Strategic Solution Accelerated Gate 1 Submission: Preliminary Feasibility Assessment

West Country North Sources & Transfers

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Submitted by: Bristol Water, Southern Water and Wessex Water

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1. Executive summary

This is the first initial feasibility study report for the West Country North Sources and Transfers solution. The scheme comprises construction of a second reservoir at Cheddar in Bristol Water's area and/or utilisation of the Wessex Water/Bristol Water interconnection at Newton Meadows pumping station, near Bath, together with a transmission system across Wessex Water's area, all with the aim of meeting part of Southern Water's major supply-demand deficit in their Hampshire region.

It is concluded that none of the options for transferring water from Cheddar to Southampton meet all the project objectives of being technically feasible, sustainable and deliverable by 2027, which is the date that Southern Water are committed to in their Section 20 undertaking with the Environment Agency. Transferring water via the interconnector between Bristol Water and Wessex Water at Newton Meadows is not feasible because there is insufficient water resource to support the transfer.

Background

The West Country North Sources and Transfers scheme is one of the 17 schemes promoted by Ofwat in the PR19 final determination issued in December 2019. The process is overseen by RAPID, an alliance of three regulators: Ofwat, the Environment Agency and the Drinking Water Inspectorate

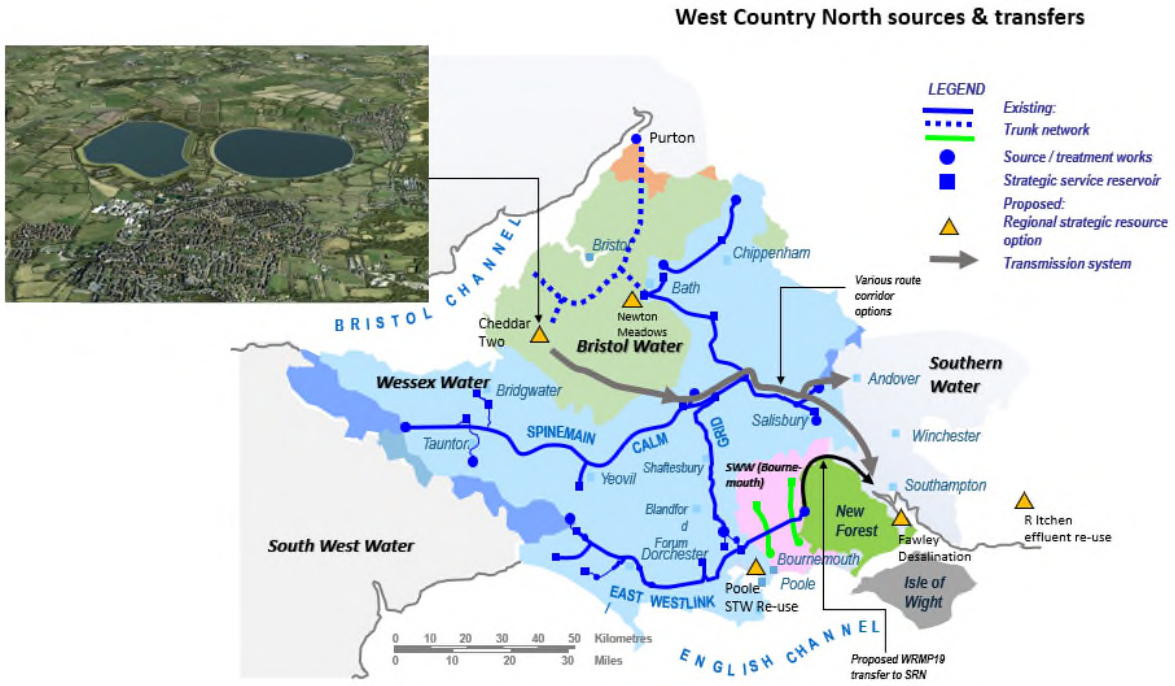
The aim of the scheme is to develop new water resources and/or to utilise spare capacity within the northern area of the West Country, and then to transfer the water from west to east in order to help meet the supply-demand deficit in Southern Water's Hampshire region.

This report is based on the template provided by RAPID. Supporting documents are referred to at the end of each section of the report and listed in Appendix A. Appendix B includes a cross reference between the Gate 1 activities listed in the final determination appendix, this report and the supporting documents, in order to help the reader navigate the submission. The report is in alignment with the risks and issues included in the quarterly dashboard reports, and also with the monthly checkpoint progress meetings that have been held with RAPID since April 2020.

Scheme overview, objectives and sub-options

Figure 1.1 below provides an overview of the scheme.

Figure 1.1: Overall schematic



The objectives of the Gate 1 study are to generate sufficient information for an initial assessment of the scheme for consideration in Regional plans and draft Water Resource Management Plans, and to determine whether the scheme is suitable for progression to the next gate.

In particular, the initial feasibility study shall determine:

- Is the scheme feasible?
- Is the scheme deliverable?
- The range of costs (capital and operating costs)
- The potential water resource benefit to Southern Water.

The scheme objectives can be summarised as:

- To provide water supply in droughts to help address deficits in Southern Water's Hampshire region by March 2027, which is the date that Southern Water are committed to in their Section 20 agreement under the Water Resources Act 1991. This is earlier that the general Strategic Resources Options programme, which envisages development in the period 2020 to 2025, start of construction between 2025 and 2030, and beneficial use in the

2030s, and it is the reason the scheme is following the accelerated gate timeline.
- To ensure system availability at all times to meet peak demands.
- Compliance with drinking water quality requirements and customer acceptability.
- Lowest possible environmental impact.

A short list of four sub-options was formulated, in consultation with RAPID, with the aim of testing the boundaries of the problem. Three sub-options are supplementary bulk supplies, which if feasible could form part of Southern Water's overall plan and enable a reduction in the size of the other strategic options. A further larger capacity option has been investigated to see whether it is feasible to eliminate the need for one of the other strategic options in Southern Water's plan. The sub-options cover all of the following solution components:

- Sources – Cheddar Two reservoir and Newton Meadows pumping station.
- Transfer type – a supplementary bulk supply or a strategic option maximising the transfer capacity.
- Water quality - potable water or raw water.
- Reception points in Southern Water – Testwood water treatment works, north of Southampton or Andover.

The sub-options that have been appraised are summarised in the Table 1.1 below.

Table 1.1 - Sub-options appraised

Sub-option	Description	Supplementary or Strategic supply	Treated or Raw water	Notional capacity Ml/d	Reception point
1	Baseline option: From Cheddar Two	Supplementary	Treated	16	Testwood
2	Alternative option: From Cheddar Two	Strategic	Raw	65	Testwood
3	Secondary option. From Newton Meadows	Supplementary	Treated	5	Andover
4	Combined Option: Option 1 + Option 3	Supplementary	Treated	21	Testwood

Feasibility study data and processes

This is the first report into the feasibility of a major west to east transfer across the West Country. Cheddar Two reservoir was designed and received planning permission in the past, but for a different purpose than is being considered in this project.

The preliminary feasibility assessment, which commenced in late March 2020, has been developed through workstreams, all running in parallel. The supporting annexes set out the data that has been collected and the methodologies used for each component, as summarised in Table 1.2 below.

Table 1.2 – Summary of feasibility study workstreams, data and methods

Workstream	Data	Method
Water resources	Published WRMPs Reservoir development investigation reports	SRN's Aquator model was extended to include Cheddar Two reservoir
Water quality – treatment, network	Water quality data for Cheddar, WSX and SRN. Drinking water safety plans	Process flow diagrams and blending calculations. Risk assessment
Transmission	WSX supply schematics. GIS	Route optioneering. Hydraulic assessment. Operation & control
Environmental assessment	GIS	Strategic Environmental Assessment Habitat Regulations Assessment Carbon estimates
Cost & Risk	Route plans, scope of works and assets sizes from above	Consistent with SRN's other schemes
Project plan, Consenting & Procurement	Scope of works from above, legislation, best practice	Assessment based on scope of works and constraints

Study findings

Based on the feasibility assessment of each of the key areas, which are described in more detail in the following sections and the annexes, the study findings are summarised in the Table 1.3 below, using a RAG coding as follows:

- Red – potential showstopper or major issue that affects overall scheme feasibility
- Amber – potentially feasible subject to further assessment
- Green – feasible with comprehensive management, time and funding.

Table 1.3 – Summary of study findings

	Sub-option	Water resources	Water treatment & quality	Trans-mission	Environ-ment & consenting	Programme	Cost
1	Cheddar Two - Potable to Testwood 16 Ml/d						
2	Cheddar Two - Raw to Testwood 65 Ml/d						
3	Newton Meadows - Potable to Andover 5 Ml/d						
4	Newton Meadows - Potable to Testwood 21 Ml/d						

Planning permission for a second reservoir at Cheddar was granted in 2014, with a condition that development commences by November 2021. The extensive pre-commencement works required to fulfil a Section 106 agreement cannot be completed by the expiry date and therefore the current planning permission will lapse. A new planning application or Development Consent Order application would be required.

Given the emerging requirements from the Environment Agency's National Framework for enhanced drought resilience and further abstraction reductions to meet environmental ambitions it is possible that a sub-set or variant of the options proposed has a place within the Regional Plan for the West Country, which is due to be developed in 2021 and 2022.

Conclusions

The focus of Gate 1 is to identify solutions that are suitable for further development. Based on this initial feasibility study, it is concluded that:

- A potable transfer of 16 Ml/d (sub-option 1) from Cheddar Two reservoir, across the Wessex Water area to Testwood using a new transmission system and new water treatment works is technically feasible but the costs and carbon footprint are very high for the modest water resource benefit of the scheme. Cost estimation, which is consistent with the other Strategic solutions, indicates that the capital cost could be up to £456m. The carbon intensity in terms of tonnes CO_2e per Ml of water delivered is at least 200 times more intensive than typical water industry values.
- A large piped strategic transfer of up to 65 Ml/d of raw water (sub-option 2) is hydraulically feasible. However a feasible way of maintaining the system at the required level of operational availability without draining the reservoir has

not been identified, leading to the conclusion that this sub-option is infeasible. The cost and carbon footprint are significantly higher than sub-option 1.

- Due to the very low utilisation of the transfers to meet the need and the high costs, the average incremental unit costs (AIC in £ per Ml required) are excessive at approx. 180 times typical Water Resource Management Plan supply side option values.
- Sub-options 3 and 4 to transfer water via the Newton Meadows pumping station are not feasible because the additional flow would put Bristol Water's supply-demand balance into deficit. This assessment is against a baseline of the published WRMP19, which could change with wider regional plan considerations.
- None of the sub-options could be completed by 2027, which is the date that Southern Water are committed to in their Section 20 undertaking with the Environment Agency. The central estimate of the earliest the scheme would be available is 2038.

How this solution fits within the hierarchy of solutions and which combination of solutions is likely to provide best value in meeting Southern Water's overall supply-demand balance requirement is covered in a separate report (Refer to the Annex 18: Option Hierarchy Development in Southern Water's submission).

Based on the assessment of alternatives on this initial feasibility report, it is considered that none of the options satisfy all of the project objectives of being technically feasible and sustainable long term solutions to the supply-demand deficit challenges in Hampshire, deliverable by 2027. For these reasons Bristol Water and Wessex Water are not able to endorse the solution.

Southern Water have carried forward the technically feasible option (sub-option 1 - 16 Ml/d potable) into their comparison of solutions. The capacity potentially available is too low for it to be a like-for like comparison to the Southern Water's desalination or recycling options, as it would need to be supplemented by significant additional sources. Therefore the scheme is not suitable for progression to Gate 2 as a potential substitute for desalination and recycling.

Recommendations

It is recommended that the West Country North sources and transfers scheme does not proceed beyond Gate 1.

2. Solution description

This section of the report provides an initial view of the following:

- Outline of the solution – what does it do.
- Options and configurations, including the sub-options that have been appraised. Figure 1.1 above provides an overall schematic.
- Resource benefit of the solution and its potential conjunctive use benefit, as well as the interaction of this solution with other proposed water resources solutions.

The following aspects are described in subsequent sections:

- Section 4
  - Overall costs of the solution and operation
- Section 5
  - Summary of social, environmental and economic assessment
  - Drinking water quality considerations.
- Section 10
  - Wider resilience benefits
  - Meeting the requirements set out in the National Framework and regional plan(s).

Outline of the solution

In outline the solution comprises:

- New water resources in the Bristol Water (BRL) area and/or utilisation of the existing interconnector between Bristol Water and Wessex Water (WSX)
  - Cheddar Two reservoir, and/or
  - Newton Meadows pumping station, west of Bath
- A major transmission system to transfer water from west to east, comprising water treatment works, pumping stations, pipelines and balance tanks
- Reception in Southern Water (SRN).

In the PR19 final determination, Ofwat identified the West Country North sources of a second reservoir at Cheddar and a supply from BRL at WSX's Newton Meadows pumping station and their associated transfers as a scheme to be assessed on the accelerated timeline. BRL had previously planned to construct Cheddar Two reservoir to provide a dry year deployable output of 16 Ml/d. However after securing planning permission, changes to their long term demand forecast meant it was no longer required.

These sources have been used to form the resource components of the sub-options appraised for Gate 1.

Following consideration of water treatment and transmission components of the schemes, and the nearest respective strategic reception points that align with SRN's wider operating strategy, the transfer options comprise:

- water from Cheddar transferred to Testwood, near Southampton
- water from Newton Meadows transferred to Andover.

Options and configurations considered

The sub-options and configurations considered are set out in Table 3.1 below.

Table 3.1 – West Country Resources North – Selected Sub Options

Sub-option	Description	Treated or Raw water	Transfer capacity Ml/d	Treatment	Transmission route
1	Baseline option: From Cheddar Two. Supplementary supply	Treated	16	New water treatment works (WTW) near the transmission corridor, location to be identified	Cheddar to Testwood
2	Alternative option: From Cheddar Two. Strategic supply	Raw	65	Potential pre-treatment for Invasive non-native species Testwood WTW enhancements as required	Cheddar to Testwood
3	Secondary option. From Newton Meadows. Supplementary supply	Treated	5	Already treated	Newton Meadows to Andover
4	Combined Option of Option 1 plus part of Option 3 Supplementary supply	Treated	21	As above for Option 1 and 3	Cheddar to Codford + Newton Meadows to Codford + Codford to Testwood

The rationale for the selection of these sub options is described below:

- **Sources of water.** The study has focussed on two potential sources:
  - Cheddar Two reservoir – sub-options 1, 2 and 4
  - Newton Meadows pumping station – sub-options 3 and 4.
- **Transfer type.** Three sub-options are supplementary bulk supplies that have the opportunity to work alongside other options in SRN's portfolio. One sub-

option seeks to maximise the transfer capacity and thereby act as a strategic option that could, if feasible, replace one of the strategic options in SRN's core fWRMP19 strategy.

- **Water quality**. Three potable water bulk supply options and one raw water option. The raw water option utilises existing capacity at Testwood that would be available in drought scenarios when abstraction from the R. Test reduces.
- **Reception point in Southern Water.** Testwood water treatment works, north of Southampton or Andover. Although Testwood is the key location where a supply deficit occurs, SRN are implementing an intra-regional grid that will connect the zones in Hampshire including a link to Andover.
- **Transmission routes**. Following an initial qualitative review of potential routes between the sources and the reception points, a shortlist of routes was chosen, primarily the shortest possible routes.

Sub-options 1, 2 and 4 are mutually exclusive.

Resource benefit of the solution, conjunctive use and interaction with other solutions

Cheddar Two reservoir would be filled from the existing abstraction at Cheddar Springs, using existing infrastructure alongside BRL's continued operation of the existing Cheddar Reservoir. Based on information from previous studies, a conservative assumption that Cheddar Two may not have any inflows for three years from when it is first required, in a drought, has been adopted. This is considered to be a conservative assumption based on the review of previous modelling of the two reservoirs as part of BRL's original scheme development.

Newton Meadows was proposed as a 5 Ml/d transfer source based on a potential surplus within BRL's forecast supply demand balance and the existing transfer infrastructure to WSX. A review of the company's Final Water Resources Management Plan 2019 (fWRMP19) has shown that the surplus from the early 2030's to 2045 would be below 5 Ml/d and at points, close to zero. The very limited and uncertain future availability of water from this source therefore makes it unsuitable to be considered further as part of a Strategic Resource Option (SRO). It is possible that this inter-connection has a role in providing intra- regional resilience; for consideration as part of the Regional plan in 2021 and 2022.

The sources have been assessed in terms of their potential contribution to the forecast residual deficit in up to a 1:200 year drought that remains following implementation of the core components of SRN's fWRMP19 Strategy A, such as leakage and demand management, intra-region transfers and bulk supplies. This enables the benefit of this SRO to be compared with the other strategic options in

SRN's plan, such as desalination and indirect effluent reuse (referred to as water recycling in SRN's submission).

The assessment of the utilisation of Cheddar Two Reservoir has been undertaken using SRN's Aquator water resources model of their region, thereby enabling an assessment of conjunctive use and interaction with other sources. This shows that the reservoir could reliably provide up to 16 Ml/d in up to a 1 in 200 year drought as the source for a potable water transfer.

To assess the feasibility of the reservoir as an alternative strategic option its maximum drawdown rate was not limited, allowing the model to use the available stored volume to meet the requirement in SRN's western region. The analysis showed that during a 1 in 200 year drought, approximately half the capacity, 4,500 Ml, would be used with a maximum draw off rate of 65 Ml/d. This suggests that the reservoir is of sufficient size to meet the need, however, given the range and infrequency of flows, the transfer would need to be raw water, making use of the existing Testwood water treatment works (whose capacity would be available as, in this scenario, the existing raw water supply to the works drops to zero). A peak flow of 65 Ml/d would require a pipeline of approximately 900 mm diameter. An assessment of the raw water quality risks has found that the required sweetening flow would drain the reservoir, leaving it with insufficient water during a drought, and making this option infeasible. (Refer to Section 4 Operation and maintenance for further details).

The water resource availability and utilisation modelling in Aquator, as described above, derives plots of maximum transfer rates, annual volumes and days in operation across the range of drought events. The plots are included in Annex 1.2 and summarised in Table 2.1 below. This information has been used to size the transfer mains for the different options.

Table 2.1 Utilisation from the Aquator modelling

Sub-option	Return period years	Maximum transfer Ml/d	Annual volume Ml/yr	Number of days in operation
1. Cheddar to Testwood potable 0 – 16 Ml/d With all the core components of SRN's Strategy A	Normal year	0	0	0
	Up to 1: 10	0	0	0
	1 : 20	16	142	18
	1 : 50	16	765	59
	1 : 100	16	1163	88
	1 : 200	16	1944	127
	Average over life of project	n/a	46 P[1]	n/a
2. Cheddar to Testwood Raw 0 – 65 Ml/d With all the core components of SRN's Strategy A, except Fawley desalination	Normal year	0	0	0
	Up to 1: 10	0	0	0
	1 : 20	17	143	17
	1 : 50	42	1242	57
	1 : 100	54	2090	88
	1 : 200	65	4397	125
	Average over life of project	n/a	73 P[1]	n/a

[1] Without sweetening flows

Supporting evidence:	Annex 1.2 – Water Resources and Operational Strategy, Stantec, September 2020 Annex 1.3 – Transmission System, Stantec, September 2020

3. Outline project plan

It is not possible to deliver the scheme by March 2027, which is the date that Southern Water are committed to in their Section 20 agreement with the EA.

Figure 3.1 below provides a summary of the key durations and timescales based on a detailed programme, assuming a start date for the next phase of February 2021, which is the end of RAPID's Gate 1 assessment period.

Figure 3.1 – Summary programme

Activity	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Gate 1 - Preliminary Feasibility Assessment																			
Gate 2 - Detailed Feasibility & Concept Design																			
Gate 3 & 4 - Detailed Design, Procurement, Land Purchase, DCO Planning & DPC																			
DCO Planning Approval & DPC Funding procurement																			
DCO planning approval																			
DPC Funding Procurement																			
Construction & Commissioning																			
Mobilisation and Enabling works																			
Cheddar Two Reservoir Construction																			
Cheddar Two Reservoir Commissioning																			
Transmission System Construction																			
Transmission System Commissioning																			
Handover																			
System Commissioning/Putting to service																			
Cheddar Two Reservoir Filling																			
Risk/Optimism Bias Programme Allowance - across the whole programme																			
Total Project Duration		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Central Estimate of Completion date																			

Realistic durations for all the activities have been used to develop the programme, as explained in Annex 1.1. For instance pipelaying durations are based on the number of teams and typical meterage per week production rates. At this stage, there is considerable uncertainty about whether the programme is achievable due to the long list of assumptions and significant technical and environmental challenges that need to be overcome or mitigated. A high level assessment of the major programme risks indicates that the overall duration of the project could easily increase by 2 ½ to 5 years, even if it is assumed that the main programme risks do not run concurrently.

Thus the central estimate of the overall project duration is 18 years with a completion date to put the whole system into beneficial use of April 2038. This meets the general Strategic resources solution timetable of beneficial use in the 2030s (as mentioned on page 3), but it does not meet the SRN's much earlier timeline driven by their Section 20 undertaking.

All of the prompts in the Gate 1 template report have been considered, as summarised in Table 3.1 below with more detail in Annex 1.1.

Table 3.1 – Programme considerations

Template prompt	Comments
Timing of solution being required (based on company and regional plans, as appropriate), and any updates if this changes.	SRN require the solution by March 2027 to meet their Section 20 undertaking agreed with the EA.
Phasing of key activities and decisions.	Refer to Figure 3.1 above and Annex 1.6.
Assumptions and dependencies.	A total of 67 separate assumptions have been used to inform the programme. Refer to Annex 1.6.
Pre-construction activities (such as scoping, detailed design, development consent order (DCO) and direct procurement for customers (DPC)).	Key assumptions include: • The decision on the preferred sub-option will be frozen in early 2021. • DPC is the preferred procurement method. • Planning will be through a DCO route, and to ensure sufficient level of detail is available for the submission and remove the risk of potential changes post approval, all design will completed before planning submission. • During construction four to six sites will be live at any one time. • For commissioning it is assumed that Cheddar Two reservoir can be commissioned and filled with water within a year and that the current conservative three year refill value can be reduced for commissioning purposes.
Planned construction start date.	With mobilisation in summer 2029, main construction would start in January 2030.
Earliest possible deployable output date (assuming planning started today).	The central estimate of earliest possible deployment date is March 2038
Identify whether the programme is still on track.	Gate 1 was impacted significantly by COVID19 but generally the programme is on track.
Include an estimate of overall project delivery timescales for subsequent gates.	Development of the programme has identified that the Gate 3 and 4 timings do not align with the needs of detail design and DCO planning. It has also highlighted that the FD funding for Gates 3 and 4 would be insufficient.
Missing information – outline what is missing/delayed, and how this will be addressed before gate two. What are the reasons for any missed milestones? Have delays had an impact on the overall programme?	Refer to section 15.
For solutions on the accelerated timetable, comment on the deliverability of the solution and all sub-options/configurations by the 2027 deadline.	It is not possible to deliver the solution by the 2027 deadline.

Supporting evidence:	Annex 1.1 - Project Plan, Stantec, September 2020

4. Technical information

This section presents:

- the preliminary concept design that has been used as the basis for preparation of the initial cost estimate and project plan
- a description of how the solution will be operated and an outline of maintenance issues and requirements
- initial cost estimates.

Preliminary concept design

Initial technical information is summarised below under the following headings:

- Cheddar Two reservoir
- Newton Meadows pumping station
- Water treatment – refer also to section 5
- Transmission
- Reception.

Cheddar Two reservoir

For the purposes of this initial feasibility study, the scope of works and design for Cheddar Two reservoir is unchanged from the scheme that BRL developed in 2013. The scope of works comprises:

- Cheddar Two reservoir
    - Construction of a water storage reservoir with a capacity of 9,400 Ml formed by an encircling earth embankment 3,600 m in length with embankment heights ranging from 7 m in the east to 15.5 m in the west. The embankment fill would be excavated from within the footprint of the reservoir.
    - An intake tower
    - An outlet tower
- Intake works
- Transfer mains
- Utility diversions
- Water course diversion
- Visitor centre
- Access improvements including highway access, footpaths and car parking
- Green infrastructure and habitat enhancement, including tree and hedge row planting, compensatory flood storage, in channel works through Cheddar, restoration of a scheduled monument, community orchard etc.

Newton Meadows pumping station

Newton Meadows, located to the west of Bath, is an existing pumping station at the interconnection between BRL and WSX that boosts the bulk supply into WSX's system. It comprises a 11.4 Ml/d pumping station, constructed in 1970s and located in the flood plain.

Water treatment

Two sub-options (1 and 4) would require a new water treatment works located on the route from Cheddar Two. The main treatment stream would comprise clarification (either dissolved air flotation or Actiflo) and rapid gravity filtration for removal of the turbidity and colour, ultra-violet irradiation for Cryptosporidium inactivation, and a contact tank for chlorine disinfection. A new site with a footprint of approx. 8,000 m^2 will be required complete with ancillaries such as roads and electricity supply. The proposed treatment processes are described further in section 5 below.

Transmission system

The preliminary design and scope of works for the transmission system is based on a desktop assessment considering the following aspects:

- Pipeline corridor route alignments, based on a combination of water company GIS data, consultant GIS models and Google Earth Pro
- Topography and hydraulics, in particular limiting normal operating pressures to 15 bar
- Transfer utilisation and flow profile as explained in Section 2 above
- Constructability including pipe material, land use, potential working areas, access restrictions, traffic management, crossing types (river, road) and locations, and ground conditions.
- Environmental and third-party constraints. Routes were identified that minimised the impact to the environment, by considering the different constraints through GIS layers, including:
    - Tier 1 – major constraints likely to impact feasibility and determine whether a potential option is a 'reasonable alternative'
    - Tier 2 - other strategic constraints likely to experience adverse direct or indirect effects and require mitigation but which would not necessarily preclude a concept level option from being identified as a reasonable alternative at Gate 1
- Avoiding third-party assets and populated areas, buildings, private properties, and gardens.
- Storage tanks on the route to break pressure and balance flows
- Pumping station locations and capacity.

Table 4.1 below summarises the initial transmission system design. Further details, diagrams and drawings are given in Annex 1.3. Figure 4.1 below shows the 114 km route from Cheddar to Testwood.

Table 4.1 – Transmission system design summary

Sub-Option	Water Type	Capacity(Ml/d)	Diameter (mm)	Material	Length (km)	Number of pumping stations	Number of tanks
1. Cheddar to Testwood	Potable	16	450	Ductile Iron	114	4 [a]	5 [a]
2. Cheddar to Testwood	Raw	65	900	Steel	114	3 [a]	4 [a]
3. Newton Meadows to Andover	Potable	5	355	Poly-ethylene	82	3	5
4. Newton Meadows & Cheddar to Testwood	Potable	21	355	Poly-ethylene	34	3	5
			450	Ductile Iron	114	3	4
			500	Ductile Iron		1	1

a. The number of pumping stations and tanks is a function of the hydraulic design, head losses and pipe size (Annex 1.3).

Figure 4.1 – Transmission route from Cheddar to Testwood

Consideration was given to the potential interaction with existing networks and assets. For the purposes of this initial feasibility it has been assumed that all the infrastructure for the transmission system will be new, and the cost estimate is on this basis. For the raw water transfer the infrastructure has to be new, as there are no suitable rivers or canals that could be used as open water transfers. The rivers in the Cheddar area flow from east to west discharging into the Severn Estuary. The principal river in Wiltshire is the Hampshire Avon and the whole river system is designated as an SSSI. The Dorset Stour river is in the south of the WSX area and will be considered as part of the West Country South sources & transfer scheme.

The primary reasons for adopting this approach for the potable transfers relates to:

- **Partial system overlap.** There is only partial overlap between the proposed and existing trunk main systems. The route of the transmission system from Cheddar Two to Testwood Lakes is 114 km long. Large sections of the route are across territory where there are no large diameter trunk mains and in these areas the infrastructure has to be new. The first 41 km to the high point and the last 30 km from Salisbury, totally 71 km (62%) of the route, are in areas where there are no large diameter trunk mains. The remaining 43 km (38%) follows a similar route corridor to Wessex Water's Grid.
- **Spare capacity.** Where there is some overlap, there is unlikely to be any spare capacity to enable the transfer using existing mains or by displacement.

Additional factors include:

- Water quality considerations
- Reservation/network access charging mechanisms
- The condition and life of existing assets, compared with the required design life of the project
- The potential additional costs arising from connecting new and existing assets
- The potential procurement models and allocation of responsibilities and risks, including trunk main leakage and metering etc.
- The timescale available to assess this subject.

Reception in Southern Water

The water would be received at either:

- Testwood water treatment works, north of Southampton, or
- Andover River Way water treatment works in Andover. An alternative of connecting into Upper Enham service reservoir has been identified.

No significant works at the reception sites have been allowed for in the cost estimate for the West Country North scheme, in order to avoid any double counting with SRN's other schemes and their maintenance programme.

Measures required to upgrade Testwood Lakes and treatment works and to mitigate risks in the downstream distribution system that have been identified in the study are included in the risk register and set out in the Annexes (but excluded from the cost estimate).

Operation and maintenance

The assets proposed are all conventional (reservoirs, pumping stations and pipelines) and thus standard operation and maintenance requirements and design lives will apply (e.g. years: dams 100, infrastructure assets 60 to 100, plant & machinery 3 to 30 etc.).

The greatest challenge for operation of the scheme is the long length and geographic spread of the transmission system. As mentioned in section 2 above under water resources the required sweetening flow for the 65 Ml/d strategic raw water transfer is so great that it would drain the reservoir, leaving it with insufficient water to respond to a drought. The 114 km 900 mm diameter long transfer pipeline with several tanks along its length has a total volume of approximately 75 Ml. In order to avoid it becoming untreatable, the raw water should not reside in the pipeline for more than three days. Therefore a continuous sweetening flow of 75/3 i.e. 25 Ml/d is required. Such a flow rate equates to 9,125 Ml/year, which means the reservoir would be drained within one year and hence be unavailable in the event of a severe drought which could happen in any year.

An overarching project objective is that the system shall have a high level of availability and be able to respond to drought events with minimal intervention. The main challenges with regard to how the system would be operated (for sub-options 1 and 2 only) are:

- What is the best mode of operation for the transmission system given its intermittent use in order to maintain serviceability and provide a system that is ready when needed?
- How to ensure Cheddar Two reservoir has the water available for the worse case 1:200 year drought event?
- How do we ensure adequate water turnover to maintain serviceability?
- How do we deal with the potable and raw scenarios that have differing parameters and requirements?

A review of these issues identified the following key outcomes:

- The potable water solution will require a minimum, continuous operation of 4 Ml/d, which will still allow enough storage for a 1:200 year drought event.
- The raw water solution will require some or all the system to be de-commissioned and re-commissioned. Recommissioning would be a lengthy and costly process over months, involving multiple teams. There would be severe challenges obtaining the water for flushing the pipeline and difficulties discharging such a large amounts of water to waste. Although there will be advance warning of droughts, inevitably there would be numerous costly false

starts over the life of the project. An alternative multi-pipe option would add excessive costs and is not considered a viable solution. This is considered to be such a significant operational and maintenance issue that it makes the large piped raw water transfer infeasible.

Initial cost estimates

Initial cost estimates are summarised in Table 4.2 below. The basis of the estimates is given in Annex 1.8, and includes:

- The cost estimates for the proposed treatment and transmission scope of works have been prepared using the same unit cost information and in a consistent way with SRN's other schemes on the accelerated timeline.
- The cost estimate for Cheddar Two is based on the estimate prepared by BRL in 2013 indexed up to current prices.
- The estimates include optimism bias using the Green Book methodology.
- The estimates exclude any work or payments to make the scheme carbon neutral.
- Benchmarking of the treatment and pipeline costs, with an explanation of the variances.

Table 4.2 – Initial cost estimates @ 2017/18 prices

Sub-option	Capex range £m	Opex range £m/yr	NPV range £m	Illustrative average incremental cost £/Ml
1. Baseline option: From Cheddar Two. Potable 16 Ml/d	298 - 456	0.5 – 0.9	315 - 486	390,000
2. Alternative Strategic supply option. From Cheddar Two. Raw water. 65 Ml/d	437 - 682	0.7 – 1.1	425 - 665	335,000
3. Secondary option. From Newton Meadows. Supplementary supply. Potable. 5 Ml/d	n/a – as option discounted on water resources grounds			
4. Combined Option Supplementary supply. Potable. 21 Ml/d	n/a – as option discounted on water resources grounds			

To illustrate comparative costs, average incremental unit costs have been calculated using the NPV values above and the present value of the average annual transfer volume to meet the drought needs from Table 2.1. This shows that unit costs for sub-options 1 and 2 are up to 180 times more costly than typical supply side schemes in companies' WRMPs.

Costs for each gate are included in section 14.

Supporting evidence:	Annex 1.2 – Water Resources and Operational Strategy, Stantec, September 2020 Annex 1.3 – Transmission System, Stantec, September 2020 Annex 1.8 – Project Capex/Opex Estimation, Stantec, September 2020

5. Environmental and drinking water quality considerations

High level environmental statement

In this section there is a summary of:

- Initial option level Strategic Environmental Assessment and Habitats Regulations Assessments
- Initial environmental, social and economic valuations including:
    - Carbon emissions
    - Note that environmental net gain and natural capital assessments have been deferred to Gate 2, pending identification of a preferred sub -option.

Given the limited and proportionate environmental assessment undertaken at Gate 1, it is not appropriate to definitively confirm that the scheme is feasible in environmental terms, rather the aim has been to identify the key environmental and socio-economic risks which will require further examination and whether any of these issues preclude proceeding to the next phase.

Strategic Environmental Assessment (SEA)

The assessment is based on SEA+ covering likely significant environmental, social and economic effects, grounded in SEA Regulations, caselaw and best practice and covering ‘population’, ‘health’ and ‘material assets’ socio-economic topics. Development of a multi-stage SEA Framework has guided optioneering to identify all ‘potentially reasonable alternative’ options and determine limited actual ‘reasonable alternatives’.

The initial conclusions are that there are numerous key risks and impacts, as listed below:

- River Cheddar abstraction – deteriorating Water Framework directive (WFD) status, geomorphological and ecological effects
- Invasive non native species (INNS) transfer risks - Nuttals Waterweed & Signal Crayfish around Cheddar Springs
- Encroachment of Glastonbury Festival Site and surrounding roads (phasing implications)

- Interaction with strategic development allocations in Wells, Salisbury and Totton
- Encroachment of Ancient Woodland, native woodland and other forestry
- Multiple watercourse and flood zone crossings (potential compensatory storage requirements).

Habitats Regulations Assessment (HRA)

An initial HRA Screening was undertaken to identify relevant European Sites (within 15 km of sub-option components) and consider the potential for Likely Significant Effects (LSE) due to:

- Direct loss of habitats
- Indirect effects on habitats (e.g. through hydrological effects, sedimentation, habitat degradation, fragmentation) (physical damage or disturbance)
- Direct or indirect impacts on relevant species (e.g. disturbance resulting from human/machine activity, i.e. noise or lighting)
- Transfer of non-native species
- Pollutant run off (including fuels, silts etc and commissioning/flushing water from construction activities).

A large majority of the sub-option components lie within SSSI Impact Risk Zones considered sensitive to pipeline infrastructure. This includes crossings of the River Avon SAC and proximity to the New Forest SAC where direct effects could occur, together with potential indirect effects on:

- Bats: Mendip Woodlands, Mendip Grasslands, North Somerset Bats, Avon Bats SACs due to construction and abstraction related disturbance
- Birds: Solent and Southampton Water SPA and Ramsar Site due to construction related disturbance to functionally linked land
- Aquatic Species: Severn Estuary SAC and Ramsar due to potential abstraction effects on River Cheddar Yeo and resultant knock-on effects to features which support relevant species.

SEA+ and HRA work also considered the risk of invasive/Non-Native Species (INNS) transfer, including via pipeline outfalls at low points within rivers or on agricultural land. Two INNS were previously recorded within Cheddar Springs (Nuttalls Waterweed and Signal Crayfish).

For both the SEA+ and HRA risks and impacts, it is considered that these do not prevent the scheme progressing to the next Gate.

Carbon assessment

Estimates of the carbon emissions for each option are summarised in Table 5.1 below. This also includes a high level illustration of the carbon intensity of the solution, carbon intensity being calculated as the total whole life carbon emissions divided by the volume of water needed to be transferred over 60 years (as set out in Table 2.1 above).

Table 5.1 – Carbon estimates (for likely transfer flows over 60 years)

Sub-option	Component	Whole life carbon (kilo tonnes CO_2e)		Carbon intensity factor (tCO_2e per Ml)
		Using UKWIR methodology	With fixed grid electricity emissions factor	
1. From Cheddar Two. Potable 16 Ml/d	Cheddar Two reservoir	87	87	59 to 112
	Treatment & Transmission	76	222	
	Total	163	309	
2. From Cheddar Two. Raw water. 65 Ml/d	Cheddar Two reservoir	87	87	45 to 46
	Treatment & Transmission	111	113	
	Total	198	200	
3. From Newton Meadows. Potable. 5 Ml/d	Treatment & Transmission	16	34	n/a
4. Combined Option Potable. 21 Ml/d	Cheddar Two reservoir	87	87	n/a
	Treatment & Transmission	92	270	
	Total	179	357	

To put the carbon estimates into perspective, some high level comparators are included below:

- Total greenhouse gas emissions for Southern Water's entire water and wastewater service (water 2.5 million population and wastewater 4.7 million population) were 189 kilo tonnes per year in 2019/20[1].
- The carbon intensity factor for the two main sub-options is some 200 to 600 times more intensive than typical water industry values of 185 - 224 kg CO_2e per Ml of water treated.
- Thames Tideway, which is one of the largest construction projects in Europe, is reported to have total carbon footprint of 840 kilo tonnes of which 84% is

[1] https://southernwater.annualreport2020.com Page 98

embodied carbon[2]. Thus the carbon footprint of sub-options 1, 2 and 4 is equivalent to more than 20% of the Thames Tideway project.

Environmental Net Gain

It has not been possible to assess the net environmental benefits at Gate 1 and therefore this is a Gate 2 activity. Factors to consider as part of the assessment include:

- There are adverse impacts of different types largely across Bristol / Wessex area whereas the water resource benefit accrues in Southern Water's Hampshire region.
- The sustainability reductions on the Rivers Test and Itchen form part of the baseline, and cannot be counted as a beneficial impact.
- The West Country North sources & transfers is only a partial contribution to addressing Southern Water's deficit.

At Cheddar Two reservoir potential benefits include:

- Opportunity to transform poor quality agricultural land into species rich wetland (flood compensation for reservoir construction) with landscaping (e.g. Duck Decoy restoration)
- Opportunity to enhance tourism and recreation offering for Cheddar Village – importance of 'staycations' in COVID-19 green recovery, need to diversify local economic base.

Supporting evidence:	Annex 1.6 – Environmental Assessment, Stantec, September 2020

Initial drinking water quality considerations and risk assessments

For both potable and raw transfers it is feasible to meet all drinking water quality requirements, and meet customer acceptability expectations subject to appropriate management and interventions in the downstream network.

[2] http://www.energyforlondon.org/thames-tideway-tunnel-energy-and-carbon-footprint/

Potable Transfer

For a potable transfer from Cheddar Two Reservoir, a new treatment works is required as the existing works would be fully utilised at times of peak demand. Furthermore the existing works uses slow sand filters which would not be sufficiently flexible with regard to rate of change of flow. For preliminary design it has been assumed that the new Cheddar Two reservoir, which will be filled from the same springs, will have similar raw water quality characteristics to Cheddar One.

The new West Country North water treatment works has been sized to treat up to 16 Ml/d of raw water. The main treatment stream consists of clarification (either dissolved air flotation or Actiflo) and rapid gravity filtration for removal of the turbidity and colour, ultra-violet irradiation for *Cryptosporidium* inactivation, and a contact tank for chlorine disinfection. The wastewater treatment stream consists of wash water balancing, a lamella settler, continuous thickener and sludge pressing to provide a sludge cake for disposal off site. A new site with a footprint of approx. 8,000 m^2 will be required complete with ancillaries such as roads and electricity supply.

Raw Water Transfer

For a raw water transfer, the ability of the existing processes at Testwood to treat this new source of raw water has been assessed. Following storage in Testwood lakes, the existing process stream consists of Powdered Activated Carbon dosing, clarification (including polymer and ferric sulphate dosing), filtration, chlorine disinfection, ultra-violet irradiation, and final water conditioning with phosphate dosing. High level Water!Pro™ modelling demonstrated that treating Cheddar One reservoir water quality through the existing Testwood process would result in an increased risk of discolouration events in the network. This can be partially mitigated through pH correction at Testwood.

To enable treatment of raw water from Cheddar Two Reservoir at Testwood, the following additional works will be necessary:

- improvement and maintenance of Testwood Lakes to ensure availability of the full balancing capacity and to reduce algal blooms
- implementation of pH correction at clarification and in the final water to mitigate against variable alkalinity anticipated in the Cheddar Two reservoir
- improvement or replacement of the existing disinfection process.

Development of Drinking Water Safety Plans

An initial assessment of the hazards in Cheddar One reservoir raw water in conjunction with the Testwood WTW process stream indicated that the main residual

risks would be geosmin and MIB, as for the new water treatment works, but in addition microbiological parameters, due to hazards identified within the existing Testwood treatment process. The drinking water safety plan would be developed further at Gate 2, once a preferred option is identified.

Water quality hazards associated with the potable transfers have also been assessed. The principal risks relate to the downstream distribution system fed from Testwood WTW, which is SRN's responsibility and excluded from the project scope.

Engagement

The solution has been discussed with company Drinking Water Quality teams. A detailed briefing was held with the DWI on 30 June 2020, with positive feedback on the approach that had been taken. DWI confirmed that the assessment approach was met their guidance, which was issued on 29 June 2020. Regular liaison would continue through Gate 2.

Supporting evidence:	Annex 1.4 – Water Treatment, Stantec, September 2020 Annex 1.5 – Networks Water Quality, Stantec, September 2020

6. Initial outline of procurement and operation strategy

Sub-options 1 and 2 would be suitable for Direct Procurement for Customers (DPC) and there are other procurement models that could also be used. It is considered that sub-options 3 and 4, which involve considerable interaction with existing assets and operations would not be suitable for DPC.

However it is considered to be too early in the project feasibility assessment to be definitive on the preferred method of procurement and ownership and operation.

Alternative procurement models

The scheme is complex with multiple assets to be constructed across a wide geographical area. Several procurement options are possible for delivery of such a scheme and they could be adopted as either a single procurement option strategy or as a mixed programme procurement model to suit the risk parameters. Potential procurement models include:

- Direct Procurement for Customers (DPC) option. The scheme would meet the PR19 DPC criteria, based on the project value criteria.
- The model adopted for Havant Thicket reservoir
- External market tender engagement options.
- The use of existing Water Company framework supply chains.

Risk allocation

However the most significant issue is the balance of risk between the recipient and the donor/transmission companies.

BRL remain concerned that the current DPC model suggested by Ofwat transfers risk to BRL customers, and as this appraisal shows there is no benefit to BRL customers obvious from Cheddar Two reservoir. Therefore the procurement model requires the interaction with bulk supply charges to be explored. BRL have suggested a remit to Ofwat for such a project. Similar issues apply to WSX as the "transmission" company.

Supporting evidence:	Annex 1.10 – Procurement Strategy. Stantec September 2020

7. Planning considerations

The key objective is to ensure a flexible, structured and robust approach to obtaining and implementing the planning consent as well as ensuring adequate provision is made for repair and maintenance of the scheme once operational. A summary of the status of the planning permission for Cheddar Two reservoir and an outline of the possible planning routes for the scheme are given in the following sections.

Cheddar Two reservoir

Outline design and environmental assessment for a second reservoir at Cheddar and its associated works were completed by BRL in 2013. Planning permission was granted by Sedgemoor District Council on 10 November 2014, subject to 40 planning conditions and a Section 106 agreement. One of the conditions of the permission is that development commences within seven years i.e. no later that 10 November 2021.

The Section 106 agreement requires extensive pre-commencement works, which cannot be completed by the expiry date. Therefore the current planning permission will lapse.

For the scheme to proceed it would be necessary to submit a new planning application. The new planning application would require an updated Environmental Impact Assessment, consultation with local communities and additional ecological and hydrological surveys. Until a preferred sub-option for the overall scheme and planning strategy (refer to next section) is selected it is not possible to develop the scope and programme for these additional studies, engage with local communities or discuss the project with the planning authority.

Planning route

The scope of the development is described above. It will also include

- provision for environmental and community mitigation
- enabling and associated development (to be determined), including temporary and permanent works for construction and operational phases.

National policy and legislation includes:

- Draft National Policy Statement for Water Resources Infrastructure (NPS), November 2018
- The Infrastructure Planning (Water Resources) (England) Order 2019. This introduces a threshold such that water transfer schemes with deployable output > 80 Ml/d fall within the NPS regime. As the scheme is below the NPS threshold, it would be necessary for the promoter to apply for a s35 direction for the project to be considered under the Planning Act 2008 thereby benefitting from the weight of the NPS.

There are two principal consent routes: DCO vs TCPA (plus Permitted Development). A brief summary of the DCO approach is given below, followed by a discussion of the two approaches. It is considered too early in the project lifecycle to make a recommendation on the preferred route. However a DCO route is most likely for sub-options 1, 2 and 4; a TCPA approach could be considered for sub-option 3.

The main features of the DCO route are:

- Equivalent of planning permission, under the Planning Act 2008
- Bundled consent for nationally significant infrastructure projects (NSIPs)
- Compulsory if project qualifies as an NSIP
- Designed to simplify and speed up the authorisation process for NSIPs
- Reduces the number of separate applications and permits required
- Reduced statutory timeframe for faster decisions
- The ‘front-end loaded’ consent process seeks to avoid historical issues of lengthy (and costly) delays during consideration of the application.

Comparing the two approaches of DCO versus TCPA:

- DCO provides certainty and ‘positivity’ in process (NPS settles the need case, post application timetable guaranteed, high success rate for projects with NPS backing, all consents obtained at one time)

- DCO is flexible - scheme flexibility permitted as experience is growing (NIPA, PINS best practice) and wide interpretation of what is 'associated development'
- DCO is resource hungry - due to often lengthy front-end loaded process (although it is being streamlined as it matures):
    - Pre-application consultation on how the applicant intends to consult
    - Pre-application consultation on scheme and preliminary environmental information
    - Details of construction, design and delivery of mitigation required prior to submission
- Novelty - experience still being gained on implementing DCOs vs 'traditional' hybrid TCPA (note precedents e.g. HARP, TT and others)
- Potential for dis-engaged/dis-empowered local planning authorities and other stakeholders – DCO still largely unknown quantity (<90 DCO schemes granted to date)
- Needs early contractor involvement in design/planning process to ensure flexibility in delivery.

Supporting evidence:	Annex 1.6 – Environment Assessment, Stantec, September 2020 Annex 1.7 – Planning Strategy, Stantec, September 2020 Annex 1.11 – Planning review of Cheddar Two reservoir, September 2020

8. Stakeholder engagement

This section summarises the stakeholder engagement and customer research that has been carried out for Gate 1.

Stakeholder engagement

Stakeholder engagement on the project in 2020 includes:

- Environment Agency. Project specific meetings in July and August 2020
- Natural England. Project specific meetings in July and August 2020
- Drinking Water Inspectorate. Project specific meetings in July 2020
- West Country Water Resources Group (Regional Group attended by BRL, WSX, South West Water, Environment Agency with affiliates including Southern Water, Water Resources South East and others). Regular briefing on progress at steering group and Board meetings
- West Country Water Resources Group engagement day in January 2020. Overview briefing.

Customer research

Southern Water are running a major customer engagement exercise for Water for Life – Hampshire that commenced in November 2019. It is focussed on the attitudes of their customers, the recipients of the water from the Strategic resource options. For their WRMPs the West Country water companies have carried out various customer research projects, but the previous research did not cover the attitudes of customers in the donor areas to transfers out of area.

Thus the need to understand customer attitudes to the project and specifically inter-region water transfers was identified, but in a way that was achievable within the short accelerated Gate 1 timescale. At the meeting with RAPID in May 2020 it was agreed to carry out the Gate 1 customer research using online customer panels. The survey questionnaire, which included six questions, was developed jointly with SRN.

3,483 invitations were sent out to members of WSX's on-line panel on 3 July 2020 and a total of 841 panel members completed the survey by 20 July 2020. For BRL's panel 2,100 invitations were sent out and 908 panel members completed the survey by the closing date on 21 August 2020.

The results are summarised below:

Wessex Water

- When asked to what extent they agreed with a list of statements about water sharing 80% of agreed (either strongly agreed or agreed) that *it makes sense to share water between companies*. 23% thought that *water sharing will impact on the local environment*, 16% that *water sharing will lead to a water shortage in the local area* and just 12% that *it would impact on the quality of drinking water*
- Regarding transferring surplus water within the Wessex Water region 78% agreed (either strongly agreed or agreed) with transferring surplus water within the Wessex Water region. Just 4% disagreed.
- Finally, when asked to what extent they agreed with transferring surplus water to neighbouring water companies. 64% agreed (either strongly agreed or agreed) with transferring surplus water to neighbouring water companies. Just 8% disagreed.

Bristol Water

- 53 % of the customers surveyed agreed with the concept of transferring water from Bristol Water to other regions. 19% of customers said they disagreed with water transfers with 28% neither agreeing nor disagreeing.
- Customers who agreed explained their response was due to the potential for improved infrastructure, reduction in bills and that it's the right thing to do.

Customers however were cautious of the potential impact on customers own supply and the quality of this supply. There was additional support for a wider 'National network' of water supplies.

- Customers who disagreed in principle to water transfers disagreed because of problems with current infrastructure, such as high levels of leakage, the potential impact on quality and availability of their own supply, the potential negative environmental impacts and financial burden to the customer. There was also a belief amongst a number of customers that a transfer network was open to misuse and abuse by companies who were not efficiently managing their own wastage.

Subject to the outcome of Gate 1 the next stage of research would be broader qualitative and quantitative research, potentially carried in the winter and spring of 2021, tied in with regional planning needs.

Supporting evidence:	Annex 1.12 – Stakeholder engagement and Customer Research, September 2020

9. Key risks and mitigation measures

Key risks to the solution achieving its strategic objectives, some of which have been highlighted in the quarterly dashboard reports, are summarised in Table 9.1 below. The project risk register in Annex 1.9 sets out key assumptions and key risks; the risks are categorised with current and residual scores after mitigation on a 5 x 5 basis.

Table 9.1 – Key risks and mitigations

Project area	Key risk	Mitigation
Water resource benefit	Water resource availability and Cheddar Two refill characteristics. Better understanding of likely operating regime.	Further analysis at Gate 2.
Environmental impact	LSEs cannot be mitigated to satisfaction of stakeholders	Further development of the SEA and HRA at Gate 2.
Water quality	Discolouration events in distribution Algal blooms in Testwood lakes	pH correction, treatment enhancements to be assessed further at Gate 2
Design	Transmission routes, site locations, operating regimes.	Further development of the design at Gate 2, once a preferred sub-option is selected.
Land and planning	Cheddar Two planning and land acquisition. DCO planning.	Engagement with planning authorities Finalise planning route strategy
Cost	In addition to normal construction risks such as ground conditions, unforeseen services and design development, 23 separate risks are included on the risk register.	Comprehensive management of the risk register. Risk allowance factored in the cost estimate.

Project area	Key risk	Mitigation
Programme	The project plan includes 67 separate assumptions and dependencies.	Comprehensive management of the schedule. Programme risk allowance factored in the project plan.

Supporting evidence:	Annex 1.9 – Project Risk Register, Stantec, September 2020 Annex 1.1 – Project plan, Stantec, September 2020

10. Option cost/benefits comparison

The project meets the requirements of the Environment Agency's National Framework, published in March 2020 insofar as the National Framework encourages regional groups to consider inter-regional transfers and supports the development of the Strategic Resource Solutions.

It is not possible to state how the scheme fits in with Regional plans (West Country Regional Plan and Water resources in the South-East Regional plan) because these plans will not be available until 2021.

The Gate 1 feasibility has concentrated on whether the solution has the potential to assist in meeting SRN's supply-demand balance challenge. A review of potential wider resilience benefits or benefits for other sectors can be carried out in Gate 2. This could include an assessment of the benefit of having a resource, remote from other Hampshire supply sources, that might provide more resilience to shocks as well as improved drought resilience by the likely lower coincidence of droughts between the locations.

The comparison of this scheme with other schemes being considered to address the needs of Southern Water's Western area is set out in a separate Summary report, as agreed with RAPID at the July 2020 progress meeting. In order that solutions can be compared objectively consistent methods have been used for the assessment of water resources, drinking water quality, cost and risk and environmental impact.

Supporting evidence:	Southern Water Strategic Resource Options, Summary report, September 2020, and supporting technical annexes

11. Impacts on current plan

The impact of this scheme on Southern Water's current WRMP is discussed in detail in a separate Summary report, as agreed with RAPID at the July 2020 progress meeting.

Supporting evidence:	Southern Water Strategic Resource Options, Summary report, September 2020, and supporting technical annexes

12. Assurance

Assurance

The final determination and the report template provided by RAPID calls for external assurance of the quality and consistency of data and approaches used in preparation of the submission, as well as evidence of efficient cost expenditure.

In addition to internal review and sign-off by the team responsible for each workstream and document, a review group from the wider programme team and internal experts from the companies has reviewed the key deliverables.

Jacobs, as independent third party external assurers, have reviewed the Gate 1 report and the supporting annexes. For Gate 1 the extent and depth of the reviews are proportionate given the very early stage of the scheme development. In addition BRL appointed Atkins as external assurers of the Gate 1 report to support their Board statement. The assurance relates to the stand-alone submission on this scheme only.

Based on the approach outlined above, and supported by independent external assurance, each company assures that:

- the data and approaches used to develop the preliminary feasibility assessment in the Gate 1 submission meet the requirements set out in Ofwat's Final Determination
- the information has been appropriately reviewed to provide trust and confidence in the submission.

In addition, RAPID have asked Southern Water to provide a statement about the current hierarchy of the solutions and the impact on their approved WRMP. This is covered in a separate Summary report, as discussed with RAPID at the July 2020 progress meeting. This separate report, which has been prepared by Southern Water, has not been covered by external assurance on behalf of BRL and WSX, nor will it be subject to a Board statement from BRL and WSX.

Board statements

The Board statements from each company are included in Annexes 1.22 to 1.24.

Each partner company provides a Board statement tailored to reflect the extent of external assurance from their assurers and their potential role in the solution.

Supporting evidence:	Annex 1.21 – Jacobs Assurance letter, September 2020 Annex 1.22 - Board statement – Bristol Water, September 2020

	Annex 1.23 - Board Statement – Southern Water, September 2020 Annex 1.24 - Board Statement – Wessex Water, September 2020

13. Solution or partner changes

There is no need to change any of the solution partners or substitute other solutions. The key roles of the solution partners are summarised in Table 13.1 below.

Table 13.1 – Roles of solution partners

Partner	BRL	SRN	WSX
SRO Funding allowance split	40.9%	29.6%	29.6%
Role	Water resource from Cheddar Two Use of existing abstraction licence	Recipient of the water Mitigation measures in the downstream treatment works and distribution system	Transmission Project manager for the Gate 1 feasibility study

Supporting evidence:	Not applicable

14. Efficient spend of gate allowance

Expenditure on the Gate 1 feasibility study has been delivered efficiently, because:

- Work has only been undertaken on activities included in the list of gate activities in the FD appendix
- The three largest packages of work have been based on defined scopes of services awarded through framework agreements that were competitively tendered, and cross-checked against similar commissions. These packages are the technical consultancy contract and the two assurance consultancy appointments. All packages have defined deliverables and key dates.
- Project management and scheme partner in-house staff costs are based on actual and forecast staff time (hours) and rates, with defined scopes and budgets which are subject to regular reviews.

A summary of the costs is given in Table 14.1 below. Allowances are included for the estimated contribution to the Environment Agency's National appraisal unit (NAU) and for the Discretionary Advice Service (DAS) agreement with the Natural England, which were not expected at the time of the final determination but have subsequently been advised to be part of the Gate 1 costs.

Table 14.1 – Efficient costs

Description	Cost £m	Comments
Gate 1 allowance @ 2017/18 prices	0.492	10% of total allowance
Gate 1 allowance @ 2020/21 prices	0.515	Inflated using CPIH index. There is uncertainty about the forecast index value for 2020/21 (109.1), and the calculation should be revisited once the actual index value for 2020/21 is published.
Forecast Gate 1 costs Partners and consultants	0.474	Based on actuals to the time of writing plus a forecast to 28 Sept 2020
Variance	0.041	Forecast expenditure is 8% less than the allowance on a like for like basis
EA NAU & NE DAS	0.025	Contribution to EA's National appraisal unit (NAU) and a Discretionary Advice Service (DAS) agreement with NE
Total Gate 1 cost forecast	0.499	
Forecast Gate 2 costs	0.750	
Gate 3 and 4 allowances @ 2020/21 prices	3.863	

Supporting evidence:	Annex 1.13 Efficient spend of Gate 1 allowance

15. Proposed Gate 2 activities and outcomes

Each of the supporting annexes sets out the scope of further work to resolve issues that could not be addressed in the short timescale of this study. Subject to whether the scheme proceeds to Gate 2, for completeness, a summary of potential Gate 2 activities is given in Table 15.1 below. It would be necessary to settle on a preferred sub-option beforehand.

Table 15.1 – Key Gate 2 activities

Workstream	Further data collection	Further analysis
Water resources	Spring flow and hydrometric data. Testwood Lakes design data	Cheddar Two refill characteristics and integrated operation of the reservoir. Use of storage at Testwood Lakes
Water quality – treatment, network	Further water quality data Blending scenarios INNS data	Optioneering for Water treatment works Development of Drinking water Safety Plans
Transmission	Site visits Design standards GIS data, third part and existing infrastructure	Concept design Sweetening flow arrangements
Environmental assessment	Strategic development allocations	SEA+ - Assess likely effects HRA incl. in combination effects Natural capital and net environmental gain. Net benefit assessment
Cost & Risk	Based on updated concept design Risk management	Updated costs and risk
Project plan	Site visits	Updated project plan
Consenting	Scope of works from other workstreams	Updated consenting strategy Engagement with planning authorities
Procurement	Scope of works from other workstreams	Engage on potential procurement strategy
Stakeholder engagement and customer research	Definition of the solution	Detailed engagement Qualitative and quantitative customer research

The outcome of the Gate 2 activities is anticipated to deliver all of RAPID's requirements without any quality or delay penalties.

Supporting evidence:	Annex 1.1 – Project plan, Stantec, September 2020 Annex 1.2 – Water Resources and Operational Strategy, Stantec, September 2020 Annex 1.3 – Transmission System, Stantec, September 2020 Annex 1.4 – Water Treatment, Stantec, September 2020 Annex 1.5 – Networks Water Quality, Stantec, September 2020 Annex 1.6 – Environmental Assessment, Stantec, September 202 Annex 1.8 – Project Capex/Opex Estimation, Stantec, September 2020

16. Appendix A - List of supporting documents

Annex ref.	Title
1.1	Project Plan
1.2	Water Resources and Operational Strategy
1.3	Transmission System
1.4	Water Treatment
1.5	Networks Water Quality
1.6	Environmental Assessment
1.7	Planning Strategy
1.8	Project Capex/Opex Estimation
1.9	Project Risk Register
1.10	Procurement Strategy
1.11	Planning Review of Cheddar Two Reservoir
1.12	Stakeholder Engagement and Customer Research
1.13	Efficient Spend of Gate allowance
1.14 – 1.20	Not used
1.21	Jacobs Assurance letter
1.22	Board statement – Bristol Water
1.23	Board Statement – Southern Water
1.24	Board Statement – Wessex Water

17. Appendix B - Gate 1 deliverables checklist and navigation

Ref.	Gate 1 activities	Relevant section in Gate 1 report	Supporting document
1	Preliminary solution feasibility and data collection presented in a conceptual design report, using comparable methodologies and consistent assumptions:	Sections 2 and 4	Annexes 1.2, 1.3 & 1.4
1.1	Initial configuration/sub-option solution designs	Section 2	Annex 1.2
1.2	Initial costing and estimating report supported by benchmarking evidence	Section 4	Annex 1.8
1.3	Initial water resource benefit	Section 2	Annex 1.2
1.4	Initial data available and provided to regional groups to support high-level assessment of regional water resource benefit	Section 10	Not applicable
1.5	Initial option-level Strategic environmental Assessment and Habitat Risks Assessment , including consideration of in-combination effects and identification of environmental risk that need mitigating through solution design and costing	Section 5	Annex 1.6
1.6	Initial environmental, social and economic valuations (or metric benefits) consistent with principles in the National Planning Statement and Water Resource Planning Guidelines	Section 5	Annex 1.6
1.7	Initial drinking water quality considerations	Section 5	Annexes 1.4 & 1.5
2	Initial outline of the solution procurement strategy	Section 6	Annex 1.10
3	Initial considerations of the planning application route (high level review of process and timelines)	Section 7	Annex 1.7
4	Initial comparison of solutions' costs and benefits in early draft regional plans with consideration given to inter-regional supply options and system impacts	Section 10	SRN Summary report, and supporting technical annexes
5	External assurance of data and approaches supported by Board statement	Section 12	Annexes 1.21 to 1.24
6	Regional stakeholder engagement including customer preferences to identify any issues that need further investigation	Section 8	Annex 1.12
7	Details of efficient spend to gate submission on gate one activities, including a breakdown of coast against activities, evidence of efficiency of spend (benchmarking or tenders and assurance	Section 14	Annex 1.13
8	Assessment of key risks to identify potential regulatory barriers, guidance or changes required for the solution to progress	Section 9	Annex 1.8
9	Identify impacts on current supply-demand balance delivery plan with simple comparisons to current programme solutions	Section 11	SRN Summary report and supporting technical annexes
10	Identification of any changes in solution partner (other water company) or solution substitutions	Section 13	n/a
11	Develop solution programme plan to determine activities that need to be undertaken prior to each subsequent gate	Section 15	Annex 1.1
12	Proposals for gate two activity and outcomes, and penalty scale, assessment criteria and contributions	Section 12	Annexes 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.10, 1.12