



Large Scale Water Resource Options Screening Report

Summary Paper

May 2015

Version 1.1

This paper outlines the approach developed to review and screen resource options for Thames Water's Water Resources Management Plan 2019 (WRMP19), the options assessed and the screening decisions made by the end of Phase 1 of this work (May 2015). It also sets out the further investigations which will be undertaken from 2015 to 2017 to confirm screening decisions, increase our understanding of options and reduce uncertainty. The content of this paper will be discussed at the Water Resources Forum on the 11th May 2015.

1. Introduction

A new option screening process has been developed to review and refine the number of water resource options under consideration by Thames Water, this is referred to as Phase 1. A visualisation of the Phase 1 process is shown in Figure 1. The process has been developed with stakeholders to ensure the process reflects their priorities and provides a consistent and robust basis to reduce the Thames Water option set. It is envisioned that this process will be repeated during the next 2 years as detailed investigations improve the state of knowledge and remove uncertainties associated with the options. The process builds on the work of Thames Water’s last Water Resources Management Plan (WRMP14) to minimise re-work and ensure time and resources are focused on the best value options. All new options that are identified through the work of the Water Resources in the South-East (WRSE) group and third party engagement will be taken through the WRMP14 coarse screening to identify immediate blockers before being developed in more detail to then be taken through the fine screening assessment.

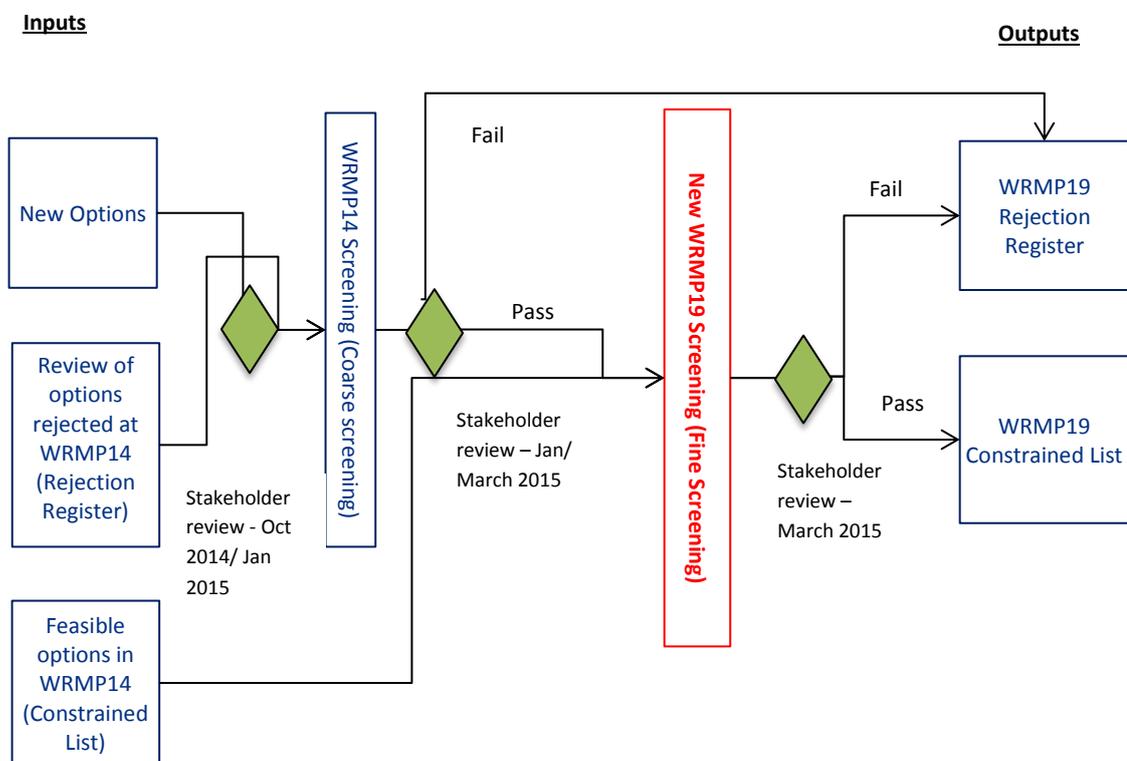


Figure 1: Phase 1 option review and screening process.

2. Supply Options

Thames Water has assessed all options in the WRMP14 constrained list, WRMP14 rejection register and new options with a yield over 50 Mega-litres per day (Ml/d). An equivalent process to review smaller options, less than 50Ml/d, will be undertaken. The type of options and main variants, called sub-options, assessed in the screening process are shown in Table 1.

Generic Option Type	No. of main sub-options	Details
Desalination	3	Desalination of brackish water in the Thames Estuary with options to supply local South East London network or Thames Water ring main.
Wastewater reuse	4	Options in the Thames or Lee valley diverting sewage effluent that is currently lost to sea by returning to river (following a high quality treatment process) to re-abtract at times of low river flow.
Surface water abstraction	1	New surface water abstraction at the Olympic Park site on the River Lee.
Reservoir	4	Options to construct a new reservoir in the Thames Valley to provide support to the River Thames at low flows. Also investigating possible redevelopment of Thames Water's existing reservoirs.
Supported transfer	6	Options to transfer water from the River Severn catchment to the River Thames using a canal or a pipeline supported by a means of storage or sewage effluent diversion.
Unsupported transfer	2	Options to transfer water from the River Severn catchment to the River Thames using a canal or a pipeline without storage.
Tankering	1	A third party commercial proposal to tanker water from Holland and Norway to the Thames estuary.
Effluent abstraction support	1	An option to divert the treated sewage effluent from Mogden Sewage Treatment Works (STW) discharge point to Teddington Weir to increase abstraction upstream of Teddington.
Greywater reuse/ direct non-potable reuse	TBC	Options to understand the potential of using greywater for non-potable purposes (e.g. to flush toilets).
Total number of sub-options:		22

Table 1: The options considered during the Phase 1 screening process (including WRMP14 constrained list, new options and those carried forward from review of the WRMP14 rejection register).

3. Coarse Screening Methodology

The first stage of screening is called coarse screening. The coarse screening has been applied to new options and options rejected at WRMP14 only. The coarse screening methodology is based on the screening approach used for WRMP14. This allows any new options to be assessed with minimum detail and ensures as many of the previous decisions made to screen out options, ratified through approval of WRMP14, are preserved. To ensure this is robust Thames Water has consulted stakeholders on the options previously rejected in WRMP14 and has conducted an internal review. This process has led to a small number of options being revisited and developed in greater detail (e.g. Mogden STW reuse, third party options utilising the Severn Thames transfer and redevelopment of existing reservoirs). The WRMP14 screening criteria, which result in a simple pass/fail against each metric, are shown in Table 2.

Coarse screening criteria	
WRMP14 Primary Screening	
1	Does the option avoid excessive cost?
2	Is the option likely to be acceptable in terms of planning and environmental constraints (e.g. internationally or nationally designated sites)?
3	Is the option likely to help meet WFD objectives and prevent deterioration of waterbody status?
4	Does the option have an acceptable risk of social impact or inequality?
5	Does the option align with national policy objectives?
6	Does the option provide flexibility / adaptability to climate change uncertainty?
7	Is the option currently technically feasible? Are there conjunctive use benefits or other benefits to WR management?
8	Does the option improve resilience against the specific supply-demand issues in the zone (i.e. meets peak week/ annual average shortfall)?
9	Is the option lead time sufficiently flexible to planning or other uncertainties to ensure security of supply is maintained?
10	Are all other risks and uncertainties acceptable, e.g. are there contaminated land issues?
11	Can cost and benefit of the demand option be modelled for comparison with alternatives at DMA level?
WRMP14 Secondary Screening	
12	Does the option avoid excessive cost using available information?
13	Is the option likely to be acceptable in terms of planning and environmental constraints (e.g. internationally or nationally designated sites)?
14	Through assessment of feasibility, capacity, engineering design and risk, does the option avoid excessive risk, and provide sufficient future resilience and net water resource benefit?

Table 2: WRMP14 screening criteria rolled into a single screening stage for WRMP19 (Adapted from Appendix P, Thames Water WRMP14)

4. Coarse Screening Results

The results of the coarse screening assessment conducted on new options and those options that had previously been rejected at the WRMP14 are shown in Table 3.

Option	Key elements	Screening Decision	Comments
Reservoirs			
Redevelopment of large scale resources	Deepening of existing reservoirs	TBC	<ul style="list-style-type: none"> Not feasible in the short to medium term as taking reservoirs out of service to increase their capacity cannot currently be accommodated.
Bulk Transfers			
Grand Union Canal	Elements currently undefined.	TBC	<ul style="list-style-type: none"> A collaborative study between water companies and the Canal and River Trust (CRT) on transfer options is underway.
Upper Severn (United Utilities (UU))	UU proposed to provide support to River Severn to facilitate transfer via the Deerhurst pipeline or Cotswold Canals	✓	<ul style="list-style-type: none"> Option carried forward to fine screening.
Middle Severn (Severn Trent Water (SVT))	SVT proposed a transfer from the River Severn to Farmoor Reservoir on the River Thames.	✓	<ul style="list-style-type: none"> Option carried forward to fine screening.
Lower Severn (SVT)	SVT proposed to provide support to River Severn to facilitate transfer via the	✓	<ul style="list-style-type: none"> Option carried forward to fine screening.

Deerhurst pipeline or Cotswold Canals			
Desalination			
Estuary south + new service reservoir	As for Estuary South desalination plant but with a local service reservoir for blending instead of the transfer tunnel from Crossness to Honor Oak that was assumed as part of the WRMP14 scheme.	✘	<ul style="list-style-type: none"> Screened out as not being feasible due to the dispersed nature of ground water sources in south-east London and the difficulty bringing sufficient groundwater to one place for blending and then redistributing it.
Estuary North	Second desalination plant to the north of the estuary.	✓	<ul style="list-style-type: none"> A second desalination plant on land approximately 1km west of Beckton with a tunnel to Coppermills where the desalinated water would be blended in a balancing tank for supply to the London Ring Main
Abstraction support using effluent			
Mogden STW - Teddington weir	Improved treatment at Mogden or off site, 300MI/d transfer to Teddington outfall. TBC whether any works to the intake would be required.	✓	<ul style="list-style-type: none"> Option carried forward to fine screening. Further work is needed to determine the effluent standards and treatment requirements that would apply. This will be done in Phase 2 and at that point it will be incorporated into the fine screening.
Beckton STW - Teddington weir	Improved treatment, increase Tideway Tunnel size, pipelines, outfall, maybe intake	✘	<ul style="list-style-type: none"> Screened out on the grounds of feasibility as the proposal includes installing a pipeline within the Thames Tideway Tunnel which is due to commence construction in 2016 (outside WRMP19 timescales).
Direct non-potable reuse or greywater reuse			
Direct non-potable reuse	Elements currently undefined	TBC	<ul style="list-style-type: none"> A demonstration project at the Queen Elizabeth Olympic Park is being proposed during AMP6 to understand the potential of this option.
Greywater reuse	Elements currently undefined	TBC	<ul style="list-style-type: none"> A literature review is proposed to better understand the current potential
Wastewater reuse			
Mogden reuse	RO, pipelines to blending site	✓	<ul style="list-style-type: none"> Option carried forward to fine screening.
Tankering			
Albion Water proposal		✘	<ul style="list-style-type: none"> Screened out on the basis of excessive cost.

Table 3: Coarse screening results

5. Fine Screening Methodology

The fine screening is a new stage in the assessment process. In contrast to the coarse screening, the new fine screening methodology requires options to have been developed to a greater level of detail using information from the Strategic Environmental Assessment (SEA), Habitats Regulations Assessment (HRA), option risk and cost assessments. This is consistent with the assessments undertaken for the WRMP14 constrained options list. The criteria have been designed to assess a scheme throughout its lifecycle from initial promotion to operation. The screening criteria and how they relate to the project lifecycle is shown in Figure 2.

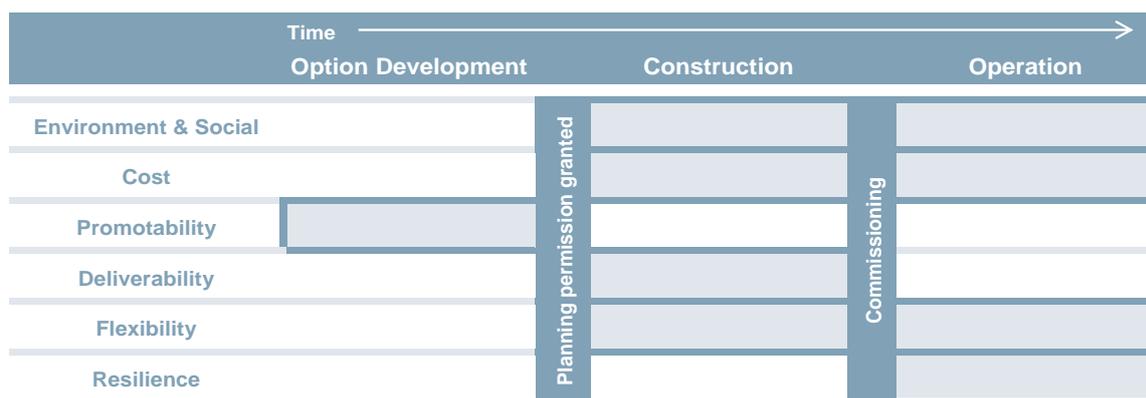


Figure 2: Fine screening criteria and their relationship with the stages of the project lifecycle.

The criteria and component elements considered within the assessment for fine screening are shown in Table 4.

Criteria	Component elements considered within criteria				
Environmental and social (E&S)	SEA	HRA	WFD	Cumulative effects	
Cost	Level of optimism bias (applied to capital cost)	Minimum utilisation	Maximum Utilisation	Average Incremental Cost (AIC)+Carbon against least cost option within capacity band	
Promotability	Synergies (with other resource zones)	Customer acceptability	Local acceptability	Regulatory acceptability	Wider stakeholder acceptability (local councils etc)
Deliverability	Constructability	Operability	Dependencies	Data confidence	
Flexibility	Lead time (planning and construction)	Phasing (construction)	Adaptability (e.g. treatment of different sources/supplying different zones)	Ramp-up (operational)	
Resilience	Vulnerability of option type to climate change & severe drought (wetter winters, drier summers)	Vulnerability of option type to other 'failure modes' (use of resilience matrix e.g. power failure, vandalism)	Net contribution to system outage resilience and future resource predictability?	Vulnerability of option type to regulatory changes (e.g. abstraction licence changes, drinking water standard changes)	

Table 4: Fine screening criteria.

Positive and negative characteristics for each criteria have been assessed using the indicators as shown in Table 5. These are designed to be indicators only and will not be used as a quantitative screening assessment. All screening decisions will be made through a narrative justifying the exclusion of the option. If further information is obtained, either through third parties or Thames Water investigations, screening decisions may be revisited.

Symbol	Meaning (other)	Description
	Substantial benefit/opportunity	The option has substantial benefits/opportunities either individually or cumulatively.
	Material benefit/opportunity	The option has some material benefits/opportunities.
	Neutral	The option does not have significant residual effects.
	Material disbenefit/risk	The option has some material residual disbenefits/risks, either individually or cumulatively
	Substantial disbenefit/risk	The option has substantial residual disbenefits/risks, either individually or cumulatively

Table 5: Screening indicators used for all criteria.

Note: A superscript 'r' next to the symbol would highlight that a disbenefit/risk that could potentially be reduced to 'neutral' by additional development of mitigation measures during detailed design.

6. Fine Screening Results

Further information on the option fine screening assessment is presented in the option screening report. The output of the option-type fine screening is summarised in Table 6.

Option	Decision	Further work to validate decision
Unsupported transfers	X (Resilience)	<ul style="list-style-type: none"> - Updated flow record of the River Severn - Synthetic droughts (to understand impact of climate change) - Probability of coincident drought in Severn and Thames catchments
Surface water abstraction	X (Cost)	<ul style="list-style-type: none"> - Monitoring of Water Quality in Lower Lee to understand any improvement
Desalination	TBC	<ul style="list-style-type: none"> - Confirm cost difference with Wastewater reuse
Reservoir	✓	
Wastewater reuse	✓	
Supported transfers	✓	

Table 6: Fine screening option-type results

The fine screening was also completed to review the sub-options. The results of the sub-option screening are presented in Table 7.

Scheme and sub-options	Decision	Further work to confirm decision
Reservoir		
1. Abingdon reservoir (phased 75Mm ³ +75Mm ³ , 100Mm ³ , 150Mm ³)	✓	- Updated site selection report
2. Abingdon reservoir (30Mm ³ , 50Mm ³ , 75Mm ³)	X (Cost)	
3. Chinnor (all sizes)	X (Cost, E&S)	
4. Longworth (all sizes)	X (Cost, E&S)	
Wastewater reuse		
1. Deephams	✓	- Comparison of Mogden and Beckton construction requirements, ring main reinforcements and costs
2. Beckton	✓	
3. Abbey Mills	X (Flexibility)	
4. Mogden	TBC	
Supported transfer		
1. Longdon Marsh (new reservoir) all options	X (Cost, Promotability)	- Severn Trent commercial proposal - Cotswold Canal conveyance capacity, costs and operational risks
2. Lake Vyrnwy (existing reservoir) via pipeline	✓	
3. Lake Vyrnwy (existing reservoir) via canal	TBC	
4. Severn Trent options (existing reservoir/ wastewater effluent) all options	TBC	

Table 7: Fine screening sub-option results

7. Phase 2 Investigations

Phase 2 comprises further investigations to improve our understanding of options. Further investigations are proposed for the following purposes:

- To finalise the fine screening decisions including:
 - a. Investigations to confirm the coarse screening where currently shown as TBC;
 - b. Including new options that have passed the coarse screening (e.g. Mogden effluent transfer) to the fine screening;
 - c. Development of new phased options (e.g. phased Beckton effluent reuse);
 - d. Investigations on specific uncertainties identified (e.g. Cotswold canal vs. Deerhurst pipeline);
 - e. Further investigations to confirm (or otherwise) provisional screening decisions; and
 - f. Development of dossiers, costs, deployable outputs and environmental assessments to a consistent level for fine screening (e.g. for third party options).

- To address uncertainties in options that pass the fine screening to feed into programme appraisal:
 - a. Review existing water supply constraints, their impact on the existing options and potential new options to alleviate constraints;
 - b. Full assessment of benefits for options;
 - c. Develop operating strategy for options and update operating costs;
 - d. Identify additional treatment and network reinforcements required for options; and a
 - e. Bottom up assessment of risk.

A breakdown of the scope and output of the investigations is available in the screening report. Figure 3 shows a conceptual timeline for the detailed investigations.

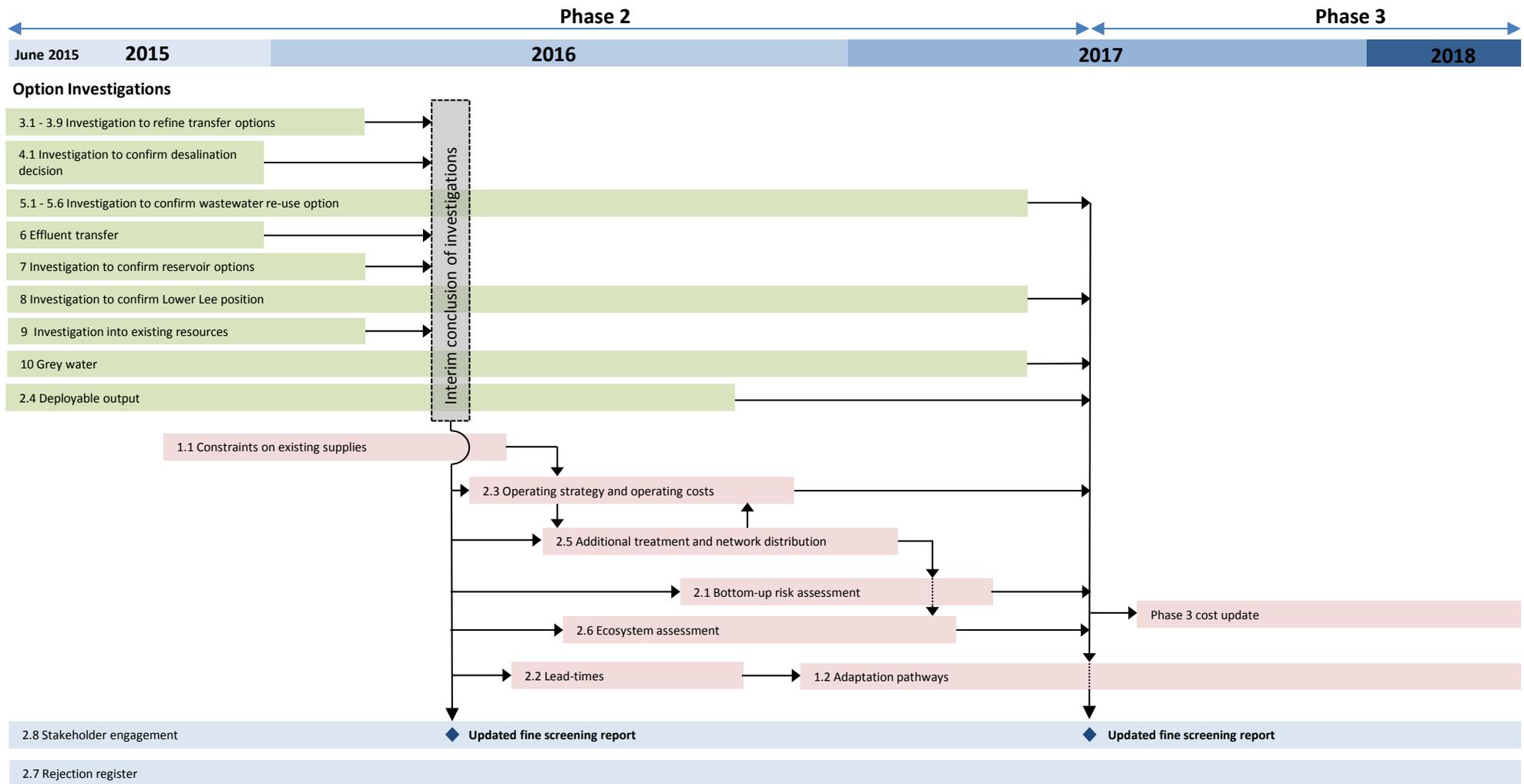


Figure 3: Conceptual view of Phase 2 programme showing dependencies between investigations

8. Further Information

The full report for the Thames Water screening approach and assessment for options will be published on Thames Water's website from the following link: <http://www.thameswater.co.uk/about-us/15548.htm>.