Thames Water

Final Water Resources Management Plan 2019

Technical Appendices

Appendix Y: Final Report of the Thames Water Expert Panel, August 2018

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This report was prepared by Thames Water's Expert Panel (EP) in July 2018, for inclusion in Thames Water's revised draft Water Resources Management Plan 2018 (rdWRMP18). It builds upon the summary report of the EP that was included in Thames Water's draft Water Resources Management Plan 2018 (dWRMP18), and it addresses comments made on the role and work of the Panel in consultee responses to that dWRMP18. Like its predecessor summary, this report was produced independently of Thames Water (TW), by the members of the Expert Panel.

1. Context

    a. National

    The regulated water companies of England and Wales are required to submit, at intervals of five years, for price review, a business plan supported by a water resources management plan. Guidance is provided by the regulators but the interpretation by companies to fit the circumstances of the region in which they supply leaves discretion for the companies. Guidance has evolved and in each review there are changing expectations. In the current price review, important changes have been made in the basis of decisions:

    - From least cost in the previous review to 'in the round' best value;
    - Providing supply resilience to drought events more extreme than those in the historical record;
    - Allocating more weight (than previously) to customer preferences, and to affordability;
    - Considering trades and transfers between companies/regions and third-party providers as water supply options;
    - Including multi-sector engagement, to take account of the need for water from the power, agricultural and business sectors, as well as for public water supplies;
    - Applying a 'triple-track' consideration to (1) demand reductions; (2) trades and transfers; (3) new supply options, subject to all-in, long-run cost tests;
    - Taking the opportunity to plan (i) over a longer period and/or (ii) over a wider area, taking account of long-run and wide-area regional needs, not just individual company needs over the next 25 years, as previously.

    b. Aims

    Thames Water sought to establish an independent panel of recognised experts in water resources planning and related fields, to provide early challenge and alternative perspectives to the Company, and thus to augment the challenge and critical analysis provided by formal regulators.

    c. Membership

    - Professor Adrian McDonald (demand assessment & forecasting)
    - Dr Colin Fenn (water resources planning)
    - Professor Julien Harou (water resources planning)
    - Dr William Sheate (strategic environmental assessment)

d. Independence

Recognised international expertise cannot be expected to be provided free of cost. We provide an estimate of the hours we have contributed and the range of tasks we have performed, below. We take this opportunity to confirm that no pressure has been applied on us to support a company position and that all data, reports and software access requested by the panel has been promptly and fully provided. The EP has noted comments made on its role (and expected outputs) in the representations made on TW's dWRMP18 by (in particular) OFWAT and the Environment Agency (EA). We note here that the choice of preferred programme was in the domain of TW and that the focus of the EP was on evaluating and commenting on the decision-making analytical methods and the process of their use. The given role of the EP was to test and challenge, not to provide assurance or evidenced verification of actions and outputs. We provide fuller information on these matters in the following sections.

e. Inputs of EP members to TW's dWRMP18 programme beyond the work of the EP

Individually, members of the expert panel contributed in their specific areas of expertise, in an advisory/review role, including prior to the first expert panel meeting in January 2016, e.g. on demand management, on SEA methodology/approach, on abstraction, and on water resource modelling for planning.

The panel members also provided, on an *ad hoc* basis, comments on the dWRMP18 to TW in relation to their specific areas of expertise.

2. Approach

a. Input and Reporting

The four members of the EP team were involved from an early stage in the planning process for TW's final WRMP 2019, most particularly in the period of preparation of its dWRMP18 and rdWRMP18. We have been briefed regularly and have provided strong challenge and received prompt responses throughout. In addition, members of the team have reviewed specialist consultants' work in their area of expertise, have been present at public and technical meetings and have spoken with regulators informally when they have attended. We have presented at meetings as requested to ensure that attendees understood our role. Our challenge has been immediate and direct.

In total, we contributed over 1000 hours of work as members of the EP, in the period from 1 January 2016 to the date of this report.

b. Meetings

EP members have attended twelve expert panel meetings (typically of one-day duration) since January 2016. Table 1 lists the dates of those panel meetings, and of stakeholder event meetings also attended by panel members.

c. Role of the Expert Panel (EP) in Thames Water's dWRMP18 decision making process

In their appraisal of Thames Water's (TW) dWRMP18, OFWAT and the EA raised some queries and stated some expectations concerning the role and the outputs of the EP, overall, and in the decision-making process in particular. The implied information sought by Ofwat's review suggests a wish to know the extent to which the EP made or influenced the decision. The EA's comments include a request for an audit record or log of the panel's challenges. We respond to these requests here and continue to summarise our fuller role.

The direct decision, i.e. on the determination of long list, short list, alternatives and final choice options for inclusion in the dWRMP18, the rdWRMP18 (and ultimately the fWRMP19) was entirely with Thames Water. The EP contributed opinions in the 5 key areas listed below. The EP was involved for over two years in making these contributions.

1. Questioning and refining the derivation, definition and value of the metrics used for selecting and phasing new (demand, supply and trading) options into the WRMP, on an on-going basis.
2. Commenting upon the individual and in-tandem use of the EBSD+ (Economics of Balancing supply and demand) and MCS (multi-criteria search) approaches used by TW to identify balanced option portfolios and plans.
3. Trialling the use and appraising the value of the 'Polyvis' decision support visualisation tool used by TW to examine trade-offs between key criteria (see below). This interactive parallel axis plotting tool was used to determine all-in (multi-criteria) best value portfolios of options and (phased) long-run plans to 2100.
4. Probing and challenging the selection rationale.
5. Commenting on the basis of the final decisions taken by TW.

3. Conduct of the Expert Panel's contribution to TW's dWRMP18 decision making process

As the guidance for WRMP19 required a movement from a 'least cost' to a balanced 'best value' basis, it became necessary for the company to develop rational and defensible measures of those additional attributes deemed to be a part of best value. Thus the analysis became a multi-criteria problem, with the focus on minimising the long-run cost of balancing supply and demand (the supply-demand balance (SDB) planning problem) adopted for previous WRMPs broadening into one involving the consideration of multiple factors (including resilience, deliverability, social utility, environmental impacts, regional value, inter-generational equity, customer preferences and affordability, as well as cost, into a broadened supply-demand planning problem).

Each additional criterion needed a metric to enable multi-criteria comparisons and evaluation. The metric could be based on a single performance measure or a suite of measures. The first role of the panel was to review the proposed metrics and give immediate feedback on their merits and weaknesses. As an example, adverse and beneficial environmental impact scores were viewed by the panel and TW as having different priorities in the programme selection process, following the principles of the mitigation hierarchy. Lower adverse impact scores were deemed preferable to high beneficial impact scores, the

latter being a 'nice to have' but not a *quid pro quo* for what may be lost. These two scores in the programme appraisal process were deliberately kept separate because they have different legal standing, accrue to different populations in many circumstances and may be exercised over different timescales.

Review of, questioning of and improvements to metrics continued throughout the development and application of the option selection process. For example, a measure of intergenerational equity was considered appropriate (and congruent with the opinions of TW customers, as well as government and regulators). A measure of this can be achieved by discount rate adjustment. This led to a consideration of whether discounting of all time distributed metrics, whether monetised or not, should be applied. Also, whereas initially some metrics aggregated several performance scores, the panel generally recommmended disaggregation of metrics so that each could be clearly and tangibly understood.

Panel members also emphasised the need for careful quality control of the data used to derive all metrics, from financial cost ones through to environmental impact ones. Considerable challenge went into ensuring that all metrics were defined in meaningful ways, using appropriate units and scales, and were reliably quantified, to enable unambiguous and confident interpretation of the change in metric values associated with one portfolio (combination) or plan (scheduled combination) of options against another, so as to enable the costs and benefits of different choices to be seen, the trade-offs between different option sets to be understood and the overall merits of short-listed reasonable plans to be judged, with appropriate degrees of confidence.

Making multi-criteria decisions from a large range of options in a complex system over long time horizons is not an easy task. To aid and illuminate the process, TW commissioned a bespoke, dynamic analysis tool with a strong visual/presentational front end to support decision making. The EP had access to this tool - referred to as 'Polyvis' - throughout the application phase of its development, and proposed many changes to it, most of which were focussed on the utility of the tool, the avoidance of misinterpretation of metrics and values, and on information enhancement. As examples, because the scales of the metrics are very different, the EP suggested that all metrics be shown in absolute units with scales restricted to appropriate operating ranges); that all metrics be presented in an orientation that showed benefit at the top of the scale, and detriment at the base; that information on the derivation of the metric and the raw data attributes should be immediately available to the user and linked to the individual metric no matter how such a metric was readjusted by an individual user.

The varying backgrounds and initial 'core preferences' of Panel Members (for (say) resilience to supply failures over inter-generational equity, or for minimising adverse environmental impacts over meeting the needs of adjacent companies) provided for broad bandwidth checking of early realisations of option portfolios, and of scheduled plans determined via both EBSD+ and MCS infrastructure system intervention assessment frameworks. The Polyvis display utility proved useful in defining acceptance ranges for individual metrics, and in identifying candidate portfolios of options with acceptable characteristics. Re-ordering the axes in the parallel axis plot (from L to R), and limiting (brushing) metric values to an acceptable range proved to be effective devices for reducing the number of portfolios to those having defined attributes, and in short-listing portfolios with high performing portfolios of options.

The metrics, the analytical approaches (EBSD+ and MCS) and the Polyvis front-end all underwent progressive and beneficial evolution during the development of the draft plan, under challenge offered by members of the EP. Neither the EP nor TW maintained an

evidential 'rolling log' of improvements made to challenges received from the EP, per the EA's expectation of the same. The EP did not have an assurance role, nor a brief to maintain a change record, and neither the EP not TW consider it appropriate for the EP to adopt such a role or to construct such a record post-hoc. That said, the members of the EP confirm that the comments made in this report, and its dWRMP18 predecessor summary, are ones they stand behind, individually and as a team. At the time of the submission of the dWRMP18, the underlying data, the appraisal evaluation tools and the plan selection utilities had been honed to a high level of reliability that gave confidence to panel members that TW's adopted approach to portfolio selection and scheduling was effective, and trustworthy. The same goes for the testing and identification of the 'reasonable alternative programmes' presented in TW's rdWRMP18. The members of the EP consider that they have participated in good faith in an open and transparent process, in which TW have been responsive to all of the issues raised. The EP was established by TW to provide challenge as they sought to carry out an exploratory process, not because they perceived a need for external approval. The panel has challenged TW to justify their data, methods, process and decisions throughout, in a way that we and TW believe to have been a valuable and creative use of a group of experts working together as a critical review panel.

The panel noted the serious consideration given by TW to all observations, suggestions and queries made by it, and were gratified that many were adopted in whole or in part. The EP hopes that this process of continuous challenge and improvement will continue as part of the business approach and not solely to address price review quality enhancement.

TW presented to the EP, at many stages in the refinement of the system and during decision phases, the logic which they were applying in developing a decision. Both the sequence in which metrics were introduced, and the values applied below which a programme became excluded (for example intergenerational equity values) were discussed. The EP further discussed the exploration of trade-offs and synergies and the need to move a filter point to understand marginal influences.

TW's use of two decision-making frameworks (EBSD+ and MCS) to sense-check their respective results contributed to the quality of the analysis and its process. The EP notes that TW developed a series of novel and appropriate modelling tools to support their decision-making process. The adaptability post-processor for EBSD+ programme review merits praise in this regard, as providing high value information on the ability of investment programmes to adapt to changes in future supply-demand predictions. The examination of near optimal (nearly least cost) solutions from the EBSD+ model, and the separation of the MCS portfolio selection process from the scheduling optimisation analysis are further examples of the effective use of analytical planning methods by TW.

As noted already, members of the EP were involved across a wider spectrum than the plan selection process. Those members were employed to undertake consultancy work themselves, and/or to review and comment on work commissioned from others by TW, and free access to the reports of TW's consultants was valuable. This was a form of additional peer review. The EP noted that additional work was occasionally required of consultants in order to deliver a document of the required standard and rigour.

The EP, it should be noted, did not generate outputs ourselves; that was not our purpose. We reviewed, critiqued and commented along the way. Hence the panel was process-focused not output -focused. It existed to provide a sounding board and reviewing process, but we were not there to provide detailed quality assurance of the diverse assessment and modelling processes; or to make decisions on behalf of TW. As the EP was process-focused and its comments were considered iteratively over the two years, it is not therefore possible

to track how specific comments and outputs from the panel impacted the preferred programmes or specific schemes within them. The preferred programmes are TW's responsibility, and they were determined by TW, taking account of the EP's comments on process and validity.

4. Other comments by the EP

   a. The need for congruence between the plan selection and SEA processes

      Notwithstanding its high valuation of the options appraisal and plan selection process conducted by TW, the EP notes the difficulties in achieving congruence between the option appraisal and plan identification process and the (obligatory) Strategic Environmental Assessment (SEA) process. We note that while the environmental metrics used in the EBSD+ and MCS analyses are derived from the scoring metrics used in the SEA process for individual elements, they do not reflect the more complex assessment of the SEA itself, and that the options appraisal (OA) and SEA analyses need to be co-analysed as a necessary and important end-of-process task, particularly in regard to the recognition of in-combination and aggregate environmental impacts. We observe the benefits to be had from closer linkages between the progression of the SEA and OA processes, and the necessity of conducting SEA reviews of final short-listed WRMP programmes (including the reasonable alternative programmes from which the final preferred rdWRMP18 is selected). While the integration of OA and SEA processes can be carried out satisfactorily at this late stage in the process, the EP advocates an earlier and more formalised integration of these strands of analysis in future WRMPs.

   b. Exclusion of the Teddington DRA option in the rdWRMP18

      The removal of the Teddington Direct River Abstraction (DRA) from TW's rdWRMP18 (cf. its anchor role in the early years of the forerunner dWRMP18) required significant revision to the composition and scheduling of the rdWRMP18. The flexibility and reliability of the OA tools developed during the development of the dWRMP18 provided indispensable value to TW's ability to respond to this situation in the short time then available to formulate revised plans and, eventually, in re-formulating its preferred rdWRMP18.

      The Teddington DRA scheme was removed from the rdWRMP18 by TW in response to the strength of the EA's representations on the potential environmental impact on fish migration, locally, as articulated in the EA's written consultation response to TW's dWRMP18 and in subsequent discussions between TW and the EA. The EP notes that lessons should be learned on the need for co-ordinated and early determinations on critical schemes, by all of the principal parties engaged in the WRMP process.

5. Conclusions

   Members of the EP attended and contributed to stakeholder and technical meetings. We note that TW have been responsive to any stakeholders seeking additional information. TW have sought to be even handed. Some stakeholder groups sought restricted priority access to meetings from which other interested stakeholders would be excluded. We supported TW's open access to all approach in this matter.

   As a panel, we note the leading role played by Thames Water in the Water Resources in the South East (WRSE) collaboration, and the potential role of TW in seeking regional solutions where appropriate, congruent with Government aims. This included seeking ambitious solutions and exploring the use of high value regional assets in association with other water

companies. Consequently, as a panel, we were supportive of the need for TW to take a long-term planning view (80+ years) rather than the standard 25 years. Given the longer-term planning horizon rightly adopted by TW, the EP were pleased to see the further analysis conducted by TW to understand the potential opportunity costs and benefits of periodic options-refocussing throughout the planning period.

Members of the panel are aware of the range of approaches being exercised across the companies. Some are adopting the approaches used in previous price reviews. We note that Thames Water have developed a range of new approaches. In our view this is appropriate given the new expectations of government and the inherent complexity (and importance) of the region and the existing inter-relationships between Thames Water and several other companies in the region.

Table 1: List of meetings attended by Expert Panel members

Meeting/date	Expert Panel Attendee
17 August 2018 – WRF – revised draft WRMP19	Colin Fenn and Adrian McDonald
21 March 2018 – Stakeholder forum	N
5 February 2018 – Launch event London	N
29 January 2018 – TSM – Resilience assessment	Colin Fenn
21 Nov 2017 – WRF – Key topics	Colin Fenn and Adrian McDonald (presenter)
18 July 2017 – WRF – SDB & scenarios	Adrian McDonald
19 June 2017 – TSM EA and DM options	Adrian McDonald, Bill Sheate
28 April 2017 – TSM DM & RO options	Colin Fenn
16 March 2017 – WRF – DM & WRSE	Adrian McDonald
7 Feb 2017 – TSM – options	Colin Fenn and Adrian McDonald
8 Nov 2016 – TSM – Prog app	Adrian McDonald, Bill Sheate,
27 Oct 2016 – WRF – drought plan & WUK study	N
6 October 2016 – TSM – options	Colin Fenn
6 May 2016 – TSM – options	N
18 April 2016 – WRF – Decision making frameworks & AIM	Colin Fenn (presenter – AIM)
22 March 2016 – TSM – Programme App	N
14 January 2016 – WRF – Env Ass & demand forecasting	Bill Sheate, Adrian McDonald
4 December 2015 – TSM – Briefing on stochastics	Colin Fenn
6 November 2015 – TSM – RO	Colin Fenn
7 September 2015 – WRF –Programme appraisal	Colin Fenn, Julien Harou (presenter)
13 July 2015 – TSM RO	Colin Fenn
11 May 2015 – WRF – RO & WRSE	Colin Fenn
26 March 2015 – TSM – Resource options	Colin Fenn
7 January 2015 – TSM – Resource options	Colin Fenn
20 January 2015 – WRF – W Eff & abstraction	N
Dates of Expert Panel Meeting with TW staff	
16 July 2018	Conference call with Julien
13 July 2018	Julien on leave
27 June 2018	All
15 May 2018	Adrian McDonald on leave
11 April 2018	Just Bill Sheate
14 March 2018	Bill Sheate away on leave
17 November 2017	All
22 August 2017	All
12 July 2017	All
20 June 2017	All
31 May 2017	All
23 June 2016	All
14 January 2016	Bill Sheate, Adrian McDonald