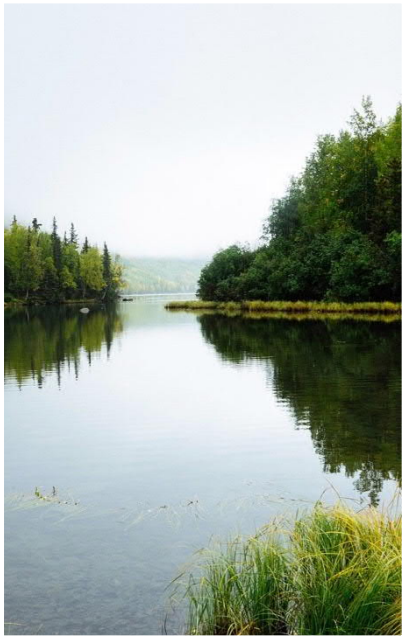

Method Statement: Multi-sector Approach

November 2022

Title	Method Statement: Multi-sector Approach
Last updated	November 2022
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History of changes made to this version	Updating method to reflect approach for the draft regional plan
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Executive Summary

Water Resources South East (WRSE) is developing a multi-sector, regional resilience plan to secure water supplies for the South East until 2100.

We have prepared Method Statements setting out the processes and procedures we will follow when preparing all the technical elements for our regional resilience plan. We consulted on these early in the plan preparation process to ensure that our methods are transparent and, as far as possible, reflect the views and requirements of customers and stakeholders.

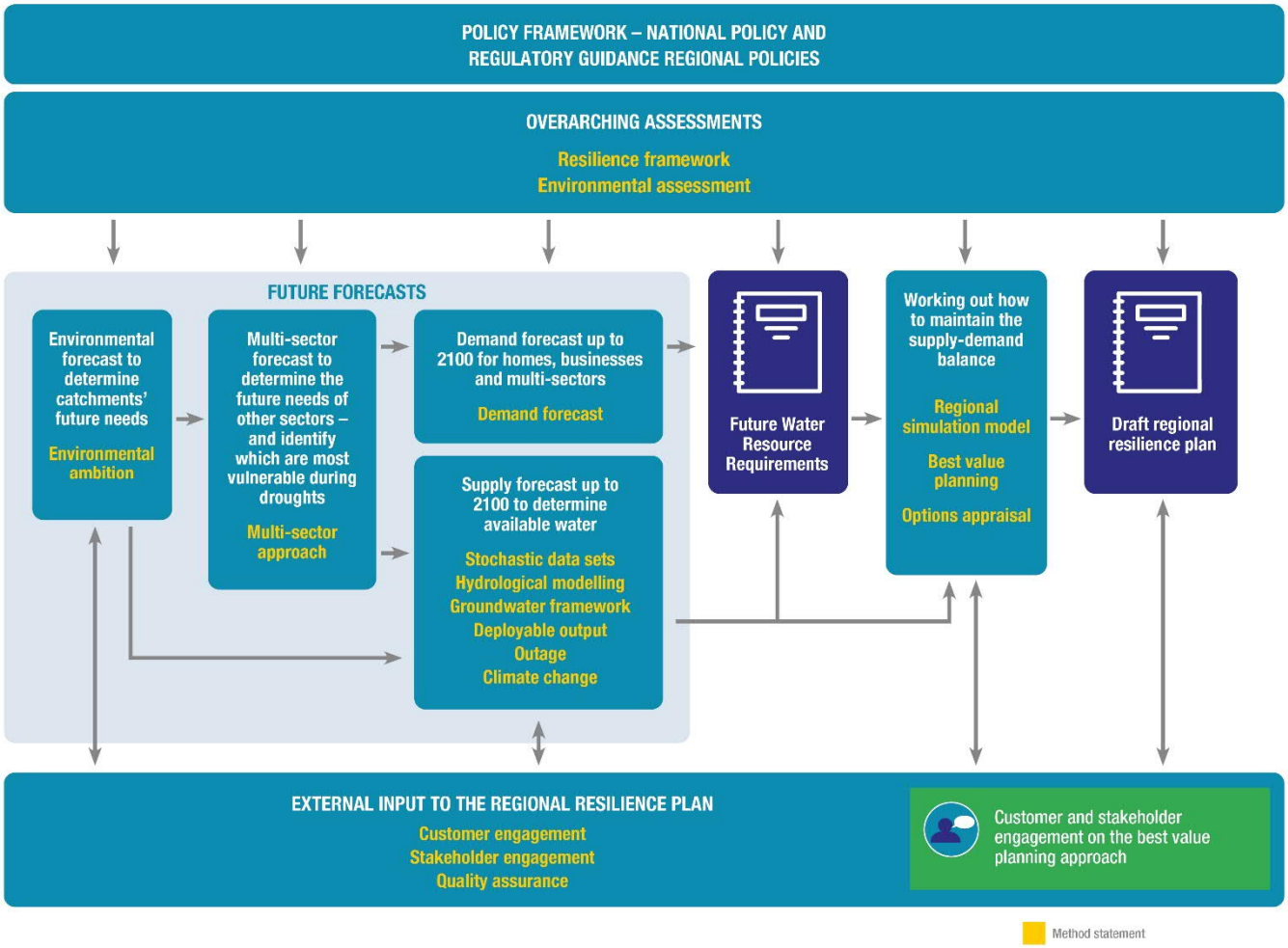
Figure ES1 illustrates how this multi-sector approach Method Statement will contribute to the preparation process for the regional resilience plan.

The water industry has planned for the potential requirements of industry, which are connected to their supply systems, based upon a range of economic and growth forecasts for the region. The Environment Agency's National Framework for Water Resources set the requirement for regional plans to consider the long-term water needs of other sectors, therefore enhancements were needed to the approach so they could be integrated into the development of the plan.

The enhancements will look at what additional water resource requirement might be required for the future to meet the needs of other sectors, what potential options there are and how the plan could improve the resilience of water supplies for all users within the region.

This Method Statement sets out how we will incorporate the key multi-sector requirements into our regional plan.

Figure ES1: Overview of the Method Statements and their role in the development of the WRSE regional resilience plan



1 Introduction

Background

1.1 Water Resources in the South East of England (WRSE) is one of five regional groups developing a regional plan. Our draft regional plan will be consulted on in November 2022 alongside the draft Water Resources Management Plans (WRMPs) produced by water companies. The National Framework for Water Resources set the requirement for regional plans to take a multi sector approach so the future water needs of sectors that have their own water supplies are considered in a more integrated way.

1.2 WRSE has committed to developing a multi-sector, regional resilience plan to achieve this. For the first time, we will consider the future water needs of other sectors and a more diverse range of solutions which could benefit other sectors, the environment as well as the water companies. We will also develop an improved understanding of how resilient some of the sectors are to events now and in the future, and how this could change as a result of the implementation of our regional plan.

1.3 This overall approach was originally set out in our Regional Multi-Sector Resilience Plan document, which we launched at a stakeholder event in September 2019. Since then, we have continued to develop the methodologies and approaches we will use. The purpose of this method statement is to set out our proposed multi-sector approach which will be used for the development of our regional plan.

1.4 For the purpose of our regional plan, the multi-sector group is defined as the industries which have a licence, or an equivalent legal permission, to abstract water from the environment in order to support their manufacturing or specific activity requirements.

1.5 We have established a multi-sector stakeholder group comprising representatives from these sectors to support and inform our work. Please see the Stakeholder Engagement Method Statement for more details on the remit of this group (Method Statement 1327 WRSE Stakeholder Engagement).

2 Multi-sector approach

2.1 To develop a regional assessment of the future water requirements it is important to understand how much water is required for the public water supply system and the other sectors over the planning period and how much water will be available from the environment to support these requirements. The difference between the requirements and the availability provides an indication of the scale of the challenge in the future.

2.2 Just like the water industry, several other industries in the South East of England abstract water from the environment. The National Framework set out the volumes of water that are currently abstracted through a number, but not all, of these abstractions. Industries such as trickle irrigators and navigation authorities (such as the Canal and Rivers Trust) also abstract water from the environment however these abstractions are not currently included in the National Framework assessment report. Therefore, the volumes of water reported in the National Framework underestimate the amount of water, outside public water supply, that is currently abstracted each day and how much extra water may be needed in the future.

2.3 WRSE have worked with different non-public water supply (non-PWS) sectors to better understand the multi-sector demands in the South East of England.

2.4 Our approach to including these demands in our regional plan has included:

- Understanding the needs of non-PWS sectors, and forecasting these water demands in conjunction with the PWS demands;
- Assessing the impacts of droughts on the multi-sector demands;
- Identifying potential multi-sector options;
- Modelling the non-PWS demands and multi-sector options in our investment model

2.5 Our approach to the multi-sector demand forecasting, assessment of multi-sector demands in drought situations, and development of multi-sector options is laid out in the following sub-chapters.

2.6 Whilst we have developed this approach for the draft regional plan, we recognise that further work is needed before the final regional plan, and also moving forwards as we look at the development of the next regional plan. The proposed next steps are outlined in the final chapter of this Method Statement.

Multi sector demand forecasts

2.7 The future water requirements of other sectors are dependent on how much water they currently use; how much it is estimated that their requirements will change in the future, and how their sources may be impacted by extreme drought events.

2.8 Building on the work on non-public water supply (non-PWS) demands undertaken through the National Framework, we have updated the forecasts by working with the key sectors and using information from

the non-household (NHH)demand forecast developed by Artesia to better understand the range of potential future requirements for each sector in the region.

2.9 Some abstractors were not included in the National Framework forecasts, for example those who are currently exempt from licencing. It is anticipated that these abstractors could be brought under the abstraction licence regime in the future, including sectors and organisations such as the Canal and Rivers Trust and trickle irrigators. Estimates for these abstractions have been included in the WRSE non-PWS forecasts based on the voluntary abstraction data from these abstractors.

2.10 The anticipated growth rates of these sectors have been aligned, where possible, with the non-household growth forecast methodology used by water companies. Where non-PWS forecasts do not exist then additional expert advice through the multi-sector group has been sought to improve the forecasts. This has included a review of the NFU integrated water management strategy document and the potential power sector freshwater consumption report provided by Energy UK for the WRSE draft regional plan (see Appendix A).

2.11 The Artesia non-PWS demand forecasts looked at multi sector demands out to 2050. Through work with the stakeholder advisory and multi sector groups WRSE extended these demands linearly out to 2075. Further adjustments were made to incorporate increased demands for the power sector to match their licenced abstraction volumes, and to include a specific paper production demand.

2.12 It was envisaged that increased non-PWS demands could be met in three potential ways:

1. Using existing licence headroom to meet any increases in non-PWS demands;
2. Using existing licence headroom combined with new multi-sector options to meet specific increases in future non-PWS demands (for example, multi-sector demand management, increased farm storage, non-PWS recycled water schemes etc);
3. Accommodate any specific increases in non-PWS demand within a revised PWS solution, i.e. creating a multi-sector option from a PWS option. For example, abstractors on the River Thames could develop a multi-sector scheme to accommodate specific future increased non-PWS demands, with non-PWS contributions to scheme development costs.

2.13 The majority of the proposed future growth for non-PWS can be met within their current abstraction licence bounds in a normal year, therefore falling under the first option listed above.

2.14 There are, however, a number of point sources which have been identified which are likely to have increased demands in future which cannot be met with existing abstraction licence headroom.

2.15 Where new multi-sector options have been identified to meet these increased demands, options have been included in the WRSE investment modelling. Some non-PWS point demands, however, do not currently have a way to be met in future.

2.16 In these cases, the increases in non-PWS demand have been included in the WRSE investment model sensitivity runs to understand what PWS options would be required to meet the additional non-PWS demand. WRSE will be continuing to work with the multi-sector group to identify if it is possible to resolve

this demand using new multi-sector options, or by amending existing PWS options, i.e. the second or third options in the list above.

2.17 The table and graphs below show the non-PWS demand forecasts which have been developed in conjunction with the Multi-Sector Group, based upon the Artesia forecasts, but amended to include forecasts for the power sector from Energy UK and specific needs identified for the paper and pulp sector. It is recognised that there are potentially additional needs for the navigation sector, in particular to provide water supply for the restoration of the Cotswold Canals and specific multi-sector options are included for this.

Table 1: Forecast Non-PWS demands 2025-2070

Sector	2025	2030	2040	2050	2070
Agriculture (non spray irrigation)	16.16	16.28	16.52	16.77	17.26
Spray irrigation	29.07	31.01	34.95	38.89	46.74
Horticulture including trickle irrigation	32.01	33.73	38.04	42.35	50.63
Chemicals	1.81	1.87	2.00	2.13	2.39
Food and drink	0.70	0.72	0.78	0.84	0.95
Minerals and extraction	1.79	1.77	1.72	1.67	1.58
Navigation	0.01	0.01	0.01	0.01	0.01
Paper and Pulp	33.02	53.67	54.96	56.26	58.85
Power	4.00	11.70	24.20	38.20	38.20
Other*	45.75	51.65	51.44	51.24	50.83
Total	164.31	202.40	224.63	248.35	267.43

*Other includes environmental sites and other private users

Figure 1: Non-PWS Demand Forecast, total and per sector, 2025-2070

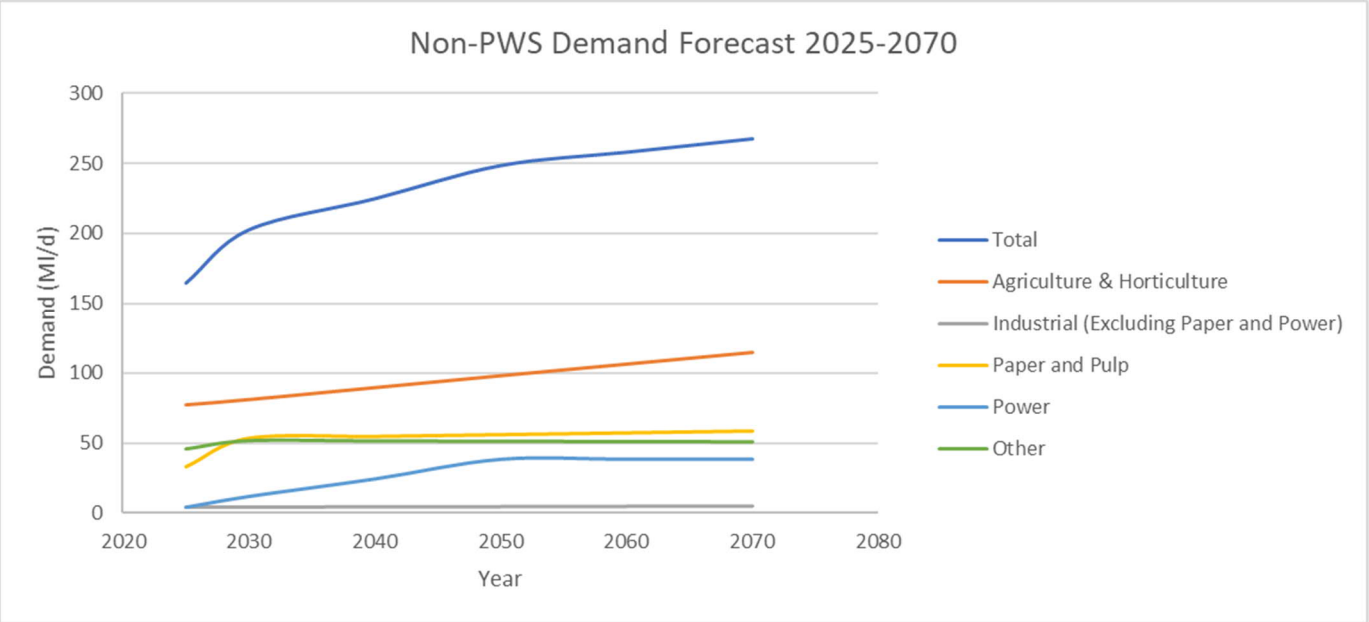


Figure 2: Non-PWS demands per sector in 2025

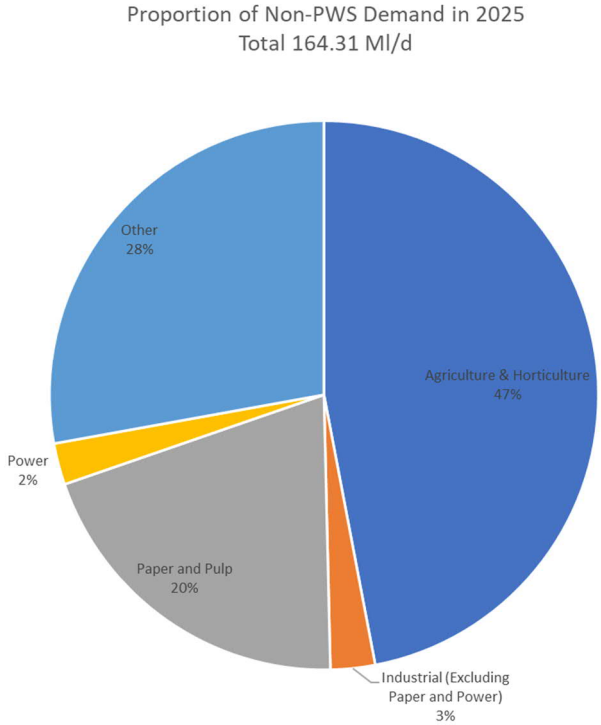
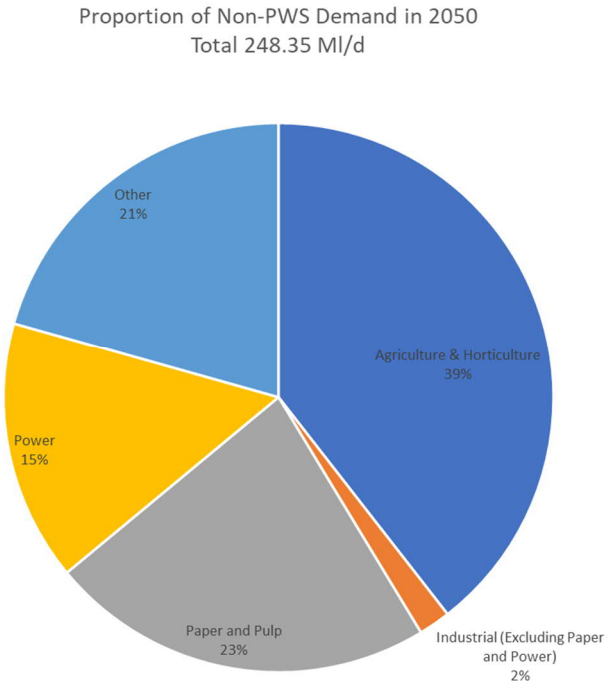


Figure 3: Non-PWS demands per sector in 2050



Water availability in droughts

2.18 Through the non-PWS demand forecasting approach outlined above, it was identified that the future demands of other water users can largely be met through their existing licences. This is, however, under normal year conditions.

2.19 The impacts of droughts on non-PWS demands have also been explored, with sensitivity testing of how demands could change in a 1:100 year scenario, and under an extreme drought scenario, i.e. a 1:500 year event.

2.20 The sensitivity testing has shown that there is no spare non-PWS capacity under an extreme drought scenario, and there would therefore likely be increased demands under these conditions. This is likely to have impacts on public water supply, particularly in the early years of the regional plan (up to 2040).

2.21 Further work is required to understand the multi-sector demands under different drought scenarios in collaboration with the multi-sector stakeholder group and regulators.

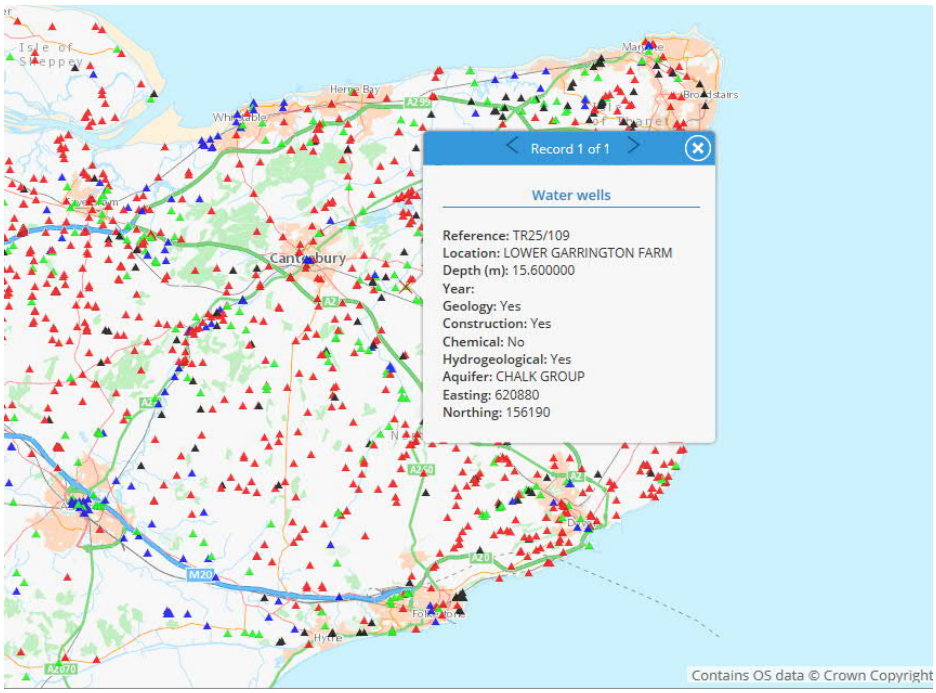
2.22 To try and understand the surface water abstraction vulnerabilities, WRSE has used the hydrological flow records generated through the methods outlined in the Method Statement 1330 WRSE Hydrological Modelling.

2.23 For an understanding of groundwater abstraction vulnerabilities, we have undertaken a screening exercise using a combination of well data, abstraction licence database and estimates of groundwater levels. Figure 1 shows an extract of the BGS geoindex. This database provides the coordinates, geology and depth information of groundwater abstractions.

2.24 The process for understanding the groundwater abstraction vulnerabilities includes:

- Correlating the BGS water wells layer with the licence data;
- Estimating the depth to water by reference to topographical data and regional groundwater model outputs for dry years, with a simple GIS processing exercise;
- Using any scaling from aquifer block indicator boreholes or from distributed regional groundwater modelling to estimate depth to water in severe/extreme drought and determining those where water level goes below the base or some fixed proportion of the well; and
- Identifying those wells at most risk of losing yield.

Figure 4: BGS geoindex



2.25 The initial results from the work on drought vulnerability of non-PWS groundwater abstractions demonstrates the need to consider non-PWS licences in long-term regional resilience planning. A significant number of non-PWS groundwater sources have been found to be at risk in an extreme drought scenario.

Multi-sector options

2.26 The options workstream is the central focus for capturing and holding the option set for the investment model. The water companies have already identified several multi-sector options within their plans and there are also several options which, if modified, could provide other sectors with a solution. There are also options which can provide solutions for the environment, multiple sectors and water companies.

2.27 All the options identified through the multi-sector stakeholder group have been passed through to the options workstream and shared across the other sector groups to get their views and comments on them.

2.28 Method Statement 1328 WRSE Options Appraisal sets out the processes WRSE is following to collate and screen these options in order to derive a set of options for our investment modelling.

2.29 An important step in the process, before we consider potential multi-sector options in the investment modelling, is to understand what level of resilience each sector wants to achieve. This is vital to understand, as there will potentially be a cost associated with improving resilience, which will need to be taken into account through future non-PWS plans. We recognise that this will likely need to be an iterative process which continues beyond this regional plan, as the costs of achieving different levels of resilience are shared, and the sectors in question can therefore make an informed choice.

2.30 We also recognise that some multi-sector options will need to be incorporated into the regional plan at a catchment level and will need to be integrated into existing catchment option and nature based solution development work by WRSE and member water companies.

3 Multi-sector engagement

3.1 The investment modelling Method Statement and the resilience framework set out the process we will follow to derive a regional plan. Along this journey it will be critical to discuss, iterate and assess the benefits different solutions can provide the various sectors and the environment.

3.2 This iterative, collaborative process will take time which is why we have built into our overall programme several months in 2021 to go through these stages with the specific groups, stakeholders and customers (see Method Statement 1327 WRSE Stakeholder Engagement and Method Statement 1326 WRSE Customer Engagement).

3.3 The emerging regional multi-sector plan was consulted on in early 2022. Following this process, we have reviewed the comments and revised the plan appropriately. The plan sets out the portfolio of options that will be required to be delivered over the short, medium and long term and suggests the likely delivery mechanisms, sectors or third parties who could implement the solutions.

3.4 During the sensitivity testing stage of the draft regional plan, we have also tested a number of scenarios to determine what would happen if some parts of the plan are not delivered by third parties or other sectors to identity alternative plans should economic circumstances limit the ability of other sectors to deliver certain parts of the plan.

3.5 The draft regional plan will be published in November 2022, and we will be engaging further with multi-sector stakeholders as part of the planned consultation.

4 Next steps

4.1 Whilst WRSE have worked to integrate the needs of multiple sectors into our draft regional plan, there is significant further work which can be undertaken to improve our understanding of non-PWS demands, vulnerabilities and options in future.

4.2 Between the draft and final regional plans, we will continue to engage with WRSE stakeholder and multi-sector groups to better our understanding of non-PWS demand forecasts, potential multi-sector options, and drought impacts on non-PWS sources.

4.3 WRSE will also continue to work with stakeholder and multi-sector groups and regulators to specifically understand the impacts of proposed licence capping regulations on non-PWS abstractions.

4.4 Energy UK have provided WRSE with updated future power needs for the South East (see Appendix A), which follows a consistent approach which has been used for all the regional groups. Further discussions are required with stakeholders and power and water regulators to understand potential commercial sensitivities and anti-competition laws to progress the development of multi-sector options in the South East.

4.5 NFU are working closely with Water Resources East (WRE) on a number of pilot schemes, given the agriculture demand in the East of England is much greater than elsewhere in the country. WRSE will continue to work with the NFU to look at the agricultural demands in the South East, and WRSE are supportive of NFU ambitions for the development of a national agricultural water framework.

4.6 In general, limited increases are expected in water demands for the navigation sector as the level of service requirements for navigation mean that in a severe drought navigation may be restricted, however specific potential needs have been identified by the Cotswold Canals Trust and the Basingstoke Canal Authority and further engagement is needed to improve understanding of needs and potential solutions.

4.7 In the development of multi-sector options, WRSE will continue to facilitate discussions around risks and commercial implications for schemes.

Changes to our Method Statement

4.8 Following the publication of WRSE's emerging regional plan and the subsequent consultation, further changes to our approach have been made. This method statement has been updated to reflect those changes which have been adopted for the draft regional plan, which is due to be published for consultation in November 2022.

4.9 If any other relevant guidance notes or policies are issued, then we will review the relevant method statement(s) and see if they need to be updated.

4.10 When we have finalised our Method Statement, we will ensure that we explain any changes we have made and publish an updated Method Statement on our website.

4.11 We will update our website with relevant information from time to time to ensure that as new information comes forward stakeholders are kept informed.

Appendix A

Potential power sector freshwater consumption report provided by Energy UK (September 2022):

All water use requirements in this document are annual freshwater requirements, reported in units of Ml/day. All data tables in this document are for the whole WRSE region.

FES21 are the four Future Energy Scenarios produced by National Grid ESO in 2021. Each of the four scenarios represents a credible pathway for the development of energy from today to 2050. No probabilities are attached to the scenarios.

The JEP has rerun the JEP power-water model[1] with FES21 scenarios for the modelled sites that sit within the WRSE boundary. The JEP model[2] is run many times, using a Monte Carlo approach, with each replication representing a power sector that meets the energy production implied by the FES scenario being modelled. This modelling approach is necessary for the energy sector because it is a competitive market without central planning. The model then aggregates the individual Monte Carlo replications to provide a 2.5th %ile, median and 97.5th %ile of the power freshwater consumption for each FES21 scenario. Table 1 presents the JEP model results for the WRSE freshwater consumption in 2050 by power (nuclear, combustion, hydrogen) for each of the four FES21 scenarios.

Table 1 Annual Freshwater consumption in 2050 in WRSE Region for combustion + nuclear + hydrogen

Freshwater in Ml/day	Steady Progression	System Transformation	Consumer Transformation	Leading the Way
2.5th %ile	0.0	0.0	0.0	0.0
Median	0.0	7.9	9.2	14.8
97.5th %ile	1.6	28.6	31.1	38.2

WRSE also requires projected annual freshwater use from today to 2050 for the power sector in the WRSE region. Table 2 reports annual values (for each year and statistic, the greatest value obtained under the four considered FES21 scenarios is taken) for the 2.5th %ile, median and 97.5th %ile of the modelled freshwater power consumption. Therefore Table 2 does not represent a specific single scenario, instead it gives an envelope of potential freshwater consumption by the power sector under FES21.

[1] See Scenarios for the Projection to 2050 of Water Use by Power Producers – updated using FES21 by A Moores, ENV/695/2021, available at https://www.energy-uk.org.uk/index.php/publication.html?task=file.download&id=8157, for a description of the model run for the whole of GB using FES21. This has been rerun to export results for sites in the WRSE region only.

[2] See Appendix B of Projections of Water Use in Electricity and Hydrogen Production, under the 2020 Future Energy and CCC Scenarios including BEIS 2020 lowest system coast analysis – with a focus on the East of England by U Gasparino & N Edwards, ENV/675/2021, available at https://www.energy-uk.org.uk/publication.html?task=file.download&id=7941 for details of the model.

Table 2 Projected Annual Power (Nuclear, Combustion, Hydrogen) Freshwater Consumption Envelope for FES21 Scenarios

Year	2.5th %ile (Ml/d)	Median (Ml/d)	97.5th %ile (Ml/d)
2023	0.8	2.8	4.8
2024	0.6	2.5	4.3
2025	0.5	2.3	4.0
2026	0.4	2.4	4.2
2027	0.5	3.0	5.1
2028	0.2	1.6	3.9
2029	0.0	0.9	8.7
2030	0.0	0.6	11.7
2031	0.0	0.7	13.2
2032	0.0	0.7	14.0
2033	0.0	0.8	15.2
2034	0.0	0.8	16.9
2035	0.0	0.6	17.3
2036	0.0	1.1	18.7
2037	0.0	1.6	19.8
2038	0.0	2.7	21.3
2039	0.0	3.9	22.8
2040	0.0	5.0	24.2
2041	0.0	6.0	25.8
2042	0.0	7.0	26.8
2043	0.0	7.8	28.3
2044	0.0	8.5	29.9

Year	2.5th %ile (Ml/d)	Median (Ml/d)	97.5th %ile (Ml/d)
2045	0.0	9.7	31.9
2046	0.0	10.6	33.2
2047	0.0	11.6	34.8
2048	0.0	12.6	35.8
2049	0.0	13.7	36.7
2050	0.0	14.8	38.2

It is important to realise these are projections based on the FES21 scenarios. Therefore actual water use in 2023, or any other future year, by the power sector could be greater than the 97.5th% in Table 2. The percentiles give the uncertainty related to which sites are used to generate electricity or hydrogen for a given demand profile and energy mix. The percentiles do not give the uncertainty associated with the weather, future demand, the generation mix, the economics of dispatch or government policy. Also the operational characteristics (e.g. water use per unit of electricity generated) of both existing and future plant in the model are drawn from a probabilistic distribution, rather than using the actual operational characteristics of existing plant, which are not publicly available.

There are currently limited freshwater power sites within the model in WRSE. WRSE is also assumed to be far from a carbon capture cluster (note this could change in a future version of the JEP model). Currently there are limited opportunities for the model to select WSRE sites for future hydrogen plant or combustion with carbon capture usage and storage (CCUS). If either a CO_2 pipeline were available for blue hydrogen (steam methane reforming with CCUS) or PWS were used for green hydrogen (electrolysis of water using renewables), there would be potential for consumption to be greater than that modelled.

Finally, just a reminder that future power and hydrogen production plant will require access to water and water rights to enable investment in the new plant and to ensure electricity system security and decarbonisation for the country as a whole, in a resilient, efficient and affordable way.