



Technical Stakeholder Meeting: Approach to develop our preferred programme

Date: Tuesday 8 November 2016

Time 10.00am to 3.00pm

Venue: Waterhouse Chamber, Reading Town Hall, Blagrove Street, Reading, RG1 1QH

Meeting Minutes

Welcome and introduction Chris Lambert welcomed everyone to the meeting. Chris provided background information on the work underway to develop our next Water Resources Management Plan 2019 (WRMP19), with the focus on the approach to develop our preferred programme.

The planning horizon

Thames Water (TW) commissioned NERA to undertake an independent piece of work to help define the planning horizon to be used for our next Water Resources Management Plan (WRMP19). The Executive Summary of the draft report produced by NERA was circulated ahead of the meeting. Key points were as follows:

- The regulatory framework has introduced the need for a long-term perspective to make water supply more resilient to future uncertainties and longer term pressures.
- The statutory minimum planning period remains at 25 years but with the onus on companies to use a longer horizon where required.
- Complex infrastructure can take as long as 15-20 years to promote and develop.
- Work completed by Atkins, for TW and the Adaptation Sub-Committee on Climate Change to investigate water resources planning under climate uncertainty in London showed that using a planning horizon to 2080 changed the optimal investment strategy compared to a 2050 horizon.
- The industry as a whole has undertaken work to consider the appropriate planning horizon and decision support tools.
- NERA developed a conceptual framework to help to determine the appropriate planning horizon for the water resources problem. In its report, NERA set out that:
 - the appropriate planning horizon will depend on the size and timing of the problem, and the nature and extent of solutions available;
 - the horizon may not be the same for all Water Resource Zones (WRZs) in an area;
 - where there is no significant deficit, or sufficient low cost options which can be quickly implemented, then the minimum planning horizon is sufficient;
 - where there is a large potential deficit, and options with long lead times and long asset lives, extensions of the planning horizon may be necessary; and
 - horizons longer than 60 years may be required for WRZs with complex planning problems.
- For most water companies the planning horizon is likely to be in region of 40-60 years, with the maximum at 100 years recognising the availability of data and uncertainties associated with long term forecasts.

We have applied the framework to the 6 WRZs which make up TW's supply area.



Imperial College: The approach is logical, but there are challenges around forecasting over such a long time frame, one can't assume business as usual, and there is a need to use exploratory scenarios around socio-economic factors and conditions. **TW** agreed that it will be necessary to look at a range of scenarios to ensure we understand how robust the plan is.

Ricardo: The foresight programme was referenced and the need to explore other similar scenarios.

Imperial College: There has been further work on scenarios which can form the basis for this work including scenarios around climate change adaptation and sustainability but need to consider the socio-economic factors more broadly.

Work that the EA has completed on foresight futures was referenced.

EA: In respect of neighbouring water companies, what planning horizons are they intending to adopt. **TW** confirmed that to the best of its knowledge, Southern Water and South East Water are looking at 50 years. United Utilities confirmed that it is looking at 60 years and Severn Trent Water is considering 40 years.

EA: Does the range of planning horizons used by different companies create risk. **TW** did not think this presented risk. WRSE is developing options in the context of the South East to a 2080 horizon. Companies wider than WRSE are also looking at longer planning horizons, e.g. WRE is planning to 2100.

Ofwat: Are you going to test the sensitivity of the planning horizon? **TW:** Yes we will undertake sensitivity analysis using different planning horizons.

Problem characterisation in individual Water Resources Zones

TW has completed problem characterisation assessment to understand the size and complexity of the planning problem for each WRZ. This helps to determine the appropriate decision support tool(s), and length of the planning horizon. TW followed the approach outlined in the UKWIR WRMP 2019 Methods – Decision making process: Guidance (2016). In summary:

- There is a problem of significant concern and complexity in London and SWOX WRZs. For these zones, an 80 year planning horizon has been selected. Complex assessment methods are being developed for these zones which reflect the significance and complexity of the planning problem.
- The London WRZ also needs to be considered in the context of Water Resources South East (WRSE) as investment solutions have potential to contribute to the wider water resources need identified in the South East.
- The other Thames Valley & Guildford WRZs do not have significant, or complex, planning problems and as such TW will adopt a 25 year planning horizon and less complex decision support tools.

Stakeholders supported the methodology and conclusions of the problem characterisation assessment.

GARD: How do you take into account interconnectivity between SWOX and London? **TW:** Both programme development models solve the problem for both zones simultaneously.



Adrian MacDonald: If you use a 25 year planning horizon in 4 WRZs, how does this sit with neighbouring companies who use a longer horizon? **TW** taking Henley WRZ as an example, Henley WRZ is self-contained and has a current surplus so to undertake the assessment and develop the forward plan is straightforward. Some of the neighbouring zones to Henley are expected to have significant growth in terms of population, and also constraints on resource availability, so these zones require a longer planning horizon.

CIWEM: Does Affinity Water rely on the River Thames. **TW:** Yes Affinity has raw water intakes from the Lower Thames below Windsor and has asked TW to include scenarios for supply of up to 100 MI/d raw water.

Anglian Water: There are knock on impacts and to understand TW, and other companies' plans, is important to Anglian's plans. **TW** agreed and a key objective of both WRSE and WRE is to ensure integrated planning and that these groups work collaboratively.

Decision Support Tools

TW and the University of Manchester (UoM) then presented the decision support tools that are planned to be used for programme development for WRMP19. There are 2 types of model, aggregate and river simulation models. TW will use both types of model and compare the outputs. The models will provide multiple potential solutions and TW will undertake sensitivity testing and adaptive futures to consider the preferred programme.

Key points presented:

- Economics of Balancing Supply and Demand (EBSD) is a simple optimisation model which uses pre-determined forecasts and ensures sufficient capacity to meet demand during dry year critical period for financial least cost.
- To move to best value programme development TW has developed EBSD+. This includes optimisation on other parameters via the use of metrics.
- The metrics have been developed taking account of WRMP14, option screening and WRMP19 Guiding Principles.
- EBSD+ will take account of all 7 metrics and provide optimised programmes. Note the input data takes account of the components of supply options from source to tap (resource, conveyance and treatment).
- EBSD+ will output a range of best value programmes. These will be shortlisted and considered from an adaptability viewpoint. Adaptability will include consideration of different climate change projections, population growth projections, legislation change and environmental assessment. The adaptability pathways allow evaluation at 5 year intervals to understand which programmes are most robust.
- A visualisation tool, developed by the UoM, for TW, provides a transparent tool to help visualise the performance of the range of possible programmes against the range of metrics.

GARD: Is there a risk of double counting, target headroom includes allowances for uncertainty. **TW:** When the UKWIR project was being undertaken this was flagged as a concern. The decision support tools and metrics have been designed to ensure that there is no double counting.



GARD: You hold 30 days emergency storage as a safety factor will this be affected? **TW:** The 30 days emergency storage will be unaffected; there is no intention to reduce this.

River simulation models

UoM presented an overview of the system simulator models. In summary the model considers system flows, abstractions, consumption, storage and multiple metrics of performance on a time-step basis (e.g. WARMS, IRAS-2010). It can be linked with different planning approaches and models so it can become more sophisticated. One approach is to link the simulator with a multi-criteria search (MCS) function, this allows trade-offs between performance metrics.

Cotswold Canal Trust: There are a number of modifications which, for relatively small costs, can provide more benefit. How can we take account of improvements in design? **UoM:** The MCS is a flexible tool which can be used to provide the best combination of options to support decision makers.

Cotswold Canal Trust: A model is only as good as the input information. **UoM:** Agreed but it can be run multiple times to provide good information to support decision making. Welcome comments for improvements.

Cotswold Canal Trust: It would be helpful to include a further iteration to ensure it takes account of the wider benefits. **TW:** Noted.

GARD: Why are you not using WARMS2? Are you confident that the simulation model gives sufficient detail? How will you check this against WARMS2? **UoM:** The model has been designed to be as similar to WARMS2 as possible with river flows, reservoirs etc. It needs to run many times to produce a good simulation, it has a rapid run time ~ 5s compared to WARMS2 ~ 1hour.

GARD: Does it include River Severn flows? **UoM:** The model has been built using TW's current system. TW is building in the Severn to Thames transfer and this will be simulated as far as possible using flow data and regulation principles.

GARD: Is there a paper which sets out the detail? **UoM:** A paper on IRAS has been published that represents the Thames catchment, it is being updated with the latest option data and the extended model including the river Severn and Severn-Thames transfer¹.

GARD: We would like to think there will be some transparency to the model. **TW** confirmed that the operating rules are the same as those included in WARMS2.

CIWEM: How do you get a number for resilience? **UoM:** The resilience metric is framed on the frequency and maximum duration for which level 3 demand restrictions are instigated over an 80 year planning horizon.

GARD: Will you adjust control lines in the Lower Thames Control Diagram (LTCD). **UoM:** The LTCD is included in the model, and the intention is not to optimise the operating rules.

¹ Evgenii S. Matrosov, Julien J. Harou *Simulating the Thames water resource system using IRAS-2010* *International Environmental Modelling and Software Society (iEMSs) 2010 International Congress on Environmental Modelling and Software Modelling for Environment's Sake, Fifth Biennial Meeting, Ottawa, Canada*



CIWEM: How does the model take into account a potential phased scheme or future flexibility. **UoM:** The model will schedule specific interventions for example a reuse strategy can be implemented in 3 phases. The model will provide a trade-off between different options and phases.

CIWEM: It is not clear how the phases will be introduced? **UoM:** The model can combine pathways into programmes to accommodate future flexibility and variation such as branching methods.

Metrics

TW provided an overview of the metrics in development to aid the selection of the preferred programme and introduced a visualisation tool. A technical paper was provided in advance of the meeting and detailed information presented in the slide pack. Key points noted were as follows:

Cost: This is the net present value of the total cost of a programme across the planning horizon and combines 4 elements (Capex, Opex, Carbon and Risk)

CIWEM: Is optimism bias in line with Treasury methodology. **TW** confirmed that it is in line with Green Book approach and that a paper is being completed to present the methodology.

GARD: For operating cost are you envisaging calculating this on an increasing basis as demand grows. **TW** confirmed that this will be in accordance with the predicted utilisation of the asset.

CIWEM: Will TW use the cheapest sources at any one time. **TW:** We expect to develop a best value programme which is robust against a number of scenarios wherein cost is one component of value.

CIWEM: Cost information has not been included in the published reports. Will you make this available? **TW** confirmed that some cost information has been included in the fine screening report at an option level. Detailed cost information is commercially confidential.

GARD: There must be some way that TW can provide more transparency on costs. GARD set out they would like information on CAPEX and how this has been made up. GARD cited the information provided at the 2010 public inquiry and requested similar data to be provided. GARD stated they want both the assumptions and the breakdown of costs.

Ofwat: Whilst the request for transparency in costs is understandable, would a disclosure agreement help to achieve this?. Ofwat stated that their position would need to be confirmed on this issue.

Cotswold Canal Trust supported GARD's request for further information on the composition of the costs.

TW raised third party options, the breakdown of costs for which are not disclosed, and how these costs would be treated in the public domain.

Chris Binnie, representing CIWEM, declared an interest as an agent for Aylesford Paper Mill. CB stated that the option was screened out by TW on the basis of costs but information was not disclosed to enable challenge. **TW** asked CB if he had requested the information, and he accepted that he had not.

Albion Water, who also proposed commercial options to TW, supported the provision of further information to support the basis of the screening decision, provided parties who might have signed a non-disclosure agreement agreed.



Deliverability: Probability that sufficient water delivered on time and to budget across the planning horizon. Developed at an option and programme level.

CIWEM clarified if works duration includes construction. **TW** confirmed that this is the case.

Atkins queried that if there is a problem with works duration the uncertainty is temporary whereas if it is yield it is a longer duration. The weighting applied was also queried. **TW** confirmed that the weighting is based on expert judgement and will undertake sensitivity test to see whether if weightings are changed the comparative values of Deliverability for different potential investment programmes vary sufficiently to drive different programme selection

Imperial College: Need to apply an appropriate degree of accuracy. It is not appropriate to apply a high degree of accuracy across the planning horizon when it is such a long duration.

GARD: Is there an overlap between yield uncertainty and climate change. **TW:** No. Yield uncertainty only refers to the expected yield for a specific solution which is independent of climate change.

CIWEM: The greatest risk is in the promotion of some of these options – is this included in the metric?
TW not fully at present

TW confirmed that Motts are producing a technical paper which describes this metric in more detail. This will be available early in 2017

Resilience: To test 14 event hazards, developed by WRSE

GARD: Where do you take account of climate change? **TW** confirmed that the medium climate change scenario is used for the most likely.

Anglian Water: Where do you take account of the WaterUK scenarios ? **TW** we are evaluating resilience to a number of specific drought frequency events, similar to those used in the Water UK project.

Adrian McDonald: Are these treated as independent hazards? **TW** confirmed that they are, combined hazards are not currently under consideration

GARD: What consideration is being given to the resilience of the Upper Thames Reservoir in the context of historic droughts? **TW:** We are looking at extreme drought events. The events that cause most difficulty are severe events within the 12 - 18 month duration. For longer duration drought events, given that the Thames catchment is spatially very large, across the catchment we get some recharge which supports the London reservoirs. The stochastic drought generation work demonstrates this well. Three dry winter drought events are not the extreme events driving the need to enhance resilience.

EA: How will the metric reflect differing performance against different hazard types. For example if an option scores well against one type of hazard (for example droughts) but low against another (flooding)? How will the metric reflect this information, and how will this get used within the decision making? **TW:** Currently we take account of the effect on DO of different hazards; flooding, water quality, asset failure as an aggregate but will consider this point.



Environment: To consider major adverse and major beneficial effects (2 separate metrics).

These are formulated based on the detailed assessment from the SEA assessment of each option. Scoring rules have been applied ie minimum grade of -9 has been set where there are impacts on internationally recognised sites. In addition to the metrics an SEA is completed of the programme.

Cotswold Canal Trust: Is the assessment pre or post mitigation. **Cascade** confirmed that the assessment reflects residual impacts post mitigation.

CIWEM: Is the assessment completed for all feasible options. **TW** confirmed that this is the case.

Imperial College: In many cases mitigation is clear and therefore straightforward, however where mitigation is less certain – how is this addressed. **Cascade** explained that uncertainty of the effects of options is included in the SEA and will be clearly noted.

GARD: Is visual impact included in the SEA. **Cascade** confirmed that visual impacts are included in the SEA.

Sustainability: This metric delivers best value for both present and future generations, in terms of affordability and protecting the most vulnerable and continues the trend of reducing overall demand via water efficiency and leakage control.

This metric is designed to help ensure that the strategy is fair for current and future water users using the social time discount rate to explore how much of cost can be shared

GARD: Does it apply to all costs capex and opex. **TW:** Yes

CIWEM: Does it favour some options over others? **TW:** No

Ofwat: I assume it is using the use same cost information but aims to show what schemes would be fairer for future generations. **TW:** Yes

Acceptability: This metric considers customers preferences and the preferences and of other water companies and other sectors

Cotswold Canal Trust: Where is promotability considered? **TW:** This is partially addressed within deliverability.

Adaptability: This aims to test how adaptable a range of ‘good value’ programmes may be to significant changes to the forecast trends due to four drivers: climate change; population growth or reduction; sustainability reductions to deliver Water Framework Directive objectives; and supply chain price changes (e.g. power cost, cost of chemicals, membranes etc.), with 3 futures considered for each driver. The assessment is considered at 5 year time intervals.

GARD: How would you decide how to sequence of options in a programme. **TW:** We define most likely DO ranges that would require significant changes in investment; within each we select one or more future pathways.



Imperial College: There is significant uncertainty when looking over an 80 year timescale and as such needs careful consideration of the scenarios. **TW** agreed and further work is to be completed to define the scenarios.

Visualisation tool

The UoM presented work completed to date to develop a visualisation tool for TW. The aim of the visualisation tool is to provide a clear presentation of the programmes and performance of the programmes against the suite of metrics, to enable better transparency for programme shortlisting and selection

GARD: Transparency is key. Will you share the outputs. **TW:** The tool has been developed to provide stakeholders with transparency of the metric information at option level and the outcomes from the decision support tools. Information will be shared with stakeholders.

Imperial College: The environmental performance data needs to be reviewed to ensure the best performing programme is aligned with the other metrics. Plus decimal places should not be used as it implies a false level of accuracy.

Albion Water: Queried the validity of the cost information. **UoM** confirmed that the data was not real data and was dummy data for illustrative purposes only.

Swindon BC: Stated their support for the development of tools to aid communication, and that a mapping tool would be helpful for Local Authorities and engagement on Local Plans.

Adrian MacDonald highlighted the need to retain history and logic to the development of preferred plans.

Anglian Water asked how the tool and the information would be used. **TW** explained that it will be used as a tool to aid internal review to develop preferred programmes. Similarly it will be used with the Expert Panel. The outputs will be used to aid communications and dialogue with external stakeholders.

GARD questioned when the tool would be available. **TW** confirmed that the programme appraisal will be completed by the end of the summer and the tool will be available to support this.

Dates of next meetings

2017:

- 7 February - Technical Stakeholder Meeting on demand management and resource options
- 16 March - Water Resources Forum

End



Attendees

Name	Organisation
Adam Comerford	Canal and Rivers Trust
Adrian MacDonald	University of Leeds
Andrea Farcomeni	Affinity Water
Anna Wallen	Thames Water
Anthony Whitaker	Swindon Borough Council
Bill Sheate	Imperial College
Brian Arkell	Atkins
Chris Binnie	CIWEM
Chris Lambert	Thames Water
Hannah Stanley-Jones	Anglian Water
Harry Hodgson	CCG
Ivana Huskova	University of London
John Lawson	GARD
John Sanders	Cascade
Kay Lacey	CCG
Ken Burgin	Cotswold Canal Trust
Kieran Conlan	Cascade
Lesley Tait	Thames Water
Malcolm Jeffery	Albion Water
Mark Smith	United Utilities
Paul Leinster	Consultant
Sarah Goode	Environment Agency
Sarah Wardell	Environment Agency
Simon Harrow	Ofwat
Stephen Knox	University of Manchester
William Mackveley	Severn Trent Water