Water Resources Management Plan 2024

Resource Options - Water Reuse Feasibility Report Addendum

Contents

Tables

Figures

Executive summary

1 This report provides a summary of changes that have been made to the water reuse options since Thames Water's 2019 Water Resources Management Plan (WRMP19) as part of the 2024 Water Resources Management Plan (WRMP24) development.

2 This report acts as an addendum to Thames Water WRMP19 Resource Options Water Reuse feasibility report, October 2018, Rev 03.

3 No new reuse options have been identified at WRMP24.

4 London Water Recycling SRO has been identified by Ofwat which includes development of the WRMP19 options at Beckton, Mogden and Mogden South Sewer reuse options through the Gate process (for further information refer to the London Water Recycling Gate 2 report[1]). Teddington DRA is also included as part of the London Water Recycling SRO, this option is included in the Direct Reuse Abstraction (DRA) feasibility addendum. Deephams Reuse has also been further developed in discussion with the Environment Agency (EA).

5 At WRMP24 backchecking of the WRMP19 screening decisions has been undertaken, where appropriate options have been further developed.

6 The updated WRMP24 feasibility assessment presents the WRMP19 options and the further developed WRMP24 options. The findings for the Stage 1 assessments were unchanged from the WRMP19 feasibility assessments. Stage 2 assessment for Deephams Reuse was updated at WRMP24 to reflect discussions with the Environment Agency, the option passed screening when implemented after 2060.

7 The following options are the confirmed list of feasible water reuse options for WRMP24:

- Beckton Reuse (up to 300 Ml/d)
- Crossness Reuse (up to 300 Ml/d)
- Mogden Reuse (up to 150 Ml/d)
- Mogden South Sewer (up to 25 Ml/d)
- Deephams Reuse post 2060 (46.5 Ml/d)

8 This report summarises the changes to the reuse options up to the end of feasibility screening. However, it should be noted that at WRMP24 Crossness Reuse option and Reuse Mogden South Sewer were rejected at further screening and are not included on the Constrained List of options for WRMP24. The rejection reasoning can be found in WRMP24 Appendix Q Scheme Rejection Register.

9 Information on option development and further screening can be found in WRMP24 Section 7 - Appraisal of Resource Options.

10 Note on terminology: At WRMP19 the terminology 'Reuse' was used, this has been maintained in the addendum for consistency with the WRMP19 feasibility report, however the terminology at WRMP24 has moved on to be 'Recycling'. The other WRMP documents refer to options as recycling options. Reuse and Recycling can be considered interchangeably in the WRMP documents.

[1] https://www.thameswater.co.uk/about-us/regulation/strategic-water-resource-solutions/water-recycling-reuse-schemes-in-london

Introduction

11 Thames Water is developing options for the 2024 Water Resources Management Plan (WRMP24). These options build on options developed as part of Thames Water's 2019 Water Resources Management Plan (WRMP19). This report provides a summary of changes that have been made to the water reuse options since WRMP19 and as part of WRMP24 development.

12 This report acts as an addendum to **Thames Water WRMP19 Resource Options Water Reuse Feasibility Report, October 2018, Rev 03.** This report should be read alongside the WRMP19 feasibility report. Information in this report supersedes information provided in the WRMP19 feasibility report.

13 Changes to the WRMP19 Water Reuse Options have been detailed in Section 0. A backchecking exercise has been completed to assess if any changes are required to WRMP19 as a result of identification of the new options or developments since WRMP19. Backchecking entails a review of options previously dismissed to see if they require reappraisal in the light of knowledge accumulated since they were previously rejected. Backchecking also provides the opportunity to take into account any changes of circumstance that might affect how an option is considered. This might include a change in the planning and environmental status of a site, changes in national and local planning policy and the emergence of viable technical solutions that were unavailable at the time the original assessment was undertaken.

14 The WRMP24 screening, option development and backchecking methodology is detailed in Section 7 - Appraisal of Resource Options.

15 This report summarises changes to the water reuse options up to the end of feasibility screening.

Structure of this report

16 **Error! Reference source not found.** summarises the structure of this report.

Section Name	Description
Executive summary	Summary of addendum report
Introduction	This section
Updates since WRMP19	Summary of the changes made to the options list since WRMP19, including changes to WRMP19 options, new WRMP24 options and changes to Deployable Output (DO).
Updated feasibility assessment	Provides a summary of the current feasibility assessment for all options including options identified at both WRMP19 and WRMP24.
Option verification and conclusion	Validation of risk and uncertainty for all options and the confirmation of the feasible list of options.
Appendix A: Reference information	A list of useful links and references
Appendix B: Option references	Table of the options WRMP19 and WRMP24 IDs
Appendix C: Environment Agency Comments	Summary of the comments received from the Environment Agency at WRMP24 in relation to options discussed in this report.

Section Name	Description
Appendix D: Middle Thames Tideway – Cumulative effects of re-use, desalination and DRA WRMP19 Options	WRMP19 assessment of the impacts of options (water reuse, desalination and direct river abstraction) that decrease the freshwater inputs to the Thames Tideway and the cumulative limit on the total additional capacity of these options.

Table 1: Structure of this report

Note on terminology: At WRMP19 the terminology 'Reuse' was used, this has been maintained in the addendum for consistency with the WRMP19 feasibility report, however the terminology at WRMP24 has moved on to be 'Recycling'. The other WRMP documents refer to options as recycling options. Reuse and Recycling can be considered interchangeably in the WRMP documents.

Updates since WRMP19

Option Identification

17 To ensure Thames Water is aligned with the WRSE approach, the following updates have been made to option identification for WRMP24:

- The WRMP19 rejection register has been revisited to ensure that the rejection reasoning remains robust for all rejected options.
- Rejected options have been reviewed to identify any options which should be revisited due to potential for regional benefits, particularly in light of changes in requirements to plan for 1:500 drought resilience (previously 1:200 at WRMP19) and the need to plan for a long-term environmental destination that achieves and maintains a sustainable level of abstraction by 2050 (Section 2.2).
- A review has been undertaken to identify new options to be considered in addition to the existing WRMP19 options, this did not identify any new reuse options.

Feasibility Screening Criteria

18 The following tables detail the criteria used for feasibility screening, which is further detailed in the WRMP19 Water Reuse Feasibility Report. This is a 3 stage process.

- Stage 1 – Option identification and assessment of absolute and other key constraints
- Stage 2 - Assessment of site performance and compilation of short list
- Stage 3 - Further detailed assessment

Stage 1 has two phases:

- Option identification – Stages Approach to option sections shown below.
- Assessment of the options identified against absolute and other key constraints to the development of a new Water Reuse plant - the criteria for which is detailed in Table 2. This is a pass / fail assessment for each criterion.

19 At stages 2 and 3 the assessed performance of each option is reviewed against a red / amber / green classification system, as

- Red – issue or constraint can be overcome, but will be very challenging
- Amber – issue or constraint can be overcome
- Green – no constraint posed

20 Additionally, Stage 3 allows for costing of each option to provide a comparison across all water resource options. The Stage 2 criteria are shown in Table 3 and the Stage 3 criteria are shown in Table 4.

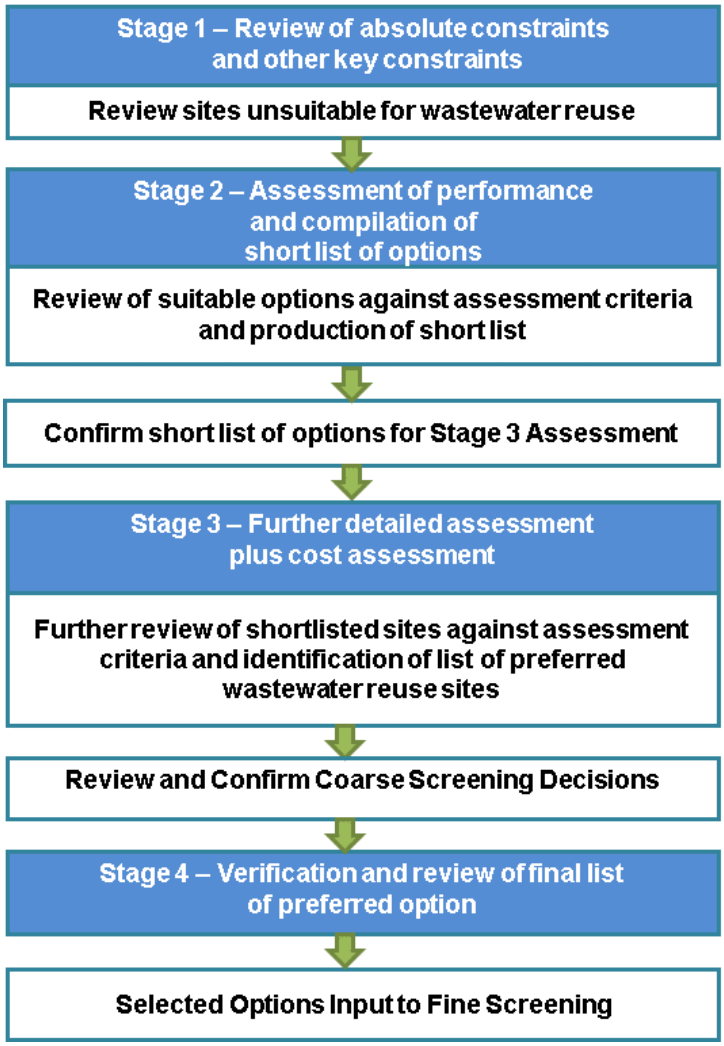

Figure 1: Staged approach to option selection

Criteria	Meaning of pass or fail
Planning, socio-economic & environmental criteria	
Potential impact on downstream abstractors	If a treatment works site's effluent discharges into a stretch of the river where its reuse would impact on downstream abstractors or where effluent discharge provides a local water resource benefit on downstream flows, it fails
National / International nature conservation sites	If the site has international designations it fails.
Areas of major built development[1]	If a significant areas of built development were required to be demolished it fails
National / International heritage sites	If the site has international designations, it fails.
Engineering criteria	
Only options which could provide a reuse water resource available to the London WRZ[2]	If an option is unable to provide reuse water as a raw water resource usable within the London WRZ, it fails. Thames Valley options have a consumptive use and would therefore reduce water availability to downstream abstractors, therefore Thames Valley options are not considered.
Compatible with Thames Water's water reuse considerations (Table 2.2 and 2.3).	Options should be IPR. Effluent discharge should be into the tidal range of the river Thames or discharges into the River Thames' tributaries will have no detrimental environmental impact, otherwise it fails.

Table 2: Criteria for Stage 1

Criterion Title	Stage 2 Criteria	Basis for assessment		
		Green	Amber	Red
Property/legal criteria				
Ownership of site & tenancies	Is there sufficient TW space required to build the facilities?	Existing TW land is available and sufficient unconstrained.	Some TW land is available, additional land may also be acquired for treatment sites and/or pipelaying required in private land under Statutory Notice.	No TW land available. Private land will need be acquired. Pipelaying required in land that cannot be served with Statutory Notice.
	Is there sufficient space to accommodate future growth and permit changes?	Space is available both for now and the future.	Space is available but is constrained both for now and the future.	No extra space for growth / there is not enough space for the maximum Scheme Capacity.
Estimated land acquisition cost	Are land acquisition costs likely to be reasonable?	Land acquisition costs likely to be relatively low. Agricultural land and isolated properties only affected.	Land acquisition costs likely to be moderate. Local or regional business or other facilities affected in addition to agricultural land.	Land acquisition costs likely to be relatively high. National businesses or land required for statutory agency's business affected in addition to agricultural land
Planning, socio-economic & environmental criteria				
Land use & land use quality	Can brownfield land be reused? Will existing non- agricultural high value land – uses be affected?	Site will reuse all brownfield land which appears to have low value.	Site contains some brownfield land to be reused and is currently occupied by existing business / commercial use.	Site contains is entirely greenfield or occupied by high value business.
Flood plain encroachment	Percentage of the site covered by floodplain	Less than 25% of the site is within Flood Zones 2 or 3 or the site is solely located within Flood Zone 1.	Between 25-50% of the site located within Flood Zones 2 or 3 or if 50% of the site benefits from existing flood protection measures.	Over 50% of the site located within Flood Zones 2 or 3 and the site does not benefit from existing flood protection measures.
Landscape character and sensitivity	Are any landscape designations affected?	No designations likely to be affected or effect likely to be positive. Site unlikely to affect a national landscape designation and not covered by a local landscape designation.	Designation of regional or local importance likely to be affected. The site lies within a locally designated landscape (e.g. Area of Great Landscape Value, Area of High Landscape Value, Strategic Landscape Area).	Designation of national importance likely to be affected. Site lies wholly or partly within or is likely to impact the setting of a national landscape designation (National Park or AONB).
Views and visual amenity	Are any visually sensitive viewpoints affected?	Important / recognised viewpoints unlikely to be affected. Site lies at a distance greater than 5km from any recognised viewpoint.	Locally visible / locally important views likely to be affected. Site lies at a distance of between 3km and	Highly visible / Panoramic views likely to be affected. Site lies at a distance less than 3km from any recognised viewpoints

Criterion Title	Stage 2 Criteria	Basis for assessment		
		Green	Amber	Red
			5km from any recognised viewpoint.	
Nature conservation and biodiversity	Are any designated species and/or areas of nature conservation/biodiversity importance affected?	No international / national or regional designations likely to be adversely affected, or effect likely to be positive. Site does not contain sites of nature conservation importance.	Designation of regional or local importance likely to be adversely affected. Site includes or lies within a regionally designated site (County Wildlife Site, or Local Nature Reserve).	Designation of national importance or Ancient Woodland likely to be adversely affected.
Archaeology and the historic environment	Are any heritage assets affected?	Heritage interest low or unknown. Site has heritage assets of low sensitivity or no records present.	Designation of regional or local importance likely to be adversely affected. No statutory designated sites present but site contains non designated heritage assets of high or moderate sensitivity.	Nationally Designated Heritage Assets likely to be affected. Site includes an international / national heritage asset (World Heritage Site, Scheduled Monument, Listed Building of a type not considered to be an absolute constraint at Stage 1), Registered Historic Park or Garden, Listed battlefield site.
Non-traffic impact of construction on local residents.	Will construction activities (excluding traffic impacts) affect local residents within a 350m radius of the site?	Less than 100 residential properties likely to be affected by on-site construction activities	Between 100-299 residential properties likely to be affected by on-site construction activities	More than 300 residential properties likely to be affected by on-site construction activities
Impact of construction on traffic	Will construction traffic affect local roads / built up areas?	Route largely not through built up areas and/or likely to have limited impacts on local traffic.	Route partly through built up areas and/or likely to have moderate impacts on local traffic.	Route predominantly through built up areas and/or likely to have substantial impacts on local traffic.
Impact on recreation	Are recreational sites or rights of way affected?	No recreational resource / right of way disrupted or affected. Sites with no formal recreational activities.	Recreational resource / right of way of local importance disrupted or affected. The site is likely to affect public rights of way.	Recreational resource / right of way of national or regional importance disrupted or affected. The site is likely to affect major recreational activities.
Water resources & water quality	Are there likely impacts on water resources and water quality, including Water Framework Directive targets?	Minor adverse impacts likely; no risk to Water Framework Directive objectives	Moderate adverse impacts likely; low risk to Water Framework Directive objectives	Major adverse impacts likely; high risk to Water Framework Directive objectives
Engineering criteria				
Network reinforcement requirements	Are significant reinforcement requirements likely to be needed to distribute water	No change to existing infrastructure	Limited modifications to existing network infrastructure	Significant network reinforcement required.
Length of conveyance routes	Total length of transfer pipeline	The length of the transfer is less than 10km from the potential abstraction to the treated water delivery point	The length of the transfer is between 10-20km from the potential abstraction to the treated water delivery point	The length of the transfer is more than 20km from the potential abstraction to the treated water delivery point

Criterion Title	Stage 2 Criteria	Basis for assessment		
		Green	Amber	Red
Pumping Head	Is the pumping head significant?	The pumping head is <50m	The pumping head is between 50m-99m	The pumping head is in excess of 100m
Water source and availability	Uncertainty around deployable output.	Scheme capacity deployable output guaranteed in all scenarios	Scheme capacity deployable output is affected by one or two issues that are expected to be resolved	Scheme capacity deployable output is affected by more than two issues or one issue that is unlikely to be resolved
Access during construction and operation	Are the means of access suitable, both for construction and operation?	Existing access arrangements are available and suitable for both construction and operation	Existing access will be suitable for operations, temporary modifications will be needed for construction activities	Existing access will require significant modification to make it suitable for both construction and operation
Connectivity to the waste system	Connectivity to wider infrastructure system.	The site is located adjacent to the wider infrastructure (waste stream)	The site is located less than 5km of the wider infrastructure (waste stream)	The site is located more than 5km from the wider waste stream infrastructure.
Construction complexity	Adverse ground conditions and major crossings.	No major crossings required or contaminated land risks identified	10 major crossings required or contaminated land risks identified	15 major crossings required or significant contaminated land risks identified.
Operational Complexity	Option requires operational capabilities that are outside TW standard operating practices or outside TW supply area	No issues/ Typical O&M procedures.	Operation of average complexity, with relatively complex processes/ operations and requirement for relatively substantial O&M procedures.	Operation of high complexity, with complex processes/ operations and requirement for major O&M procedures at regular intervals.

Table 3 Criteria for Stage 2 and basis for assessment of site performance

		Basis for assessment		
Criterion Title	Stage 3 Criteria	Green	Amber	Red
Property & legal criteria				
Ownership of site & tenancies	Assessment of ownership and tenancy constraints to any development	Land involved is under a single freehold title	Land involved has between 1 and 5 titles	More than 5 land titles involved
Planning, socio-economic & environmental criteria				
Planning policy and history	Review of Local Plan, planning policy designations and planning regulations.	The site is not allocated for significant development and there are no significant planning permissions or applications, there are no policy constraints or the site benefits from positive policy support for reservoir development	The site has some policy constraints not considered significant and no significant planning permissions or applications. May include some existing planning permissions but not considered significant. The site has significant permissions or applications but also benefits from positive policy support for reservoir development	The site or immediate area is allocated for significant development or has significant policy constraints. Extant planning permission or planning application has been submitted for significant development.
Land use & land use quality	Extent of land take and land quality, greenfield vs brownfield mix	Construction is entirely within brownfield sites	Short term effects during construction phase only on greenfield sites	Permeant effects on greenfield sites as a result of reservoir development
Flood plain encroachment (loss of floodplain / need for compensation storage)	Are there likely effects on the floodplain?	No constraint posed	Issue or constraint can be overcome	Issue or constraint can be overcome, but will be very challenging
Landscape character and sensitivity	Extent to which likely effects on landscape/townscape character & designations may be mitigated	No mitigation required	Mitigation may be employed to reduce impacts to an acceptable level	Adverse effects cannot be mitigated or constraints overcome resulting in adverse effects post mitigation
Views and visual amenity	Extent to which likely effects on visually sensitive receptors may be mitigated	No mitigation required	Mitigation may be employed to reduce impacts to an acceptable level	Adverse effects cannot be mitigated or constraints overcome resulting in adverse effects post mitigation
Employment and local economy	Extent of construction and operational effects on employment & local economy	No loss of employment	Loss of land anticipated to provide a low density of	Loss of land anticipated to provide a high density of

		Basis for assessment		
Criterion Title	Stage 3 Criteria	Green	Amber	Red
			employment opportunities (for example, fields that appear to be used for agricultural purposes)	employment opportunities (for example, a business park)
Nature conservation and biodiversity	Are there likely effects on sites / habitats	No constraint posed	Issue or constraint can be overcome	Issue or constraint can be overcome, but will be very challenging
Opportunity for biodiversity improvement	Extent of any opportunities for biodiversity enhancement	Site has potential improvement opportunities for both watercourse and woodlands.	Site has potential improvement opportunities for either a watercourse or woodlands.	No potential for biodiversity improvement opportunity.
Archaeology and the historic environment	Are there likely effects on heritage assets, including overall setting	No constraint posed	Issue or constraint can be overcome	Issue or constraint can be overcome, but will be very challenging
Non-traffic impact of construction on local residents	Potential to mitigate non-traffic construction impacts on local properties.	No constraint posed	Issue or constraint can be overcome	Issue or constraint can be overcome, but will be very challenging
Impact on recreation	Are there likely effects on recreational activities	No constraint posed	Issue or constraint can be overcome	Issue or constraint can be overcome, but will be very challenging
Water resources & water quality	Are there likely impacts on water resources and water quality, including Water Framework Directive targets?	No constraint posed	Issue or constraint can be overcome	Issue or constraint can be overcome, but will be very challenging
Engineering criteria				
Length of conveyance routes	Length of conveyance route(s) and scale (pipe diameter or equivalent)	Very limited need to transfer water in new conveyance (e.g. abstraction and treatment on the same site), discharge conveyance <1km.	Moderately long (<20km) or large diameter water transfer conveyance, making use of existing infrastructure where possible.	Long water transfer conveyance (>20km) which is comprised of entirely new infrastructure and / or large diameter (>1.5m) and / or significant tunnelling
Normalised cost	£/m3	< £1.00/m^3	£1.00/m^3 to £1.50/m^3	> £1.50/m^3
Water Source and Availability	Constraints on water source utilisation / availability	Availability of water is well understood and not dependent on other constraints	Availability of water is well understood but dependent on other constraints	Significant constraints on the water availability
Water treatability / process complexity	Water treatment risks and complexity of required water treatment	Sufficient water quality data is available. No concerns highlighted with respect to water quality,	Water quality data is available although may have some limitations in terms of duration / frequency / parameters.	Limited water quality data is available in terms of duration / frequency / parameters.

		Basis for assessment		
Criterion Title	Stage 3 Criteria	Green	Amber	Red
		standard treatment process to be employed	Some concerns with water quality although relatively simple to treat.	Significant concerns regarding water quality, risks remain about ability to treat.
Power Supply	Is sufficient power available to power the site?	Existing power supply to the site is adequate	Existing power supply is not adequate, power supply can be brought into the site relatively simply	New power supply required which would be very difficult to achieve.
Construction Complexity	More detailed review of construction requirements	Construction complexity is anticipated to have no significant impacts on construction programme and cost.	Construction complexity is anticipated to have minor impacts on construction programme and cost.	Construction complexity is anticipated to have major impacts on construction programme and cost.

Table 4: Criteria for Stage 3 and basis for assessment of site performance

Feasibility Screening

Feasibility Screening Updates

21 The overall changes to options and approach since WRMP19 are described in WRMP Section 7 Appraisal of Resource Options. Specific changes applicable to Water Reuse Options are detailed in Table 5 and Table 6. These tables should be read alongside the WRMP19 feasibility report.

WRMP19 Option Reference and name	WRSE Option Reference and name	Changes to the Option	WRMP19 Feasibility Screening Outcome	WRMP24 Feasibility Screening Outcome
London				
Deephams Reuse (46.5Ml/d) - RES-RU-DPH Option requires conveyance either through pipeline to River Lee diversion upstream of KGV intake (CON_RU-DPH-KGV) or through connection to Lockwood to KGV tunnel (CON-RU-DPH-TLTEX)	Deephams Reuse – 46.5 Ml/d, to TLT TWU_KGV_HI-REU_RE1_ALL_deephams reuse 46.5b / Deephams Reuse – 46.5 Ml/d, direct to KGV TWU_KGV_HI-REU_RE1_ALL_deephams reuse 46.5	The Environment Agency's representation on Thames Water's draft WRMP19 included "Recommendation 2 - Ensure that the Deephams option is feasible and does not pose a risk to the environment". That recommendation outlined, at R2.2, concerns over environmental impacts on downstream habitats from reduced flows from Deephams Sewage Treatment Works (STW); and at R2.3, in the estuarine Thames Tideway. At WRMP19 the Environment Agency required Thames Water to demonstrate that there are no WFD compliance risks with the option, in order for it to progress to detailed design by 2022/23 within AMP7. Further work has been undertaken by Thames Water since publication of WRMP19[2] with extensive collaborative working with the Environment Agency. Following completion of the further studies by Thames Water, review[3] of the findings with the Environment Agency has established that a Deephams STW Reuse option is incompatible with the environmental ambition flow targets that the Environment Agency is seeking to deliver for the Lower River Lee through WRSE and the Environment Agency's Environmental Destination work[4]. The option has been included on the Constrained List for implementation after 2060 as it could be considered following delivery of measures under the EA's Environmental Destination work.	Passed Stage 3 and Fine Screening – on Feasible List	The option passed screening and is included on the Feasible List of options for implementation after 2060.
Beckton Reuse (50Ml/d) - RES-RU-BEC-50	TWU_KGV_HI-REU_reuse beckton 50 Beckton Effluent Reuse – 50 Ml/d Treatment	**This is the 50Ml/d phase treatment component of Beckton Reuse** No critical changes. Refer to London Effluent Reuse Gate 2 submission for development of the engineering design and environmental assessment since WRMP19.	Passed Stage 3 – on Feasible List	Passed – included on Feasible List of options as part of the Beckton Reuse option

[2] As reported in: Thames Water (2021) Deephams STW Reuse Option Assessment – Phase 3 WFD Compliance Assessment. Report prepared by Ricardo in associated with Atkins Ltd. Draft issued 15 April 2021
[3] 30 April 2021: Project meeting between Thames Water, Environment Agency, Ricardo, and Atkins Ltd
15 July 2021: Project meeting between Thames Water, Environment Agency, Ricardo, and Atkins Ltd
22 September: Regular strategic meeting between Environment Agency and Thames Water
13 October 2021: Project meeting between Thames Water, Environment Agency, Ricardo, and Atkins Ltd
[4] A summary of the position on water environment effects of the Deephams STW Reuse option , Appendix E.

WRMP19 Option Reference and name	WRSE Option Reference and name	Changes to the Option	WRMP19 Feasibility Screening Outcome	WRMP24 Feasibility Screening Outcome
Beckton Reuse (100Ml/d) - RES-RU-BEC-100	Beckton Effluent Reuse – 100 Ml/d Treatment TWU_KGV_HI-REU_reuse beckton 100	**This is the 100Ml/d phase treatment component of Beckton Reuse** No critical changes. Refer to London Effluent Reuse Gate 2 submission for development of the engineering design and environmental assessment since WRMP19.	Passed Stage 3 – on Feasible List	Passed – included on Feasible List of options as part of the Beckton Reuse option
Beckton Reuse (150Ml/d) - RES-RU-BEC-150	Beckton Effluent Reuse – 150 Ml/d Treatment TWU_KGV_HI-REU_reuse beckton 150	**This is the 150Ml/d phase treatment component of Beckton Reuse** No critical changes. Refer to London Effluent Reuse Gate 2 submission for development of the engineering design and environmental assessment since WRMP19.	Passed Stage 3 – on Feasible List	Passed – included on Feasible List of options as part of the Beckton Reuse option
CON-RU-BEC-LCK-300 Beckton to Lockwood Conveyance	TWU_KGV_HI-TFR_beckton to lockwood Beckton to Lockwood Tunnel Conveyance	**This is the conveyance component of Beckton Reuse** No critical changes. Refer to London Effluent Reuse Gate 2 submission for development of the engineering design and environmental assessment since WRMP19.	Passed Stage 3 – on Feasible List	Passed – included on Feasible List of options as part of the Beckton Reuse option
CON-RWS-LCK-KGV-800 Raw Water System - Lockwood PS to KGV Reservoir Intake	TWU_KGV_HI-TFR_lockwood ps-kgv res TLT extension from Lockwood PS to King George V Reservoir intake	**This is the conveyance component of Beckton Reuse** No critical changes. Refer to London Effluent Reuse Gate 2 submission for development of the engineering design and environmental assessment since WRMP19.	Passed Stage 3 – on Feasible List	Passed – included on Feasible List of options as part of the Beckton Reuse option
n/a	TWU_KGV_HI-TFR_KGV_ALL_beckton tokgv100	**This is an alternative conveyance option for Beckton Reuse** New option for WRMP24 WRMP24 has developed a pipeline conveyance option for up to 100 Ml/d as an alternative to Beckton to Lockwood Tunnel Conveyance and TLT extension from Lockwood PS to King George V Reservoir intake tunnels. This has been back checked against WRMP19 feasibility assessment criteria and screened out on the grounds of cost, engineering constraints and environmental impacts. Note: Letter has been sent to RAPID[5] setting out reasons for screening out this option and RAPID have provided the reply[6].	n/a	Rejected
RES-RU-MOG-50	TWU_WLJ_HI-REU_reuse mogden 50	**This is the 50Ml/d phase treatment component of Mogden Reuse** No critical changes.	Passed Stage 3 – on Feasible List	Passed – included on Feasible List of

[5] https://www.ofwat.gov.uk/wp-content/uploads/2022/05/Thames-Water-letter-to-RAPID-Beckton-pipeline-route-rejection-version2.1.pdf
[6] https://www.ofwat.gov.uk/wp-content/uploads/2022/05/Letter-from-Paul-Hickey-to-Rob-Bromley-20-May_2022.pdf

WRMP19 Option Reference and name	WRSE Option Reference and name	Changes to the Option	WRMP19 Feasibility Screening Outcome	WRMP24 Feasibility Screening Outcome
Reuse: Mogden 50 Ml/d	Mogden Effluent Reuse – Reuse Treatment Plant - 50Ml/d	Refer to London Effluent Reuse Gate 2 submission for development of the engineering design and environmental assessment since WRMP19.		options as part of the Mogden Reuse option
RES-RU-MOG-100 Reuse: Mogden 100 Ml/d	TWU_WLJ_HI-REU_reuse mogden 100 Mogden Effluent Reuse – Reuse Treatment Plant - 100Ml/d	**This is the 100Ml/d phase treatment component of Mogden Reuse** No critical changes. Refer to London Effluent Reuse Gate 2 submission for development of the engineering design and environmental assessment since WRMP19.	Passed Stage 3 – on Feasible List	Passed – included on Feasible List of options as part of the Beckton Reuse option
RES-RU-MOG-200 Reuse: Mogden 200 Ml/d	TWU_WLJ_HI-REU_reuse mogden 200 Mogden Effluent Reuse – Reuse Treatment Plant - 200Ml/d	**This is the 200Ml/d phase treatment component of Mogden Reuse** The results show a significant risk from a 200 Ml/d scheme breaching EA thermal plume characteristics where the extent of the 2 oc temperature change from a discharge extends greater than a 25% cross sectional area of the river. The constraint therefore on maximum scheme size for Mogden is driven by the potential environmental impacts rather than the available final effluent and therefore for future scheme investigations the maximum capacity of a Mogden water recycling scheme would be capped at 150 Ml/d, Refer to London Effluent Reuse Gate 2 submission for development of the engineering design and environmental assessment since WRMP19.	Passed Stage 3 – on Feasible List	Rejected at validation
CON-RU-MOG-WAL-200 Mogden to Walton 200 MLD [7]	TWU_WLJ_HI-TFR_reuse mogden/Walton Mogden to Walton 200 Ml/d - Conveyance for Mogden Effluent Reuse Treatment	**This is the conveyance component of Mogden Reuse** Further work has identified that the maximum capacity for the option is 150Ml/d. The design of the conveyance has been revised to reflect the reduced option capacity. Refer to London Effluent Reuse Gate 2 submission for development of the engineering design and environmental assessment since WRMP19.	Passed Stage 3 – on Feasible List	Passed – included on Feasible List of options as part of the Beckton Reuse option

[7] Further modelling has shown that a maximum capacity of 200 Ml/d has a high risk of breaching Environment Agency guidance where the extent of the 2 °c temperature change from a discharge extends greater than a 25% cross sectional area of the river, this option will therefore has a maximum of 150 Ml/d in the Gate 2 Report. s

WRMP19 Option Reference and name	WRSE Option Reference and name	Changes to the Option	WRMP19 Feasibility Screening Outcome	WRMP24 Feasibility Screening Outcome
RES-RU-MSS-25; CON-RU-MSS-WAL-25 Reuse: Mogden South Sewer 25Ml/d	TWU_WLJ_HI-REU_RE1_ALL_reuse mogden south sewer Mogden South Sewer – Reuse Treatment Plant - 25Ml/d output and associated conveyance	**This is both treatment and conveyance for Mogden South Sewer** Dry Weather Flow[1] (DWF) monitoring data was gathered during the London Effluent Reuse SRO Gate 2 stage, which showed DWF values of 33 to 36Ml/d. This is substantially below a DWF of 60 Ml/d required to support a 50Ml/d Mogden South Sewer scheme. As a result, only a smaller deployable output c.25Ml/d is possible. Further information can be found in the London Reuse Gate 2, published on Thames Water website. Refer to Mogden South Sewer Conceptional Design Report: Microsoft Word - Annex A3 J698-MS-DOC-230001-0B Mogden South Sewer Conceptual Design Report (thameswater.co.uk)	n/a	Passed – on Feasible List of options.
RES-RU-MSS-50; CON-RU-MSS-WAL-50 Reuse: Mogden South Sewer 50Ml/d	TWU_WLJ_HI-REU_RE1_ALL_reuse mogden s sewer Mogden South Sewer – Reuse Treatment Plant - 50Ml/d output and associated conveyance	**This is both treatment and conveyance for Mogden South Sewer** Dry Weather Flow[8] (DWF) monitoring data was gathered during the London Effluent Reuse SRO Gate 2 stage, which showed DWF values of 33 to 36Ml/d. This is substantially below a DWF of 60 Ml/d required to support a 50Ml/d Mogden South Sewer scheme. As a result, only a smaller deployable output c.25Ml/d is possible; this option is rejected after the additional wastewater benefits of the option are reviewed. Refer to London Effluent Reuse Gate 2 submission for development of the engineering design and environmental assessment since WRMP19.	Passed Stage 3 – on Feasible List	Rejected

Table 5: Option changes since WRMP19

[8] Dry weather flow is the flow in the sewer in a dry period with no rainfall

		WRMP19 DO (Ml/d)		WRMP24 DO (Ml/d)			Difference (Ml/d)		Impact on Feasibility Assessment Scoring (all options Passed Stage 3 at WRMP19)
WRMP19 Option Name	WRMP24 Option Name	Average	Peak	1 in 2 average	1 in 500 average	1 in 500 peak	Average	Peak	
Deephams Reuse (46.5Ml/d) - RES-RU-DPH	TWU_KGV_HI-REU_RE1_ALL_deephams reuse 46.5	45	45	42	42	42	-3	-3	No Impact
	WU_KGV_HI-REU_RE1_ALL_deephams reuse 46.5b /			42	42	42	-3	-3	No Impact
Beckton Reuse 50: RES-RU-BEC-50	TWU_KGV_HI-REU_reuse beckton 50	49	49	46	46	46	-3	-3	No impact
Beckton Reuse 100: RES-RU-BEC-100	TWU_KGV_HI-REU_reuse beckton 100	95	95	89	89	89	-6	-6	No impact
Beckton Reuse 150: RES-RU-BEC-150	TWU_KGV_HI-REU_reuse beckton 150	138	138	130	130	130	-8	-8	No impact
Beckton Reuse 200: RES-RU-BEC-200	TWU_KGV_HI-REU_reuse beckton 200	183	183	172	172	172	-11	-11	No impact
Beckton Reuse 300: RES-RU-BEC-300	TWU_KGV_HI-REU_reuse beckton 300	268	268	252	252	252	-16	-16	No impact
Beckton Reuse 380: RES-RU-BEC-380 [9]	TWU_KGV_HI-REU_reuse beckton 380	336	336	316	316	316	-20	-20	No impact
Mogden 50: RES-RU-MOG-50	TWU_WLJ_HI-REU_reuse mogden 50	49	49	46	46	46	-3	-3	No impact
Mogden 100 RES-RU-MOG-100	TWU_WLJ_HI-REU_reuse mogden 100	94	94	88	88	88	-6	-6	No impact
Mogden 150: new to WRMP24	TWU_WLJ_HI-REU_reuse mogden 150	137	137	130	130	130	-7	-7	No impact
Mogden South Sewer: RES-RU-MSS-50 CON-RU-MSS-WAL-50	TWU_WLJ_HI-REU_reuse mogden s sewer	49	49	46	46	46	-3	-3	Water Source and Availability changed from Amber to Red Gate 2 assessment led to changes:

[9] A WRMP19 review of cumulative effects of Thames Water WRMP19 options on the receptor environment in the Middle Thames Tideway identified that if there is more than a 15-20% decrease (275-366 Ml/d) in freshwater inputs to the Middle Tideway normal salinity patterns could be substantially affected. The London Effluent Reuse SRO has therefore considered options up to 300 Ml/d, however at WRMP19 a maximum capacity of 380 Ml/d was assessed as feasible for Beckton Reuse. The 380 Ml/d option remains on the Feasible List while further work is ongoing to review the cumulative impact of options on the Middle Tideway salinity. The Middle Thames Tideway – Cumulative effects of re-use, desalination and DRA WRMP19 Options is provided in Appendix D.

		WRMP19 DO (Ml/d)		WRMP24 DO (Ml/d)			Difference (Ml/d)		Impact on Feasibility Assessment Scoring (all options Passed Stage 3 at WRMP19)
WRMP19 Option Name	WRMP24 Option Name	Average	Peak	1 in 2 average	1 in 500 average	1 in 500 peak	Average	Peak	
									Amber to Red for "Water Source and Availability", "AIC (Normalised Costs)" & "Planning Policy Designations". Green to Amber for "Operational Complexity"

DO = Deployable Output

Table 6 Option DO changes since WRMP19

Non-SRO option updates

Deephams Reuse

22 The final WRMP19 set out a programme of further research to ensure the option is compliant with the Water Framework Directive (WFD) Regulations before being progressed, (paragraph 11.244 of Section 11 Preferred Plan to confirm the WFD assessment).

23 Following completion of the investigations, review of the findings with the Environment Agency has established that a Deephams Sewage Treatment Works (STW) Reuse option has potential environmental risk. As such, after detailed discussion of the findings with the Environment Agency, Thames Water has withdrawn the option as the preferred WRMP19 option and also as a feasible option from future WRMPs in the medium-term period until 2060. The option has been included on the Feasible List with an earliest completion date of 2060.

Passed – on Feasible List with the constraint that the scheme cannot be delivered before 2060.

Strategic resource options

24 The following section summarises updates to the SRO Reuse options compared to WRMP19, as noted in Thames Water WRMP19 Resource Options Water Reuse Feasibility Report, October 2018, Rev 03. For full details of the engineering design development and environmental assessment since WRMP19 refer to London Effluent Reuse Gate 2 submission, published on Thames Water website (Water recycling (reuse) schemes in London | Thames Water).

25 This section details the outcome of changes to the designs on the feasibility assessments.

Beckton Reuse

26 The design of the Beckton Reuse option has been further developed for WRMP24, as part of London Effluent Reuse SRO, considering phased development in phases of 50, 100 and 150 Ml/d up to the cumulative limit of 300 Ml/d[10]. The design of these options has not materially changed since WRMP19.

27 At WRMP19 the 50 Ml/d Beckton Reuse option was rejected at Fine Screening however it has been included as a phase capacity for WRMP24 to allow flexibility of phased development in investment modelling.

28 The following conveyance elements are required as part of the Beckton Reuse option; they would be constructed with the initial phase and have sufficient capacity for all subsequent phases:

- Beckton to Lockwood tunnel - there are no material changes to the design since WRMP19.

[10] A WRMP19 review of cumulative effects of Thames Water WRMP19 options on the receptor environment in the Middle Thames Tideway identified that if there is more than a 15-20% decrease (275-366 Ml/d) in freshwater inputs to the Middle Tideway normal salinity patterns could be substantially affected. The London Effluent Reuse SRO has therefore considered options up to 300 Ml/d, however at WRMP19 a maximum capacity of 380 Ml/d was assessed as feasible for Beckton Reuse. The 380 Ml/d option remains on the Feasible List while further work is ongoing to review the cumulative impact of options on the Middle Tideway salinity.

An alternative pipeline conveyance for up to 100 Ml/d has been considered and screened out on the grounds of cost, engineering constraints and environmental impacts[11,12].

- Thames Lee Tunnel extension – Lockwood Pumping station to King George V reservoir intake - there are no material changes to the design since WRMP19. The tunnel has been designed with a capacity of around 800 Ml/d which is sufficient for 300 Ml/d from the Beckton Reuse and also to transfer the maximum flow from the existing Thames Lee Tunnel. Pumping capacity of 300 Ml/d has been included within the Beckton Reuse option.

Passed – on Feasible List with a maximum capacity of 380 Ml/d.

Mogden Reuse

29 Mogden Reuse was rejected at WRMP19 Fine Screening.

30 The option has been included in WRMP24 and is being further developed through the RAPID Gated Process within the London Effluent Reuse SRO. As part of this further development, modelling of the outfall location has been undertaken to understand the impacts of the discharge on temperature, water quality and aquatic ecology.

31 The design of the Mogden Reuse option has developed phases of 50 and 100 Ml/d for combination up to a maximum capacity of 150 Ml/d. The routes and design of the conveyance elements have also been updated (London Effluent Reuse Gate 2 submission, published on Thames Water website (Water recycling (reuse) schemes in London | Thames Water.

32 The following conveyance elements are required as part of the Mogden Reuse option; they would be constructed with the initial phase and have sufficient capacity for all subsequent phases

- Mogden to Walton 150 Ml/d

Passed – on Feasible List with a maximum capacity of 150 Ml/d

Mogden South Sewer

33 Flow monitoring has been carried out to assess the amount of flow in the sewer available for abstraction and treatment to provide an additional water resource. The results show a dry weather flow (DWF) ranging between 33 to 36 Ml/d which is substantially below a DWF of 60 Ml/d required to support a 50Ml/d option. As a result, only a smaller deployable output c.25Ml/d is possible.

34 In advance of the flow monitoring results, the design was developed for a 50 Ml/d option; however the requirements for a smaller option would be similar, although the capacity of the engineering components would be scaled back.

Passed – on Feasible List with a maximum capacity of 25 Ml/d.

[11] Letter from SRO to RAPID https://www.ofwat.gov.uk/wp-content/uploads/2022/05/Thames-Water-letter-to-RAPID-Beckton-pipeline-route-rejection-version2.1.pdf
[12] RAPID response https://www.ofwat.gov.uk/wp-content/uploads/2022/05/Letter-from-Paul-Hickey-to-Rob-Bromley-20-May_2022.pdf

Cumulative limits

35 WRMP19 investigations identified that the decrease in freshwater inputs to the Tideway, arising from water reuse, desalination and DRA options, should be limited to no more than 275-366 Ml/d in order to mitigate impacts on potentially sensitive ecological receptors.

36 A cumulative limit on the total additional capacity of water reuse and desalination options, that decrease in freshwater inputs to the Tideway, of 366 Ml/d has therefore been included in the WRSE regional modelling. Beckton Reuse, Mogden Reuse, Crossness Reuse and Deephams Reuse capacity are included within this cumulative limit.

37 Further investigation at WRMP24 is ongoing and any updates will be included in the Final WRMP24.

Updated Feasibility Assessment

Feasibility Assessment Approach

38 This section of the report outlines the updates made in WRMP24 to the WRMP19 feasibility assessment. This should be read alongside the WRMP19 Water Reuse Feasibility Report. Where options have been rejected through the screening process the rejection reason is recorded in WRMP24 Appendix Q Scheme Rejection Register.

39 A three-stage feasibility screening approach was employed at WRMP24 and this approach is unchanged from WRMP19, details of the approach can be found in the WRMP19 Water Reuse Feasibility Report.

40 The WRMP19 Water Reuse Feasibility Report Stage 1 identified 14 water reuse option locations for further assessment. Of these 14 locations, five are considered feasible following the Stage 2 and Stage 3 assessment:

- Beckton STW
- Crossness STW
- Deephams STW
- Mogden STW
- Mogden South Sewer

41 At WRMP19, fine screening was undertaken for all options which passed the feasibility screening. The WRMP19 fine screening took account of the estimated volume of predicted water resources deficit of Thames Water and, where applicable, neighbouring companies. However, the predicted water resources need for the region at WRMP24[13] is significantly higher than at WRMP19, owing to:

- increased sustainability reductions
- a change to planning for water supply resilience for a 1 in 500 year drought from 1 in 200 at WRMP19[14]

42 Furthermore, potential new transfers identified by WRSE would allow new resource options in the Thames Water supply area to supply more of the WRSE region than was considered at WRMP19. For these reasons, the potential resource need is not being used as a consideration in the screening process at WRMP24. This is to avoid rejecting options based on Thames Water's need where there could be a regional benefit. At WRMP24 the fine screening stage has therefore been replaced by use of the WRSE investment model to compare options against cost, environmental, and resilience criteria (further detail is provided in Section 7 of the Thames Water WRMP24 documentation).

43 As a result of the above review one reuse option that was rejected at WRMP19 has been reassessed and included on the WRMP24 Feasible List, which is:

- Mogden Reuse

[13] https://wrse.uk.engagementhq.com/the-challenge
[14] A 1 in 500-year event explained: This does not refer to an event that will occur every 500 years, it is better considered an event where there is a 1 in 500 chance of the event occurring in a given year, or a 0.2% chance. The probability of it happening in one year remains the same in each of the following years.

44 Appendix 0 provides a list of the WRMP19 and WRSE option identification numbers (IDs). These can be used to cross reference options to WRSE lists and WRMP19 documentation.

Stage 1 Assessment Results

45 At WRMP19 all 350 Thames Water owned wastewater catchments were reviewed at Stage 1 to identify appropriate sites for final effluent reuse from STW and where suitable abstraction of raw sewage from wastewater catchments.

46 The Stage 1 assessment used the key constraints (as defined in WRMP19 Water Reuse Feasibility Report, Section 3.2), to focus on STW catchments, where:

- current treated effluent discharges are into a stretch of river where reuse of the water would not impact on downstream abstractors,
- discharges which would otherwise be lost in the tidal reach of the River Thames (Thames Tideway), and
- where catchments can supply the London WRZ.

47 Six STW catchments passed the Stage 1 assessment (as shown in Table 7).

48 No new sites have been identified at WRMP24 and the Stage 1 assessment remains unchanged. Full methodology for Phase 1 assessment is detailed in Section 4 of the WRMP19 Feasibility Report, with the full list of assessed sites detailed in Appendix A of the report.

Option / STW catchments	No potential impact on downstream abstractors	No national or international nature conservation designation	No national or international heritage designation	Will the site provide water to London?	Compatible with Thames Water's reuse policy	Result
Beckton	✓	✓	✓	✓	✓	PASS
Mogden	✓	✓	✓	✓	✓	PASS
Crossness	✓	✓	✓	✓	✓	PASS
Deephams	✓	✓	✓	✓	✓	PASS
Long Reach	✓	✓	✓	✓	✓	PASS
Riverside	✓	✓	✓	✓	✓	PASS

Table 7: Sites which passed stage 1 assessment

Key changes to WRMP19 decisions

49 There are no changes from the WRMP19 assessment at the Stage 1 Assessment.

Stage 2 assessment results

50 The WRMP19 Feasibility Report identified options within the STW catchments at Stage 2 based on:

- The "reliable" source yield from the location within the catchment (generally the STW final effluent or a sewer mining location) and a corresponding expected option capacity taking into account the treatment losses.
- The treatment technology
- The location of the option discharge into a raw water body
- The location of land available for treatment

51 The Stage 2 assessment of the WRMP19 and WRMP24 options that passed Stage 1 is presented in Table 9 providing the red, amber, green assessment of the criteria described in the WRMP19 Water Reuse Feasibility Report.

52 Sixteen options passed the Stage 2 assessment at WRMP19. Further details are included in the WRMP19 Water Reuse Report.

53 Where changes have been made to WRMP19 RAG status they are identified in **Error! Reference source not found.**. The RAG assessment of SRO options below has not been reviewed at WRMP24, namely:

- Beckton Reuse
- Mogden Reuse

54 The RAG assessment for SRO option Mogden South Sewer has been revisited as part of backchecking (Section 4).

Option	Criteria	WRMP19	WRMP24	Reason for change
Deephams Reuse	Impacts on water resources & quality			Summary of current position (Appendix E) has identified that the flow reduction associated with this option is contrary to the environmental ambition for waterbodies downstream of the option. The option is likely to cause major adverse impacts including a high risk to Water Framework Directive objectives

Table 8 Changes to WRMP19 RAG status – Stage 2 assessment

Criteria	Beckton STW (Beckton STW) 300 +	Beckton STW (Beckton STW) 100-299	Beckton STW (Beckton STW) <100	Beckton mining - Abbey Mills (Luxborough Lane) 300	Beckton mining - Abbey Mills (Luxborough Lane) 100-299	Beckton mining - Abbey Mills (Luxborough Lane) <100	Beckton mining - Abbey Mills (Lower Hall) 300	Beckton mining Abbey Mills (Lower Hall) 100-299	Beckton mining - Abbey Mills (Lower Hall) <100	Crossness STW (Crossness Southern Marshes) 100 - 199	Crossness STW (Crossness Southern Marshes) <100	Crossness mining - Greenwich (Lower Hall) 100 -150	Crossness mining - Greenwich (Lower Hall) < 100	Crossness mining - Greenwich (Hogsmill) 100 -150	Crossness mining - Greenwich (Hogsmill) <100	Crossness mining – Millbrook (Hogsmill) 100 – 150	Crossness mining -Millbrook (Hogsmill) <100	Crossness mining –Wandle Valley PS (Hogsmill) <50	Mogden STW (Mogden STW) - 212	Mogden STW 100 - 200	Mogden STW <100	Mogden South Sewer 50	Deephams STW post 2060 (Deephams STW) 25- 46.5	Long Reach STW (within and adjacent to STW site) 50-90Ml/d	Riverside STW (within STW site) 38Ml/d
Property & legal																									
Sufficient TW owned land																									
Space for future growth & changes																									
Land acquisition costs																									
Planning & environmental																									
Land use & quality																									
Floodplain encroachment																									
Landscape designations																									
Visually sensitive viewpoints																									
Nature conservation and biodiversity																									
Archaeology and heritage assets																									
Non-traffic impacts on construction																									
Impacts of construction on traffic																									
Impacts on recreational sites or PRoW																									
Impacts on water resources & quality																									
Engineering																									
Network reinforcements																									
Length of conveyance																									
Pumping head																									
Water resource & availability																									
Suitable access for construction / operation																									
Connectivity for waste streams																									
Construction complexity																									
Operational complexity																									
Option taken through to Stage 3	**Yes**	**Yes**	**Yes**	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No	No

Table 9: Stage 2 assessment of all options

Notes:

a) Title includes the catchment / STW source and in brackets the location of the reuse treatment.

b) Where a criterion relates to two or more sites, the least favourable basis of assessment is shown (i.e. if one site is amber and another site red, then red will be shown).

c) Land and Legal criteria relate to pump station / treatment site location

d) The RAG assessment for SRO options had not been reviewed at WRM24

.

55 Nine options were rejected at Stage 2; the reasons for the option rejection are included in the WRMP24 Appendix Q - Scheme Rejection Register.

56 There are no changes to the WRMP19 Stage 2 feasibility assessment outcomes and the following options were therefore taken forward to Stage 3:

- Beckton Catchment - Beckton STW to site within treatment works boundary 380, 300, 200, 150, 100, 50 Ml/d
- Beckton mining - Abbey Mills to Lower Hall 300, 200, 150, 100, 50 Ml/d
- Crossness Catchment – Crossness STW to site within STW boundary 190,150,100, 50Ml/d
- Crossness Catchment – Millbrook Road SPS to site at Hogsmill STW 100, 50 Ml/d
- Crossness Catchment – Wandle Valley SPS to site at Hogsmill STW 17 Ml/d
- Mogden Catchment – Mogden STW to Site within Mogden STW 212 Ml/d
- Mogden Catchment – Mogden STW to site near Kempton 200,150,100, 50 Ml/d
- Mogden Catchment – Mogden South Sewer to site near Kempton 50 Ml/d
- Deephams Catchment – Deephams STW to site within the STW boundary 46.5 Ml/d.

Key changes to WRMP19 RAG assessment

Deephams STW (Deephams)

57 The "Impacts on water resources & quality" criteria have been reassessed from Amber to Red. However the option has still progressed to Stage 3 on the assumption that it could be implemented post 2060.

58 Further information regarding the investigations into the options is included in the WRMP19 Water Reuse Feasibility report and London Effluent Reuse SRO Gate 2 documents.

Stage 3 assessment results

59 Assessment against Stage 3 criteria of options has been undertaken for all options that passed Stage 2.

60 The Stage 3 assessment of the WRMP19 and WRMP24 options that passed Stage 2 is presented in Table 10 providing the red, amber, green assessment of the criteria described in WRMP19 Water Reuse Feasibility report. Four options passed the Stage 3 assessment. Further details are included in the WRMP19 Water Reuse Feasibility report and SRO Gate documents.

61 Where changes have been made to WRMP19 RAG status this is indicated in Table 10.

Option	Criteria	WRMP19	WRMP24	Reason for change
Deephams Reuse	Nature conservation and biodiversity			Summary of the current position (Appendix E) between the EA and Thames Water has identified that the option has potential environmental risk, this criteria has therefore been updated from Amber to Red.
	Water resources & water quality			Summary of the current position (Appendix E) has identified that the flow reduction associated with this option is contrary to the environmental ambition for waterbodies downstream of the option.

Table 10 Changes to WRMP19 RAG status – stage 3 assessment

Criteria	Beckton STW (Beckton) 300 +	Beckton STW (Beckton) 100-299	Beckton STW (Beckton) <100	Beckton SM - AM (LH) 300	Beckton SM -AM (LH) 100-299	Beckton SM – AM (LH) <100	Crossness STW (Southern Marshes) 100-299	Crossness STW (Southern Marshes) <100	Crossness SM – Millbrook (HM) 100 – 150	Crossness SM -Millbrook (HM) < 100	Crossness SM –Wandle Valley PS (HM) < 50	Mogden STW (Mogden) 212	Mogden STW (HF) 100 - 200	Mogden STW (HF) <100	Mogden South Sewer (HF) 50*	Deephams STW post 2060 (Deephams) 46.5
Property & legal																
Assessment of ownership and tenancy																
Planning, socio-economic & environmental																
Planning policy designations.																
Land take and land quality																
Floodplain encroachment																
Landscape character sensitivity																
Visual sensitivity																
Employment & local economy																
Nature conservation & biodiversity																
Opportunity for biodiversity enhancement																
Heritage assets																
Non-traffic construction impacts																
Impact on recreation																
Water resources & water quality																
Engineering																
Length of conveyance																
Normalised Cost / AIC																
Water source & availability																
Water treatment risks and complexity																
Power supply																
Construction Complexity																
The option included in the feasible list	**Yes**	**Yes**	**Yes**	No	No	No	**Yes**	**Yes**	No	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**

Table 11: Stage 3 assessment

Location Abbreviations: STW sewage treatment works, SM sewer mining, LH lower Hall, HM Hogsmill sewage treatment works.
* required to support a 50Ml/d Mogden South Sewer scheme. As a result only a smaller deployable output c.25Ml/d is possible; the 50Ml/d option is rejected after the additional wastewater benefits of the option are reviewed
The RAG assessment for SRO options had not been reviewed at WRM24.

62 There are no changes to the WRMP19 Stage 3 feasibility assessment outcomes; nine options passed the Stage 3 assessment and seven failed the Stage 3 assessment.

63 Further information regarding the investigations into the options is included in the WRMP19 Water Reuse Feasibility report and SRO Gate documents.

64 The following list of options passed Stage 3 feasibility assessment and were taken forward for further consideration:

- Beckton Catchment - Beckton STW to site within STW boundary up to 380 Ml/d[15]
- Crossness Catchment – Crossness STW to the Southern Marshes site up to 190 Ml/d
- Mogden Catchment – Mogden STW to site near Kempton WTW up to 200 Ml/d
- Mogden Catchment – Mogden South Sewer to site near Kempton up to 50 Ml/d[16]
- Deephams Catchment – Deephams STW to site within the STW boundary 46.5 Ml/d (post 2060)

[15] A WRMP19 review of cumulative effects of Thames Water WRMP19 options on the receptor environment in the Middle Thames Tideway identified that if there is more than a 15-20% decrease (275-366 Ml/d) in freshwater inputs to the Middle Tideway normal salinity patterns could be substantially affected. The London Effluent Reuse SRO has therefore considered options up to 300 Ml/d, however at WRMP19 a maximum capacity of 380 Ml/d was assessed as feasible for Beckton Reuse. The 380 Ml/d option remains on the Feasible List while further work is ongoing to review the cumulative impact of options on the Middle Tideway salinity.
[16] Dry Weather Flow (DWF) monitoring data was gathered during the London Effluent Reuse SRO Gate 2 stage, which showed DWF values of 33 to 36Ml/d. This is substantially below a DWF of 60 Ml/d required to support a 50Ml/d Mogden South Sewer scheme. As a result only a smaller deployable output c.25Ml/d is possible; the 50Ml/d option is rejected after the additional wastewater benefits of the option are reviewed.

Option Verification and Conclusion

65 The validation discussion of risk and uncertainty in Section 7 of the WRMP19 Water Reuse Feasibility report remains unchanged. Where options have been rejected through the screening process the rejection reason is recorded in Appendix Q rejection register.

Validation

66 Following further development through the SRO Gated process Mogden STW 200 Ml/d was backchecked against the screening criteria and was rejected at validation. Environmental investigations show a significant risk from a 200 Ml/d scheme breaching EA thermal plume characteristics where the extent of the 2°c temperature change from a discharge extends greater than a 25% cross sectional area of the river.

67 The constraint on maximum scheme size for Mogden Reuse is therefore driven by the potential environmental impacts rather than the available final effluent. For future scheme investigations the maximum capacity of a Mogden water recycling scheme is therefore capped at 150 Ml/d and the 200 Ml/d option is rejected. For more information see the London Recycling SRO Gate 2 submission.

Confirmation of feasible list of options:

68 The following list of options are the confirmed list of feasible reuse options for WRMP24:

- Beckton Catchment - Beckton STW to site within STW boundary up to 380 Ml/d[17]
- Crossness Catchment – Crossness STW to the Southern Marshes site up to 190 Ml/d
- Mogden Catchment – Mogden STW to site near Kempton WTW up to 150 Ml/d[18]
- Mogden Catchment – Mogden South Sewer to site near Kempton up to 25 Ml/d
- Deephams Catchment – Deephams STW to site within the STW boundary 46.5 Ml/d (post 2060)

69 This report summarises changes to the reuse options up to the end of feasibility screening. However, it should be noted that at WRMP24 Crossness Reuse, and Mogden South Sewer 50 Ml/d were rejected at further screening and are not included on the Constrained List of options for WRMP24. The rejection reasoning can be found in WRMP24 Appendix Q Scheme Rejection Register and details of the Further Screening Process can be found in WRMP24 Section 7 – Appraisal of Resource options.

70 Following the backchecking of the WRMP19 feasibility assessment for WRMP24, flow monitoring undertaken by the London Effluent Reuse SRO showed that the Dry Weather Flow (DWF) in the Mogden South Sewer is substantially below a DWF of 60 Ml/d required to support a 50Ml/d Mogden South Sewer option. As a result, only a smaller deployable

[17] A WRMP19 review of cumulative effects of Thames Water WRMP19 options on the receptor environment in the Middle Thames Tideway identified that if there is more than a 15-20% decrease (275-366 Ml/d) in freshwater inputs to the Middle Tideway normal salinity patterns could be substantially affected. The London Effluent Reuse SRO has therefore considered options up to 300 Ml/d, however at WRMP19 a maximum capacity of 380 Ml/d was assessed as feasible for Beckton Reuse. The 380 Ml/d option remains on the Feasible List while further work is ongoing to review the cumulative impact of options on the Middle Tideway salinity.
[18] Further modelling has shown that a maximum capacity of 200 Ml/d has a high risk of breaching Environment Agency guidance where the extent of the 2 oc temperature change from a discharge extends greater than a 25% cross sectional area of the river, this option therefore has a maximum of 150 Ml/d in the Gate 2 Report

output c.25Ml/d is possible. The RAG assessment of this option has been backchecked and the changes made to WRMP19 RAG status are indicated in Table 12 and Table 13.

Option	Criteria	WRMP19	WRMP24	Reason for change
Mogden South Sewer	Operational Complexity			Further review by the SRO has concluded that the operation is of average complexity, but with relatively complex processes/ operations and requirement for relatively substantial O&M procedures. The Stage 2 assessment of Operational Complexity has therefore been changed to Amber.

Table 12 Changes to WRMP19 RAG status – Stage 2 assessment

Option	Criteria	WRMP19	WRMP24	Reason for change
Mogden South Sewer	Water Source and Availability			The source flow monitoring results show only c33 Ml/d DWF available blackwater source compared to a required abstraction volume of c60 Ml/d assessed at Gate 1. The source flow is therefore insufficient for a 50 Ml/d option. Stage 3 assessment of Water Source and Availability has therefore been changed to Red as there are significant constraints on the water availability.
	Normalised cost			AIC £/m^3 assessment for Gate 1 gave Normalised Costs between £1.17 and £1.49 per m^3 which under the basis for assessment is an Amber status; "£1.00/m^3 to £1.50/m^3 ". The Gate 2 assessment demonstrates likelihood of increased costs Stage 3 assessment of Normalised cost has therefore been changed to Red (>£1.50/m^3)
	Planning, socio-economic and environmental			Gate 2 assessment has shown that there are a number of emerging issues around loss of woodland, proximity to the SPA and green belt status which makes the site element of the scheme (i.e. the potential site for STW/AWRP) more difficult to develop than assessed at WRMP19. Stage 3 assessment of Planning, socio-economic and environmental has therefore been changed to Red.

Table 13 Changes to WRMP19 RAG status – stage 3 assessment

71 Mogden South Sewer has been retained as a WRMP24 option while the additional wastewater benefits of the option are reviewed.

72 Information on option development and investment modelling can be found in WRMP24 Section 7 - Appraisal of Resource Options.

Appendix A Reference information

The draft WRMP24 and Technical Appendices can be found on the Thames Water website at:

Please contact consultation@thames-wrmp.co.uk for access to WRMP19 reports

Water resources | Regulation | About us | Thames Water

Please contact consultation@thames-wrmp.co.uk for access to WRMP19 reports

SRO documents referenced in report can be found on the Thames Water website at:

Regional water resources | Regulation | About us | Thames Water

Appendix B Option references

	WRMP 19 ID	WRSE ID
Beckton Effluent Reuse – 150 Ml/d Treatment	RES-DES-BEC-150;	TWU_KGV_HI-REU_reuse beckton 150
Beckton Effluent Reuse – 100 Ml/d Treatment	RES-RU-BEC-100	TWU_KGV_HI-REU_reuse beckton 100
Beckton Effluent Reuse – 50 Ml/d Treatment	RES-RU-BEC-50	TWU_KGV_HI-REU_reuse beckton 50
Beckton Effluent Reuse – TLT extension from Lockwood PS to King George V Reservoir intake	CON-RU-BEC-LCK-300	TWU_KGV_HI-TFR_beckton to lockwood
Beckton Effluent Reuse – Beckton to Lockwood Tunnel Conveyance	CON-RWS-LCK-KGV-800	TWU_KGV_HI-TFR_lockwood ps-kgv res
Beckton mining - Abbey Mills (Luxborough Lane) 300	See note	TWU_LON_HI-REU_ALL_ALL_abbeymillspslux300
Beckton mining - Abbey Mills (Luxborough Lane) 100-299	See note	TWU_LON_HI-REU_ALL_ALL_abbeymillspslux200 TWU_LON_HI-REU_ALL_ALL_abbeymillspslux150 TWU_LON_HI-REU_ALL_ALL_abbeymillspslux100
Beckton mining - Abbey Mills (Luxborough Lane) <100	See note	TWU_LON_HI-REU_ALL_ALL_abbeymills pslux50
Beckton mining - Abbey Mills (Lower Hall) 300	See note	TWU_LON_HI-REU_ALL_ALL_abbeymillspslh300
Beckton mining Abbey Mills (Lower Hall) 100-299	See note	TWU_LON_HI-REU_ALL_ALL_abbeymillspslh200 TWU_LON_HI-REU_ALL_ALL_abbeymillspslh150 TWU_LON_HI-REU_ALL_ALL_abbeymillspslh100
Beckton mining - Abbey Mills (Lower Hall) <100	See note	TWU_LON_HI-REU_ALL_ALL_abbeymillspslh50
Crossness STW (Crossness Southern Marshes) 100 - 199	See note	TWU_LON_HI-DES_RE1_ALL_crossness(erith) 300 TWU_LON_HI-DES_RE1_ALL_crossness(erith) 150
Crossness STW (Crossness Southern Marshes) <100	See note	
Crossness mining - Greenwich (Lower Hall) 100 -150	See note	TWU_LON_HI-REU_ALL_ALL_greenwichpslh150 TWU_LON_HI-REU_ALL_ALL_greenwichpslh100 TWU_LON_HI-REU_ALL_ALL_greenwichpslh50
Crossness mining - Greenwich (Lower Hall) < 100	See note	
Crossness mining - Greenwich (Hogsmill) 100 -150	See note	TWU_LON_HI-REU_ALL_ALL_greenwichpshogs150 TWU_LON_HI-REU_ALL_ALL_greenwichpshogs100
Crossness mining - Greenwich (Hogsmill) <100	See note	TWU_LON_HI-REU_ALL_ALL_greenwichpshogs50
Crossness mining – Millbrook (Hogsmill) 100 – 150	See note	TWU_LON_HI-REU_ALL_ALL_millbrookpshogs100
Crossness mining -Millbrook (Hogsmill) <100	See note	TWU_LON_HI-REU_ALL_ALL_millbrookpshogs50
Crossness mining –Wandle Valley PS (Hogsmill) <50	See note	TWU_LON_HI-REU_RE1_ALL_wandlepshogs17
Mogden Effluent Reuse (Mogden STW) - 212	See note	TWU_LON_HI-REU_RE1_ALL_mogdeneffru-stw
Mogden Effluent Reuse – Reuse Treatment Plant - 100Ml/d	RES-RU-MOG-100	TWU_WLJ_HI-REU_reuse mogden 100

	WRMP 19 ID	WRSE ID
		TWU_WLJ_HI-REU_RE2_ALL_reuse mogden 100 p2
Mogden Effluent Reuse – Reuse Treatment Plant - 50Ml/d	RES-RU-MOG-50	TWU_WLJ_HI-REU_RE1_CNO_reuse mogden 50 TWU_WLJ_HI-REU_RE2_ALL_reuse mogden 50 p2
Mogden to Walton 200 Ml/d - Conveyance for Mogden Effluent Reuse Treatment	CON-RU-MOG-WAL-200	TWU_WLJ_HI-TFR_reuse mogden/Walton
Mogden South Sewer – Reuse Treatment Plant - 50Ml/d output	RES-RU-MSS-50;	TWU_WLJ_HI-REU_RE1_ALL_reuse mogden s sewer
Mogden South Sewer – Reuse Treatment Plant – 25Ml/d output		
Mogden South Sewer associated conveyance	CON-RU-MSS-WAL-50	
Deephams STW post 2060 (Deephams STW) 46.5 Ml/d	RES-RU-DPH and either CON_RU-DPH-KGV; or CON-RU-DPH-TLTEX	TWU_KGV_HI-REU_RE1_ALL_deephams reuse 46.5
Deephams STW post 2060 (Deephams STW) 25 Ml/d	See note	TWU_LON_HI-REU_RE1_ALL_deephams reuse 25
Long Reach STW (within and adjacent to STW site) 50-90Ml/d	See note	TWU_LON_HI-REU_RE1_ALL_lrstweffluentreuse80 TWU_LON_HI-REU_RE1_ALL_lrstweffluentreuse50
Riverside STW (within STW site) 38Ml/d	See note	TWU_LON_HI-REU_RE1_ALL_riversideeff.reuse38

Table 14: Option WRMP19 and WRSE IDs

NOTE: Note - Options rejected prior to constrained list were not all assigned a WRMP19 ID

Appendix C Environment Agency Comments

Source	Option description	Environment Agency comments	Date of response	Outcome of option screening
Summary of position (Appendix E) between Environment Agency and Thames Water on water environment effects of the Deephams STW Reuse option Mar 2022 v0.5	Deephams Reuse	Environmental ambition scenarios for the South East to redress these deficits. The flow reduction associated with a Deephams STW Reuse Option is therefore contrary to the environmental ambition for these waterbodies as laid out by the Environment Agency Waterbody Assessment Tool (2021) and adopted by WRSE, if the scheme were implemented before 2060, after which schemes such as Beckton Reuse will be able to provide compensatory flows. No further work on the environmental risks of a Deephams STW Reuse option before this point, or work to identify bespoke mitigation of the risks, will satisfactorily resolve the risk in the absence of a compensatory scheme.	March 2022	As the option is not viable prior to 2060, it has been appraised for a post 2060 introduction

Table 15: Environment Agency Engagement

Appendix D Middle Thames Tideway – Cumulative effects of re-use, desalination and DRA WRMP19 Options

Appendix E: Deephams Reuse Summary of Position

Summary of position following discussion between the Environment Agency and Thames Water on water environment effects of the Deephams STW Reuse option.

Thames Water's Water Resources Management Plan 2019 position

The Deephams STW Reuse option was included as a preferred option in the adaptive pathway of Thames Water's adopted Water Resources Management Plan 2019[19] (WRMP19) subject to further investigations. The preferred option in the adaptive pathway has a transfer rate of 46.5 Ml/d from Deephams STW to the reuse outfall.

The Environment Agency's representation[20] on Thames Water's revised draft WRMP19[21] included "Recommendation 2 - Ensure that the Deephams option is feasible and does not pose a risk to the environment". That recommendation outlined, at R2.2, concerns over environmental impacts on downstream habitats from reduced flows from Deephams STW; and at R2.3, in the estuarine Thames Tideway.

In response, in its final WRMP19 Thames Water set out a programme of further research to ensure the option is compliant with the Water Framework Directive (WFD) Regulations[22] before being progressed, at paragraph 11.244 of Section 11 *Preferred Plan* to confirm the WFD assessment.

Further work has been undertaken by Thames Water since publication of WRMP19[23] with extensive collaborative working with the Environment Agency throughout. This collaborative working built on the WRMP19 comment log[24], through a series of 10 meetings with Hertfordshire and North London Area Environment Agency staff, leading to adoption of a Methodology Report for the assessment which included scope development, assessment criteria and assessment methods.

Summary of Position

Following completion of the further studies by Thames Water and discussion with the Environment Agency[25] on the findings it has been established that a Deephams STW Reuse option has potential environmental risk. As such, after detailed discussion of the findings with the Environment Agency, Thames Water has withdrawn the option as the preferred WRMP19 option and also as a feasible option[26] from future WRMPs in the medium-term period to c.2060.

At times of operation, a Deephams STW Reuse option would reduce flow in reaches of the River Lee downstream of Deephams STW. For the stretch of the Lower Lee impacted by the scheme, the WFD classification[27] for hydrological regime is 'Does not support Good'. In the Water Resources National

---

[19] Thames Water (2020) Final Water Resources Management Plan 2019 Section 11: Preferred plan *https://www.thameswater.co.uk/media-library/home/about-us/regulation/water-resources/technical-report/preferred-plan.pdf*

[20] Environment Agency (2018) Environment Agency Evidence Report (Annex 1)

[21] Including the WFD Compliance Assessment set out as Appendix BB of Thames Water's draft WRMP19.

[22] Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. SI 2017 No. 407

[23] As reported in: Thames Water (2021) Deephams STW Reuse Option Assessment – Phase 3 WFD Compliance Assessment. Report prepared by Ricardo in associated with Atkins Ltd. Draft issued 15 April 2021

[24] Environment Agency (2018) Environment Agency Evidence Report (Annex 1)

[25] 30 April 2021: Project meeting between Thames Water, Environment Agency, Ricardo, and Atkins Ltd
15 July 2021: Project meeting between Thames Water, Environment Agency, Ricardo, and Atkins Ltd
22 September: Regular strategic meeting between Environment Agency and Thames Water
13 October 2021: Project meeting between Thames Water, Environment Agency, Ricardo, and Atkins Ltd

[26] Environment Agency, Natural Resources Wales and Ofwat (2021) Water Resources Planning Guideline Section 8.22 states: *You should confirm that there is no risk of deterioration from a potential new abstraction or from increased abstraction at an existing source before you consider it as a feasible option*.

[27] WFD classification as reported by Environment Agency Catchment Data Explorer: https://environment.data.gov.uk/catchment-planning/WaterBody/GB106038077852

Framework[28], the Environment Agency utilised a bespoke spreadsheet tool (Waterbody Abstraction Tool) to estimate water balance deficits in 2050; and some of the reaches downstream of a Deephams STW Reuse option have been identified to have a water balance deficit. For the Lower Lee, the calculated deficit is substantial and ranges between 425-521Ml/d under a range of scenarios for the reach impacted by this scheme.

The flow reduction associated with a Deephams STW Reuse Option is therefore contrary to the environmental ambition for these waterbodies as laid out by the Environment Agency Waterbody Assessment Tool (2021) and adopted by WRSE, if the scheme were implemented before major licence reductions on the River Lee. No further work on the environmental risks of a Deephams STW Reuse option before this point, or work to identify bespoke mitigation of the risks, will satisfactorily resolve the risk in the absence of a compensatory scheme.

Background to current position

Through the Water Resources National Framework, the proposed approach to define the longer-term aquatic environment requirements of catchments is to use flow indicators and in so doing to develop potential future flow targets. A Deephams STW Reuse option needs considering in that context. A Deephams STW Reuse option would operate intermittently, as a strategic asset, at times of sustained low river flow and environmental drought. As such it would adversely change the flow regime of the Lower River Lee compared with flow targets as detailed in the Environment Agency Waterbody Assessment Tool (2021) and that cannot be off-set by other flows generated by the remaining Lower Lee watercourses.

Since WRMP19 Thames Water has undertaken further environmental data collection and assessment of the aquatic environment study area for a Deephams STW Reuse option, in regular and extensive consultation with the Environment Agency. Thames Water's assessment of the potential effects on the aquatic environment of a Deephams STW Reuse option was set out in the context of WFD Regulations compliance. Such compliance is in terms of demonstrating both the avoidance of WFD deterioration, and the avoidance of introducing impediment to achieving WFD targets set out in the River Basin Management Plan (RBMP). In the key WFD water body[29], which is hydro-morphologically designated as heavily modified, the current, second cycle, RBMP (2015) overall ecological potential is Bad, with Bad status individually listed for both fish and the dissolved oxygen. The latest published interim classification (2019) of the water body remains Bad ecological potential, with Bad status individually listed only for fish.

In that context, Thames Water's WFD Regulations compliance assessment identified that without mitigation there is a risk to WFD Regulations compliance at times of operation of a Deephams STW Reuse option for water resources purposes. The effects of the option on flow were investigated in a holistic assessment of water quality effects; and on in-channel aquatic ecology through flow effects on wetted habitat and linked water quality impacts. That assessment identified only water quality pathway effects on in-channel aquatic ecology. Water quality modelling undertaken as part of the assessment identified effects on dissolved oxygen in the Lee Navigation and downstream River Lee at Hackney Marshes. Without mitigation, the effects on dissolved oxygen at times of operation was assessed as having the potential to deteriorate the status of macro-invertebrates and fish in the Lee Navigation and downstream River Lee.

Setting out a detailed approach to confirming or mitigating the dissolved oxygen effect is not appropriate because mitigating the dissolved oxygen effect and in so doing confirming the WFD Regulations compliance of the option does not resolve the effect of the option on achieving the advised flow targets. The extensive programme of monitoring that would be required to secure acceptability of mitigation of effects on flow targets sufficient to enable a Deephams STW Reuse option, for example through flow augmentation elsewhere in the catchment, is not considered by Thames Water to represent value for money to customers.

[28] Environment Agency (2020) Meeting our future water needs: a national framework for water resources. Version 1. 16 March 2020
[29] GB106038077852 Lee (Tottenham Locks to Bow Locks/Three Mills Locks) river water body


Thames
Water