert judgement	R	For the intake/outfall: The intake/outfall structure is a far away and/or complex construction is required to achieve connection to the intake/outfall structure.	Assuming a STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall shaft structure, the STT pipeline for Option A would need to be long as the location is further north than the ADC discharge location. The final section of pipeline would need to be inside a culvert when routed through the flooded gravel pit, adding to construction complexity.	STT
Operability						
OPS1A	Safety - Risk of endangering operational staff, visitors or members of the public during operation	Look at operational activities and public access. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be operated safely but enhanced control measures required	This option will require enhanced control measures due to proximity to water. This option will require security fencing to reduce the risk of endangering the public during operation. This option poses potentially a low risk to the public as the main shaft is located within the existing Abingdon Sewage Treatment works, and is therefore less accessible.	Health and Safety
OPS1B	Safety - Access and egress for operational staff, visitors, deliveries and waste removal during normal operations and emergencies	Tunnel silt issue to be considered by expert judgement	A	Access/egress can be provided, however it is challenging / restricted	During larger River Thames flood events this option would not be accessible, as the access road is not intended to be raised above the River Thames flood level.	Health and Safety
OPS2A	Maintenance - Ease of maintenance	Expert judgement	A	Majority of maintenance activities could be undertaken during moderate closure periods and / or with moderate disruption	This option does not have long culverts which may mean the majority of maintenance activities could be undertaken during moderate closure periods and / or with moderate disruption.	Operational Complexity
OPS3A	Performance - Impact of intake location on removal of screenings and large floating debris e.g. rate of removal and volume to be removed	Expert judgement	A	Moderate reduction of screen capacity during high flows (partial intake blockage and reduced transfer capacity)	All options consider the same intake screen design and experience the same flows as their locations are similar, and may experience moderate reduction in capacity. Geomorphological performance considered in OPS11.	Operational Complexity
OPS4A	Reliability - Footprint of the option within flood zones (as an indication of the potential for damage and the challenge of operation / maintenance during flood events)	Review GIS supported by expert judgement	A	Option is within the flood zone, however damage is not considered to be a significant risk	The intention is for the area around the shaft to be raised above the River Thames flood level. However, the access road to the structure is not intended to be raised (in order to reduce the risk of impacting River Thames flooding).	Operational Resilience
OPS6A	Evolvability - Risk to operation from future climate change, e.g. losses from evaporation due to higher temperatures, impact of higher rainfall, intake/outfall flood risk perspective	Expert judgement	R	Option could be significantly impacted by future climate change impact	This option is within the flood zones 2 and 3 and therefore has a risk to operation from increased flood levels.	Operational Resilience
OPS7A	Sustainability - Reuse of assets or temporary works for permanent items, e.g. materials storage slab, haulage roads, compound car park	Expert judgement	A	Some potential for reuse of assets/temporary works	This option does not reuse assets or temporary works for permanent items. Option C does use a disused area of the Abingdon STWs.	Operational Resilience
OPS7B	Sustainability - Power required for operation	Calculated power requirement for the option	A	Option requires moderate amount of energy to operate	Option requires moderate amount of energy to operate	Operational Resilience
OPS8A	3rd Party Impact - Potential to disrupt existing road network during operation	Expert judgement	A	Disruption likely to be limited	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 3,100m. The route will likely cause moderate disruption. If access to site is to remain via the south after construction using Peep-O-Day Lane, there is an opportunity to upgrade Peep-O-Day Lane to make it better suited for users.	Transport Planning
OPS10	Quality - Impact on water quality received by the reservoir from the intake	Expert judgement	A	Design requires moderate amounts of interventions to ensure water quality	Impact on water quality is unlikely to significantly differ between the options, moderate interventions required to ensure quality for all options e.g. air diffusers within the reservoir. Geomorphological performance considered in OPS11.	Reservoir water quality
OPS11	Performance - Geomorphological impacts, e.g. potential sedimentation around the structure	Expert judgement	R	Geomorphology is likely to have a large impact on the performance of the structure.	Option is located within the a zone of deposition (defined as part of previous assessment - see evidence) and therefore sedimentation way occur around the structure impacting operation.	Operational Resilience
OPS12A	STT Integration Complexity - Complexity of operating STT directly into the intake/outfall structure.	Expert judgement	R	Intake/outfall: Operability and/or resilience of SESRO and/or STT compromised.	The STT pipeline to Option A would be longer and potentially require greater operational input. The section of pipeline within the flooded gravel pit would likely be more difficult to maintain as it would need to be culverted.	STT
Relative Costs						
COS1	Capex cost of the option	Cost estimate calculation for each option.	G	CAPEX estimated to result in an increase of <1% of the CAPEX for the overall SESRO project compared to the lowest cost option	Initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option A is the lowest cost intake/outfall option.	Cost
COS3	Opportunity for cost-sharing with other SROs, NSIPs and local non-SRO schemes/plans, e.g. STT, T2ST, SWOX/Farmoor, Abingdon flood storage	Cost estimate calculation for each option.	G	Multiple opportunities identified for cost saving.	For the Intake/Outfall structure an opportunity for sharing costs seems to be present for just STT. Reviewing the connection between SESRO and STT the opportunity is more present for STT. The best saving would be made by Thames Water agreeing that STT can discharge into the SESRO tunnel, so that STT flows discharge to the River Thames either by the tunnel or the ADC. However, assuming STT must connect to the SESRO Intake/Outfall structure, the opportunity is that both could discharge through the same outfall structure.	Cost
Carbon Costs						
CAR1	Carbon costs associated to the Capex of the option	Carbon estimate calculation for each option.	G	Emissions (tCO2e) estimated to result in an increase of <1% of the emissions (tCO2e) for the overall SESRO project compared to the lowest emissions (tCO2e) option	Initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent 1.6% of total SESRO carbon. Option A is the lowest carbon intake/outfall option.	Carbon
Environmental Performance						
ENV1A	Minimise impacts on Special Area of Conservation (SAC)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SAC's or potential SAC's within the boundary of the proposed Intake/Outfall Option A. The closest SAC to the Intake/Outfall is 5.4Km to the north-west (Cothill Fen SAC)	Biodiversity and Nature Conservation
ENV1B	Minimise impacts on Special Protection Area (SPA)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SPA's or potential SPA's within the boundary of the proposed Intake/Outfall Option A. The closest SPA to the Intake/Outfall is approximately 40Km to the south-east (Thames Basin Heaths SPA)	Biodiversity and Nature Conservation
ENV1C	Minimise impacts on Ramsar	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no Ramsar sites or potential Ramsar sites within the boundary of the proposed Intake/Outfall Option A. The closest Ramsar to the Intake/Outfall is approximately 54Km to the south-east (South West London Waterbodies)	Biodiversity and Nature Conservation
ENV1D	Minimise impacts on Site of Special Scientific Interest (SSSI)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SSSI sites or potential SSSI sites within the boundary of the proposed Intake/Outfall Option A. The closest SSSI to the Intake/Outfall is approximately 1.4Km to the north-east (Culham Brake SSSI). The Intake/Outfall is within the Impact Risk Zone for Culham Brake SSSI but pipeline works are not included within the list of risks within this area.	Biodiversity and Nature Conservation
ENV1E	Minimise impacts on National Nature Reserve	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no NNRs or potential NNRs within the boundary of the proposed Intake/Outfall Option A. The closest NNR to the Intake/Outfall is approximately 4.8Km to the north (Cothill NNR)	Biodiversity and Nature Conservation
ENV1F	Minimise impacts on Local Nature Reserve (LNR)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no LNRs or potential LNRs within the boundary of the proposed Intake/Outfall Option A. The closest LNR to the Intake/Outfall is approximately 2.8Km to the north-east (Abbey Fishponds)	Biodiversity and Nature Conservation
ENV2A	Minimise impacts on Ancient Woodland	Natural England Ancient Woodland Maps and Professional Judgement.	G	No ancient woodland impacted	Historic mapping indicates that there is no ancient woodland present on-site	Biodiversity and Nature Conservation

ENV2B	Minimise impacts on Ancient and Veteran Trees	Woodland Trust Ancient Tree Inventory map search and professional judgement	A	Development in close proximity with potential indirect impact to ancient or veteran trees	There are no ancient or veteran trees recorded by the Woodland Trusts Ancient Tree Inventory on or close to this option. However, survey may identify trees that could be classified as ancient or veteran. As such, this option scores amber on a precautionary basis pending survey.	Biodiversity and Nature Conservation
ENV2C	Minimise impacts on Protected Trees	Check against published TPO dataset.	G	No protected trees impacted	No protected trees would be impacted.	Landscape & Visual
ENV2D	Minimise impacts on vegetation (including trees, woodland, hedges and shrubs)	Check against baseline resources and based upon high level knowledge of site from previous site visits. Professional judgement.	A	Direct impact on vegetation within a moderate proportion of construction footprint, which is of high arboricultural/amenity value (e.g. A or B grade) or biodiversity habitat in good condition. OR Direct impact on vegetation within large proportion of construction footprint, which is of lower arboricultural/visual amenity value (e.g. C grade) or biodiversity habitat in poor condition.	The tunnel excavation is assumed to be trenchless and therefore to only affect vegetation at the entry and exit points. Construction of the intake/outfall would require the removal of vegetation along the River Thames and a tree belt along an adjacent gravel pit. It is assumed that some A or B grade trees potentially could be impacted as a result of this. Localised vegetation clearance may also be required to facilitate the construction access road. Assuming a trenchless method of excavation is utilised, the extension of the STW Outfall would require limited vegetation removal. The habitats to be removed may provide habitat for a range of protected and notable species including otter and water vole (riparian mammals), bats and badgers.	Biodiversity and Nature Conservation and Landscape
ENV3	Minimise impacts on Local Wildlife Sites (LWS)	Professional Judgement and LWS Citation provided by TVERC.	G	No impacts to LWS	There are no LWS or potential LWS within the boundary of the proposed Intake/Outfall Option A. The closest LWS to the Intake/Outfall is approximately 2Km to the north-west (Marcham Salt Spring LWS)	Biodiversity and Nature Conservation
ENV4A	Minimise impacts on Scheduled monuments or activities which could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No physical loss to scheduled monuments. The nearest scheduled monument to the option is a dovecote at Culham Manor (NHLE 1019391) which lies 530m south-east of the option intake/outfall - potential change to setting	Historic Environment
ENV4B	Minimise impacts on listed buildings or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	The nearest listed building to the intake/ outfall structure is the Grade II listed Church of St Paul (NHLE 1059792) at Culham which lies 435m to the south-east of the option. This has implications for the setting of the building	Historic Environment
ENV4C	Minimise impacts on Registered Parks and Garden or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any Registered Park and Garden in physical terms. Sutton Courtenay Manor is the nearest such designation lying 1.1km to the south-east of the intake/outfall option, so setting changes unlikely	Historic Environment
ENV4D	Minimise impacts on Registered Battlefields or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any Registered Battlefields with the nearest being the Battle of Chalgrove (NHLE 1000006) 14.5km to the east of the option	Historic Environment
ENV4E	Avoid impacts on World Heritage Sites or activities that could lead to a loss of significance, including setting	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any World Heritage Sites with the nearest being Blenheim Palace (NHLE 1000091) over 20km to the north	Historic Environment
ENV4F	Minimise impacts on conservation areas which could result in loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No disturbance within a conservation area and no major changes to setting - amber scoring due to distance from Culham conservation area which lies 380m south east of the intake/outfall location	Historic Environment
ENV5A	Minimise loss to non-designated built heritage	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Extensive loss of non-designated built heritage of low value within the permanent infrastructure zone and adverse changes to within a 500m area from the edges of the permanent infrastructure OR more limited effects on non-designated built heritage of medium value	No loss of known historic buildings expected with no historic structure on the HER dataset within the option footprint	Historic Environment
ENV5B	Minimise loss to paleoenvironmental remains	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or damage to low value remains within the construction area and adverse changes to similar buried remains in a 1km area around the permanent infrastructure from temporary and permanent changes to local hydrogeological regimes OR more limited effects on remains of medium value	Likely loss of some paleoenvironmental material as structures are within the River Thames floodplain and the likely relict paleochannels within the buried environment and organic remains interleaved with alluvial deposits	Historic Environment
ENV5C	Minimise loss to non-designated historic landscapes	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or extensive changes to low value non-designated historic landscapes within the construction area and extensive changes to the setting of the same resource outside the permanent infrastructure OR more limited effects on non-designated historic landscapes of medium value	No loss of non-designated historic landscapes as no non-designated historic landscapes are recorded within the option footprint	Historic Environment
ENV5D	Minimise loss of non-designated archaeological remains	Professional judgement, incorporating the use of the IEMA's Principles of Cultural Heritage Assessment in the UK and the Chartered Institute for Archaeologists standard and guidance document for desk based assessment	G	Permanent infrastructure and construction area will result in the loss and / permanent damage to non-designated buried and extant archaeological remains worthy of local significance which can be adequately mitigated through preservation by record	Minimal disturbance of known archaeological remains with possible vibration-related damage occurring to the site of a Romano-British complex near the option intake/ outfall although this has evidently been erased by historic quarrying	Historic Environment
ENV6A	Minimise loss of fluvial flood storage within Flood Zone 2 or 3	Measure using GIS	R	Site is within flood zone 2 and 3 and replacement flood storage is required but not available	The intake/outfall structure is within both flood zones 2 and 3. 1415m of tunnel length within flood zones	Flood Risk
ENV7A	Minimise disturbance of potentially contaminated land	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of potentially contaminated land with one or more of the following properties: - Unlikely to have significant cost or program implications - Unlikely to cause significant harm to potential receptors - Can be easily mitigated and remediated	This option is proposed to pass beneath the A34, close to two areas recorded as sewage works within historical mapping, (Abingdon Sewage Treatment Works). The option is also proposed to pass adjacent to a farm with associated tanks and 170m north of Sutton Wick leachate treatment plant. Geological mapping also indicates an area of Made Ground along the route (between the sewage works areas). There may also be the potential for unrecorded areas of Made Ground (and hence potential contamination) along the route. Additionally the tunnel is likely to bore through Kimmeridge Clay which may present a risk of hydrocarbon contamination due to potential bituminous content. There may be the potential for significant effects associated with land contamination, however, based on currently available information it is likely these can be addressed with appropriate mitigation.	Land

ENV7B	Minimise disturbance of potentially contaminated land specifically in relation to authorised and historic landfills	Desk based assessment of areas to identify location extent of historical and authorised landfills	R	Within authorised landfills or previous industrial sites	This option is proposed to pass beneath/through the Southern Town Park historical landfill in the location of historical sand and gravel extraction. The landfill is recorded as being licensed to accept inert, commercial, household and liquid sludge, with waste accepted between 1967 and 1978. There is currently little information available relating to the construction, depth or infrastructure which may be present associated with this landfill and it is assumed, at this stage, that there may be significant effects associated with its disturbance, these may range from risks associated with direct disturbance or disturbance of the ground surrounding the landfill. The following risks should be considered; - landfill gas and leachate pathway disturbance, - waste disturbance - infrastructure disturbance (e.g. liner or pipework) - permitting arrangements - potential for significant costs and programme delays Consultation will be required with regulators to obtain further detail to assist with assessments.	Land
ENV8	Minimise disturbance of land with known potential for Unexploded Ordnance (UXO)	Use of a Preliminary Desk Study Assessment from Zetica.	A	Disturbance of a low quantity of UXO which can be easily managed / remediated. Unlikely to have significant cost or program implications	The detailed Zetica desk study (P13129-23-R1) has assessed the area to be low risk, defined as 'There is no positive evidence that UXO is present, but its occurrence cannot be totally discounted'. There are records showing bomb drop locations on and around the options north of Drayton in this low risk area. In a low risk area Zetica recommends 'a UXO briefing for all staff involved in excavations'. Further consultation may be required to determine appropriate mitigation for sub-surface tunnelling. The detailed study doesn't cover the entire eastern extent of the route.	Land
ENV9A	Minimise loss of terrestrial priority habitats (use narrative to describe type and quantum)	Use of aerial imagery, MAGIC maps and Professional Judgement	G	No priority habitat directly impacted by proposed option footprint	The pipeline for Intake/Outfall Option A passes through several areas of broadleaf woodland priority habitat including areas within Abingdon STW. The pipeline also passes through an area described as 'no main habitats but additional habitats present'. The River Thames is also considered priority habitat. Where the pipeline is underground, habitats should not be impacted.	Biodiversity and Nature Conservation
ENV9B	Minimise loss of aquatic priority habitats (use narrative to describe type and quantum)	Professional judgement based on knowledge of Water Framework Directive.	A	Priority habitat directly impacted but mitigation feasible	As a result of this option, a proportion of the bank of the River Thames will be lost. The options will span 205m of bank however not all of this habitat will be lost. Depending on the design of the intake screen, between 35 - 38m of bank are expected to be lost. The length of habitat lost will need to be mitigated for appropriately.	Aquatic Environment
ENV10A	Reduce effects on North Wessex Downs Area of Outstanding Natural Beauty (AONB) and its setting	Professional judgement.	A	AONB and its setting likely to be affected. Effect is unlikely to be significant.	The introduction of the intake and outfall infrastructure along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the North Wessex Downs AONB due the limited scale of the structures above ground, distance, intervening urban areas and vegetation in the landscape between the AONB and the infrastructure.	Landscape & Visual
ENV10B	Reduce effects on local landscape character	Professional judgement.	A	Effect on local landscape character is unlikely to be significant.	The introduction of the intake and outfall infrastructure, including the Control Building, could affect the sense of tranquillity along the River Thames. The loss of vegetation and tree belts could erode a key characteristic which contributes positively to the local landscape character. While effects on local landscape character may be significant in the short term, this could be mitigated in the long term, particularly given the context of the nearby sewage and mineral works which already affects the sense of place and tranquillity.	Landscape & Visual
ENV11A	Reduce effects on panoramic views from national trail, open access land and important viewpoints in AONB	Professional judgement.	G	Panoramic views from national trail, open access land and important viewpoints in AONB unlikely to be affected or the proposal is likely to be barely discernible in views.	The intake and outfall infrastructure is likely to be barely discernible in panoramic views from The Ridgeway National Trail in the AONB, given the distance and intervening urban areas and vegetation.	Landscape & Visual
ENV11B	Reduce effects on sensitive local visual receptors	Professional judgement.	R	Effect on local views of sensitive visual receptors likely to be significant.	Some PRoWs, National Cycle Network Route 5 and the Vale Way Long Distance Path would be directly affected by the haul road and construction traffic on it. Although a substantial tree belt along the left bank of the River Thames would help to screen the intake and outfall infrastructure in views from the Thames Path National Trail, where it passes at its closest point, there would be close-range views from other parts of the trail, a nearby PRoW and from the river itself, including views of the intake screens/river barrier and Control Building. There could also be intermittent middle-distance views from the National Cycle Network Route 5 and Vale Way Long distance Path. Although such views are affected to varying degrees by the presence of pylons and overhead lines or Didcot Power Station, the effect could potentially be significant given the sensitivity of the visual receptors. Visitors to Abingdon Marina and nearby residents may also have partially filtered views through intervening vegetation towards the infrastructure. While effects on these views may be significant in the short term, the effects could be mitigated long term.	Landscape & Visual
ENV12	Minimise disturbance/encroachment into Air Quality Management Area (AQMA)	Based on an understanding of the scale and nature of activities, air quality management areas (AQMAs) were identified in close proximity to the proposed works.	G	Site is located further than 1km from AQMA OR no construction traffic must go through an AQMA	Marcham AQMA is approximately 2.2 km NW of Option A at its closest point. Abingdon AQMA is approximately 1.4 km N of Option A at its closest point. The anticipated construction and operational activities would likely lead to a negligible change in air quality.	Air Quality
ENV13	Minimise disturbance/encroachment into Groundwater Source Protection Zone (SPZ)	Magic maps	G	Site is within Zone 3 or not within a SPZ	Site is not within an SPZ.	Aquatic Environment
ENV14A	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Cow Common Brook and Portobello Ditch' WFD waterbody (GB106039023360) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14B	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ock and tributaries (Land Brook confluence to Thames)' WFD waterbody (GB106039023430) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment

ENV14C	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Thames (Evenlode to Thame)' WFD waterbody (GB106039030334) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	A	Moderate adverse impacts likely; low risk to ability to attain Water Framework Directive objectives for this waterbody	This option will impact the River Thames WFD waterbody as a section of the WFD principal waterbody will be lost. The option has the potential to impact the ecological status of the waterbody due to a loss of river bank and riparian habitat. However, this impact is considered to be localised and not at a waterbody scale. Impacts can be easily mitigated.	Aquatic Environment
ENV14D	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Sandford Brook (source to Ock)' WFD waterbody (GB106039023410) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14E	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Childrey Brook and Norbrook at Common' WFD waterbody (GB106039023380) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14F	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ginge Brook and Mill Brook' WFD waterbody (GB106039023660) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14G	Option does not affect Water Framework Directive (WFD) Quality Elements within one of WFD waterbodies downstream of the River Thame to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives. These WFD waterbodies include: - Thames Wallingford to Caversham - WFD waterbody GB106039030331 - Thames (Reading to Cookham) - WFD waterbody GB106039023233 - Thames (Cookham to Egham) - WFD waterbody GB106039023231 - Thames (Egham to Teddington) - WFD waterbody GB106039023232	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV15A	Maximise potential for future environmental benefits (terrestrial), e.g. increase tree planting	Professional Judgement	A	Site allows some additional environmental benefits to be realised	No specific space allowed for environmental benefit. Location would remove areas of trees, woodland, shrub and riparian vegetation along the Thames.	Biodiversity and nature conservation
ENV16	Maximise flexibility in routing diverted watercourses so their habitats can be of sufficiently high quality to contribute to catchment Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Site allows significant flexibility in routing watercourses / Good or high quality habitat options are available	Option does not impact routing of diverted watercourses.	Aquatic Environment
ENV17	Minimise disturbance/encroachment into Local Geological Sites (LGS)	Desk based assessment of areas to identify potential sources of contamination	G	Site is located more than 250m from LGS	No known designated geological sites within 250m	Land
ENV18A	Minimise impacts associated with Noise and Vibration as a consequence of the construction of the option	Indicative assessment with noise sensitive sample receptors within RAG bands identified based on predicted construction noise levels during Gate 2 assessment, with updates made to construction activitues at intake / outfall facility. Draft Gate 3 plant list includes a Secondary Lining activity, which will involve the use of concrete batch plant and represents the worst-case activity in the draft Gate 3 plant list. This activity has been used for the optioneering study. The assessment considers five sample receptors, each representing clusters of properties/receptors in the vicinity of the intake / outfall options. The sample receptors are: NV-A: Residential properties on South Quay NV-B: Residential properties west of St Paul's Church, west of The Burycroft road NV-C: Farm east of The Burycroft road NV-D: Location of Moored boats at Marina NV-E: Residential properties north of St Paul's Church, west of The Burycroft road Red band distance is from works site/access road to the SOAEL+5dB, and Amber distance is from SOAEL+5dB to the SOAEL. Road Construction: Red 60m, Amber 61-99m, Green 100m. Construction Traffic (on access road): Red 5m, Amber 6-	R	Significant effects likely which would be difficult to mitigate	The closest sample receptors to the proposed facility at Option A are NV-A (~210m) and NV-D (~225m). At these distances, and when considering the predicted construction noise levels at the facility during secondary lining activities, the receptors are predicted to be within the Red band. In total, there are approximately 7 residential receptors and a number of mooring points in the Abingdon Marina which fall into the Red band. Sample receptor NV-B (~410m from the facility) is predicted to be within the Amber band. The proposed access road for Option A would be as close as ~70m to sample receptor NV-D, and as such the sample receptor would be within the Amber band during construction of the access road. No significant effects are predicted as a result of construction traffic on the proposed access road for Option A. However, construction movements on the local road network have the potential to result in adverse effects (e.g. South Quay and Stonehill Lane)	Noise
ENV18B	Minimise impacts associated with Noise and Vibration as a consequence of the operation of the option	Quantitative assessment not possible at this time. As such, the option appraisal study has considered the qualitative assessment undertaken at Gate 2 and applies professional judgement in assigning RAG bands to each option under assessment	A	Potential significant effects but likely to be mitigated if they occur	Sample receptor NV-A is ~210m from the facility at Option A. At this distance, it is possible that noise from the facility would be audible during normal operations. However, with the implementation of noise and vibration control measures within the design of the facility, it would be anticipated that significant effects would be avoided.	Noise
ENV19A	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the construction of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	There are between 10 - 100 high sensitivity receptors (i.e. dwellings) within 20 m of the construction route for Option A (i.e. along South Quay and West Quay) and there are between 10 - 100 high sensitivity receptors (i.e. dwellings) between 210 - 350 m of the main works (i.e. shaft and control building, raised area etc). It is considered that there are no proposed dust-generating construction activities that could not be managed using normal good practices (IAQM construction dust guidance, 2023) to prevent significant effects at any off-site receptor. Given that relatively low numbers of plant and items of machinery would be used and the anticipated number of construction vehicles, the potential effects would likely lead to a negligible change in air quality.	Air Quality
ENV19B	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the operation of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	The likely minimal operational-related traffic (e.g. staff, planned maintenance, repair, refurbishment and replacement events) is such that the potential effects from vehicle emissions would likely lead to a negligible change in air quality at nearby receptors.	Air Quality
ENV20A	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the construction of the option	Professional judgement.	A	Noticeable changes to visual amenity of local community	Construction activities and traffic associated with the intake and outfall could lead to noticeable changes to the visual amenity of the local community near Abingdon Marina. This could in part be due to temporary security lighting and/or night-time construction works. However, there would be little effect on the visual amenity of the communities in Culham, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV20B	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the operation of the option	Professional judgement.	G	Barely perceptible changes to visual amenities, with no or little effect on local community	While the effect of operational lighting would be limited, the intake and outfall infrastructure, including the Control Building, could potentially lead to noticeable changes to the visual amenity of the local community near Abingdon Marina in the short term. However, these effects could be mitigated in the long term. There would be little effect on the visual amenity of the communities in Culham, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual

ENV21A	Minimise impacts associated with solid discharge during construction, e.g. aggregate spills during material transport, sediment runoff from clay erosion due to excavation of the pipeline / tunnel and construction works	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
ENV21B	Minimise impacts associated with solid discharge during operation, e.g. release of sediment into surrounding environment during maintenance such as dredging, debris removal	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from operation likely to be readily controlled using standard mitigation	Pollution
Community and Planning Considerations						
CPC1	Distance to the nearest property that will stay during construction (metres)	GIS	R	Less than 250m from the nearest property	Intake Outfall Structure - 210m to nearest property Tunnel - 70m to nearest property	Socio-Economic
CPC2	Minimise impacts on local community during construction associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	A	Community access/use of community assets is disrupted during construction	Intake/outfall and access road is within 500m of homes, Abingdon marina, Abingdon Marina Park, Southern Town Park, a sports club and NCN5. During construction it is reasonable to expect some disruption from traffic and temporary periods of restricted access particularly along NCN5 and to the Marina and Abingdon Marina Park.	Socio-Economic
CPC3	Minimise impacts on local community during operation associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	G	Community access/use of community assets is not disrupted during operation	Intake/outfall and access road is within 500m of homes, Abingdon marina, Abingdon Marina Park, Southern Town Park, a sports club and NCN5. During operation it is reasonable to expect no disruption to residents or those accessing assets such as NCN5.	Socio-Economic
CPC4A	Are public rights of way (PRoW) disrupted or adversely affected?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	R	Recreational resources / rights of way of national or regional importance are disrupted or affected	Intake/outfall and access road is within 500m of homes, Abingdon Marina, Abingdon Marina Park, a sports club and NCN5. Disruption will be experienced during construction along a long section of NCN5. Although during operation there will be minimal disruption.	Socio-Economic
CPC4B	Are there opportunities to create or improve linkages of Public Rights of Way (PRoW) and recreational routes?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	G	Links to a recreational resource / right of way of national or regional importance can be enhanced	NCN may experience disruption but linkages to it could be improved.	Socio-Economic
CPC5	Maximise potential opportunity for recreational benefits	GIS analysis of PRoW, open spaces, cycle routes, canals, other forms of regional/nationally important receptors (eg National Cycle Routes), and community assets.	A	Option allows some additional recreational benefits to be realised	This option represents disruption to the longest stretch of NCN during construction compared to other options. However, this does not preclude the recreational opportunities of a strategically important route in the long term.	Socio-Economic
CPC6	Support the realisation of socio-economic incentives on SESRO, including employment, skills, tourism, sustainable travel, connecting people with nature and environmental education	GIS analysis of footprint, community assets, private residents, and businesses. Also awareness of overall project objectives is needed to conclude if the designs align with these.	A	Site supports some of the social-economic incentives of the overall scheme	This option represents disruption to the longest stretch of NCN during construction compared to other options. However, this does not preclude the recreational opportunities of a strategically important route in the long term.	Socio-Economic
CPC7	Minimise overall SESRO Order Limits extent and land acquisition, without compromising SESRO needs and project benefits	Spatial comparison of land that would likely be included in the DCO Order Limits, including construction working areas, access and highways or PRoW interactions.	A	Requires minor additional Order Limits extent	The tunnel route and intake/outfall location is outside of the land safeguarded for the reservoir (CP14) in the Vale of White Horse Local Plan 2031, requiring different land acquisition and Order Limits extent compared to other options which do stay within this safeguarded land area.	Consenting
CPC8	Aim for consistency with published and (insofar as possible) emerging Local Plan land use allocations	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in existing and any emerging Local Plan documents and any Supplementary Planning Documents.	A	Negotiation required with LPA to accommodate scheme within Local Plan	The tunnel and intake/outfall structures are within the area safeguarded for the South Abingdon-on-Thames Bypass linking the A415 to the West and South, including a new River Thames Crossing east of the town (Vale of White Horse Local Plan 2031, policy CP12). The tunnel may be able to be accommodated alongside any potential road alignment, but intake/outfall structures are more likely to impact the potential location of the River Thames road crossing. No land use allocation conflicts with the Oxfordshire County Council Minerals and Waste Local Plans. The proposed realigned safeguarded area for the Southern Abingdon Movement Corridor in the draft Joint Local Plan 2041 has been revised such that it would overlap with all of the right-bank options considered in this appraisal. Thames Water will seek to engage further with the joint local authorities and with Oxfordshire County Council about the SESRO design to explore options, constraints and opportunities for this policy area, as the Local Plan moves through the consultation and examination process. As this is a draft policy, subject to change, it has been considered alongside (not necessarily superseding) the existing Policy CP12 in this options appraisal and has not altered the conclusion.	Consenting
CPC9	Aim for consistency with any adopted Neighbourhood Plan policy applicable to the land area affected	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in any made Neighbourhood Plan.	A	Negotiation required with Parish Council to accommodate scheme within Neighbourhood Plan	All options pass through the area of the Drayton Neighbourhood Plan, which is the only made neighbourhood plan in the area. Community Policy C-T5 states that a weight limit will apply for HGVs travelling through the village. Options A-F will use Drayton Road (B4017) for access but it is anticipated that this would be from the north, not passing through Drayton. The indicative potential tunnel alignment for option A passes under the very north edge of the 'North of Barrow Road' area that is allocated for housing in the Drayton Neighbourhood Plan, and has been developed into housing and a sports/play area under permission P14/V2504/FUL. The indicative tunnel alignment passes under the open space within this site, not the houses. The Abingdon-on-Thames NP is being prepared and the Sutton Courtenay NP is being examined.	Consenting
CPC10	Avoid development of infrastructure within specifically designated areas or their setting, as applicable (e.g. Green Belt, AONB, Common Land, Open Space)	Spatial comparison with designated sites, their settings, and the nature of development works expected.	G	Does not require development of above-ground infrastructure within these designations or development likely to have more than a negligible effect on the setting (where applicable)	Not located within a specifically designated area, such as Green Belt, AONB, Common Land or Open Space.	Consenting
CPC11	Avoid encroachment on any safeguarded land in minerals and waste policy, unless the minerals can be beneficially utilised as a result	Spatial comparison of allocated sites and review of policy wording in existing and any emerging Waste and Minerals Local Plan documents.	G	Low or no impact	Not located in minerals safeguarding area or on a site allocated for minerals or waste uses.	Consenting
CPC12	Ability to integrate with existing nationally-significant infrastructure, statutory undertakers' major infrastructure, or any proposed future Nationally Significant Infrastructure Projects (NSIP) (such as that of National Highways, Environment Agency, Network Rail)	Review of NSIP projects on PINS's register; review of Network Rail and National Highways investment plans; spatial review of statutory undertakers' assets.	G	Low or no interaction with existing infrastructure or proposed Nationally Significant Infrastructure Project (NSIP)	No NSIPs currently registered. No known proposals from Network Rail or National Highways. The National Highways RIS3 Investment Plan will be published in 2024 which will detail the A34 improvement project.	Consenting
CPC13	Minimise the consenting complexity due to the need for additional consents and licenses that may be required outside the Development Consent Order (DCO), e.g. additional Flood Risk Activity Permit, Environmental Permit, abstraction/discharge Licence, European protected species licence, etc	Review of the nature of expected development works against the list of other consents and licenses developed at Gateway 2.	A	One or more additional consent/license required	A Land Drainage Consent would be required for works in, over, under or affecting the flow of an ordinary watercourse. A Bespoke Flood Risk Activity Permit will be required for this scale of works on or near a main river. This can be applied for post-DCO. A Temporary Traffic Regulation Order may be required as PRoWs will need to be temporarily closed for construction of the tunnel, although this can potentially be included within the DCO application. Planning consent for the Abingdon STW discharge relocation is expected to be required outside the DCO, but this is applicable to all the options except G.	Consenting
CPC14	Avoid or minimise the need for any consequential development consenting (i.e. displacement or alteration of other development)	Review of existing development within the likely land-take, its nature and scale.	G	No existing development requires planning permission to relocate or alter	The tunnel crosses the A34 and Drayton Road, and Hanson Way National Cycle Route, as do all options. The tunnel will pass under fields used for Abingdon Rugby Club. The tunnel also crosses electric lines, telecom lines, gas lines and water lines (most of which are also underground) which could require diversion, but this can form part of the DCO associated development or potentially be delivered through statutory undertaker permitted development. Option A crosses these lines the fewest number of times compared to the other options. The tunnel also passes under the corner of P21/V1924/FUL - sports pitches and sports pavilion which was granted on 20th April 2023. Abingdon STW outfall relocation would require planning consent, expected to be outside the DCO, but this is applicable to all the options except G.	Consenting
Property & Land Acquisition						

PRP1	Minimise loss of sensitive properties, e.g. residential, commercial, green belt, common land, historical or community assets due to project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of sensitive properties	Assume construction via TBM; would not detrimentally impact surface uses. Tunnelling below Rugby Club land under land/gardens associated with listed buildings at Stonehill farm. No buildings directly above tunnel line. Otherwise all privately owned agricultural land. Construction review may result in increase/decrease of RAG status. Risk of vibration assumed to be exceptionally low risk.	Property & Land Acquisition
PRP2	Minimise loss of land allocated within the Local Plan for alternative higher value / social / cultural value uses, i.e. residential, historical or community assets due project delivery	Review Land allocation mapping on ArcGIS.	A	Temporary loss of allocated land for higher value or social value properties	Assume construction via TBM; however, potential for exclusion zone may impact residential proposals. Beginning of tunnel route cuts through planning application on land west of Abingdon road. Construction / exclusion zone review may result in increase/decrease of RAG status.	Property & Land Acquisition
PRP3	Minimise permanent loss of best and most versatile agricultural land (grades 1, 2 and 3)	Review of agricultural grading layer on ArcGIS, based on 2019 Provisional Agricultural Land Classification	A	Results in loss of any Grade 2 agricultural land or >50% Grade 3 agricultural land	Surface land graded 2 land at over 30%. Assume construction via TBM would not detrimentally agricultural use. Grade 2 = 31% Grade 3 = 60% Grade 4 = 9%	Property & Land Acquisition
PRP4	Assessment of Land and Property asset costs and associated compensation due under the Compensation Code	Review of land use / designation on ArcGIS	A	Land acquisition costs likely to be relatively moderate.	Subsoil values at de minimus, exclusion zone may attract claim for depreciated development potential. Tunnels N/A based on subsoil value of £50 per interest. Construction methodology and surface requirements regarding a potential exclusion zone may escalate this position.	Property & Land Acquisition
PRP5	Assessment of Special Category Land	Review of affected landowners	A	Nature and / or extent Special Category Land is likely to cause moderate consenting risk	Two SCLs possibly identified. Vale of White Horse Council, National Highways.	Property & Land Acquisition
PRP6	Minimise disruptions of landowners access to their land required for temporary works	Review location in conjunction with existing road network	G	Assumption that landowners will be able to access their land during construction and operational phases.	No direct impact on landowners access identified. Assumption that landowners will be able to access their land during construction and operational phases. Crossing of Drayton Rd B4017 may cause general disruption of access between Drayton and Abingdon.	Property & Land Acquisition

Appendix J. Intake/Outfall Option B Criteria Workbook

Intake Outfall Option B Appraisal Workbook

Criteria code	Criteria Description	Method of Assessment	RAG	Description of RAG	Narrative	Sub-Theme
Constructability						
CON1	Safety - Risk of endangering construction workers or members of the public during construction e.g. water, ground, height, rail, road and utilities	Look at programme and list types of construction involved. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be constructed safely but enhanced control measures required	Located between one of the flooded gravel pits and the River Thames.	Health and Safety
CON2A	Programme - Duration, longest /shortest, but also consider whether the longer duration has an impact on the overall scheme programme	Compare differences in the programmes which would materialise from different options. Consider earthworks seasons.	A	Likely to extend the duration of the relevant area of works (e.g. road, rail siding or intake/offtake construction) compared to the Gate 2 SESRO programme but unlikely to impact on the critical path of the Gate 2 SESRO programme.	Complicated sequential work with the shaft and outlet / inlet all close together. The overall programme duration will be unaffected as the increase in tunnel duration will not affect the critical path and it will be maintained through the tunnel to the reservoir.	Programme
CON2B	Programme - Opportunities for construction programme acceleration through efficiencies	Compare differences in the programmes which would materialise from different options.	A	The option has limited potential to introduce programme efficiencies and reduce the construction programme	Completing the treatment works pipeline extension will be possible alongside other works however this will restrict access and some concurrency opportunities. Programme acceleration opportunities are limited with this location due to the length of the tunnel. It may be possible to complete the inlet outlet at the same time as other activities.	Programme
CON2C	Programme - Dependencies i.e. proximity or physical relationships between elements of scope that introduce programme dependencies	Is the options on the critical path? Will it impact other critical activities?	A	Several major dependencies/ multiple minor dependencies	The work will remain off the critical path but the total float for the TBM recovery will reduce and be very close to the critical path (<5 days). Space is available around the shaft to complete intake / outtake works concurrently with other activities.	Programme
CON2D	Programme - Risk	Are there items in the construction which have a significant programme risk	A	Moderate programme risk	Access is based on using Stonehill Lane which runs into an unnamed track east and then north into Peep O Day Lane. From Peep O Day Lane access would be east along an existing track and then north adjacent to the River Thames. Using Marcham Road for all works remains an opportunity. To achieve this structures across the A34, Stonehill Lane and the B4017 will be required to be constructed followed by a haul road. Flooding of the particularly low lying site could make access difficult.	Programme
CON2E	Programme - Use of existing assets to reduce the amount of construction required	Identify if any existing assets can be used	A	Option does not make use of existing assets	Other than road access, this option does not reuse assets or temporary works for permanent items.	Programme
CON3A	Logistics - Space available for construction and materials storage	Determine space constraints using GIS and options layouts from option definition.	G	Adequate space	Although the location is between a gravel pit and the River Thames, it is still considered to have adequate space.	Logistics
CON3B	Logistics - Suitable and efficient access for construction workers, deliveries and waste removal including minimisation of lengths of new roads for access during construction	Determine method of access using GIS and options layouts from option definition.	A	Due to restricted access, an additional length of road is likely required for construction of the option.	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,750m. This would require upgrades to approx. 620m length of Peep-O-Day Lane. The length of additional new access road is approximately 430m. There may be an opportunity for construction access to the intake/outfall structure site via the Auxiliary Drawdown Channel, which would then reduce construction vehicle usage of the B4017 and Stonehill Lane. However, this is programme dependent and will only be an opportunity if the ADC is retained in the design.	Logistics
CON3C	Logistics - Import of materials or resources during construction	Use quantity estimates to assess different options.	A	Moderate amount of import materials required.	Moderate additional road length (430m) required for accessing site, with a moderate tunnel length (3620m). Moderate length for extending the Sewage Treatment Works Twin 300 dia Pipework length (330m).	Logistics
CON3D	Logistics - Haulage distance required for construction materials arrival on site to the placement location	Determine length using GIS and options layouts from option definition.	G	One main site location is used for construction of the option.	One main site location is used for construction of the option.	Logistics
CON3E	Logistics - Vehicle movements	Use vehicle movement estimates to assess different options.	A	Construction likely to add vehicle movements.	Space is available to complete works without major additional vehicle movements or temporary structures.	Logistics
CON4A	Construction Complexity - Temporary conditions/works requirements e.g. embankment slope stability and moisture outside of placement seasons.	Expert Judgement	G	Temporary Works requirements minimal and can be used in the permanent state and no extension to the programme	Requires a STW outfall extension - approximate length is 330m, temporary works required to create a dry working area at the outfall. Safe working arrangements for working adjacent to the River Thames. Temporary access required includes a narrow track in between 2no flooded gravel pits.	Construction complexity
CON4B	Construction Complexity - Location conflict/opportunity with another engineering component of the scheme or other SRO/non-SRO schemes, e.g. Severn to Thames Transfer (STT), Thames to Southern Transfer (T2ST), TW Swindon and Oxfordshire supply zone transfer, Transfer to Farmoor Reservoir	Expert judgement and knowledge of surrounding schemes	A	Location / layout of the option neither clashes nor provides an opportunity to be developed with another component of this scheme (or another scheme)	Assuming that the STT pipeline connects into the shaft for discharging to the Thames through the outfall, the shaft is located between an existing flooded gravel pit and the River Thames with constraints on both sides of the flooded gravel pit - this location is likely to be moderately challenging to allow connection of the Severn to Thames (STT) pipeline..	Construction complexity
CON4C	Construction Complexity - Minimise the number and complexity of additional structures/assets required or modifications to the existing structures/assets in order to facilitate the option, e.g. bridges, culverts, crossings	Determine using GIS and options layouts from option definition.	G	Option requires no or few additional structures and/or modifications to existing structures. None required are likely to be complex.	The option has: no need for infilling of a flooded gravel pit, relatively short culverts and relatively short extension of the sewage treatment works outfall.	Construction complexity
CON4E	Construction Complexity - Complexity of construction technique e.g. construction of tunnels, Auxiliary Drawdown Channel (ADC) or both for the emergency discharge	List out the differences in construction complexity (engineering cost risk & stakeholder interfaces risk). Use expert judgement to decide on the assessment. Compare with inclusions on cost to ensure no double-counting.	G	Simple construction technique required that carries low risk. Simple construction techniques would not include, for example (for the intake/outfall), infilling of existing gravel pits, construction across existing gravel pits or extension of the tunnel below the River Thames.	The option has relatively less complex construction techniques required in comparison to other options.	Construction complexity
CON5A	3rd Party Impact - Potential to disrupt existing road network during enabling works and construction	Expert judgement	R	Disruption likely to be significant	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,750m. The route is will likely cause significant disruption, particularly to the National Cycle Network Route 5, which would need to be upgraded and used during construction.	3rd Party Impact
CON7A	Ground - Terrain of site, and implications for the need for earthworks and engineered slopes	Use of lidar and civil 3D models to assess amount/location of earthworks required	G	Terrain is favourable to the design of assets and therefore reduces the amount of earthworks required	Option is on the right bank of the River Thames, and therefore the site is low and flat. This option does require some raising of the ground to bring the shaft above flood level but does not have the additional earthworks required for long culverts which is required for some of the other options.	Construction complexity
CON7B	Ground - Risk of unexpected conditions	Use of expert judgement based on comparable areas	A	Moderate exposure to risk of unexpected ground conditions.	Relatively higher risk of unexpected ground conditions due to distance from existing boreholes.	Construction complexity
CON7C	Ground - Impact of ground conditions on the complexity of design and construction	Expert judgement	G	Ground conditions are unlikely to increase the complexity of design and construction with likely only a minimal (if any) impact on cost or requirement for materials that are difficult to source	Complexity of the design of the option could be impacted by ground conditions.	Construction complexity
CON7D	Ground - Risk of ground settlement above line of tunnel affecting other structures/houses	Expert judgement	A	Risk level acceptable or can be reduced with mitigation	Tunnel route chosen to avoid passing below structures that can be identified from aerial imagery.	Construction complexity

CON8A	STT Integration Complexity - Complexity of connecting STT directly into the intake/outfall structure.	Expert judgement	A	For the intake/outfall: The intake/outfall structure is a moderate distance away and/or moderately complex construction required to achieve connection to the intake/outfall structure.	Assuming a STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall shaft structure, Option B is north of where the ADC discharges to the Thames, so a pipeline would need to be slightly longer. The final section of pipeline would need to be inside a culvert when routed through the flooded gravel pit, adding to construction complexity	STT
Operability						
OPS1A	Safety - Risk of endangering operational staff, visitors or members of the public during operation	Look at operational activities and public access. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be operated safely but enhanced control measures required	This option will require enhanced control measures due to proximity to water. This option will require security fencing to reduce the risk of endangering the public during operation.	Health and Safety
OPS1B	Safety - Access and egress for operational staff, visitors, deliveries and waste removal during normal operations and emergencies	Tunnel silt issue to be considered by expert judgement	A	Access/egress can be provided, however it is challenging / restricted	During larger River Thames flood events this option would not be accessible, as the access road is not intended to be raised above the River Thames flood level.	Health and Safety
OPS2A	Maintenance - Ease of maintenance	Expert judgement	A	Majority of maintenance activities could be undertaken during moderate closure periods and / or with moderate disruption	This option does not have long culverts which may mean the majority of maintenance activities could be undertaken during moderate closure periods.	Operational Complexity
OPS3A	Performance - Impact of intake location on removal of screenings and large floating debris e.g. rate of removal and volume to be removed	Expert judgement	A	Moderate reduction of screen capacity during high flows (partial intake blockage and reduced transfer capacity)	All options consider the same intake screen design and experience the same flows as their locations are similar, and may experience moderate reduction in capacity. Geomorphological performance considered in OPS11.	Operational Complexity
OPS4A	Reliability - Footprint of the option within flood zones (as an indication of the potential for damage and the challenge of operation / maintenance during flood events)	Review GIS supported by expert judgement	A	Option is within the flood zone, however damage is not considered to be a significant risk	The intention is for the area around the shaft to be raised above the River Thames flood level. However, the access road to the structure is not intended to be raised (in order to reduce the risk of impacting River Thames flooding).	Operational Resilience
OPS6A	Evolvability - Risk to operation from future climate change, e.g. losses from evaporation due to higher temperatures, impact of higher rainfall, intake/outfall flood risk perspective	Expert judgement	R	Option could be significantly impacted by future climate change impact	This option is within the flood zones 2 and 3 and therefore has a risk to operation from increased flood levels.	Operational Resilience
OPS7A	Sustainability - Reuse of assets or temporary works for permanent items, e.g. materials storage slab, haulage roads, compound car park	Expert judgement	A	Some potential for reuse of assets/temporary works	This option does not reuse assets or temporary works for permanent items.	Operational Resilience
OPS7B	Sustainability - Power required for operation	Calculated power requirement for the option	A	Option requires moderate amount of energy to operate	Option requires moderate amount of energy to operate	Operational Resilience
OPS8A	3rd Party Impact - Potential to disrupt existing road network during operation	Expert judgement	A	Disruption likely to be limited	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,750m. The route will likely cause moderate disruption. If access to site is to remain via the south after construction using Peep-O-Day Lane, there is an opportunity to upgrade Peep-O-Day Lane to make it better suited for users.	Transport Planning
OPS10	Quality - Impact on water quality received by the reservoir from the intake	Expert judgement	A	Design requires moderate amounts of interventions to ensure water quality	Impact on water quality is unlikely to significantly differ between the options, moderate interventions required to ensure quality for all options e.g. air diffusers within the reservoir. Geomorphological performance considered in OPS11.	Reservoir water quality
OPS11	Performance - Geomorphological impacts, e.g. potential sedimentation around the structure	Expert judgement	A	Geomorphology is likely to have a moderate impact on the performance of the structure	This option is located at a cross over between two bends so you may get some deposition in the margins but it will be less concentrated than on the inside of the bend. This has potential to cause some sedimentation around the structure which could impact operation.	Operational Resilience
OPS12A	STT Integration Complexity - Complexity of operating STT directly into the intake/outfall structure.	Expert judgement	A	Intake/outfall: Operability and/or resilience of SESRO and /or STT partially affected but can be resolved with mitigation.	The STT pipeline to Option B would be long and would require a large operational input. The section of pipeline within the flooded gravel pit would likely be difficult to maintain as it would need to be culverted.	STT
Relative Costs						
COS1	Capex cost of the option	Cost estimate calculation for each option.	G	CAPEX estimated to result in an increase of <1% of the CAPEX for the overall SESRO project compared to the lowest cost option	Initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option B results in a total project cost of 0.14% more than the lowest cost intake/outfall option.	Cost
COS3	Opportunity for cost-sharing with other SROs, NSIPs and local non-SRO schemes/plans, e.g. STT, T2ST, SWOX/Farmoor, Abingdon flood storage	Cost estimate calculation for each option.	G	Multiple opportunities identified for cost saving.	For the Intake/Outfall structure an opportunity for sharing costs seems to be present for just STT. Reviewing the connection between SESRO and STT the opportunity is more present for STT. The best saving would be made by Thames Water agreeing that STT can discharge into the SESRO tunnel, so that STT flows discharge to the River Thames either by the tunnel or the ADC. However, assuming STT must connect to the SESRO Intake/Outfall structure, the opportunity is that both could discharge through the same outfall structure.	Cost
Carbon Costs						
CAR1	Carbon costs associated to the Capex of the option	Carbon estimate calculation for each option.	G	Emissions (tCO2e) estimated to result in an increase of <1% of the emissions (tCO2e) for the overall SESRO project compared to the lowest emissions (tCO2e) option	Initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent 1.6% of total SESRO carbon. Option B results in a total project carbon of 0.1% more than the lowest carbon intake/outfall option.	Carbon
Environmental Performance						
ENV1A	Minimise impacts on Special Area of Conservation (SAC)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SAC's or potential SAC's within the boundary of the proposed Intake/Outfall Option B. The closest SAC to the Intake/Outfall is 5.6Km to the north-west (Cothill Fen SAC)	Biodiversity and Nature Conservation
ENV1B	Minimise impacts on Special Protection Area (SPA)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SPA's or potential SPA's within the boundary of the proposed Intake/Outfall Option B. The closest SPA to the Intake/Outfall is approximately 40Km to the south-east (Thames Basin Heaths SPA)	Biodiversity and Nature Conservation
ENV1C	Minimise impacts on Ramsar	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no Ramsar sites or potential Ramsar sites within the boundary of the proposed Intake/Outfall Option B. The closest Ramsar to the Intake/Outfall is approximately 54Km to the south-east (South West London Waterbodies)	Biodiversity and Nature Conservation
ENV1D	Minimise impacts on Site of Special Scientific Interest (SSSI)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SSSI sites or potential SSSI sites within the boundary of the proposed Intake/Outfall Option B. The closest SSSI to the Intake/Outfall is approximately 1.7Km to the north-east (Culham Brake SSSI). The Intake/Outfall is within the Impact Risk Zone for Culham Brake SSSI but pipeline works are not included within the list of risks within this area.	Biodiversity and Nature Conservation
ENV1E	Minimise impacts on National Nature Reserve	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no NNRs or potential NNRs within the boundary of the proposed Intake/Outfall Option B. The closest NNR to the Intake/Outfall is approximately 4.8Km to the north (Cothill NNR)	Biodiversity and Nature Conservation
ENV1F	Minimise impacts on Local Nature Reserve (LNR)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no LNRs or potential LNRs within the boundary of the proposed Intake/Outfall Option B. The closest LNR to the Intake/Outfall is approximately 3Km to the north-east (Abbey Fishponds)	Biodiversity and Nature Conservation
ENV2A	Minimise impacts on Ancient Woodland	Natural England Ancient Woodland Maps and Professional Judgement.	G	No ancient woodland impacted	Historic mapping indicates that there is no ancient woodland present on-site	Biodiversity and Nature Conservation
ENV2B	Minimise impacts on Ancient and Veteran Trees	Woodland Trust Ancient Tree Inventory map search and professional judgement	G	No presence of ancient or veteran trees	There are no ancient or veteran trees recorded by the Woodland Trusts Ancient Tree Inventory on or close to this option. However, survey may identify trees that could be classified as ancient or veteran. As such, this option scores amber on a precautionary basis pending survey.	Biodiversity and Nature Conservation

ENV2C	Minimise impacts on Protected Trees	Check against published TPO dataset.	G	No protected trees impacted	No protected trees would be impacted.	Landscape & Visual
ENV2D	Minimise impacts on vegetation (including trees, woodland, hedges and shrubs)	Check against baseline resources and based upon high level knowledge of site from previous site visits. Professional judgement.	A	Direct impact on vegetation within a moderate proportion of construction footprint, which is of high arboricultural/amenity value (e.g. A or B grade) or biodiversity habitat in good condition. OR Direct impact on vegetation within large proportion of construction footprint, which is of lower arboricultural/visual amenity value (e.g. C grade) or biodiversity habitat in poor condition.	The tunnel excavation is assumed to be trenchless and therefore to only affect vegetation at the entry and exit points. Construction of the intake/outfall could require the removal of a number of trees along the River Thames that are assumed to include several A or B grade trees. Localised vegetation clearance may also be required to facilitate the construction access road. Assuming a trenchless method of excavation is utilised, the extension of the STW Outfall would require limited vegetation removal. The habitats to be removed may provide habitat for a range of protected and notable species including otter and water vole (riparian mammals), bats and badgers.	Biodiversity and Nature Conservation and Landscape
ENV3	Minimise impacts on Local Wildlife Sites (LWS)	Professional Judgement and LWS Citation provided by TVERC.	G	No impacts to LWS	There are no LWS or potential LWS within the boundary of the proposed Intake/Outfall Option B. The closest LWS to the Intake/Outfall is approximately 2Km to the north-west (Marcham Salt Spring LWS)	Biodiversity and Nature Conservation
ENV4A	Minimise impacts on Scheduled monuments or activities which could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No physical loss to scheduled monuments. The nearest scheduled monument to the option is a dovecote at Culham Manor (NHLE 1019391) which lies 360m south-east of the option intake/outfall - potential change to setting	Historic Environment
ENV4B	Minimise impacts on listed buildings or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No listed buildings physically affected. Culham Manor dovecote is a Grade II* listed structure (as well as a scheduled monument - see above) and the distance of 360m to the intake/outfall option might have implications for it's setting along with the associate Grade II* listed manor house (NHLE 1285637) which lies 70m to the east of the dovecote	Historic Environment
ENV4C	Minimise impacts on Registered Parks and Garden or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No physical changes to any Registered Park and Garden. Sutton Courtenay Manor is the nearest such designation from the option lying 780m to the south-east , so changes to setting are unlikely	Historic Environment
ENV4D	Minimise impacts on Registered Battlefields or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any Registered Battlefields with the nearest being the Battle of Chalgrove (NHLE 1000006) 14.5km to the east of the option	Historic Environment
ENV4E	Avoid impacts on World Heritage Sites or activities that could lead to a loss of significance, including setting	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any World Heritage Sites with the nearest being Blenheim Palace (NHLE 1000091) over 20km to the north	Historic Environment
ENV4F	Minimise impacts on conservation areas which could result in loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No changes within any conservation areas - amber score given proximity of the Culham conservation area 290m to the south east of the option	Historic Environment
ENV5A	Minimise loss to non-designated built heritage	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Extensive loss of non-designated built heritage of low value within the permanent infrastructure zone and adverse changes to within a 500m area from the edges of the permanent infrastructure OR more limited effects on non-designated built heritage of medium value	No expected loss of non-designated historic buildings - none shown on OCC HER dataset	Historic Environment
ENV5B	Minimise loss to paleoenvironmental remains	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or damage to low value remains within the construction area and adverse changes to similar buried remains in a 1km area around the permanent infrastructure from temporary and permanent changes to local hydrogeological regimes OR more limited effects on remains of medium value	Likely loss of some paleoenvironmental material as structures are within the River Thames floodplain and the likely relict paleochannels within the buried environment and organic remains interleaved with alluvial deposits	Historic Environment
ENV5C	Minimise loss to non-designated historic landscapes	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or extensive changes to low value non-designated historic landscapes within the construction area and extensive changes to the setting of the same resource outside the permanent infrastructure OR more limited effects on non-designated historic landscapes of medium value	No loss of non-designated historic landscapes as no non-designated historic landscapes are recorded within the option footprint	Historic Environment
ENV5D	Minimise loss of non-designated archaeological remains	Professional judgement, incorporating the use of the IEMA's Principles of Cultural Heritage Assessment in the UK and the Chartered Institute for Archaeologists standard and guidance document for desk based assessment	G	Permanent infrastructure and construction area will result in the loss and / permanent damage to non-designated buried and extant archaeological remains worthy of local significance which can be adequately mitigated through preservation by record	No loss of known archaeological remains with reference to the OCC HER dataset	Historic Environment
ENV6A	Minimise loss of fluvial flood storage within Flood Zone 2 or 3	Measure using GIS	R	Site is within flood zone 2 and 3 and replacement flood storage is required but not available	The intake/outfall structure is within both flood zones 2 and 3. 1315m of tunnel length within flood zones	Flood Risk
ENV7A	Minimise disturbance of potentially contaminated land	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of potentially contaminated land with one or more of the following properties: - Unlikely to have significant cost or program implications - Unlikely to cause significant harm to potential receptors - Can be easily mitigated and remediated	This option is proposed to pass beneath the A34, Abingdon Sewage Treatment Works and gravel pits. The option is also proposed to pass adjacent to a farm with associated tanks and 150m north of Sutton Wick leachate treatment plant. There may also be the potential for unrecorded areas of Made Ground (and hence potential contamination) along the route. Additionally, the tunnel is likely to bore through Kimmeridge Clay which may present a risk of hydrocarbon contamination due to potential bituminous content. There may be the potential for significant effects associated with land contamination, however, based on currently available information is it likely these can be addressed with appropriate mitigation.	Land

ENV7B	Minimise disturbance of potentially contaminated land specifically in relation to authorised and historic landfills	Desk based assessment of areas to identify potential sources of contamination	A	Within authorised and historic landfills or previous industrial sites or within 250m of historic and authorised landfills or previous industrial sites. Impacts are likely to be managed or mitigated	This option is proposed to pass 140m north of Sutton Wick No.1 landfill. The landfill is recorded as being licensed to accept inert, industrial, household, special and liquid sludge wastes, and accepted waste from 1981. This proposed access road is proposed to extend to Peep-O-Day Lane adjacent the Southern Town Park historical landfill. The landfill is recorded as being licensed to accept inert, commercial, household and liquid sludge, with waste accepted between 1967 and 1978. There is currently little information available relating to this landfill and the potential for landfill gases and leachate to be encountered within the surrounding area. Consultation will be required with regulators to obtain further detail to assist with assessments.	Land
ENV8	Minimise disturbance of land with known potential for Unexploded Ordnance (UXO)	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of a low quantity of UXO which can be easily managed / remediated. Unlikely to have significant cost or program implications	The detailed Zetica desk study (P13129-23-R1) has assessed the area to be low risk, defined as 'There is no positive evidence that UXO is present, but its occurrence cannot be totally discounted'. There are records showing bomb drop locations on and around the options north of Drayton in this low risk area. In a low risk area Zetica recommends 'a UXO briefing for all staff involved in excavations'. Further consultation may be required to determine appropriate mitigation for sub-surface tunnelling.	Land
ENV9A	Minimise loss of terrestrial priority habitats (use narrative to describe type and quantum)	Use of aerial imagery, MAGIC maps and Professional Judgement	G	No priority habitat directly impacted by proposed option footprint	The pipeline for Intake/Outfall Option B passes through an area described as 'no main habitats but additional habitats present'. The River Thames is also considered priority habitat. Where the pipeline is underground, habitats should not be impacted.	Biodiversity and Nature Conservation
ENV9B	Minimise loss of aquatic priority habitats (use narrative to describe type and quantum)	Professional judgement based on knowledge of Water Framework Directive.	A	Priority habitat directly impacted but mitigation feasible	As a result of this option, a proportion of the bank of the River Thames will be lost. The options will span 185m of bank however not all of this habitat will be lost. Depending on the design of the intake screen, between 35 - 38m of bank are expected to be lost. The length of habitat lost will need to be mitigated for appropriately.	Aquatic Environment
ENV10A	Reduce effects on North Wessex Downs Area of Outstanding Natural Beauty (AONB) and its setting	Professional judgement.	A	AONB and its setting likely to be affected. Effect is unlikely to be significant.	The introduction of the intake and outfall infrastructure along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the North Wessex Downs AONB due the limited scale of the structures above ground, distance, intervening urban areas and vegetation in the landscape between the AONB and the infrastructure.	Landscape & Visual
ENV10B	Reduce effects on local landscape character	Professional judgement.	A	Effect on local landscape character is unlikely to be significant.	The introduction of the intake and outfall infrastructure, including the Control Building, could affect the sense of tranquillity along the River Thames. The loss of trees along the river could erode a key characteristic which contributes positively to the local landscape character. While effects on local landscape character may be significant in the short term, this could be mitigated in the long term, particularly given the context of the nearby sewage and mineral works which already affects the sense of place and tranquillity.	Landscape & Visual
ENV11A	Reduce effects on panoramic views from national trail, open access land and important viewpoints in AONB	Professional judgement.	G	Panoramic views from national trail, open access land and important viewpoints in AONB unlikely to be affected or the proposal is likely to be barely discernible in views.	The intake and outfall infrastructure is likely to be barely discernible in panoramic views from The Ridgeway National Trail in the AONB, given the distance and intervening urban areas and vegetation.	Landscape & Visual
ENV11B	Reduce effects on sensitive local visual receptors	Professional judgement.	R	Effect on local views of sensitive visual receptors likely to be significant.	Some PRoWs, National Cycle Network Route 5 and the Vale Way Long Distance Path would be directly affected by the haul road and construction traffic on it. There would be open close-range views from the Thames Path National Trail, a nearby PRoW and the River Thames to the intake and outfall infrastructure, including the intake screens/river barrier and Control Building. The infrastructure could also be visible in middle-distance views from residential properties on the western edge of Culham Conservation Area and filtered middle-distance views from the National Cycle Network Route 5 and Vale Way Long Distance Path to the west. Although such views are affected to varying degrees by the presence of pylons and overhead lines or Didcot Power Station, and the effect on some views could be reduced in the long term, some effects could potentially be significant long term given the sensitivity of the visual receptors.	Landscape & Visual
ENV12	Minimise disturbance/encroachment into Air Quality Management Area (AQMA)	Based on an understanding of the scale and nature of activities, air quality management areas (AQMAs) were identified in close proximity to the proposed works.	G	Site is located further than 1km from AQMA OR no construction traffic must go through an AQMA	Marcham AQMA is approximately 2.2 km NW of Option B at its closest point. Abingdon AQMA is approximately 1.6 km NNE of Option B at its closest point. The anticipated construction and operational activities would likely lead to a negligible change in air quality.	Air Quality
ENV13	Minimise disturbance/encroachment into Groundwater Source Protection Zone (SPZ)	Magic maps	G	Site is within Zone 3 or not within a SPZ	Site is not within an SPZ.	Aquatic Environment
ENV14A	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Cow Common Brook and Portobello Ditch' WFD waterbody (GB106039023360) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14B	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ock and tributaries (Land Brook confluence to Thames)' WFD waterbody (GB106039023430) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14C	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Thames (Evenlode to Thame)' WFD waterbody (GB106039030334) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	A	Moderate adverse impacts likely; low risk to ability to attain Water Framework Directive objectives for this waterbody	This option will impact the River Thames WFD waterbody as a section of the WFD principal waterbody will be lost. The option has the potential to impact the ecological status of the waterbody due to a loss of river bank and riparian habitat. However, this impact is considered to be localised and not at a waterbody scale. Impacts can be easily mitigated.	Aquatic Environment

ENV14D	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Sandford Brook (source to Ock)' WFD waterbody (GB106039023410) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14E	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Childrey Brook and Norbrook at Common' WFD waterbody (GB106039023380) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14F	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ginge Brook and Mill Brook' WFD waterbody (GB106039023660) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14G	Option does not affect Water Framework Directive (WFD) Quality Elements within one of WFD waterbodies downstream of the River Thame to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives. These WFD waterbodies include: - Thames Wallingford to Caversham - WFD waterbody GB106039030331 - Thames (Reading to Cookham) - WFD waterbody GB106039023233 - Thames (Cookham to Egham) - WFD waterbody GB106039023231 - Thames (Egham to Teddington) - WFD waterbody GB106039023232	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV15A	Maximise potential for future environmental benefits (terrestrial), e.g. increase tree planting	Professional Judgement	A	Site allows some additional environmental benefits to be realised	No specific space allowed for environmental benefit. Location would remove areas of trees, shrub, grassland and riparian vegetation along the Thames.	Biodiversity and nature conservation
ENV16	Maximise flexibility in routing diverted watercourses so their habitats can be of sufficiently high quality to contribute to catchment Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Site allows significant flexibility in routing watercourses / Good or high quality habitat options are available	Option does not impact routing of diverted watercourses.	Aquatic Environment
ENV17	Minimise disturbance/encroachment into Local Geological Sites (LGS)	Desk based assessment of areas to identify potential sources of contamination	G	Site is located more than 250m from LGS	No known geological sites within 250m	Land
ENV18A	Minimise impacts associated with Noise and Vibration as a consequence of the construction of the option	Indicative assessment with noise sensitive sample receptors within RAG bands identified based on predicted construction noise levels during Gate 2 assessment, with updates made to construction activitues at intake / outfall facility. Draft Gate 3 plant list includes a Secondary Lining activity, which will involve the use of concrete batch plant and represents the worst-case activity in the draft Gate 3 plant list. This activity has been used for the optioneering study. The assessment considers five sample receptors, each representing clusters of properties/receptors in the vicinity of the intake / outfall options. The sample receptors are: NV-A: Residential properties on South Quay NV-B: Residential properties west of St Paul's Church, west of The Burycroft road NV-C: Farm east of The Burycroft road NV-D: Location of Moored boats at Marina NV-E: Residential properties north of St Paul's Church, west of The Burycroft road Red band distance is from works site/access road to the SOAEL+5dB, and Amber distance is from SOAEL+5dB to the SOAEL. Road Construction: Red 60m, Amber 61-99m, Green 100m. Construction Traffic (on access road): Red 5m, Amber 6-	A	Potential for significant effects but likely to be mitigated if they occur	The closest sample receptors to the proposed facility at Option B are NV-B (~320m) and NV-E (~370m). At these distances, and when considering the predicted construction noise levels at the facility during secondary lining activities, the receptors are predicted to be within the Amber band. No significant effects are predicted as a result of construction of the access road or from traffic movements on the proposed access road for Option B. However, construction movements on Stonehill Lane have the potential to result in adverse effects for properties on this road.	Noise
ENV18B	Minimise impacts associated with Noise and Vibration as a consequence of the operation of the option	Quantitative assessment not possible at this time. As such, the option appraisal study has considered the qualitative assessment undertaken at Gate 2 and applies professional judgement in assigning RAG bands to each option under assessment	A	Potential significant effects but likely to be mitigated if they occur	Sample receptor NV-B is ~320m from the facility at Option B. At this distance, it is possible that noise from the facility would be audible during normal operations. However, with the implementation of noise and vibration control measures within the design of the facility, it would be anticipated that significant effects would be avoided.	Noise
ENV19A	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the construction of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	There are between 1 - 10 high sensitivity receptors (i.e. dwellings) within 20 m of the construction route for Option B (i.e. along Stonehill Lane) and there are between 1 - 10 high sensitivity receptors (i.e. dwellings at 'The Green') approximately 310 m SE of the main works (i.e. shaft and control building, intake screens etc). It is considered that there are no proposed dust-generating construction activities that could not be managed using normal good practices (IAQM construction dust guidance, 2023) to prevent significant effects at any off-site receptor. Given that relatively low numbers of plant and items of machinery would be used and the anticipated number of construction vehicles, the potential effects would likely lead to a negligible change in air quality.	Air Quality
ENV19B	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the operation of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	The likely minimal operational-related traffic (e.g. staff, planned maintenance, repair, refurbishment and replacement events) is such that the potential effects from vehicle emissions would likely lead to a negligible change in air quality at nearby receptors.	Air Quality
ENV20A	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the construction of the option	Professional judgement.	A	Noticeable changes to visual amenity of local community	Construction activities and traffic associated with the intake and outfall would lead to noticeable changes to the visual amenity of the local community on the western edge of Culham. This could in part be due to temporary security lighting and/or night-time construction works. There would be little effect on the visual amenity of the communities near Abingdon Marina, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV20B	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the operation of the option	Professional judgement.	A	Noticeable changes to visual amenity of local community	While the effect of operational lighting would be limited, the intake and outfall infrastructure, including the Control Building, could potentially lead to noticeable changes to the visual amenity of the local community on the western edge of Culham, which could be difficult to mitigate. There would be little effect on the visual amenity of the communities near Abingdon Marina, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV21A	Minimise impacts associated with solid discharge during construction, e.g. aggregate spills during material transport, sediment runoff from clay erosion due to excavation of the pipeline / tunnel and construction works	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
ENV21B	Minimise impacts associated with solid discharge during operation, e.g. release of sediment into surrounding environment during maintenance such as dredging, debris removal	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
Community and Planning Considerations						

CPC1	Distance to the nearest property that will stay during construction (metres)	GIS	R	Less than 250m from the nearest property	Intake Outfall Structure - 310m to nearest property Tunnel - 85m to nearest property	Socio-Economic
CPC2	Minimise impacts on local community during construction associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	A	Community access/use of community assets is disrupted during construction	Intake/outfall and access road is within 500m of homes, Abingdon marina, Abingdon Marina Park, Southern Town Park, a sports club and NCN5. During construction it is reasonable to expect some disruption from traffic and temporary periods of restricted access particularly along NCN 5.	Socio-Economic
CPC3	Minimise impacts on local community during operation associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	g	Community access/use of community assets is not disrupted during operation	Intake/outfall and access road is within 500m of homes, Abingdon marina, Abingdon Marina Park, Southern Town Park, a sports club and NCN5. During operation it is reasonable to expect no disruption to residents or those accessing assets such as NCN5.	Socio-Economic
CPC4A	Are public rights of way (PRoW) disrupted or adversely affected?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	R	Recreational resources / rights of way of national or regional importance are disrupted or affected	Intake/outfall and access road is within 500m of homes, Abingdon Marina, Abingdon Marina Park, a sports club and NCN5. Disruption will be experienced during construction along a long section of NCN5. Although during operation there will be minimal disruption.	Socio-Economic
CPC4B	Are there opportunities to create or improve linkages of Public Rights of Way (PRoW) and recreational routes?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	G	Links to a recreational resource / right of way of national or regional importance can be enhanced	NCN may experience disruption but linkages to it could be improved.	Socio-Economic
CPC5	Maximise potential opportunity for recreational benefits	GIS analysis of PRoW, open spaces, cycle routes, canals, other forms of regional/nationally important receptors (eg National Cycle Routes), and community assets.	A	Option allows some additional recreational benefits to be realised	This option may disrupt the NCN during construction.	Socio-Economic
CPC6	Support the realisation of socio-economic incentives on SESRO, including employment, skills, tourism, sustainable travel, connecting people with nature and environmental education	GIS analysis of footprint, community assets, private residents, and businesses. Also awareness of overall project objectives is needed to conclude if the designs align with these.	A	Site supports some of the social-economic incentives of the overall scheme	This option may disrupt the NCN during construction.	Socio-Economic
CPC7	Minimise overall SESRO Order Limits extent and land acquisition, without compromising SESRO needs and project benefits	Spatial comparison of land that would likely be included in the DCO Order Limits, including construction working areas, access and highways or PRoW interactions.	A	Requires minor additional Order Limits extent	The majority of the tunnel stays within the area safeguarded for the reservoir (CP14), although the control building, raised area, intake screens, outfall weir and access road fall outside of this area. Different land acquisition and Order Limits extent will be required for the control building, but to a lesser extent than options A, F, G and H.	Consenting
CPC8	Aim for consistency with published and (insofar as possible) emerging Local Plan land use allocations	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in existing and any emerging Local Plan documents and any Supplementary Planning Documents.	G	Low or no impact	The tunnel enters the area safeguarded for the South Abingdon-on-Thames Bypass linking the A415 to the West and South, including a new River Thames Crossing east of the town (Vale of White Horse Local Plan 2031, policy CP12), but may be able to be accommodated alongside any potential road alignment. The intake/outfall and associated structures are outside the area allocated for the bypass and river crossing. No other conflicts with the VoWHLP. The tunnel passes through the area of Policy SW1 of the saved policies of the Oxfordshire Minerals and Waste Local Plan 1996. Policy SW1 states that the designated area will be released for sharp sand and gravel extraction. However, much of this area has already been worked with extant gravel pits, so a conflict is not considered likely. The proposed realigned safeguarded area for the Southern Abingdon Movement Corridor in the draft Joint Local Plan 2041 has been revised such that it would overlap with all of the right-bank options considered in this appraisal. Thames Water will seek to engage further with the joint local authorities and with Oxfordshire County Council about the SESRO design to explore options, constraints and opportunities for this policy area, as the Local Plan moves through the consultation and examination process. As this is a draft policy, subject to change, it has been considered alongside (not necessarily superseding) the existing Policy CP12 in this options appraisal and has not altered the conclusion.	Consenting
CPC9	Aim for consistency with any adopted Neighbourhood Plan policy applicable to the land area affected	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in any made Neighbourhood Plan.	G	Low or no impact	All options pass through the area of the Drayton Neighbourhood Plan, which is the only made neighbourhood plan in the area. Community Policy C-T5 states that a weight limit will apply for HGVs travelling through the village. Options A-F will use Drayton Road (B4017) for access but it is anticipated that this would be from the north, not passing through Drayton. The Abingdon-on-Thames NP is being prepared and the Sutton Courtenay NP is being examined.	Consenting
CPC10	Avoid development of infrastructure within specifically designated areas or their setting, as applicable (e.g. Green Belt, AONB, Common Land, Open Space)	Spatial comparison with designated sites, their settings, and the nature of development works expected.	G	Does not require development of above-ground infrastructure within these designations or development likely to have more than a negligible effect on the setting (where applicable)	Not located within a specifically designated area, such as Green Belt, AONB, Common Land or Open Space.	Consenting
CPC11	Avoid encroachment on any safeguarded land in minerals and waste policy, unless the minerals can be beneficially utilised as a result	Spatial comparison of allocated sites and review of policy wording in existing and any emerging Waste and Minerals Local Plan documents.	G	Low or no impact	The tunnel passes through the area of Policy SW1 of the saved policies of the Oxfordshire Minerals and Waste Local Plan 1996. Policy SW1 states that designated area will be "released for sharp sand and gravel extraction". Much of the area safeguarded in this policy has already been quarried and restored to lakeside water-related activities.	Consenting
CPC12	Ability to integrate with existing nationally-significant infrastructure, statutory undertakers' major infrastructure, or any proposed future Nationally Significant Infrastructure Projects (NSIP) (such as that of National Highways, Environment Agency, Network Rail)	Review of NSIP projects on PINS's register; review of Network Rail and National Highways investment plans; spatial review of statutory undertakers' assets.	G	Low or no interaction with existing infrastructure or proposed Nationally Significant Infrastructure Project (NSIP)	No NSIPs currently registered. No known proposals from Network Rail or National Highways. The National Highways RIS3 Investment Plan will be published in 2024 which will detail the A34 improvement project.	Consenting
CPC13	Minimise the consenting complexity due to the need for additional consents and licenses that may be required outside the Development Consent Order (DCO), e.g. additional Flood Risk Activity Permit, Environmental Permit, abstraction/discharge Licence, European protected species licence, etc	Review of the nature of expected development works against the list of other consents and licenses developed at Gateway 2.	A	One or more additional consent/license required	A Land Drainage Consent would be required for works in, over, under or affecting the flow of an ordinary watercourse. A Bespoke Flood Risk Activity Permit will be required for this scale of works on or near a main river. This can be applied for post-DCO. A Temporary Traffic Regulation Order may be required as PRoWs will need to be temporarily closed for construction of the tunnel, although this can potentially be included within the DCO application. Planning consent for the Abingdon STW discharge relocation is expected to be required outside the DCO, but this is applicable to all the options except G.	Consenting
CPC14	Avoid or minimise the need for any consequential development consenting (i.e. displacement or alteration of other development)	Review of existing development within the likely land-take, its nature and scale.	G	No existing development requires planning permission to relocate or alter	The tunnel crosses the A34 and Drayton Road, and Hanson Way National Cycle Route, as do all options. The tunnel will pass under fields used for Abingdon Rugby Club. The tunnel also crosses electric lines, telecom lines, gas lines and water lines (most of which are also underground) which could require diversion, but this can form part of the DCO associated development or potentially be delivered through statutory undertaker permitted development. The control building and other above ground structures will not impact built or proposed development. Abingdon STW outfall relocation would require planning consent, expected to be outside the DCO, but this is applicable to all the options except G.	Consenting
Property & Land Acquisition						

PRP1	Minimise loss of sensitive properties, e.g. residential, commercial, green belt, common land, historical or community assets due to project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of sensitive properties	Assume construction via TBM; would not detrimentally impact surface uses along tunnel length, including Quarry extension at Oday Quarry which incorporates a planning condition to accommodate the project. Construction and timing review may result in increase/decrease of RAG status. Tunnel under land associated with listed buildings at Stonehill farm. Assume exceptionally low risk of vibration to be considered for listed buildings.	Property & Land Acquisition
PRP2	Minimise loss of land allocated within the Local Plan for alternative higher value / social / cultural value uses, i.e. residential, historical or community assets due project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of allocated land for higher value or social value properties	No allocation, assumed Quarry expansion application would not be affected.	Property & Land Acquisition
PRP3	Minimise permanent loss of best and most versatile agricultural land (grades 1, 2 and 3)	Review of agricultural grading layer on ArcGIS, based on 2019 Provisional Agricultural Land Classification	A	Results in loss of any Grade 2 agricultural land or >50% Grade 3 agricultural land	Surface land graded 2 land at over 25%. Assume construction via TBM would not detrimentally agricultural use. Grade 2 = 27% Grade 3 = 63% Grade 4 = 10%	Property & Land Acquisition
PRP4	Assessment of Land and Property asset costs and associated compensation due under the Compensation Code	Review of land use / designation on ArcGIS	G	Land acquisition costs likely to be relatively low.	Subsoil values at de minimus. Tunnels N/A based on subsoil value of £50 per interest.	Property & Land Acquisition
PRP5	Assessment of Special Category Land	Review of affected landowners	A	Nature and / or extent Special Category Land is likely to cause moderate consenting risk	Two SCLs possibly identified. Vale of White Horse Council, National Highways.	Property & Land Acquisition
PRP6	Minimise disruptions of landowners access to their land required for temporary works	Review location in conjunction with existing road network	G	Assumption that landowners will be able to access their land during construction and operational phases.	No direct impact on landowners access identified. Assumption that landowners will be able to access their land during construction and operational phases. Crossing of Drayton Rd B4017 may cause general disruption of access between Drayton and Abingdon.	Property & Land Acquisition

Appendix K. Intake/Outfall Option C Criteria Workbook

Intake Outfall Option C Appraisal Workbook

Criteria code	Criteria Description	Method of Assessment	RAG	Description of RAG	Narrative	Sub-Theme
Constructability						
CON1	Safety - Risk of endangering construction workers or members of the public during construction e.g. water, ground, height, rail, road and utilities	Look at programme and list types of construction involved. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be constructed safely but enhanced control measures required	Two separate working areas will reduce work clashes. The shaft that is located within the Abingdon WTW will add additional safe working arrangements. Enabling works within the WTW will increase the volume of work increasing the amount of risks and hazards.	Health and Safety
CON2A	Programme - Duration, longest /shortest, but also consider whether the longer duration has an impact on the overall scheme programme	Compare differences in the programmes which would materialise from different options. Consider earthworks seasons.	A	Likely to extend the duration of the relevant area of works (e.g. road, rail siding or intake/offtake construction) compared to the Gate 2 SESRO programme but unlikely to impact on the critical path of the Gate 2 SESRO programme.	Tunnel length is short and would save time on the tunnel programme duration. Includes channels to install which is could increase the site works.	Programme
CON2B	Programme - Opportunities for construction programme acceleration through efficiencies	Compare differences in the programmes which would materialise from different options.	G	The option has the potential to introduce programme efficiencies and reduce the construction programme	The shaft / TBM removal & the intake outfall works can be completed concurrently due to the separation of the elements. Programme acceleration opportunities are possible with this option. Completion of the shaft connection from the outside requires a large area which may reduce time taken to complete and the critical path. This is helped by the intake and outtake being next to each other. Opportunity present to backfill gravel pit during excavation of channel and shaft.	Programme
CON2C	Programme - Dependencies i.e. proximity or physical relationships between elements of scope that introduce programme dependencies	Is the options on the critical path? Will it impact other critical activities?	R	Multiple major programme dependencies	This option would increase total float on the TBM recovery, however no overall saving on the overall construction programme. The works on the channel through the gravel pit, the shaft and the intake/outfall will be dependant on each other but this is mitigated by the separation in these elements. Temporary works requirements in the flooded gravel pit to create a dry working area to construct the culvert connecting the shaft and the intake / outfall. Very limited space for silo/plant set up. Heavily dependant on the partial relocation of the treatment works. A significant size area will be required to feed the secondary lining.	Programme
CON2D	Programme - Risk	Are there items in the construction which have a significant programme risk	R	Major programme risk	Access is based on using Stonehill Lane which runs into an unnamed track east and then north into Peep O Day Lane. Using Marcham Road for all works remains an opportunity. To achieve this structures across the A34, Stonehill Lane and the B4017 will be required to be constructed followed by a haul road. Permission will be required to complete works within existing treatment works and elements within it may require relocation before main works can commence. Channel passes under so will interface with power lines.	Programme
CON2E	Programme - Use of existing assets to reduce the amount of construction required	Identify if any existing assets can be used	G	Option makes use of existing assets	Uses a disused area of the Abingdon STWs for the location of the shaft.	Programme
CON3A	Logistics - Space available for construction and materials storage	Determine space constraints using GIS and options layouts from option definition.	A	Limited / restricted space	The option requires two separate main working areas. The shaft within the existing Abingdon WTW may introduce additional space constraints in comparison to other options. The option requires work adjacent to (and partially within) an existing flooded gravel pit which introduces some space constraints.	Logistics
CON3B	Logistics - Suitable and efficient access for construction workers, deliveries and waste removal including minimisation of lengths of new roads for access during construction	Determine method of access using GIS and options layouts from option definition.	A	Due to restricted access, an additional length of road is likely required for construction of the option.	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,800m. For this option, this would require upgrades to approx. 620m length of Peep-O-Day Lane. The length of additional new access road is approximately 540m. There may be an opportunity for construction access to the intake/outfall structure site via the Auxiliary Drawdown Channel, which would then reduce construction vehicle usage of the B4017 and Stonehill Lane. However, this is programme dependent and will only be an opportunity if the ADC is retained in the design (which is currently being considered in a separate options appraisal).	Logistics
CON3C	Logistics - Import of materials or resources during construction	Use quantity estimates to assess different options.	R	Large amount of import materials required and/or one or several logistical challenges identified for the import of material.	Long additional road length (540m) required for accessing site, with a relatively short tunnel length (3260m). Moderate length for extending Sewage Treatment Works Twin 300mm dia Pipework length (400m). Option also requires a twin Intake pipeline length (370m).	Logistics
CON3D	Logistics - Haulage distance required for construction materials arrival on site to the placement location	Determine length using GIS and options layouts from option definition.	A	Two main site locations are used for the construction of the option.	Two main site locations are used for the construction of the option.	Logistics
CON3E	Logistics - Vehicle movements	Use vehicle movement estimates to assess different options.	R	Construction works likely to require a large number of vehicle movements and vehicle movements may be difficult.	Most vehicle access will be to the treatment works so reduced frequency of transport to the intake / outfall is beneficial however temporary access routes still required.	Logistics

CON4A	Construction Complexity - Temporary conditions/works requirements e.g. embankment slope stability and moisture outside of placement seasons.	Expert Judgement	A	Temporary Works requirements extensive and in some cases complicated and extend the programme	Requires a STW outfall extension - approximate length is 400m, temporary works required to create a dry working area at the outfall. Safe working arrangements for working adjacent to the River Thames. Temporary access required includes a narrow track in between 2no flooded gravel pits. The flooded gravel pit will require dewatering or a cofferdam constructing to enable the precast culvert to be installed. The shaft will require some advance enabling works within Abingdon STW to be carried out to create an access and working area. The inclusion of the channel through the gravel pit is a large difference which will need to be factored in for.	Construction complexity
CON4B	Construction Complexity - Location conflict/opportunity with another engineering component of the scheme or other SRO/non-SRO schemes, e.g. Severn to Thames Transfer (STT), Thames to Southern Transfer (T2ST), TW Swindon and Oxfordshire supply zone transfer, Transfer to Farmoor Reservoir	Expert judgement and knowledge of surrounding schemes	R	Location / layout of option clashes with another component of this scheme (or another scheme) which is already set or would be difficult to change	Assuming that the STT pipeline connects into the shaft for discharging to the Thames through the outfall, the shaft is located within the Abingdon Sewage Treatment Works (close to existing lagoons) - the length of STT pipeline from the main site would be short, as the STW is further west than the Thames, however this location is likely to be very challenging to connect the Severn to Thames (STT) pipeline.	Construction complexity
CON4C	Construction Complexity - Minimise the number and complexity of additional structures/assets required or modifications to the existing structures/assets in order to facilitate the option, e.g. bridges, culverts, crossings	Determine using GIS and options layouts from option definition.	R	Option requires a complex and/or high number of additional structures and/or modifications to existing structures.	The option has: no need for infilling of a flooded gravel pit, long culverts and relatively short extension of the sewage treatment works outfall. The long culverts directly across an existing gravel pit are considered a significant additional component.	Construction complexity
CON4E	Construction Complexity - Complexity of construction technique e.g. construction of tunnels, Auxiliary Drawdown Channel (ADC) or both for the emergency discharge	List out the differences in construction complexity (engineering cost risk & stakeholder interfaces risk). Use expert judgement to decide on the assessment. Compare with inclusions on cost to ensure no double-counting.	A	Moderate construction technique required that carries a moderate risk but risk which is likely mitigable. Examples of moderate risk activities (for intake/outfall) include: Construction across existing gravel pits and/or extension of the tunnel below the River Thames. Examples of moderate risk activities (for emergency discharge) include: construction of structures such as locks, gated structures and box culverts, as well as major road crossings.	The option requires a long culvert across an existing gravel pit.	Construction complexity
CON5A	3rd Party Impact - Potential to disrupt existing road network during enabling works and construction	Expert judgement	R	Disruption likely to be significant	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,800m. The route is will likely cause significant disruption, particularly to the National Cycle Network Route 5, which would need to be upgraded and used during construction.	3rd Party Impact
CON7A	Ground - Terrain of site, and implications for the need for earthworks and engineered slopes	Use of lidar and civil 3D models to assess amount/location of earthworks required	A	Terrain is unfavourable to the design of assets and therefore increases the amount of earthworks required	Option is on the right bank of the River Thames, and therefore the site is low and flat. While this option requires some raising of the ground as the shaft is located away from the bank of the River Thames (where the existing ground level is higher) there would be additional earthworks required to construct the long culverts.	Construction complexity
CON7B	Ground - Risk of unexpected conditions	Use of expert judgement based on comparable areas	R	High exposure to risk of unexpected ground conditions.	High risk of unexpected ground conditions due to distance from existing boreholes and a larger structure footprint due to the culverts that pass through an existing flooded gravel pit.	Construction complexity
CON7C	Ground - Impact of ground conditions on the complexity of design and construction	Expert judgement	A	Ground conditions may impact the complexity of design and construction to a limited extent resulting in, for example, increased costs and a requirement for materials that are difficult to source.	Complexity of the design of the culvert across the existing flooded gravel pit could be impacted by ground conditions.	Construction complexity
CON7D	Ground - Risk of ground settlement above line of tunnel affecting other structures/houses	Expert judgement	A	Risk level acceptable or can be reduced with mitigation	Tunnel route chosen to avoid passing below structures that can be identified from aerial imagery.	Construction complexity
CON8A	STT Integration Complexity - Complexity of connecting STT directly into the intake/outfall structure.	Expert judgement	A	For the intake/outfall: The intake/outfall structure is a moderate distance away and/or moderately complex construction required to achieve connection to the intake/outfall structure.	Assuming a STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall structure, the STT pipeline for Option C is a moderate distance away.	STT
Operability						
OPS1A	Safety - Risk of endangering operational staff, visitors or members of the public during operation	Look at operational activities and public access. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be operated safely but enhanced control measures required	Option requires enhanced control measures due to proximity to water. Option will require security fencing to reduce the risk of endangering the public during operation. Option C poses low risk to the public as the main shaft is located within the existing Abingdon Sewage Treatment works, and is therefore less accessible.	Health and Safety
OPS1B	Safety - Access and egress for operational staff, visitors, deliveries and waste removal during normal operations and emergencies	Tunnel silt issue to be considered by expert judgement	A	Access/egress can be provided, however it is challenging / restricted	This option has long culverts which may make access for maintenance activities for this option relatively more challenging. However, during larger River Thames flood events the shaft for this option would be accessible as it is set away from the bank of the River Thames.	Health and Safety
OPS2A	Maintenance - Ease of maintenance	Expert judgement	A	Majority of maintenance activities could be undertaken during moderate closure periods and / or with moderate disruption	This option has long culverts which may make maintenance activities for this option challenging to undertake.	Operational Complexity
OPS3A	Performance - Impact of intake location on removal of screenings and large floating debris e.g. rate of removal and volume to be removed	Expert judgement	A	Moderate reduction of screen capacity during high flows (partial intake blockage and reduced transfer capacity)	All options consider the same intake screen design and experience the same flows as their locations are similar, and may experience moderate reduction in capacity. Geomorphological performance considered in OPS11.	Operational Complexity

OPS4A	Reliability - Footprint of the option within flood zones (as an indication of the potential for damage and the challenge of operation / maintenance during flood events)	Review GIS supported by expert judgement	G	Option is outside the flood zone	The option has the main shaft constructed within the Abingdon Sewage Treatment Works and outside of the flood zone, therefore it has a low risk of flooding.	Operational Resilience
OPS6A	Evolvability - Risk to operation from future climate change, e.g. losses from evaporation due to higher temperatures, impact of higher rainfall, intake/outfall flood risk perspective	Expert judgement	A	Option could be slightly impacted by future climate change impact	The option has the main shaft constructed within the Abingdon Sewage Treatment Works and outside of the flood zone (still in flood zone 2), therefore the option has a low risk to operation from increased flood levels.	Operational Resilience
OPS7A	Sustainability - Reuse of assets or temporary works for permanent items, e.g. materials storage slab, haulage roads, compound car park	Expert judgement	G	Option includes for reuse of assets/temporary works	This option makes use of a disused area of the Abingdon STWs.	Operational Resilience
OPS7B	Sustainability - Power required for operation	Calculated power requirement for the option	A	Option requires moderate amount of energy to operate	Option requires moderate amount of energy to operate	Operational Resilience
OPS8A	3rd Party Impact - Potential to disrupt existing road network during operation	Expert judgement	A	Disruption likely to be limited	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,800m. The route will likely cause moderate disruption. If access to site is to remain via the south after construction using Peep-O-Day Lane, there is an opportunity to upgrade Peep-O-Day Lane to make it better suited for users.	Transport Planning
OPS10	Quality - Impact on water quality received by the reservoir from the intake	Expert judgement	A	Design requires moderate amounts of interventions to ensure water quality	Impact on water quality is unlikely to significantly differ between the options, moderate interventions required to ensure quality for all options e.g. air diffusers within the reservoir. Geomorphological performance considered in OPS11.	Reservoir water quality
OPS11	Performance - Geomorphological impacts, e.g. potential sedimentation around the structure	Expert judgement	A	Geomorphology is likely to have a moderate impact on the performance of the structure	This option is located at a cross over between bends, near the outside of the bend. There may be some minor deposition but this is not expected to impact the performance of the structure.	Operational Resilience
OPS12A	STT Integration Complexity - Complexity of operating STT directly into the intake/outfall structure.	Expert judgement	A	Intake/outfall: Operability and/or resilience of SESRO and /or STT partially affected but can be resolved with mitigation.	The STT pipeline to Option C would be long and would require a large operational input. The section of pipeline within the flooded gravel pit would likely be difficult to maintain as it would need to be culverted.	STT
Relative Costs						
COS1	Capex cost of the option	Cost estimate calculation for each option.	G	CAPEX estimated to result in an increase of <1% of the CAPEX for the overall SESRO project compared to the lowest cost option	Initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option C results in a total project cost of 0.27% more than the lowest cost intake/outfall option.	Cost
COS3	Opportunity for cost-sharing with other SROs, NSIPs and local non-SRO schemes/plans, e.g. STT, T2ST, SWOX/Farmoor, Abingdon flood storage	Cost estimate calculation for each option.	G	Multiple opportunities identified for cost saving.	For the Intake/Outfall structure an opportunity for sharing costs seems to be present for just STT. Reviewing the connection between SESRO and STT the opportunity is more present for STT. The best saving would be made by Thames Water agreeing that STT can discharge into the SESRO tunnel, so that STT flows discharge to the River Thames either by the tunnel or the ADC. However, assuming STT must connect to the SESRO Intake/Outfall structure, the opportunity is that both could discharge through the same outfall structure.	Cost
Carbon Costs						
CAR1	Carbon costs associated to the Capex of the option	Carbon estimate calculation for each option.	A	Emissions (tCO2e) estimated to result in an increase of >1% and <5% of the emissions (tCO2e) for the overall SESRO project compared to the lowest emissions (tCO2e) option	Initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent 1.6% of total SESRO carbon. Option C results in a total project carbon of 1.6% more than the lowest carbon intake/outfall option.	Carbon
Environmental Performance						
ENV1A	Minimise impacts on Special Area of Conservation (SAC)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SAC's or potential SAC's within the boundary of the proposed Intake/Outfall Option C. The closest SAC to the Intake/Outfall is 5.6Km to the north-west (Cothill Fen SAC)	Biodiversity and Nature Conservation
ENV1B	Minimise impacts on Special Protection Area (SPA)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SPA's or potential SPA's within the boundary of the proposed Intake/Outfall Option C. The closest SPA to the Intake/Outfall is approximately 40Km to the south-east (Thames Basin Heaths SPA)	Biodiversity and Nature Conservation
ENV1C	Minimise impacts on Ramsar	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no Ramsar sites or potential Ramsar sites within the boundary of the proposed Intake/Outfall Option C. The closest Ramsar to the Intake/Outfall is approximately 54Km to the south-east (South West London Waterbodies)	Biodiversity and Nature Conservation
ENV1D	Minimise impacts on Site of Special Scientific Interest (SSSI)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SSSI sites or potential SSSI sites within the boundary of the proposed Intake/Outfall Option C. The closest SSSI to the Intake/Outfall is approximately 1.8Km to the north-east (Culham Brake SSSI). The Intake/Outfall is within the Impact Risk Zone for Culham Brake SSSI but pipeline works are not included within the list of risks within this area.	Biodiversity and Nature Conservation
ENV1E	Minimise impacts on National Nature Reserve	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no NNRs or potential NNRs within the boundary of the proposed Intake/Outfall Option C. The closest NNR to the Intake/Outfall is approximately 4.8Km to the north (Cothill NNR)	Biodiversity and Nature Conservation
ENV1F	Minimise impacts on Local Nature Reserve (LNR)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no LNRs or potential LNRs within the boundary of the proposed Intake/Outfall Option C. The closest LNR to the Intake/Outfall is approximately 3.1Km to the north-east (Abbey Fishponds)	Biodiversity and Nature Conservation
ENV2A	Minimise impacts on Ancient Woodland	Natural England Ancient Woodland Maps and Professional Judgement.	G	No ancient woodland impacted	Historic mapping indicates that there is no ancient woodland present on-site	Biodiversity and Nature Conservation
ENV2B	Minimise impacts on Ancient and Veteran Trees	Woodland Trust Ancient Tree Inventory map search and professional judgement	A	Development in close proximity with potential indirect impact to ancient or veteran trees	There are no ancient or veteran trees recorded by the Woodland Trusts Ancient Tree Inventory on or close to this option. However, survey may identify trees that could be classified as ancient or veteran. As such, this option scores amber on a precautionary basis pending survey.	Biodiversity and Nature Conservation

ENV2C	Minimise impacts on Protected Trees	Check against published TPO dataset.	G	No protected trees impacted	No protected trees would be impacted.	Landscape & Visual
ENV2D	Minimise impacts on vegetation (including trees, woodland, hedges and shrubs)	Check against baseline resources and based upon high level knowledge of site from previous site visits. Professional judgement.	A	Direct impact on vegetation within a moderate proportion of construction footprint, which is of high arboricultural/amenity value (e.g. A or B grade) or biodiversity habitat in good condition. OR Direct impact on vegetation within large proportion of construction footprint, which is of lower arboricultural/visual amenity value (e.g. C grade) or biodiversity habitat in poor condition.	The tunnel excavation is assumed to be trenchless and therefore to only affect vegetation at the entry and exit points. Construction of the intake/outfall could require the removal of a number of trees along the River Thames that are assumed to include several A or B grade trees. Localised vegetation clearance may also be required to facilitate the construction access road. Assuming a trenchless method of excavation is utilised, the extension of the STW Outfall would require limited vegetation removal. As the shaft and Control Building would be installed within an area of hardstanding at the Abingdon Sewage Treatment Works, it is assumed that the existing trees in the vicinity would not be impacted. The habitats to be removed may provide habitat for a range of protected and notable species including otter and water vole (riparian mammals), bats and badgers.	Biodiversity and Nature Conservation and Landscape
ENV3	Minimise impacts on Local Wildlife Sites (LWS)	Professional Judgement and LWS Citation provided by TVERC.	G	No impacts to LWS	There are no LWS or potential LWS within the boundary of the proposed Outfall Option C. The closest LWS to the Outfall is approximately 2Km to the north-west (Marcham Salt Spring LWS)	Biodiversity and Nature Conservation
ENV4A	Minimise impacts on Scheduled monuments or activities which could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No physical loss of scheduled monuments. The scheduled dovecote (NHLE 1019391) at Culham Manor lies 350m east of the option intake/outfall and therefore the setting of the monument might be relevant	Historic Environment
ENV4B	Minimise impacts on listed buildings or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No listed buildings physically affected. The Grade II* listed dovecote (NHLE 1019391) at Culham Manor lies 350m from the intake/outfall option and setting might therefore be relevant, as it would be for the associated Grade II* listed manor house (NHLE 1285637) 70m to the east of the dovecote	Historic Environment
ENV4C	Minimise impacts on Registered Parks and Garden or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any Registered Park and Garden. Sutton Courtenay Manor lies 760m to the south-east of the intake/outfall option. Changes to setting unlikely	Historic Environment
ENV4D	Minimise impacts on Registered Battlefields or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any Registered Battlefields with the nearest being the Battle of Chalgrove (NHLE 1000006) 14.5km to the east of the option	Historic Environment
ENV4E	Avoid impacts on World Heritage Sites or activities that could lead to a loss of significance, including setting	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any World Heritage Sites with the nearest being Blenheim Palace (NHLE 1000091) over 20km to the north	Historic Environment
ENV4F	Minimise impacts on conservation areas which could result in loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No changes within any conservation areas - amber score given proximity of the Culham conservation area 290m to the south east of the option	Historic Environment
ENV5A	Minimise loss to non-designated built heritage	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Extensive loss of non-designated built heritage of low value within the permanent infrastructure zone and adverse changes to within a 500m area from the edges of the permanent infrastructure OR more limited effects on non-designated built heritage of medium value	No expected loss of non-designated historic buildings - none shown on OCC HER dataset	Historic Environment
ENV5B	Minimise loss to paleoenvironmental remains	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or damage to low value remains within the construction area and adverse changes to similar buried remains in a 1km area around the permanent infrastructure from temporary and permanent changes to local hydrogeological regimes OR more limited effects on remains of medium value	Likely loss of some paleoenvironmental material as structures are within the River Thames floodplain and the likely relict paleochannels within the buried environment and organic remains interleaved with alluvial deposits	Historic Environment
ENV5C	Minimise loss to non-designated historic landscapes	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or extensive changes to low value non-designated historic landscapes within the construction area and extensive changes to the setting of the same resource outside the permanent infrastructure OR more limited effects on non-designated historic landscapes of medium value	No loss of non-designated historic landscapes as no non-designated historic landscapes are recorded within the option footprint	Historic Environment
ENV5D	Minimise loss of non-designated archaeological remains	Professional judgement, incorporating the use of the IEMA's Principles of Cultural Heritage Assessment in the UK and the Chartered Institute for Archaeologists standard and guidance document for desk based assessment	G	Permanent infrastructure and construction area will result in the loss and / permanent damage to non-designated buried and extant archaeological remains worthy of local significance which can be adequately mitigated through preservation by record	No loss of known archaeological remains with reference to the OCC HER dataset	Historic Environment

ENV6A	Minimise loss of fluvial flood storage within Flood Zone 2 or 3	Measure using GIS	A	Site is within flood zone 2 and 3 but loss of storage is minor or mitigation is available	The intake/outfall structure is only within flood zone 2.1315m of tunnel length within flood zones	Flood Risk
ENV7A	Minimise disturbance of potentially contaminated land	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of potentially contaminated land with one or more of the following properties: - Unlikely to have significant cost or program implications - Unlikely to cause significant harm to potential receptors - Can be easily mitigated and remediated	This option is proposed to pass beneath the A34 and Abingdon Sewage Treatment Works. Excavation for the eastern shaft will directly disturb ground at the southeast of the sewage works. The culvert connecting the shaft to the intake/outfall is proposed to pass through a historical and now flooded gravel pit. The option is also proposed to pass adjacent to a farm with associated tanks, 150m north of Sutton Wick leachate treatment plant and adjacent to gravel pits south of the sewage farm. There may also be the potential for unrecorded areas of Made Ground (and hence potential contamination along the route). Additionally the tunnel bores through Kimmeridge Clay which may present a risk of hydrocarbon contamination due to potential bituminous content. There may be the potential for significant effects associated with land contamination, however, based on currently available information it is likely these can be addressed with appropriate mitigation.	Land
ENV7B	Minimise disturbance of potentially contaminated land specifically in relation to authorised and historic landfills	Desk based assessment of areas to identify potential sources of contamination	A	Within authorised and historic landfills or previous industrial sites or within 250m of historic and authorised landfills or previous industrial sites. Impacts are likely to be managed or mitigated	This option is proposed to pass 220m south of the Southern Town Park historical landfill which is recorded as being licensed to accept inert, commercial, household and liquid sludge, with waste accepted between 1967 and 1978. The proposed access road is proposed to extend to Peep-O-Day Lane adjacent the Southern Town Park historical landfill. This option is proposed to pass 140m north of Sutton Wick No.1 landfill which is recorded as being licensed to accept inert, industrial, household, special and liquid sludge wastes, and accepted waste from 1981. There is currently little information available relating to these landfills and the potential for landfill gases and leachate to be encountered within the surrounding area. Consultation will be required with regulators to obtain further detail to assist with assessments.	Land
ENV8	Minimise disturbance of land with known potential for Unexploded Ordnance (UXO)	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of a low quantity of UXO which can be easily managed / remediated. Unlikely to have significant cost or program implications	The detailed Zetica desk study (P13129-23-R1) has assessed the area to be low risk, defined as 'There is no positive evidence that UXO is present, but its occurrence cannot be totally discounted'. There are records showing bomb drop locations on and around the options north of Drayton in this low risk area. In a low risk area Zetica recommends 'a UXO briefing for all staff involved in excavations'. Further consultation may be required to determine appropriate mitigation for sub-surface tunnelling.	Land
ENV9A	Minimise loss of terrestrial priority habitats (use narrative to describe type and quantum)	Use of aerial imagery, MAGIC maps and Professional Judgement	G	No priority habitat directly impacted by proposed option footprint	The pipeline for Intake/Outfall Option C passes through an area described as 'no main habitats but additional habitats present'. The River Thames is also considered priority habitat. Where the pipeline is underground, habitats should not be impacted.	Biodiversity and Nature Conservation
ENV9B	Minimise loss of aquatic priority habitats (use narrative to describe type and quantum)	Professional judgement based on knowledge of Water Framework Directive.	A	Priority habitat directly impacted but mitigation feasible	As a result of this option, a proportion of the bank of the River Thames will be lost. The options will span 155m of bank however not all of this habitat will be lost. Depending on the design of the intake screen, between 35 - 38m of bank are expected to be lost. The length of habitat lost will need to be mitigated for appropriately.	Aquatic Environment
ENV10A	Reduce effects on North Wessex Downs Area of Outstanding Natural Beauty (AONB) and its setting	Professional judgement.	A	AONB and its setting likely to be affected. Effect is unlikely to be significant.	The introduction of the intake and outfall infrastructure along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the North Wessex Downs AONB due the limited scale of the structures above ground, distance, intervening urban areas and vegetation in the landscape between the AONB and the infrastructure.	Landscape & Visual

ENV10B	Reduce effects on local landscape character	Professional judgement.	A	Effect on local landscape character is unlikely to be significant.	The introduction of the intake and outfall infrastructure could affect the sense of tranquillity along the River Thames, although the location of the Control Building within the Abingdon Sewage Treatment Works would help to reduce the effect. The loss of trees along the river could erode a key characteristic which contributes positively to the local landscape character. While effects on local landscape character may be significant in the short term, this could be mitigated in the long term, particularly given the context of the nearby sewage and mineral works which already affects the sense of place and tranquillity.	Landscape & Visual
ENV11A	Reduce effects on panoramic views from national trail, open access land and important viewpoints in AONB	Professional judgement.	G	Panoramic views from national trail, open access land and important viewpoints in AONB unlikely to be affected or the proposal is likely to be barely discernible in views.	The intake and outfall infrastructure is likely to be barely discernible in panoramic views from The Ridgeway National Trail in the AONB, given the distance and intervening urban areas and vegetation.	Landscape & Visual
ENV11B	Reduce effects on sensitive local visual receptors	Professional judgement.	R	Effect on local views of sensitive visual receptors likely to be significant.	Some PRoWs, National Cycle Network Route 5 and the Vale Way Long Distance Path would be directly affected by the haul road and construction traffic on it. There would be open close-range views from the Thames Path National Trail and the River Thames to the intake and outfall infrastructure, including the intake screens/river barrier. There could also be partially filtered middle-distance views from residential properties on the western edge of Culham Conservation Area. Although the Control Building would be screened by vegetation surrounding the Abingdon Sewage Treatment Works, the views are affected to varying degrees by the presence of pylons and overhead lines, and the effect on some views could be reduced in the long term, some effects could potentially be significant long term given the sensitivity of the visual receptors. However, once constructed, the infrastructure would be barely discernible in views from the National Cycle Network Route 5 and Vale Way Long Distance Path to due to intervening vegetation.	Landscape & Visual
ENV12	Minimise disturbance/encroachment into Air Quality Management Area (AQMA)	Based on an understanding of the scale and nature of activities, air quality management areas (AQMAs) were identified in close proximity to the proposed works.	G	Site is located further than 1km from AQMA OR no construction traffic must go through an AQMA	Marcham AQMA is approximately 2.2 km NW of Option C at its closest point. Abingdon AQMA is approximately 1.6 km NNE of Option C at its closest point. The anticipated construction and operational activities would likely lead to a negligible change in air quality.	Air Quality
ENV13	Minimise disturbance/encroachment into Groundwater Source Protection Zone (SPZ)	Magic maps	G	Site is within Zone 3 or not within a SPZ	Site is not within an SPZ.	Aquatic Environment
ENV14A	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Cow Common Brook and Portobello Ditch' WFD waterbody (GB106039023360) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14B	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ock and tributaries (Land Brook confluence to Thames)' WFD waterbody (GB106039023430) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14C	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Thames (Evenlode to Thame)' WFD waterbody (GB106039030334) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	A	Moderate adverse impacts likely; low risk to ability to attain Water Framework Directive objectives for this waterbody	This option will impact the River Thames WFD waterbody as a section of the WFD principal waterbody will be lost. The option has the potential to impact the ecological status of the waterbody due to a loss of river bank and riparian habitat. However, this impact is considered to be localised and not at a waterbody scale. Impacts can be easily mitigated.	Aquatic Environment
ENV14D	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Sandford Brook (source to Ock)' WFD waterbody (GB106039023410) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment

ENV14E	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Childrey Brook and Norbrook at Common' WFD waterbody (GB106039023380) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14F	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ginge Brook and Mill Brook' WFD waterbody (GB106039023660) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14G	Option does not affect Water Framework Directive (WFD) Quality Elements within one of WFD waterbodies downstream of the River Thame to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives. These WFD waterbodies include: - Thames Wallingford to Caversham - WFD waterbody GB106039030331 - Thames (Reading to Cookham) - WFD waterbody GB106039023233 - Thames (Cookham to Egham) - WFD waterbody GB106039023231 - Thames (Egham to Teddington) - WFD waterbody GB106039023232	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV15A	Maximise potential for future environmental benefits (terrestrial), e.g. increase tree planting	Professional Judgement	A	Site allows some additional environmental benefits to be realised	No specific space allowed for environmental benefit. Location would remove areas of trees, shrub, grassland and riparian vegetation along the Thames.	Biodiversity and nature conservation
ENV16	Maximise flexibility in routing diverted watercourses so their habitats can be of sufficiently high quality to contribute to catchment Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Site allows significant flexibility in routing watercourses / Good or high quality habitat options are available	Option does not impact routing of diverted watercourses.	Aquatic Environment
ENV17	Minimise disturbance/encroachment into Local Geological Sites (LGS)	Desk based assessment of areas to identify potential sources of contamination	G	Site is located more than 250m from LGS	No known geological sites within 250m	Land
ENV18A	Minimise impacts associated with Noise and Vibration as a consequence of the construction of the option	Indicative assessment with noise sensitive sample receptors within RAG bands identified based on predicted construction noise levels during Gate 2 assessment, with updates made to construction activitues at intake / outfall facility. Draft Gate 3 plant list includes a Secondary Lining activity, which will involve the use of concrete batch plant and represents the worst-case activity in the draft Gate 3 plant list. This activity has been used for the optioneering study. The assessment considers five sample receptors, each representing clusters of properties/receptors in the vicinity of the intake / outfall options. The sample receptors are: NV-A: Residential properties on South Quay NV-B: Residential properties west of St Paul's Church, west of The Burycroft road NV-C: Farm east of The Burycroft road NV-D: Location of Moored boats at Marina NV-E: Residential properties north of St Paul's Church, west of The Burycroft road Red band distance is from works site/access road to the SOAEL+5dB, and Amber distance is from SOAEL+5dB to the SOAEL. Road Construction: Red 60m, Amber 61-99m, Green 100m. Construction Traffic (on access road): Red 5m, Amber 6-	A	Potential for significant effects but likely to be mitigated if they occur	The closest sample receptors to the proposed facility at Option C are NV-B (~310m) and NV-E (~400m). At these distances, and when considering the predicted construction noise levels at the facility during secondary lining activities, the receptors are predicted to be within the Amber band. No significant effects are predicted as a result of construction of the access road or from traffic movements on the proposed access road for Option C. However, construction movements on Stonehill Lane have the potential to result in adverse effects for properties on this road.	Noise
ENV18B	Minimise impacts associated with Noise and Vibration as a consequence of the operation of the option	Quantitative assessment not possible at this time. As such, the option appraisal study has considered the qualitative assessment undertaken at Gate 2 and applies professional judgement in assigning RAG bands to each option under assessment	A	Potential significant effects but likely to be mitigated if they occur	Sample receptor NV-B is ~310m from the facility at Option C. At this distance, it is possible that noise from the facility would be audible during normal operations. However, with the implementation of noise and vibration control measures within the design of the facility, it would be anticipated that significant effects would be avoided.	Noise
ENV19A	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the construction of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	There are between 1 - 10 high sensitivity receptors (i.e. dwellings) within 20 m of the construction route for Option C (i.e. along Stonehill Lane) and there are between 1 - 10 high sensitivity receptors (i.e. dwellings at 'The Green') approximately 310 m SE of the main works (i.e. shaft and control building, intake screens etc). Medium sensitivity receptors (i.e. staff at the Abingdon Sewage Treatment Works) are adjacent to the proposed works. It is considered that there are no proposed dust-generating construction activities that could not be managed using normal good practices (IAQM construction dust guidance, 2023) to prevent significant effects at any off-site receptor. Given that relatively low numbers of plant and items of machinery would be used and the anticipated number of construction vehicles, the potential effects would likely lead to a negligible change in air quality.	Air Quality

ENV19B	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the operation of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	The likely minimal operational-related traffic (e.g. staff, planned maintenance, repair, refurbishment and replacement events) is such that the potential effects from vehicle emissions would likely lead to a negligible change in air quality at nearby receptors.	Air Quality
ENV20A	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the construction of the option	Professional judgement.	A	Noticeable changes to visual amenity of local community	While trees along the left bank of the River Thames would partially filter views of construction activities and traffic associated with the intake and outfall, there could be noticeable changes to the visual amenity of the local community on the western edge of Culham. This could in part be due to temporary security lighting and/or night-time construction works. However, there would be little effect on the visual amenity of the communities near Abingdon Marina, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV20B	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the operation of the option	Professional judgement.	G	Barely perceptible changes to visual amenities, with no or little effect on local community	The effect of operational lighting would be limited and the Control Building within the sewage works and generally low level intake and outfall infrastructure along the river bank would have little effect on the visual amenity of the local community on the western edge of Culham due to intervening vegetation. There would be no effect on the visual amenity of the communities near Abingdon Marina, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV21A	Minimise impacts associated with solid discharge during construction, e.g. aggregate spills during material transport, sediment runoff from clay erosion due to excavation of the pipeline / tunnel and construction works	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
ENV21B	Minimise impacts associated with solid discharge during operation, e.g. release of sediment into surrounding environment during maintenance such as dredging, debris removal	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
Community and Planning Considerations						
CPC1	Distance to the nearest property that will stay during construction (metres)	GIS	R	Less than 250m from the nearest property	Intake Outfall Structure - 310m to nearest property Tunnel - 85m to nearest property	Socio-Economic
CPC2	Minimise impacts on local community during construction associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	A	Community access/use of community assets is disrupted during construction	Access road is within 500m of homes, Abingdon marina, Abingdon Marina Park, Southern Town Park, a sports club and NCN5. During construction it is reasonable to expect some disruption from traffic and temporary periods of restricted access particularly along NCN 5.	Socio-Economic
CPC3	Minimise impacts on local community during operation associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	G	Community access/use of community assets is not disrupted during operation	Access road is within 500m of homes, Abingdon marina, Abingdon Marina Park, Southern Town Park, a sports club and NCN5. During operation it is reasonable to expect no disruption to residents or those accessing assets such as NCN5.	Socio-Economic
CPC4A	Are public rights of way (PRoW) disrupted or adversely affected?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	R	Recreational resources / rights of way of national or regional importance are disrupted or affected	Access road is within 500m of homes, Abingdon Marina, Abingdon Marina Park, a sports club and NCN5. Disruption will be experienced during construction along a long section of NCN5. Although during operation there will be minimal disruption.	Socio-Economic
CPC4B	Are there opportunities to create or improve linkages of Public Rights of Way (PRoW) and recreational routes?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	G	Links to a recreational resource / right of way of national or regional importance can be enhanced	NCN may experience disruption but linkages to it could be improved.	Socio-Economic
CPC5	Maximise potential opportunity for recreational benefits	GIS analysis of PRoW, open spaces, cycle routes, canals, other forms of regional/nationally important receptors (eg National Cycle Routes), and community assets.	A	Option allows some additional recreational benefits to be realised	This option may disrupt the NCN during construction.	Socio-Economic
CPC6	Support the realisation of socio-economic incentives on SESRO, including employment, skills, tourism, sustainable travel, connecting people with nature and environmental education	GIS analysis of footprint, community assets, private residents, and businesses. Also awareness of overall project objectives is needed to conclude if the designs align with these.	A	Site supports some of the social-economic incentives of the overall scheme	This option may disrupt the NCN during construction.	Socio-Economic
CPC7	Minimise overall SESRO Order Limits extent and land acquisition, without compromising SESRO needs and project benefits	Spatial comparison of land that would likely be included in the DCO Order Limits, including construction working areas, access and highways or PRoW interactions.	A	Requires minor additional Order Limits extent	The majority of the tunnel route stays within the area safeguarded for the reservoir (CP14) and the control building is also within this area. However, the raised area, intake screens, outfall weir and access road falls outside of this area. Different land acquisition and Order Limits extent will be required for the area outside the safeguarded land, but to a lesser extent than options A, F, G and H.	Consenting

CPC8	Aim for consistency with published and (insofar as possible) emerging Local Plan land use allocations	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in existing and any emerging Local Plan documents and any Supplementary Planning Documents.	G	Low or no impact	The tunnel enters the area safeguarded for the South Abingdon-on-Thames Bypass linking the A415 to the West and South, including a new River Thames Crossing east of the town (Vale of White Horse Local Plan 2031, policy CP12), but may be able to be accommodated alongside any potential road alignment. The intake/outfall and associated structures are outside the area allocated for the bypass and river crossing. No other conflicts with the VoWHLP. The tunnel passes through the area of Policy SW1 of the saved policies of the Oxfordshire Minerals and Waste Local Plan 1996. Policy SW1 states that the designated area will be released for sharp sand and gravel extraction. However, much of this area has already been worked with extant gravel pits, so a conflict is not considered likely. The proposed realigned safeguarded area for the Southern Abingdon Movement Corridor in the draft Joint Local Plan 2041 has been revised such that it would overlap with all of the right-bank options considered in this appraisal. Thames Water will seek to engage further with the joint local authorities and with Oxfordshire County Council about the SESRO design to explore options, constraints and opportunities for this policy area, as the Local Plan moves through the consultation and examination process. As this is a draft policy, subject to change, it has been considered alongside (not necessarily superseding) the existing Policy CP12 in this options appraisal and has not altered the conclusion.	Consenting
CPC9	Aim for consistency with any adopted Neighbourhood Plan policy applicable to the land area affected	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in any made Neighbourhood Plan.	G	Low or no impact	All options pass through the area of the Drayton Neighbourhood Plan, which is the only made neighbourhood plan in the area. Community Policy C-T5 states that a weight limit will apply for HGVs travelling through the village. Options A-F will use Drayton Road (B4017) for access but it is anticipated that this would be from the north, not passing through Drayton. The Abingdon-on-Thames NP is being prepared and the Sutton Courtenay NP is being examined.	Consenting
CPC10	Avoid development of infrastructure within specifically designated areas or their setting, as applicable (e.g. Green Belt, AONB, Common Land, Open Space)	Spatial comparison with designated sites, their settings, and the nature of development works expected.	G	Does not require development of above-ground infrastructure within these designations or development likely to have more than a negligible effect on the setting (where applicable)	Not located within a specifically designated area, such as Green Belt, AONB, Common Land or Open Space.	Consenting
CPC11	Avoid encroachment on any safeguarded land in minerals and waste policy, unless the minerals can be beneficially utilised as a result	Spatial comparison of allocated sites and review of policy wording in existing and any emerging Waste and Minerals Local Plan documents.	G	Low or no impact	The tunnel passes through the area of Policy SW1 of the saved policies of the Oxfordshire Minerals and Waste Local Plan 1996. Policy SW1 states that designated area will be "released for sharp sand and gravel extraction". Much of the area safeguarded in this policy has already been quarried and restored to lakeside water-related activities.	Consenting
CPC12	Ability to integrate with existing nationally-significant infrastructure, statutory undertakers' major infrastructure, or any proposed future Nationally Significant Infrastructure Projects (NSIP) (such as that of National Highways, Environment Agency, Network Rail)	Review of NSIP projects on PINS's register; review of Network Rail and National Highways investment plans; spatial review of statutory undertakers' assets.	G	Low or no interaction with existing infrastructure or proposed Nationally Significant Infrastructure Project (NSIP)	No NSIPs currently registered. No known proposals from Network Rail or National Highways. The National Highways RIS3 Investment Plan will be published in 2024 which will detail the A34 improvement project.	Consenting
CPC13	Minimise the consenting complexity due to the need for additional consents and licenses that may be required outside the Development Consent Order (DCO), e.g. additional Flood Risk Activity Permit, Environmental Permit, abstraction/discharge Licence, European protected species licence, etc	Review of the nature of expected development works against the list of other consents and licenses developed at Gateway 2.	A	One or more additional consent/license required	A Land Drainage Consent would be required for works in, over, under or affecting the flow of an ordinary watercourse. A Bespoke Flood Risk Activity Permit will be required for this scale of works on or near a main river. This can be applied for post-DCO. A Temporary Traffic Regulation Order may be required as PRoWs will need to be temporarily closed for construction of the tunnel, although this can potentially be included within the DCO application. Planning consent for the Abingdon STW discharge relocation is expected to be required outside the DCO, but this is applicable to all the options except G.	Consenting
CPC14	Avoid or minimise the need for any consequential development consenting (i.e. displacement or alteration of other development)	Review of existing development within the likely land-take, its nature and scale.	G	No existing development requires planning permission to relocate or alter	The tunnel crosses the A34 and Drayton Road, and Hanson Way National Cycle Route, as do all options. The tunnel will pass under fields used for Abingdon Rugby Club. The tunnel also crosses electric lines, telecom lines, gas lines and water lines (most of which are also underground) which could require diversion, but this can form part of the DCO associated development or potentially be delivered through statutory undertaker permitted development. The tunnel, control building and access road is within Abingdon Sewage Treatment Works but it is anticipated that the treatment works would not require relocation/expansion to accommodate the development. The tunnel passes under a small section of Drayton Road allotments but is not anticipated to disrupt the allotments. Abingdon STW outfall relocation would require planning consent, expected to be outside the DCO, but this is applicable to all the options except G.	Consenting
Property & Land Acquisition						

PRP1	Minimise loss of sensitive properties, e.g. residential, commercial, green belt, common land, historical or community assets due to project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of sensitive properties	Assume construction via TBM; would not detrimentally impact surface uses. Privately owned land and Thames Water land affected. Tunnel under land/gardens associated with listed buildings at Stonehill farm. No buildings directly above tunnel line. Otherwise all privately owned agricultural land. Construction review may result in increase/decrease of RAG status. Low risk of vibration to be considered for listed buildings.	Property & Land Acquisition
PRP2	Minimise loss of land allocated within the Local Plan for alternative higher value / social / cultural value uses, i.e. residential, historical or community assets due project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of allocated land for higher value or social value properties	None Identified None Identified	Property & Land Acquisition
PRP3	Minimise permanent loss of best and most versatile agricultural land (grades 1, 2 and 3)	Review of agricultural grading layer on ArcGIS, based on 2019 Provisional Agricultural Land Classification	A	Results in loss of any Grade 2 agricultural land or >50% Grade 3 agricultural land	Surface land graded 2 land at over 25%. Assume construction via TBM would not detrimentally agricultural use. Grade 2 = 27% Grade 3 = 62% Grade 4 = 11%	Property & Land Acquisition
PRP4	Assessment of Land and Property asset costs and associated compensation due under the Compensation Code	Review of land use / designation on ArcGIS	G	Land acquisition costs likely to be relatively low.	Subsoil values at de minimus at OMV. Tunnels N/A based on subsoil value of £50 per interest.	Property & Land Acquisition
PRP5	Assessment of Special Category Land	Review of affected landowners	A	Nature and / or extent Special Category Land is likely to cause moderate consenting risk	Two SCLs identified. Vale of White Horse Council, National Highways.	Property & Land Acquisition
PRP6	Minimise disruptions of landowners access to their land required for temporary works	Review location in conjunction with existing road network	G	Assumption that landowners will be able to access their land during construction and operational phases.	No direct impact on landowners access identified. Assumption that landowners will be able to access their land during construction and operational phases. Crossing of Drayton Rd B4017 may cause general disruption of access between Drayton and Abingdon.	Property & Land Acquisition

Appendix L. Intake/Outfall Option D Criteria Workbook

Intake Outfall Option D Appraisal Workbook

Criteria code	Criteria Description	Method of Assessment	RAG	Description of RAG	Narrative	Sub-Theme
Constructability						
CON1	Safety - Risk of endangering construction workers or members of the public during construction e.g. water, ground, height, rail, road and utilities	Look at programme and list types of construction involved. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be constructed safely but enhanced control measures required	Working adjacent to a flooded gravel pit, Abingdon WTW and tight areas	Health and Safety
CON2A	Programme - Duration, longest /shortest, but also consider whether the longer duration has an impact on the overall scheme programme	Compare differences in the programmes which would materialise from different options. Consider earthworks seasons.	A	Likely to extend the duration of the relevant area of works (e.g. road, rail siding or intake/offtake construction) compared to the Gate 2 SESRO programme but unlikely to impact on the critical path of the Gate 2 SESRO programme.	Tunnel length is short and would save time on the tunnel programme duration. Includes channels to install which is could increase the site works.	Programme
CON2B	Programme - Opportunities for construction programme acceleration through efficiencies	Compare differences in the programmes which would materialise from different options.	G	The option has the potential to introduce programme efficiencies and reduce the construction programme	Shaft / TBM reception can be completed concurrently with the intake. Programme acceleration opportunities are increased with this option and location due to the shorter length of tunnel. Completion of the shaft connection requires a larger area which may reduce time taken to complete and the critical path. This is helped by the intake and outtake being next to each other in this option.	Programme
CON2C	Programme - Dependencies i.e. proximity or physical relationships between elements of scope that introduce programme dependencies	Is the options on the critical path? Will it impact other critical activities?	A	Several major dependencies/ multiple minor dependencies	Overflow channel should be completed after pipeline and other structures so working area is available. Infilling of gravel pit temporarily will be required to complete this. Linked to access road and ADC. Very limited space for silo/plant set up.	Programme
CON2D	Programme - Risk	Are there items in the construction which have a significant programme risk	A	Moderate programme risk	Access is based on using Stonehill Lane which runs into an unnamed track east and then north into Peep O Day Lane. Using Marcham Road for all works remains an opportunity. To achieve this structures across the A34, Stonehill Lane and the B4017 will be required to be constructed followed by a haul road. Permission will be required to complete works within existing quarry. Split site reduces programme risk by enabling concurrent works to take place. The location of the OH powerlines adds to the overall risk.	Programme
CON2E	Programme - Use of existing assets to reduce the amount of construction required	Identify if any existing assets can be used	A	Option does not make use of existing assets	Other than road access, this option does not reuse assets or temporary works for permanent items.	Programme
CON3A	Logistics - Space available for construction and materials storage	Determine space constraints using GIS and options layouts from option definition.	A	Limited / restricted space	The option requires two separate main working areas. The option requires work adjacent to (and partially within) an existing flooded gravel pit which introduces some space constraints.	Logistics
CON3B	Logistics - Suitable and efficient access for construction workers, deliveries and waste removal including minimisation of lengths of new roads for access during construction	Determine method of access using GIS and options layouts from option definition.	A	Due to restricted access, an additional length of road is likely required for construction of the option.	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,400m. This would require upgrades to approx. 620m length of Peep-O-Day Lane. The length of additional new access road is approximately 410m. There may be an opportunity for construction access to the intake/outfall structure site via the Auxiliary Drawdown Channel, which would then reduce construction vehicle usage of the B4017 and Stonehill Lane. However, this is programme dependent and will only be an opportunity if the ADC is retained in the design (which is currently being considered in a separate options appraisal).	Logistics
CON3C	Logistics - Import of materials or resources during construction	Use quantity estimates to assess different options.	A	Moderate amount of import materials required.	Moderate additional road length (410m) required for accessing the site, with a short tunnel length (3220m). Long length for extending Sewage Treatment Works Twin 300mm dia Pipework length (965m) + pumping station required. Option also requires a twin Intake pipeline length (375m).	Logistics
CON3D	Logistics - Haulage distance required for construction materials arrival on site to the placement location	Determine length using GIS and options layouts from option definition.	A	Two main site locations are used for the construction of the option.	Two main site locations are used for the construction of the option.	Logistics
CON3E	Logistics - Vehicle movements	Use vehicle movement estimates to assess different options.	R	Construction works likely to require a large number of vehicle movements and vehicle movements may be difficult.	The shaft and intake/outfall structure are separated so additional vehicle movements are required during construction between the two sites.	Logistics
CON4A	Construction Complexity - Temporary conditions/works requirements e.g. embankment slope stability and moisture outside of placement seasons.	Expert Judgement	R	No acceptable Temporary Works available to enable construction	Requires a STW outfall extension - approximate length is 965m, temporary works required to create a dry working area at the outfall and inlet. Safe working arrangements for working adjacent to the River Thames and the flooded gravel pit. Temporary access required includes a narrow track in between 2no flooded gravel pits. The flooded gravel pit will require dewatering or other temporary measures to construct the precast culvert. The shaft construction will require the temporary closure of Peep O Day Lane. The construction of the shaft will impact the construction of the ADC but will not delay the programme. Shaft located under power lines which will require diversion. Significant temporary / permanent works required to construct channels.	Construction complexity

CON4B	Construction Complexity - Location conflict/opportunity with another engineering component of the scheme or other SRO/non-SRO schemes, e.g. Severn to Thames Transfer (STT), Thames to Southern Transfer (T2ST), TW Swindon and Oxfordshire supply zone transfer, Transfer to Farmoor Reservoir	Expert judgement and knowledge of surrounding schemes	G	Location / layout of option provides an opportunity to be developed along with another component of this scheme (or another scheme)	Assuming that the STT pipeline connects into the shaft for discharging through the outfall, the shaft is located to the south of the Abingdon Sewage Treatment Works and so there is an opportunity for STT to discharge to the existing flooded gravel pit. The STT pipeline would be relatively short, as the location of the shaft in this option is further west than the Thames.	Construction complexity
CON4C	Construction Complexity - Minimise the number and complexity of additional structures/assets required or modifications to the existing structures/assets in order to facilitate the option, e.g. bridges, culverts, crossings	Determine using GIS and options layouts from option definition.	R	Option requires a complex and/or high number of additional structures and/or modifications to existing structures.	The option has: no need for infilling of a flooded gravel pit, long culverts and significant extension of the sewage treatment works outfall (which would also need to pass over the ADC (if constructed)). The long culverts together with the long extension of the sewage treatment works outfall are considered significant additional components.	Construction complexity
CON4E	Construction Complexity - Complexity of construction technique e.g. construction of tunnels, Auxiliary Drawdown Channel (ADC) or both for the emergency discharge	List out the differences in construction complexity (engineering cost risk & stakeholder interfaces risk). Use expert judgement to decide on the assessment. Compare with inclusions on cost to ensure no double-counting.	A	Moderate construction technique required that carries a moderate risk but risk which is likely mitigable. Examples of moderate risk activities (for intake/outfall) include: Construction across existing gravel pits and/or extension of the tunnel below the River Thames. Examples of moderate risk activities (for emergency discharge) include: construction of structures such as locks, gated structures and box culverts, as well as major road crossings.	The option requires a long culvert across an existing gravel pit.	Construction complexity
CON5A	3rd Party Impact - Potential to disrupt existing road network during enabling works and construction	Expert judgement	R	Disruption likely to be significant	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,400m. The route will likely cause significant distruption, particularly to the National Cycle Network Route 5, which would need to be temporarily closed during construction.	3rd Party Impact
CON7A	Ground - Terrain of site, and implications for the need for earthworks and engineered slopes	Use of lidar and civil 3D models to assess amount/location of earthworks required	A	Terrain is unfavourable to the design of assets and therefore increases the amount of earthworks required	Option is on the right bank of the River Thames, and therefore the site is low and flat. While this option requires some raising of the ground as the shaft is located away from the bank of the River Thames (where the existing ground level is higher) there would be additional earthworks required to construct the long culverts.	Construction complexity
CON7B	Ground - Risk of unexpected conditions	Use of expert judgement based on comparable areas	R	High exposure to risk of unexpected ground conditions.	High risk of unexpected ground conditions due to distance from existing boreholes and a larger structure footprint due to the culverts that pass along the edge of an existing flooded gravel pit.	Construction complexity
CON7C	Ground - Impact of ground conditions on the complexity of design and construction	Expert judgement	A	Ground conditions may impact the complexity of design and construction to a limited extent resulting in, for example, increased costs and a requirement for materials that are difficult to source.	Complexity of the design of the culvert along the edge of the existing flooded gravel pit could be impacted by ground conditions.	Construction complexity
CON7D	Ground - Risk of ground settlement above line of tunnel affecting other structures/houses	Expert judgement	A	Risk level acceptable or can be reduced with mitigation	Tunnel route chosen to avoid passing below structures that can be identified from aerial imagery.	Construction complexity
CON8A	STT Integration Complexity - Complexity of connecting STT directly into the intake/outfall structure.	Expert judgement	G	For the intake/outfall: The intake/outfall structure is close with simple construction required to achieve connection to the intake/outfall structure.	Assuming a STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall shaft structure, the STT pipeline for Option D would be considered simple construction, particularly as the outfall is located into flooded gravel pits.	STT
Operability						
OPS1A	Safety - Risk of endangering operational staff, visitors or members of the public during operation	Look at operational activities and public access. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be operated safely but enhanced control measures required	Option D will require enhanced control measures due to proximity to water. Option D will require security fencing to reduce the risk of endangering the public during operation.	Health and Safety
OPS1B	Safety - Access and egress for operational staff, visitors, deliveries and waste removal during normal operations and emergencies	Tunnel silt issue to be considered by expert judgement	A	Access/egress can be provided, however it is challenging / restricted	This option has long culverts which may make access for maintenance activities for this option relatively more challenging. However, during larger River Thames flood events the shaft for this option would be accessible as it is set away from the bank of the River Thames.	Health and Safety
OPS2A	Maintenance - Ease of maintenance	Expert judgement	A	Majority of maintenance activities could be undertaken during moderate closure periods and / or with moderate disruption	This option has long culverts which may make maintenance activities for this option challenging to undertake.	Operational Complexity
OPS3A	Performance - Impact of intake location on removal of screenings and large floating debris e.g. rate of removal and volume to be removed	Expert judgement	A	Moderate reduction of screen capacity during high flows (partial intake blockage and reduced transfer capacity)	All options consider the same intake screen design and experience the same flows as their locations are similar, and may experience moderate reduction in capacity. Geomorphological performance considered in OPS11.	Operational Complexity
OPS4A	Reliability - Footprint of the option within flood zones (as an indication of the potential for damage and the challenge of operation / maintenance during flood events)	Review GIS supported by expert judgement	G	Option is outside the flood zone	The option has the main shaft constructed within a raised area on the edge of the River Thames flood zone, therefore it has a low risk of flooding.	Operational Resilience
OPS6A	Evolvability - Risk to operation from future climate change, e.g. losses from evaporation due to higher temperatures, impact of higher rainfall, intake/outfall flood risk perspective	Expert judgement	A	Option could be slightly impacted by future climate change impact	The option has the main shaft constructed within a raised area on the edge of the River Thames flood zone (still in flood zone 2), therefore the option has a low risk to operation from increased flood levels.	Operational Resilience
OPS7A	Sustainability - Reuse of assets or temporary works for permanent items, e.g. materials storage slab, haulage roads, compound car park	Expert judgement	R	Option does not include for reuse of assets/temporary works	This option does not reuse assets or temporary works for permanent items. Option D blocks the section of the Wilts and Berks Canal, which would make the canal unusable.	Operational Resilience
OPS7B	Sustainability - Power required for operation	Calculated power requirement for the option	A	Option requires moderate amount of energy to operate	Option requires moderate amount of energy to operate	Operational Resilience

OPS8A	3rd Party Impact - Potential to disrupt existing road network during operation	Expert judgement	A	Disruption likely to be limited	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,400m. The route will likely cause moderate disruption. If access to site is to remain via the south after construction using Peep-O-Day Lane, there is an opportunity to upgrade Peep-O-Day Lane to make it better suited for users.	Transport Planning
OPS10	Quality - Impact on water quality received by the reservoir from the intake	Expert judgement	A	Design requires moderate amounts of interventions to ensure water quality	Impact on water quality is unlikely to significantly differ between the options, moderate interventions required to ensure quality for all options e.g. air diffusers within the reservoir. Geomorphological performance considered in OPS11.	Reservoir water quality
OPS11	Performance - Geomorphological impacts, e.g. potential sedimentation around the structure	Expert judgement	A	Geomorphology is likely to have a moderate impact on the performance of the structure	This option is located at a cross over between bends, near the outside of the bend. There may be some minor deposition but this is not expected to impact the performance of the structure.	Operational Resilience
OPS12A	STT Integration Complexity - Complexity of operating STT directly into the intake/outfall structure.	Expert judgement	G	Intake/outfall: Operability and/or resilience of SESRO and/or STT unaffected.	The STT pipeline to Option D would be short and require some operational input.	STT
Relative Costs						
COS1	Capex cost of the option	Cost estimate calculation for each option.	G	CAPEX estimated to result in an increase of <1% of the CAPEX for the overall SESRO project compared to the lowest cost option	Initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option D results in a total project cost of 0.15% more than the lowest cost intake/outfall option.	Cost
COS3	Opportunity for cost-sharing with other SROs, NSIPs and local non-SRO schemes/plans, e.g. STT, T2ST, SWOX/Farmoor, Abingdon flood storage	Cost estimate calculation for each option.	G	Multiple opportunities identified for cost saving.	For the Intake/Outfall structure an opportunity for sharing costs seems to be present for just STT. Reviewing the connection between SESRO and STT the opportunity is more present for STT. The best saving would be made by Thames Water agreeing that STT can discharge into the SESRO tunnel, so that STT flows discharge to the River Thames either by the tunnel or the ADC. However, assuming STT must connect to the SESRO Intake/Outfall structure, the opportunity is that both could discharge through the same outfall structure.	Cost
Carbon Costs						
CAR1	Carbon costs associated to the Capex of the option	Carbon estimate calculation for each option.	A	Emissions (tCO2e) estimated to result in an increase of >1% and <5% of the emissions (tCO2e) for the overall SESRO project compared to the lowest emissions (tCO2e) option	Initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent 1.6% of total SESRO carbon. Option D results in a total project carbon of 1.3% more than the lowest carbon intake/outfall option.	Carbon
Environmental Performance						
ENV1A	Minimise impacts on Special Area of Conservation (SAC)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SAC's or potential SAC's within the boundary of the proposed Intake/Outfall Option D. The closest SAC to the Intake/Outfall is 5.7Km to the north-west (Cothill Fen SAC)	Biodiversity and Nature Conservation
ENV1B	Minimise impacts on Special Protection Area (SPA)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SPA's or potential SPA's within the boundary of the proposed Intake/Outfall Option D. The closest SPA to the Intake/Outfall is approximately 40Km to the south-east (Thames Basin Heaths SPA)	Biodiversity and Nature Conservation
ENV1C	Minimise impacts on Ramsar	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no Ramsar sites or potential Ramsar sites within the boundary of the proposed Intake/Outfall Option D. The closest Ramsar to the Intake/Outfall is approximately 54Km to the south-east (South West London Waterbodies)	Biodiversity and Nature Conservation
ENV1D	Minimise impacts on Site of Special Scientific Interest (SSSI)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SSSI sites or potential SSSI sites within the boundary of the proposed Intake/Outfall Option D. The closest SSSI to the Intake/Outfall is approximately 1.9Km to the north-east (Culham Brake SSSI). The Intake/Outfall is within the Impact Risk Zone for Culham Brake SSSI but pipeline works are not included within the list of risks within this area.	Biodiversity and Nature Conservation
ENV1E	Minimise impacts on National Nature Reserve	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no NNRs or potential NNRs within the boundary of the proposed Intake/Outfall Option D. The closest NNR to the Intake/Outfall is approximately 4.8Km to the north (Cothill NNR)	Biodiversity and Nature Conservation
ENV1F	Minimise impacts on Local Nature Reserve (LNR)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no LNRs or potential LNRs within the boundary of the proposed Intake/Outfall Option D. The closest LNR to the Intake/Outfall is approximately 3.2Km to the north-east (Abbey Fishponds)	Biodiversity and Nature Conservation
ENV2A	Minimise impacts on Ancient Woodland	Natural England Ancient Woodland Maps and Professional Judgement.	G	No ancient woodland impacted	Historic mapping indicates that there is no ancient woodland present on-site	Biodiversity and Nature Conservation
ENV2B	Minimise impacts on Ancient and Veteran Trees	Woodland Trust Ancient Tree Inventory map search and professional judgement	A	Development in close proximity with potential indirect impact to ancient or veteran trees	There are no ancient or veteran trees recorded by the Woodland Trusts Ancient Tree Inventory on or close to this option. However, survey may identify trees that could be classified as ancient or veteran. As such, this option scores amber on a precautionary basis pending survey.	Biodiversity and Nature Conservation
ENV2C	Minimise impacts on Protected Trees	Check against published TPO dataset.	G	No protected trees impacted	No protected trees would be impacted.	Landscape & Visual
ENV2D	Minimise impacts on vegetation (including trees, woodland, hedges and shrubs)	Check against baseline resources and based upon high level knowledge of site from previous site visits. Professional judgement.	G	No direct impact on vegetation which is of high arboricultural/amenity value (A or B grade) or biodiversity habitat in good condition. OR Limited direct impact on vegetation which is of lower arboricultural/visual amenity value (e.g. C grade) or biodiversity habitat in poor condition.	The tunnel excavation is assumed to be trenchless and therefore to only affect vegetation at the entry and exit points. Construction of the intake/outfall could require the removal of a few trees along the River Thames and the shaft and Control Building could also require some additional vegetation clearance despite the location on the edge of mineral workings. Localised vegetation clearance may also be required to facilitate the construction access road. Assuming a trenchless method of excavation is utilised, the extension of the STW Outfall would require limited vegetation removal. As such, it is assumed that few if any A and B grade trees would be impacted. The habitats to be removed may provide habitat for a range of protected and notable species including otter and water vole (riparian mammals), bats and badgers.	Biodiversity and Nature Conservation and Landscape
ENV3	Minimise impacts on Local Wildlife Sites (LWS)	Professional Judgement and LWS Citation provided by TVERC.	G	No impacts to LWS	There are no LWS or potential LWS within the boundary of the proposed Intake/Outfall Option D. The closest LWS to the Intake/Outfall is approximately 2Km to the north-west (Marcham Salt Spring LWS)	Biodiversity and Nature Conservation
ENV4A	Minimise impacts on Scheduled monuments or activities which could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No physical loss of scheduled monuments. The scheduled dovecote (NHLE 1019391) at Culham Manor lies 350m east of the option intake/outfall and therefore the setting of the monument might be relevant	Historic Environment

ENV4B	Minimise impacts on listed buildings or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No listed buildings physically affected. The Grade II* listed dovecote (NHLE 1019391) at Culham Manor lies 350m from the intake/outfall option and setting might therefore be relevant, as it would be for the associated Grade II* listed manor house (NHLE 1285637) 70m to the east of the dovecote	Historic Environment
ENV4C	Minimise impacts on Registered Parks and Garden or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any Registered Park and Garden. Sutton Courtenay Manor lies 740m to the south-east of the intake/ outfall option. Changes to setting unlikely	Historic Environment
ENV4D	Minimise impacts on Registered Battlefields or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any Registered Battlefields with the nearest being the Battle of Chalgrove (NHLE 1000006) 14.5km to the east of the option	Historic Environment
ENV4E	Avoid impacts on World Heritage Sites or activities that could lead to a loss of significance, including setting	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any World Heritage Sites with the nearest being Blenheim Palace (NHLE 1000091) over 20km to the north	Historic Environment
ENV4F	Minimise impacts on conservation areas which could result in loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No changes within any conservation areas - amber score given proximity of the Culham conservation area 330m to the south east of the option	Historic Environment
ENV5A	Minimise loss to non-designated built heritage	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Extensive loss of non-designated built heritage of low value within the permanent infrastructure zone and adverse changes to within a 500m area from the edges of the permanent infrastructure OR more limited effects on non-designated built heritage of medium value	No expected loss of non-designated historic buildings - none shown on OCC HER dataset	Historic Environment
ENV5B	Minimise loss to paleoenvironmental remains	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or damage to low value remains within the construction area and adverse changes to similar buried remains in a 1km area around the permanent infrastructure from temporary and permanent changes to local hydrogeological regimes OR more limited effects on remains of medium value	Likely loss of some paleoenvironmental material as structures are within the River Thames floodplain and the likely relict paleochannels within the buried environment and organic remains interleaved with alluvial deposits	Historic Environment
ENV5C	Minimise loss to non-designated historic landscapes	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or extensive changes to low value non-designated historic landscapes within the construction area and extensive changes to the setting of the same resource outside the permanent infrastructure OR more limited effects on non-designated historic landscapes of medium value	No loss of non-designated historic landscapes as no non-designated historic landscapes are recorded within the option footprint	Historic Environment
ENV5D	Minimise loss of non-designated archaeological remains	Professional judgement, incorporating the use of the IEMA's Principles of Cultural Heritage Assessment in the UK and the Chartered Institute for Archaeologists standard and guidance document for desk based assessment	G	Permanent infrastructure and construction area will result in the loss and / permanent damage to non-designated buried and extant archaeological remains worthy of local significance which can be adequately mitigated through preservation by record	No loss of known archaeological remains with reference to the OCC HER dataset	Historic Environment
ENV6A	Minimise loss of fluvial flood storage within Flood Zone 2 or 3	Measure using GIS	A	Site is within flood zone 2 and 3 but loss of storage is minor or mitigation is available	The intake/outfall structure is only within flood zone 2. 1315m of tunnel length within flood zones	Flood Risk
ENV7A	Minimise disturbance of potentially contaminated land	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of potentially contaminated land with one or more of the following properties: - Unlikely to have significant cost or program implications - Unlikely to cause significant harm to potential receptors - Can be easily mitigated and remediated	This option is proposed to pass beneath the A34 and gravel pits south of Abingdon Sewage Treatment Works. The culvert connecting the shaft to the intake/outfall is proposed to pass through a historical and now flooded gravel pit. The option is also proposed to pass adjacent to a farm with associated tanks and 150m north of Sutton Wick leachate treatment plant. There may also be the potential for unrecorded areas of Made Ground (and hence and potential contamination along the route). Additionally the tunnel bores through Kimmeridge Clay which may present a risk of hydrocarbon contamination due to potential bituminous content. There may be the potential for significant effects associated with land contamination, however, based on currently available information is it likely these can be addressed with appropriate mitigation.	Land
ENV7B	Minimise disturbance of potentially contaminated land specifically in relation to authorised and historic landfills	Desk based assessment of areas to identify potential sources of contamination	R	Within authorised landfills or previous industrial sites	This option tunnel is proposed to pass 100m north of Sutton Wick No.1 landfill which is recorded as being licensed to accept inert, industrial, household, special and liquid sludge wastes, and accepted waste from 1981. The indicative outfall extension is shown to be located potentially disturbing the corner of the landfill. There is currently little information available relating to the construction, depth or infrastructure which may be present associated with this landfill and it is assumed, at this stage that there may be significant effects associated with its disturbance, these may range from risks associated with direct disturbance or disturbance of the ground surrounding the landfill. The following risks should be considered; - landfill gas and leachate pathway disturbance, - waste disturbance - infrastructure disturbance (e.g. liner or pipework) - permitting arrangements - potential for significant costs and programme delays Consultation will be required with regulators to obtain further detail to assist with assessments.	Land

ENV8	Minimise disturbance of land with known potential for Unexploded Ordnance (UXO)	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of a low quantity of UXO which can be easily managed / remediated. Unlikely to have significant cost or program implications	The detailed Zetica desk study (P13129-23-R1) has assessed the area to be low risk, defined as 'There is no positive evidence that UXO is present, but its occurrence cannot be totally discounted'. There are records showing bomb drop locations on and around the options north of Drayton in this low risk area. In a low risk area Zetica recommends 'a UXO briefing for all staff involved in excavations'. Further consultation may be required to determine appropriate mitigation for sub-surface tunnelling.	Land
ENV9A	Minimise loss of terrestrial priority habitats (use narrative to describe type and quantum)	Use of aerial imagery, MAGIC maps and Professional Judgement	G	No priority habitat directly impacted by proposed option footprint	The pipeline for Intake/Outfall Option D passes through an area described as 'no main habitats but additional habitats present'. The River Thames is also considered priority habitat. The indicative STW outfall extension also passes through an area of coastal and floodplain grazing marsh priority habitat. Where the pipeline is underground, habitats should not be impacted.	Biodiversity and Nature Conservation
ENV9B	Minimise loss of aquatic priority habitats (use narrative to describe type and quantum)	Professional judgement based on knowledge of Water Framework Directive.	A	Priority habitat directly impacted but mitigation feasible	As a result of this option, a proportion of the bank of the River Thames will be lost. The options will span 230m of bank however not all of this habitat will be lost. Depending on the design of the intake screen, between 35 - 38m of bank are expected to be lost. The length of habitat lost will need to be mitigated for appropriately.	Aquatic Environment
ENV10A	Reduce effects on North Wessex Downs Area of Outstanding Natural Beauty (AONB) and its setting	Professional judgement.	A	AONB and its setting likely to be affected. Effect is unlikely to be significant.	The introduction of the intake and outfall infrastructure along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the North Wessex Downs AONB due the limited scale of the structures above ground, distance, intervening urban areas and vegetation in the landscape between the AONB and the infrastructure.	Landscape & Visual
ENV10B	Reduce effects on local landscape character	Professional judgement.	A	Effect on local landscape character is unlikely to be significant.	The introduction of the intake and outfall infrastructure could affect the sense of tranquillity along the River Thames, although the location of the Control Building on the edge of mineral workings would help to reduce the effect. The loss of some trees would have a limited effect on a key characteristic which contributes positively to the local landscape character. While effects on local landscape character may be significant in the short term, this could be mitigated in the long term, particularly given the context of the nearby sewage and mineral works which already affects the sense of place and tranquillity.	Landscape & Visual
ENV11A	Reduce effects on panoramic views from national trail, open access land and important viewpoints in AONB	Professional judgement.	G	Panoramic views from national trail, open access land and important viewpoints in AONB unlikely to be affected or the proposal is likely to be barely discernible in views.	The intake and outfall infrastructure is likely to be barely discernible in panoramic views from The Ridgeway National Trail in the AONB, given the distance and intervening urban areas and vegetation.	Landscape & Visual
ENV11B	Reduce effects on sensitive local visual receptors	Professional judgement.	R	Effect on local views of sensitive visual receptors likely to be significant.	Some PRoWs, National Cycle Network Route 5 and the Vale Way Long Distance Path would be directly affected by the haul road and construction traffic on it. There would be open close-range views from the River Thames and partially filtered views through trees from the Thames Path National Trail and residential properties on the western edge of Culham Conservation Area, looking to the intake and outfall infrastructure, including the intake screens/river barrier. In these views, the Control Building could be visible in the background, partially filtered by trees. There would also be close-range views from the National Cycle Network Route 5 and Vale Way Long Distance Path to the Control Building. Although the views are affected to varying degrees by the presence of pylons and overhead lines, and the effect on some views could be reduced in the long term, some effects could potentially be significant long term given the sensitivity of the visual receptors.	Landscape & Visual
ENV12	Minimise disturbance/encroachment into Air Quality Management Area (AQMA)	Based on an understanding of the scale and nature of activities, air quality management areas (AQMAs) were identified in close proximity to the proposed works.	G	Site is located further than 1km from AQMA OR no construction traffic must go through an AQMA	Marcham AQMA is approximately 2.2 km NW of Option D at its closest point. Abingdon AQMA is approximately 1.7 km NNE of Option D at its closest point. The anticipated construction and operational activities would likely lead to a negligible change in air quality.	Air Quality
ENV13	Minimise disturbance/encroachment into Groundwater Source Protection Zone (SPZ)	Magic maps	G	Site is within Zone 3 or not within a SPZ	Site is not within an SPZ.	Aquatic Environment
ENV14A	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Cow Common Brook and Portobello Ditch' WFD waterbody (GB106039023360) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment

ENV14B	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ock and tributaries (Land Brook confluence to Thames)' WFD waterbody (GB106039023430) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14C	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Thames (Evenlode to Thame)' WFD waterbody (GB106039030334) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	A	Moderate adverse impacts likely; low risk to ability to attain Water Framework Directive objectives for this waterbody	This option will impact the River Thames WFD waterbody as a section of the WFD principal waterbody will be lost. The option has the potential to impact the ecological status of the waterbody due to a loss of river bank and riparian habitat. However, this impact is considered to be localised and not at a waterbody scale. Impacts can be easily mitigated.	Aquatic Environment
ENV14D	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Sandford Brook (source to Ock)' WFD waterbody (GB106039023410) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14E	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Childrey Brook and Norbrook at Common' WFD waterbody (GB106039023380) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14F	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ginge Brook and Mill Brook' WFD waterbody (GB106039023660) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14G	Option does not affect Water Framework Directive (WFD) Quality Elements within one of WFD waterbodies downstream of the River Thame to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives. These WFD waterbodies include: - Thames Wallingford to Caversham - WFD waterbody GB106039030331 - Thames (Reading to Cookham) - WFD waterbody GB106039023233 - Thames (Cookham to Egham) - WFD waterbody GB106039023231 - Thames (Egham to Teddington) - WFD waterbody GB106039023232	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV15A	Maximise potential for future environmental benefits (terrestrial), e.g. increase tree planting	Professional Judgement	A	Site allows some additional environmental benefits to be realised	No specific space allowed for environmental benefit. Location would remove areas of trees, hedgerow, grassland and riparian vegetation along the Thames. Location also blocks the natural access to the Wilts and Berkshire Canal which could impede movement of riparian species (and fish).	Biodiversity and nature conservation
ENV16	Maximise flexibility in routing diverted watercourses so their habitats can be of sufficiently high quality to contribute to catchment Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Site allows significant flexibility in routing watercourses / Good or high quality habitat options are available	Option does not impact routing of diverted watercourses.	Aquatic Environment
ENV17	Minimise disturbance/encroachment into Local Geological Sites (LGS)	Desk based assessment of areas to identify potential sources of contamination	G	Site is located more than 250m from LGS	No known geological sites within 250m	Land

ENV18A	Minimise impacts associated with Noise and Vibration as a consequence of the construction of the option	Indicative assessment with noise sensitive sample receptors within RAG bands identified based on predicted construction noise levels during Gate 2 assessment, with updates made to construction activitues at intake / outfall facility. Draft Gate 3 plant list includes a Secondary Lining activity, which will involve the use of concrete batch plant and represents the worst-case activity in the draft Gate 3 plant list. This activity has been used for the optioneering study. The assessment considers five sample receptors, each representing clusters of properties/receptors in the vicinity of the intake / outfall options. The sample receptors are: NV-A: Residential properties on South Quay NV-B: Residential properties west of St Paul's Church, west of The Burycroft road NV-C: Farm east of The Burycroft road NV-D: Location of Moored boats at Marina NV-E: Residential properties north of St Paul's Church, west of The Burycroft road Red band distance is from works site/access road to the SOAEL+5dB, and Amber distance is from SOAEL+5dB to the SOAEL. Road Construction: Red 60m, Amber 61-99m, Green 100m. Construction Traffic (on access road): Red 5m, Amber 6-	A	Potential for significant effects but likely to be mitigated if they occur	The closest sample receptor to the proposed facility at Option D is NV-B at approximately 350m. At this distance, and when considering the predicted construction noise levels at the facility during secondary lining activities, this receptor is predicted to be within the Amber band. No significant effects are predicted as a result of construction of the access road or from traffic movements on the proposed access road for Option D. However, construction movements on Stonehill Lane have the potential to result in adverse effects for properties on this road.	Noise
ENV18B	Minimise impacts associated with Noise and Vibration as a consequence of the operation of the option	Quantitative assessment not possible at this time. As such, the option appraisal study has considered the qualitative assessment undertaken at Gate 2 and applies professional judgement in assigning RAG bands to each option under assessment	A	Potential significant effects but likely to be mitigated if they occur	Sample receptor NV-B is ~350m from the facility at Option D. At this distance, it is possible that noise from the facility would be audible during normal operations. However, with the implementation of noise and vibration control measures within the design of the facility, it would be anticipated that significant effects would be avoided.	Noise
ENV19A	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the construction of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	There are between 1 - 10 high sensitivity receptors (i.e. dwellings) within 20 m of the construction route for Option D (i.e. along Stonehill Lane). Abingdon Sewage Treatment Works also adjacent to the main works (i.e. shaft and control building etc). It is considered that there are no proposed dust-generating construction activities that could not be managed using normal good practices (IAQM construction dust guidance, 2023) to prevent significant effects at any off-site receptor. Given that relatively low numbers of plant and items of machinery would be used and the anticipated number of construction vehicles, the potential effects would likely lead to a negligible change in air quality.	Air Quality
ENV19B	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the operation of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	The likely minimal operational-related traffic (e.g. staff, planned maintenance, repair, refurbishment and replacement events) is such that the potential effects from vehicle emissions would likely lead to a negligible change in air quality at nearby receptors.	Air Quality
ENV20A	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the construction of the option	Professional judgement.	A	Noticeable changes to visual amenity of local community	While trees along the left bank of the River Thames would partially filter views of construction activities and traffic associated with the intake and outfall, there could be noticeable changes to the visual amenity of the local community on the western edge of Culham. This could in part be due to temporary security lighting and/or night-time construction works. However, there would be little effect on the visual amenity of the communities near Abingdon Marina, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV20B	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the operation of the option	Professional judgement.	G	Barely perceptible changes to visual amenities, with no or little effect on local community	The effect of operational lighting would be limited and the Control Building within the edge of the mineral workings and generally low level intake and outfall infrastructure along the river bank would have little effect on the visual amenity of the local community on the western edge of Culham due to intervening vegetation. There would be no effect on the visual amenity of the communities near Abingdon Marina, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV21A	Minimise impacts associated with solid discharge during construction, e.g. aggregate spills during material transport, sediment runoff from clay erosion due to excavation of the pipeline / tunnel and construction works	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
ENV21B	Minimise impacts associated with solid discharge during operation, e.g. release of sediment into surrounding environment during maintenance such as dredging, debris removal	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
Community and Planning Considerations						
CPC1	Distance to the nearest property that will stay during construction (metres)	GIS	R	Less than 250m from the nearest property	Intake Outfall Structure - 340m to nearest property Tunnel - 85m to nearest property	Socio-Economic
CPC2	Minimise impacts on local community during construction associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	A	Community access/use of community assets is disrupted during construction	Intake/outfall and access road is within 500m of a sports club and NCN5. During construction it is reasonable to expect some disruption in the form of traffic and potential periods of restricted access.	Socio-Economic

CPC3	Minimise impacts on local community during operation associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	G	Community access/use of community assets is not disrupted during operation	Intake/outfall and access road is within 500m of a sports club and NCN5. During operation it is reasonable to expect no disruption to residents but there may be limited disruption to those using the NCN as the access road joins this.	Socio-Economic
CPC4A	Are public rights of way (PRoW) disrupted or adversely affected?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	R	Recreational resources / rights of way of national or regional importance are disrupted or affected	Intake/outfall and access road is within 500m of a sports club and NCN5. NCN will be disrupted as a result of construction.	Socio-Economic
CPC4B	Are there opportunities to create or improve linkages of Public Rights of Way (PRoW) and recreational routes?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	G	Links to a recreational resource / right of way of national or regional importance can be enhanced	NCN may experience disruption but linkages to it could be improved.	Socio-Economic
CPC5	Maximise potential opportunity for recreational benefits	GIS analysis of PRoW, open spaces, cycle routes, canals, other forms of regional/nationally important receptors (eg National Cycle Routes), and community assets.	A	Option allows some additional recreational benefits to be realised	This option may disrupt the NCN during construction.	Socio-Economic
CPC6	Support the realisation of socio-economic incentives on SESRO, including employment, skills, tourism, sustainable travel, connecting people with nature and environmental education	GIS analysis of footprint, community assets, private residents, and businesses. Also awareness of overall project objectives is needed to conclude if the designs align with these.	A	Site supports some of the social-economic incentives of the overall scheme	This option may disrupt the NCN during construction.	Socio-Economic
CPC7	Minimise overall SESRO Order Limits extent and land acquisition, without compromising SESRO needs and project benefits	Spatial comparison of land that would likely be included in the DCO Order Limits, including construction working areas, access and highways or PRoW interactions.	G	Requires minimum Order Limits extent	The majority of the tunnel route stays within the area safeguarded for the reservoir (CP14). The control building, the raised area, intake screens, outfall weir and access road also fall within this area, requiring minimal different Order Limits extent and land acquisition. The control building would be located in the previously-developed area of Oday Quarry workings rather than on the river bank.	Consenting
CPC8	Aim for consistency with published and (insofar as possible) emerging Local Plan land use allocations	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in existing and any emerging Local Plan documents and any Supplementary Planning Documents.	G	Low or no impact	The tunnel enters the area safeguarded for the South Abingdon-on-Thames Bypass linking the A415 to the West and South, including a new River Thames Crossing east of the town (Vale of White Horse Local Plan 2031, policy CP12), but may be able to be accommodated alongside any potential road alignment. The intake/outfall and associated structures are outside the area allocated for the bypass and river crossing. No other conflicts with the VoWHLP. The tunnel passes through the area of Policy SW1 of the saved policies of the Oxfordshire Minerals and Waste Local Plan 1996. Policy SW1 states that the designated area will be released for sharp sand and gravel extraction. However, much of this area has already been worked with extant gravel pits, so a conflict is not considered likely. The proposed realigned safeguarded area for the Southern Abingdon Movement Corridor in the draft Joint Local Plan 2041 has been revised such that it would overlap with all of the right-bank options considered in this appraisal. Thames Water will seek to engage further with the joint local authorities and with Oxfordshire County Council about the SESRO design to explore options, constraints and opportunities for this policy area, as the Local Plan moves through the consultation and examination process. As this is a draft policy, subject to change, it has been considered alongside (not necessarily superseding) the existing Policy CP12 in this options appraisal and has not altered the conclusion.	Consenting
CPC9	Aim for consistency with any adopted Neighbourhood Plan policy applicable to the land area affected	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in any made Neighbourhood Plan.	G	Low or no impact	All options pass through the area of the Drayton Neighbourhood Plan, which is the only made neighbourhood plan in the area. Community Policy C-T5 states that a weight limit will apply for HGVs travelling through the village. Options A-F will use Drayton Road (B4017) for access but it is anticipated that this would be from the north, not passing through Drayton. The Abingdon-on-Thames NP is being prepared and the Sutton Courtenay NP is being examined.	Consenting
CPC10	Avoid development of infrastructure within specifically designated areas or their setting, as applicable (e.g. Green Belt, AONB, Common Land, Open Space)	Spatial comparison with designated sites, their settings, and the nature of development works expected.	G	Does not require development of above-ground infrastructure within these designations or development likely to have more than a negligible effect on the setting (where applicable)	Not located within a specifically designated area, such as Green Belt, AONB, Common Land or Open Space.	Consenting
CPC11	Avoid encroachment on any safeguarded land in minerals and waste policy, unless the minerals can be beneficially utilised as a result	Spatial comparison of allocated sites and review of policy wording in existing and any emerging Waste and Minerals Local Plan documents.	A	Potential conflict with development or use of safeguarded minerals or waste allocations	The tunnel passes through the area of Policy SW1 of the saved policies of the Oxfordshire Minerals and Waste Local Plan 1996. Policy SW1 states that designated area will be "released for sharp sand and gravel extraction". Much of the area safeguarded in this policy has already been quarried and restored to lakeside water-related activities but Oday Hill Quarry remains active and could be impacted by this option. However, the extant planning permission for an extension to Oday Quarry approved in February 2023 (OCC ref. MW.0104/20; VoWH ref. P20/V3206/CM) contains Condition 7 requiring a restoration plan that does not prejudice the SESRO project or the Wilts and Berks Canal and Thames Water withdrew its objection to the quarry permission.	Consenting
CPC12	Ability to integrate with existing nationally-significant infrastructure, statutory undertakers' major infrastructure, or any proposed future Nationally Significant Infrastructure Projects (NSIP) (such as that of National Highways, Environment Agency, Network Rail)	Review of NSIP projects on PINS's register; review of Network Rail and National Highways investment plans; spatial review of statutory undertakers' assets.	G	Low or no interaction with existing infrastructure or proposed Nationally Significant Infrastructure Project (NSIP)	No NSIPs currently registered. No known proposals from Network Rail or National Highways. The National Highways RIS3 Investment Plan will be published in 2024 which will detail the A34 improvement project.	Consenting

CPC13	Minimise the consenting complexity due to the need for additional consents and licenses that may be required outside the Development Consent Order (DCO), e.g. additional Flood Risk Activity Permit, Environmental Permit, abstraction/discharge Licence, European protected species licence, etc	Review of the nature of expected development works against the list of other consents and licenses developed at Gateway 2.	A	One or more additional consent/license required	A Land Drainage Consent would be required for works in, over, under or affecting the flow of an ordinary watercourse. A Bespoke Flood Risk Activity Permit will be required for this scale of works on or near a main river. This can be applied for post-DCO. A Temporary Traffic Regulation Order may be required as PRoWs will need to be temporarily closed for construction of the tunnel, although this can potentially be included within the DCO application. Planning consent for the Abingdon STW discharge relocation is expected to be required outside the DCO, but this is applicable to all the options except G.	Consenting
CPC14	Avoid or minimise the need for any consequential development consenting (i.e. displacement or alteration of other development)	Review of existing development within the likely land-take, its nature and scale.	G	No existing development requires planning permission to relocate or alter	The tunnel crosses the A34 and Drayton Road, and Hanson Way National Cycle Route, as do all options. The tunnel also crosses electric lines, telecom lines, gas lines and water lines (most of which are also underground) which could require diversion, but this can form part of the DCO associated development or potentially be delivered through statutory undertaker permitted development. The tunnel and some of the control building and other raised structures would be located within Oday Hill Quarry, but the extant planning permission for an extension to Oday Quarry approved in February 2023 (OCC ref. MW.0104/20; VoWH ref. P20/V3206/CM) contains Condition 7 requiring a restoration plan that does not prejudice the SESRO project or the Wilts and Berks Canal and Thames Water withdrew its objection to the quarry permission. Abingdon STW outfall relocation would require planning consent, expected to be outside the DCO, but this is applicable to all the options except G.	Consenting
Property & Land Acquisition						
PRP1	Minimise loss of sensitive properties, e.g. residential, commercial, green belt, common land, historical or community assets due to project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of sensitive properties	Assume construction via TBM; would not detrimentally impact surface uses along tunnel length including Quarry extension at Oday Quarry which incorporates a planning condition to accommodate the project. Privately owned land and Oday Hill Quarry. Tunnelling under land/gardens associated with listed buildings at Stonehill farm. Construction and timing review may result in increase/decrease of RAG status. Assumed Exceptionally low risk of vibration.	Property & Land Acquisition
PRP2	Minimise loss of land allocated within the Local Plan for alternative higher value / social / cultural value uses, i.e. residential, historical or community assets due project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of allocated land for higher value or social value properties	Assumed Quarry expansion application would not be affected. Slight overlap with current design and Greenbelt allocation of the river surface. Assumed detailed design will enable prevention of impact on Greenbelt.	Property & Land Acquisition
PRP3	Minimise permanent loss of best and most versatile agricultural land (grades 1, 2 and 3)	Review of agricultural grading layer on ArcGIS, based on 2019 Provisional Agricultural Land Classification	A	Results in loss of any Grade 2 agricultural land or >50% Grade 3 agricultural land	Surface land graded 2 land at 25%. Assume construction via TBM would not detrimentally agricultural use. Grade 2 = 25% Grade 3 = 63% Grade 4 = 12%	Property & Land Acquisition
PRP4	Assessment of Land and Property asset costs and associated compensation due under the Compensation Code	Review of land use / designation on ArcGIS	A	Land acquisition costs likely to be relatively moderate.	Subsoil values at de minimums. Tunnels N/A based on subsoil value of £50 per interest. Greenbelt land may require replacement land within immediate vicinity.	Property & Land Acquisition
PRP5	Assessment of Special Category Land	Review of affected landowners	A	Nature and / or extent Special Category Land is likely to cause moderate consenting risk	Two SCLs possibly identified. Vale of White Horse Council, National Highways.	Property & Land Acquisition
PRP6	Minimise disruptions of landowners access to their land required for temporary works	Review location in conjunction with existing road network	G	Assumption that landowners will be able to access their land during construction and operational phases.	No direct impact on landowners access identified. Assumption that landowners will be able to access their land during construction and operational phases. Crossing of Drayton Rd B4017 may cause general disruption of access between Drayton and Abingdon.	Property & Land Acquisition

Appendix M. Intake/Outfall Option E Criteria Workbook

Intake Outfall Option E Appraisal Workbook

Criteria code	Criteria Description	Method of Assessment	RAG	Description of RAG	Narrative	Sub-Theme
Constructability						
CON1	Safety - Risk of endangering construction workers or members of the public during construction e.g. water, ground, height, rail, road and utilities	Look at programme and list types of construction involved. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be constructed safely but enhanced control measures required	Working adjacent to a flooded gravel pit, the River Thames and a channel. Tight working areas	Health and Safety
CON2A	Programme - Duration, longest /shortest, but also consider whether the longer duration has an impact on the overall scheme programme	Compare differences in the programmes which would materialise from different options. Consider earthworks seasons.	A	Likely to extend the duration of the relevant area of works (e.g. road, rail siding or intake/offtake construction) compared to the Gate 2 SESRO programme but unlikely to impact on the critical path of the Gate 2 SESRO programme.	Working adjacent to water will require additional time to set up temporary safe methods of working. This is a baseline duration site without other additional works ie. longer channels.	Programme
CON2B	Programme - Opportunities for construction programme acceleration through efficiencies	Compare differences in the programmes which would materialise from different options.	A	The option has limited potential to introduce programme efficiencies and reduce the construction programme	STW extension can be completed concurently with other works. Programme acceleration opportunities are limited with this location due to the length of the tunnel.	Programme
CON2C	Programme - Dependencies i.e. proximity or physical relationships between elements of scope that introduce programme dependencies	Is the options on the critical path? Will it impact other critical activities?	A	Several major dependencies/ multiple minor dependencies	Work is not on the critical path. Working space is limited and a tight working layout will need to be adopted. The TBM will need to be recovered from the shaft. Access to the tunnel for the secondary lining will take place from within the shaft. This will impact works constructing the inlet and outlet. Close proximity of elements of the works will mean that items will need to be completed in a sequential way. Works will not be able to commence until temporary land take has been completed. This option requires a long extension of the STW outfall.	Programme
CON2D	Programme - Risk	Are there items in the construction which have a significant programme risk	R	Major programme risk	Access is based on using Stonehill Lane which runs into an unnamed track east and then north into Peep O Day Lane. From Peep O Day Lane access would be east through the fields. Using Marcham Road for all works remains an opportunity. To achieve this structures across the A34, Stonehill Lane and the B4017 will be required to be constructed followed by a haul road. Site is within green belt area so permission will need to be sought for construction in this area and it may be met with some resistance.	Programme
CON2E	Programme - Use of existing assets to reduce the amount of construction required	Identify if any existing assets can be used	A	Option does not make use of existing assets	Other than road access, this option does not reuse assets or temporary works for permanent items.	Programme
CON3A	Logistics - Space available for construction and materials storage	Determine space constraints using GIS and options layouts from option definition.	A	Limited / restricted space	The option requires work adjacent to (and partially within) the cutting formed for a potential future Wilts and Berks Canal which introduces some space constraints.	Logistics
CON3B	Logistics - Suitable and efficient access for construction workers, deliveries and waste removal including minimisation of lengths of new roads for access during construction	Determine method of access using GIS and options layouts from option definition.	A	Due to restricted access, an additional length of road is likely required for construction of the option.	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,500m. This would require upgrades to approx. 620m length of Peep-O-Day Lane. The length of addtional new access road is approximately 460m. There may be an opportunity for construction access to the intake/outfall structure site via the Auxiliary Drawdown Channel, which would then reduce construction vehicle usage of the B4017 and Stonehill Lane. However, this is programme dependent and will only be an opportunity if the ADC is retained in the design (which is currently being considered in a separate options appraisal).	Logistics
CON3C	Logistics - Import of materials or resources during construction	Use quantity estimates to assess different options.	A	Moderate amount of import materials required.	Moderate additional road length (460m) required for accessing the site, with a moderate tunnel length (3550m). Long length for extending Sewage Treatment Works Twin 300mm dia Pipework (965m) + pumping station required.	Logistics
CON3D	Logistics - Haulage distance required for construction materials arrival on site to the placement location	Determine length using GIS and options layouts from option definition.	G	One main site location is used for construction of the option.	One main site location is used for construction of the option.	Logistics
CON3E	Logistics - Vehicle movements	Use vehicle movement estimates to assess different options.	A	Construction likely to add vehicle movements.	Space is available to complete works without major additional vehicle movements or temporary structures.	Logistics
CON4A	Construction Complexity - Temporary conditions/works requirements e.g. embankment slope stability and moisture outside of placement seasons.	Expert Judgement	A	Temporary Works requirements extensive and in some cases complicated and extend the programme	Requires a STW outfall extension - approximate length is 965m, temporary works required to create a dry working area at the outfall and inlet. Safe working arrangements for working adjacent to the River Thames and the flooded gravel pit. Temporary access would be along the proposed ADC. Significant work required to bring ground level up to a work from.	Construction complexity
CON4B	Construction Complexity - Location conflict/opportunity with another engineering component of the scheme or other SRO/non-SRO schemes, e.g. Severn to Thames Transfer (STT), Thames to Southern Transfer (T2ST), TW Swindon and Oxfordshire supply zone transfer, Transfer to Farmoor Reservoir	Expert judgement and knowledge of surrounding schemes	G	Location / layout of option provides an opportunity to be developed along with another component of this scheme (or another scheme)	Assuming that the STT pipeline connects into the shaft and discharges to the Thames through the outfall and generally follows the alignment of the ADC, the route would be relatively short as the shaft is located close to the River Thames where the ADC discharge is located, south of an existing cutting created for the Wilts and Berks Canal.	Construction complexity
CON4C	Construction Complexity - Minimise the number and complexity of additional structures/assets required or modifications to the existing structures/assets in order to facilitate the option, e.g. bridges, culverts, crossings	Determine using GIS and options layouts from option definition.	A	Option requires a moderately complex (mitigation likely) and/or moderate number of additional structures and/or modification to existing structures.	The option has: no need for infilling of a flooded gravel pit, relatively short culverts and significant extension of the sewage treatment works outfall (which would also need to pass over the ADC (if constructed)). The long extension of the sewage treatment works outfall is considered an additional component.	Construction complexity
CON4E	Construction Complexity - Complexity of construction technique e.g. construction of tunnels, Auxiliary Drawdown Channel (ADC) or both for the emergency discharge	List out the differences in construction complexity (engineering cost risk & stakeholder interfaces risk). Use expert judgement to decide on the assessment. Compare with inclusions on cost to ensure no double-counting.	G	Simple construction technique required that carries low risk. Simple construction techniques would not include, for example (for the intake/outfall), infilling of existing gravel pits, construction across existing gravel pits or extension of the tunnel below the River Thames.	The option has few complex construction techniques.	Construction complexity

CON5A	3rd Party Impact - Potential to disrupt existing road network during enabling works and construction	Expert judgement	R	Disruption likely to be significant	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,500m. The route will likely cause significant distruption, particularly to the National Cycle Network Route 5, which would need to be upgraded and used during construction.	3rd Party Impact
CON7A	Ground - Terrain of site, and implications for the need for earthworks and engineered slopes	Use of lidar and civil 3D models to assess amount/location of earthworks required	G	Terrain is favourable to the design of assets and therefore reduces the amount of earthworks required	Option is on the right bank of the River Thames, and therefore the site is low and flat. This option does require some raising of the ground to bring the shaft above flood level but does not have the additional earthworks required for long culverts.	Construction complexity
CON7B	Ground - Risk of unexpected conditions	Use of expert judgement based on comparable areas	G	Low exposure to risk of unexpected ground conditions.	Previous Ground Investigation in the area.	Construction complexity
CON7C	Ground - Impact of ground conditions on the complexity of design and construction	Expert judgement	G	Ground conditions are unlikely to increase the complexity of design and construction with likely only a minimal (if any) impact on cost or requirement for materials that are difficult to source	Complexity of the design of the culvert along the edge of the existing flooded gravel pit could be impacted by ground conditions.	Construction complexity
CON7D	Ground - Risk of ground settlement above line of tunnel affecting other structures/houses	Expert judgement	A	Risk level acceptable or can be reduced with mitigation	Tunnel route chosen to avoid passing below structures that can be identified from aerial imagery.	Construction complexity
CON8A	STT Integration Complexity - Complexity of connecting STT directly into the intake/outfall structure.	Expert judgement	G	For the intake/outfall: The intake/outfall structure is close with simple construction required to achieve connection to the intake/outfall structure.	Assuming a STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall structure, the STT pipeline for Option E would be considered simple construction.	STT
Operability						
OPS1A	Safety - Risk of endangering operational staff, visitors or members of the public during operation	Look at operational activities and public access. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be operated safely but enhanced control measures required	This option will require enhanced control measures due to proximity to water. This option will require security fencing to reduce the risk of endangering the public during operation.	Health and Safety
OPS1B	Safety - Access and egress for operational staff, visitors, deliveries and waste removal during normal operations and emergencies	Tunnel silt issue to be considered by expert judgement	A	Access/egress can be provided, however it is challenging / restricted	During larger River Thames flood events this option would not be accessible, as the access road is not intended to be raised above the River Thames flood level.	Health and Safety
OPS2A	Maintenance - Ease of maintenance	Expert judgement	A	Majority of maintenance activities could be undertaken during moderate closure periods and / or with moderate disruption	This option does not have long culverts which may mean the majority of maintenance activities could be undertaken during moderate closure periods.	Operational Complexity
OPS3A	Performance - Impact of intake location on removal of screenings and large floating debris e.g. rate of removal and volume to be removed	Expert judgement	A	Moderate reduction of screen capacity during high flows (partial intake blockage and reduced transfer capacity)	All options consider the same intake screen design and experience the same flows as their locations are similar, and may experience moderate reduction in capacity. Geomorphological performance considered in OPS11.	Operational Complexity
OPS4A	Reliability - Footprint of the option within flood zones (as an indication of the potential for damage and the challenge of operation / maintenance during flood events)	Review GIS supported by expert judgement	A	Option is within the flood zone, however damage is not considered to be a significant risk	The intention is for the area around the shaft to be raised above the River Thames flood level. However, the access road to the structure is not intended to be raised (in order to reduce the risk of impacting River Thames flooding).	Operational Resilience
OPS6A	Evolvability - Risk to operation from future climate change, e.g. losses from evaporation due to higher temperatures, impact of higher rainfall, intake/outfall flood risk perspective	Expert judgement	R	Option could be significantly impacted by future climate change impact	This option is within the flood zones 2 and 3 and therefore has a high risk to operation from increased flood levels.	Operational Resilience
OPS7A	Sustainability - Reuse of assets or temporary works for permanent items, e.g. materials storage slab, haulage roads, compound car park	Expert judgement	R	Option does not include for reuse of assets/temporary works	This option does not reuse assets or temporary works for permanent items.	Operational Resilience
OPS7B	Sustainability - Power required for operation	Calculated power requirement for the option	A	Option requires moderate amount of energy to operate	Option requires moderate amount of energy to operate	Operational Resilience
OPS8A	3rd Party Impact - Potential to disrupt existing road network during operation	Expert judgement	A	Disruption likely to be limited	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,500m. The route will likely cause moderate distruption. If access to site is to remain via the south after construction using Peep-O-Day Lane, there is an opportunity to upgrade Peep-O-Day Lane to make it better suited for users.	Transport Planning
OPS10	Quality - Impact on water quality received by the reservoir from the intake	Expert judgement	A	Design requires moderate amounts of interventions to ensure water quality	Impact on water quality is unlikely to significantly differ between the options, moderate interventions required to ensure quality for all options e.g. air diffusers within the reservoir. Geomorphological performance considered in OPS11.	Reservoir water quality
OPS11	Performance - Geomorphological impacts, e.g. potential sedimentation around the structure	Expert judgement	A	Geomorphology is likely to have a moderate impact on the performance of the structure	This option is located at a cross over between bends, near the outside of the bend. There may be some minor deposition but this is not expected to impact the performance of the structure.	Operational Resilience
OPS12A	STT Integration Complexity - Complexity of operating STT directly into the intake/outfall structure.	Expert judgement	G	Intake/outfall: Operability and/or resilience of SESRO and/or STT unaffected.	The STT pipeline to Option E would be relatively short and require some operational input.	STT
Relative Costs						
COS1	Capex cost of the option	Cost estimate calculation for each option.	G	CAPEX estimated to result in an increase of <1% of the CAPEX for the overall SESRO project compared to the lowest cost option	Initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option E results in a total project cost of 0.02% more than the lowest cost intake/outfall option.	Cost
COS3	Opportunity for cost-sharing with other SROs, NSIPs and local non-SRO schemes/plans, e.g. STT, T2ST, SWOX/Farmoor, Abingdon flood storage	Cost estimate calculation for each option.	G	Multiple opportunities identified for cost saving.	For the Intake/Outfall structure an oppportunity for sharing costs seems to be present for just STT. Reviewing the connection between SESRO and STT the opportunity is more present for STT. The best saving would be made by Thames Water agreeing that STT can discharge into the SESRO tunnel, so that STT flows discharge to the River Thames either by the tunnel or the ADC. However, assuming STT must connect to the SESRO Intake/Outfall structure, the opportunity is that both could discharge through the same outfall structure.	Cost
Carbon Costs						
CAR1	Carbon costs associated to the Capex of the option	Carbon estimate calculation for each option.	G	Emissions (tCO2e) estimated to result in an increase of <1% of the emissions (tCO2e) for the overall SESRO project compared to the lowest emissions (tCO2e) option	Initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent 1.6% of total SESRO carbon. Option E results in a total project carbon of 0.3% more than the lowest carbon intake/outfall option.	Carbon
Environmental Performance						
ENV1A	Minimise impacts on Special Area of Conservation (SAC)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SAC's or potential SAC's within the boundary of the proposed Intake/Outfall Option E. The closest SAC to the Intake/Outfall is 5.7Km to the north-west (Cothill Fen SAC)	Biodiversity and Nature Conservation
ENV1B	Minimise impacts on Special Protection Area (SPA)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SPA's or potential SPA's within the boundary of the proposed Intake/Outfall Option E. The closest SPA to the Intake/Outfall is approximately 40Km to the south-east (Thames Basin Heaths SPA)	Biodiversity and Nature Conservation
ENV1C	Minimise impacts on Ramsar	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no Ramsar sites or potential Ramsar sites within the boundary of the proposed Intake/Outfall Option E. The closest Ramsar to the Intake/Outfall is approximately 54Km to the south-east (South West London Waterbodies)	Biodiversity and Nature Conservation

ENV1D	Minimise impacts on Site of Special Scientific Interest (SSSI)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SSSI sites or potential SSSI sites within the boundary of the proposed Intake/Outfall Option E. The closest SSSI to the Intake/Outfall is approximately 1.9Km to the north-east (Culham Brake SSSI). The Intake/Outfall is within the Impact Risk Zone for Culham Brake SSSI but pipeline works are not included within the list of risks within this area.	Biodiversity and Nature Conservation
ENV1E	Minimise impacts on National Nature Reserve	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no NNRs or potential NNRs within the boundary of the proposed Intake/Outfall Option E. The closest NNR to the Intake/Outfall is approximately 4.8Km to the north (Cothill NNR)	Biodiversity and Nature Conservation
ENV1F	Minimise impacts on Local Nature Reserve (LNR)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no LNRs or potential LNRs within the boundary of the proposed Intake/Outfall Option E. The closest LNR to the Intake/Outfall is approximately 3.5Km to the north-east (Abbey Fishponds)	Biodiversity and Nature Conservation
ENV2A	Minimise impacts on Ancient Woodland	Natural England Ancient Woodland Maps and Professional Judgement.	G	No ancient woodland impacted	Historic mapping indicates that there is no ancient woodland present on-site	Biodiversity and Nature Conservation
ENV2B	Minimise impacts on Ancient and Veteran Trees	Woodland Trust Ancient Tree Inventory map search and professional judgement	A	Development in close proximity with potential indirect impact to ancient or veteran trees	There are no ancient or veteran trees recorded by the Woodland Trusts Ancient Tree Inventory on or close to this option. However, survey may identify trees that could be classified as ancient or veteran. As such, this option scores amber on a precautionary basis pending survey.	Biodiversity and Nature Conservation
ENV2C	Minimise impacts on Protected Trees	Check against published TPO dataset.	G	No protected trees impacted	No protected trees would be impacted.	Landscape & Visual
ENV2D	Minimise impacts on vegetation (including trees, woodland, hedges and shrubs)	Check against baseline resources and based upon high level knowledge of site from previous site visits. Professional judgement.	A	Direct impact on vegetation within a moderate proportion of construction footprint, which is of high arboricultural/amenity value (e.g. A or B grade) or biodiversity habitat in good condition. OR Direct impact on vegetation within large proportion of construction footprint, which is of lower arboricultural/visual amenity value (e.g. C grade) or biodiversity habitat in poor condition.	The tunnel excavation is assumed to be trenchless and therefore to only affect vegetation at the entry and exit points. Construction of the intake/outfall could require the removal of a several trees along the River Thames that are assumed to include several A or B grade trees. Localised vegetation clearance may also be required to facilitate the construction access road. Assuming a trenchless method of excavation is utilised, the extension of the STW Outfall would require limited vegetation removal. The habitats to be removed may provide habitat for a range of protected and notable species including otter and water vole (riparian mammals), bats and badgers.	Biodiversity and Nature Conservation and Landscape
ENV3	Minimise impacts on Local Wildlife Sites (LWS)	Professional Judgement and LWS Citation provided by TVERC.	G	No impacts to LWS	There are no LWS or potential LWS within the boundary of the proposed Intake/Outfall Option E. The closest LWS to the Intake/Outfall is approximately 2Km to the north-west (Marcham Salt Spring LWS)	Biodiversity and Nature Conservation
ENV4A	Minimise impacts on Scheduled monuments or activities which could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	The Culham Manor scheduled dovecote (NHLE 1019391) lies 370m east of the intake/outfall option and changes to setting might be relevant	Historic Environment
ENV4B	Minimise impacts on listed buildings or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No listed buildings physically affected. The Grade II* listed dovecote (NHLE 1019391) at Culham Manor lies 370m from the intake/outfall option and setting might therefore be relevant, as it would be for the associated Grade II* listed manor house (NHLE 1285637) 70m to the east of the dovecote	Historic Environment
ENV4C	Minimise impacts on Registered Parks and Garden or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any Registered Park and Garden. Sutton Courtenay Manor lies 710m to the south-east of the intake/outfall option. Changes to setting unlikely	Historic Environment
ENV4D	Minimise impacts on Registered Battlefields or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any Registered Battlefields with the nearest being the Battle of Chalgrove (NHLE 1000006) 14.5km to the east of the option	Historic Environment
ENV4E	Avoid impacts on World Heritage Sites or activities that could lead to a loss of significance, including setting	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any World Heritage Sites with the nearest being Blenheim Palace (NHLE 1000091) over 20km to the north	Historic Environment
ENV4F	Minimise impacts on conservation areas which could result in loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No changes within any conservation areas - amber score given proximity of the Culham conservation area 340m to the south east of the option	Historic Environment
ENV5A	Minimise loss to non-designated built heritage	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Extensive loss of non-designated built heritage of low value within the permanent infrastructure zone and adverse changes to within a 500m area from the edges of the permanent infrastructure OR more limited effects on non-designated built heritage of medium value	No expected loss of non-designated historic buildings - none shown on OCC HER dataset	Historic Environment
ENV5B	Minimise loss to paleoenvironmental remains	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or damage to low value remains within the construction area and adverse changes to similar buried remains in a 1km area around the permanent infrastructure from temporary and permanent changes to local hydrogeological regimes OR more limited effects on remains of medium value	Likely loss of some palaeoenvironmental material as structures are within the River Thames floodplain and the likely relict palaochannels within the buried environment and organic remains interleaved with alluvial deposits	Historic Environment

ENV5C	Minimise loss to non-designated historic landscapes	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or extensive changes to low value non-designated historic landscapes within the construction area and extensive changes to the setting of the same resource outside the permanent infrastructure OR more limited effects on non-designated historic landscapes of medium value	No loss of non-designated historic landscapes as no non-designated historic landscapes are recorded within the option footprint	Historic Environment
ENV5D	Minimise loss of non-designated archaeological remains	Professional judgement, incorporating the use of the IEMA's Principles of Cultural Heritage Assessment in the UK and the Chartered Institute for Archaeologists standard and guidance document for desk based assessment	G	Permanent infrastructure and construction area will result in the loss and / permanent damage to non-designated buried and extant archaeological remains worthy of local significance which can be adequately mitigated through preservation by record	No loss of known archaeological remains with reference to the OCC HER dataset	Historic Environment
ENV6A	Minimise loss of fluvial flood storage within Flood Zone 2 or 3	Measure using GIS	R	Site is within flood zone 2 and 3 and replacement flood storage is required but not available	The intake/outfall structure is within both flood zones 2 and 3. 1315m of tunnel length within flood zones	Flood Risk
ENV7A	Minimise disturbance of potentially contaminated land	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of potentially contaminated land with one or more of the following properties: -Unlikely to have significant cost or program implications -Unlikely to cause significant harm to potential receptors -Can be easily mitigated and remediated	This option is proposed to pass beneath the A34 and gravel pits south of Abingdon Sewage Treatment Works. The outfall extension is shown running along the eastern edge of the sewage works. The culvert connecting the shaft to the intake/outfall is proposed to pass through a historical and now flooded gravel pit. The option is also proposed to pass adjacent to adjacent a farm with associated tanks and 150m north of Sutton Wick leachate treatment plant. There may also be the potential for unrecorded areas of Made Ground and contamination along the route. Additionally the tunnel bores through Kimmeridge Clay which may present a risk of hydrocarbon contamination due to potential bituminous content. There may be the potential for significant effects associated with land contamination, however, based on currently available information is it likely these can be addressed with appropriate mitigation.	Land
ENV7B	Minimise disturbance of potentially contaminated land specifically in relation to authorised and historic landfills	Desk based assessment of areas to identify potential sources of contamination	R	Within authorised landfills or previous industrial sites	This option tunnel is proposed to pass 100m north of Sutton Wick No.1 landfill which is recorded as being licensed to accept inert, industrial, household, special and liquid sludge wastes, and accepted waste from 1981. The indicative outfall extension is shown to be located potentially disturbing the corner of the landfill. There is currently little information available relating to the construction, depth or infrastucture which may be present associated with this landfill and it is assumed, at this stage, that there may be significant effects associated with its disturbance, these may range from risks associated with direct disturbance or disturbance of the ground surrrounding the landfill. The following risks should be considered; - landfill gas and leachate pathway disturbance, - waste disturbance - infrastructure disturbance (e.g liner or pipework) - permitting arrangements - potential for significant costs and programme delays Consultation will be required with regulators to obtain further detail to assist with assessments.	Land
ENV8	Minimise disturbance of land with known potential for Unexploded Ordnance (UXO)	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of a low quantity of UXO which can be easily managed / remediated. Unlikely to have significant cost or program implications	The detailed Zetica desk study (P13129-23-R1) has assessed the area to be low risk, defined as 'There is no positive evidence that UXO is present, but its occurence cannot be totally discounted'. There are records showing bomb drop locations on and around the options north of Drayton in this low risk area. In a low risk area Zetica recommends 'a UXO briefing for all staff involved in excavations'. Further consultation may be required to determine appropriate mitigation for sub-surface tunneling.	Land
ENV9A	Minimise loss of terrestrial priority habitats (use narrative to describe type and quantum)	Use of aerial imagery, MAGIC maps and Professional Judgement	R	Priority habitat directly impacted	The pipeline for Intake/Outfall Option E passes through an area described as 'no main habitats but additional habitats present'. The River Thames is also considered priority habitat. The Option E access road also passes through an area of coastal and floodplain grazing marsh priority habitat. Where the pipeline is underground, habitats should not be impacted.	Biodiversity and Nature Conservation
ENV9B	Minimise loss of aquatic priority habitats (use narrative to describe type and quantum)	Professional judgement based on knowledge of Water Framework Directive.	A	Priority habitat directly impacted but mitigation feasible	As a result of this option, a proportion of the bank of the River Thames will be lost. The options willl span 195m of bank however not all of this habitat will be lost. Depending on the design of the intake screen, between 35 - 38m of bank are expected to be lost. The length of habitat lost will need to be mitigated for appropriately.	Aquatic Environment
ENV10A	Reduce effects on North Wessex Downs Area of Outstanding Natural Beauty (AONB) and its setting	Professional judgement.	A	AONB and its setting likely to be affected. Effect is unlikely to be significant.	The introduction of the intake and outfall infrastructure along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the North Wessex Downs AONB due the limited scale of the structures above ground, distance, intervening urban areas and vegetation in the landscape between the AONB and the infrastructure.	Landscape & Visual

ENV10B	Reduce effects on local landscape character	Professional judgement.	A	Effect on local landscape character is unlikely to be significant.	The introduction of the intake and outfall infrastructure, including the Control Building, could affect the sense of tranquillity along the River Thames. The loss of trees along the river could erode a key characteristic which contributes positively to the local landscape character. While effects on local landscape character may be significant in the short term, this could be mitigated in the long term, particularly given the context of the nearby sewage and mineral works which already affects the sense of place and tranquillity.	Landscape & Visual
ENV11A	Reduce effects on panoramic views from national trail, open access land and important viewpoints in AONB	Professional judgement.	G	Panoramic views from national trail, open access land and important viewpoints in AONB unlikely to be affected or the proposal is likely to be barely discernible in views.	The intake and outfall infrastructure is likely to be barely discernible in panoramic views from The Ridgeway National Trail in the AONB, given the distance and intervening urban areas and vegetation.	Landscape & Visual
ENV11B	Reduce effects on sensitive local visual receptors	Professional judgement.	R	Effect on local views of sensitive visual receptors likely to be significant.	Some PRoWs, National Cycle Network Route 5 and the Vale Way Long Distance Path would be directly affected by the haul road and construction traffic on it. There would be open close-range views from the River Thames and partially filtered views through trees from the Thames Path National Trail and residential properties on the western edge of Culham Conservation Area, looking to the intake and outfall infrastructure, including the Control Building and intake screens/river barrier. The Control Building could also be visible in filtered views from the National Cycle Network Route 5 and Vale Way Long Distance Path. Although the views are affected to varying degrees by the presence of pylons and overhead lines, and the effect on some views could be reduced in the long term, some effects could potentially be significant long term given the sensitivity of the visual receptors.	Landscape & Visual
ENV12	Minimise disturbance/encroachment into Air Quality Management Area (AQMA)	Based on an understanding of the scale and nature of activities, air quality management areas (AQMAs) were identified in close proximity to the proposed works.	G	Site is located further than 1km from AQMA OR no construction traffic must go through an AQMA	Marcham AQMA is approximately 2.2 km NW of Option E at its closest point. Abingdon AQMA is approximately 1.7 km NNE of Option E at its closest point. The anticipated construction and operational activities would likely lead to a negligible change in air quality.	Air Quality
ENV13	Minimise disturbance/encroachment into Groundwater Source Protection Zone (SPZ)	Magic maps	G	Site is within Zone 3 or not within a SPZ	Site is not within an SPZ.	Aquatic Environment
ENV14A	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Cow Common Brook and Portobello Ditch' WFD waterbody (GB106039023360) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14B	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ock and tributaries (Land Brook confluence to Thames)' WFD waterbody (GB106039023430) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14C	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Thames (Evenlode to Thame)' WFD waterbody (GB106039030334) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	A	Moderate adverse impacts likely; low risk to ability to attain Water Framework Directive objectives for this waterbody	This option will impact the River Thames WFD waterbody as a section of the WFD principal waterbody will be lost. The option has the potential to impact the ecological status of the waterbody due to a loss of river bank and riparian habitat. However, this impact is considered to be localised and not at a waterbody scale. Impacts can be easily mitigated.	Aquatic Environment
ENV14D	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Sandford Brook (source to Ock)' WFD waterbody (GB106039023410) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14E	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Childrey Brook and Norbrook at Common' WFD waterbody (GB106039023380) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14F	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ginge Brook and Mill Brook' WFD waterbody (GB106039023660) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment

ENV14G	Option does not affect Water Framework Directive (WFD) Quality Elements within one of WFD waterbodies downstream of the River Thame to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives. These WFD waterbodies include: - Thames Wallingford to Caversham - WFD waterbody GB106039030331 - Thames (Reading to Cookham) - WFD waterbody GB106039023233 - Thames (Cookham to Egham) - WFD waterbody GB106039023231 - Thames (Egham to Teddington) - WFD waterbody GB106039023232	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV15A	Maximise potential for future environmental benefits (terrestrial), e.g. increase tree planting	Professional Judgement	R	Site allows only the minimum environmental benefits to be realised	No specific space allowed for environmental benefit. Location would remove areas of trees, shrub, grassland and riparian vegetation along the Thames. Site access track is also located within an area of Coastal and Floodplain Grazing Marsh Priority Habitat which would be lost.	Biodiversity and nature conservation
ENV16	Maximise flexibility in routing diverted watercourses so their habitats can be of sufficiently high quality to contribute to catchment Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Site allows significant flexibility in routing watercourses / Good or high quality habitat options are available	Option does not impact routing of diverted watercourses.	Aquatic Environment
ENV17	Minimise disturbance/encroachment into Local Geological Sites (LGS)	Desk based assessment of areas to identify potential sources of contamination	G	Site is located more than 250m from LGS	No known geological sites within 250m	Land
ENV18A	Minimise impacts associated with Noise and Vibration as a consequence of the construction of the option	Indicative assessment with noise sensitive sample receptors within RAG bands identified based on predicted construction noise levels during Gate 2 assessment, with updates made to construction activitues at intake / outfall facility. Draft Gate 3 plant list includes a Secondary Lining activity, which will involve the use of concrete batch plant and represents the worst-case activity in the draft Gate 3 plant list. This activity has been used for the optioneering study. The assessment considers five sample receptors, each representing clusters of properties/receptors in the vicinity of the intake / outfall options. The sample receptors are: NV-A: Residential properties on South Quay NV-B: Residential properties west of St Paul's Church, west of The Burycroft road NV-C: Farm east of The Burycroft road NV-D: Location of Moored boats at Marina NV-E: Residential properties north of St Paul's Church, west of The Burycroft road Red band distance is from works site/access road to the SOAEL+5dB, and Amber distance is from SOAEL+5dB to the SOAEL. Road Construction: Red 60m, Amber 61-99m, Green 100m. Construction Traffic (on access road): Red 5m, Amber 6	A	Potential for significant effects but likely to be mitigated if they occur	The closest sample receptor to the proposed facility at Option E is NV-B at approximately 360m. At this distance, and when considering the predicted construction noise levels at the facility during secondary lining activities, this receptor is predicted to be within the Amber band. No significant effects are predicted as a result of construction of the access road or from traffic movements on the proposed access road for Option E. However, construction movements on Stonehill Lane have the potential to result in adverse effects for properties on this road.	Noise
ENV18B	Minimise impacts associated with Noise and Vibration as a consequence of the operation of the option	Quantitative assessment not possible at this time. As such, the option appraisal study has considered the qualitative assessment undertaken at Gate 2 and applies professional judgement in assigning RAG bands to each option under assessment	A	Potential significant effects but likely to be mitigated if they occur	Sample receptor NV-B is ~360m from the facility at Option E. At this distance, it is possible that noise from the facility would be audible during normal operations. However, with the implementation of noise and vibration control measures within the design of the facility, it would be anticipated that significant effects would be avoided.	Noise
ENV19A	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the construction of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	There are between 1 - 10 high sensitivity receptors (i.e. dwellings) within 20 m of the construction route for Option E (i.e. along Stonehill Lane). It is considered that there are no proposed dust-generating construction activities that could not be managed using normal good practices (IAQM construction dust guidance, 2023) to prevent significant effects at any off-site receptor. Given that relatively low numbers of plant and items of machinery would be used and the anticipated number of construction vehicles, the potential effects would likely lead to a negligible change in air quality.	Air Quality
ENV19B	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the operation of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	The likely minimal operational-related traffic (e.g. staff, planned maintenance, repair, refurbishment and replacement events) is such that the potential effects from vehicle emissions would likely lead to a negligible change in air quality at nearby receptors.	Air Quality
ENV20A	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the construction of the option	Professional judgement.	A	Noticeable changes to visual amenity of local community	While trees along the left bank of the River Thames could partially filter views of construction activities and traffic associated with the intake and outfall, there would be a noticeable change to the visual amenity of the local community on the western edge of Culham. This could in part be due to temporary security lighting and/or night-time construction works. However, there would be little effect on the visual amenity of the communities near Abingdon Marina, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV20B	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the operation of the option	Professional judgement.	A	Noticeable changes to visual amenity of local community	While the effect of operational lighting would be limited, the intake and outfall infrastructure, including the Control Building, could potentially lead to noticeable changes to the visual amenity of the local community on the western edge of Culham, which could be difficult to mitigate. There would be no effect on the visual amenity of the communities near Abingdon Marina, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV21A	Minimise impacts associated with solid discharge during construction, e.g. aggregate spills during material transport, sediment runoff from clay erosion due to excavation of the pipeline / tunnel and construction works	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
ENV21B	Minimise impacts associated with solid discharge during operation, e.g. release of sediment into surrounding environment during maintenance such as dredging, debris removal	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
Community and Planning Considerations						
CPC1	Distance to the nearest property that will stay during construction (metres)	GIS	R	Less than 250m from the nearest property	Intake Outfall Structure - 360m to nearest property Tunnel - 85m to nearest property	Socio-Economic

CPC2	Minimise impacts on local community during construction associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	A	Community access/use of community assets is disrupted during construction	Access road is within 500m of a sports club and NCN5. During construction it is reasonable to expect some disruption in the form of traffic and potential periods of restricted access.	Socio-Economic
CPC3	Minimise impacts on local community during operation associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	G	Community access/use of community assets is not disrupted during operation	Access road is within 500m of a sports club and NCN5. During operation it is reasonable to expect no disruption to residents but there may be limited disruption to those using the NCN as the access road joins this.	Socio-Economic
CPC4A	Are public rights of way (PRoW) disrupted or adversely affected?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	A	Recreational resources / rights of way of local importance are disrupted or affected. The site is likely to affect public rights of way	Access road is within 500m of a sports club and NCN5. Access road joins to NCN which may be disrupted as a result of construction.	Socio-Economic
CPC4B	Are there opportunities to create or improve linkages of Public Rights of Way (PRoW) and recreational routes?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	G	Links to a recreational resource / right of way of national or regional importance can be enhanced	NCN may experience disruption but linkages to it could be improved.	Socio-Economic
CPC5	Maximise potential opportunity for recreational benefits	GIS analysis of PRoW, open spaces, cycle routes, canals, other forms of regional/nationally important receptors (eg National Cycle Routes), and community assets.	A	Option allows some additional recreational benefits to be realised	This option may disrupt the NCN during construction.	Socio-Economic
CPC6	Support the realisation of socio-economic incentives on SESRO, including employment, skills, tourism, sustainable travel, connecting people with nature and environmental education	GIS analysis of footprint, community assets, private residents, and businesses. Also awareness of overall project objectives is needed to conclude if the designs align with these.	A	Site supports some of the social-economic incentives of the overall scheme	This option may disrupt the NCN during construction.	Socio-Economic
CPC7	Minimise overall SESRO Order Limits extent and land acquisition, without compromising SESRO needs and project benefits	Spatial comparison of land that would likely be included in the DCO Order Limits, including construction working areas, access and highways or PRoW interactions.	G	Requires minimum Order Limits extent	The majority of the tunnel route stays within the area safeguarded for the reservoir (CP14). The control building, the raised area, intake screens, outfall weir and access road also fall within this area, requiring minimal different Order Limits extent and land acquisition.	Consenting
CPC8	Aim for consistency with published and (insofar as possible) emerging Local Plan land use allocations	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in existing and any emerging Local Plan documents and any Supplementary Planning Documents.	G	Low or no impact	The tunnel enters the area safeguarded for the South Abingdon-on-Thames Bypass linking the A415 to the West and South, including a new River Thames Crossing east of the town (Vale of White Horse Local Plan 2031, policy CP12), but may be able to be accommodated alongside any potential road alignment. The intake/outfall and associated structures are outside the area allocated for the bypass and river crossing. No other conflicts with the VoWHLP. The tunnel passes through the area of Policy SW1 of the saved policies of the Oxfordshire Minerals and Waste Local Plan 1996. Policy SW1 states that the designated area will be released for sharp sand and gravel extraction. However, much of this area has already been worked with extant gravel pits, so a conflict is not considered likely. The proposed realigned safeguarded area for the Southern Abingdon Movement Corridor in the draft Joint Local Plan 2041 has been revised such that it would overlap with all of the right-bank options considered in this appraisal. Thames Water will seek to engage further with the joint local authorities and with Oxfordshire County Council about the SESRO design to explore options, constraints and opportunities for this policy area, as the Local Plan moves through the consultation and examination process. As this is a draft policy, subject to change, it has been considered alongside (not necessarily superseding) the existing Policy CP12 in this options appraisal and has not altered the conclusion.	Consenting
CPC9	Aim for consistency with any adopted Neighbourhood Plan policy applicable to the land area affected	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in any made Neighbourhood Plan.	G	Low or no impact	All options pass through the area of the Drayton Neighbourhood Plan, which is the only made neighbourhood plan in the area. Community Policy C-T5 states that a weight limit will apply for HGVs travelling through the village. Options A-F will use Drayton Road (B4017) for access but it is anticipated that this would be from the north, not passing through Drayton. The Abingdon-on-Thames NP is being prepared and the Sutton Courtenay NP is being examined.	Consenting
CPC10	Avoid development of infrastructure within specifically designated areas or their setting, as applicable (e.g. Green Belt, AONB, Common Land, Open Space)	Spatial comparison with designated sites, their settings, and the nature of development works expected.	G	Does not require development of above-ground infrastructure within these designations or development likely to have more than a negligible effect on the setting (where applicable)	Not located within a specifically designated area, such as Green Belt, AONB, Common Land or Open Space.	Consenting
CPC11	Avoid encroachment on any safeguarded land in minerals and waste policy, unless the minerals can be beneficially utilised as a result	Spatial comparison of allocated sites and review of policy wording in existing and any emerging Waste and Minerals Local Plan documents.	A	Potential conflict with development or use of safeguarded minerals or waste allocations	The tunnel passes through the area of Policy SW1 of the saved policies of the Oxfordshire Minerals and Waste Local Plan 1996. Policy SW1 states that designated area will be "released for sharp sand and gravel extraction". Much of the area safeguarded in this policy has already been quarried and restored to lakeside water-related activities but Oday Hill Quarry remains active and could be impacted by this option. However, the extant planning permission for an extension to Oday Quarry approved in February 2023 (OCC ref. MW.0104/20; VoWH ref. P20/V3206/CM) contains Condition 7 requiring a restoration plan that does not prejudice the SESRO project or the Wilts and Berks Canal and Thames Water withdrew its objection to the quarry permission.	Consenting
CPC12	Ability to integrate with existing nationally-significant infrastructure, statutory undertakers' major infrastructure, or any proposed future Nationally Significant Infrastructure Projects (NSIP) (such as that of National Highways, Environment Agency, Network Rail)	Review of NSIP projects on PINS's register; review of Network Rail and National Highways investment plans; spatial review of statutory undertakers' assets.	G	Low or no interaction with existing infrastructure or proposed Nationally Significant Infrastructure Project (NSIP)	No NSIPs currently registered. No known proposals from Network Rail or National Highways. The National Highways RIS3 Investment Plan will be published in 2024 which will detail the A34 improvement project.	Consenting
CPC13	Minimise the consenting complexity due to the need for additional consents and licenses that may be required outside the Development Consent Order (DCO), e.g. additional Flood Risk Activity Permit, Environmental Permit, abstraction/discharge Licence, European protected species licence, etc	Review of the nature of expected development works against the list of other consents and licenses developed at Gateway 2.	A	One or more additional consent/license required	A Land Drainage Consent would be required for works in, over, under or affecting the flow of an ordinary watercourse. A Bespoke Flood Risk Activity Permit will be required for this scale of works on or near a main river. This can be applied for post-DCO. A Temporary Traffic Regulation Order may be required as PRoWs will need to be temporarily closed for construction of the tunnel, although this can potentially be included within the DCO application. Planning consent for the Abingdon STW discharge relocation is expected to be required outside the DCO, but this is applicable to all the options except G.	Consenting

CPC14	Avoid or minimise the need for any consequential development consenting (i.e. displacement or alteration of other development)	Review of existing development within the likely land-take, its nature and scale.	G	No existing development requires planning permission to relocate or alter	The tunnel crosses the A34 and Drayton Road, and Hanson Way National Cycle Route, as do all options. The tunnel also crosses electric lines, telecom lines, gas lines and water lines (most of which are also underground) which could require diversion, but this can form part of the DCO associated development or potentially be delivered through statutory undertaker permitted development. The tunnel passes under Oday Hill Quarry, but the extant planning permission for an extension to Oday Quarry approved in February 2023 (OCC ref. MW.0104/20; VoWH ref. P20/V3206/CM) contains Condition 7 requiring a restoration plan that does not prejudice the SESRO project or the Wilts and Berks Canal and Thames Water withdrew its objection to the quarry permission. Abingdon STW outfall relocation would require planning consent, expected to be outside the DCO, but this is applicable to all the options except G.	Consenting
Property & Land Acquisition						
PRP1	Minimise loss of sensitive properties, e.g. residential, commercial, green belt, common land, historical or community assets due to project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of sensitive properties	Assume construction via TBM; would not deterimentally impact surface uses along tunnel length including Quarry extension at Oday Quarry which incorporates a planning condition to accomodate the project. Privately owned land and Oday Hill Quarry. Tunnelling under land/gardens associated with listed buildings at Stonehill farm. Construction and timing review may result in increase/decrease of RAG status. Assumed excetionally low risk of vibration to be considered for listed buildings.	Property & Land Acquisition
PRP2	Minimise loss of land allocated within the Local Plan for alternative higher value / social / cultural value uses, i.e. residential, historical or community assets due project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of allocated land for higher value or social value properties	No allocation, assumed Quarry expansion application would not be affected. Slight overlap with current design and Greenbelt allocation of the river surface. Assumed detailed design will enable prevention of impact on Greenbelt.	Property & Land Acquisition
PRP3	Minimise permanent loss of best and most versatile agricultural land (grades 1, 2 and 3)	Review of agricultural grading layer on ArcGIS, based on 2019 Provisional Agricultural Land Classification	A	Results in loss of any Grade 2 agricultural land or >50% Grade 3 agricultural land	Surface land graded 2 land at 25%. Assume construction via TBM would not detrimentally agricultural use. Grade 2 = 25% Grade 3 = 63% Grade 4 = 12%	Property & Land Acquisition
PRP4	Assessment of Land and Property asset costs and associated compensation due under the Compensation Code	Review of land use / designation on ArcGIS	G	Land acquisition costs likely to be relatively low.	Subsoil values at de minimus. Tunnels N/A based on subsoil value of £50 per interest.	Property & Land Acquisition
PRP5	Assessment of Special Category Land	Review of affected landowners	A	Nature and / or extent Special Category Land is likely to cause moderate consenting risk	Two SCLs possibly identified. Vale of White Horse Council, National Highways.	Property & Land Acquisition
PRP6	Minimise disruptions of landowners access to their land required for temporary works	Review location in conjunction with existing road network	G	Assumption that landowners will be able to access their land during construction and operational phases.	No direct impact on landowners access identified. Assumption that landowners will be able to access their land during construction and operational phases. Crossing of Drayton Rd B4017 may cause general disruption of access between Drayton and Abingdon.	Property & Land Acquisition

Appendix N. Intake/Outfall Option F Criteria Workbook

Intake Outfall Option F Appraisal Workbook

Criteria code	Criteria Description	Method of Assessment	RAG	Description of RAG	Narrative	Sub-Theme
Constructability						
CON1	Safety - Risk of endangering construction workers or members of the public during construction e.g. water, ground, height, rail, road and utilities	Look at programme and list types of construction involved. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be constructed safely but enhanced control measures required	Close proximity to the River Thames and another body of water on the other side of the shaft	Health and Safety
CON2A	Programme - Duration, longest /shortest, but also consider whether the longer duration has an impact on the overall scheme programme	Compare differences in the programmes which would materialise from different options. Consider earthworks seasons.	A	Likely to extend the duration of the relevant area of works (e.g. road, rail siding or intake/offtake construction) compared to the Gate 2 SESRO programme but unlikely to impact on the critical path of the Gate 2 SESRO programme.	Working adjacent to water will require additional time to set up temporary safe methods of working.	Programme
CON2B	Programme - Opportunities for construction programme acceleration through efficiencies	Compare differences in the programmes which would materialise from different options.	R	The option has no potential to introduce programme efficiencies and reduce the construction programme	STW extension can be completed concurrently with other works. Programme acceleration opportunities are limited with this location due to the length of the tunnel. Intake outfall space limited so this may not be able to take place concurrently due to the existing channel to the North reducing access to the shaft.	Programme
CON2C	Programme - Dependencies i.e. proximity or physical relationships between elements of scope that introduce programme dependencies	Is the options on the critical path? Will it impact other critical activities?	A	Several major dependencies/ multiple minor dependencies	Work is not on the critical path. Working space is limited and a tight working layout will need to be adopted. The TBM will need to be recovered from the shaft. Access to the tunnel for the secondary lining will take place from within the shaft. This will impact works constructing the inlet and outlet. Close proximity of elements of the works will mean that items will need to be completed in a sequential way. Works will not be able to commence until temporary land take has been completed.	Programme
CON2D	Programme - Risk	Are there items in the construction which have a significant programme risk	R	Major programme risk	Access is based on using Stonehill Lane which runs into an unnamed track east and then north into Peep O Day Lane. From Peep O Day Lane access would be east through the fields. Using Marcham Road for all works remains an opportunity. To achieve this structures across the A34, Stonehill Lane and the B4017 will be required to be constructed followed by a haul road. Site is within green belt area so permission will need to be sought for construction in this area and it may be met with some resistance.	Programme
CON2E	Programme - Use of existing assets to reduce the amount of construction required	Identify if any existing assets can be used	A	Option does not make use of existing assets	Other than road access, this option does not reuse assets or temporary works for permanent items.	Programme
CON3A	Logistics - Space available for construction and materials storage	Determine space constraints using GIS and options layouts from option definition.	A	Limited / restricted space	A relatively tight working area between a flooded gravel pit and the River Thames.	Logistics
CON3B	Logistics - Suitable and efficient access for construction workers, deliveries and waste removal including minimisation of lengths of new roads for access during construction	Determine method of access using GIS and options layouts from option definition.	A	Due to restricted access, an additional length of road is likely required for construction of the option.	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,525m. This would require upgrades to approx. 620m length of Peep-O-Day Lane. The length of additional new access road is approximately 475m. There may be an opportunity for construction access to the intake/outfall structure site via the Auxiliary Drawdown Channel, which would then reduce construction vehicle usage of the B4017 and Stonehill Lane. However, this is programme dependent and will only be an opportunity if the ADC is retained in the design (which is currently being considered in a separate options appraisal).	Logistics
CON3C	Logistics - Import of materials or resources during construction	Use quantity estimates to assess different options.	A	Moderate amount of import materials required.	Moderate additional road length (475m) required to access the site. Moderate tunnel length (3530m). Long length for extending Sewage Treatment Works Twin 300mm dia STW pipework (1100m) + pumping station required.	Logistics
CON3D	Logistics - Haulage distance required for construction materials arrival on site to the placement location	Determine length using GIS and options layouts from option definition.	G	One main site location is used for construction of the option.	One main site location is used for construction of the option.	Logistics
CON3E	Logistics - Vehicle movements	Use vehicle movement estimates to assess different options.	R	Construction works likely to require a large number of vehicle movements and vehicle movements may be difficult.	Narrow restricted area making vehicle movements difficult. One way system may need to be implemented or no passing of the shaft possible at various stages.	Logistics
CON4A	Construction Complexity - Temporary conditions/works requirements e.g. embankment slope stability and moisture outside of placement seasons.	Expert Judgement	A	Temporary Works requirements extensive and in some cases complicated and extend the programme	Requires a STW outfall extension - approximate length is 1100m, temporary works required to create a dry working area at the outfall and inlet. Safe working arrangements for working adjacent to the River Thames and large pond. Temporary access would be along the proposed ADC. The temporary and permanent access would need to cross a small stream. Significant work required to bring ground level up to a work from.	Construction complexity
CON4B	Construction Complexity - Location conflict/opportunity with another engineering component of the scheme or other SRO/non-SRO schemes, e.g. Severn to Thames Transfer (STT), Thames to Southern Transfer (T2ST), TW Swindon and Oxfordshire supply zone transfer, Transfer to Farmoor Reservoir	Expert judgement and knowledge of surrounding schemes	A	Location / layout of the option neither clashes nor provides an opportunity to be developed with another component of this scheme (or another scheme)	Assuming that the STT pipeline connects into the shaft and discharges to the Thames through the outfall, the connection would be moderately complex as the shaft is located between an existing flooded gravel pit and the River Thames, with constraints on one side of the flooded gravel pit.	Construction complexity

CON4C	Construction Complexity - Minimise the number and complexity of additional structures/assets required or modifications to the existing structures/assets in order to facilitate the option, e.g. bridges, culverts, crossings	Determine using GIS and options layouts from option definition.	A	Option requires a moderately complex (mitigation likely) and/or moderate number of additional structures and/or modification to existing structures.	The option has: no need for infilling of a flooded gravel pit, relatively short culverts and significant extension of the sewage treatment works outfall (which would also need to pass over the ADC (if constructed)). The long extension of the sewage treatment works outfall is considered an additional component.	Construction complexity
CON4E	Construction Complexity - Complexity of construction technique e.g. construction of tunnels, Auxiliary Drawdown Channel (ADC) or both for the emergency discharge	List out the differences in construction complexity (engineering cost risk & stakeholder interfaces risk). Use expert judgement to decide on the assessment. Compare with inclusions on cost to ensure no double-counting.	G	Simple construction technique required that carries low risk. Simple construction techniques would not include, for example (for the intake/outfall), infilling of existing gravel pits, construction across existing gravel pits or extension of the tunnel below the River Thames.	The option has few complex construction techniques.	Construction complexity
CON5A	3rd Party Impact - Potential to disrupt existing road network during enabling works and construction	Expert judgement	R	Disruption likely to be significant	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,525m. The route will likely cause significant disruption, particularly to the National Cycle Network Route 5, which would need to be upgraded and used during construction.	3rd Party Impact
CON7A	Ground - Terrain of site, and implications for the need for earthworks and engineered slopes	Use of lidar and civil 3D models to assess amount/location of earthworks required	G	Terrain is favourable to the design of assets and therefore reduces the amount of earthworks required	Option is on the right bank of the River Thames, and therefore the site is low and flat. This option does require some raising of the ground to bring the shaft above flood level but does not have the additional earthworks required for long culverts.	Construction complexity
CON7B	Ground - Risk of unexpected conditions	Use of expert judgement based on comparable areas	A	Moderate exposure to risk of unexpected ground conditions.	Relatively higher risk of unexpected ground conditions due to distance from existing boreholes.	Construction complexity
CON7C	Ground - Impact of ground conditions on the complexity of design and construction	Expert judgement	G	Ground conditions are unlikely to increase the complexity of design and construction with likely only a minimal (if any) impact on cost or requirement for materials that are difficult to source	Complexity of the design of the culvert along the edge of the existing flooded gravel pit could be impacted by ground conditions.	Construction complexity
CON7D	Ground - Risk of ground settlement above line of tunnel affecting other structures/houses	Expert judgement	A	Risk level acceptable or can be reduced with mitigation	Tunnel route chosen to avoid passing below structures that can be identified from aerial imagery.	Construction complexity
CON8A	STT Integration Complexity - Complexity of connecting STT directly into the intake/outfall structure.	Expert judgement	A	For the intake/outfall: The intake/outfall structure is a moderate distance away and/or moderately complex construction required to achieve connection to the intake/outfall structure.	Assuming a STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall structure, the STT pipeline for Option F would need to be moderately long. However, an STT pipeline into the outfall at Option F would not impact the alignment to the SESRO tunnel.	STT
Operability						
OPS1A	Safety - Risk of endangering operational staff, visitors or members of the public during operation	Look at operational activities and public access. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be operated safely but enhanced control measures required	This option will require enhanced control measures due to proximity to water. This option will require security fencing to reduce the risk of endangering the public during operation.	Health and Safety
OPS1B	Safety - Access and egress for operational staff, visitors, deliveries and waste removal during normal operations and emergencies	Tunnel silt issue to be considered by expert judgement	A	Access/egress can be provided, however it is challenging / restricted	This option has long culverts which may make access for maintenance activities for this option relatively more challenging. However, during larger River Thames flood events the shaft for this option would be accessible as it is set away from the bank of the River Thames.	Health and Safety
OPS2A	Maintenance - Ease of maintenance	Expert judgement	A	Majority of maintenance activities could be undertaken during moderate closure periods and / or with moderate disruption	This option has long culverts which may make maintenance activities for this option challenging to undertake.	Operational Complexity
OPS3A	Performance - Impact of intake location on removal of screenings and large floating debris e.g. rate of removal and volume to be removed	Expert judgement	A	Moderate reduction of screen capacity during high flows (partial intake blockage and reduced transfer capacity)	All options consider the same intake screen design and experience the same flows as their locations are similar, and may experience moderate reduction in capacity. Geomorphological performance considered in OPS11.	Operational Complexity
OPS4A	Reliability - Footprint of the option within flood zones (as an indication of the potential for damage and the challenge of operation / maintenance during flood events)	Review GIS supported by expert judgement	A	Option is within the flood zone, however damage is not considered to be a significant risk	The intention is for the area around the shaft to be raised above the River Thames flood level. However, the access road to the structure is not intended to be raised (in order to reduce the risk of impacting River Thames flooding).	Operational Resilience
OPS6A	Evolvability - Risk to operation from future climate change, e.g. losses from evaporation due to higher temperatures, impact of higher rainfall, intake/outfall flood risk perspective	Expert judgement	R	Option could be significantly impacted by future climate change impact	This option is within the flood zones 2 and 3 and therefore has a high risk to operation from increased flood levels.	Operational Resilience
OPS7A	Sustainability - Reuse of assets or temporary works for permanent items, e.g. materials storage slab, haulage roads, compound car park	Expert judgement	A	Some potential for reuse of assets/temporary works	This option does not reuse assets or temporary works for permanent items.	Operational Resilience
OPS7B	Sustainability - Power required for operation	Calculated power requirement for the option	A	Option requires moderate amount of energy to operate	Option requires moderate amount of energy to operate	Operational Resilience
OPS8A	3rd Party Impact - Potential to disrupt existing road network during operation	Expert judgement	A	Disruption likely to be limited	The distance to the site from the B4017 (via Stonehill Lane and Peep-O-Day Lane) is approximately 2,525m. The route will likely cause moderate disruption. If access to site is to remain via the south after construction using Peep-O-Day Lane, there is an opportunity to upgrade Peep-O-Day Lane to make it better suited for users.	Transport Planning
OPS10	Quality - Impact on water quality received by the reservoir from the intake	Expert judgement	A	Design requires moderate amounts of interventions to ensure water quality	Impact on water quality is unlikely to significantly differ between the options, moderate interventions required to ensure quality for all options e.g. air diffusers within the reservoir. Geomorphological performance considered in OPS11.	Reservoir water quality
OPS11	Performance - Geomorphological impacts, e.g. potential sedimentation around the structure	Expert judgement	G	Geomorphology is not likely to impact the performance of the structure	This option is located on the outside of the bend so you would not expect deposition to occur to a great extent in this area.	Operational Resilience
OPS12A	STT Integration Complexity - Complexity of operating STT directly into the intake/outfall structure.	Expert judgement	G	Intake/outfall: Operability and/or resilience of SESRO and/or STT unaffected.	The STT pipeline to Option F could be routed to avoid the flood gravel pits, making it easier to maintain.	STT
Relative Costs						
COS1	Capex cost of the option	Cost estimate calculation for each option.	G	CAPEX estimated to result in an increase of <1% of the CAPEX for the overall SESRO project compared to the lowest cost option	Initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option F results in a total project cost of 0.01% more than the lowest cost intake/outfall option.	Cost

COS3	Opportunity for cost-sharing with other SROs, NSIPs and local non-SRO schemes/plans, e.g. STT, T2ST, SWOX/Farmoor, Abingdon flood storage	Cost estimate calculation for each option.	G	Multiple opportunities identified for cost saving.	For the Intake/Outfall structure an opportunity for sharing costs seems to be present for just STT. Reviewing the connection between SESRO and STT the opportunity is more present for STT. The best saving would be made by Thames Water agreeing that STT can discharge into the SESRO tunnel, so that STT flows discharge to the River Thames either by the tunnel or the ADC. However, assuming STT must connect to the SESRO Intake/Outfall structure, the opportunity is that both could discharge through the same outfall structure.	Cost
Carbon Costs						
CAR1	Carbon costs associated to the Capex of the option	Carbon estimate calculation for each option.	G	Emissions (tCO2e) estimated to result in an increase of <1% of the emissions (tCO2e) for the overall SESRO project compared to the lowest emissions (tCO2e) option	Initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent 1.6% of total SESRO carbon. Option F results in a total project carbon of 0.3% more than the lowest carbon intake/outfall option.	Carbon
Environmental Performance						
ENV1A	Minimise impacts on Special Area of Conservation (SAC)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SAC's or potential SAC's within the boundary of the proposed Intake/Outfall Option F. The closest SAC to the Intake/Outfall is 5.9Km to the north-west (Cothill Fen SAC)	Biodiversity and Nature Conservation
ENV1B	Minimise impacts on Special Protection Area (SPA)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SPA's or potential SPA's within the boundary of the proposed Intake/Outfall Option F. The closest SPA to the Intake/Outfall is approximately 40Km to the south-east (Thames Basin Heaths SPA)	Biodiversity and Nature Conservation
ENV1C	Minimise impacts on Ramsar	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no Ramsar sites or potential Ramsar sites within the boundary of the proposed Intake/Outfall Option F. The closest Ramsar to the Intake/Outfall is approximately 54Km to the south-east (South West London Waterbodies)	Biodiversity and Nature Conservation
ENV1D	Minimise impacts on Site of Special Scientific Interest (SSSI)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SSSI sites or potential SSSI sites within the boundary of the proposed Intake/Outfall Option F. The closest SSSI to the Intake/Outfall is approximately 2Km to the north-east (Culham Brake SSSI) but pipeline works are not included within the list of risks within this area.	Biodiversity and Nature Conservation
ENV1E	Minimise impacts on National Nature Reserve	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no NNRs or potential NNRs within the boundary of the proposed Intake/Outfall Option F. The closest NNR to the Intake/Outfall is approximately 4.8Km to the north (Cothill NNR)	Biodiversity and Nature Conservation
ENV1F	Minimise impacts on Local Nature Reserve (LNR)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no LNRs or potential LNRs within the boundary of the proposed Intake/Outfall Option F. The closest LNR to the Intake/Outfall is approximately 3.5Km to the north-east (Abbey Fishponds)	Biodiversity and Nature Conservation
ENV2A	Minimise impacts on Ancient Woodland	Natural England Ancient Woodland Maps and Professional Judgement.	G	No ancient woodland impacted	Historic mapping indicates that there is no ancient woodland present on-site	Biodiversity and Nature Conservation
ENV2B	Minimise impacts on Ancient and Veteran Trees	Woodland Trust Ancient Tree Inventory map search and professional judgement	A	Development in close proximity with potential indirect impact to ancient or veteran trees	There are no ancient or veteran trees recorded by the Woodland Trusts Ancient Tree Inventory on or close to this option. However, survey may identify trees that could be classified as ancient or veteran. As such, this option scores amber on a precautionary basis pending survey.	Biodiversity and Nature Conservation
ENV2C	Minimise impacts on Protected Trees	Check against published TPO dataset.	G	No protected trees impacted	No protected trees would be impacted.	Landscape & Visual
ENV2D	Minimise impacts on vegetation (including trees, woodland, hedges and shrubs)	Check against baseline resources and based upon high level knowledge of site from previous site visits. Professional judgement.	A	Direct impact on vegetation within a moderate proportion of construction footprint, which is of high arboricultural/amenity value (e.g. A or B grade) or biodiversity habitat in good condition. OR Direct impact on vegetation within large proportion of construction footprint, which is of lower arboricultural/visual amenity value (e.g. C grade) or biodiversity habitat in poor condition.	The tunnel excavation is assumed to be trenchless and therefore to only affect vegetation at the entry and exit points. Construction of the intake/outfall could require the removal of a several trees along the River Thames that are assumed to include several A or B grade trees. Localised vegetation clearance may also be required to facilitate the construction access road. Assuming a trenchless method of excavation is utilised, the extension of the STW Outfall would require limited vegetation removal. The habitats to be removed may provide habitat for a range of protected and notable species including otter and water vole (riparian mammals), bats and badgers.	Biodiversity and Nature Conservation and Landscape
ENV3	Minimise impacts on Local Wildlife Sites (LWS)	Professional Judgement and LWS Citation provided by TVERC.	G	No impacts to LWS	There are no LWS or potential LWS within the boundary of the proposed Intake/Outfall Option F. The closest LWS to the Intake/Outfall is approximately 2Km to the north-west (Marcham Salt Spring LWS)	Biodiversity and Nature Conservation
ENV4A	Minimise impacts on Scheduled monuments or activities which could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	The Culham Manor scheduled dovecote (NHLE 1019391) lies 450m north-east of the intake/outfall option and changes to setting might be relevant	Historic Environment
ENV4B	Minimise impacts on listed buildings or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No listed buildings physically affected. The Grade II* listed dovecote (NHLE 1019391) at Culham Manor lies 370m from the intake/outfall option and setting might therefore be relevant, as it would be for the associated Grade II* listed manor house (NHLE 1285637) 70m to the east of the dovecote	Historic Environment
ENV4C	Minimise impacts on Registered Parks and Garden or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any Registered Park and Garden. Sutton Courtenay Manor lies 560m to the south-east of the intake/outfall option. Changes to setting unlikely	Historic Environment
ENV4D	Minimise impacts on Registered Battlefields or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any Registered Battlefields with the nearest being the Battle of Chalgrove (NHLE 1000006) 14.5km to the east of the option	Historic Environment
ENV4E	Avoid impacts on World Heritage Sites or activities that could lead to a loss of significance, including setting	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any World Heritage Sites with the nearest being Blenheim Palace (NHLE 1000091) over 20km to the north	Historic Environment

ENV4F	Minimise impacts on conservation areas which could result in loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No changes within any conservation areas - amber score given proximity of the Culham conservation area 390m to the south east of the option	Historic Environment
ENV5A	Minimise loss to non-designated built heritage	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Extensive loss of non-designated built heritage of low value within the permanent infrastructure zone and adverse changes to within a 500m area from the edges of the permanent infrastructure OR more limited effects on non-designated built heritage of medium value	No expected loss of non-designated historic buildings - none shown on OCC HER dataset	Historic Environment
ENV5B	Minimise loss to paleoenvironmental remains	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or damage to low value remains within the construction area and adverse changes to similar buried remains in a 1km area around the permanent infrastructure from temporary and permanent changes to local hydrogeological regimes OR more limited effects on remains of medium value	Likely loss of some paleoenvironmental material as structures are within the River Thames floodplain and the likely relict paleochannels within the buried environment and organic remains interleaved with alluvial deposits	Historic Environment
ENV5C	Minimise loss to non-designated historic landscapes	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or extensive changes to low value non-designated historic landscapes within the construction area and extensive changes to the setting of the same resource outside the permanent infrastructure OR more limited effects on non-designated historic landscapes of medium value	No loss of non-designated historic landscapes as no non-designated historic landscapes are recorded within the option footprint	Historic Environment
ENV5D	Minimise loss of non-designated archaeological remains	Professional judgement, incorporating the use of the IEMA's Principles of Cultural Heritage Assessment in the UK and the Chartered Institute for Archaeologists standard and guidance document for desk based assessment	G	Permanent infrastructure and construction area will result in the loss and / permanent damage to non-designated buried and extant archaeological remains worthy of local significance which can be adequately mitigated through preservation by record	No loss of known archaeological remains with reference to the OCC HER dataset	Historic Environment
ENV6A	Minimise loss of fluvial flood storage within Flood Zone 2 or 3	Measure using GIS	R	Site is within flood zone 2 and 3 and replacement flood storage is required but not available	The intake/outfall structure is within both flood zones 2 and 3. 1730m of tunnel length within flood zones	Flood Risk
ENV7A	Minimise disturbance of potentially contaminated land	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of potentially contaminated land with one or more of the following properties: - Unlikely to have significant cost or program implications - Unlikely to cause significant harm to potential receptors - Can be easily mitigated and remediated	This option is proposed to pass beneath the A34 and adjacent to a farm with associated tanks and 30m north of Sutton Wick leachate treatment plant. The outfall extension is shown running along the eastern edge of Abingdon Sewage Treatment Works. There may also be the potential for unrecorded areas of Made Ground (and hence potential contamination along the route). Additionally the tunnel bores through Kimmeridge Clay which may present a risk of hydrocarbon contamination due to potential bituminous content. There may be the potential for significant effects associated with land contamination, however, based on currently available information is it likely these can be addressed with appropriate mitigation.	Land
ENV7B	Minimise disturbance of potentially contaminated land specifically in relation to authorised and historic landfills	Desk based assessment of areas to identify potential sources of contamination	R	Within authorised landfills or previous industrial sites	This option passes directly under/through the Sutton Wick No.1 historic landfill which is recorded as being licensed to accept inert, industrial, household, special and liquid sludge wastes, and accepted waste from 1981. There is currently little information available relating to the construction, depth or infrastructure which may be present associated with this landfill and it is assumed, at this stage, that there may be significant effects associated with its disturbance, these may range from risks associated with direct disturbance or disturbance of the ground surrounding the landfill. The following risks should be considered; - landfill gas and leachate pathway disturbance, - waste disturbance - infrastructure disturbance (e.g. liner or pipework) - permitting arrangements - potential for significant costs and programme delays Consultation will be required with regulators to obtain further detail to assist with assessments.	Land
ENV8	Minimise disturbance of land with known potential for Unexploded Ordnance (UXO)	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of a low quantity of UXO which can be easily managed / remediated. Unlikely to have significant cost or program implications	The detailed Zetica desk study (P13129-23-R1) has assessed the area to be low risk, defined as 'There is no positive evidence that UXO is present, but its occurrence cannot be totally discounted'. There are records showing bomb drop locations on and around the options north of Drayton in this low risk area. In a low risk area Zetica recommends 'a UXO briefing for all staff involved in excavations'. Further consultation may be required to determine appropriate mitigation for sub-surface tunnelling. The detailed study doesn't cover the entire eastern extent of the route.	Land
ENV9A	Minimise loss of terrestrial priority habitats (use narrative to describe type and quantum)	Use of aerial imagery, MAGIC maps and Professional Judgement	R	Priority habitat directly impacted	The Intake/Outfall Option F and associated pipeline are located within an area of coastal and floodplain grazing marsh priority habitat. The Intake/Outfall is also located along the River Thames which is a priority habitat. The pipeline for Intake/Outfall Option F passes through an area described as 'no main habitats but additional habitats present'.	Biodiversity and Nature Conservation
ENV9B	Minimise loss of aquatic priority habitats (use narrative to describe type and quantum)	Professional judgement based on knowledge of Water Framework Directive.	A	Priority habitat directly impacted but mitigation feasible	As a result of this option, a proportion of the bank of the River Thames will be lost. The options will span 150m of bank however not all of this habitat will be lost. Depending on the design of the intake screen, between 35 - 38m of bank are expected to be lost. Further habitat will be lost as the proposed access road crosses a tributary of the Thames. The length of habitat lost will need to be mitigated for appropriately, which is considered feasible. Compared to other options, Option F will also result in habitat loss within the Oday Ditch system which will ideally require the creation of replacement watercourse habitat, or restoring other nearby watercourses. Whilst this is feasible it is more involved than the other options.	Aquatic Environment

ENV10A	Reduce effects on North Wessex Downs Area of Outstanding Natural Beauty (AONB) and its setting	Professional judgement.	A	AONB and its setting likely to be affected. Effect is unlikely to be significant.	The introduction of the intake and outfall infrastructure along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the North Wessex Downs AONB due the limited scale of the structures above ground, distance, intervening urban areas and vegetation in the landscape between the AONB and the infrastructure.	Landscape & Visual
ENV10B	Reduce effects on local landscape character	Professional judgement.	R	Effect on local landscape character is likely to be significant.	The introduction of the intake and outfall infrastructure, including the Control Building, could affect the sense of tranquillity along the River Thames and slightly affect the 'openness of the green belt'. The loss of trees along the river could erode a key characteristic which contributes positively to the local landscape character. The effect on local landscape character may potentially be significant long term, given the generally undeveloped character of this area.	Landscape & Visual
ENV11A	Reduce effects on panoramic views from national trail, open access land and important viewpoints in AONB	Professional judgement.	G	Panoramic views from national trail, open access land and important viewpoints in AONB unlikely to be affected or the proposal is likely to be barely discernible in views.	The intake and outfall infrastructure is likely to be barely discernible in panoramic views from The Ridgeway National Trail in the AONB, given the distance and intervening urban areas and vegetation.	Landscape & Visual
ENV11B	Reduce effects on sensitive local visual receptors	Professional judgement.	R	Effect on local views of sensitive visual receptors likely to be significant.	Some PRoWs, National Cycle Network Route 5 and the Vale Way Long Distance Path would be directly affected by the haul road and construction traffic on it. There would be open close-range views from the River Thames to the intake and outfall infrastructure, including the Control Building and intake screens/river barrier. The infrastructure could also be visible in partially filtered middle-distance views between trees from the north-western edge of Sutton Courtenay Manor Grade II Registered Park and Garden. The effects on these views could potentially be significant long term given the sensitivity of the visual receptors. However, once constructed, the infrastructure would be barely discernible in views from the Thames Path National Trail, National Cycle Network Route 5 and Vale Way Long Distance Path to due to intervening vegetation.	Landscape & Visual
ENV12	Minimise disturbance/encroachment into Air Quality Management Area (AQMA)	Based on an understanding of the scale and nature of activities, air quality management areas (AQMAs) were identified in close proximity to the proposed works.	G	Site is located further than 1km from AQMA OR no construction traffic must go through an AQMA	Marcham AQMA is approximately 2.2 km NW of Option F at its closest point. Abingdon AQMA is approximately 1.7 km NNE of Option F at its closest point. The anticipated construction and operational activities would likely lead to a negligible change in air quality.	Air Quality
ENV13	Minimise disturbance/encroachment into Groundwater Source Protection Zone (SPZ)	Magic maps	G	Site is within Zone 3 or not within a SPZ	Site is not within an SPZ.	Aquatic Environment
ENV14A	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Cow Common Brook and Portobello Ditch' WFD waterbody (GB106039023360) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14B	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ock and tributaries (Land Brook confluence to Thames)' WFD waterbody (GB106039023430) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14C	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Thames (Evenlode to Thame)' WFD waterbody (GB106039030334) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	A	Moderate adverse impacts likely; low risk to ability to attain Water Framework Directive objectives for this waterbody	This option will impact the River Thames WFD waterbody due to a loss of river bank and riparian habitat, which is considered mitigable. Compared to other options, a section of the Oday Ditch, a WFD principal waterbody, will also be lost. The option therefore has the potential to impact the ecological status of this watercourse. However, this impact is considered to be confined to the Oday Ditch sub-catchment and not at a waterbody scale. Whilst there is uncertainty about the current hydrological, geomorphological and ecological baseline of the Oday Ditch system, it is considered likely that effects can be remedied through mitigation or compensation - either within the Oday Ditch catchment or nearby. The extent of mitigation required is, nevertheless, higher for Option F than for any other option.	Aquatic Environment

ENV14D	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Sandford Brook (source to Ock)' WFD waterbody (GB106039023410) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14E	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Childrey Brook and Norbrook at Common' WFD waterbody (GB106039023380) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14F	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ginge Brook and Mill Brook' WFD waterbody (GB106039023660) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14G	Option does not affect Water Framework Directive (WFD) Quality Elements within one of WFD waterbodies downstream of the River Thame to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives. These WFD waterbodies include: - Thames Wallingford to Caversham - WFD waterbody GB106039030331 - Thames (Reading to Cookham) - WFD waterbody GB106039023233 - Thames (Cookham to Egham) - WFD waterbody GB106039023231 - Thames (Egham to Teddington) - WFD waterbody GB106039023232	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV15A	Maximise potential for future environmental benefits (terrestrial), e.g. increase tree planting	Professional Judgement	R	Site allows only the minimum environmental benefits to be realised	No specific space allowed for environmental benefit. Location would remove areas of trees, shrub, grassland and riparian vegetation along the Thames. Site is also located within an area of Coastal and Floodplain Grazing Marsh Priority Habitat which would be lost.	Biodiversity and nature conservation
ENV16	Maximise flexibility in routing diverted watercourses so their habitats can be of sufficiently high quality to contribute to catchment Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Site allows significant flexibility in routing watercourses / Good or high quality habitat options are available	Option does not impact routing of diverted watercourses.	Aquatic Environment
ENV17	Minimise disturbance/encroachment into Local Geological Sites (LGS)	Desk based assessment of areas to identify potential sources of contamination	G	Site is located more than 250m from LGS	No known geological sites within 250m	Land
ENV18A	Minimise impacts associated with Noise and Vibration as a consequence of the construction of the option	Indicative assessment with noise sensitive sample receptors within RAG bands identified based on predicted construction noise levels during Gate 2 assessment, with updates made to construction activitues at intake / outfall facility. Draft Gate 3 plant list includes a Secondary Lining activity, which will involve the use of concrete batch plant and represents the worst-case activity in the draft Gate 3 plant list. This activity has been used for the optioneering study. The assessment considers five sample receptors, each representing clusters of properties/receptors in the vicinity of the intake / outfall options. The sample receptors are: NV-A: Residential properties on South Quay NV-B: Residential properties west of St Paul's Church, west of The Burycroft road NV-C: Farm east of The Burycroft road NV-D: Location of Moored boats at Marina NV-E: Residential properties north of St Paul's Church, west of The Burycroft road Red band distance is from works site/access road to the SOAEL+5dB, and Amber distance is from SOAEL+5dB to the SOAEL. Road Construction: Red 60m, Amber 61-99m, Green 100m. Construction Traffic (on access road): Red 5m, Amber 6	G	Impacts unlikely, or adverse impacts are likely to be mitigated if they occur	The closest sample receptor to the proposed facility at Option F is NV-B at approximately 450m. At this distance, and when considering the predicted construction noise levels at the facility during secondary lining activities, this receptor is predicted to be within the Green band. No significant effects are predicted as a result of construction of the access road or from traffic movements on the proposed access road for Option F. However, construction movements on Stonehill Lane have the potential to result in adverse effects for properties on this road.	Noise
ENV18B	Minimise impacts associated with Noise and Vibration as a consequence of the operation of the option	Quantitative assessment not possible at this time. As such, the option appraisal study has considered the qualitative assessment undertaken at Gate 2 and applies professional judgement in assigning RAG bands to each option under assessment	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Sample receptor NV-B is ~450m from the facility at Option F. At this distance, it is possible that noise from the facility would be audible during normal operations. However, with the implementation of noise and vibration control measures within the design of the facility, it would be anticipated that significant effects would be avoided.	Noise
ENV19A	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the construction of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	There are between 1 - 10 high sensitivity receptors (i.e. dwellings) within 20 m of the construction route for Option F (i.e. along Stonehill Lane). It is considered that there are no proposed dust-generating construction activities that could not be managed using normal good practices (IAQM construction dust guidance, 2023) to prevent significant effects at any off-site receptor. Given that relatively low numbers of plant and items of machinery would be used and the anticipated number of construction vehicles, the potential effects would likely lead to a negligible change in air quality.	Air Quality

ENV19B	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the operation of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	The likely minimal operational-related traffic (e.g. staff, planned maintenance, repair, refurbishment and replacement events) is such that the potential effects from vehicle emissions would likely lead to a negligible change in air quality at nearby receptors.	Air Quality
ENV20A	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the construction of the option	Professional judgement.	G	Barely perceptible changes to visual amenity, with no or little effect on local community	There would be little effect on the visual amenity of the communities near Abingdon Marina, Culham, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV20B	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the operation of the option	Professional judgement.	G	Barely perceptible changes to visual amenities, with no or little effect on local community	There would be no effect on the visual amenity of the communities near Abingdon Marina, Culham, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV21A	Minimise impacts associated with solid discharge during construction, e.g. aggregate spills during material transport, sediment runoff from clay erosion due to excavation of the pipeline / tunnel and construction works	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
ENV21B	Minimise impacts associated with solid discharge during operation, e.g. release of sediment into surrounding environment during maintenance such as dredging, debris removal	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
Community and Planning Considerations						
CPC1	Distance to the nearest property that will stay during construction (metres)	GIS	R	Less than 250m from the nearest property	Intake Outfall Structure - 430m to nearest property Tunnel - 85m to nearest property	Socio-Economic
CPC2	Minimise impacts on local community during construction associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	A	Community access/use of community assets is disrupted during construction	Access road is within 500m of a sports club and NCN5. During construction it is reasonable to expect some disruption in the form of traffic and potential periods of restricted access.	Socio-Economic
CPC3	Minimise impacts on local community during operation associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	G	Community access/use of community assets is not disrupted during operation	Access road is within 500m of a sports club and NCN5. During operation it is reasonable to expect no disruption to residents but there may be limited disruption to those using the NCN as the access road joins this.	Socio-Economic
CPC4A	Are public rights of way (PRoW) disrupted or adversely affected?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	A	Recreational resources / rights of way of local importance are disrupted or affected. The site is likely to affect public rights of way	Access road is within 500m of a sports club and NCN5. Access road joins to NCN which may be disrupted as a result of construction.	Socio-Economic
CPC4B	Are there opportunities to create or improve linkages of Public Rights of Way (PRoW) and recreational routes?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	G	Links to a recreational resource / right of way of national or regional importance can be enhanced	NCN may experience disruption but linkages to it could be improved.	Socio-Economic
CPC5	Maximise potential opportunity for recreational benefits	GIS analysis of PRoW, open spaces, cycle routes, canals, other forms of regional/nationally important receptors (eg National Cycle Routes), and community assets.	A	Option allows some additional recreational benefits to be realised	This option may disrupt the NCN during construction.	Socio-Economic
CPC6	Support the realisation of socio-economic incentives on SESRO, including employment, skills, tourism, sustainable travel, connecting people with nature and environmental education	GIS analysis of footprint, community assets, private residents, and businesses. Also awareness of overall project objectives is needed to conclude if the designs align with these.	A	Site supports some of the social-economic incentives of the overall scheme	This option may disrupt the NCN during construction.	Socio-Economic
CPC7	Minimise overall SESRO Order Limits extent and land acquisition, without compromising SESRO needs and project benefits	Spatial comparison of land that would likely be included in the DCO Order Limits, including construction working areas, access and highways or PRoW interactions.	A	Requires minor additional Order Limits extent	Tunnel, control building, raised area, intake screens, outfall weir and access roads all fall outside of the land safeguarded for the reservoir (CP14), requiring different land acquisition and Order Limits extent compared to other options which do stay within this safeguarded land area.	Consenting
CPC8	Aim for consistency with published and (insofar as possible) emerging Local Plan land use allocations	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in existing and any emerging Local Plan documents and any Supplementary Planning Documents.	G	Low or no impact	The tunnel enters the area safeguarded for the South Abingdon-on-Thames Bypass linking the A415 to the West and South, including a new River Thames Crossing east of the town (Vale of White Horse Local Plan 2031, policy CP12), but may be able to be accommodated alongside any potential road alignment. The intake/outfall and associated structures are outside the area allocated for the bypass and river crossing. No other conflicts with the VoWHLP. The tunnel passes through the area of Policy SW1 of the saved policies of the Oxfordshire Minerals and Waste Local Plan 1996. Policy SW1 states that the designated area will be released for sharp sand and gravel extraction. However, much of this area has already been worked with extant gravel pits, so a conflict is not considered likely. The proposed realigned safeguarded area for the Southern Abingdon Movement Corridor in the draft Joint Local Plan 2041 has been revised such that it would overlap with all of the right-bank options considered in this appraisal. Thames Water will seek to engage further with the joint local authorities and with Oxfordshire County Council about the SESRO design to explore options, constraints and opportunities for this policy area, as the Local Plan moves through the consultation and examination process. As this is a draft policy, subject to change, it has been considered alongside (not necessarily superseding) the existing Policy CP12 in this options appraisal and has not altered the conclusion.	Consenting

CPC9	Aim for consistency with any adopted Neighbourhood Plan policy applicable to the land area affected	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in any made Neighbourhood Plan.	G	Low or no impact	All options pass through the area of the Drayton Neighbourhood Plan, which is the only made neighbourhood plan in the area. Community Policy C-T5 states that a weight limit will apply for HGVs travelling through the village. Options A-F will use Drayton Road (B4017) for access but it is anticipated that this would be from the north, not passing through Drayton. The Abingdon-on-Thames NP is being prepared and the Sutton Courtenay NP is being examined.	Consenting
CPC10	Avoid development of infrastructure within specifically designated areas or their setting, as applicable (e.g. Green Belt, AONB, Common Land, Open Space)	Spatial comparison with designated sites, their settings, and the nature of development works expected.	A	Requires development of minor above-ground infrastructure within the designation, which is sympathetic with surroundings and access, or likely to have a less than significant impact on the setting (where applicable)	The control building, raised area, access roads, intake screens and outfall weir are within the Green Belt and may be considered inappropriate development as above-ground structures. No other constraints such as AONB, Common Land or Open Space.	Consenting
CPC11	Avoid encroachment on any safeguarded land in minerals and waste policy, unless the minerals can be beneficially utilised as a result	Spatial comparison of allocated sites and review of policy wording in existing and any emerging Waste and Minerals Local Plan documents.	A	Potential conflict with development or use of safeguarded minerals or waste allocations	The tunnel passes through the area of Policy SW1 of the saved policies of the Oxfordshire Minerals and Waste Local Plan 1996. Policy SW1 states that designated area will be "released for sharp sand and gravel extraction". Much of the area safeguarded in this policy has already been quarried and restored to lakeside water-related activities but Oday Hill Quarry remains active and could be impacted by this option. However, the extant planning permission for an extension to Oday Quarry approved in February 2023 (OCC ref. MW.0104/20; VoWH ref. P20/V3206/CM) contains Condition 7 requiring a restoration plan that does not prejudice the SESRO project or the Wilts and Berks Canal and Thames Water withdrew its objection to the quarry permission.	Consenting
CPC12	Ability to integrate with existing nationally-significant infrastructure, statutory undertakers' major infrastructure, or any proposed future Nationally Significant Infrastructure Projects (NSIP) (such as that of National Highways, Environment Agency, Network Rail)	Review of NSIP projects on PINS's register; review of Network Rail and National Highways investment plans; spatial review of statutory undertakers' assets.	G	Low or no interaction with existing infrastructure or proposed Nationally Significant Infrastructure Project (NSIP)	No NSIPs currently registered. No known proposals from Network Rail or National Highways. The National Highways RIS3 Investment Plan will be published in 2024 which will detail the A34 improvement project.	Consenting
CPC13	Minimise the consenting complexity due to the need for additional consents and licenses that may be required outside the Development Consent Order (DCO), e.g. additional Flood Risk Activity Permit, Environmental Permit, abstraction/discharge Licence, European protected species licence, etc	Review of the nature of expected development works against the list of other consents and licenses developed at Gateway 2.	A	One or more additional consent/license required	A Land Drainage Consent would be required for works in, over, under or affecting the flow of an ordinary watercourse. A Bespoke Flood Risk Activity Permit will be required for this scale of works on or near a main river. This can be applied for post-DCO. A Temporary Traffic Regulation Order may be required as PRoWs will need to be temporarily closed for construction of the tunnel, although this can potentially be included within the DCO application. Planning consent for the Abingdon STW discharge relocation is expected to be required outside the DCO, but this is applicable to all the options except G.	Consenting
CPC14	Avoid or minimise the need for any consequential development consenting (i.e. displacement or alteration of other development)	Review of existing development within the likely land-take, its nature and scale.	G	No existing development requires planning permission to relocate or alter	The tunnel crosses the A34 and Drayton Road, and Hanson Way National Cycle Route, as do all options. The tunnel also crosses electric lines, telecom lines, gas lines and water lines (most of which are also underground) which could require diversion, but this can form part of the DCO associated development or potentially be delivered through statutory undertaker permitted development. The tunnel passes under Oday Hill Quarry, but the extant planning permission for an extension to Oday Quarry approved in February 2023 (OCC ref. MW.0104/20; VoWH ref. P20/V3206/CM) contains Condition 7 requiring a restoration plan that does not prejudice the SESRO project or the Wilts and Berks Canal and Thames Water withdrew its objection to the quarry permission. Abingdon STW outfall relocation would require planning consent, expected to be outside the DCO, but this is applicable to all the options except G.	Consenting
Property & Land Acquisition						
PRP1	Minimise loss of sensitive properties, e.g. residential, commercial, green belt, common land, historical or community assets due to project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of sensitive properties	Assume construction via TBM; would not detrimentally impact surface uses along tunnel length including Quarry extension at Oday Quarry which incorporates a planning condition to accommodate the project. Privately owned land and Oday Hill Quarry. Tunnelling under land/gardens associated with listed buildings at Stonehill farm. Construction and timing review may result in increase/decrease of RAG status. Assumed exceptionally low risk of vibration to be considered for listed buildings.	Property & Land Acquisition
PRP2	Minimise loss of land allocated within the Local Plan for alternative higher value / social / cultural value uses, i.e. residential, historical or community assets due project delivery	Review Land allocation mapping on ArcGIS.	R	Permanent loss of allocated land for higher value or social value properties	Impact on Greenbelt, assumed Quarry expansion application would not be affected.	Property & Land Acquisition
PRP3	Minimise permanent loss of best and most versatile agricultural land (grades 1, 2 and 3)	Review of agricultural grading layer on ArcGIS, based on 2019 Provisional Agricultural Land Classification	A	Results in loss of any Grade 2 agricultural land or >50% Grade 3 agricultural land	Surface land graded 2 land at 20%. Assume construction via TBM would not detrimentally agricultural use. Grade 2 = 20% Grade 3 = 56% Grade 4 = 24%	Property & Land Acquisition
PRP4	Assessment of Land and Property asset costs and associated compensation due under the Compensation Code	Review of land use / designation on ArcGIS	A	Land acquisition costs likely to be relatively moderate.	Subsoil values at de minimus. Tunnels N/A based on subsoil value of £50 per interest. Greenbelt land impacted, this may require replacement land within immediate vicinity.	Property & Land Acquisition
PRP5	Assessment of Special Category Land	Review of affected landowners	A	Nature and / or extent Special Category Land is likely to cause moderate consenting risk	Two SCLs possibly identified. Vale of White Horse Council, National Highways.	Property & Land Acquisition
PRP6	Minimise disruptions of landowners access to their land required for temporary works	Review location in conjunction with existing road network	G	Assumption that landowners will be able to access their land during construction and operational phases.	No direct impact on landowners access identified. Assumption that landowners will be able to access their land during construction and operational phases. Crossing of Drayton Rd B4017 may cause general disruption of access between Drayton and Abingdon.	Property & Land Acquisition

Appendix O. Intake/Outfall Option G Criteria Workbook

Intake Outfall Option G Appraisal Workbook

Criteria code	Criteria Description	Method of Assessment	RAG	Description of RAG	Narrative	Sub-Theme
Constructability						
CON1	Safety - Risk of endangering construction workers or members of the public during construction e.g. water, ground, height, rail, road and utilities	Look at programme and list types of construction involved. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be constructed safely but enhanced control measures required	Working adjacent to the River Thames. Good working area available	Health and Safety
CON2A	Programme - Duration, longest /shortest, but also consider whether the longer duration has an impact on the overall scheme programme	Compare differences in the programmes which would materialise from different options. Consider earthworks seasons.	R	Likely to impact the critical path of the Gate 2 SESRO programme and therefore the estimated overall duration of the SESRO construction works.	Longest tunnel of all the options will increase tunnelling duration. This would add time onto the tunnel drive, cleaning of the tunnel and removing temporary services and the secondary lining. This is a baseline duration site without other additional works ie. longer channels.	Programme
CON2B	Programme - Opportunities for construction programme acceleration through efficiencies	Compare differences in the programmes which would materialise from different options.	A	The option has limited potential to introduce programme efficiencies and reduce the construction programme	STW extension can be completed concurrently with other works. Programme acceleration opportunities are limited with this location due to the length of the tunnel.	Programme
CON2C	Programme - Dependencies i.e. proximity or physical relationships between elements of scope that introduce programme dependencies	Is the options on the critical path? Will it impact other critical activities?	R	Multiple major programme dependencies	The critical path would switch to the tunnel to the River Intake & Outfall and the planned completion could be delayed by 8-months. The big jump in the planned completion being due to the additional 8-weeks to complete the tunnel/secondary lining and the reservoir filling calendar that restricts filling between the 1st November and 31st March each year. Good space available for silo/plant set up & concurrent construction activities. Opportunity to complete intake / outfall concurrently with other works.	Programme
CON2D	Programme - Risk	Are there items in the construction which have a significant programme risk	G	Minor programme risk	Access is based on using Abingdon Road and The Burycroft avoiding Abingdon. Site is within green belt area so permission will need to be sought for construction in this area and it may be met with some resistance.	Programme
CON2E	Programme - Use of existing assets to reduce the amount of construction required	Identify if any existing assets can be used	A	Option does not make use of existing assets	This option does not reuse assets or temporary works for permanent items.	Programme
CON3A	Logistics - Space available for construction and materials storage	Determine space constraints using GIS and options layouts from option definition.	G	Adequate space	Good working area available	Logistics
CON3B	Logistics - Suitable and efficient access for construction workers, deliveries and waste removal including minimisation of lengths of new roads for access during construction	Determine method of access using GIS and options layouts from option definition.	G	Adequate access is available with no or minimal additional road length required for construction of the option.	Access road currently envisaged to connect to the existing road "The Burycroft". The length of the new access road is approximately 240m. The distance to the site from Abingdon Road is approximately 500m.	Logistics
CON3C	Logistics - Import of materials or resources during construction	Use quantity estimates to assess different options.	G	No (or minimal) import of materials required.	Relatively short additional road length (240m) required for accessing the site, but no STW outfall extension is required. The option requires a long tunnel length (3840m) however.	Logistics
CON3D	Logistics - Haulage distance required for construction materials arrival on site to the placement location	Determine length using GIS and options layouts from option definition.	G	One main site location is used for construction of the option.	One main site location is used for construction of the option.	Logistics
CON3E	Logistics - Vehicle movements	Use vehicle movement estimates to assess different options.	R	Construction works likely to require a large number of vehicle movements and vehicle movements may be difficult.	Access would be required via the A415 through Abingdon adding to difficulty.	Logistics
CON4A	Construction Complexity - Temporary conditions/works requirements e.g. embankment slope stability and moisture outside of placement seasons.	Expert Judgement	G	Temporary Works requirements minimal and can be used in the permanent state and no extension to the programme	Temporary works required to create a dry working area at the outfall and inlet. Safe working arrangements for working adjacent to the River Thames. Temporary and permanent access would be from The Burycroft and onto the A415.	Construction complexity
CON4B	Construction Complexity - Location conflict/opportunity with another engineering component of the scheme or other SRO/non-SRO schemes, e.g. Severn to Thames Transfer (STT), Thames to Southern Transfer (T2ST), TW Swindon and Oxfordshire supply zone transfer, Transfer to Farmoor Reservoir	Expert judgement and knowledge of surrounding schemes	R	Location / layout of option clashes with another component of this scheme (or another scheme) which is already set or would be difficult to change	Assuming that the STT pipeline connects into the shaft and discharges to the Thames through the outfall, the connection would very complex as the shaft is located on the opposite side of the River Thames.	Construction complexity
CON4C	Construction Complexity - Minimise the number and complexity of additional structures/assets required or modifications to the existing structures/assets in order to facilitate the option, e.g. bridges, culverts, crossings	Determine using GIS and options layouts from option definition.	A	Option requires a moderately complex (mitigation likely) and/or moderate number of additional structures and/or modification to existing structures.	The option has: no need for infilling of a flooded gravel pit, relatively short culverts and no extension of the sewage treatment works outfall. However, there is a need for the tunnel to pass under the River Thames.	Construction complexity

CON4E	Construction Complexity - Complexity of construction technique e.g. construction of tunnels, Auxiliary Drawdown Channel (ADC) or both for the emergency discharge	List out the differences in construction complexity (engineering cost risk & stakeholder interfaces risk). Use expert judgement to decide on the assessment. Compare with inclusions on cost to ensure no double-counting.	A	Moderate construction technique required that carries a moderate risk but risk which is likely mitigable. Examples of moderate risk activities (for intake/outfall) include: Construction across existing gravel pits and/or extension of the tunnel below the River Thames. Examples of moderate risk activities (for emergency discharge) include: construction of structures such as locks, gated structures and box culverts, as well as major road crossings.	The option requires an extension of the tunnel below the River Thames.	Construction complexity
CON5A	3rd Party Impact - Potential to disrupt existing road network during enabling works and construction	Expert judgement	A	Disruption likely to be moderate	The distance to the site from the Abingdon Road A415 is approximately 500m. The route is a good option for road access. The new road will likely cause disruption to the Thames Path (National Trail) which would need to be diverted during construction and operation.	3rd Party Impact
CON7A	Ground - Terrain of site, and implications for the need for earthworks and engineered slopes	Use of lidar and civil 3D models to assess amount/location of earthworks required	G	Terrain is favourable to the design of assets and therefore reduces the amount of earthworks required	Option is on the left bank of the River Thames, and therefore the site is relatively flat. This option also does not have the additional earthworks required for long culverts.	Construction complexity
CON7B	Ground - Risk of unexpected conditions	Use of expert judgement based on comparable areas	A	Moderate exposure to risk of unexpected ground conditions.	Relatively higher risk of unexpected ground conditions due to a further distance from existing boreholes.	Construction complexity
CON7C	Ground - Impact of ground conditions on the complexity of design and construction	Expert judgement	G	Ground conditions are unlikely to increase the complexity of design and construction with likely only a minimal (if any) impact on cost or requirement for materials that are difficult to source	Complexity of the design of the culvert along the edge of the existing flooded gravel pit could be impacted by ground conditions.	Construction complexity
CON7D	Ground - Risk of ground settlement above line of tunnel affecting other structures/houses	Expert judgement	A	Risk level acceptable or can be reduced with mitigation	Tunnel route chosen to avoid passing below structures that can be identified from aerial imagery.	Construction complexity
CON8A	STT Integration Complexity - Complexity of connecting STT directly into the intake/outfall structure.	Expert judgement	R	For the intake/outfall: The intake/outfall structure is a far away and/or complex construction is required to achieve connection to the intake/outfall structure.	Assuming a STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall structure, the STT pipeline for Option G would be considered complex construction. The final section of pipeline would need cross the River Thames by going underneath it which makes the option very complex to construct.	STT
Operability						
OPS1A	Safety - Risk of endangering operational staff, visitors or members of the public during operation	Look at operational activities and public access. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be operated safely but enhanced control measures required	This option will require enhanced control measures due to proximity to water. This option will require security fencing to reduce the risk of endangering the public during operation.	Health and Safety
OPS1B	Safety - Access and egress for operational staff, visitors, deliveries and waste removal during normal operations and emergencies	Tunnel silt issue to be considered by expert judgement	G	Access/egress can be provided	During larger River Thames flood events the shaft for this option would be accessible as it is on the left bank of the River Thames with an access road that would be above flood levels.	Health and Safety
OPS2A	Maintenance - Ease of maintenance	Expert judgement	A	Majority of maintenance activities could be undertaken during moderate closure periods and / or with moderate disruption	This option does not have long culverts which may mean the majority of maintenance activities could be undertaken during moderate closure periods.	Operational Complexity
OPS3A	Performance - Impact of intake location on removal of screenings and large floating debris e.g. rate of removal and volume to be removed	Expert judgement	A	Moderate reduction of screen capacity during high flows (partial intake blockage and reduced transfer capacity)	All options consider the same intake screen design and experience the same flows as their locations are similar, and may experience moderate reduction in capacity. Geomorphological performance considered in OPS11.	Operational Complexity
OPS4A	Reliability - Footprint of the option within flood zones (as an indication of the potential for damage and the challenge of operation / maintenance during flood events)	Review GIS supported by expert judgement	G	Option is outside the flood zone	This option is on the left bank of the River Thames where the ground level is higher, and therefore reduces the flood risk.	Operational Resilience
OPS6A	Evolvability - Risk to operation from future climate change, e.g. losses from evaporation due to higher temperatures, impact of higher rainfall, intake/outfall flood risk perspective	Expert judgement	A	Option could be slightly impacted by future climate change impact	This option is on the left bank of the River Thames where the ground level is higher, therefore the option has a low risk to operation from increased flood levels (still in flood zone 2).	Operational Resilience
OPS7A	Sustainability - Reuse of assets or temporary works for permanent items, e.g. materials storage slab, haulage roads, compound car park	Expert judgement	A	Some potential for reuse of assets/temporary works	This option does not reuse assets or temporary works for permanent items.	Operational Resilience
OPS7B	Sustainability - Power required for operation	Calculated power requirement for the option	A	Option requires moderate amount of energy to operate	Option requires moderate amount of energy to operate	Operational Resilience
OPS8A	3rd Party Impact - Potential to disrupt existing road network during operation	Expert judgement	G	No disruption likely / possibility of enhancement	The distance to the site from the Abingdon Road A415 is approximately 500m. The route is a good option for road access during operation, assuming the Thames Path is diverted for operation.	Transport Planning
OPS10	Quality - Impact on water quality received by the reservoir from the intake	Expert judgement	A	Design requires moderate amounts of interventions to ensure water quality	Impact on water quality is unlikely to significantly differ between the options, moderate interventions required to ensure quality for all options e.g. air diffusers within the reservoir. Geomorphological performance considered in OPS11.	Reservoir water quality
OPS11	Performance - Geomorphological impacts, e.g. potential sedimentation around the structure	Expert judgement	A	Geomorphology is likely to have a moderate impact on the performance of the structure	This option is located at a cross over between two bends so you may get some deposition in the margins but it will be less concentrated than on the inside of the bend. This has potential to cause some sedimentation around the structure which could impact operation.	Operational Resilience

OPS12A	STT Integration Complexity - Complexity of operating STT directly into the intake/outfall structure.	Expert judgement	R	Intake/outfall: Operability and/or resilience of SESRO and/or STT compromised.	The section of pipeline within/under the River Thames would increase operational input and make it more difficult to maintain.	STT
Relative Costs						
COS1	Capex cost of the option	Cost estimate calculation for each option.	G	CAPEX estimated to result in an increase of <1% of the CAPEX for the overall SESRO project compared to the lowest cost option	Initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option G results in a total project cost of 0.37% more than the lowest cost intake/outfall option.	Cost
COS3	Opportunity for cost-sharing with other SROs, NSIPs and local non-SRO schemes/plans, e.g. STT, T2ST, SWOX/Farmoor, Abingdon flood storage	Cost estimate calculation for each option.	G	Multiple opportunities identified for cost saving.	For the Intake/Outfall structure an opportunity for sharing costs seems to be present for just STT. Reviewing the connection between SESRO and STT the opportunity is more present for STT. The best saving would be made by Thames Water agreeing that STT can discharge into the SESRO tunnel, so that STT flows discharge to the River Thames either by the tunnel or the ADC. However, assuming STT must connect to the SESRO Intake/Outfall structure, the opportunity is that both could discharge through the same outfall structure.	Cost
Carbon Costs						
CAR1	Carbon costs associated to the Capex of the option	Carbon estimate calculation for each option.	G	Emissions (tCO2e) estimated to result in an increase of <1% of the emissions (tCO2e) for the overall SESRO project compared to the lowest emissions (tCO2e) option	Initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent 1.6% of total SESRO carbon. Option G results in a total project carbon of 0.5% more than the lowest carbon intake/outfall option.	Carbon
Environmental Performance						
ENV1A	Minimise impacts on Special Area of Conservation (SAC)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SAC's or potential SAC's within the boundary of the proposed Intake/Outfall Option G. The closest SAC to the Intake/Outfall is 5.6Km to the north-west (Cothill Fen SAC)	Biodiversity and Nature Conservation
ENV1B	Minimise impacts on Special Protection Area (SPA)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SPA's or potential SPA's within the boundary of the proposed Intake/Outfall Option G. The closest SPA to the Intake/Outfall is approximately 40Km to the south-east (Thames Basin Heaths SPA)	Biodiversity and Nature Conservation
ENV1C	Minimise impacts on Ramsar	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no Ramsar sites or potential Ramsar sites within the boundary of the proposed Intake/Outfall Option G. The closest Ramsar to the Intake/Outfall is approximately 54Km to the south-east (South West London Waterbodies)	Biodiversity and Nature Conservation
ENV1D	Minimise impacts on Site of Special Scientific Interest (SSSI)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SSSI sites or potential SSSI sites within the boundary of the proposed Intake/Outfall Option G. The closest SSSI to the Intake/Outfall is approximately 1.5Km to the north-east (Culham Brake SSSI). The Intake/Outfall is within the Impact Risk Zone for Culham Brake SSSI but pipeline works are not included within the list of risks within this area.	Biodiversity and Nature Conservation
ENV1E	Minimise impacts on National Nature Reserve	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no NNRs or potential NNRs within the boundary of the proposed Intake/Outfall Option G. The closest NNR to the Intake/Outfall is approximately 4.8Km to the north (Cothill NNR)	Biodiversity and Nature Conservation
ENV1F	Minimise impacts on Local Nature Reserve (LNR)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no LNRs or potential LNRs within the boundary of the proposed Intake/Outfall Option G. The closest LNR to the Intake/Outfall is approximately 2.6Km to the north-east (Abbey Fishponds)	Biodiversity and Nature Conservation
ENV2A	Minimise impacts on Ancient Woodland	Natural England Ancient Woodland Maps and Professional Judgement.	G	No ancient woodland impacted	Historic mapping indicates that there is no ancient woodland present on-site	Biodiversity and Nature Conservation
ENV2B	Minimise impacts on Ancient and Veteran Trees	Woodland Trust Ancient Tree Inventory map search and professional judgement	A	Development in close proximity with potential indirect impact to ancient or veteran trees	There are no ancient or veteran trees recorded by the Woodland Trusts Ancient Tree Inventory on or close to this option. However, survey may identify trees that could be classified as ancient or veteran. As such, this option scores amber on a precautionary basis pending survey.	Biodiversity and Nature Conservation
ENV2C	Minimise impacts on Protected Trees	Check against published TPO dataset.	G	No protected trees impacted	No protected trees would be impacted.	Landscape & Visual
ENV2D	Minimise impacts on vegetation (including trees, woodland, hedges and shrubs)	Check against baseline resources and based upon high level knowledge of site from previous site visits. Professional judgement.	G	No direct impact on vegetation which is of high arboricultural/amenity value (A or B grade) or biodiversity habitat in good condition. OR Limited direct impact on vegetation which is of lower arboricultural/visual amenity value (e.g. C grade) or biodiversity habitat in poor condition.	The tunnel excavation is assumed to be trenchless and therefore to only affect vegetation at the entry and exit points. Construction of the intake/outfall may require the removal of a few trees along the River Thames, as well as a short section of hedgerow along The Burycroft for access. As such, it is assumed that few if any A and B grade trees would be impacted. The habitats to be removed may provide habitat for a range of protected and notable species including otter and water vole (riparian mammals), bats and badgers.	Biodiversity and Nature Conservation and Landscape
ENV3	Minimise impacts on Local Wildlife Sites (LWS)	Professional Judgement and LWS Citation provided by TVERC.	G	No impacts to LWS	There are no LWS or potential LWS within the boundary of the proposed Intake/Outfall Option G. The closest LWS to the Intake/Outfall is approximately 2Km to the north-west (Marcham Salt Spring LWS)	Biodiversity and Nature Conservation
ENV4A	Minimise impacts on Scheduled monuments or activities which could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	The Culham Manor scheduled dovecote (NHLE 1019391) lies 520m south of the intake/outfall option and changes to setting might be relevant	Historic Environment

ENV4B	Minimise impacts on listed buildings or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	The Grade II listed building no. 13 The Green (NHLE 1194536) lies 350m south-east of the option intake/ outfall location and changes to setting might be a factor	Historic Environment
ENV4C	Minimise impacts on Registered Parks and Garden or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any Registered Park and Garden. Sutton Courtenay Manor lies 1km to the south of the intake/outfall option. Changes to setting unlikely	Historic Environment
ENV4D	Minimise impacts on Registered Battlefields or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any Registered Battlefields with the nearest being the Battle of Chalgrove (NHLE 1000006) 14.5km to the east of the option	Historic Environment
ENV4E	Avoid impacts on World Heritage Sites or activities that could lead to a loss of significance, including setting	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any World Heritage Sites with the nearest being Blenheim Palace (NHLE 1000091) over 20km to the north	Historic Environment
ENV4F	Minimise impacts on conservation areas which could result in loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No changes within any conservation areas - amber score given proximity of the Culham conservation area 240m to the east of the option	Historic Environment
ENV5A	Minimise loss to non-designated built heritage	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Extensive loss of non-designated built heritage of low value within the permanent infrastructure zone and adverse changes to within a 500m area from the edges of the permanent infrastructure OR more limited effects on non-designated built heritage of medium value	No expected loss of non-designated historic buildings - none shown on OCC HER dataset	Historic Environment
ENV5B	Minimise loss to paleoenvironmental remains	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or damage to low value remains within the construction area and adverse changes to similar buried remains in a 1km area around the permanent infrastructure from temporary and permanent changes to local hydrogeological regimes OR more limited effects on remains of medium value	Likely loss of some paleoenvironmental material as structures are within the River Thames floodplain and the likely relict paleochannels within the buried environment and organic remains interleaved with alluvial deposits	Historic Environment
ENV5C	Minimise loss to non-designated historic landscapes	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or extensive changes to low value non-designated historic landscapes within the construction area and extensive changes to the setting of the same resource outside the permanent infrastructure OR more limited effects on non-designated historic landscapes of medium value	No loss of non-designated historic landscapes as no non-designated historic landscapes are recorded within the option footprint	Historic Environment
ENV5D	Minimise loss of non-designated archaeological remains	Professional judgement, incorporating the use of the IEMA's Principles of Cultural Heritage Assessment in the UK and the Chartered Institute for Archaeologists standard and guidance document for desk based assessment	G	Permanent infrastructure and construction area will result in the loss and / permanent damage to non-designated buried and extant archaeological remains worthy of local significance which can be adequately mitigated through preservation by record	No loss of known archaeological remains with reference to the OCC HER dataset	Historic Environment
ENV6A	Minimise loss of fluvial flood storage within Flood Zone 2 or 3	Measure using GIS	A	Site is within flood zone 2 and 3 but loss of storage is minor or mitigation is available	The intake/outfall structure is only within flood zone 2. 1530m of tunnel length within flood zones	Flood Risk
ENV7A	Minimise disturbance of potentially contaminated land	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of potentially contaminated land with one or more of the following properties: - Unlikely to have significant cost or program implications - Unlikely to cause significant harm to potential receptors - Can be easily mitigated and remediated	This option is proposed to pass beneath the A34, close to two areas recorded as sewage works within historical mapping, (Abingdon Sewage Treatment Works). The option is also proposed to pass adjacent to a farm with associated tanks and 170m north of Sutton Wick leachate treatment plant. Geological mapping also indicates an area of Made Ground along the route (between the sewage works areas). There may also be the potential for unrecorded areas of Made Ground (and hence potential contamination along the route). Additionally, the tunnel is likely to bore through Kimmeridge Clay which may present a risk of hydrocarbon contamination due to potential bituminous content. There may be the potential for significant effects associated with land contamination, however, based on currently available information is it likely these can be addressed with appropriate mitigation.	Land

ENV7B	Minimise disturbance of potentially contaminated land specifically in relation to authorised and historic landfills	Desk based assessment of areas to identify potential sources of contamination	R	Within authorised landfills or previous industrial sites	This option is proposed to pass beneath/through the Southern Town Park historical landfill in the location of historical sand and gravel extraction. The landfill is recorded as being licensed to accept inert, commercial, household and liquid sludge, with waste accepted between 1967 and 1978. There is currently little information available relating to the construction, depth or infrastructure which may be present associated with this landfill and it is assumed, at this stage, that there may be significant effects associated with its disturbance, these may range from risks associated with direct disturbance or disturbance of the ground surrounding the landfill. The following risks should be considered; - landfill gas and leachate pathway disturbance, - waste disturbance - infrastructure disturbance (e.g. liner or pipework) - permitting arrangements - potential for significant costs and programme delays Consultation will be required with regulators to obtain further detail to assist with assessments.	Land
ENV8	Minimise disturbance of land with known potential for Unexploded Ordnance (UXO)	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of a low quantity of UXO which can be easily managed / remediated. Unlikely to have significant cost or program implications	The detailed Zetica desk study (P13129-23-R1) has assessed the area to be low risk, defined as 'There is no positive evidence that UXO is present, but its occurrence cannot be totally discounted'. There are records showing bomb drop locations on and around the options north of Drayton in this low risk area. In a low risk area Zetica recommends 'a UXO briefing for all staff involved in excavations'. Further consultation may be required to determine appropriate mitigation for sub-surface tunnelling. The detailed study doesn't cover the entire eastern extent of the route.	Land
ENV9A	Minimise loss of terrestrial priority habitats (use narrative to describe type and quantum)	Use of aerial imagery, MAGIC maps and Professional Judgement	G	No priority habitat directly impacted by proposed option footprint	The pipeline for Intake/Outfall Option G passes through an area described as 'no main habitats but additional habitats present'. The River Thames is also considered priority habitat. Where the pipeline is underground, habitats should not be impacted.	Biodiversity and Nature Conservation
ENV9B	Minimise loss of aquatic priority habitats (use narrative to describe type and quantum)	Professional judgement based on knowledge of Water Framework Directive.	A	Priority habitat directly impacted but mitigation feasible	As a result of this option, a proportion of the bank of the River Thames will be lost. The options will span 265m of bank however not all of this habitat will be lost. Depending on the design of the intake screen, between 35 - 38m of bank are expected to be lost. The length of habitat lost will need to be mitigated for appropriately.	Aquatic Environment
ENV10A	Reduce effects on North Wessex Downs Area of Outstanding Natural Beauty (AONB) and its setting	Professional judgement.	A	AONB and its setting likely to be affected. Effect is unlikely to be significant.	The introduction of the intake and outfall infrastructure along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the North Wessex Downs AONB due the limited scale of the structures above ground, distance, intervening urban areas and vegetation in the landscape between the AONB and the infrastructure.	Landscape & Visual
ENV10B	Reduce effects on local landscape character	Professional judgement.	R	Effect on local landscape character is likely to be significant.	The introduction of the intake and outfall infrastructure, including the Control Building, could affect the sense of tranquillity along the River Thames and slightly affect the 'openness of the green belt'. The loss of trees along the river could erode a key characteristic which contributes positively to the local landscape character. The effect on local landscape character may potentially be significant long term, given the generally undeveloped character of this area.	Landscape & Visual
ENV11A	Reduce effects on panoramic views from national trail, open access land and important viewpoints in AONB	Professional judgement.	G	Panoramic views from national trail, open access land and important viewpoints in AONB unlikely to be affected or the proposal is likely to be barely discernible in views.	The intake and outfall infrastructure is likely to be barely discernible in panoramic views from The Ridgeway National Trail in the AONB, given the distance and intervening urban areas and vegetation.	Landscape & Visual

ENV11B	Reduce effects on sensitive local visual receptors	Professional judgement.	R	Effect on local views of sensitive visual receptors likely to be significant.	There would be open close-range views from the Thames Path National Trail (which would have to be diverted), a nearby PRoW and the River Thames to the intake and outfall infrastructure, including the intake screens/river barrier and Control Building. The infrastructure could also be visible in middle-distance views from residential properties on the north-western edge of Culham, including the Conservation Area, and filtered middle-distance views from residential properties near Abingdon Marina, the National Cycle Network Route 5 and Vale Way Long Distance Path to the west. Although such views are affected to varying degrees by the presence of pylons and overhead lines or Didcot Power Station, and the effect on some views could be reduced in the long term, some effects could potentially be significant long term given the sensitivity of the visual receptors.	Landscape & Visual
ENV12	Minimise disturbance/encroachment into Air Quality Management Area (AQMA)	Based on an understanding of the scale and nature of activities, air quality management areas (AQMAs) were identified in close proximity to the proposed works.	G	Site is located further than 1km from AQMA OR no construction traffic must go through an AQMA	Marcham AQMA is approximately 2.2 km NW of Option G at its closest point. Abingdon AQMA is approximately 1.4 km NNW of Option G at its closest point. The anticipated construction and operational activities would likely lead to a negligible change in air quality.	Air Quality
ENV13	Minimise disturbance/encroachment into Groundwater Source Protection Zone (SPZ)	Magic maps	G	Site is within Zone 3 or not within a SPZ	Site is not within an SPZ.	Aquatic Environment
ENV14A	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Cow Common Brook and Portobello Ditch' WFD waterbody (GB106039023360) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14B	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ock and tributaries (Land Brook confluence to Thames)' WFD waterbody (GB106039023430) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14C	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Thames (Evenlode to Thame)' WFD waterbody (GB106039030334) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	A	Moderate adverse impacts likely; low risk to ability to attain Water Framework Directive objectives for this waterbody	This option will impact the River Thames WFD waterbody as a section of the WFD principal waterbody will be lost. The option has the potential to impact the ecological status of the waterbody due to a loss of river bank and riparian habitat. However, this impact is considered to be localised and not at a waterbody scale. Impacts can be easily mitigated.	Aquatic Environment
ENV14D	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Sandford Brook (source to Ock)' WFD waterbody (GB106039023410) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14E	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Childrey Brook and Norbrook at Common' WFD waterbody (GB106039023380) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14F	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ginge Brook and Mill Brook' WFD waterbody (GB106039023660) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment

ENV14G	Option does not affect Water Framework Directive (WFD) Quality Elements within one of WFD waterbodies downstream of the River Thame to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives. These WFD waterbodies include: - Thames Wallingford to Caversham - WFD waterbody GB106039030331 - Thames (Reading to Cookham) - WFD waterbody GB106039023233 - Thames (Cookham to Egham) - WFD waterbody GB106039023231 - Thames (Egham to Teddington) - WFD waterbody GB106039023232	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV15A	Maximise potential for future environmental benefits (terrestrial), e.g. increase tree planting	Professional Judgement	A	Site allows some additional environmental benefits to be realised	No specific space allowed for environmental benefit. Location would remove areas of woodland, trees, cropland and riparian vegetation along the Thames.	Biodiversity and nature conservation
ENV16	Maximise flexibility in routing diverted watercourses so their habitats can be of sufficiently high quality to contribute to catchment Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Site allows significant flexibility in routing watercourses / Good or high quality habitat options are available	Option does not impact routing of diverted watercourses.	Aquatic Environment
ENV17	Minimise disturbance/encroachment into Local Geological Sites (LGS)	Desk based assessment of areas to identify potential sources of contamination	G	Site is located more than 250m from LGS	No known geological sites within 250m	Land
ENV18A	Minimise impacts associated with Noise and Vibration as a consequence of the construction of the option	Indicative assessment with noise sensitive sample receptors within RAG bands identified based on predicted construction noise levels during Gate 2 assessment, with updates made to construction activitues at intake / outfall facility. Draft Gate 3 plant list includes a Secondary Lining activity, which will involve the use of concrete batch plant and represents the worst-case activity in the draft Gate 3 plant list. This activity has been used for the optioneering study. The assessment considers five sample receptors, each representing clusters of properties/receptors in the vicinity of the intake / outfall options. The sample receptors are: NV-A: Residential properties on South Quay NV-B: Residential properties west of St Paul's Church, west of The Burycroft road NV-C: Farm east of The Burycroft road NV-D: Location of Moored boats at Marina NV-E: Residential properties north of St Paul's Church, west of The Burycroft road Red band distance is from works site/access road to the SOAEL+5dB, and Amber distance is from SOAEL+5dB to the SOAEL. Road Construction: Red 60m, Amber 61-99m, Green 100m. Construction Traffic (on access road): Red 5m, Amber 6-	R	Significant effects likely which would be difficult to mitigate	The closest sample receptor to the proposed facility at Option G is NV-D at approximately 190m. At this distance, and when considering the predicted construction noise levels at the facility during secondary lining activities, the receptor is predicted to be within the Red band. Approximately half the mooring points in Abingdon Marina fall into the Red band. Sample receptors NV-A (~265m from the facility) and NV-C are predicted to be within the Amber band. No significant effects are predicted as a result of construction of the access road or from traffic movements on the proposed access road for Option G. However, construction movements on The Burycroft have the potential to result in adverse effects for Tollgate Cottage, located near to the A415 junction.	Noise
ENV18B	Minimise impacts associated with Noise and Vibration as a consequence of the operation of the option	Quantitative assessment not possible at this time. As such, the option appraisal study has considered the qualitative assessment undertaken at Gate 2 and applies professional judgement in assigning RAG bands to each option under assessment	A	Potential significant effects but likely to be mitigated if they occur	Sample receptor NV-D is ~190m from the facility at Option G. At this distance, it is possible that noise from the facility would be audible during normal operations. However, with the implementation of noise and vibration control measures within the design of the facility, it would be anticipated that significant effects would be avoided.	Noise
ENV19A	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the construction of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	There is 1 high sensitivity receptor (i.e. dwelling long The Burycroft before accessing the A415) within 20 m of the construction route for Option G and there are between 10 - 100 high sensitivity receptors (i.e. dwellings at 'The Green' and South Quay) approximately 280 m NW and SE, respectively, of the proposed works. It is considered that there are no proposed dust-generating construction activities that could not be managed using normal good practices (IAQM construction dust guidance, 2023) to prevent significant effects at any off-site receptor. Given that relatively low numbers of plant and items of machinery would be used and the anticipated number of construction vehicles, the potential effects would likely lead to a negligible change in air quality. Based on its location, Option G is considered favourable compared to the other Options.	Air Quality
ENV19B	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the operation of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	The likely minimal operational-related traffic (e.g. staff, planned maintenance, repair, refurbishment and replacement events) is such that the potential effects from vehicle emissions would likely lead to a negligible change in air quality at nearby receptors.	Air Quality

ENV20A	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the construction of the option	Professional judgement.	A	Noticeable changes to visual amenity of local community	Construction activities and traffic associated with the intake and outfall could lead to noticeable changes to the visual amenity of the local community on the north-western edge of Culham. This could in part be due to temporary security lighting and/or night-time construction works. There would be little effect on the visual amenity of the communities near Abingdon Marina, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV20B	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the operation of the option	Professional judgement.	A	Noticeable changes to visual amenity of local community	While the effect of operational lighting would be limited, the intake and outfall infrastructure, including the Control Building, could potentially lead to noticeable changes to the visual amenity of the local community on the north-western edge of Culham, which could be difficult to mitigate. There would be little effect on the visual amenity of the communities near Abingdon Marina, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV21A	Minimise impacts associated with solid discharge during construction, e.g. aggregate spills during material transport, sediment runoff from clay erosion due to excavation of the pipeline / tunnel and construction works	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
ENV21B	Minimise impacts associated with solid discharge during operation, e.g. release of sediment into surrounding environment during maintenance such as dredging, debris removal	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
Community and Planning Considerations						
CPC1	Distance to the nearest property that will stay during construction (metres)	GIS	R	Less than 250m from the nearest property	Intake Outfall Structure - 340m to nearest property Tunnel - 85m to nearest property	Socio-Economic
CPC2	Minimise impacts on local community during construction associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	A	Community access/use of community assets is disrupted during construction	The intake/outfall and access road occupy parts of the Thames Path (a national trail) that allows pedestrians to access the river and enjoy amenity benefits. This is a stretch of national trail/public path that would be significantly altered during construction and operation. Mitigation in the form of a diversion would need to be put in place, otherwise access would be completely severed. Intake/outfall and access road is within 500m of homes and a place of worship. It is reasonable to expect some disruption in the form of traffic and potential periods of restricted access.	Socio-Economic
CPC3	Minimise impacts on local community during operation associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	A	Community access/use of community assets is disrupted during operation	The intake/outfall and access road would occupy parts of the Thames Path (a national trail) that allows pedestrians to access the river and enjoy amenity benefits. This is a stretch of national trail/public path that would be significantly altered during operation. Mitigation in the form of a diversion would need to be put in place, otherwise access would be completely severed. Intake/outfall and access road is within 500m of homes and a place of worship. During operation it is not expected that there would be significant disruption to these.	Socio-Economic
CPC4A	Are public rights of way (PRoW) disrupted or adversely affected?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	R	Recreational resources / rights of way of national or regional importance are disrupted or affected	The intake/outfall and access road occupy parts of the Thames Path (a national trail) that allows pedestrians to access the river and enjoy amenity benefits. This is a stretch of national trail/public path that would be significantly altered during construction and operation. Mitigation in the form of a diversion would need to be put in place, otherwise access would be completely severed. Intake/outfall and access road is within 500m of homes and a place of worship. It is reasonable to expect some disruption in the form of traffic and potential periods of restricted access.	Socio-Economic
CPC4B	Are there opportunities to create or improve linkages of Public Rights of Way (PRoW) and recreational routes?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	R	No opportunity to create or enhance PRoW links to recreational resources	The intake/outfall and access road would occupy parts of the Thames Path (a national trail) that allows pedestrians to access the river and enjoy amenity benefits. This is a stretch of national trail/public path that would be significantly altered during construction and operation. Mitigation in the form of a diversion would need to be put in place, otherwise access would be completely severed.	Socio-Economic
CPC5	Maximise potential opportunity for recreational benefits	GIS analysis of PRoW, open spaces, cycle routes, canals, other forms of regional/nationally important receptors (eg National Cycle Routes), and community assets.	R	Option allows only the minimum recreational benefits to be realised	The intake/outfall and access road occupy parts of the Thames Path (a national trail) that allows pedestrians to access the river and enjoy amenity benefits. This is a stretch of national trail/public path that would be significantly altered during construction and operation. Mitigation in the form of a diversion would need to be put in place, otherwise access would be completely severed. This can be seen as negative impact for those using the Thames Path.	Socio-Economic
CPC6	Support the realisation of socio-economic incentives on SESRO, including employment, skills, tourism, sustainable travel, connecting people with nature and environmental education	GIS analysis of footprint, community assets, private residents, and businesses. Also awareness of overall project objectives is needed to conclude if the designs align with these.	R	Site does not support the social-economic incentives of the overall scheme	The intake/outfall and access road occupy parts of the Thames Path (a national trail) that allows pedestrians to access the river and enjoy amenity benefits. This is a stretch of national trail/public path that would be significantly altered during construction and operation. Mitigation in the form of a diversion would need to be put in place, otherwise access would be completely severed. This can be seen as negative impact for those using the Thames Path.	Socio-Economic

CPC7	Minimise overall SESRO Order Limits extent and land acquisition, without compromising SESRO needs and project benefits	Spatial comparison of land that would likely be included in the DCO Order Limits, including construction working areas, access and highways or PRoW interactions.	A	Requires minor additional Order Limits extent	Tunnel route, control building, raised area, intake screens, outfall weir and access roads all fall outside of the land safeguarded for the reservoir (CP14), requiring additional land acquisition and Order Limits extent compared to other options which do stay within this safeguarded land area and on the right bank of the Thames. The control building, raised area, intake/outfall and access roads fall within the South Oxfordshire District.	Consenting
CPC8	Aim for consistency with published and (insofar as possible) emerging Local Plan land use allocations	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in existing and any emerging Local Plan documents and any Supplementary Planning Documents.	A	Negotiation required with LPA to accommodate scheme within Local Plan	The tunnel enters the area safeguarded for the South Abingdon-on-Thames Bypass linking the A415 to the West and South, including a new River Thames Crossing east of the town (Vale of White Horse Local Plan 2031, policy CP12), but may be able to be accommodated alongside any potential road alignment. The control building, intake/outfall and other above-ground structures fall within the area safeguarded for road (TRANS3) in the South Oxfordshire Local Plan 2035 on the left bank of the Thames. The allocation is for the South Abingdon Bypass and so the above-ground structures could impact the delivery of a future road crossing under this policy. No land use allocation conflicts with the Oxfordshire County Council Minerals and Waste Local Plans. The proposed realigned safeguarded area for the Southern Abingdon Movement Corridor in the draft Joint Local Plan 2041 indicates a similar location for the connection to the A415 to the east, with similar considerations arising.	Consenting
CPC9	Aim for consistency with any adopted Neighbourhood Plan policy applicable to the land area affected	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in any made Neighbourhood Plan.	G	Low or no impact	All options pass through the area of the Drayton Neighbourhood Plan, which was adopted in 2015. The indicative potential tunnel alignment for option G passes under the very north edge of the 'North of Barrow Road' area that is allocated for housing in the Drayton Neighbourhood Plan, and has been developed into housing and a sports/play area under permission P14/V2504/FUL. The indicative tunnel alignment passes under the open space within this site, not the houses. Option G also enters the area of the made Culham NP, adopted in 2023. No conflicts with either NP.	Consenting
CPC10	Avoid development of infrastructure within specifically designated areas or their setting, as applicable (e.g. Green Belt, AONB, Common Land, Open Space)	Spatial comparison with designated sites, their settings, and the nature of development works expected.	A	Requires development of minor above-ground infrastructure within the designation, which is sympathetic with surroundings and access, or likely to have a less than significant impact on the setting (where applicable)	The control building, raised area, access roads, intake screens and outfall weir are within the Green Belt and may be considered inappropriate development as above-ground structures. No other constraints such as AONB, Common Land or Open Space.	Consenting
CPC11	Avoid encroachment on any safeguarded land in minerals and waste policy, unless the minerals can be beneficially utilised as a result	Spatial comparison of allocated sites and review of policy wording in existing and any emerging Waste and Minerals Local Plan documents.	G	Low or no impact	Not located in minerals safeguarding area or on a site allocated for minerals or waste uses.	Consenting
CPC12	Ability to integrate with existing nationally-significant infrastructure, statutory undertakers' major infrastructure, or any proposed future Nationally Significant Infrastructure Projects (NSIP) (such as that of National Highways, Environment Agency, Network Rail)	Review of NSIP projects on PINS's register; review of Network Rail and National Highways investment plans; spatial review of statutory undertakers' assets.	G	Low or no interaction with existing infrastructure or proposed Nationally Significant Infrastructure Project (NSIP)	No NSIPs currently registered. No known proposals from Network Rail or National Highways. The National Highways RIS3 Investment Plan will be published in 2024 which will detail the A34 improvement project.	Consenting
CPC13	Minimise the consenting complexity due to the need for additional consents and licenses that may be required outside the Development Consent Order (DCO), e.g. additional Flood Risk Activity Permit, Environmental Permit, abstraction/discharge Licence, European protected species licence, etc	Review of the nature of expected development works against the list of other consents and licenses developed at Gateway 2.	A	One or more additional consent/license required	A Land Drainage Consent would be required for works in, over, under or affecting the flow of an ordinary watercourse. A Bespoke Flood Risk Activity Permit will be required for this scale of works on or near a main river. This can be applied for post-DCO. A Temporary Traffic Regulation Order may be required as PRoWs will need to be temporarily closed for construction of the tunnel, although this can potentially be included within the DCO application.	Consenting
CPC14	Avoid or minimise the need for any consequential development consenting (i.e. displacement or alteration of other development)	Review of existing development within the likely land-take, its nature and scale.	G	No existing development requires planning permission to relocate or alter	The tunnel crosses the A34 and Drayton Road, and Hanson Way National Cycle Route, as do all options. The tunnel also crosses electric lines, telecom lines, gas lines and water lines which would require diversion, but this can form part of the DCO associated development or potentially be delivered through statutory undertaker permitted development.	Consenting
Property & Land Acquisition						
PRP1	Minimise loss of sensitive properties, e.g. residential, commercial, green belt, common land, historical or community assets due to project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of sensitive properties	Assume construction via TBM; would not detrimentally impact surface uses along tunnel length including Quarry extension at Oday Quarry which incorporates a planning condition to accommodate the project. Tunnelling below Rugby Club land under land/gardens associated with listed buildings at Stonehill farm. Otherwise all privately owned agricultural land. No buildings directly above tunnel line. Otherwise all privately owned agricultural land. Assumed exceptionally low risk of vibration.	Property & Land Acquisition

PRP2	Minimise loss of land allocated within the Local Plan for alternative higher value / social / cultural value uses, i.e. residential, historical or community assets due project delivery	Review Land allocation mapping on ArcGIS.	R	Permanent loss of allocated land for higher value or social value properties	Greenbelt land impacted to the east of the Thames.	Property & Land Acquisition
PRP3	Minimise permanent loss of best and most versatile agricultural land (grades 1, 2 and 3)	Review of agricultural grading layer on ArcGIS, based on 2019 Provisional Agricultural Land Classification	A	Results in loss of any Grade 2 agricultural land or >50% Grade 3 agricultural land	Surface land graded 2 land at over 35%. Assume construction via TBM would not detrimentally agricultural use. Grade 2 = 38% Grade 3 = 54% Grade 4 = 8%	Property & Land Acquisition
PRP4	Assessment of Land and Property asset costs and associated compensation due under the Compensation Code	Review of land use / designation on ArcGIS	A	Land acquisition costs likely to be relatively moderate.	Subsoil values at de minimus. Tunnels N/A based on subsoil value of £50 per interest. Greenbelt land impacted, this may require replacement land within immediate vicinity.	Property & Land Acquisition
PRP5	Assessment of Special Category Land	Review of affected landowners	A	Nature and / or extent Special Category Land is likely to cause moderate consenting risk	Two SCLs possibly identified. Vale of White Horse Council, National Highways.	Property & Land Acquisition
PRP6	Minimise disruptions of landowners access to their land required for temporary works	Review location in conjunction with existing road network	G	Assumption that landowners will be able to access their land during construction and operational phases.	No direct impact on landowners access identified. Assumption that landowners will be able to access their land during construction and operational phases. Crossing of Drayton Rd B4017 may cause general disruption of access between Drayton and Abingdon.	Property & Land Acquisition

Appendix P. Intake/Outfall Option H Criteria Workbook

Intake Outfall Option H Appraisal Workbook

Criteria code	Criteria Description	Method of Assessment	RAG	Description of RAG	Narrative	Sub-Theme
Constructability						
CON1	Safety - Risk of endangering construction workers or members of the public during construction e.g. water, ground, height, rail, road and utilities	Look at programme and list types of construction involved. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be constructed safely but enhanced control measures required	Working adjacent to the River Thames. Good working area available	Health and Safety
CON2A	Programme - Duration, longest /shortest, but also consider whether the longer duration has an impact on the overall scheme programme	Compare differences in the programmes which would materialise from different options. Consider earthworks seasons.	R	Likely to impact the critical path of the Gate 2 SESRO programme and therefore the estimated overall duration of the SESRO construction works.	This option would add time onto the tunnel drive, cleaning of the tunnel and removing temporary services and the secondary lining. This is a baseline duration site without other additional works ie. longer channels.	Programme
CON2B	Programme - Opportunities for construction programme acceleration through efficiencies	Compare differences in the programmes which would materialise from different options.	A	The option has limited potential to introduce programme efficiencies and reduce the construction programme	The long tunnel length will increase the overall duration of the construction programme reducing opportunities for construction programme acceleration. Significant extension to STW outfall although this can be completed away from the critical path. Opportunity to complete intake / outfall concurrently with other works.	Programme
CON2C	Programme - Dependencies i.e. proximity or physical relationships between elements of scope that introduce programme dependencies	Is the options on the critical path? Will it impact other critical activities?	R	Multiple major programme dependencies	The critical path would switch to the tunnel to the River Intake & Outfall and the planned completion would be delayed by 8-months. The big jump in the planned completion being due to the additional 8-weeks to complete the tunnel/secondary lining and the reservoir filling calendar that restricts filling between the 1st November and 31st March each year. Good space available for silo/plant set up. Opportunity to complete intake / outfall concurrently with other works.	Programme
CON2D	Programme - Risk	Are there items in the construction which have a significant programme risk	G	Minor programme risk	Access is based on using Abingdon Road and The Burycroft avoiding Abingdon. Site is within green belt area so permission will need to be sought for construction in this area and it may be met with some resistance.	Programme
CON2E	Programme - Use of existing assets to reduce the amount of construction required	Identify if any existing assets can be used	A	Option does not make use of existing assets	This option does not reuse assets or temporary works for permanent items.	Programme
CON3A	Logistics - Space available for construction and materials storage	Determine space constraints using GIS and options layouts from option definition.	G	Adequate space	Good working area available	Logistics
CON3B	Logistics - Suitable and efficient access for construction workers, deliveries and waste removal including minimisation of lengths of new roads for access during construction	Determine method of access using GIS and options layouts from option definition.	A	Due to restricted access, an additional length of road is likely required for construction of the option.	Access road currently envisaged to connect to the existing road "The Burycroft". The length of the new access road is approximately 580m. The distance to the site from Abingdon Road is approximately 1150m.	Logistics
CON3C	Logistics - Import of materials or resources during construction	Use quantity estimates to assess different options.	R	Large amount of import materials required and/or one or several logistical challenges identified for the import of material.	Relatively long additional road length (580m) required to access the site as well as a longer tunnel length (3740m) needed because it is located on the left bank of the River Thames. Long length for extending the Sewage Treatment Works Twin 300mm dia Pipework length (1100m) + pumping station required.	Logistics
CON3D	Logistics - Haulage distance required for construction materials arrival on site to the placement location	Determine length using GIS and options layouts from option definition.	G	One main site location is used for construction of the option.	One main site location is used for construction of the option.	Logistics
CON3E	Logistics - Vehicle movements	Use vehicle movement estimates to assess different options.	R	Construction works likely to require a large number of vehicle movements and vehicle movements may be difficult.	Access would be required via the A415 through Abingdon adding to difficulty.	Logistics
CON4A	Construction Complexity - Temporary conditions/works requirements e.g. embankment slope stability and moisture outside of placement seasons.	Expert Judgement	G	Temporary Works requirements minimal and can be used in the permanent state and no extension to the programme	Temporary works required to create a dry working area at the outfall and inlet. Safe working arrangements for working adjacent to the River Thames. Temporary and permanent access would be from The Burycroft and onto the A415.	Construction complexity
CON4B	Construction Complexity - Location conflict/opportunity with another engineering component of the scheme or other SRO/non-SRO schemes, e.g. Severn to Thames Transfer (STT), Thames to Southern Transfer (T2ST), TW Swindon and Oxfordshire supply zone transfer, Transfer to Farmoor Reservoir	Expert judgement and knowledge of surrounding schemes	R	Location / layout of option clashes with another component of this scheme (or another scheme) which is already set or would be difficult to change	Assuming that the STT pipeline connects into the shaft and discharges to the Thames through the outfall, the connection would very complex as the shaft is located on the opposite side of the River Thames.	Construction complexity

CON4C	Construction Complexity - Minimise the number and complexity of additional structures/assets required or modifications to the existing structures/assets in order to facilitate the option, e.g. bridges, culverts, crossings	Determine using GIS and options layouts from option definition.	R	Option requires a complex and/or high number of additional structures and/or modifications to existing structures.	The option has: no need for infilling of a flooded gravel pit, relatively short culverts and significant extension of the sewage treatment works outfall (which would also need to pass over the ADC (if constructed)). There is also a need for the tunnel to pass under the River Thames. The passing of the tunnel below the River Thames together with the long extension of the sewage treatment works outfall are considered significant additional components.	Construction complexity
CON4E	Construction Complexity - Complexity of construction technique e.g. construction of tunnels, Auxiliary Drawdown Channel (ADC) or both for the emergency discharge	List out the differences in construction complexity (engineering cost risk & stakeholder interfaces risk). Use expert judgement to decide on the assessment. Compare with inclusions on cost to ensure no double-counting.	A	Moderate construction technique required that carries a moderate risk but risk which is likely mitigable. Examples of moderate risk activities (for intake/outfall) include: Construction across existing gravel pits and/or extension of the tunnel below the River Thames. Examples of moderate risk activities (for emergency discharge) include: construction of structures such as locks, gated structures and box culverts, as well as major road crossings.	The option requires an extension of the tunnel below the River Thames.	Construction complexity
CON5A	3rd Party Impact - Potential to disrupt existing road network during enabling works and construction	Expert judgement	A	Disruption likely to be moderate	The distance to the site from the Abingdon Road A415 is approximately 1,150m. The route is a good option for road access. The new road will likely cause disruption to the Thames Path (National Trail) which would need to be diverted during construction and operation.	3rd Party Impact
CON7A	Ground - Terrain of site, and implications for the need for earthworks and engineered slopes	Use of lidar and civil 3D models to assess amount/location of earthworks required	G	Terrain is favourable to the design of assets and therefore reduces the amount of earthworks required	Option is on the left bank of the River Thames, and therefore the site is relatively flat. On the left bank of the River Thames the ground level is higher, and therefore the amount of earthworks required to bring the shaft above flood level is reduced. This option also does not have the additional earthworks required for long culverts.	Construction complexity
CON7B	Ground - Risk of unexpected conditions	Use of expert judgement based on comparable areas	A	Moderate exposure to risk of unexpected ground conditions.	Relatively higher risk of unexpected ground conditions due to a further distance from existing boreholes.	Construction complexity
CON7C	Ground - Impact of ground conditions on the complexity of design and construction	Expert judgement	G	Ground conditions are unlikely to increase the complexity of design and construction with likely only a minimal (if any) impact on cost or requirement for materials that are difficult to source	Complexity of the design of the culvert along the edge of the existing flooded gravel pit could be impacted by ground conditions.	Construction complexity
CON7D	Ground - Risk of ground settlement above line of tunnel affecting other structures/houses	Expert judgement	A	Risk level acceptable or can be reduced with mitigation	Tunnel route chosen to avoid passing below structures that can be identified from aerial imagery.	Construction complexity
CON8A	STT Integration Complexity - Complexity of connecting STT directly into the intake/outfall structure.	Expert judgement	R	For the intake/outfall: The intake/outfall structure is a far away and/or complex construction is required to achieve connection to the intake/outfall structure.	Assuming a STT pipeline is constructed with the same alignment as the ADC and connects to the intake/outfall structure, the STT pipeline for Option H would be considered complex construction. The final section of pipeline would need cross the River Thames by going underneath it which makes the option very complex to construct.	STT
Operability						
OPS1A	Safety - Risk of endangering operational staff, visitors or members of the public during operation	Look at operational activities and public access. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be operated safely but enhanced control measures required	This option will require enhanced control measures due to proximity to water. This option will require security fencing to reduce the risk of endangering the public during operation.	Health and Safety
OPS1B	Safety - Access and egress for operational staff, visitors, deliveries and waste removal during normal operations and emergencies	Tunnel silt issue to be considered by expert judgement	G	Access/egress can be provided	This option does not have long culverts which may mean the majority of maintenance activities could be undertaken during moderate closure periods. During larger River Thames flood events the shaft for this option would be accessible as it is on the left bank of the River Thames with an access road that would be above flood levels.	Health and Safety
OPS2A	Maintenance - Ease of maintenance	Expert judgement	A	Majority of maintenance activities could be undertaken during moderate closure periods and / or with moderate disruption	This option does not have long culverts which may mean the majority of maintenance activities could be undertaken during moderate closure periods.	Operational Complexity
OPS3A	Performance - Impact of intake location on removal of screenings and large floating debris e.g. rate of removal and volume to be removed	Expert judgement	A	Moderate reduction of screen capacity during high flows (partial intake blockage and reduced transfer capacity)	All options consider the same intake screen design and experience the same flows as their locations are similar, and may experience moderate reduction in capacity. Geomorphological performance considered in OPS11.	Operational Complexity
OPS4A	Reliability - Footprint of the option within flood zones (as an indication of the potential for damage and the challenge of operation / maintenance during flood events)	Review GIS supported by expert judgement	G	Option is outside the flood zone	This option is on the left bank of the River Thames where the ground level is higher, and therefore reduces the flood risk.	Operational Resilience
OPS6A	Evolvability - Risk to operation from future climate change, e.g. losses from evaporation due to higher temperatures, impact of higher rainfall, intake/outfall flood risk perspective	Expert judgement	A	Option could be slightly impacted by future climate change impact	This option is on the left bank of the River Thames where the ground level is higher, therefore the option has a low risk to operation from increased flood levels (still in flood zone 2).	Operational Resilience

OPS7A	Sustainability - Reuse of assets or temporary works for permanent items, e.g. materials storage slab, haulage roads, compound car park	Expert judgement	A	Some potential for reuse of assets/temporary works	This option does not reuse assets or temporary works for permanent items.	Operational Resilience
OPS7B	Operability - Power required for operational energy use	Calculated power requirement for the option	A	Option requires moderate amount of energy to operate	Option requires moderate amount of energy to operate	Operational Resilience
OPS8A	3rd Party Impact - Potential to disrupt existing road network during operation	Expert judgement	G	No disruption likely / possibility of enhancement	The distance to the site from the Abingdon Road A415 is approximately 1,150m. The route is a good option for road access during operation, assuming the Thames Path is diverted for operation.	Transport Planning
OPS10	Quality - Impact on water quality received by the reservoir from the intake	Expert judgement	A	Design requires moderate amounts of interventions to ensure water quality	Impact on water quality is unlikely to significantly differ between the options, moderate interventions required to ensure quality for all options e.g. air diffusers within the reservoir. Geomorphological performance considered in OPS11.	Reservoir water quality
OPS11	Performance - Geomorphological impacts, e.g. potential sedimentation around the structure	Expert judgement	R	Geomorphology is likely to have a large impact on the performance of the structure.	This option is located on the inside of the bend so is likely to be in a depositional area. This could result in sedimentation around the structure impacting operation.	Operational Resilience
OPS12A	STT Integration Complexity - Complexity of operating STT directly into the intake/outfall structure.	Expert judgement	R	Intake/outfall: Operability and/or resilience of SESRO and/or STT compromised.	The section of pipeline within/under the River Thames would increase operational input and make it more difficult to maintain.	STT
Relative Costs						
COS1	Capex cost of the option	Cost estimate calculation for each option.	G	CAPEX estimated to result in an increase of <1% of the CAPEX for the overall SESRO project compared to the lowest cost option	Initial high-level cost estimate indicates that the range in costs for intake/outfall options represent <0.5% of total SESRO costs. Option H results in a total project cost of 0.36% more than the lowest cost intake/outfall option.	Cost
COS3	Opportunity for cost-sharing with other SROs, NSIPs and local non-SRO schemes/plans, e.g. STT, T2ST, SWOX/Farmoor, Abingdon flood storage	Cost estimate calculation for each option.	G	Multiple opportunities identified for cost saving.	For the Intake/Outfall structure an opportunity for sharing costs seems to be present for just STT. Reviewing the connection between SESRO and STT the opportunity is more present for STT. The best saving would be made by Thames Water agreeing that STT can discharge into the SESRO tunnel, so that STT flows discharge to the River Thames either by the tunnel or the ADC. However, assuming STT must connect to the SESRO Intake/Outfall structure, the opportunity is that both could discharge through the same outfall structure.	Cost
Carbon Costs						
CAR1	Carbon costs associated to the Capex of the option	Carbon estimate calculation for each option.	G	Emissions (tCO2e) estimated to result in an increase of <1% of the emissions (tCO2e) for the overall SESRO project compared to the lowest emissions (tCO2e) option	Initial high-level carbon estimate indicates that the range in carbon for intake/outfall options represent 1.6% of total SESRO carbon. Option H results in a total project carbon of 0.8% more than the lowest carbon intake/outfall option.	Carbon
Environmental Performance						
ENV1A	Minimise impacts on Special Area of Conservation (SAC)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SAC's or potential SAC's within the boundary of the proposed Intake/Outfall Option H. The closest SAC to the Intake/Outfall is 5.7Km to the north-west (Cothill Fen SAC)	Biodiversity and Nature Conservation
ENV1B	Minimise impacts on Special Protection Area (SPA)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SPA's or potential SPA's within the boundary of the proposed Intake/Outfall Option H. The closest SPA to the Intake/Outfall is approximately 40Km to the south-east (Thames Basin Heaths SPA)	Biodiversity and Nature Conservation
ENV1C	Minimise impacts on Ramsar	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no Ramsar sites or potential Ramsar sites within the boundary of the proposed Intake/Outfall Option H. The closest Ramsar to the Intake/Outfall is approximately 54Km to the south-east (South West London Waterbodies)	Biodiversity and Nature Conservation
ENV1D	Minimise impacts on Site of Special Scientific Interest (SSSI)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SSSI sites or potential SSSI sites within the boundary of the proposed Intake/Outfall Option H. The closest SSSI to the Intake/Outfall is approximately 1.8Km to the north-east (Culham Brake SSSI). The Intake/Outfall is within the Impact Risk Zone for Culham Brake SSSI but pipeline works are not included within the list of risks within this area.	Biodiversity and Nature Conservation
ENV1E	Minimise impacts on National Nature Reserve	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no NNRs or potential NNRs within the boundary of the proposed Intake/Outfall Option H. The closest NNR to the Intake/Outfall is approximately 4.8Km to the north (Cothill NNR)	Biodiversity and Nature Conservation
ENV1F	Minimise impacts on Local Nature Reserve (LNR)	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no LNRs or potential LNRs within the boundary of the proposed Intake/Outfall Option H. The closest LNR to the Intake/Outfall is approximately 3.1Km to the north-east (Abbey Fishponds)	Biodiversity and Nature Conservation
ENV2A	Minimise impacts on Ancient Woodland	Natural England Ancient Woodland Maps and Professional Judgement.	G	No ancient woodland impacted	Historic mapping indicates that there is no ancient woodland present on-site	Biodiversity and Nature Conservation
ENV2B	Minimise impacts on Ancient and Veteran Trees	Woodland Trust Ancient Tree Inventory map search and professional judgement	A	Development in close proximity with potential indirect impact to ancient or veteran trees	There are no ancient or veteran trees recorded by the Woodland Trusts Ancient Tree Inventory on or close to this option. However, survey may identify trees that could be classified as ancient or veteran. As such, this option scores amber on a precautionary basis pending survey.	Biodiversity and Nature Conservation
ENV2C	Minimise impacts on Protected Trees	Check against published TPO dataset.	G	No protected trees impacted	Access road is within 15m of a number of trees on the edge of Culham Conservation Area (which should be treated similar to trees with TPOs). Providing appropriate ground protection is implemented, it is assumed that no direct impact on the trees, including their roots, would occur.	Landscape & Visual

ENV2D	Minimise impacts on vegetation (including trees, woodland, hedges and shrubs)	Check against baseline resources and based upon high level knowledge of site from previous site visits. Professional judgement.	A	Direct impact on vegetation within a moderate proportion of construction footprint, which is of high arboricultural/amenity value (e.g. A or B grade) or biodiversity habitat in good condition. OR Direct impact on vegetation within large proportion of construction footprint, which is of lower arboricultural/visual amenity value (e.g. C grade) or biodiversity habitat in poor condition.	The tunnel excavation is assumed to be trenchless and therefore to only affect vegetation at the entry and exit points. Construction of the intake/outfall could require the removal of several trees along the River Thames that are assumed to include several A or B grade trees. A short section of hedgerow along The Burycroft could also be required to be removed to facilitate the construction access road. Assuming a trenchless method of excavation is utilised, the extension of the STW Outfall would require limited vegetation removal. The habitats to be removed may provide habitat for a range of protected and notable species including otter and water vole (riparian mammals), bats and badgers.	Biodiversity and Nature Conservation and Landscape
ENV3	Minimise impacts on Local Wildlife Sites (LWS)	Professional Judgement and LWS Citation provided by TVERC.	G	No impacts to LWS	There are no LWS or potential LWS within the boundary of the proposed Intake/Outfall Option H. The closest LWS to the Intake/Outfall is approximately 2Km to the north-west (Marcham Salt Spring LWS)	Biodiversity and Nature Conservation
ENV4A	Minimise impacts on Scheduled monuments or activities which could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	The Culham Manor scheduled dovecote (NHLE 1019391) lies 220m east of the intake/outfall option and changes to setting might be relevant	Historic Environment
ENV4B	Minimise impacts on listed buildings or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	No listed buildings physically affected. The Grade II* listed dovecote (NHLE 1019391) at Culham Manor lies 220m to the east of the intake/outfall option and setting will be relevant, as it would be for the associated Grade II* listed manor house (NHLE 1285637) 70m to the east of the dovecote	Historic Environment
ENV4C	Minimise impacts on Registered Parks and Garden or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No physical changes to any Registered Park and Garden. Sutton Courtenay Manor lies 620m to the south-east of the intake/ outfall option. Changes to setting unlikely	Historic Environment
ENV4D	Minimise impacts on Registered Battlefields or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any Registered Battlefields with the nearest being the Battle of Chalgrove (NHLE 1000006) 14.5km to the east of the option	Historic Environment
ENV4E	Avoid impacts on World Heritage Sites or activities that could lead to a loss of significance, including setting	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	No changes to any World Heritage Sites with the nearest being Blenheim Palace (NHLE 1000091) over 20km to the north	Historic Environment
ENV4F	Minimise impacts on conservation areas which could result in loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	The proposed option (access road) crosses into the boundary of Culham conservation area on The Burycroft and skirts the designation boundary at The Green. The intake/outfall is also located only 130m from the conservation area boundary which has setting implications for the western edges of the designation	Historic Environment
ENV5A	Minimise loss to non-designated built heritage	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Extensive loss of non-designated built heritage of low value within the permanent infrastructure zone and adverse changes to within a 500m area from the edges of the permanent infrastructure OR more limited effects on non-designated built heritage of medium value	No expected loss of non-designated historic buildings - none shown on OCC HER dataset	Historic Environment
ENV5B	Minimise loss to paleoenvironmental remains	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or damage to low value remains within the construction area and adverse changes to similar buried remains in a 1km area around the permanent infrastructure from temporary and permanent changes to local hydrogeological regimes OR more limited effects on remains of medium value	Likely loss of some paleoenvironmental material as structures are within the River Thames floodplain and the likely relict paleochannels within the buried environment and organic remains interleaved with alluvial deposits	Historic Environment
ENV5C	Minimise loss to non-designated historic landscapes	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or extensive changes to low value non-designated historic landscapes within the construction area and extensive changes to the setting of the same resource outside the permanent infrastructure OR more limited effects on non-designated historic landscapes of medium value	No loss of non-designated historic landscapes as no non-designated historic landscapes are recorded within the option footprint	Historic Environment

ENV5D	Minimise loss of non-designated archaeological remains	Professional judgement, incorporating the use of the IEMA's Principles of Cultural Heritage Assessment in the UK and the Chartered Institute for Archaeologists standard and guidance document for desk based assessment	A	Permanent infrastructure and construction area will result in the loss and / permanent damage to non-designated buried and extant archaeological remains worthy of regional significance which can only be partially mitigated through preservation by record	Loss of known archaeology on east bank of River Thames (Iron Age and Romano-British settlement - MOX11121) from intake/outfall structure and associated access road	Historic Environment
ENV6A	Minimise loss of fluvial flood storage within Flood Zone 2 or 3	Measure using GIS	A	Site is within flood zone 2 and 3 but loss of storage is minor or mitigation is available	The intake/outfall structure is only within flood zone 2. 2450m of tunnel length within flood zones	Flood Risk
ENV7A	Minimise disturbance of potentially contaminated land	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of potentially contaminated land with one or more of the following properties: - Unlikely to have significant cost or program implications - Unlikely to cause significant harm to potential receptors - Can be easily mitigated and remediated	This option is proposed to pass beneath the A34 and gravel pits south of Abingdon Sewage Treatment Works. The outfall extension is shown running along the eastern edge of the sewage works. The culvert connecting the shaft to the intake/outfall is proposed to pass through a historical and now flooded gravel pit. The option is also proposed to pass adjacent to a farm with associated tanks and 150m north of Sutton Wick leachate treatment plant. There may also be the potential for unrecorded areas of Made Ground (and hence potential contamination along the route). Additionally the tunnel bores through Kimmeridge Clay which may present a risk of hydrocarbon contamination due to potential bituminous content. There may be the potential for significant effects associated with land contamination, however, based on currently available information is it likely these can be addressed with appropriate mitigation.	Land
ENV7B	Minimise disturbance of potentially contaminated land specifically in relation to authorised and historic landfills	Desk based assessment of areas to identify potential sources of contamination	R	Within authorised landfills or previous industrial sites	This option tunnel is proposed to pass 100m north of Sutton Wick No.1 landfill which is recorded as being licensed to accept inert, industrial, household, special and liquid sludge wastes, and accepted waste from 1981. The indicative outfall extension is shown to be located potentially disturbing the corner of the landfill. There is currently little information available relating to the construction, depth or infrastructure which may be present associated with this landfill and it is assumed, at this stage, that there may be significant effects associated with its disturbance, these may range from risks associated with direct disturbance or disturbance of the ground surrounding the landfill. The following risks should be considered; - landfill gas and leachate pathway disturbance, - waste disturbance - infrastructure disturbance (e.g. liner or pipework) - permitting arrangements - potential for significant costs and programme delays Consultation will be required with regulators to obtain further detail to assist with assessments.	Land
ENV8	Minimise disturbance of land with known potential for Unexploded Ordnance (UXO)	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of a low quantity of UXO which can be easily managed / remediated. Unlikely to have significant cost or program implications	The detailed Zetica desk study (P13129-23-R1) has assessed the area to be low risk, defined as 'There is no positive evidence that UXO is present, but its occurrence cannot be totally discounted'. There are records showing bomb drop locations on and around the options north of Drayton in this low risk area. In a low risk area Zetica recommends 'a UXO briefing for all staff involved in excavations'. Further consultation may be required to determine appropriate mitigation for sub-surface tunnelling. The detailed study doesn't cover the entire eastern extent of the route.	Land
ENV9A	Minimise loss of terrestrial priority habitats (use narrative to describe type and quantum)	Use of aerial imagery, MAGIC maps and Professional Judgement	G	No priority habitat directly impacted by proposed option footprint	The pipeline for Intake/Outfall Option H passes through an area described as 'no main habitats but additional habitats present'. The River Thames is also considered priority habitat. Where the pipeline is underground, habitats should not be impacted.	Biodiversity and Nature Conservation
ENV9B	Minimise loss of aquatic priority habitats (use narrative to describe type and quantum)	Professional judgement based on knowledge of Water Framework Directive.	A	Priority habitat directly impacted but mitigation feasible	As a result of this option, a proportion of the bank of the River Thames will be lost. The options will span 290m of bank however not all of this habitat will be lost. Depending on the design of the intake screen, between 35 - 38m of bank are expected to be lost. The length of habitat lost will need to be mitigated for appropriately.	Aquatic Environment
ENV10A	Reduce effects on North Wessex Downs Area of Outstanding Natural Beauty (AONB) and its setting	Professional judgement.	A	AONB and its setting likely to be affected. Effect is unlikely to be significant.	The introduction of the intake and outfall infrastructure along the River Thames would be unlikely to have a significant effect on the landscape character or tranquillity of the North Wessex Downs AONB due the limited scale of the structures above ground, distance, intervening urban areas and vegetation in the landscape between the AONB and the infrastructure.	Landscape & Visual

ENV10B	Reduce effects on local landscape character	Professional judgement.	R	Effect on local landscape character is likely to be significant.	The introduction of the intake and outfall infrastructure, including the Control Building, could affect the sense of tranquillity along the River Thames and slightly affect the 'openness of the green belt'. The loss of trees along the river could erode a key characteristic which contributes positively to the local landscape character. The effect on local landscape character may potentially be significant long term, given the generally undeveloped character of this area.	Landscape & Visual
ENV11A	Reduce effects on panoramic views from national trail, open access land and important viewpoints in AONB	Professional judgement.	G	Panoramic views from national trail, open access land and important viewpoints in AONB unlikely to be affected or the proposal is likely to be barely discernible in views.	The intake and outfall infrastructure is likely to be barely discernible in panoramic views from The Ridgeway National Trail in the AONB, given the distance and intervening urban areas and vegetation.	Landscape & Visual
ENV11B	Reduce effects on sensitive local visual receptors	Professional judgement.	R	Effect on local views of sensitive visual receptors likely to be significant.	There would be open close-range views from the River Thames and the Thames Path National Trail (which would have to be diverted) and residential properties on the western edge of Culham Conservation Area (inc. the grounds of Culham Manor (grade II* listed building)), looking to the intake and outfall infrastructure, including the Control Building and intake screens/river barrier. Although the views are affected to varying degrees by the presence of pylons and overhead lines, and the effect on some views could be reduced in the long term, most effects could potentially be significant long term given the sensitivity of the visual receptors. However, the infrastructure would be barely discernible in views from the National Cycle Network Route 5 and Vale Way Long Distance Path to due to intervening vegetation.	Landscape & Visual
ENV12	Minimise disturbance/encroachment into Air Quality Management Area (AQMA)	Based on an understanding of the scale and nature of activities, air quality management areas (AQMAs) were identified in close proximity to the proposed works.	G	Site is located further than 1km from AQMA OR no construction traffic must go through an AQMA	Marcham AQMA is approximately 2.2 km NW of Option H at its closest point. Abingdon AQMA is approximately 1.7 km NNW of Option H at its closest point. The anticipated construction and operational activities would likely lead to a negligible change in air quality.	Air Quality
ENV13	Minimise disturbance/encroachment into Groundwater Source Protection Zone (SPZ)	Magic maps	G	Site is within Zone 3 or not within a SPZ	Site is not within an SPZ.	Aquatic Environment
ENV14A	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Cow Common Brook and Portobello Ditch' WFD waterbody (GB106039023360) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14B	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ock and tributaries (Land Brook confluence to Thames)' WFD waterbody (GB106039023430) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14C	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Thames (Evenlode to Thame)' WFD waterbody (GB106039030334) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	A	Moderate adverse impacts likely; low risk to ability to attain Water Framework Directive objectives for this waterbody	This option will impact the River Thames WFD waterbody as a section of the WFD principal waterbody will be lost. The option has the potential to impact the ecological status of the waterbody due to a loss of river bank and riparian habitat. However, this impact is considered to be localised and not at a waterbody scale. Impacts can be easily mitigated.	Aquatic Environment
ENV14D	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Sandford Brook (source to Ock)' WFD waterbody (GB106039023410) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment

ENV14E	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Childrey Brook and Norbrook at Common' WFD waterbody (GB106039023380) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14F	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ginge Brook and Mill Brook' WFD waterbody (GB106039023660) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14G	Option does not affect Water Framework Directive (WFD) Quality Elements within one of WFD waterbodies downstream of the River Thame to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives. These WFD waterbodies include: - Thames Wallingford to Caversham - WFD waterbody GB106039030331 - Thames (Reading to Cookham) - WFD waterbody GB106039023233 - Thames (Cookham to Egham) - WFD waterbody GB106039023231 - Thames (Egham to Teddington) - WFD waterbody GB106039023232	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV15A	Maximise potential for future environmental benefits (terrestrial), e.g. increase tree planting	Professional Judgement	A	Site allows some additional environmental benefits to be realised	No specific space allowed for environmental benefit. Location would remove areas of trees, cropland and riparian vegetation along the Thames.	Biodiversity and nature conservation
ENV16	Maximise flexibility in routing diverted watercourses so their habitats can be of sufficiently high quality to contribute to catchment Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Site allows significant flexibility in routing watercourses / Good or high quality habitat options are available	Option does not impact routing of diverted watercourses.	Aquatic Environment
ENV17	Minimise disturbance/encroachment into Local Geological Sites (LGS)	Desk based assessment of areas to identify potential sources of contamination	G	Site is located more than 250m from LGS	No known geological sites within 250m	Land
ENV18A	Minimise impacts associated with Noise and Vibration as a consequence of the construction of the option	Indicative assessment with noise sensitive sample receptors within RAG bands identified based on predicted construction noise levels during Gate 2 assessment, with updates made to construction activitues at intake / outfall facility. Draft Gate 3 plant list includes a Secondary Lining activity, which will involve the use of concrete batch plant and represents the worst-case activity in the draft Gate 3 plant list. This activity has been used for the optioneering study. The assessment considers five sample receptors, each representing clusters of properties/receptors in the vicinity of the intake / outfall options. The sample receptors are: NV-A: Residential properties on South Quay NV-B: Residential properties west of St Paul's Church, west of The Burycroft road NV-C: Farm east of The Burycroft road NV-D: Location of Moored boats at Marina NV-E: Residential properties north of St Paul's Church, west of The Burycroft road Red band distance is from works site/access road to the SOAEL+5dB, and Amber distance is from SOAEL+5dB to the SOAEL. Road Construction: Red 60m, Amber 61-99m, Green 100m. Construction Traffic (on access road): Red 5m, Amber 6-	R	Significant effects likely which would be difficult to mitigate	The closest sample receptor to the proposed facility at Option H is NV-B at approximately 205m. At this distance, and when considering the predicted construction noise levels at the facility during secondary lining activities, the receptor is predicted to be within the Red band. In total, there are 4 residential receptors which fall into the Red band. Sample receptor NV-E (~330m from the facility) is predicted to be within the Amber band. The proposed access road for Option H would be as close as ~17m to sample receptors NV-E and ~40m to sample receptor NV-B, and as such these sample receptors would be within the Red band during construction of the access road. In total approximately 10 residential properties would fall within the Red band. No significant effects are predicted as a result of construction of the access road or from traffic movements on the proposed access road for Option H. However, construction movements on The Burycroft have the potential to result in adverse effects for Tollgate Cottage, located near to the A415 junction.	Noise
ENV18B	Minimise impacts associated with Noise and Vibration as a consequence of the operation of the option	Quantitative assessment not possible at this time. As such, the option appraisal study has considered the qualitative assessment undertaken at Gate 2 and applies professional judgement in assigning RAG bands to each option under assessment	A	Potential significant effects but likely to be mitigated if they occur	Sample receptor NV-B is ~205m from the facility at Option H. At this distance, it is possible that noise from the facility would be audible during normal operations. However, with the implementation of noise and vibration control measures within the design of the facility, it would be anticipated that significant effects would be avoided.	Noise

ENV19A	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the construction of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	There are between 1 - 10 high sensitivity receptors (i.e. dwellings on 'The Green') within 20 m of the construction route for Option H (i.e. before accessing The Burycroft). There are between 1 - 10 high sensitivity receptors (i.e. dwellings at 'The Green') approximately 210 m E of the main works (i.e. shaft and control building, raised area etc). It is considered that there are no proposed dust-generating construction activities that could not be managed using normal good practices (IAQM construction dust guidance, 2023) to prevent significant effects at any off-site receptor. Given that relatively low numbers of plant and items of machinery would be used and the anticipated number of construction vehicles, the potential effects would likely lead to a negligible change in air quality.	Air Quality
ENV19B	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the operation of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	The likely minimal operational-related traffic (e.g. staff, planned maintenance, repair, refurbishment and replacement events) is such that the potential effects from vehicle emissions would likely lead to a negligible change in air quality at nearby receptors.	Air Quality
ENV20A	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the construction of the option	Professional judgement.	R	Complete or very noticeable changes to visual amenity of local community	Construction activities and traffic associated with the intake and outfall could lead to very noticeable changes to the visual amenity of the local community on the western edge of Culham. This could in part be due to temporary security lighting and/or night-time construction works. There would be little effect on the visual amenity of the communities near Abingdon Marina, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV20B	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the operation of the option	Professional judgement.	A	Noticeable changes to visual amenity of local community	While the effect of operational lighting would be limited, the intake and outfall infrastructure, including the Control Building, could potentially lead to noticeable changes to the visual amenity of the local community on the western edge of Culham, which could be difficult to mitigate. There would be little effect on the visual amenity of the communities near Abingdon Marina, Drayton or Sutton Courtenay due to intervening vegetation.	Landscape & Visual
ENV21A	Minimise impacts associated with solid discharge during construction, e.g. aggregate spills during material transport, sediment runoff from clay erosion due to excavation of the pipeline / tunnel and construction works	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
ENV21B	Minimise impacts associated with solid discharge during operation, e.g. release of sediment into surrounding environment during maintenance such as dredging, debris removal	Professional judgement.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
Community and Planning Considerations						
CPC1	Distance to the nearest property that will stay during construction (metres)	GIS	R	Less than 250m from the nearest property	Intake Outfall Structure - 210m to nearest property Tunnel - 70m to nearest property	Socio-Economic
CPC2	Minimise impacts on local community during construction associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	A	Community access/use of community assets is disrupted during construction	The intake/outfall and access road occupy parts of the Thames Path (a national trail) that allows pedestrians to access the river and enjoy amenity benefits. This is a stretch of national trail/public path that would be significantly altered during construction and operation. Mitigation in the form of a diversion would need to be put in place, otherwise access would be completely severed. Intake/outfall and access road is within 500m of homes and a place of worship. It is reasonable to expect some disruption in form of traffic, potential times of restricted access.	Socio-Economic
CPC3	Minimise impacts on local community during operation associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	A	Community access/use of community assets is disrupted during operation	The intake/outfall and access road would occupy parts of the Thames Path (a national trail) that allows pedestrians to access the river and enjoy amenity benefits. This is a stretch of national trail/public path that would be significantly altered during operation. Mitigation in the form of a diversion would need to be put in place, otherwise access would be completely severed. Intake/outfall and access road is within 500m of homes and a place of worship. During operation it is not expected that there would be significant disruption to these.	Socio-Economic
CPC4A	Are public rights of way (PRoW) disrupted or adversely affected?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	R	Recreational resources / rights of way of national or regional importance are disrupted or affected	The intake/outfall and access road occupy parts of the Thames Path (a national trail) that allows pedestrians to access the river and enjoy amenity benefits. This is a stretch of national trail/public path that would be significantly altered during construction and operation. Mitigation in the form of a diversion would need to be put in place, otherwise access would be completely severed. Intake/outfall and access road is within 500m of homes and a place of worship. It is reasonable to expect some disruption in form of traffic, potential times of restricted access.	Socio-Economic

CPC4B	Are there opportunities to create or improve linkages of Public Rights of Way (PRoW) and recreational routes?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	R	No opportunity to create or enhance PRoW links to recreational resources	The intake/outfall and access road would take the place of the Thames Path (a national trail) that allows pedestrians to access the river and enjoy amenity benefits. This is a stretch of national trail/public path that would be significantly altered during construction and operation. Mitigation in the form of a diversion would need to be put in place, otherwise access would be completely severed.	Socio-Economic
CPC5	Maximise potential opportunity for recreational benefits	GIS analysis of PRoW, open spaces, cycle routes, canals, other forms of regional/nationally important receptors (eg National Cycle Routes), and community assets.	R	Option allows only the minimum recreational benefits to be realised	The intake/outfall and access road occupy parts of the Thames Path (a national trail) that allows pedestrians to access the river and enjoy amenity benefits. This is a stretch of national trail/public path that would be significantly altered during construction and operation. Mitigation in the form of a diversion would need to be put in place, otherwise access would be completely severed. This can be seen as negative impact for those using the Thames Path.	Socio-Economic
CPC6	Support the realisation of socio-economic incentives on SESRO, including employment, skills, tourism, sustainable travel, connecting people with nature and environmental education	GIS analysis of footprint, community assets, private residents, and businesses. Also awareness of overall project objectives is needed to conclude if the designs align with these.	R	Site does not support the social-economic incentives of the overall scheme	The intake/outfall and access road occupy parts of the Thames Path (a national trail) that allows pedestrians to access the river and enjoy amenity benefits. This is a stretch of national trail/public path that would be significantly altered during construction and operation. Mitigation in the form of a diversion would need to be put in place, otherwise access would be completely severed. This can be seen as negative impact for those using the Thames Path.	Socio-Economic
CPC7	Minimise overall SESRO Order Limits extent and land acquisition, without compromising SESRO needs and project benefits	Spatial comparison of land that would likely be included in the DCO Order Limits, including construction working areas, access and highways or PRoW interactions.	A	Requires minor additional Order Limits extent	The majority of the tunnel falls within the land safeguarded for the reservoir (CP14). The control building, raised area, intake screens, outfall weir and access roads, however, all fall outside of the safeguarded land, requiring additional land acquisition and Order Limits extent compared to other options which do stay within this safeguarded land area and on the right bank of the Thames. The control building, raised area, intake/outfall and access roads fall within the South Oxfordshire District.	Consenting
CPC8	Aim for consistency with published and (insofar as possible) emerging Local Plan land use allocations	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in existing and any emerging Local Plan documents and any Supplementary Planning Documents.	G	Low or no impact	The tunnel enters the area safeguarded for the South Abingdon-on-Thames Bypass linking the A415 to the West and South, including a new River Thames Crossing east of the town (Vale of White Horse Local Plan 2031, policy CP12), but may be able to be accommodated alongside any potential road alignment. The intake/outfall and associated structures are outside the area allocated for the bypass and river crossing. No other conflicts with any land use allocations in the South Oxfordshire Local Plan. The tunnel passes through the area of Policy SW1 of the saved policies of the Oxfordshire Minerals and Waste Local Plan 1996. Policy SW1 states that the designated area will be released for sharp sand and gravel extraction. However, much of this area has already been worked with extant gravel pits, so a conflict is not considered likely. The proposed realigned safeguarded area for the Southern Abingdon Movement Corridor in the draft Joint Local Plan 2041 indicates the possibility of the river crossing being further south, adjacent to the Option H intake/outfall structure. Thames Water will seek to engage further with the joint local authorities and with Oxfordshire County Council about the SESRO design to explore options, constraints and opportunities for this policy area, as the Local Plan moves through the consultation and examination process. As this is a draft policy, subject to change, it has been considered alongside (not necessarily superseding) the existing Policy CP12 in this options appraisal and has not altered the conclusion.	Consenting
CPC9	Aim for consistency with any adopted Neighbourhood Plan policy applicable to the land area affected	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in any made Neighbourhood Plan.	G	Low or no impact	All options pass through the area of the Drayton Neighbourhood Plan, which was adopted in 2015. Option G also enters the area of the made Culham NP, adopted in 2023. No conflicts with either NP.	Consenting
CPC10	Avoid development of infrastructure within specifically designated areas or their setting, as applicable (e.g. Green Belt, AONB, Common Land, Open Space)	Spatial comparison with designated sites, their settings, and the nature of development works expected.	A	Requires development of minor above-ground infrastructure within the designation, which is sympathetic with surroundings and access, or likely to have a less than significant impact on the setting (where applicable)	The control building, raised area, access roads, intake screens and outfall weir are within the Green Belt and may be considered inappropriate development as above ground structures. No other constraints such as AONB, Common Land or Open Space.	Consenting
CPC11	Avoid encroachment on any safeguarded land in minerals and waste policy, unless the minerals can be beneficially utilised as a result	Spatial comparison of allocated sites and review of policy wording in existing and any emerging Waste and Minerals Local Plan documents.	A	Potential conflict with development or use of safeguarded minerals or waste allocations	The tunnel passes through the area of Policy SW1 of the saved policies of the Oxfordshire Minerals and Waste Local Plan 1996. Policy SW1 states that designated area will be "released for sharp sand and gravel extraction". Much of the area safeguarded in this policy has already been quarried and restored to lakeside water-related activities but Oday Hill Quarry remains active and could be impacted by this option. However, the extant planning permission for an extension to Oday Quarry approved in February 2023 (OCC ref. MW.0104/20; VoWH ref. P20/V3206/CM) contains Condition 7 requiring a restoration plan that does not prejudice the SESRO project or the Wilts and Berks Canal and Thames Water withdrew its objection to the quarry permission.	Consenting

CPC12	Ability to integrate with existing nationally-significant infrastructure, statutory undertakers' major infrastructure, or any proposed future Nationally Significant Infrastructure Projects (NSIP) (such as that of National Highways, Environment Agency, Network Rail)	Review of NSIP projects on PINS's register; review of Network Rail and National Highways investment plans; spatial review of statutory undertakers' assets.	G	Low or no interaction with existing infrastructure or proposed Nationally Significant Infrastructure Project (NSIP)	No NSIPs currently registered. No known proposals from Network Rail or National Highways. The National Highways RIS3 Investment Plan will be published in 2024 which will detail the A34 improvement project.	Consenting
CPC13	Minimise the consenting complexity due to the need for additional consents and licenses that may be required outside the Development Consent Order (DCO), e.g. additional Flood Risk Activity Permit, Environmental Permit, abstraction/discharge Licence, European protected species licence, etc	Review of the nature of expected development works against the list of other consents and licenses developed at Gateway 2.	A	One or more additional consent/license required	A Land Drainage Consent would be required for works in, over, under or affecting the flow of an ordinary watercourse. A Bespoke Flood Risk Activity Permit will be required for this scale of works on or near a main river. This can be applied for post-DCO. A Temporary Traffic Regulation Order may be required as PRoWs will need to be temporarily closed for construction of the tunnel, although this can potentially be included within the DCO application. Planning consent for the Abingdon STW discharge relocation is expected to be required outside the DCO, but this is applicable to all the options except G.	Consenting
CPC14	Avoid or minimise the need for any consequential development consenting (i.e. displacement or alteration of other development)	Review of existing development within the likely land-take, its nature and scale.	G	No existing development requires planning permission to relocate or alter	The tunnel crosses the A34 and Drayton Road, and Hanson Way National Cycle Route, as do all options. The tunnel also crosses electric lines, telecom lines, gas lines and water lines (most of which are also underground) which could require diversion, but this can form part of the DCO associated development or potentially be delivered through statutory undertaker permitted development. The tunnel passes under Oday Hill Quarry, but the extant planning permission for an extension to Oday Quarry approved in February 2023 (OCC ref. MW.0104/20; VoWH ref. P20/V3206/CM) contains Condition 7 requiring a restoration plan that does not prejudice the SESRO project or the Wilts and Berks Canal and Thames Water withdrew its objection to the quarry permission. Abingdon STW outfall relocation would require planning consent, expected to be outside the DCO, but this is applicable to all the options except G.	Consenting
Property & Land Acquisition						
PRP1	Minimise loss of sensitive properties, e.g. residential, commercial, green belt, common land, historical or community assets due to project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of sensitive properties	Assume construction via TBM; would not detrimentally impact surface uses along tunnel length including Quarry extension at Oday Quarry which incorporates a planning condition to accommodate the project. Tunnelling through land associated with listed buildings at Stonehill farm. Otherwise privately owned land. Construction review may result in increase/decrease of RAG status. Assumed exceptionally low risk of vibration.	Property & Land Acquisition
PRP2	Minimise loss of land allocated within the Local Plan for alternative higher value / social / cultural value uses, i.e. residential, historical or community assets due project delivery	Review Land allocation mapping on ArcGIS.	R	Permanent loss of allocated land for higher value or social value properties	Greenbelt land impacted to the east of the Thames.	Property & Land Acquisition
PRP3	Minimise permanent loss of best and most versatile agricultural land (grades 1, 2 and 3)	Review of agricultural grading layer on ArcGIS, based on 2019 Provisional Agricultural Land Classification	A	Results in loss of any Grade 2 agricultural land or >50% Grade 3 agricultural land	Surface land graded 2 land at over 30%. Assume construction via TBM would not detrimentally agricultural use. Grade 2 = 34% Grade 3 = 54% Grade 4 = 12%	Property & Land Acquisition
PRP4	Assessment of Land and Property asset costs and associated compensation due under the Compensation Code	Review of land use / designation on ArcGIS	A	Land acquisition costs likely to be relatively moderate.	Subsoil values at de minimus. Tunnels N/A based on subsoil value of £50 per interest. Greenbelt land impacted, this may require replacement land within immediate vicinity.	Property & Land Acquisition
PRP5	Assessment of Special Category Land	Review of affected landowners	A	Nature and / or extent Special Category Land is likely to cause moderate consenting risk	Two SCLs possibly identified. Vale of White Horse Council, National Highways.	Property & Land Acquisition
PRP6	Minimise disruptions of landowners access to their land required for temporary works	Review location in conjunction with existing road network	G	Assumption that landowners will be able to access their land during construction and operational phases.	No direct impact on landowners access identified. Assumption that landowners will be able to access their land during construction and operational phases. Crossing of Drayton Rd B4017 may cause general disruption of access between Drayton and Abingdon.	Property & Land Acquisition

Appendix Q. Emergency Discharge Option B Criteria Workbook

Emergency Discharge Option B

Option Description

Criteria code	Criteria Description	Method of Assessment	RAG	Description of RAG	Narrative	Sub-Theme
Constructability						
CON1	Safety - Risk of endangering construction workers or members of the public during construction e.g. water, ground, height, rail, road and utilities	Look at programme and list types of construction involved. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be constructed safely but enhanced control measures required	For Option B, a 4.2m ID TBM tunnel is well suited to a 3-4km long tunnel in stiff clay, albeit underground works have inherent risks which need to be controlled using the correct method and detailed risk assessment. For Option B, there is a need for a separate surface channel (Auxiliary Drawdown Channel) and there are a large amount of surface works and a high number of locations where construction works sites will need to interact with existing infrastructure. However, option B is still considered to be works that can be constructed safely with enhanced control measures applied.	Health and Safety
CON2A	Programme - Duration, longest /shortest, but also consider whether the longer duration has an impact on the overall scheme programme	Compare differences in the programmes which would materialise from different options. Consider earthworks seasons.	A	Likely to extend the duration of the relevant area of works (e.g. road, rail siding or intake/offtake construction) compared to the Gate 2 SESRO programme but unlikely to impact on the critical path of the Gate 2 SESRO programme.	For Option B, the tunnel is likely to have approximately 10% increase in production once the TBM is in cruise mode. This would equate to approximately 2-weeks saving on the overall tunnel programme, compared to the Gate 2 indictive design. A similar 2-week saving can be expected with the 1km length of secondary lining due to the reduced concrete volumes. For Option B, there is a need for a separate surface channel (Auxiliary Drawdown Channel) however the works associated with the ADC are not programme-critical and do not affect the overall construction programme.	Programme
CON2B	Programme - Opportunities for construction programme acceleration through efficiencies	Compare differences in the programmes which would materialise from different options.	A	The option has limited potential to introduce programme efficiencies and reduce the construction programme	While there is potential for a refurbished TBM, the procurement period required is unlikely to be shorter for a smaller TBM (4.2m ID). The smaller TBM (4.2m ID) could have a 10% increase in production, saving 2-weeks on the programme. However this is not considered to be a significant difference between the options.	Programme
CON2C	Programme - Dependencies i.e. proximity or physical relationships between elements of scope that introduce programme dependencies	Is the options on the critical path? Will it impact other critical activities?	R	Multiple major programme dependencies	Whilst the pumping station is being constructed, a components pre-assembly will take place at ground level adjacent to the pumping station. A working area of approximately 1500m2 will be required for this assembly, excluding craneage requirements and other temporary works requirements. The TBM operations will get underway in the pumping station once the base slab is complete and sufficiently cured. The secondary lining can get underway once the TBM has been recovered from the Inlet / Outlet shaft. The recovery will also require an area of approximately 1500m2 , excluding craneage and other temporary facilities (Full area approx. 7500m2). The critical path runs through the embankment construction. The tunnelling and secondary lining works are non-critical, though if the 4-year embankment construction can be improved the tunnelling construction may revert to being critical. For Option B, there is a need for a separate surface channel (Auxiliary Drawdown Channel). This introduces additional programme dependencies, particularly with the crossing of the ADC below the A34 - which will need to be developed in consultation with National Highways. Option B also requires the installing and commissioning of a gated structure at the downstream end of the ADC, which has the potential to create a high programme dependency.	Programme
CON2D	Programme - Risk	Are there items in the construction which have a significant programme risk	A	Moderate programme risk	The main risks associated with the construction programme for the tunnel relate to: unexpected ground conditions and potential breakdown of the Tunnel Boring Machine. Option B also requires the construction of an Auxiliary Drawdown Channel. The main risks associated with the construction programme for the ADC and associated structures relate to: the additional service diversions (e.g. overhead lines), the construction of the A34 box culvert (which requires significant engagement with National Highways) and risks of construction of the ADC (particularly with the final 1km length within the River Thames floodplain), as well as the installing and commissioning of a gated structure at the downstream end of the ADC, which has the potential to create a high programme dependency. These risks can be mitigated with construction programming (and also noting that dependencies are scored against CON2D).	Programme
CON2E	Programme - Use of existing assets to reduce the amount of construction required	Identify if any existing assets can be used	A	Option does not make use of existing assets	Option B does not use existing assets.	Programme
CON3A	Logistics - Space available for construction and materials storage	Determine space constraints using GIS and options layouts from option definition.	A	Limited / restricted space	There is considered to be adequate space for the shafts associated with the underground works. For TBM recovery, Option B requires an area of approximately 1500m2, excluding craneage and other temporary facilities (Full area approx. 7500m2). For Option B, there is a need for a separate surface channel (Auxiliary Drawdown Channel) and therefore an increase in the space needed for construction worksites. While there has been some land safeguarded for the ADC, this will be logistically challenging for Option B. It may also be challenging to establish sufficient space within the cutting of the downstream end of the ADC during construction.	Logistics
CON3B	Logistics - Suitable and efficient access for construction workers, deliveries and waste removal including minimisation of lengths of new roads for access during construction	Determine method of access using GIS and options layouts from option definition.	A	Due to restricted access, an additional length of road is likely required for construction of the option.	There is considered to be adequate space for access required at the shafts for the underground works. For Option B, there is a need for a separate surface channel (Auxiliary Drawdown Channel). This would require temporary haul road construction and would be logistically challenging. For example, the A34 box culvert crossing would need to be undertaken initially, so that a haul road can be established through the culvert to the cutting end of the ADC to allow excavated materials to be transported to the main site for processing/placement.	Logistics
CON3C	Logistics - Import of materials or resources during construction	Use quantity estimates to assess different options.	R	Large amount of import materials required and/or one or several logistical challenges identified for the import of material.	The import of materials for the underground works associated with tunnelling and shafts will largely be to the main SESRO site (with the tunnel being driven from the reservoir to the river). Construction materials for the shaft at the River Intake / Outfall structure, and the secondary lining of the last 1km length of the tunnel would need to be delivered to the River Intake / Outfall Structure site, this is assessed separately. Where there is also a need for an Auxiliary Drawdown Channel there will also need to be an import of materials required for the associated structures (including bridges, locks, box culvert below the A34 and a gated structure). For Option B, there are concrete requirements for the tunnelling and shaft works and for the ADC structures. Resulting in a high total concrete required for Option B as well as a need for sheet piles. This will also be logistically challenging to deliver to multiple worksites.	Logistics
CON3D	Logistics - Haulage distance required for construction materials arrival on site to the placement location	Determine length using GIS and options layouts from option definition.	R	More than two main site locations are used for the construction of the option..	For Option B, there is a need for a separate surface channel (Auxiliary Drawdown Channel) in addition to a tunnel and therefore there are more construction worksites and haulage routes than a tunnel only option. Because of the A34 and B4017 crossings required, as well as the length of the ADC which requires earthworks for construction, Option B is likely to require more than two site compounds for construction.	Logistics
CON3E	Logistics - Vehicle movements	Use vehicle movement estimates to assess different options.	R	Construction works likely to require a large number of vehicle movements and vehicle movements may be difficult.	Construction of a smaller diameter tunnel will require lower concrete volumes for the 1km secondary lining and shaft construction, which will reduce concrete deliveries to this part of the construction site. However, Option B requires the construction of a separate surface channel (Auxiliary Drawdown Channel) and associated structures, which is likely to result in a large number of vehicle movements in total to construct the option.	Logistics
CON4A	Construction Complexity - Temporary conditions/works requirements e.g. embankment slope stability and moisture outside of placement seasons.	Expert Judgement	A	Temporary Works requirements extensive and in some cases complicated and extend the programme	CL : The largest lift for the smaller tunnel would be approximately 40T which would need a 300-350T crane for the TBM launch. A smaller 100T crane would be required to service the shaft. The construction of the ADC and the associated structures will involve a high volume of earthwork vehicle movements and vehicle movements associated with the structures construction within the site limits. The ADC also crosses a high voltage overhead powerline adjacent to Peep O Day Lane, the assumption is that clearances are sufficient to undertake vegetation clearance and earthwork activities.	Construction complexity
CON4B	Construction Complexity - Location conflict/opportunity with another engineering component of the scheme or other SRO/non-SRO schemes, e.g. STT, T2ST, SWOX/Farmoor	Expert judgement and knowledge of surrounding schemes	G	Location / layout of option provides an opportunity to be developed along with another component of this scheme (or another scheme)	Option B includes an Auxiliary Drawdown Channel (ADC) which provides a crossing below the A34 and other roads. The Severn to Thames Transfer (STT) pipeline could be laid along the tow path of the SESRO ADC to help facilitate these crossings. There may also be options for the STT to discharge into the ADC - however, the STT flow will need to be re-oxygenated before discharge into the ADC - this will need to be looked at in further detail in later design stages.	Construction complexity
CON4C	Construction Complexity - Minimise the number and complexity of additional structures/assets required or modifications to the existing structures/assets in order to facilitate the option, e.g. bridges, culverts, crossings	Determine using GIS and options layouts from option definition.	R	Option requires a complex and/or high number of additional structures and/or modifications to existing structures.	For Option B, there is a need for a separate surface channel (Auxiliary Drawdown Channel) in addition to a tunnel and therefore multiple structures would be required (including locks, a gated structure and the A34 box culvert). These structures could introduce significant complexity - particularly for the A34 crossing.	Construction complexity

CON4E	Construction Complexity - Complexity of construction technique e.g. construction of tunnels, ADC or both for the emergency discharge	List out the differences in construction complexity (engineering cost risk & stakeholder interfaces risk). Use expert judgement to decide on the assessment. Compare with inclusions on cost to ensure no double-counting.	A	Moderate construction technique required that carries a moderate risk but risk which is likely mitigable. Examples of moderate risk activities (for intake/outfall) include: Construction across existing gravel pits and/or extension of the tunnel below the River Thames. Examples of moderate risk activities (for emergency discharge) include: construction of structures such as locks, gated structures and box culverts, as well as major road crossings.	For Option B, there is a need for a separate surface channel (Auxiliary Drawdown Channel) in addition to a tunnel and therefore mulitple structures would be required (including locks, a gated structure and the A34 box culvert). These structures introduce additional work and the ADC requires substantial volumes of excavation (680,000m3 total excavation for ADC). Whilst the ADC includes a number of work items, the construction techniques anticipated for the additional works and structures are relatively straightforward.	Construction complexity
CON5A	3rd Party Impact - Potential to disrupt existing road network during enabling works and construction	Expert judgement	R	Disruption likely to be significant	For Option B, there is a need for a separate surface channel (Auxiliary Drawdown Channel) and a tunnel. The A34 crossing, the locks / bridges around Oday Hill and the bridge crossings to the east of the A34 (including the B4017) associated with the surface channel have potential to impact the existing road network during construction.	3rd Party Impact
CON7A	Ground - Terrain of site, and implications for the need for earthworks and engineered slopes	Use of lidar and civil 3D models to assess amount/location of earthworks required	G	Terrain is favourable to the design of assets and therefore reduces the amount of earthworks required	For Option B there is a need for a separate surface channel (Auxiliary Drawdown Channel) which would require significant earthworks including a cutting through Oday Hill either side of the A34 and a wide channel to be excavated within the River Thames floodplain. The presence of Oday Hill provides benefit as it means the A34 does not need to be raised to clear the ADC below.	Construction complexity
CON7B	Ground - Risk of unexpected conditions	Use of expert judgement based on comparable areas	A	Moderate exposure to risk of unexpected ground conditions.	The small diameter and high cover associated with Option B reduces the risk of encountering poorer / unexpected conditions / other strata. For Option B there is a need for a separate surface channel (Auxiliary Drawdown Channel) which requires significant earthworks including a cutting through Oday Hill either side of the A34 and a wide channel to be excavated within the River Thames floodplain. A lower risk of the tunnelling encountering unexpected conditions is considered to be more significant than the additional risks associated with the ADC encountering unexpected conditions. This is based on the floodplain and groundwater levels being taken into account within other criteria.	Construction complexity
CON7C	Ground - Impact of ground conditions on the complexity of design and construction	Use of expert judgement	A	Ground conditions may impact the complexity of design and construction to a limited extent resulting in, for example, increased costs and a requirement for materials that are difficult to source.	Option B includes earthworks for the ADC but it is not expected that there would be difficult or complex ground conditions for this option. This is based on the floodplain and groundwater levels being taken into account within other criteria.	Construction complexity
CON7D	Ground - Risk of ground settlement above line of tunnel affecting other structures/houses	Use of expert judgement	G	No risk of ground settlement affecting other structures	Option B has a risk of ground settlement above the line of the tunnel. At this stage of design, it is considered to be manageable.	Construction complexity
CON8A	STT Integration Complexity - Complexity of integrating STT to the Intake/Outfall Structure	Use of expert judgement	G	For the emergency discharge: Option makes it simple for the STT pipeline to connect to the Intake/Outfall Structure	Option B provides a means for the STT pipeline to cross the A34 and the B4017 making it straightforward to connect to the Intake/Outfall Structure.	STT
Operability						
OPS1A	Safety - Risk of endangering operational staff, visitors or members of the public during operation	Look at operational activities and public access. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be operated safely but enhanced control measures required	For Option B there is a need for a separate surface channel (Auxiliary Drawdown Channel) which is intended to be used as a navigable canal. Therefore there is likely to be a high number of interactions with existing infrastructure and the public, however it is anticipated that these can be sufficiently mitigated with design features.	Health and Safety
OPS1B	Safety - Access and egress for operational staff, visitors, deliveries and waste removal during normal operations and emergencies	Tunnel silt issue to be considered by expert judgement	A	Access/egress can be provided, however it is challenging / restricted	For Option B there is a need for a separate surface channel (Auxiliary Drawdown Channel) in addition to a tunnel and therefore there is a larger area for operational staff to manage, and access would be provided to the ADC for visitors meaning that Option B inherently has more access / egress safety risks to manage than a tunnel only option. In an emergency discharge scenario, the discharge would be passed through both the tunnel and the ADC for Option B, which requires the need for evacuation of an Auxiliary Drawdown Channel.	Health and Safety
OPS2A	Maintenance - Ease of maintenance	Expert judgement	A	Majority of maintenance activities could be undertaken during moderate closure periods and / or with moderate disruption	Option B is considered to require moderate closure periods with moderate disruption.	Operational Complexity
OPS4A	Reliability - Footprint of the option within flood zones (as an indication of the potential for damage and the challenge of operation / maintenance during flood events)	Review GIS supported by expert judgement	A	Option is within the flood zone, however damage is not considered to be a significant risk	For Option B there is a need for a separate surface channel (Auxiliary Drawdown Channel). While the design of the ADC through the River Thames floodplain would need to be developed further, it is expected that it can be designed in a way in which flooding would not be a significant risk.	Operational Resilience
OPS4B	Reliability - The option does not have a single point of failure but rather includes backup infrastructure so that it can remain in operation if the primary infrastructure is unavailable, e.g. siphons in addition to tunnel for emergency discharge or alternative road route to reservoir crest	Expert judgement	A	There is a single point of failure but mitigation measures can be introduced to allow for continued operation, which might be a delayed or reduced service	For Option B there is a tunnel as well as a surface channel (Auxiliary Drawdown Channel (ADC)) and therefore there are two routes for discharging water out of the reservoir. Therefore, for Option B, there is an alternative way for discharging flows from the reservoir (albeit at reduced flow rate), if required during periods where either the tunnel or the ADC is unavailable (e.g. during tunnel maintenance). Although, this would not be sufficient to pass the full emergency discharge. The likelihood of unplanned outage for the tunnel is considered low and the frequency of planned maintenance is considered low.	Operational Resilience
OPS5A	Adaptability - Space available for future expansion of social / recreation infrastructure	Expert judgement	G	Opportunity / adequate space for envisaged expansion	For Option B there is a surface channel (Auxiliary Drawdown Channel) which is proposed to be navigable and form part of a potential future Wilts & Berks Canal. The ADC would allow for canal boats to visit the SESRO site, but would also provide a walking / cycling route. Inclusion in the scheme allows for potential future expansion.	Operational Resilience
OPS6A	Evolvability - Risk to operation from future climate change, e.g. losses from evaporation due to higher temperatures, impact of higher rainfall, intake/outfall flood risk perspective	Expert judgement	A	Option could be slightly impacted by future climate change impact	Option could be slightly impacted by future climate change impact if predictions built into design parameters are underestimated.	Operational Resilience
OPS7A	Sustainability - Reuse of assets or temporary works for permanent items, e.g. materials storage slab, haulage roads, compound car park	Expert judgement	G	Option includes for reuse of assets/temporary works	For Option B there is a surface channel (Auxiliary Drawdown Channel) which is proposed to be navigable and form part of a potential future Wilts & Berks Canal. Dual function increases the sustainability of the option.	Operational Resilience
OPS7B	Operability - Power required for operational energy use	Calculated power requirement for the option	A	Option requires moderate amount of energy to operate	In the Gate 2 indicative design water in the tunnel is required to be replaced every ~4 days during periods of the year when water is not being passed from the river to the reservoir (or vice-versa) to reduce the risk of stagnation. The sweetening flow and therefore the pumping energy required would be considered moderate for Option B. However, it should be noted that sweetening flow pumping is a small percentage of the total annual energy requirement. There is therefore not considered to be a significant difference between the options against this criteria.	Operational Resilience
OPS8A	3rd Party Impact - Potential to disrupt existing road network during operation	Expert judgement	A	Disruption likely to be limited	For Option B, there is a need for a separate surface channel (Auxiliary Drawdown Channel). While the main impact on the road network would be during construction, there would need to be maintenance activities along the ADC, for the A34 crossing, the locks / bridges around Oday Hill and the bridge crossings to the east of the A34 (including the B4017). Therefore there is a potential for Option B to impact the existing road network during operation.	Transport Planning
OPS12A	STT Integration Complexity - Complexity/resilence of operating STT to the Intake/Outfall Structure	Use of expert judgement	G	Emergency discharge: No impact on operating SESRO and/or STT.	Option B with the ADC would enable crossings of the A34 and B4017 that would likely make it possible to maintain the pipeline if needed, as the pipeline would be accessible from the towpath under the roads.	STT
Relative Costs						
COS1	Capex cost of the option	Cost estimate calculation for each option.	A	CAPEX estimated to result in a an increase of >1% and <5% of the CAPEX for the overall SESRO project compared to the lowest cost option	Initial high-level cost estimate indicates that the range in costs for emergency discharge options represent c 3% of total SESRO costs. Option B results in a total project cost of 2.79% more than the lowest cost emergency discharge option.	Cost
COS3	Opportunity for cost-sharing with other SROs, NSIPs and local non-SRO schemes/plans, e.g. STT, T2ST, SWOX/Farmoor, Abingdon flood storage	Cost estimate calculation for each option.	G	Multiple opportunities identified for cost saving.	For the Emergency Discharge an opportunity for sharing costs seems to be present for just STT. Reviewing the connection between SESRO and STT the opportunity is more present for STT. The best saving would be made by Thames Water agreeing that STT can discharge into the SESRO tunnel, so that STT flows discharge to the River Thames either by the tunnel or the ADC.	Cost
Carbon Costs						
CAR1	Carbon costs associated to the Capex of the option	Carbon estimate calculation for each option.	G	Emissions (tCO2e) estimated to result in an increase of <1% of the emissions (tCO2e) for the overall SESRO project compared to the lowest emissions (tCO2e) option	Initial high-level carbon estimate indicates that the range in carbon for emergency discharge options represent c 2.1% of total SESRO carbon. Option B is the lowest carbon emergency discharge option.	Carbon
Environmental Performance						
ENV1A	Minimise impacts on Special Area of Conservation	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SAC's or potential SAC's located within 100m of the ADC and tunnel. The closest SAC to the ADC and tunnel is located approximately 4.6Km to the north-west at Cothill Fen SAC.	Biodiversity and Nature Conservation

ENV1B	Minimise impacts on Special Protection Area	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SPA's or potential SPA's located within 100m of the ADC and tunnel. The closest SPA to the ADC and tunnel is located approximately 40.2Km to the south-east at the Thames Basin Heaths SPA.	Biodiversity and Nature Conservation
ENV1C	Minimise impacts on Ramsar	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no Ramsar sites or potential Ramsar sites located within 100m of the ADC and tunnel. The closest Ramsar to the ADC and tunnel is located approximately 54.5Km to the south-east at the South-west London Waterbodies	Biodiversity and Nature Conservation
ENV1D	Minimise impacts on Site of Special Scientific Interest	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SSSI's or potential SSSI's located within 100m of the ADC and tunnel. The closest SSSI to the ADC and tunnel is located approximately 1.8Km to the north-east at Culham Brake SSSI. The ADC and tunnel is also located within the SSSI Impact Risk Zone for Culham Brake SSSI and Barrow Farm Fen SSSI. Pipelines are included within the list of activities which could have an impact on the Culham Brake SSSI. SSSI IRZ define areas around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts. As the tunnel will be located to the west of the River Thames and Culham Brake SSSI is located to the east, it is considered unlikely there will be any pathways to impact on the SSSI as result of the tunnel excavation.	Biodiversity and Nature Conservation
ENV1E	Minimise impacts on National Nature Reserve	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no NNR's or potential NNR's located within 100m of the ADC and tunnel. The closest NNR to the ADC and tunnel is located approximately 4.7Km to the north-west at Cothill NNR.	Biodiversity and Nature Conservation
ENV1F	Minimise impacts on Local Nature Reserve	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no LNR's or potential LNR's located within 100m of the ADC and tunnel. The closest LNR to the ADC and tunnel is located approximately 3.3Km to the north-east at Abbey Fishponds LNR.	Biodiversity and Nature Conservation
ENV2A	Minimise impacts on Ancient Woodland	Natural England Ancient Woodland Maps and Professional Judgement.	G	No ancient woodland impacted	Historic mapping indicates that there is no ancient woodland present on-site	Biodiversity and Nature Conservation
ENV2B	Minimise impacts on Ancient and Veteran Trees	Woodland Trust Ancient Tree Inventory map search and professional judgement	A	Development in close proximity with potential indirect impact to ancient or veteran trees	There are no ancient or veteran trees recorded by the Woodland Trusts Ancient Tree Inventory on or close to this option. However, survey may identify trees that could be classified as ancient or veteran. As such, this option scores amber on a precautionary basis pending survey.	Biodiversity and Nature Conservation
ENV2C	Minimise impacts on Protected Trees	Check against published TPO dataset.	G	No protected trees impacted	No protected trees would be impacted.	Landscape & Visual
ENV2D	Minimise impacts on vegetation (including trees, woodland, hedges and shrubs)	Check against baseline resources and based upon high level knowledge of site from previous site visits. Professional judgement.	R	Direct impact on vegetation within large proportion of construction footprint, which is of high arboricultural/amenity value (e.g. A or B grade) or biodiversity habitat in good condition.	Construction of the ADC and tunnel will require the removal of habitats including grassland, cropland, woodland, heathland and shrub, hedgerow, lakes / reservoirs and rivers / wet ditches. Protected and notable species associated with these habitats including birds, badgers, bats, invertebrates and reptiles which may be impacted by the proposed works. Construction of the ADC could require the removal of a number of trees and severance of multiple hedgerows, including hedgerow trees, as well as tree belts that are assumed to include several A or B grade trees. The tunnel excavation is assumed to be trenchless and therefore to only affect vegetation at the entry and exit points. No vegetation of arboricultural or visual amenity value would be affected as part of this.	Biodiversity and Nature Conservation and Landscape
ENV3	Minimise impacts on Local Wildlife Sites (LWS)	Professional Judgement and LWS Citation provided by TVERC.	G	No impacts to LWS	There are no LWS's located within 100m of the ADC and tunnel. The closest LWS to the ADC and tunnel is located approximately 1.2Km to the north-west at Marcham Salt Spring LWS.	Biodiversity and Nature Conservation
ENV4A	Minimise impacts on Scheduled monuments or activities which could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	The option lies 90m to the south of the Sutton Wick Settlement Site scheduled monument and setting issues may arise as a result of the ADC, otherwise there will be no change in setting	Historic Environment
ENV4B	Minimise impacts on listed buildings or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	The option lies 190m to the south of two Grade II listed barns and approximately 30m south west of Stonehill House and setting may be an issue	Historic Environment
ENV4C	Minimise impacts on Registered Parks and Garden or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	The Grade II listed Registered Park and Garden of Sutton Courtenay Manor lies 800m to the south-east of the option and it is unlikely setting will be an issue given the designations location in relation to it	Historic Environment
ENV4D	Minimise impacts on Registered Battlefields or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	The Registered Battlefield of Chalgrove 1683 lies over 14km to the east of the option	Historic Environment
ENV4E	Avoid impacts on World Heritage Sites or activities that could lead to a loss of significance, including setting	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	The World Heritage Site of Blenheim Palace lies over 20km to the north-west of the option	Historic Environment
ENV4F	Minimise impacts on conservation areas which could result in loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	The option lies just over 300m west of Culham conservation area and setting will be an issue though intervisibility appears to be limited	Historic Environment
ENV5A	Minimise loss to non-designated built heritage	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Extensive loss of non-designated built heritage of low value within the permanent infrastructure zone and adverse changes to within a 500m area from the edges of the permanent infrastructure OR more limited effects on non-designated built heritage of medium value	No loss of standing non-designated structures identified though buried structural remains of the Wiltshire and Berkshire Canal are present (MOX962)	Historic Environment
ENV5B	Minimise loss to paleoenvironmental remains	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	A	Extensive scale of loss or damage to medium value remains within the construction area and adverse changes to similar buried remains in a 1km area around the permanent infrastructure from temporary and permanent changes to local hydrogeological regimes OR more limited effects on remains of high value	ADC excavation will have an impact on buried organic remains	Historic Environment
ENV5C	Minimise loss to non-designated historic landscapes	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or extensive changes to low value non-designated historic landscapes within the construction area and extensive changes to the setting of the same resource outside the permanent infrastructure OR more limited effects on non-designated historic landscapes of medium value	No loss of known non-designated historic landscapes	Historic Environment

ENV5D	Minimise loss of non-designated archaeological remains	Professional judgement, incorporating the use of the IEMA's Principles of Cultural Heritage Assessment in the UK and the Chartered Institute for Archaeologists standard and guidance document for desk based assessment	G	Permanent infrastructure and construction area will result in the loss and / permanent damage to non-designated buried and extant archaeological remains worthy of local significance which can be adequately mitigated through preservation by record	Loss of part of the historic route of the Wiltshire-Berkshire Canal (MOX962)	Historic Environment
ENV6A	Minimise loss of fluvial flood storage within Flood Zone 2 or 3	Measure using GIS	A	Site is within flood zone 2 and 3 but loss of storage is minor or mitigation is available	Although Option B has been developed to mitigate issues arising from having the ADC located within the Thames floodplain, there remains a potential impact and the operation of the functional floodplain is higher for Option B which includes the ADC. Fluvial flooding is not an issue for the tunnel, however approx. 57% of the ADC is routed through flood zone 2 or 3. Replacement flood storage will need to be established for this loss however, the ADC is linear infrastructure and so the total volume is relatively low.	Flood Risk
ENV6B	Minimise impacts of pluvial flood risk.	Expert judgement	G	No predicted impacts on pluvial flood risk	No significant risk of flooding from surface water	Flood Risk
ENV6C	Minimise impacts of groundwater flood risk.	Checking existing national and local records	G	No predicted impacts on groundwater flood risk	Both options include tunnelling and so will be subject to groundwater dewatering during construction. As both tunnel options are the same, this is not seen as a material differentiator.	Flood Risk
ENV7A	Minimise disturbance of potentially contaminated land	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of potentially contaminated land with one or more of the following properties: - Unlikely to have significant cost or program implications - Unlikely to cause significant harm to potential receptors - Can be easily mitigated and remediated	Both the ADC and Tunnel (4m diameter approx.) are proposed to be excavated through gravel pits/workings, immediately south of Abingdon Sewage Treatment Works. The ADC and tunnel are located 130m and 160m south of the Sutton Wick leachate treatment plant respectively. They both then pass under the current A34. The ADC then passes through fields and a disused (likely infilled) canal, the tunnel passes adjacent to a farm with associated tanks. There may be the potential for unrecorded areas of Made Ground (and hence potential contamination) along the route. The excavations and tunnel may encounter Kimmeridge Clay which may present a risk of hydrocarbon contamination due to potential bituminous content.	Land
ENV7B	Minimise disturbance of potentially contaminated land specifically in relation to authorised and historic landfills	Desk based assessment of areas to identify potential sources of contamination	R	Within authorised landfills or previous industrial sites	Both the main ADC and Tunnel works (4m diameter approx.) are proposed to pass 90m north of Sutton Wick No.1 historic landfill which is recorded as being licensed to accept inert, industrial, household, special and liquid sludge wastes, and accepted waste from 1981. However, the gate structure is shown to clip the corner of the landfill and the earthworks extent is shown to extend to 30m north of the landfill boundary. There is currently little information available relating to the construction, depth or infrastructure which may be present associated with this landfill and it is assumed, at this stage, that there may be significant effects associated with its disturbance, these may range from risks associated with direct disturbance or disturbance of the ground surrounding the landfill. The following risks should be considered; - landfill gas and leachate pathway disturbance, - waste disturbance - infrastructure disturbance (e.g. liner or pipework) - permitting arrangements - potential for significant costs and programme delays Consultation will be required with regulators to obtain further detail to assist with assessments.	Land
ENV8	Minimise disturbance of land with known potential for Unexploded Ordnance (UXO)	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of a low quantity of UXO which can be easily managed / remediated. Unlikely to have significant cost or program implications	The detailed Zetica desk study (P13129-23-R1) has assessed the area to be low risk, defined as 'There is no positive evidence that UXO is present, but its occurrence cannot be totally discounted'. There are records showing bomb drop locations north of Drayton in this low risk area. In a low risk area Zetica recommends 'a UXO briefing for all staff involved in excavations'. Further consultation may be required to determine appropriate mitigation for sub-surface tunnelling.	Land
ENV9A	Minimise loss of terrestrial priority habitats (use narrative to describe type and quantum)	Use of aerial imagery, MAGIC maps and Professional Judgement	R	Priority habitat directly impacted	Construction of the ADC and tunnel will require the removal of priority habitats including Coastal and Floodplain Grazing Marsh and priority habitat which is described as 'no main habitat but additional habitat exists'. There is also potential for small areas of priority deciduous woodland to be impacted in the far west near Mere Dike.	Biodiversity and Nature Conservation
ENV9B	Minimise loss of aquatic priority habitats (use narrative to describe type and quantum)	Professional judgement based on knowledge of Water Framework Directive.	A	Priority habitat directly impacted but mitigation feasible	The inclusion of the ADC within this design means that watercourse length is lost. Watercourse lost will need to be mitigated for, however watercourses that will be lost due to the ADC are suspected to be low quality habitats (heavily influenced by Abingdon STW final effluent). The initial BNG calculations suggest that the required level of BNG would still be reached and therefore no further mitigation should be required. The new canal habitat created is not a priority habitat.	Aquatic Environment
ENV10A	Reduce effects on North Wessex Downs AONB and its setting	Professional judgement.	A	AONB and its setting likely to be affected. Effect is unlikely to be significant.	Once construction had been completed, the introduction of the ADC and tunnel, including the above ground tunnel infrastructure such as the main inlet/outlet tower and pumping station, would be unlikely to have a significant effect on the landscape character or tranquillity of the North Wessex Downs AONB due the low level nature of the channel and mitigation tree and hedgerow planting which could integrate the infrastructure into the local landscape in the long term. The distance, intervening urban areas and vegetation in the landscape between the AONB and the infrastructure would also reduce the effect.	Landscape & Visual
ENV10B	Reduce effects on local landscape character	Professional judgement.	A	Effect on local landscape character is unlikely to be significant.	The introduction of the ADC would help to restore the historic Wilts and Berks canal in the local landscape, albeit along an alternative alignment. While the new channel and towpath would bisect the landscape and slightly alter the landform permanently, it would also provide new connections for recreational access from adjoining PRoWs, the Vale Way Long Distance Path, the National Cycle Network Route 5 and recreational users of the River Thames, enhancing the waterborne recreation and access locally, which is an intrinsic and positive attribute of the floodplain character near the River Thames. The ADC and towpaths would also provide a positive feature within a landscape that is affected by detractors such as the sewage works, pylons and overhead lines. While effects of vegetation loss and changes to the landform may be significant in the short-term, this could be mitigated long term with planting to help to integrate the ADC into the landscape. Overall there would likely be a small beneficial effect associated with this. Due to the trenchless excavation of the tunnel, the tunnel would only affect the local landscape character at either end of the tunnel. Following construction, the presence of the above ground tunnel infrastructure, including the main inlet/outlet tower and pumping station, would affect the local landscape character, mainly at the reservoir end where effects may be significant locally. However, when considering the ADC and tunnel together, the overall effects on local landscape character are not likely to be significant, due to the long-term beneficial effect of the ADC.	Landscape & Visual
ENV11A	Reduce effects on panoramic views from national trail, open access land and important viewpoints in AONB	Professional judgement.	A	Effect on panoramic views from national trail, open access land and important viewpoints in AONB unlikely to be significant.	The ADC is likely to be barely discernible in panoramic views from the Ridgeway National Trail in the AONB, given the distance and intervening urban areas and vegetation. Due to the distance and trenchless excavation of the tunnel, the tunnel construction and infrastructure would only be visible at either end of the tunnel in panoramic views from The Ridgeway National Trail. Due to the localised works and distance, effects on the wide views would be unlikely to be significant.	Landscape & Visual
ENV11B	Reduce effects on sensitive local visual receptors	Professional judgement.	R	Effect on local views of sensitive visual receptors likely to be significant.	There would likely be close-range views from nearby PRoWs which cross the proposed ADC or are in the vicinity of proposed above ground infrastructure at the reservoir end of the tunnel. There could also be intermittent close range views from the Thames Path National Trail, Vale Way Long Distance Path and National Cycle Network Route 5, as well as a range of open or filtered middle-distance views from residential properties on the northern edge of Steventon, north-western and northern edge of Drayton, south-western edge of Caldecott and western edge of Culham Conservation Area. Although the views are affected to varying degrees by the presence of pylons and overhead lines, and the effect on most views could be reduced in the long term, some effects associated with the above ground infrastructure at the reservoir end of the tunnel, could potentially be significant long term given the sensitivity of the visual receptors.	Landscape & Visual
ENV12	Minimise disturbance/encroachment into Air Quality Management Area (AQMA)	Based on an understanding of the scale and nature of activities, air quality management areas (AQMAs) were identified in close proximity to the proposed works.	G	Site is located further than 1km from AQMA OR no construction traffic must go through an AQMA	Marcham AQMA is approximately 1.5 km NNW of Option B at its closest point. Abingdon AQMA is approximately 2 km NNE of Option B at its closest point. The anticipated construction and operational activities would likely lead to a negligible change in air quality.	Air Quality
ENV13	Minimise disturbance/encroachment into Groundwater Source Protection Zone (SPZ)	Magic maps	G	Site is within Zone 3 or not within a SPZ	Site is not within an SPZ.	Aquatic Environment

ENV14A	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Cow Common Brook and Portobello Ditch' WFD waterbody (GB106039023360) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	A	Moderate adverse impacts likely; low risk to ability to attain Water Framework Directive objectives for this waterbody	The inclusion of the ADC within this design means that watercourses in this catchment may be lost or impacted. This includes a crossing on the Mere Dyke main river. Any loss of watercourse or impacts to the hydrological, ecological and/or geomorphological functioning of watercourses will need to be mitigated for appropriately. Assuming mitigation and compensation is put in place at a scheme level, there should be no risk of WFD Deterioration.	Aquatic Environment
ENV14B	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ock and tributaries (Land Brook confluence to Thames)' WFD waterbody (GB106039023430) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	The ADC passes through this waterbody but does not impact any watercourses. Therefore there is no risk of WFD Deterioration.	Aquatic Environment
ENV14C	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Thames (Evenlode to Thame)' WFD waterbody (GB106039030334) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	A	Moderate adverse impacts likely; low risk to ability to attain Water Framework Directive objectives for this waterbody	The inclusion of the ADC within this design means that watercourses in this catchment may be lost or impacted. This includes a crossing on the Oday Ditches main river. Any loss of watercourse or impacts to the hydrological, ecological and/or geomorphological functioning of watercourses will need to be mitigated for appropriately. Assuming mitigation and compensation is put in place at a scheme level, there should be no risk of WFD Deterioration at a WFD water body scale.	Aquatic Environment
ENV14D	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Sandford Brook (source to Ock)' WFD waterbody (GB106039023410) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14E	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Childrey Brook and Norbrook at Common' WFD waterbody (GB106039023380) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14F	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ginge Brook and Mill Brook' WFD waterbody (GB106039023660) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14G	Option does not affect Water Framework Directive (WFD) Quality Elements within one of WFD waterbodies downstream of the River Thame to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives. These WFD waterbodies include: - Thames Wallingford to Caversham - WFD waterbody GB106039030331 - Thames (Reading to Cookham) - WFD waterbody GB106039023233 - Thames (Cookham to Egham) - WFD waterbody GB106039023231 - Thames (Egham to Teddington) - WFD waterbody GB106039023232	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV15A	Maximise potential for future environmental benefits (terrestrial), e.g. increase tree planting	Professional Judgement	G	Site allows substantial additional environmental benefits to be realised	Construction of the ADC offers the opportunity to create riparian habitat. This type of habitat can support numerous species including wading birds, otter and water vole.	Biodiversity and nature conservation
ENV15B	Maximise potential for future environmental benefits (aquatic), e.g. increase wetlands area	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Site allows substantial additional environmental benefits to be realised	The ADC provides additional aquatic habitat, which would have value to fish, macroinvertebrates and plants that prefer still to slow-flowing habitats. The ADC would be categorised as a canal in terms of BNG (and an artificial WFD water body for WFD purposes). According to the latest BNG guidance it cannot be used to mitigate for river or ditch losses elsewhere across the scheme.	Aquatic Environment
ENV16	Maximise flexibility in routing diverted watercourses so their habitats can be of sufficiently high quality to contribute to catchment Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	A	Site allows some flexibility in routing watercourses / Good quality habitat options are available	The ADC will be required to cross the Eastern Watercourse Diversion.	Aquatic Environment
ENV17	Minimise disturbance/encroachment into Local Geological Sites (LGS)	Desk based assessment of areas to identify potential sources of contamination	G	Site is located more than 250m from LGS	No known geological sites within 250m	Land
ENV18A	Minimise impacts associated with Noise and Vibration as a consequence of the construction of the option	Indicative assessment with noise sensitive sample receptors within RAG bands identified based on predicted construction noise levels during Gate 2 assessment (reviewed by M Surley for Gate 3). The assessment considers ten sample receptors, each representing clusters of properties/receptors in the vicinity of the ADC/tunnel options. The sample receptors are: NV-1: Rushey, Mill Road, Marcham NV-2: Meadow Farm House, Mill Road, Narcham NV-3: Residential properties on Whitehorns Way, Drayton NV-4: Residential properties on Lyford, Drayton NV-5: Residential properties on Willow Way, Drayton NV-6: Stable Cottage, Stonehill, Drayton NV-7: Residential properties on Oday Hill, Drayton NV-8: Stonehill House, Stonehill, Drayton NV-9: Residential properties on The Green, Abingdon NV-10: Residential properties on South Quay, Abingdon Red band distance is from works site to the SOAEL+5dB, and Amber distance is from SOAEL+5dB to the SOAEL. Tunnelling: Red 55m, Green 56m (Note: no Amber band used for assessment). ADC Construction (excavation and fill): Red 105m, Amber 106-174m, Green 175m. Piling at Bridges (at ADC): Red 75m, Amber 76-124m	R	Significant effects likely which would be difficult to mitigate	The closest sample receptor to the proposed tunnel alignment at Option B is NV5 (Willow Way), ~80m from the pipeline route. At this distance, and when considering the predicted indicative ground borne noise and vibration levels during tunnelling works, the receptor is predicted to be within the Green band. The closest sample receptors to the proposed ADC are NV6 (Stable Cottage) and NV7 (Oday Hill), both ~90m from the ADC. At these distances, and when considering the predicted construction noise levels during excavation and filling activities, the receptors are predicted to be within the Red band. In total, there are approximately 5 residential receptors that fall into the Red band. The other sample receptors are predicted to fall within the Green band. The closest sample receptor to the proposed ADC bridges is NV7 (~125m). At this distance, and when considering the predicted construction noise levels during piling activities, the receptor is predicted to be within the Amber band. In total, there are approximately 2 residential receptors that fall into the Amber band. The other sample receptors are predicted to fall within the Green band.	Noise
ENV18B	Minimise impacts associated with Noise and Vibration as a consequence of the operation of the option	Quantitative assessment not possible at this time. As such, the option appraisal study has considered the qualitative assessment undertaken at Gate 2 and applies professional judgement in assigning RAG bands to each option under assessment.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Sample receptor NV3 (Whitehorns Way) is ~775m from the proposed pump station at Option B. At this distance, and when considering the location of the A34 road between the receptor and pump station, noise from the facility is very unlikely to be audible during normal operations. With the implementation of noise and vibration control measures within the design of the pump station, it would be anticipated that significant effects would be avoided.	Noise
ENV19A	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the construction of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	There are between 10 - 100 high sensitivity receptors (i.e. dwellings) within 20 m of the construction route for Option B (i.e. along South Quay then Lambrick Way) and there are between 1-10 high sensitivity receptors (i.e. dwellings) approximately 100 m from the works (e.g. ADC paths / levees). It is considered that there are no proposed dust-generating construction activities that could not be managed using normal good practices (IAQM construction dust guidance, 2023) to prevent significant effects at any off-site receptor. Given that relatively low numbers of plant and items of machinery would be used and the anticipated number of construction vehicles, the potential effects would likely lead to a negligible change in air quality.	Air Quality

ENV19B	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the operation of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	The likely minimal operational-related traffic (e.g. staff, planned maintenance, repair, refurbishment and replacement events) is such that the potential effects from vehicle emissions would likely lead to a negligible change in air quality at nearby receptors.	Air Quality
ENV20A	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the construction of the option	Professional judgement.	A	Noticeable changes to visual amenity of local community	Construction activities and traffic associated with the ADC and tunnel could lead to noticeable changes to the visual amenity of the local communities on the northern edge of Steventon, north-western and northern edge of Drayton, south-western edge of Caldecott and western edge of Culham. This could, in part, be due to temporary security lighting and/or night-time construction works.	Landscape & Visual
ENV20B	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the operation of the option	Professional judgement.	A	Noticeable changes to visual amenity of local community	The above ground tunnel infrastructure at the river end of the tunnel, including the main inlet/outlet tower and pumping station and associated operational lighting, would lead to noticeable changes to the visual amenity of the local community on the northern end of Steventon. However, the ADC and assumed associated levels of limited and generally low level lighting, would have little effect on the visual amenity of the local communities once fully integrated into the landscape with planting.	Landscape & Visual
ENV21A	Minimise impacts associated with solid discharge during construction, e.g. aggregate spills during material transport, sediment runoff from clay erosion due to excavation of the pipeline / tunnel and construction works	NA	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Large volumes of excavated material expected from the ADC and tunnel. However, spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
ENV21B	Minimise impacts associated with solid discharge during operation, e.g. release of sediment into surrounding environment during maintenance such as dredging, debris removal	NA	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment in runoff from operation likely to be readily controlled using standard mitigation	Pollution
Community and Planning Considerations						
CPC1	Distance to the nearest property that will stay during construction (metres)	GIS	R	Less than 250m from the nearest property	The closest property that will remain appears to be at Oday Hill. The property is approx. 70m from the ADC and tunnel centrelines.	Socio-Economic
CPC2	Minimise impacts on local community during construction associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	R	Community access/use of community assets is severed, without alternative access, during construction	The ADC and conveyance tunnel pass within 850m of the settlement of Drayton and 800m of Abingdon, which include several schools, public amenities and a community hospital. Both the ADC and tunnel intersect the A34 and Drayton Road, therefore, it is reasonable to expect disruption due to bridge construction, earthworks, tunnel boring and increased traffic from material transport. Diversions are likely to be required which may restrict access to community assets.	Socio-Economic
CPC3	Minimise impacts on local community during operation associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	G	Community access/use of community assets is not disrupted during operation	The ADC and conveyance tunnel pass within 850m of the settlement of Drayton and 800m of Abingdon, which include several schools, public amenities and a community hospital. Both the ADC and tunnel intersect the A34 and Drayton Road. During operation it is reasonable to expect minimal disruption due to bridge, channel and tunnel inspection or maintenance repairs.	Socio-Economic
CPC4A	Are public rights of way disrupted or adversely affected?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	A	Recreational resources / rights of way of local importance are disrupted or affected. The site is likely to affect public rights of way	Footpaths will be severed by the ADC at Oday Hill, west of Drayton Road and west of the A34 near the terminus of the ADC. It is reasonable to assume periods of disruption and/or temporary diversion during construction. During operation no disruption is expected due to bridges providing access in these locations.	Socio-Economic
CPC4B	Are there opportunities to create or improve linkages of Public Rights of Way (PRoW) and recreational routes?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	G	Links to a recreational resource / right of way of national or regional importance can be enhanced	The ADC paths would provide new recreational routes and improve linkages between existing PRoW and to NCN5. Further opportunities could be realised by providing access over the River Thames to join the Thames Path on the east bank.	Socio-Economic
CPC5	Maximise potential opportunity for recreational benefits	GIS analysis of PRoW, open spaces, cycle routes, canals, other forms of regional/nationally important receptors (eg National Cycle Routes), and community assets.	G	Option allows significant additional recreational benefits to be realised	During construction PRoW and NCN5 will be disrupted. However, during operation the ADC paths will provide a new recreational route, linking up existing footpaths as well as the channel itself being a recreational resource. The opportunity to form the eastern end of a future rehabilitated Wilts and Berks Canal would provide significant benefit, particularly if accessible for in-stream navigation/recreation.	Socio-Economic
CPC6	Support the realisation of socio-economic incentives on SESRO, including employment, skills, tourism, sustainable travel, connecting people with nature and environmental education	GIS analysis of footprint, community assets, private residents, and businesses. Also awareness of overall project objectives is needed to conclude if the designs align with these.	G	Site supports the social-economic incentives of the overall scheme	The ADC paths and channel would connect existing routes and create a new recreational asset. The opportunity to form the eastern end of a future rehabilitated Wilts and Berks Canal would support the realisation of multiple socio-economic benefits including tourism, sustainable travel, connecting people with nature and opportunities for environmental education. A revitalised canal could act as a catalyst for development, providing considerable economic and social benefits to surrounding communities.	Socio-Economic
CPC7	Minimise overall SESRO Order Limits extent and land acquisition, without compromising SESRO needs and project benefits	Spatial comparison of land that would likely be included in the DCO Order Limits, including construction working areas, access and highways or PRoW interactions.	A	Requires minor additional Order Limits extent	The ADC remains wholly within the safeguarded area for the reservoir (CP14). The tunnel goes outside this area for a short section and so this part will require different Order Limits extent and land acquisition. Taken together, the ADC and tunnel would require a greater extent of land-take than Option C, but to a limited degree as much of the route is within the general development area of the SESRO site.	Consenting
CPC8	Aim for consistency with published and (insofar as possible) emerging Local Plan land use allocations	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in existing and any emerging Local Plan documents and any Supplementary Planning Documents.	G	Low or no impact	The ADC enters the area safeguarded for the South Abingdon-on-Thames Bypass linking the A415 to the West and South, including a new River Thames Crossing east of the town (Vale of White Horse Local Plan 2031, policy CP12). However, there is overlap in the LP between this policy and the area safeguarded for the reservoir (CP14). The ADC channel would facilitate delivery of the Wilts and Berks Canal under policy DP32. No land use allocation conflicts with the Oxfordshire County Council Minerals and Waste Local Plans. The proposed realigned safeguarded area for the Southern Abingdon Movement Corridor in the draft Joint Local Plan 2041 has been revised such that it would overlap or be adjacent to the canal and tunnel alignment in Option B, including the crossing point for the A34. Thames Water will seek to engage further with the joint local authorities and with Oxfordshire County Council about the SESRO design to explore options, constraints and opportunities for this policy area, as the Local Plan moves through the consultation and examination process. As this is a draft policy, subject to change, it has been considered alongside (not necessarily superseding) the existing Policy CP12 in this options appraisal and has not altered the conclusion.	Consenting
CPC9	Aim for consistency with any adopted Neighbourhood Plan policy applicable to the land area affected	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in any made Neighbourhood Plan.	G	Low or no impact	The ADC and tunnel passes through the area of Drayton Neighbourhood Plan, which is the only made neighbourhood plan in the area. No conflicts with the Drayton NP. The Abingdon-on-Thames NP is being prepared and the Sutton Courtenay NP is being examined.	Consenting
CPC10	Avoid development of infrastructure within specifically designated areas or their setting, as applicable (e.g. Green Belt, AONB, Common Land, Open Space)	Spatial comparison with designated sites, their settings, and the nature of development works expected.	G	Does not require development of above-ground infrastructure within these designations or development likely to have more than a negligible effect on the setting (where applicable)	Not located within a specifically designated area, such as Green Belt, AONB, Common Land or Open Space.	Consenting
CPC11	Avoid encroachment on any safeguarded land in minerals and waste policy, unless the minerals can be beneficially utilised as a result	Spatial comparison of allocated sites and review of policy wording in existing and any emerging Waste and Minerals Local Plan documents.	A	Potential conflict with development or use of safeguarded minerals or waste allocations	The tunnel passes through the area of Policy SW1 of the saved policies of the Oxfordshire Minerals and Waste Local Plan 1996. Policy SW1 states that designated area will be "released for sharp sand and gravel extraction". Much of the area safeguarded in this policy has already been quarried and restored to lakeside water-related activities but Oday Hill Quarry remains active and its working area would need to be replaced by a canal/lakes section for this option. However, the extant planning permission for an extension to Oday Quarry approved in February 2023 (OCC ref. MW.0104/20; VoWH ref. P20/V3206/CM) contains Condition 7 requiring a restoration plan that does not prejudice the SESRO project or the Wilts and Berks Canal and Thames Water withdrew its objection to the quarry permission.	Consenting
CPC12	Ability to integrate with existing nationally-significant infrastructure, statutory undertakers' major infrastructure, or any proposed future Nationally Significant Infrastructure Projects (NSIP) (such as that of National Highways, Environment Agency, Network Rail)	Review of NSIP projects on PINS's register; review of Network Rail and National Highways investment plans; spatial review of statutory undertakers' assets.	A	Negotiation required with existing infrastructure owner / Nationally Significant Infrastructure Project (NSIP) owner/promoter to accommodate scheme	No NSIPs currently registered. No known proposals from Network Rail or National Highways. The National Highways RIS3 Investment Plan will be published in 2024 which will detail the A34 improvement project. The ADC, compared to a tunnel-only Option C, is likely to require more substantial and disruptive works to National Highways' strategic highway infrastructure for the A34 crossing.	Consenting
CPC13	Minimise the consenting complexity due to the need for additional consents and licenses that may be required outside the Development Consent Order (DCO), e.g. additional Flood Risk Activity Permit, Environmental Permit, abstraction/discharge Licence, European protected species licence, etc	Review of the nature of expected development works against the list of other consents and licenses developed at Gateway 2.	A	One or more additional consent/license required	A Land Drainage Consent would be required for works in, over, under or affecting the flow of an ordinary watercourse. A Bespoke Flood Risk Activity Permit will be required for this scale of works on or near a main river. A Temporary Traffic Regulation Order may be required as PRoWs will need to be temporarily closed for construction of the tunnel, although this can potentially be included within the DCO application.	Consenting

CPC14	Avoid or minimise the need for any consequential development consenting (i.e. displacement or alteration of other development)	Review of existing development within the likely land-take, its nature and scale.	G	No existing development requires planning permission to relocate or alter	The ADC passes through the extant planning permission for an extension to Oday Quarry approved in February 2023 (OCC ref. MW.0104/20; VoWH ref. P20/V3206/CM) but the permission contains Condition 7 requiring a restoration plan that does not prejudice the SESRO project or the Wilts and Berks Canal and Thames Water withdrew its objection. The tunnel avoids this, but both tunnel and ADC pass through the existing Oday Quarry area. Both the ADC and tunnel cross the A34 and Drayton Road. Electric lines, telecom lines, gas lines and water lines are also crossed by both ADC and tunnel. Much of these are buried and so would require diversion, but this can form part of the DCO associated development or potentially be delivered through statutory undertaker permitted development. There are no other planning applications affected by this option.	Consenting
Property & Land Acquisition						
PRP1	Minimise loss of sensitive properties, i.e. residential, commercial, green belt, common land, historical or community assets due to project delivery	Review Land allocation mapping on ArcGIS.	A	Moderate or temporary loss of sensitive properties	Surface channel - Potentially 0-2 properties. Predominately privately owned land including Oday Hill Quarry and land associated with Stonehill farm, assumed not to impact the listing curtilage. Construction review may result in increase/decrease of RAG status. Surface channels will have higher level of impact compared to tunnel-only option.	Property & Land Acquisition
PRP2	Minimise loss of land allocated within the Local Plan for alternative higher value / social / cultural value uses, i.e. residential, historical or community assets due project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of allocated land for higher value / social value properties	No allocations.	Property & Land Acquisition
PRP3	Minimise permanent loss of best and most versatile agricultural land (grades 1, 2 and 3)	Review of agricultural grading layer on ArcGIS, based on 2019 Provisional Agricultural Land Classification	A	Results in loss of any Grade 2 agricultural land or >50% Grade 3 agricultural land	Surface land graded 2 land at over 10%. Grade 2 = 11% Grade 3 = 62% Grade 4 = 27%	Property & Land Acquisition
PRP4	Assessment of Land and Property asset costs and associated compensation due under the Compensation Code	Review of land use / designation on ArcGIS	A	Land acquisition costs likely to be moderate. Local or regional business or other facilities affected in addition to agricultural land	Agricultural land value plus potential costs relating to agricultural severance and injurious affection. Surface agricultural values at OMV in the region of £10,000 - £15,000 per acre. Residential values calculated on an individual property basis. Tunnels N/A based on subsoil value of £50 per interest. Severance and injurious affection may be applicable where farming access is disturbed within fields, and potential injurious affection / material detriment for any field areas made inaccessible. Assumed no impact on the curtilage of the listed building due to distance from channel. Residential / site impact assessment may result in increase/decrease of RAG status. Surface channels will have higher level of impact compared to tunnel-only option.	Property & Land Acquisition
PRP5	Assessment of special land considerations, including Special Category Land (SCL), utility infrastructure, national asset protection agencies and Crown bodies	Review of affected landowners	A	Nature and number of SCL is medium / low and may represent delivery risks	Two owners of SCLs identified. Vale of White Horse Council, National Highways.	Property & Land Acquisition
PRP6	Minimise disruptions of landowners access to their land required for temporary works	Review location in conjunction with existing road network	G	Landowners able to access their land during construction and operation phases	Assumption that landowners will be able to access their land during construction and operational phases. Crossing of Drayton Rd B4017 may cause general disruption of access between Drayton and Abingdon.	Property & Land Acquisition

Appendix R. Emergency Discharge Option C Criteria Workbook

Emergency Discharge Option C

Criteria code	Criteria Description	Method of Assessment	RAG	Description of RAG	Narrative	Sub-Theme
Constructability						
CON1	Safety - Risk of endangering construction workers or members of the public during construction e.g. water, ground, height, rail, road and utilities	Look at programme and list types of construction involved. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be constructed safely but enhanced control measures required	For Option C, a 6m ID TBM tunnel is well suited to a 3-4km long tunnel in stiff clay, albeit underground works have inherent risks which need to be controlled using the correct method for each situation and detailed risk assessment. For Option C, there is no need for a separate surface channel (Auxiliary Drawdown Channel), this reduces the amount of required surface works and number of locations where construction works sites will need to interact with existing infrastructure. However, option C is still considered to comprise of works that can be constructed safely with enhanced control measures applied.	Health and Safety
CON2A	Programme - Duration, longest /shortest, but also consider whether the longer duration has an impact on the overall scheme programme	Compare differences in the programmes which would materialise from different options. Consider earthworks seasons.	A	Likely to extend the duration of the relevant area of works (e.g. road, rail siding or intake/offtake construction) compared to the Gate 2 SESRO programme but unlikely to impact on the critical path of the Gate 2 SESRO programme.	Option C is likely to have approximately 10% decrease in production once the TBM is in cruise mode. This would equate to approximately 2-weeks addition on the overall tunnel programme, compared to the Gate 2 indictive design. A similar 2-week addition can be expected with the 1km length of secondary lining due to the concrete volumes.	Programme
CON2B	Programme - Opportunities for construction programme acceleration through efficiencies	Compare differences in the programmes which would materialise from different options.	A	The option has limited potential to introduce programme efficiencies and reduce the construction programme	While there is potential for a refurbished TBM, the procurement period is unlikely to be longer for a larger TBM (6m ID). The larger TBM (6m ID) could have a 10% decrease in production, adding 2-weeks on the programme. However this is not considered to be a significant difference between the options.	Programme
CON2C	Programme - Dependencies i.e. proximity or physical relationships between elements of scope that introduce programme dependencies	Is the options on the critical path? Will it impact other critical activities?	A	Several major dependencies/ multiple minor dependencies	Whilst the pumping station is being constructed, a components pre-assembly will take place at ground level adjacent to the pumping station. An area of approximately 2250m2 will be required for this assembly, excluding craneage requirements. The TBM operations will get underway in the pumping station once the base slab is complete and sufficiently cured. The secondary lining can get underway once the TBM has been recovered from the Inlet / Outlet shaft. The recovery will also require an area of approximately 2250m2 , excluding craneage and other temporary facilities (Full area approx. 9000m2). The critical path runs through the embankment construction. The tunnelling and secondary lining works are non-critical, though if the 4-year embankment construction can be improved the tunnelling construction may revert to being critical.	Programme
CON2D	Programme - Risk	Are there items in the construction which have a significant programme risk	A	Moderate programme risk	The main risks associated with the construction programme for the tunnel relate to: unexpected ground conditions and potential breakdown of the Tunnel Boring Machine.	Programme
CON2E	Programme - Use of existing assets to reduce the amount of construction required	Identify if any existing assets can be used	A	Option does not make use of existing assets	Option does not make use of existing assets	Programme
CON3A	Logistics - Space available for construction and materials storage	Determine space constraints using GIS and options layouts from option definition.	G	Adequate space	There is considered to be adequate space for the shafts associated with the underground works. For TBM recovery, Option C requires an area of approximately 2,250m2, excluding craneage and other temporary facilities (Full area approx. 9000m2). Option C has no surface channel so in general there option requires fewer surface works and less space needed for construction worksites.	Logistics
CON3B	Logistics - Suitable and efficient access for construction workers, deliveries and waste removal including minimisation of lengths of new roads for access during construction	Determine method of access using GIS and options layouts from option definition.	A	Due to restricted access, an additional length of road is likely required for construction of the option.	There is considered to be adequate space for access required at the shafts for the underground works. For Option C, there is no need for a separate surface channel (Auxiliary Drawdown Channel) and therefore this reduces the amount of surface works, the amount of access required to construction worksites, and the amount of temporary haul road construction. However, Option C will generate a large amount of spoil from the tunnel. The spoil will need to be treated with lime to stabilise it for it to be used for landscape fill. Excavated material form the ADC however, will not require such treatment.	Logistics
CON3C	Logistics - Import of materials or resources during construction	Use quantity estimates to assess different options.	A	Moderate amount of import materials required.	The import of materials for the underground works associated with tunnelling and underground works will be to the main SESRO site (with the tunnel being driven from the reservoir to the river). Construction materials for the shaft at the River Intake / Outfall structure, and the secondary lining of the last 1km length of the tunnel would need to be delivered to the River Intake / Outfall Structure site.	Logistics
CON3D	Logistics - Haulage distance required for construction materials arrival on site to the placement location	Determine length using GIS and options layouts from option definition.	G	One main site location is used for construction of the option.	For Option C, there is no need for a separate surface channel (Auxiliary Drawdown Channel) and therefore there are less construction worksites and so the haulage distances are likely to be lower.	Logistics
CON3E	Logistics - Vehicle movements	Use vehicle movement estimates to assess different options.	A	Construction likely to add vehicle movements.	For Option C, the larger diameter tunnel and inlet / outlet shaft (compared with the Gate 2 indicative design) will increase concrete volumes for the 1km secondary lining and shaft construction by approximately 2000m3. This will increase concrete deliveries to this part of the site by approximately 250 using a 8m concrete truck or approximately 334 using a 6m concrete truck. The larger diameter tunnel will also produce greater spoil, requiring a greater nuber of veicles. However, Option C does not require the construction of a separate surface channel (Auxiliary Drawdown Channel) and associated structures, therefore this is likely to result in a lower number of vehicle movements in total.	Logistics
CON4A	Construction Complexity - Temporary conditions/works requirements e.g. embankment slope stability and moisture outside of placement seasons.	Expert Judgement	A	Temporary Works requirements extensive and in some cases complicated and extend the programme	The largest lift for the Option C tunnel would be approximately 60T which would need a 450T crane for the TBM launch. A large enough laydown area for Option C would increase temporary works costs compared to the tunnel in the Gate 2 Indicative design. Option C will not require vehicle movements and temporary works associated with constructing structures on the A34, B4017 and Stonehill Lane. Vehicle movements relating to earthworks and smaller works (such as installation locks, footways etc) associated with constructing an ADC will not be required. There will also be minor impact to 3rd Parties with some construction traffic on the local road network, minor disruption to traffic and local communities and minor land purchase.	Construction complexity

CON4B	Construction Complexity - Location conflict/opportunity with another engineering component of the scheme or other SRO/non-SRO schemes, e.g. STT, T2ST, SWOX/Farmoor	Expert judgement and knowledge of surrounding schemes	G	Location / layout of option provides an opportunity to be developed along with another component of this scheme (or another scheme)	Option C does not include an Auxiliary Drawdown Channel (ADC) and therefore this does not provides a crossing below the A34 and other roads which could help facilitate crossings for the STT pipeline. There may however be options for the STT to discharge into the SESRO tunnel - this will need to be looked at in further detail in later design stages.	Construction complexity
CON4C	Construction Complexity - Minimise the number and complexity of additional structures/assets required or modifications to the existing structures/assets in order to facilitate the option, e.g. bridges, culverts, crossings	Determine using GIS and options layouts from option definition.	G	Option requires no or few additional structures and/or modifications to existing structures. None required are likely to be complex.	For Option C, there is no need for a separate surface channel (Auxiliary Drawdown Channel) as the option is tunnel only. While this reduces construction complexity (particularly for the A34 crossing) the required increase in the size of the pumping station box associated with a larger tunnel size increases complexity for this component of the scheme.	Construction complexity
CON4E	Construction Complexity - Complexity of construction technique e.g. construction of tunnels, ADC or both for the emergency discharge	List out the differences in construction complexity (engineering cost risk & stakeholder interfaces risk). Use expert judgement to decide on the assessment. Compare with inclusions on cost to ensure no double-counting.	A	Moderate construction technique required that carries a moderate risk but risk which is likely mitigable. Examples of moderate risk activities (for intake/outfall) include: Construction across existing gravel pits and/or extension of the tunnel below the River Thames. Examples of moderate risk activities (for emergency discharge) include: construction of structures such as locks, gated structures and box culverts, as well as major road crossings.	For Option C, there is no need for a separate surface channel (Auxiliary Drawdown Channel). While this reduces construction complexity (particularly for the A34 crossing) the required increase in the size of the pumping station box increases complexity for this competent of the scheme.	Construction complexity
CON5A	3rd Party Impact - Potential to disrupt existing road network during enabling works and construction	Expert judgement	A	Disruption likely to be moderate	For Option C, there is no need for a separate surface channel (Auxiliary Drawdown Channel). This removes the need for the A34 crossing, the locks / bridges around Oday Hill and the bridge crossings to the east of the A34 (including the B4017), required in the Gate 2 indicative design, reducing the potential of Option C to impact the existing road network during construction. However, the absence of an Auxiliary Drawdown Channel does remove the opportunity for haul road access along it during construction and, therefore, access to the River Intake / Outfall location would need to be from the B4017, Stonehill Lane and Peep-o-day Lane.	3rd Party Impact
CON7A	Ground - Terrain of site, and implications for the need for earthworks and engineered slopes	Use of lidar and civil 3D models to assess amount/location of earthworks required	G	Terrain is favourable to the design of assets and therefore reduces the amount of earthworks required	Option C is tunnel only and does not require the separate surface channel (Auxiliary Drawdown Channel) which removes the need for significant earthworks including a cutting through Oday Hill either side of the A34 and a wide channel to be excavated within the River Thames floodplain.	Construction complexity
CON7B	Ground - Risk of unexpected conditions	Use of expert judgement based on comparable areas	R	High exposure to risk of unexpected ground conditions.	Option C has a risk of encountering poorer / unexpected conditions / other strata. However, For Option C there is no need for a separate surface channel (Auxiliary Drawdown Channel) which removes the significant earthworks including a cutting through Oday Hill either side of the A34 and a wide channel to be excavated within the River Thames floodplain. A risk of the larger diameter tunnelling encountering unexpected conditions is considered to be more significant than the risks associated with the ADC encountering unexpected conditions.	Construction complexity
CON7C	Ground - Impact of ground conditions on the complexity of design and construction	Use of expert judgement	A	Ground conditions may impact the complexity of design and construction to a limited extent resulting in, for example, increased costs and a requirement for materials that are difficult to source.	It is not expected that there would be difficult or complex ground conditions for this option, but the larger diameter increases the liklihood of encountering materials which are difficult to handle .	Construction complexity
CON7D	Ground - Risk of ground settlement above line of tunnel affecting other structures/houses	Use of expert judgement	A	Risk level acceptable or can be reduced with mitigation	Option C has a risk of ground settlement above the line of the tunnel. At this stage of design, it is considered to be manageable.	Construction complexity
CON8A	STT Integration Complexity - Complexity of integrating STT to the Intake/Outfall Structure	Use of expert judgement	A	For the emergency discharge: Option makes it difficult for the STT pipeline to connect to the Intake/Outfall Structure	Option C does not provide a clear means for the STT pipeline to cross the A34 and the B4017 to connect to the Intake/Outfall Structure. The pipeline would need to be routed under the roads using directional drilling or similar, which would require the installation of drive/reception shafts.	STT
Operability						
OPS1A	Safety - Risk of endangering operational staff, visitors or members of the public during operation	Look at operational activities and public access. Identify any that could potentially score red or amber. Sub-list of activities which would make it amber i.e. Tunnelling = Amber	A	Works can be operated safely but enhanced control measures required	For Option C is tunnel only with minimal anticpated interaction with public. Enhanced measures for flood conditions around inlet / outfall may be required and management of confined space working witin the structures.	Health and Safety
OPS1B	Safety - Access and egress for operational staff, visitors, deliveries and waste removal during normal operations and emergencies	Tunnel silt issue to be considered by expert judgement	G	Access/egress can be provided	For Option C there is no need for a separate surface channel (Auxiliary Drawdown Channel) and therefore there is less area for operational staff to access (and shafts associated with the tunnelling can be fenced off to reduce risk to visitors and the general public). This, means as a tunnel only option, Option C inherently has less access / egress safety risks to manage. In an emergency discharge scenario, the full discharge would be passed through a tunnel in Option C, which removes the need for evacuation of an Auxiliary Drawdown Channel.	Health and Safety
OPS2A	Maintenance - Ease of maintenance	Expert judgement	A	Majority of maintenance activities could be undertaken during moderate closure periods and / or with moderate disruption	Option C is considered to require moderate closure periods with moderate disruption.	Operational Complexity
OPS4A	Reliability - Footprint of the option within flood zones (as an indication of the potential for damage and the challenge of operation / maintenance during flood events)	Review GIS supported by expert judgement	A	Option is within the flood zone, however damage is not considered to be a significant risk	The shaft for Option C is within the floodplain.	Operational Resilience

OPS4B	Reliability - The option does not have a single point of failure but rather includes backup infrastructure so that it can remain in operation if the primary infrastructure is unavailable, e.g. siphons in addition to tunnel for emergency discharge or alternative road route to reservoir crest	Expert judgement	R	There is a single point of failure and no mitigation measures.	For Option C the tunnel provides the only way for discharging water from the reservoir to the river. Therefore, if internal inspections or maintenance was being carried out within the tunnel, water cannot be released from the reservoir until such work is complete. For operational conveyances this is not expected to be an issue given that inspections and planned maintenance will be undertaken when conveyance to/from the river is not required. The likelihood of unplanned maintenance being required coinciding with operational need is deemed very low. In the very unlikely event that an Emergency Drawdown was required whilst the tunnel was being inspected or maintained the tunnel would be evacuated prior to releases – such a short delay is manageable. Note reliance on a single outlet conveyance is common for UK reservoirs.	Operational Resilience
OPS5A	Adaptability - Space available for future expansion of social / recreation infrastructure	Expert judgement	A	Limited opportunity / space available for future expansion (however this expansion is unlikely to be required)	As a tunnel only option, Option C presents little opportunity for potential future expansion.	Operational Resilience
OPS6A	Evolvability - Risk to operation from future climate change, e.g. losses from evaporation due to higher temperatures, impact of higher rainfall, intake/outfall flood risk perspective	Expert judgement	A	Option could be slightly impacted by future climate change impact	Option could be slightly impacted by future climate change impact if predictions built into design parameters are underestimated.	Operational Resilience
OPS7A	Sustainability - Reuse of assets or temporary works for permanent items, e.g. materials storage slab, haulage roads, compound car park	Expert judgement	A	Some potential for reuse of assets/temporary works	Some potential for use of temporary working area around the shaft to be retained in the permanent works.	Operational Resilience
OPS7B	Operability - Power required for operational energy use	Calculated power requirement for the option	A	Option requires moderate amount of energy to operate	Because of the larger diameter tunnel, the pumping energy required to fill the reservoir would be marginally lower for Option C than the Gate 2 Indicative Design, due to lower head loss. However, this is considered to be negligible. IN the Gate 2 Indicative Design water in the tunnel is required to be replaced every ~4 days during periods of the year when water is not being passed from the river to the reservoir (or vice-versa) to reduce the risk of stagnation. The sweetening flow and therefore the pumping energy required for Option C is moderate. However, it should be noted that sweetening flow pumping is a small percentage of the total annual energy requirement. There is therefore not considered to be a significant difference between the options against this criteria.	Operational Resilience
OPS8A	3rd Party Impact - Potential to disrupt existing road network during operation	Expert judgement	G	No disruption likely / possibility of enhancement	For Option C, there is no need for a separate surface channel (Auxiliary Drawdown Channel). It is a tunnel only option therefore there is a low potential to impact the existing road network during operation.	Transport Planning
OPS12A	STT Integration Complexity - Complexity/resilence of operating STT to the Intake/Outfall Structure	Use of expert judgement	A	Emergency discharge: Increases complexity of operating SESRO and/or STT but can be mitigated.	Option C without the ADC would not as provide an easy means of crossings the A34 and B4017 for the STT pipeline. The crossings would likely require sections of pipeline under the roads using inverted siphons, which would potentially make the option more difficult to maintain.	STT
Relative Costs						
COS1	Capex cost of the option	Cost estimate calculation for each option.	G	CAPEX estimated to result in an increase of <1% of the CAPEX for the overall SESRO project compared to the lowest cost option	Initial high-level cost estimate indicates that the range in costs for emergency discharge options represent c 3% of total SESRO costs. Option C is the lowest cost emergency discharge option.	Cost
COS3	Opportunity for cost-sharing with other SROs, NSIPs and local non-SRO schemes/plans, e.g. STT, T2ST, SWOX/Farmoor, Abingdon flood storage	Cost estimate calculation for each option.	G	Multiple opportunities identified for cost saving.	Reviewing the connection between SESRO and STT the opportunity is more present for STT. The best saving would be made by Thames Water agreeing that STT can discharge into the SESRO tunnel, so that STT flows discharge to the River Thames either by the tunnel or the ADC.	Cost
Carbon Costs						
CAR1	Carbon costs associated to the Capex of the option	Carbon estimate calculation for each option.	A	Emissions (tCO2e) estimated to result in an increase of >1% and <5% of the emissions (tCO2e) for the overall SESRO project compared to the lowest emissions (tCO2e) option	Initial high-level carbon estimate indicates that the range in carbon for emergency discharge options represent c 2.1% of total SESRO carbon. Option C results in a total project carbon of 2.1% more than the lowest carbon emergency discharge option.	Carbon
Environmental Performance						
ENV1A	Minimise impacts on Special Area of Conservation	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SAC's or potential SAC's located within 100m of the underground tunnel. The closest SAC to the tunnel is located approximately 4.6Km to the north-west at Cothill Fen SAC.	Biodiversity and Nature Conservation
ENV1B	Minimise impacts on Special Protection Area	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SPA's or potential SPA's located within 100m of the tunnel. The closest SPA to the tunnel is located approximately 40.2Km to the south-east at the Thames Basin Heaths SPA.	Biodiversity and Nature Conservation
ENV1C	Minimise impacts on Ramsar	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no Ramsar sites or potential Ramsar sites located within 100m of the tunnel. The closest Ramsar to the tunnel is located approximately 54.5Km to the south-east at the South-west London Waterbodies	Biodiversity and Nature Conservation
ENV1D	Minimise impacts on Site of Special Scientific Interest	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no SSSI's or potential SSSI's located within 100m of the tunnel. The closest SSSI to the tunnel is located approximately 1.9Km to the north-east at Culham Brake SSSI. The tunnel is also located within the SSSI Impact Risk Zone for Culham Brake SSSI and Barrow Farm Fen SSSI. Pipelines are included within the list of activities which could have an impact on the Culham Brake SSSI. SSSI IRZ define areas around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts. As the tunnel will be located to the west of the River Thames and Culham Brake SSSI is located to the east, it is considered unlikely there will be any pathways to impact on the SSSI as result of the tunnel excavation.	Biodiversity and Nature Conservation
ENV1E	Minimise impacts on National Nature Reserve	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no NNR's or potential NNR's located within 100m of the tunnel. The closest NNR to the tunnel is located approximately 4.7Km to the north-west at Cothill NNR.	Biodiversity and Nature Conservation
ENV1F	Minimise impacts on Local Nature Reserve	Professional Judgement and use of MAGIC maps.	G	No statutory designated sites within 100m of proposed option footprint OR no indirect impact on statutory designated site	There are no LNR's or potential LNR's located within 100m of the tunnel. The closest LNR to the tunnel is located approximately 3.3Km to the north-east at Abbey Fishponds LNR.	Biodiversity and Nature Conservation

ENV2A	Minimise impacts on Ancient Woodland	Natural England Ancient Woodland Maps and Professional Judgement.	G	No ancient woodland impacted	Historic mapping indicates that there is no ancient woodland present on-site	Biodiversity and Nature Conservation
ENV2B	Minimise impacts on Ancient and Veteran Trees	Woodland Trust Ancient Tree Inventory map search and professional judgement	A	Development in close proximity with potential indirect impact to ancient or veteran trees	There are no ancient or veteran trees recorded by the Woodland Trusts Ancient Tree Inventory on or close to this option. However, survey may identify trees that could be classified as ancient or veteran. As such, this option scores amber on a precautionary basis pending survey.	Biodiversity and Nature Conservation
ENV2C	Minimise impacts on Protected Trees	Check against published TPO dataset.	G	No protected trees impacted	No protected trees would be impacted by the tunnel only option.	Landscape & Visual
ENV2D	Minimise impacts on vegetation (including trees, woodland, hedges and shrubs)	Check against baseline resources and based upon high level knowledge of site from previous site visits. Professional judgement.	G	No direct impact on vegetation which is of high arboricultural/amenity value (A or B grade) or biodiversity habitat in good condition. OR Limited direct impact on vegetation which is of lower arboricultural/visual amenity value (e.g. C grade) or biodiversity habitat in poor condition.	Construction of the tunnel will be entirely below ground and will, therefore, not require any vegetation clearance. All above ground habitats will be retained and consequently any protected or notable species associated with those habitats will also be undisturbed. The tunnel excavation is assumed to be trenchless and therefore would only affect vegetation at the entry and exit points. No vegetation of arboricultural or visual amenity value would be affected.	Biodiversity and Nature Conservation and Landscape
ENV3	Minimise impacts on Local Wildlife Sites (LWS)	Professional Judgement and LWS Citation provided by TVERC.	G	No impacts to LWS	There are no LWS's located within 100m of the tunnel. The closest LWS to the tunnel is located approximately 2.1 Km to the north-west at Marcham Salt Spring LWS.	Biodiversity and Nature Conservation
ENV4A	Minimise impacts on Scheduled monuments or activities which could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	The nearest above-ground structures relating to this option lie 1.4km from the Sutton Wick Settlement Site scheduled monument. There will be no implications arising from the tunnel itself. However, they are 360m from the scheduled Dovecote in Culham so there is the potential for setting effects	Historic Environment
ENV4B	Minimise impacts on listed buildings or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	The nearest above-ground structures associated with this option lie 360m west of the nearest listed building: the Grade II* listed Dovecote 75m west of Culham Manor (NHLE 1059793) in Culham. There is the potential for changes to setting from the above ground structures but none from the tunnel.	Historic Environment
ENV4C	Minimise impacts on Registered Parks and Garden or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	The Sutton Courtenay Registered Park and Garden (NHLE 1001107) lies 650m south east of the option's above-ground structures. Setting is unlikely to be an issue and there will be no effects arising from the tunnel	Historic Environment
ENV4D	Minimise impacts on Registered Battlefields or activities that could lead to a loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	The Battle of Chalgrove 1643 Registered Battlefield lies over 14km east of the option	Historic Environment
ENV4E	Avoid impacts on World Heritage Sites or activities that could lead to a loss of significance, including setting	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Permanent infrastructure more than 500m from designated heritage asset and/or no likely setting effects. Construction area not located within 100m of designated heritage assets	The Blenheim Palace World Heritage Site lies over 20km north-west of the option	Historic Environment
ENV4F	Minimise impacts on conservation areas which could result in loss of significance	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	A	Permanent infrastructure within 500m of designated heritage asset with potential for setting effects. Construction area located within designated heritage asset; mitigation may be required but option still feasible	The Culham conservation area lies 335m from the option's above-ground structures. Given the topography and vegetation visual setting is unlikely to be a major issue in terms of visual intrusion and there will be no such issues from the tunnel	Historic Environment
ENV5A	Minimise loss to non-designated built heritage	Professional judgement, incorporating Historic England's Good Practice Advice Note no.3 regarding the setting of heritage assets	G	Extensive loss of non-designated built heritage of low value within the permanent infrastructure zone and adverse changes to within a 500m area from the edges of the permanent infrastructure OR more limited effects on non-designated built heritage of medium value	No non-designated structures identified in the HER dataset affected by this option	Historic Environment
ENV5B	Minimise loss to paleoenvironmental remains	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or damage to low value remains within the construction area and adverse changes to similar buried remains in a 1km area around the permanent infrastructure from temporary and permanent changes to local hydrogeological regimes OR more limited effects on remains of medium value	Probable loss of some buried paleoenvironmental remains at the locations of the above ground structures and possibly within the River Thames flood plain from the bored tunnel	Historic Environment
ENV5C	Minimise loss to non-designated historic landscapes	Professional judgement, based on Historic England's guidance on the establishing the significance of heritage assets	G	Extensive scale of loss or extensive changes to low value non-designated historic landscapes within the construction area and extensive changes to the setting of the same resource outside the permanent infrastructure OR more limited effects on non-designated historic landscapes of medium value	No loss of non-designated historic landscapes has been identified	Historic Environment
ENV5D	Minimise loss of non-designated archaeological remains	Professional judgement, incorporating the use of the IEMA's Principles of Cultural Heritage Assessment in the UK and the Chartered Institute for Archaeologists standard and guidance document for desk based assessment	G	Permanent infrastructure and construction area will result in the loss and / permanent damage to non-designated buried and extant archaeological remains worthy of local significance which can be adequately mitigated through preservation by record	Some known archaeological assets likely to be affected such as earthworks (MOX10452) and a concentration of archaeological cropmarks likely denoting a settlement site at the western end of the option. The tunnel should not affect archaeological remains	Historic Environment
ENV6A	Minimise loss of fluvial flood storage within Flood Zone 2 or 3	Measure using GIS	G	Site is outside flood zone 2 and 3	Fluvial flooding is not an issue for the tunnel only option.	Flood Risk
ENV6B	Minimise impacts of pluvial flood risk.	Expert judgement	G	No predicted impacts on pluvial flood risk	No significant risk of flooding from surface water	Flood Risk

ENV6C	Minimise impacts of groundwater flood risk.	Checking existing national and local records	G	No predicted impacts on groundwater flood risk	Both options include tunnelling and so will be subject to groundwater dewatering during construction. As both tunnel options are the same, this is not seen as a material differentiator.	Flood Risk
ENV7A	Minimise disturbance of potentially contaminated land	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of potentially contaminated land with one or more of the following properties: -Unlikely to have significant cost or program implications -Unlikely to cause significant harm to potential receptors -Can be easily mitigated and remediated	The proposed tunnel (larger diameter approx. 6m) is proposed to be excavated through gravel pits/workings, immediately south of Abingdon Sewage Treatment Works. The proposed tunnel is located 160m south of the Sutton Wick leachate treatment plant, it then passes under the current A34 and then adjacent to a farm with associated tanks. A larger volume of Kimmeridge Clay would be produced as arisings from the tunnel boring if the larger diameter tunnel option was chosen, meaning potentially more bituminous material to manage. The volume is unlikely to cause contamination issues but should be considered in terms of material management.	Land
ENV7B	Minimise disturbance of potentially contaminated land specifically in relation to authorised and historic landfills	Desk based assessment of areas to identify potential sources of contamination	R	Within authorised landfills or previous industrial sites	The proposed tunnel (larger diameter approx. 6m) is proposed to pass 90m north of Sutton Wick No.1 historic landfill which is recorded as being licensed to accept inert, industrial, household, special and liquid sludge wastes, and accepted waste from 1981. There is currently little information available relating to this landfill and the potential for landfill gases and leachate to be encountered within the surrounding area. Consultation will be required with regulators to obtain further detail to assist with assessments.	Land
ENV8	Minimise disturbance of land with known potential for Unexploded Ordnance (UXO)	Desk based assessment of areas to identify potential sources of contamination	A	Disturbance of a low quantity of UXO which can be easily managed / remediated. Unlikely to have significant cost or program implications	The detailed Zetica desk study (P13129-23-R1) has assessed the area to be low risk, defined as 'There is no positive evidence that UXO is present, but its occurrence cannot be totally discounted'. There are records showing bomb drop locations north of Drayton in this low risk area. In a low risk area Zetica recommends 'a UXO briefing for all staff involved in excavations'. Further consultation may be required to determine appropriate mitigation for sub-surface tunnelling.	Land
ENV9A	Minimise loss of terrestrial priority habitats (use narrative to describe type and quantum)	Use of aerial imagery, MAGIC maps and Professional Judgement	G	No priority habitat directly impacted by proposed option footprint	The tunnel will be located entirely below the surface of the ground, therefore no priority habitat will be impacted by the proposed works. Any shaft locations should be situated outside of priority habitat.	Biodiversity and Nature Conservation
ENV9B	Minimise loss of aquatic priority habitats (use narrative to describe type and quantum)	Professional judgement based on knowledge of Water Framework Directive.	G	No priority habitat directly impacted by proposed option footprint	No priority habitat will be directly impacted by the proposed option.	Aquatic Environment
ENV10A	Reduce effects on North Wessex Downs AONB and its setting	Professional judgement.	A	AONB and its setting likely to be affected. Effect is unlikely to be significant.	Due to the distance and trenchless excavation of the tunnel, there would only be intervisibility between the North Wessex Downs AONB and the tunnel construction and infrastructure at either end of the tunnel. Following construction, the above ground tunnel infrastructure, including the main inlet/outlet tower and pumping station, would be unlikely to have a significant effect on the landscape character and tranquillity of the AONB.	Landscape & Visual
ENV10B	Reduce effects on local landscape character	Professional judgement.	R	Effect on local landscape character is likely to be significant.	Due to the trenchless excavation of the tunnel, the tunnel would only affect the local landscape character at either end of the tunnel. Following construction, the presence of the above ground tunnel infrastructure, including the main inlet/outlet tower and pumping station, would affect the local landscape character, mainly at the reservoir end where effects may be significant locally.	Landscape & Visual
ENV11A	Reduce effects on panoramic views from national trail, open access land and important viewpoints in AONB	Professional judgement.	A	Effect on panoramic views from national trail, open access land and important viewpoints in AONB unlikely to be significant.	Due to the distance and trenchless excavation of the tunnel, the tunnel construction and infrastructure would only be visible at either end of the tunnel in panoramic views from The Ridgeway National Trail. Due to the localised works and distance, effects on the wide views would be unlikely to be significant.	Landscape & Visual
ENV11B	Reduce effects on sensitive local visual receptors	Professional judgement.	R	Effect on local views of sensitive visual receptors likely to be significant.	There would be open views of the tunnel construction and above ground infrastructure at either end of the tunnel, including the main inlet/outlet tower and pumping station, in open views from local PRoWs at the reservoir end and filtered views from the Thames Path National Trail, National Cycle Network Route 5 and Vale Way Long Distance Path at the river end. Although such views are affected to varying degrees by the presence of pylons and overhead lines, the effect could potentially be significant given the sensitivity of the visual receptors.	Landscape & Visual
ENV12	Minimise disturbance/encroachment into Air Quality Management Area (AQMA)	Based on an understanding of the scale and nature of activities, air quality management areas (AQMAs) were identified in close proximity to the proposed works.	G	Site is located further than 1km from AQMA OR no construction traffic must go through an AQMA	Marcham AQMA is approximately 1.5 km NNW of Option B at its closest point. Abingdon AQMA is approximately 2 km NNE of Option B at its closest point. The anticipated construction and operational activities would likely lead to a negligible change in air quality.	Air Quality
ENV13	Minimise disturbance/encroachment into Groundwater Source Protection Zone (SPZ)	Magic maps	G	Site is within Zone 3 or not within a SPZ	Site is not within an SPZ.	Aquatic Environment

ENV14A	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Cow Common Brook and Portobello Ditch' WFD waterbody (GB106039023360) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14B	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ock and tributaries (Land Brook confluence to Thames)' WFD waterbody (GB106039023430) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14C	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Thames (Evenlode to Thame)' WFD waterbody (GB106039030334) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14D	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Sandford Brook (source to Ock)' WFD waterbody (GB106039023410) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14E	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Childrey Brook and Norbrook at Common' WFD waterbody (GB106039023380) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14F	Option does not affect Water Framework Directive (WFD) Quality Elements within the 'Ginge Brook and Mill Brook' WFD waterbody (GB106039023660) to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV14G	Option does not affect Water Framework Directive (WFD) Quality Elements within one of WFD waterbodies downstream of the River Thame to a degree that there is a risk of deterioration; or compromise the ability to attain Water Framework Directive objectives. These WFD waterbodies include: - Thames Wallingford to Caversham - WFD waterbody GB106039030331 - Thames (Reading to Cookham) - WFD waterbody GB106039023233 - Thames (Cookham to Egham) - WFD waterbody GB106039023231 - Thames (Egham to Teddington) - WFD waterbody GB106039023232	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Minor adverse impacts likely; no risk to attaining Water Framework Directive objectives for this waterbody	No risk of WFD deterioration - This waterbody is not directly impacted by the option.	Aquatic Environment
ENV15A	Maximise potential for future environmental benefits (terrestrial), e.g. increase tree planting	Professional Judgement	A	Site allows some additional environmental benefits to be realised	No specific space allowed for environmental benefit as the tunnel will be underground.	Biodiversity and nature conservation
ENV15B	Maximise potential for future environmental benefits (aquatic), e.g. increase wetlands area	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	A	Site allows some additional environmental benefits to be realised	This option does not provide any environmental benefits to the scheme.	Aquatic Environment

ENV16	Maximise flexibility in routing diverted watercourses so their habitats can be of sufficiently high quality to contribute to catchment Water Framework Directive objectives	Professional judgement based on knowledge of Water Framework Directive and Biodiversity Net Gain legislation	G	Site allows significant flexibility in routing watercourses / Good or high quality habitat options are available	Option does not impact routing of diverted watercourses.	Aquatic Environment
ENV17	Minimise disturbance/encroachment into Local Geological Sites (LGS)	Desk based assessment of areas to identify potential sources of contamination	G	Site is located more than 250m from LGS	No known geological sites within 250m	Land
ENV18A	Minimise impacts associated with Noise and Vibration as a consequence of the construction of the option	Indicative assessment with noise sensitive sample receptors within RAG bands identified based on predicted construction noise levels during Gate 2 assessment (reviewed by M Surley for Gate 3). The assessment considers ten sample receptors, each representing clusters of properties/receptors in the vicinity of the ADC/tunnel options. The sample receptors are: NV-1: Rushey, Mill Road, Marcham NV-2: Meadow Farm House, Mill Road, Narcham NV-3: Residential properties on Whitehorns Way, Drayton NV-4: Residential properties on Lyford, Drayton NV-5: Residential properties on Willow Way, Drayton NV-6: Stable Cottage, Stonehill, Drayton NV-7: Residential properties on Oday Hill, Drayton NV-8: Stonehill House, Stonehill, Drayton NV-9: Residential properties on The Green, Abingdon NV-10: Residential properties on South Quay, Abingdon Red band distance is from works site to the SOAEL+5dB, and Amber distance is from SOAEL+5dB to the SOAEL. Tunnelling: Red 55m, Green 56m (Note: no Amber band used for assessment). ADC Construction (excavation and fill): Red 105m, Amber 106-174m, Green 175m. Piling at Bridges (at ADC): Red 75m, Amber 76-124m	G	Impacts unlikely, or adverse impacts are likely to be mitigated if they occur	The closest sample receptor to the proposed tunnel alignment at Option C is NV5 (Willow Way), ~80m from the pipeline route. At this distance, and when considering the predicted indicative ground borne noise and vibration levels during tunnelling works, the receptor is predicted to be within the Green band.	Noise
ENV18B	Minimise impacts associated with Noise and Vibration as a consequence of the operation of the option	Quantitative assessment not possible at this time. As such, the option appraisal study has considered the qualitative assessment undertaken at Gate 2 and applies professional judgement in assigning RAG bands to each option under assessment.	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Sample receptor NV3 (Whitehorns Way) is ~775m from the proposed pump station at Option C. At this distance, and when considering the location of the A34 road between the receptor and pump station, noise from the facility is very unlikely to be audible during normal operations. With the implementation of noise and vibration control measures within the design of the pump station, it would be anticipated that significant effects would be avoided.	Noise
ENV19A	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the construction of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	It is considered that there are no proposed dust-generating construction activities that could not be managed using normal good practices (IAQM construction dust guidance, 2023) to prevent significant effects at any off-site receptor. Given that relatively low numbers of plant and items of machinery would be used on the surface and the anticipated number of construction vehicles, the potential effects would likely lead to a negligible change in air quality.	Air Quality
ENV19B	Minimise impacts associated with Air Quality including dust, smell, fumes and smoke as a consequence of the operation of the option	Based on an understanding of the scale and nature of activities, sensitive receptors were identified in close proximity to the proposed works.	G	Based on the on the scale of the activities and number, proximity and sensitivity of nearby sensitive receptors (including the nearby Marcham AQMA), the potential for a significant effect is unlikely / air quality impacts are negligible. An appropriate level of mitigation may still be required to reduce risk of impacts occurring.	The likely minimal operational-related traffic (e.g. staff, planned maintenance, repair, refurbishment and replacement events) is such that the potential effects from vehicle emissions would likely lead to a negligible change in air quality at nearby receptors.	Air Quality
ENV20A	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the construction of the option	Professional judgement.	A	Noticeable changes to visual amenity of local community	The tunnel excavation would require 24/7 working, mainly from the reservoir end and occasionally from the outfall/intake end. As such, construction activities associated with the tunnel excavation, including lighting, could lead to noticeable changes in the visual amenity of the local community on the northern end of Steventon and eastern edge of Culham. However, there would be little effect on Drayton due to intervening vegetation along the A34 which would provide screening.	Landscape & Visual
ENV20B	Minimise impacts associated with Visual Amenity including light pollution, as a consequence of the operation of the option	Professional judgement.	A	Noticeable changes to visual amenity of local community	The above ground tunnel infrastructure at the river end of the tunnel, including the main inlet/outlet tower and pumping station and associated operational lighting, would lead to noticeable changes to the visual amenity of the local community on the northern end of Steventon. However, there would be little effect on Culham, due to the limited infrastructure visible above ground, and Drayton, due to intervening vegetation along the A34 which would provide screening.	Landscape & Visual
ENV21A	Minimise impacts associated with solid discharge during construction, e.g. aggregate spills during material transport, sediment runoff from clay erosion due to excavation of the pipeline / tunnel and construction works	NA	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Large volumes of excavated material expected from the tunnel. However, spillages of solids and sediment in runoff from construction likely to be readily controlled using standard construction mitigation	Pollution
ENV21B	Minimise impacts associated with solid discharge during operation, e.g. release of sediment into surrounding environment during maintenance such as dredging, debris removal	NA	G	Impacts unlikely, or adverse impacts likely to be mitigated if they occur	Spillages of solids and sediment from operation likely to be readily controlled using standard mitigation	Pollution
Community and Planning Considerations						
CPC1	Distance to the nearest property that will stay during construction (metres)	GIS	R	Less than 250m from the nearest property	The closest property that will reamin appears to be at Oday Hill. The property is approx. 70m from the ADC and tunnel centrelines.	Socio-Economic

CPC2	Minimise impacts on local community during construction associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	A	Community access/use of community assets is disrupted during construction	The conveyance tunnel passes within 800m of the settlement of Drayton and 850m of Abingdon which include several schools, public amenities and a community hospital. The tunnel intersects the A34 and Drayton Road therefore it is reasonable to expect disruption due to tunnel boring and increased traffic from material transport. Temporary diversions may be required which may restrict access to community assets.	Socio-Economic
CPC3	Minimise impacts on local community during operation associated with disturbances of community assets such as schools, hospitals, GP surgeries, schools, libraries, youth centres, Country Parks, allotments, green open spaces and disruptions to recreation	GIS analysis of footprint, community assets, and links with residences.	G	Community access/use of community assets is not disrupted during operation	The conveyance tunnel passes within 800m of the settlement of Drayton and 850m of Abingdon, which include several schools, public amenities and a community hospital. The tunnel intersects the A34 and Drayton Road. During operation it is reasonable to expect minimal disruption due to tunnel inspection or maintenance repairs.	Socio-Economic
CPC4A	Are public rights of way disrupted or adversely affected?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	G	No recreational resource / right of way are disrupted or affected. Sites with no recreational activities	The conveyance tunnel intersects footpaths at Oday Hill, west of Drayton Road and west of the A34 near the terminus of the ADC. NCN5 is intersected at Peep-o-day Lane. It is reasonable to assume minimal disruption during construction to allow for temporary works access. During operation no disruption is expected.	Socio-Economic
CPC4B	Are there opportunities to create or improve linkages of Public Rights of Way (PRoW) and recreational routes?	GIS analysis of PRoW, open spaces, cycle routes, canals and other forms of regional or nationally important receptors (eg National Cycle Routes).	R	No opportunity to create or enhance PRoW links to recreational resources	No opportunities to create or improve linkages to recreational routes are identified.	Socio-Economic
CPC5	Maximise potential opportunity for recreational benefits	GIS analysis of PRoW, open spaces, cycle routes, canals, other forms of regional/nationally important receptors (eg National Cycle Routes), and community assets.	R	Option allows only the minimum recreational benefits to be realised	No opportunities to maximise recreational benefits are identified.	Socio-Economic
CPC6	Support the realisation of socio-economic incentives on SESRO, including employment, skills, tourism, sustainable travel, connecting people with nature and environmental education	GIS analysis of footprint, community assets, private residents, and businesses. Also awareness of overall project objectives is needed to conclude if the designs align with these.	R	Site does not support the social-economic incentives of the overall scheme	No opportunities to support the realisation of socio-economic incentives are identified.	Socio-Economic
CPC7	Minimise overall SESRO Order Limits extent and land acquisition, without compromising SESRO needs and project benefits	Spatial comparison of land that would likely be included in the DCO Order Limits, including construction working areas, access and highways or PRoW interactions.	G	Requires minimum Order Limits extent	The overall land-take for Option C is likely to be lower than Option B due to not requiring the separate ADC, and may involve more limited acquisition of permanent rights due to the tunnel being below ground.The tunnel route does run partially outside the area safeguarded for the reservoir (CP14) in the Vale of White Horse Local Plan for a short section and so will different additional Order Limits extent and land acquisition, but this is also true of Option B.	Consenting
CPC8	Aim for consistency with published and (insofar as possible) emerging Local Plan land use allocations	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in existing and any emerging Local Plan documents and any Supplementary Planning Documents.	G	Low or no impact	The tunnel enters the area safeguarded for the South Abingdon-on-Thames Bypass linking the A415 to the West and South, including a new River Thames Crossing east of the town (Vale of White Horse Local Plan 2031, policy CP12). However, as it will be buried, no conflicts are expected with this policy. No land use allocation conflicts with the Oxfordshire County Council Minerals and Waste Local Plans. The proposed realigned safeguarded area for the Southern Abingdon Movement Corridor in the draft Joint Local Plan 2041 has been revised such that it would overlap or be adjacent to the tunnel alignment in Option C, including the crossing point for the A34. Thames Water will seek to engage further with the joint local authorities and with Oxfordshire County Council about the SESRO design to explore options, constraints and opportunities for this policy area, as the Local Plan moves through the consultation and examination process. As this is a draft policy, subject to change, it has been considered alongside (not necessarily superseding) the existing Policy CP12 in this options appraisal and has not altered the conclusion.	Consenting
CPC9	Aim for consistency with any adopted Neighbourhood Plan policy applicable to the land area affected	Spatial comparison of allocated sites and other policy areas, and review of policy wording, in any made Neighbourhood Plan.	G	Low or no impact	The tunnel passes through the area of Drayton Neighbourhood Plan, which is the only made neighbourhood plan in the area. No conflicts with the Drayton NP. The Abingdon-on-Thames NP is being prepared and the Sutton Courtenay NP is being examined.	Consenting
CPC10	Avoid development of infrastructure within specifically designated areas or their setting, as applicable (e.g. Green Belt, AONB, Common Land, Open Space)	Spatial comparison with designated sites, their settings, and the nature of development works expected.	G	Does not require development of above-ground infrastructure within these designations or development likely to have more than a negligible effect on the setting (where applicable)	Not located within a specifically designated area, such as Green Belt, AONB, Common Land or Open Space.	Consenting
CPC11	Avoid encroachment on any safeguarded land in minerals and waste policy, unless the minerals can be beneficially utilised as a result	Spatial comparison of allocated sites and review of policy wording in existing and any emerging Waste and Minerals Local Plan documents.	G	Low or no impact	The ADC and tunnel passes through the area of Policy SW1 of the saved policies of the Oxfordshire Minerals and Waste Local Plan 1996. Policy SW1 states that designated area will be "released for sharp sand and gravel extraction". Much of the area safeguarded in this policy has already been quarried and restored to lakeside water-related activities.	Consenting
CPC12	Ability to integrate with existing nationally-significant infrastructure, statutory undertakers' major infrastructure, or any proposed future Nationally Significant Infrastructure Projects (NSIP) (such as that of National Highways, Environment Agency, Network Rail)	Review of NSIP projects on PINS's register; review of Network Rail and National Highways investment plans; spatial review of statutory undertakers' assets.	G	Low or no interaction with existing infrastructure or proposed Nationally Significant Infrastructure Project (NSIP)	No NSIPs currently registered. No known proposals from Network Rail or National Highways. The National Highways RIS3 Investment Plan will be published in 2024 which will detail the A34 improvement project. The tunnel-only Option C, compared to the ADC required by Option B, is likely to less disruptive works to National Highways' strategic highway infrastructure for the A34 crossing.	Consenting

CPC13	Minimise the consenting complexity due to the need for additional consents and licenses that may be required outside the Development Consent Order (DCO), e.g. additional Flood Risk Activity Permit, Environmental Permit, abstraction/discharge Licence, European protected species licence, etc	Review of the nature of expected development works against the list of other consents and licenses developed at Gateway 2.	A	One or more additional consent/license required	A Land Drainage Consent would be required for works in, over, under or affecting the flow of an ordinary watercourse. A Bespoke Flood Risk Activity Permit will be required for this scale of works on or near a main river. This can be applied for post-DCO. A Temporary Traffic Regulation Order may be required as PRoWs will need to be temporarily closed for construction of the tunnel, although this can potentially be included within the DCO application.	Consenting
CPC14	Avoid or minimise the need for any consequential development consenting (i.e. displacement or alteration of other development)	Review of existing development within the likely land-take, its nature and scale.	G	No existing development requires planning permission to relocate or alter	The tunnel crosses the A34 and Drayton Road, and goes through the Oday Hill Quarry. Electric lines, telecom lines, gas lines and water lines are also crossed by the tunnel. Much of these are buried and so would require diversion, but this can form part of the DCO associated development or potentially be delivered through statutory undertaker permitted development. There are no planning applications affected by this option.	Consenting
Property & Land Acquisition						
PRP1	Minimise loss of sensitive properties, i.e. residential, commercial, green belt, common land, historical or community assets due to project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of sensitive properties	Tunnel only option. Assumed would have no permanent impact on surface properties. Predominately privately owned land including Oday Hill Quarry. Land/gardens associated with listed buildings at Stonehill farm affected, but the extent depends upon how it would be considered within the listing curtilage. Construction review may result in increase/decrease of RAG status. Surface channels will have higher level of impact compared to tunnel-only option.	Property & Land Acquisition
PRP2	Minimise loss of land allocated within the Local Plan for alternative higher value / social / cultural value uses, i.e. residential, historical or community assets due project delivery	Review Land allocation mapping on ArcGIS.	G	No permanent or temporary loss of allocated land for higher value / social value properties	No allocations.	Property & Land Acquisition
PRP3	Minimise permanent loss of best and most versatile agricultural land (grades 1, 2 and 3)	Review of agricultural grading layer on ArcGIS, based on 2019 Provisional Agricultural Land Classification	A	Results in loss of any Grade 2 agricultural land or >50% Grade 3 agricultural land	Surface land graded 2 land at 25%. Grade 2 = 25% Grade 3 = 63% Grade 4 = 12%	Property & Land Acquisition
PRP4	Assessment of Land and Property asset costs and associated compensation due under the Compensation Code	Review of land use / designation on ArcGIS	G	Land acquisition costs likely to be relatively low. Only agricultural land and isolated properties affected	Surface agricultural values at OMV in the region of £10,000 - £15,000 per acre. Tunnels at OMV based on subsoil value of £50 per interest.	Property & Land Acquisition
PRP5	Assessment of special land considerations, including Special Category Land (SCL), utility infrastructure, national asset protection agencies and Crown bodies	Review of affected landowners	A	Nature and number of SCL is medium / low and may represent delivery risks	Two SCLs identified. Vale of White Horse Council, National Highways.	Property & Land Acquisition
PRP6	Minimise disruptions of landowners access to their land required for temporary works	Review location in conjunction with existing road network	G	Landowners able to access their land during construction and operation phases	Assumption that landowners will be able to access their land during construction and operational phases. Crossing of Drayton Rd B4017 may cause general disruption of access between Drayton and Abingdon.	Property & Land Acquisition

Appendix S. Draft Master Plan with Emergency Discharge Option B

Legend

Existing:

- Public Rights of Way
- Woodland in the Wider Landscape
- Woodland to be Retained as far as Practicable
- Scrub to be Retained as far as Practicable
- Hedgerow to be Retained as far as Practicable
- Hedgerow with Trees to be Retained as far as Practicable
- Tree Belt to be Retained as far as Practicable
- Watercourse to be Retained
- Water Body to be Retained

Proposed:

- Reservoir Water Extent
- Indicative Replacement Floodplain Storage
- Inner Toe of Reservoir Embankment and Borrow Pit Contours
- Indicative Embankment and Bund Contours
- Corridor for Future Canal Diversion
- Indicative Vantage Point with Seating Area for Views towards North Wessex Downs National Landscape and Corallian Limestone Ridge
- Public Rights of Way and Permissive Paths
- Car Park with Hardstanding
- Car Park with Reinforced Grass
- Visitor Centre
- Cafe
- Education Centre
- Water Sports Centre
- Recreational Facility
- Operational Facility

Proposed:

- Above ground emergency discharge channel
- Watercourse Diversion
- Watercourse Realignment
- Wetland Ditch
- Embankment Toe-drain/Perimeter Ditch
- Wetland Habitat Mosaic with Reeds, Species Rich Wet Grassland and Floodplain Marsh
- Floating Island
- Wildlife Ponds, Scrapes and Pools
- Great Crested Newt Habitat Pond
- Recreational Lakes
- Marginal Habitat
- Species-rich Native Hedgerow
- Species-rich Native Hedgerow with Trees
- Existing Hedgerow to be Retained as far as Practicable and Enhanced
- Existing Hedgerow with Trees to be Retained as far as Practicable and Enhanced
- Existing Tree Belt to be Retained as far as Practicable and Enhanced
- Pasture for Sheep Grazing
- Species-rich Neutral Grassland
- Scrub
- Intermittent Trees and Shrubs
- Woodland and Copse
- Wet Woodland
- Land to be Reinstated and Returned to Agriculture
- Land to be Reinstated to Existing Use

MAIN SHEET

Caldecott

Drayton

B4017

CONVEYANCE TUNNEL

INTAKE/OUTFALL STRUCTURE

Abingdon Sewage Treatment Works

GATED STRUCTURE FOR EMERGENCY DISCHARGE CHANNEL

ALTERNATIVE INDICATIVE LOCATIONS FOR T2ST WATER TREATMENT WORKS AND TEMPORARY COMPOUND

Marcham

Marcham Road

A34

Abingdon

River Ock

ALTERNATIVE EDUCATION CENTRE LOCATION

CAFE NEXT TO RECREATIONAL LAKES

SESRO MAIN ACCESS ROAD

Bird hides may be incorporated within the wetland area.

Characteristic pattern of wide verges with ditches for road drainage and hedgerows with standard trees to be included along the access road.

PUMPING STATION

RECREATIONAL FACILITIES ASSOCIATED WITH LAKES

A338

River Ock

Wet woodland adjacent to existing watercourse and tree belt with an ancient and several veteran trees. To be established through strategic tree planting and natural regeneration.

Series of linked ponds, scrapes and backwaters to be created within existing floodplain, to include an informal network of footpaths and pond dipping platforms to provide biodiversity enhancements and an educational and recreational resource.

Childrey Brook

INSET A

Caldecott

B4017

CONVEYANCE TUNNEL

Drayton

Green infrastructure proposals along the northern fringe to align with the Ock Valley Blue Corridor ambitions, set out in the South & Vale Green Infrastructure Strategy. Key opportunities for strategic green infrastructure enhancement, linkage and creation to be explored.

Enhancements to Public Rights of Way network with proposed Public Rights of Way and permissive path links, including along the alignment of the corridor for future canal diversion. This would improve accessibility within this strategic green infrastructure corridor.

Bird hides may be incorporated within the wetland area.

Wetland lagoons with marginal habitat and wet woodland for biodiversity and visual amenity enhancement.

Existing hedgerow along A338 to be retained and enhanced.

MINOR CAR PARK WITH RESTRICTED ACCESS

Steventon Road

East Hanney

A338

Hedgerows, small woodlands and woodland copses proposed on reservoir embankments for habitat connectivity and to help to integrate the embankments into the surrounding landscape.

Letcombe Brook

RESERVOIR TOWERS WITH CONNECTING CULVERT

SIPHON

CAFE NEXT TO RESERVOIR

B4017

A34

MAIN VISITOR CAR PARK

ALTERNATIVE VISITOR CENTRE LOCATION

Bridleway access across A34 retained for pedestrians, cyclists and horse-riders. (No public vehicular access)

ALTERNATIVE VISITOR AND EDUCATION CENTRE LOCATION

ALTERNATIVE OPERATIONAL EMERGENCY ACCESS ROAD (No public vehicular access)

ALTERNATIVE WATER SPORTS CENTRE LOCATIONS. Limited associated secured and monitored car parking accessed via controlled barrier.

POTENTIAL EXTENSION OF ACCESS ROAD TO ALTERNATIVE WATER SPORTS CENTRE

Natural play features to be incorporated along trails.

Steventon Substation

MINOR CAR PARK WITH RESTRICTED ACCESS

Hanney Road

Steventon

STEVENTON TO EAST HANNEY ROAD DIVERSION

Great Western Main Line Railway

0 100 200 300 400 500 600 700 800 900 1000 m

SCALE 1 : 10,000

Note:

The indicative proposals illustrated on this drawing, including potential locations of operational and recreational facilities, is subject to stakeholder engagement and further design development.

Revision	Status	Suitability Description	Authored	Checked	Reviewed	Date
P01	Draft	For consultation	MP/JP	LD	DS	28/03/2024

Site Name: Abingdon

Project Name: South East Strategic Reservoir Option (SESRO)

Drawing Title: INTERIM LANDSCAPE AND ENVIRONMENTAL MASTER PLAN WITH ABOVE GROUND EMERGENCY DISCHARGE CHANNEL

Scale:	Sheet Size:	Status:
A1- 1:10 000 A3-1:20 000	A1	Draft

Drawing Number: J696-AJ-A02X-ZZZZ-DR-EN-100019 | Revision: P01

DRAFT

PLOTTED ON 28/03/2024
LOCATION : \\Gblon0vs01\croydon\Data\Projects\Environment\PROJECTS\B22849BO SESRO\500-CAD\502_Drawings

Appendix T. Draft Master Plan with Emergency Discharge Option C

Legend

Existing:

- Public Rights of Way
- Woodland in the Wider Landscape
- Woodland to be Retained as far as Practicable
- Scrub to be Retained as far as Practicable
- Hedgerow to be Retained as far as Practicable
- Hedgerow with Trees to be Retained as far as Practicable
- Tree Belt to be Retained as far as Practicable
- Watercourse to be Retained
- Water Body to be Retained

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- Car Park with Hardstanding
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- Water Sports Centre
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- Operational Facility

Proposed:

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- Watercourse Realignment
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- Embankment Toe-drain/Perimeter Ditch
- Wetland Habitat Mosaic with Reeds, Species Rich Wet Grassland and Floodplain Marsh
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- Marginal Habitat
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- Existing Tree Belt to be Retained as far as Practicable and Enhanced
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MAIN SHEET

Caldecott

INTAKE/OUTFALL STRUCTURE

Abingdon Sewage Treatment Works

B4017

CONVEYANCE TUNNEL (INCLUDING EMERGENCY DISCHARGE)

Drayton

ALTERNATIVE INDICATIVE LOCATIONS FOR T2ST WATER TREATMENT WORKS AND TEMPORARY COMPOUND

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Marcham Road

A34

Abingdon

N

River Ock

ALTERNATIVE EDUCATION CENTRE LOCATION

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RECREATIONAL FACILITIES ASSOCIATED WITH LAKES

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River Ock

River Ock

River Ock

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Childrey Brook

INSET A

Caldecott

B4017

CONVEYANCE TUNNEL (INCLUDING EMERGENCY DISCHARGE)

Drayton

Childrey Brook

Green infrastructure proposals along the northern fringe to align with the Ock Valley Blue Corridor ambitions, set out in the South & Vale Green Infrastructure Strategy. Key opportunities for strategic green infrastructure enhancement, linkage and creation to be explored.

Enhancements to Public Rights of Way network with proposed Public Rights of Way and permissive path links, including along the alignment of the corridor for future canal diversion. This would improve accessibility within this strategic green infrastructure corridor.

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East Hanney

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Letcombe Brook

SIPHON

CAFE NEXT TO RESERVOIR

RESERVOIR TOWERS WITH CONNECTING CULVERT

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P01	Draft	For consultation	MB/JP	LD	DS	28/03/2024

DRAFT

Site Name: Abingdon

Project Name: South East Strategic Reservoir Option (SESRO)

Drawing Title: INTERIM LANDSCAPE AND ENVIRONMENTAL MASTER PLAN WITH BELOW GROUND EMERGENCY DISCHARGE TUNNEL

Scale:	Sheet Size:	Status:
A1- 1:10 000 A3-1:20 000	A1	Draft

Drawing Number: J696-AJ-A02X-ZZZZ-DR-EN-100020 | Revision: P01

PLOTTED ON 28/03/2024
LOCATION : \\Gblon0vs01\croydon\Data\Projects\Environment\PROJECTS\B22849BO SESRO\500-CAD\502_Drawings

Appendix U. Excluded Appraisal Criteria

Connectivity to the River Thames - Excluded Criteria

Criteria code	Criteria Description	Excluded from the intake/outfall, emergency discharge or both appraisals	Subtheme	Reason for exclusion
CON5B	3rd Party Impact - Potential to disrupt existing rail network during enabling works and construction	Both		Criteria not required - All emergency discharge and intake and outfall options are located away from the existing rail network.
OPS5B	Adaptability - Flexibility for future modifications e.g. increasing reservoir storage volume, rail station at wantage and grove, construction of Marcham Bypass	Both	Operational Resilience	The Severn Thames Transfer is considered to be the most likely future modification to be required for the connectivity to the River Thames. This has been considered under a specific criteria for this appraisal, therefore this wider criteria is not required to capture STT.
CAR3	Opportunity for mitigation e.g. smaller earthworks may lead to less carbon	Both	Carbon	This is considered to be covered by the assessment of CAR1.
OPS4B	Reliability - The option does not have a single point of failure but rather includes backup infrastructure so that it can remain in operation if the primary infrastructure is unavailable, e.g. siphons in addition to tunnel for emergency discharge or alternative road route to reservoir crest	Intake/Outfall	Operational Resilience	This is not considered to be a differentiator. All intake/outfall options considered include a single intake/ outfall structure.
OPS5A	Adaptability - Space available for future expansion of social / recreation infrastructure	Intake/Outfall	Operational Resilience	This is not considered to be a differentiator for intake/outfall options. No social/recreation infrastructure is identified within the scope of this asset.


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