Comment ID number	Document/Meeting	Report Release	Name	Organisation	Page Number	Comment	Response from project team
1	Stakeholder meeting 28/05/2019	n/a	Paul Jennings	River Chess Association	n/a	1. When modelling the movement of water from Lake Vyrnwy STT you will need to take into account the impact of weather, especially rainfall.	Acknowledged - we are liaising with the EA regarding their rain gauge network and access to radar rainfall data. We will outline an approach in the refined methodology. This will be presented at the stakeholder technical meeting in Autumn 2019.
2	Stakeholder meeting 28/05/2019	n/a	Paul Jennings	River Chess Association	n/a	2. As there is a residency time for Lake Vyrnwy water travelling down the Severn you will need to understand the impact of unpredicted heavy rainfall occurring during the transmission period. This could create an incremental flood risk.	Acknowledged - we are liaising with the EA about flood risk during releases, and acknowledge that there are risks to data collection during unpredicted rainfall events. A strategy to deal with rainfall events will be presented within the refined methodology
3	Stakeholder meeting 28/05/2019	n/a	Paul Jennings	River Chess Association	n/a	3. What ecological data will be captured prior, during and after the transmission trials? Invertebrate numbers, dissolved oxygen, turbidity, temperature and ph levels should be looked at.	We will consider a number of ecological and water quality parameters as part of the physical testing. These will be outlined in the refined methodology.
4	Stakeholder meeting 28/05/2019	n/a	Paul Jennings	River Chess Association	n/a	4. There will be similar projects around the world where lessons can be learnt. This should be part of the data gathering process.	As part of this phase of work, we will be undertaking a literature review, which will cover literature pertinent to the River Severn, as well as physical testing and transfer schemes that have been undertaken worldwide. This evidence will be presented within the refined methodology
5	Stakeholder meeting 28/05/2019	n/a	Paul Jennings	River Chess Association	n/a	5. Need to look at the historic records of water storage at Lake Vyrnwy. Need to understand under what circumstances Lake Vyrnwy would be unable to supply the scheme. We discovered at the meeting that it is unlikely you will be able to test this year because of low levels. This already highlights a major limitation of this project.	There is a significant difference between the water available for physical testing and water available once the scheme is actually implemented (water available for testing comes from the Vyrnwy water bank, whereas water during the scheme operation would come from United Utilities resource). The refined methodology will put forward a strategy for dealing with low water levels in reservoirs during the physical testing.
6	Stakeholder meeting 28/05/2019	n/a	Paul Jennings	River Chess Association	n/a	6. The tests in the mid 1970s were impacted by exceptional weather conditions, understanding what they were will be important.	The 1974 testing was postponed due to "unfavourable weather conditions". A brief review of the testing reports and catchment average rainfall indicates that this was likely due to showery rainfall during the summer of 1974.
7	Stakeholder meeting 28/05/2019	n/a	Paul Jennings	River Chess Association	n/a	7. How this project operates, with big short slugs or smaller longer releases will need to be evaluated but I would feel that both approaches will need to work with significant incremental storage closer to the final destination.	The approach to licensing is the EA's responsibility and they will use the output of this work to inform their view on licence arrangements. Measures implemented to mitgate the impact on net yield based on the type of licence arrangement are outside the scope of this study, however should be considered when calculating the net yield.
8	Stakeholder meeting 28/05/2019	n/a	Paul Jennings	River Chess Association	n/a	8. The chances are the water from Lake Vyrnwy will be most critical when other stresses on water supply exist. Who will have priority.	Competing demand for water is a critical aspect of any water supply scheme. This will ultimately be decided by the EA, based on the type of licencing arrangement put in place, and the way in which drought orders are implemented in the catchment during times of stress. Determining this is outside the scope of this work. To confirm, the EA will lead this aspect of work.
9	Stakeholder meeting 28/05/2019	n/a	Paul Jennings	River Chess Association	n/a	9. Weather data will be critical to modelling this project.	Agreed - see comment ID 1
10	Stakeholder meeting 28/05/2019	n/a	Paul Jennings	River Chess Association	n/a	10. We will need to fully understand the water quality from Lake Vyrnwy and the River Severn and how that will impact on water in the Thames Catchment.	Agreed. As part of the physical testing, we are proposing to collect water quality data. Specific parameters will be detailed in the physical testing methodology

11	Stakeholder meeting 28/05/2019	n/a	Paul Jennings	River Chess Association	n/a	11. Water quality in the Severn will be highly variable due to discharges and weather condition, how will this impact the processing requirements.	The refined methodology will outline the parameters we propose to collect. The results of the physical testing will improve understanding around changes in water quality under different conditions.
12	Stakeholder meeting 28/05/2019	n/a	Paul Jennings	River Chess Association	n/a	12. Data relating to STW outfalls will need to be included in the studies and tests.	Agreed - HR Wallingford are liaising with STWL, SSW, the EA and NRW as part of the data collection and provision process, which will include discharges as well as abstractions.
13	Stakeholder meeting 28/05/2019	n/a	Paul Jennings	River Chess Association	n/a	13. You will need to address the principles of a Lake Vyrnwy offtake agreement at an early stage to understand if there are any show stoppers.	Agreed - we need to understand existing agreements and legislation to determine what will be possible for physical test releases. This will form part of the refined methodology.
14	Stakeholder meeting 28/05/2019	n/a	Neil Edwards	RWE Npower	n/a	Verbal via Chris Lambert - Neil Edwards asked if spores as tracers had been considered to help investigate the question of losses as dyes can get too diluted.	The use of a tracer in tracking the release is something we are considering. The use of tracers will be reviewed as part of the literature review and refined methodology
15	Stakeholder meeting 28/05/2019	n/a	John Lawson	Group Against Reservoir Development	n/a	1. Generally, I am happy with the proposed 3-year programme of work, which will include physical tests using trial releases, as well as desk work. This seems reasonably comprehensive, but I have some comments on detail as below.	Introductory comment - no response required.
16	Stakeholder meeting 28/05/2019	n/a	John Lawson	Group Against Reservoir Development	n/a	2. The plans for trial releases should take account of GARD's lessons learned from analysis of losses using gauged river flow records, as described in Appendix A to GARD's response to TW's consultation on their revised dWRMP, dated 28.11.2018: • The importance of conducting loss trials in dry weather. The methodology should assume dry weather is essential and focus on getting flexible plans and permissions in place, ready to implement when dry weather windows are forecast. If rain occurs unexpectedly, the trial should be abandoned and another dry window awaited. • The sensitivity of loss estimates to the accuracy of knowledge of underlying baseflow. Errors in estimating underlying baseflow can dwarf the losses that the trials are hoping to measure. The solution to this problem is "on-off-on" or "off-on-off" trials, in which the start and end release amounts are the same. A good example was Event No 1 in GARD's loss report, for which the hydrographs at Buildwas, Bewdley and Saxon's Lode are attached. Provided the start and end releases are the same, the slope of the underlying base flow recession is known with some certainty, as can be seen from the hydrographs for Event No 1. Event no 1 would have been even more effective if the start and end Vyrnwy releases had been exactly the same (the start release was about 650 Ml/d and the end release was 500 Ml/d, but probably close enough for a reasonable estimate of losses at the three locations – respectively 12%, 5% and 9%).	Regarding dry weather conditions, the importance of this is acknowledged. The refined methodology will be structured so that it is flexible enough to allow for changes in weather conditions. We will consider the types of releases within the refined methodology.
17	Stakeholder meeting 28/05/2019	n/a	John Lawson	Group Against Reservoir Development	n/a	3. The methodology does not say how many trial releases would be made. In my opinion, there should be at least, say, five separate trials to gain an understanding of the variability of the loss estimates and the reasons for the variability. The trials should include both "off-on-off" and "on-off-on" trials, which would cover both bank-side gravel "losses" when releases start and "gains" when releases stop (see later comments on allowing for bank-side gravel losses).	It is acknowledged that multiple releases will be required to understand the variability in physical losses. Bank storage is a key component of release attenuation, as identified within HR Wallingford (2018), and the refined methodology will address this through physical measurement.

18	Stakeholder meeting 28/05/2019	n/a	John Lawson	Group Against Reservoir Development	n/a	4. In my opinion, the methodology attaches too much importance to releases from Vyrnwy rather than Clywedog. A high proportion of the potential losses will be downstream of the Vyrnwy/Severn confluence, so releases from Clywedog would also provide valid loss estimates. If trial releases from Clywedog are easier to organise than releases from Vyrnwy, they should be used. It would be better to have a good number of trials using Clywedog releases, rather than insufficient trials due to the difficulty of organising Vyrnwy releases.	Releases from Clywedog are being considered as a possible option, given the greater flexibility in release volumes. Work over this summer will investigate the costs/benefits of using both reservoirs
19	Stakeholder meeting 28/05/2019	n/a	John Lawson	Group Against Reservoir Development	n/a	5. In my opinion, the proposed methodology places too much emphasis on losses due to “pulsed” releases. I don’t think pulsed releases will be needed. The methodology seems to believe that pulsed releases will be needed by Affinity, because they don’t have their own storage, so regulation releases for Affinity would need to be adjusted frequently (ie “pulsed”) to allow for a) varying need due to flow fluctuations in the River Thames and b) fluctuations in Affinity’s demands. In my opinion, it is both impractical and unnecessary to supply Affinity from the STT independently of TW’s London supplies. Instead, Affinity should be supplied as a raw water transfer from TW’s London supply system, which would use the existing London reservoirs to store water transferred from the STT. Affinity’s supply would simply be an additional demand on the London supply system (with about 80% returned to London via STW effluents and enhanced chalk stream flows). More details of GARD’s proposal for supplying Affinity from London can be seen in GARD’s response to Affinity’s revised dWRMP.	It is not within the scope of this project to determine the operation of the scheme. As presented within the proposed methodology, the refined methodology will take into account possible future changes in scheme operation and the impact on losses.
20	Stakeholder meeting 28/05/2019	n/a	John Lawson	Group Against Reservoir Development	n/a	6. Another dubious loss source being considered by HRW is the need to make pulsed releases from Vyrnwy, because “EA/NRW say if continuous releases are made it will wash out the juvenile salmon in the River Vyrnwy”. This sounds to me like a subjective, safety first decision by EA without supporting evidence. If losses from such pulsed releases are to be allowed for, there should be an evidence-based assessment of the need taking account of: • There are already frequent, large continuous flood releases made from Vyrnwy, seemingly without “washing out the juveniles” • There are larger continuous regulation releases made from the River Dee reservoirs, into the Afon Tryweryn and Afon Alwen, in another Habitats Directive salmonid river catchment, with EA/NRW approval and without apparently “washing out the juveniles”	The key aspect is that there is uncertainty about how the scheme will be operated. Conversations with the NRW fisheries expert have indicated that there could be issues with long releases at a high flow rate. All possible options are therefore being considered in the design of the refined methodology given that the environmental constraints are not fully understood. We will be liaising with NRW to more fully understand the constraints.
21	Stakeholder meeting 28/05/2019	n/a	John Lawson	Group Against Reservoir Development	n/a	7. The proposed methodology does not mention learning from the measurement, allowances or mitigation of losses in other regulated rivers. The loss investigation should include a significant component entitled “Experience from other regulation schemes”. These could include: • The existing Severn regulation scheme • The Ely-Ouse to Essex scheme • Llyn Brianne • Roadford • Kielder	This work is to be undertaken within the literature review stage.

22	Stakeholder meeting 28/05/2019	n/a	John Lawson	Group Against Reservoir Development	n/a	8. One of the loss sources to be considered by HRW's methodology will be not being allowed to abstract water at Deerhurst due to dis-allowance of "put-and-take", so there would be no abstraction of regulation release allowed when gauged flows are below the Deerhurst hands-off flow, regardless of how much regulation has been released upstream. This is tantamount to saying that, if the gauged flow is less than the Deerhurst HoF, a loss of 100% must be assumed. In my opinion this is irrational and cannot be justified. If such "losses" are to be considered, the investigation should include an evidence-based justification, taking account of practice on other regulated rivers. Note: changes to the Deerhurst HoF itself are a separate issue and should not be part of the Severn loss investigation.	It is acknowledged that an assessment of the physical aspects of net yield should not explicitly include a hands-off-flow licence arrangement. However, the impact of the licence arrangement on the physical processes and the net yield of the scheme should be acknowledged to help develop a robust physical testing programme.
23	Stakeholder meeting 28/05/2019	n/a	John Lawson	Group Against Reservoir Development	n/a	9. The methodology recognises that losses to bank-side gravels will only occur on startup of regulation and will not continue during the long duration releases that will be the norm for the STT (particularly in critical droughts). The methodology should include estimates of overall losses into bank-side gravels, not just start-up losses. There should also be recognition that some of the water "lost" to bank-side storage will return to the River Severn as baseflow recedes, so will not be lost.	HR Wallingford (2018) confirmed that bank storage is not a "loss" based on evidence from the 1975 physical testing, however it could be "lost" if the water cannot be subsequently abstracted at the abstraction point. This is an example of where there is an interaction between the physical processes and the licence arrangement. The physical testing methodology will take into account bank storage.
24	Stakeholder meeting 28/05/2019	n/a	John Lawson	Group Against Reservoir Development	n/a	10. The investigation should include losses in the River Thames between Culham and Teddington. These losses will also apply to Abingdon reservoir regulation releases. It is appreciated that the amount of River Thames losses will not affect comparisons of the Abingdon and STT options, but they will affect comparisons between Abingdon and options such as London re-use and desalination. Many of the potential losses in the Severn will be applicable to the Thames: • Start-up losses in bank-side gravels • Losses into the chalk aquifer as underflow • Time of travel losses due to increases in Teddington flows and, therefore, reduction of regulation needs between the release being called for and the release arriving at Teddington • Losses due to unauthorised or licensed abstraction by others between Culham and Teddington (although in my opinion these will be negligible in both the Severn and the Thames)	It was explained at the Techncial Stakeholder meeting held in May 2019 that a separate study would be undertaken to examine losses during conveyance in the River Thames. This was in response to a question by John Lawson, who represented GARD, and is recorded in the minutes of the meeting which have been circulated to stakeholders.

25	Stakeholder meeting 28/05/2019	n/a	Ken Burgin	Cotswold Canal Trust	n/a	The methodology that HR Wallingford were proposing seems very inefficient and is most unlikely to yield results which anyone could have much confidence in. Essentially they were proposing to release a pulse of water at the top end and measure the flow at Deerhurst some hours later. The result could be affected by anything anyone does anywhere between the release point and Deerhust so they would have to find out about everything that was going on at the time of the test to compensate for it and just one omission could corrupt the outcome. I suggested using a form of autocorrelation (https://en.wikipedia.org/wiki/Autocorrelation) whereby a series of releases in a very specific timing pattern are made and repeated over a number of cycles. This pattern has to be slow enough for the effect not to be smoothed out so it likely to be of the order of pulses lasting a day or more with a complete sequence perhaps lasting a week or more before it is repeated. You then filter the output flow data at Deerhurst looking for the input flow pattern. Assuming a sufficiently distinctive pattern has been chosen, all of the other changes by all of the other activities and even including rainfall (within reason) will all disappear leaving only the effect of the discharges. The reason is that the other activities will not fit the pattern you are looking for. I am not a maths person so I cannot tell you how many cycles you need in a sequence nor what pattern to use but there must be people around who can. You may want to run the full sequence a few times with different release volumes and/or under different base flow conditions to refine your understanding but the first sequence should give an initial feel for what the order of loss that might be expected. The aim would be to characterise the river so that the evidence is there to support a "put & take" arrangement.	As part of the literature review, a review into the feasibility of using mathematical techniques, including autocorrelation, will be investigated. This will be used to help formulate the physical testing programme if they can be implemented. The EA will have to make a decision on the licence arrangement based on the available evidence.